Power Generation

# Operator Manual

## Generator Set

### QSB7 Engine with PowerCommand® 1.1 Control

C125D6D (Spec A-B)
C150D6D (Spec A-B)
C175D6D (Spec A-B)
C200D6D (Spec A-B)

English
Original Instructions

4-2020

A056K985 (Issue 3)

**CALIFORNIA**
**Proposition 65 Warning**

**Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

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# 1 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during installation and maintenance of the generator set and batteries.

Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

## 1.1 Warning, Caution, and Note Styles Used in This Manual

The following safety styles and symbols found throughout this manual indicate potentially hazardous conditions to the operator, service personnel, or equipment.

| ⚠ DANGER |
| --- |
| ***Indicates a hazardous situation that, if not avoided, will result in death or serious injury.*** |

| ⚠ WARNING |
| --- |
| ***Indicates a hazardous situation that, if not avoided, could result in death or serious injury.*** |

| ⚠ CAUTION |
| --- |
| ***Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.*** |

| *NOTICE* |
| --- |
| **Indicates information considered important, but not hazard-related (e.g., messages relating to property damage).** |

## 1.2 General Information

This manual should form part of the documentation package supplied by Cummins with specific generator sets. If this manual has been supplied in isolation, please contact your authorized dealer.

| *NOTICE* |
| --- |
| **It is in the operator's interest to read and understand all warnings and cautions contained in the documentation relevant to the generator set operation and daily maintenance.** |

 

## 1.2.1 General Safety Precautions

**⚠ WARNING**

***Hot Pressurized Liquid***

***Contact with hot liquid can cause severe burns.***

***Do not open the pressure cap while the engine is running. Let the engine cool down before removing the cap. Turn the cap slowly and do not open it fully until the pressure has been relieved.***

**⚠ WARNING**

***Moving Parts***

***Moving parts can cause severe personal injury.***

***Use extreme caution around moving parts. All guards must be properly fastened to prevent unintended contact.***

**⚠ WARNING**

***Toxic Hazard***

***Used engine oils have been identified by some state and federal agencies to cause cancer or reproductive toxicity.***

***Do not ingest, breathe the fumes, or contact used oil when checking or changing engine oil. Wear protective gloves and face guard.***

**⚠ WARNING**

***Electrical Generating Equipment***

***Incorrect operation and maintenance can result in severe personal injury or death.***

***Do not operate equipment when fatigued, or after consuming any alcohol or drug.***

***Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.***

**⚠ WARNING**

***Toxic Gases***

***Substances in exhaust gases have been identified by some state and federal agencies to cause cancer or reproductive toxicity.***

***Do not breathe in or come into contact with exhaust gases.***

**⚠ WARNING**

***High Noise Level***

***Generator sets in operation emit noise, which can cause hearing damage.***

***Wear appropriate ear protection at all times.***

**⚠ WARNING**

***Hot Surfaces***

***Contact with hot surfaces can cause severe burns.***

***The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.***

**⚠ WARNING**

***Toxic Hazard***

***Ethylene glycol, used as an engine coolant, is toxic to humans and animals.***

***Wear appropriate PPE. Clean up coolant spills and dispose of used coolant in accordance with local environmental regulations.***

**⚠ WARNING**

***Combustible Liquid***

***Ignition of combustible liquids is a fire or explosion hazard which can cause severe burns or death.***

***Do not store fuel, cleaners, oil, etc., near the generator set. Do not use combustible liquids like ether.***

**⚠ WARNING**

***Combustible Gases***

***Generator sets in operation have combustible gases under pressure, which if ignited can cause eye and ear damage.***

***Wear appropriate eye and ear protection at all times.***

**⚠ WARNING**

***Combustible Gases***

***Generator sets in operation have combustible gases under pressure, which if ignited can cause severe injury.***

***Do not operate the generator set with any doors open.***

**⚠ WARNING**

***Fire Hazard***

***Materials drawn into the generator set, as well as accumulated grease and oil, are a fire hazard. Fire can cause severe burns or death.***

***Keep the generator set and the surrounding area clean and free from obstructions. Make sure the generator set is mounted in a manner to prevent combustible materials from accumulating under the unit.***

**⚠ WARNING**

***Automated Machinery***

***Accidental or remote starting of the generator set can cause severe personal injury or death.***

***Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).***

***NOTICE***

**Keep multi-type ABC fire extinguishers close by. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquid fuels and gaseous fuels. Class C fires involve live electrical equipment. (Refer to NFPA No. 10 in the applicable region.)**

 

**NOTICE**

**Before performing maintenance and service procedures on enclosed generator sets, make sure the service access doors are secured open.**

**NOTICE**

**Stepping on the generator set can cause parts to bend or break, leading to electrical shorts, or to fuel leaks, coolant leaks, or exhaust leaks. Do not step on the generator set when entering or leaving the generator set room.**

## 1.3 Generator Set Safety Code

Before operating the generator set, read the manuals and become familiar with them and the equipment. **Safe and efficient operation can be achieved only if the equipment is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

**⚠ WARNING**

***Electrical Generating Equipment***

***Incorrect operation and maintenance can result in severe personal injury or death.***

***Read and follow all Safety Precautions, Warnings, and Cautions throughout this manual and the documentation supplied with the generator set.***

## 1.4 Moving Parts Can Cause Severe Personal Injury or Death

- Keep hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect the battery charger from its AC source, then disconnect the starting batteries using an insulated wrench, negative (**–**) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps; keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts.
- If any adjustments must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

## 1.5 Electrical Shocks and Arc Flashes Can Cause Severe Personal Injury or Death

- Only qualified service personnel certified and authorized to work on power circuits should work on exposed energized power circuits.
- All relevant service material must be available for any electrical work performed by certified service personnel.
- Exposure to energized power circuits with potentials of 50 VAC or 75 VDC or higher poses a significant risk of electrical shock and electrical arc flash.

- Refer to standard NFPA 70E, or equivalent safety standards in corresponding regions, for details of the dangers involved and for safety requirements.

# 1.6 Fuel and Fumes Are Flammable

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

- Do not fill fuel tanks while the engine is running unless the tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- Do not permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will become brittle if continuously vibrated or repeatedly bent.
- Make sure all fuel supplies have a positive shutoff valve.
- Make sure the battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

## 1.6.1 Do Not Operate in Flammable and Explosive Environments

Flammable vapor can cause an engine to over speed and become difficult to stop, resulting in possible fire, explosion, severe personal injury, and death. Do not operate a generator set where a flammable vapor environment can be created, 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 Cummins distributor for more information.

## 1.6.2 Spillage

Any spillage that occurs during fueling, oil top-off, or oil change must be cleaned up before starting the generator set.

## 1.6.3 Fluid Containment

| *NOTICE* |
| --- |
| **Where spillage containment is not part of a Cummins supply, it is the responsibility of the installer to provide the necessary containment to prevent contamination of the environment, especially water courses and sources.** |

If fluid containment is incorporated into the bedframe, it must be inspected at regular intervals. Any liquid present should be drained out and disposed of in line with local health and safety regulations. Failure to perform this action may result in spillage of liquids which could contaminate the surrounding area.

Any other fluid containment area must also be checked and emptied, as described above.

# 1.7 Batteries Can Explode

Batteries can explode, causing severe skin and eye burns and can release toxic electrolytes.

 

**⚠ WARNING**

***Combustible Gases***

***Batteries can explode, causing severe skin and eye burns, and can release toxic electrolytes.***

***Do not dispose of the battery in a fire, because it is capable of exploding. Do not open or mutilate the battery. Do not charge frozen batteries.***

**⚠ WARNING**

***Electric Shock Hazard***

***Batteries present the risk of high short circuit current.***

***When servicing the generator set:***

- ***Remove watches, rings, or other metal objects.***
- ***Use tools with insulated handles.***

***NOTICE***

**Servicing of batteries must be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.**

- Wear safety glasses.
- Do not smoke.
- Do not charge frozen batteries.
- To prevent arcing when disconnecting the battery:
  1. Press the Off switch from the display and then press the E-Stop button (if equipped).
  2. Disconnect AC power from any battery chargers.
  3. Remove the negative (-) battery cables to prevent starting.
- To prevent arcing when reconnecting the battery:
  1. Reconnect the positive (+) cables.
  2. Reconnect the negative (-) cables.
  3. Reconnect the battery charger to AC power supply.
- When replacing the generator set battery, always replace it with a battery as specified in this manual.

# 1.8 Exhaust Gases Are Deadly

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas, and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust system daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Make sure the unit is well ventilated.

### 1.8.1 Exhaust Precautions

**⚠ WARNING**

***Hot Exhaust Gases***

***Contact with hot exhaust gases can cause severe burns.***

***Wear personal protective equipment when working on equipment.***

**⚠ WARNING**

***Hot Surfaces***

***Contact with hot surfaces can cause severe burns.***

***The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.***

**⚠ WARNING**

***Toxic Gases***

***Inhalation of exhaust gases can cause asphyxiation and death.***

***Pipe exhaust gas outside and away from windows, doors, or other inlets to buildings. Do not allow exhaust gas to accumulate in habitable areas.***

**⚠ WARNING**

***Fire Hazard***

***Contaminated insulation is a fire hazard. Fire can cause severe burns or death.***

***Remove any contaminated insulation and dispose of it in accordance with local regulations.***

The exhaust outlet may be sited at the top or bottom of the generator set. Make sure that the exhaust outlet is not obstructed. Personnel using this equipment must be made aware of the exhaust position. Position the exhaust away from flammable materials - in the case of exhaust outlets at the bottom, make sure that vegetation is removed from the vicinity of the exhaust.

The exhaust pipes may have some insulating covers fitted. If these covers become contaminated they must be replaced before the generator set is run.

To minimize the risk of fire, make sure the following steps are observed:

- Make sure that the engine is allowed to cool thoroughly before performing maintenance or operation tasks.
- Clean the exhaust pipe thoroughly.

## 1.9 The Hazards of Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless, tasteless and non-irritating gas. You cannot see it or smell it. Red blood cells, however, have a greater affinity for CO than for oxygen. Therefore, exposure even to low levels of CO for a prolonged period can lead to asphyxiation (lack of oxygen) resulting in death. Mild effects of CO poisoning include eye irritation, dizziness, headaches, fatigue and the inability to think clearly. More extreme symptoms include vomiting, seizures and collapse.

Engine-driven generator sets produce harmful levels of carbon monoxide that can injure or kill you.

 

### 1.9.1 Special Risks of CO near the Building

**⚠ WARNING**

***Toxic Gases***

***Carbon monoxide (CO) gas can cause nausea, fainting, or death. Occupants can be exposed to lethal levels of CO when the generator set is running. Depending on air temperature and wind, CO can accumulate in or near the building.***

***To protect yourself and others from the dangers of CO poisoning, it is recommended that reliable, approved, and operable CO detector alarms are installed in proper locations in the building as specified by their manufacturer.***

### 1.9.2 Protecting Yourself from CO Poisoning

- Locate the generator set in an area where there are no windows, doors, or other access points into the building.
- Make sure all CO detectors are installed and working properly.
- Pay attention for signs of CO poisoning.
- Check the exhaust system for corrosion, obstruction, and leaks every time you start the generator set and every eight hours when you run it continuously.

## 1.10 Earth Ground Connection

The neutral of the generator set may be required to be bonded to earth ground at the generator set location, or at a remote location, depending on system design requirements. Consult the engineering drawings for the facility or a qualified electrical design engineer for proper installation.

***NOTICE***

**The end user is responsible to make sure that the ground connection point surface area is clean and free of rust before making a connection.**

***NOTICE***

**The end user is responsible for making sure that an earthing arrangement that is compliant with local conditions is established and tested before the equipment is used.**

# 2 Introduction

## 2.1 Safety

**⚠ WARNING**

***Hazardous Voltage***

***Contact with high voltages can cause severe electrical shock, burns, or death.***

***Make sure that only a trained and experienced electrician makes generator set electrical output connections, in accordance with the installation instructions and all applicable codes.***

**⚠ WARNING**

***Electrical Generating Equipment***

***Faulty electrical generating equipment can cause severe personal injury or death.***

***Generator sets must be installed, certified, and operated by trained and experienced persons in accordance with the installation instructions and all applicable codes.***

## 2.2 About This Manual

The purpose of this manual is to provide the users with sound, general information. It is for guidance and assistance with recommendations for correct and safe procedures. Cummins Inc. cannot accept any liability whatsoever for problems arising as a result of following recommendations in this manual.

The information contained within the manual is based on information available at the time of going to print. In line with Cummins Inc. policy of continuous development and improvement, information may change at any time without notice. The users should therefore make sure that they have the latest information available before starting any work. The latest version of this manual is available on QuickServe Online (**https://quickserve.cummins.com**).

Users are respectfully advised that, in the interests of good practice and safety, it is their responsibility to employ competent people to carry out any installation work. Consult your authorized dealer for further installation information. It is essential that the utmost care is taken with the application, installation, and operation of any generator set due to their potentially hazardous nature. Careful reference should also be made to other Cummins Inc. literature. You must operate and maintain your generator set properly if you are to expect safe and reliable operation.

For further assistance, contact your authorized Cummins Inc. dealer.

***NOTICE***

**This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:**

- **This device may not cause harmful interferences.**
- **This device must accept any interference received, including interference that may cause undesired operation.**

 

# 2.3 Schedule of Abbreviations

This list is not exhaustive. For example, it does not identify units of measure or acronyms that appear only in parameters, event/fault names, or part/accessory names.

| Abbr. | Description | Abbr. | Description |
|---|---|---|---|
| AC | Alternating Current | LED | Light-Emitting Diode |
| AMP | AMP, Inc. (part of Tyco Electronics) | MFM | Multifunction Monitor |
| ANSI | American National Standards Institute | Mil Std | Military Standard |
| ASOV | Automatic Shut Off Valve | MPU | Magnetic Pickup |
| ASTM | American Society for Testing and Materials (ASTM International) | NC | Normally Closed |
| ATS | Automatic Transfer Switch | NC | Not Connected |
| AVR | Automatic Voltage Regulator | NFPA | National Fire Protection Agency |
| AWG | American Wire Gauge | NO | Normally Open |
| CAN | Controlled Area Network | NWF | Network Failure |
| CB | Circuit Breaker | OEM | Original Equipment Manufacturer |
| CE | Conformité Européenne | OOR | Out Of Range |
| CCA | Cold Cranking Ampere | OORH/ ORH | Out Of Range High |
| CFM | Cubic Feet per Minute | OORL/ORL | Out Of Range Low |
| CGT | Cummins Generator Technologies | PB | Push Button |
| CMM | Cubic Meters per Minute | PCC | PowerCommand® Control |
| CT | Current Transformer | PGI | Power Generation Interface |
| DC | Direct Current | PGN | Parameter Group Number |
| DEF | Diesel Exhaust Fluid | PI | Proportional/Integral |
| DPF | Diesel Particulate Filter | PID | Proportional/Integral/ Derivative |
| EBS | Excitation Boost System | PLC | Programmable Logic Controller |
| ECM | Engine Control Module | PMG | Permanent Magnet Generator |
| ECS | Engine Control System | PPE | Personal Protective Equipment |
| EMI | Electromagnetic Interference | PT | Potential Transformer |
| EN | European Standard | PTC | Power Transfer Control |
| EPS | Engine Protection System | PWM | Pulse-Width Modulation |

| Abbr. | Description | Abbr. | Description |
|---|---|---|---|
| E-Stop | Emergency Stop | RFI | Radio Frequency Interference |
| FAE | Full Authority Electronic | RH | Relative Humidity |
| FMI | Failure Mode Identifier | RMS | Remote Monitoring System |
| FSO | Fuel Shutoff | RMS | Root Mean Square |
| Genset | Generator Set | RTU | Remote Terminal Unit |
| GCP | Generator Control Panel | SAE | Society of Automotive Engineers |
| GND | Ground | scfh | Standard Cubic Feet of gas per Hour |
| HMI | Human-Machine Interface | SCR | Selective Catalytic Reduction |
| IC | Integrated Circuit | SPN | Suspect Parameter Number |
| ISO | International Organization for Standardization | SW_B+ | Switched B+ |
| LBNG | Lean-Burn Natural Gas | UL | Underwriters Laboratories |
| LCD | Liquid Crystal Display | UPS | Uninterruptible Power Supply |
| LCT | Low Coolant Temperature | | |

# 2.4 Related Literature

Before any attempt is made to operate the generator set, the operator should take time to read all of the manuals supplied with the generator set and familiarize themselves with the warnings and operating procedures.

***NOTICE***

**A generator set must be operated and maintained properly if you are to expect safe and reliable operation. The Operator manual includes a maintenance schedule and a troubleshooting guide.**

**The Health and Safety manual must be read in conjunction with the Operator manual for the safe operation of the generator set.**

- Health and Safety Manual (0908-0110)

The relevant manuals appropriate to your generator set are also available, the documents below are in English:

- Installation Manual for QSB7 Engine with PCC1.1/2.3 Control (A056K983)
- Operator Manual for QSB7 Engine with PCC1.1 Control (A056K985)

  or

  Operator Manual for QSB7 Engine with PCC2.3 Control (A060H298)
- Generator Set Service Manual for QSB7 Engine with PCC1.1 Control (A056K987)

  or

  Generator Set Service Manual for QSB7 Engine with PCC2.3 Control (A060H299)

 

- Recommended Spares List (RSL) by model:
  - C125D6D (A060Y780)
  - C150D6D (A060Y785)
  - C175D6D (A060Y790)
  - C200D6D (A060Y796)
- Parts Manual for QSB7 Engine with PCC1.1/2.3 Control (A056K989)
- Standard Repair Times - CX Family (0900-0912)
- Service Tool Manual (A043D529)
- Failure Code Manual (F1115C)
- Engineering Application Manual *T-030: Liquid Cooled Generator Sets* (A040S369)
- Engine Operation and Maintenance Manual (4021531)
- Engine Service Manual (4021271)
- Warranty Administration Manual (4021290)
- Global Commercial Warranty Statement (A028U870)
- Emission Warranty Statement (Federal Emissions EPA Title 40 CFR Part 90 Component Warranty) (A028X278)
- Seismic Certification (A045V378)

# 2.5 Model Specifications

**TABLE 1. MODEL VARIATIONS (ALL MODELS 60 HZ)**

| Model | kW | Phase | Amps | Voltage (L-N/L-L) V |
|---|---|---|---|---|
| C125D6D | 125 | 1 | 520.8 | 120/240 |
| | | 3 | 433.7 | 120/208 |
| | | 3 | 410.0 | 127/220 |
| | | 3 | 375.9 | 120/240 |
| | | 3 | 187.9 | 277/480 |
| | | 3 | 150.4 | 347/600 |
| C150D6D | 150 | 1 | 625.0 | 120/240 |
| | | 3 | 520.4 | 120/208 |
| | | 3 | 492.1 | 127/220 |
| | | 3 | 451.1 | 120/240 |
| | | 3 | 225.5 | 277/480 |
| | | 3 | 180.4 | 347/600 |

| Model | kW | Phase | Amps | Voltage (L-N/L-L) V |
|---|---|---|---|---|
| C175D6D | 175 | 1 | 729.2 | 120/240 |
| | | 3 | 607.2 | 120/208 |
| | | 3 | 574.1 | 127/220 |
| | | 3 | 526.2 | 120/240 |
| | | 3 | 263.1 | 277/480 |
| | | 3 | 210.5 | 347/600 |
| C200D6D | 200 | 1 | 833.3 | 120/240 |
| | | 3 | 693.9 | 120/208 |
| | | 3 | 656.1 | 127/220 |
| | | 3 | 601.4 | 120/240 |
| | | 3 | 300.7 | 277/480 |
| | | 3 | 240.6 | 347/600 |

**TABLE 2. COLD WEATHER SPECIFICATIONS (ALL MODELS)**

| Temperature | Description | Battery Type | Group |
|---|---|---|---|
| Above 10 °C (50 °F) | No starting aids required. | 2 Standard | 34 |
| -17 to 10 °C (0 to 50 °F) | All starting aids (battery heater, 1500 W coolant heater) recommended. Factory options available. | 2 Standard | 34 |
| Below -17 °C (0 °F) | All starting aids (battery heater, 2000 W coolant heater, oil pan heater) recommended. Factory options available. | 2 Standard | 34 |

***NOTICE***

**For NFPA 110 applications, a coolant heater is required. A factory option is available.**

**TABLE 3. FUEL CONSUMPTION (GAL/HR)**

| Full Load Rating | C125D6D | C150D6D | C175D6D | C200D6D |
|---|---|---|---|---|
| Standby | 10.10 | 11.69 | 13.28 | 14.88 |
| Prime | 9.30 | 10.74 | 12.17 | 13.60 |

 

**TABLE 4. FUEL TANK PART NUMBERS**

| Option | Tank Type | Capacity Min. (Hr) | C125D6D | C150D6D | C175D6D | C200D6D |
|---|---|---|---|---|---|---|
| C319-2 | Basic | 24 | A058J692 | A058J694 | A058J694 | A058J695 |
| C320-2 | Basic | 48 | A058J695 | A056Y394 | A056Y394 | A056Y394 |
| C301-2 | Regional | 24 | A056Y392 | A056Y392 | A056Y392 | A056Y392 |
| C303-2 | Regional | 48 | A056Y394 | A056Y394 | A056Y394 | A056Y394 |
| C305-2 | Regional | 72 | A056Y394 | A055S002 | A055S002 | A055S002 |
| C307-2 | Regional | 96 | A055S002 | NA | NA | NA |

**TABLE 5. ENGINE SPECIFICATIONS (ALL MODELS)**

| Type | Specification |
|---|---|
| Engine | 4 Cylinder-in-line, liquid-cooled, 4-stroke<br>• *QSB7:* C125D6D, C150D6D, C175D6D, C200D6D |
| Aspiration | Turbocharged and charge air cooled |
| Displacement | 6686 cc (408 $in^3$) |
| Compression Ratio | 17.2:1 |
| Fuel | ASTM number 2D fuel (refer to the engine operator and maintenance manual) |
| Coolant | 50/50 coolant solution (50% pure water and 50% anti-freeze) |
| Coolant Fill Rate | Maximum 3 GPM |
| Fuel Flow | Maximum fuel flow:<br>• C125D6D-C200D6D: 15 gal/hr |
| | Maximum fuel inlet restriction with clean filter: 17 kPa (5 in. Hg) |
| | Maximum return restriction: 20 kPa (6 in. Hg) |

**TABLE 6. LUBRICATING OIL SYSTEM SPECIFICATIONS (ALL MODELS)**

| Type | Value |
|---|---|
| Lubricating Oil Pressure at Rated Speed (Minimum) | *G5 engine:* 310 kPa (45 psi) |
| Oil Recommendation | 15W40 (refer to the engine operator and maintenance manual) |
| **Lubricating Oil Capacity:** | |
| --Full at High Mark on Dipstick | 17.5 L (18.5 qt) |
| --Low Mark on Dipstick | 15 L (15.8 qt) |

**TABLE 7. GENERATOR SET SIZE SPECIFICATIONS**

| Enclosure Type | Size (L x W x H) |
|---|---|
| Open/Weather | 2867 x 1016 x 1841 mm (112.9 x 40 x 72.5 in); does not include exhaust discharge elbow |
| Sound Level 1 | 3621 x 1016 x 1841 mm (142.6 x 40 x 72.5 in) |
| Sound Level 2 | 4061 x 1016 x 1841 mm (159.9 x 40 x 72.5 in) |

**TABLE 8. OPEN UNIT WET WEIGHT**

| Model | kg | lb |
|---|---|---|
| C125D6D | 1390 | 3064 |
| C150D6D | 1442 | 3179 |
| C175D6D | 1480 | 3262 |
| C200D6D | 1583 | 3491 |

***NOTICE***

**Maximum $I_2$= 8%.**

 

**TABLE 9. GENERATOR SET DERATING GUIDELINES**

| Power | Model | Derate |
|---|---|---|
| Standby | C125D6D | Engine power available up to 3850 m (12633 ft) at ambient temperatures up to 40° C (104° F) and 2695 m (8842 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C150D6D | Engine power available up to 3425 m (11237 ft) at ambient temperatures up to 40° C (104° F) and 2298 m (7540 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C175D6D | Engine power available up to 2947 m (9670 ft) at ambient temperatures up to 40° C (104° F) and 1812 m (5945 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C200D6D | Engine power available up to 2148 m (7049ft) at ambient temperatures up to 40° C (104° F) and 1086 m (3563 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| Prime | C125D6D | Engine power available up to 3136 m (10290 ft) at ambient temperatures up to 40° C (104° F) and 2466 m (8090 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C150D6D | Engine power available up to 2743 m (9000 ft) at ambient temperatures up to 40° C (104° F) and 2151 m (7057 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C175D6D | Engine power available up to 2316 m (7600 ft) at ambient temperatures up to 40° C (104° F) and 1674 m (5492 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |
| | C200D6D | Engine power available up to 1944 m (6377 ft) at ambient temperatures up to 40° C (104° F) and 811 m (2660 ft) at 50° C (122° F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters. |

**TABLE 10. CONTROL SPECIFICATIONS (ALL MODELS)**

| Control |
|---|
| PowerCommand® 1.1 (Standard) |
| PowerCommand® 2.3 (Optional) |

**TABLE 11. DC SYSTEM SPECIFICATIONS (ALL MODELS)**

| Type | Value |
|---|---|
| Nominal Battery Voltage (VDC) | 12 |
| Battery Group | 34 |
| Battery Type | Lead acid (wet) |
| Minimum Cold Crank Amps (CCA) | 2 batteries x 850 CCA (per battery) = Total 1700 CCA |

# 2.6 After Sales Services

Cummins offers a full range of maintenance and warranty services.

## 2.6.1 Maintenance

**⚠ WARNING**

***Electrical Generating Equipment***

***Incorrect service or parts replacement can result in severe personal injury, death, and/or equipment damage.***

***Make sure service personnel are qualified to perform electrical and mechanical service.***

For expert generator set service at regular intervals, contact your Cummins service provider. See power.cummins.com/sales-service-locator for service locations that service this application. Maintenance tasks should only be undertaken by trained and experienced technicians provided by your Cummins service provider.

## 2.6.2 Warranty

For details of the warranty coverage for your generator set, refer to the *Warranty Statement* listed in the Related Literature section.

Extended warranty coverage is also available. In the event of a breakdown, prompt assistance can normally be given by factory trained service technicians with facilities to undertake all minor and many major repairs to equipment on site.

For further warranty details, contact your authorized dealer.

***NOTICE***

**Damage caused by failure to follow the manufacturer's recommendations will not be covered by the warranty. Please contact your authorized dealer.**

### 2.6.2.1 Warranty Limitations

For details of the warranty limitations for your generator set, refer to the warranty statement applicable to the generator set.

## 2.6.3 How to Obtain Service

For parts, service, and product information, contact the nearest authorized Cummins dealer. To easily locate the nearest certified distributor/dealer for Cummins generator sets in your area, or for more information, contact us at 1-800-CUMMINS™ (1-800-286-6467) or visit **www.cummins.com/support**.

### 2.6.3.1 Generator Set Nameplate

**⚠ WARNING**

***Electrical Generating Equipment***

***Improper service or replacement of parts can lead to severe personal injury or death and to damage to equipment and property.***

***Make sure service personnel are qualified to perform electrical and mechanical service.***

 

| *NOTICE* |
| --- |
| **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.** |

**Model, Spec, and Serial Numbers:** Be ready to provide the model, spec, and serial numbers on the generator set nameplate when contacting Cummins for information, parts, and service. The nameplate is located on the inside of the customer access door on enclosed generator sets.

Record these numbers so that they are easy to find when needed. Each character in these numbers is significant for obtaining the right parts listed in the Parts Catalog. Genuine Cummins replacement parts are recommended for best results.

| **My Generator Set Information** | |
| --- | --- |
| Model | |
| Spec | |
| Serial Number | |

## 2.6.4 Manufacturing Facilities

| Facility | Address | Phone Numbers |
|---|---|---|
| U.S. and CANADA | Cummins Inc.<br>1400 73rd Ave. NE<br>Minneapolis, MN 55432 USA | Toll Free 1-800-CUMMINS™<br>(1-800-286-6467)<br>Phone +1 763-574-5000<br>Fax +1 763-574-5298 |
| EMEA, CIS | Cummins Inc.<br>Columbus Avenue<br>Manston Park<br>Manston, Ramsgate<br>Kent CT12 5BF<br>United Kingdom<br>----------<br>Cummins Inc.<br>Royal Oak Way South<br>Daventry<br>Northamptonshire<br>NN11 8NU<br>United Kingdom | Phone +44 1843 255000<br>Fax +44 1843 255902 |
| ASIA PACIFIC | Cummins Inc.<br>10 Toh Guan Road #07-01<br>TT International Tradepark<br>Singapore 608838 | Phone +65 6417 2388<br>Fax +65 6417 2399 |
| BRAZIL | Rua Jati, 310, Cumbica<br>Guarulhos, SP 07180-900<br>Brazil | Phone +55 11 2186 4195<br>Fax +55 11 2186 4729 |
| CHINA | Cummins Inc.<br>2 Rongchang East Street,<br>Beijing Economic – Technological Development Area<br>Beijing 100176, P.R. China | Phone 86 10 59023001<br>Fax +86 10 5902 3199 |
| INDIA | Cummins Inc.<br>Plot No B-2, SEZ Industrial Area,<br>Village-Nandal & Surwadi, Taluka- Phaltan<br>Dist- Satara, Maharashtra 415523<br>India | Phone<br>+91 021 66305514 |
| LATIN AMERICA | 3350 Southwest 148th Ave.<br>Suite 205<br>Miramar, FL 33027 USA | Phone +1 954 431 551<br>Fax +1 954 433 5797 |
| MEXICO | Eje 122 No. 200 Zona Industrial<br>San Luis Potosi, S.L.P. 78395<br>Mexico | Phone +52 444 870 6700<br>Fax +52 444 824 0082 |

 

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# 3 Control System PowerCommand 1.1

## 3.1 Control System Description

The control system is used to start and stop the generator set, and provides full generator set monitoring capability and protection from the display screen. It monitors the engine for temperature, oil pressure, and speed. It also provides voltage and current metering. In the event of a fault, the unit will indicate the fault type and, on critical faults, automatically shut down the generator set.

All indicators, control buttons, and the display screen are on the face of the operator panel.

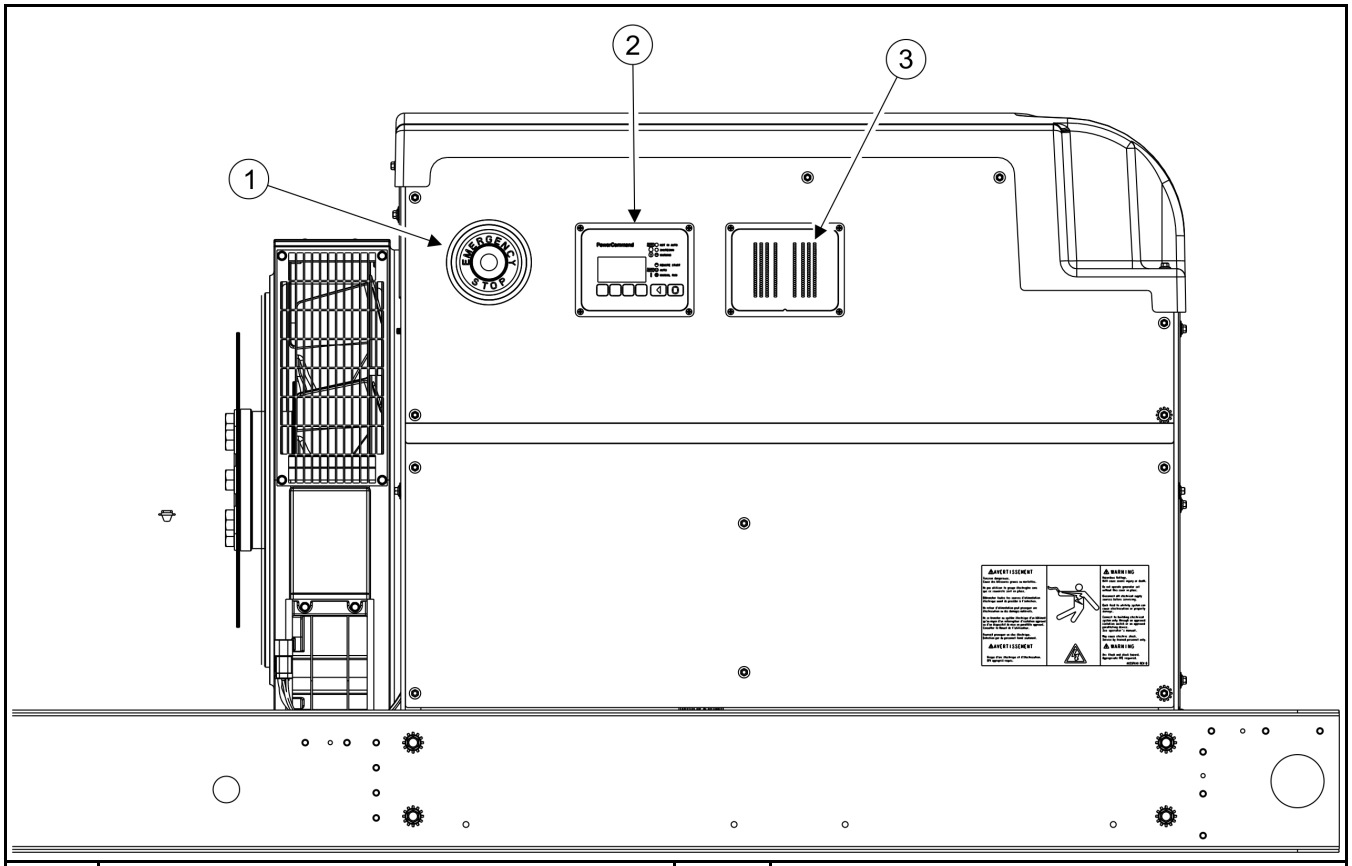
There are two fault level signals generated by the control system:

- **Warning:** Signals an imminent or non-critical fault for the generator set. The control provides an indication only for this condition.
- **Shutdown:** Signals a potentially critical fault for the generator set. The control will immediately take the engine off-load and automatically shuts it down.

The standard control system operates on 12 VDC battery power. The history data is stored in non-volatile memory and will not be deleted due to the loss of battery power.

## 3.1.1 Control System Panel




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Emergency Stop Button | 3 | Bargraph Meter Panel (Option) |
| 2 | Operator Panel | | |

**FIGURE 1. CONTROL SYSTEM PANEL**

## 3.1.2 Standard Operator Panel

The operator panel includes indicator lights (LEDs), display buttons used to navigate through the menus, control mode buttons, and an LCD display. The display enables the operator to check the status, adjust the settings, and start and stop the generator set. The standard operator panel (show below) is located on every generator set. An optional remote display operator panel accessory is also available.

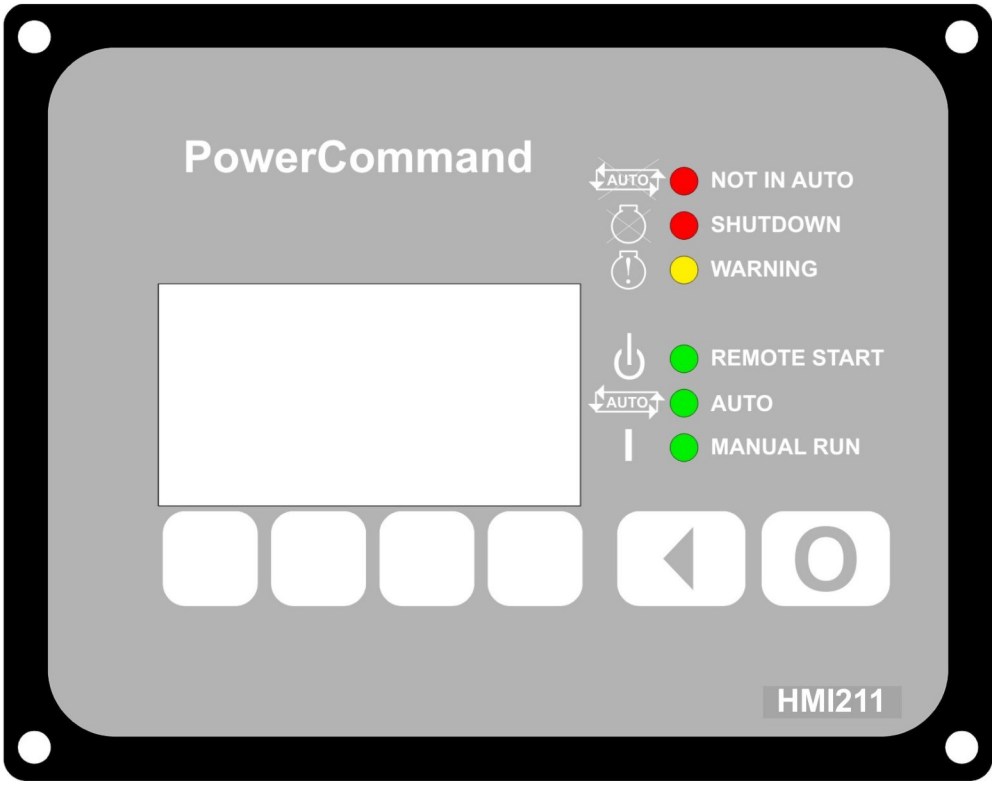



**FIGURE 2. STANDARD OPERATOR PANEL (HMI211)**

### 3.1.2.1 Standard Key Functions (HMI211)

The user interface includes two fixed action buttons and four soft key buttons. The action of the soft key buttons changes to meet the requirements of each screen.

**TABLE 12. KEY FUNCTIONS**

| Key/Symbol | Action |
|---|---|
| O | Switches to Off mode (fixed action button). |
| AUTO | Switches to Auto mode. |
| ✋ | Switches to Manual Run mode. |
| ◄ | Navigates to the previous menu level (fixed action button). |
| ▲ | (Up Arrow) Navigates to the previous screen/menu in a list. |
| ▼ | (Down Arrow) Navigates to the next screen/menu in a list. |
| ▲and ▼ | Hold the up and down arrows simultaneously for two seconds from any Info Menu to navigate to the Menu screen. |
| Save | Saves changes and navigates to the associated screen. |
| Adjust | Navigates to the Adjust Menu of a specific menu. |
| → | (Right Arrow) Advances the highlighted field to the next editable field. |
| - | Decreases value of the highlighted editable field. |

| Key/Symbol | Action |
|---|---|
| + | Increases value of highlighted editable field. |

### 3.1.2.2 Standard LED Indicators (HMI211)

The operator panel has six LED indicators. Colors, flashing frequency, and conditions to turn them on/off/blink are included in the table below.

**TABLE 13. LED INDICATORS**

| LED | Color | Action |
|---|---|---|
| Not in Auto | Red | Indicates the generator set is in Manual or Off Mode. |
| Shutdown | Red | Indicates a Shutdown Fault has occurred. |
| Warning | Yellow | Indicates a Warning Fault has occurred. |
| Remote Start | Green | Indicates that the generator set has received a Remote Start Command. |
| Auto | Green | Indicates that the generator set is in Auto Mode. The generator starts when it receives a Remote Start Command. |
| Manual Run | Green | Indicates that the generator set has received a Manual Run Command. |

## 3.2 Display Text or Symbolic Version

The operator panel graphical display can be set to show text (English only) or symbols for fault messages, operator menus, and the Mode Change Menu. Descriptions of commonly used symbols are included in the following table. Combinations of symbols are used to display some fault conditions.

When shipped from the factory, the display is set to display symbols. Qualified service personnel are required to change the default setting.

**TABLE 14. SYMBOLS**

| Symbol | Text |
|---|---|
|  | Generator Warning Fault |
|  | Generator Shutdown Fault |
|  | Coolant Temperature |
|  | Oil Pressure |
|  | Voltage Alternating Current (VAC) |
|  | Voltage Direct Current (VDC) |
|  | AC Current |
| **Hz** | Frequency |

| Symbol | Text |
|---|---|
|  | Battery |
|  | Out of Range |
|  | High or Pre-High |
|  | Low or Pre-Low |
|  | Annunciator |
|  | Over Speed |
|  | Crank Fail |
|  | Emergency Stop |

## 3.3 Exercise Settings

| *NOTICE* |
|---|
| **When battery power is lost, these settings must be reset.** |

| *NOTICE* |
|---|
| **Not applicable without an RA series transfer switch.** |

To access the Clock/Exerciser Menu:

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Navigate through the screens to find and select **Clock/Excr** in the Service Menu.

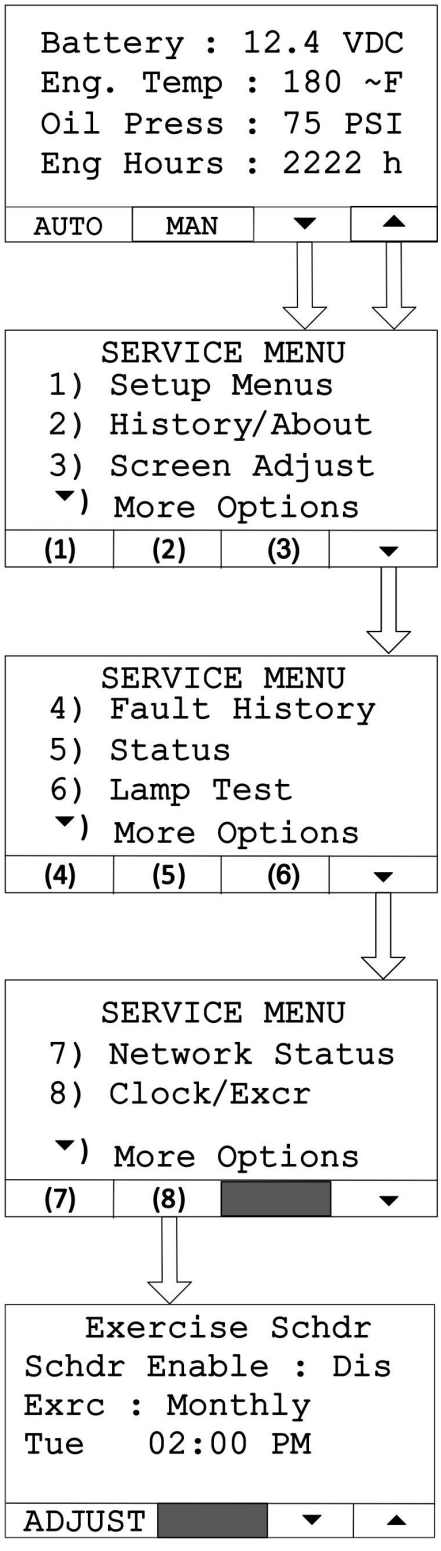



**FIGURE 3. CLOCK/EXERCISER MENU NAVIGATION**

## 3.3.1 Updating Exercise Duration (RA Switches only)

| NOTICE |
| --- |
| **Not applicable without an RA series transfer switch.** |

To update the exercise duration on the Clock/Exerciser Menu:

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Access the Time Setup screen by selecting **Clock Exerciser** on the Genset Service Menu.
3. Press the down key on the Time Setup screen to access the Daylight Saving Adjust screen.
4. Select **Adjust**.
5. Press the down key on the Daylight Saving Adjust Start screen.
6. Select **Adjust**.
7. Press **Exercise Schdr** on the Daylight Saving Adjust End screen.
8. Press the down key on the Exercise Schdr Menu.
9. Press **Adjust**.

When updating these settings, the functions of the keys are as follows:

- The horizontal right arrow key is used to select the duration block for editing exercise duration.
- Use the + or - keys to edit the exercise duration minutes.
- Press **Save** to save any changes. After saving, the Save button changes to the Adjust button.

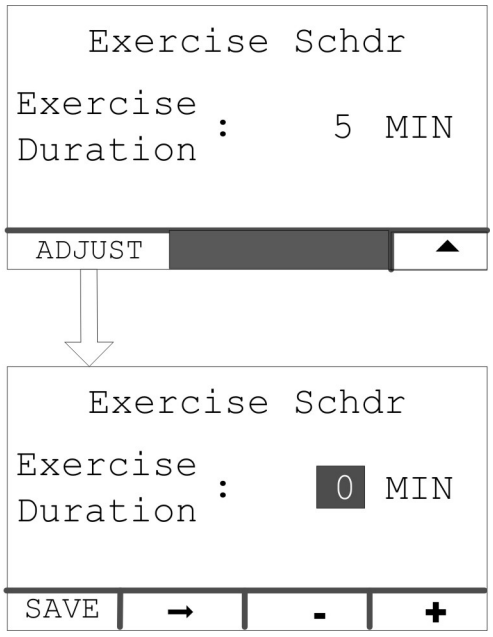



**FIGURE 4. EXERCISE DURATION NAVIGATION**

# 3.4 Time Setup (RA Switches only)

| NOTICE |
| --- |
| **When battery power is lost, these settings must be reset.** |

| NOTICE |
| --- |
| **Not applicable without an RA series transfer switch.** |

To set up the generator set clock for the current date and time:

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Access the Time Setup screen by selecting **Clock Exerciser** on the Genset Service Menu.
3. Select **Adjust**.

When updating these settings, the functions of the keys are as follows:

- The horizontal right arrow key is used to select successive blocks for editing settings on the screen.
- Select the left arrow to return to the previous screen.
- Adjust values by using the + or - keys on the Adjust Menu of the Time Setup screen.
- Press **Save** to save any changes. After saving, the Save button changes to the Adjust button.

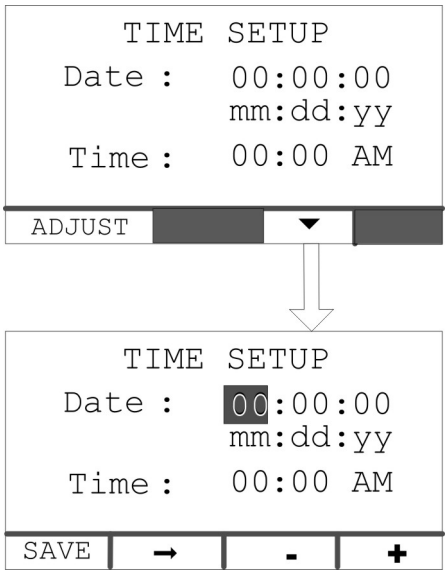



**FIGURE 5. TIME SETUP SCREEN**

## 3.4.1 Updating Daylight Saving Adjust Screens

**Update Values on the Daylight Saving Adjust Screen**

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Navigate to the Genset Service Menu.
3. Select **Clock Exerciser** to access the Time Setup screen.
4. Press the down key on the Time Setup screen to access the Daylight Saving Adjust screen.

5. Select **Adjust**. When updating these settings, the functions of the keys are as follows:

**TABLE 15. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST SCREEN**

| Key/Button | Function |
|---|---|
| Horizontal right arrow key | Select successive blocks for editing settings on the screen |
| Left arrow key | Return to the previous screen |
| + or - keys | Adjust values on the Adjust screen of the Daylight Saving Adjust screen |
| **Save** button | Save any changes; after saving, the **Save** button changes to the **Adjust** button |

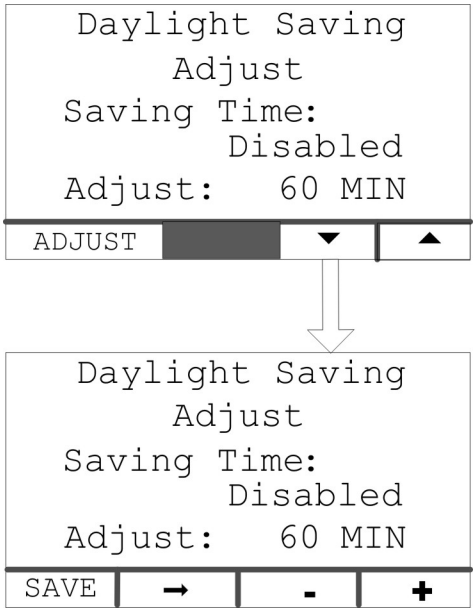



**FIGURE 6. "DAYLIGHT SAVING ADJUST SAVING TIME" SCREEN NAVIGATION**

**Access and Update the Daylight Saving Adjust Start Screen**

1. Press the down arrow key on the Daylight Saving Adjust screen.
2. Press **Adjust**. When updating these settings, the functions of the keys are as follows:

**TABLE 16. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST START SCREEN**

| Key/Button | Function |
|---|---|
| Horizontal right arrow key | Select successive blocks for editing settings on the screen |
| + or - keys | Adjust Month, Week, Day or Hour |
| **Save** button | Save any changes; after saving, the **Save** button changes to the **Adjust** button |

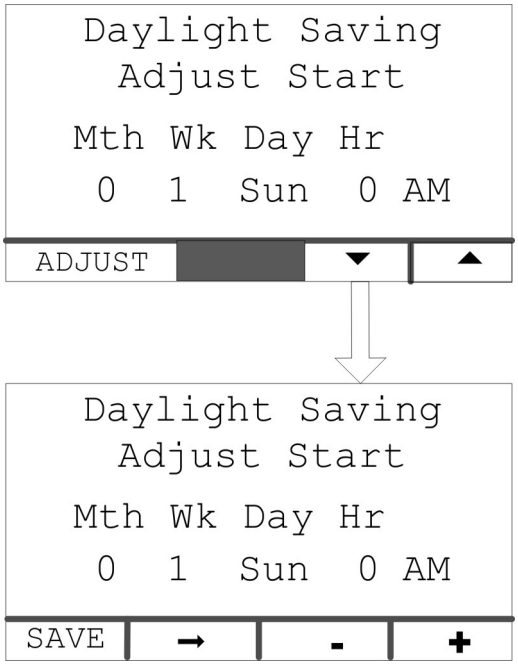



**FIGURE 7. DAYLIGHT SAVING ADJUST START SCREEN**

**Update the Daylight Saving Adjust End Screen**

1. Press the down key on the Daylight Saving Adjust Start screen.
2. Press **Adjust**. When updating these settings, the functions of the keys are as follows:

**TABLE 17. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST END SCREEN**

| Key/Button | Function |
|---|---|
| Horizontal right arrow key | Select successive blocks for editing settings on the screen |
| + or - keys | Adjust Month, Week, Day or Hour |
| **Save** button | Save any changes; after saving, the **Save** button changes to the **Adjust** button |

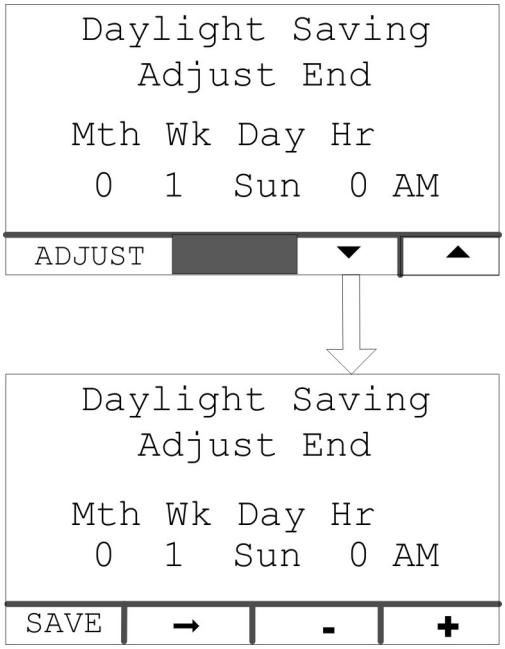



**FIGURE 8. DAYLIGHT SAVING ADJUST END SCREEN**

# 3.5 Brightness and Contrast

The Screen Adjust screen allows the contrast, brightness, and units to be set. To access the Screen Adjust screen:

1. From any Information screen, hold down the up and down arrows simultaneously for two seconds to gain access to the Service Menu screen.
2. Select **Screen Adjust**.

To adjust the contrast, brightness, or units from the Screen Adjust screen:

1. From the Screen Adjust screen, select **Adjust** to access the screen variables.
2. Press the right arrow to move between the variables.
3. Adjust settings, and press **Save** to save any changes.

When updating these settings, the functions of the keys are as follows:

- The horizontal right arrow key is used to select successive blocks for editing settings on the screen.
- Select the left arrow to return to the previous screen.
- Adjust values by using the + or - keys on the Adjust screen of the Display Setup screen.
- Press **Save** to save any changes. After saving, the Save button changes to the Adjust button.

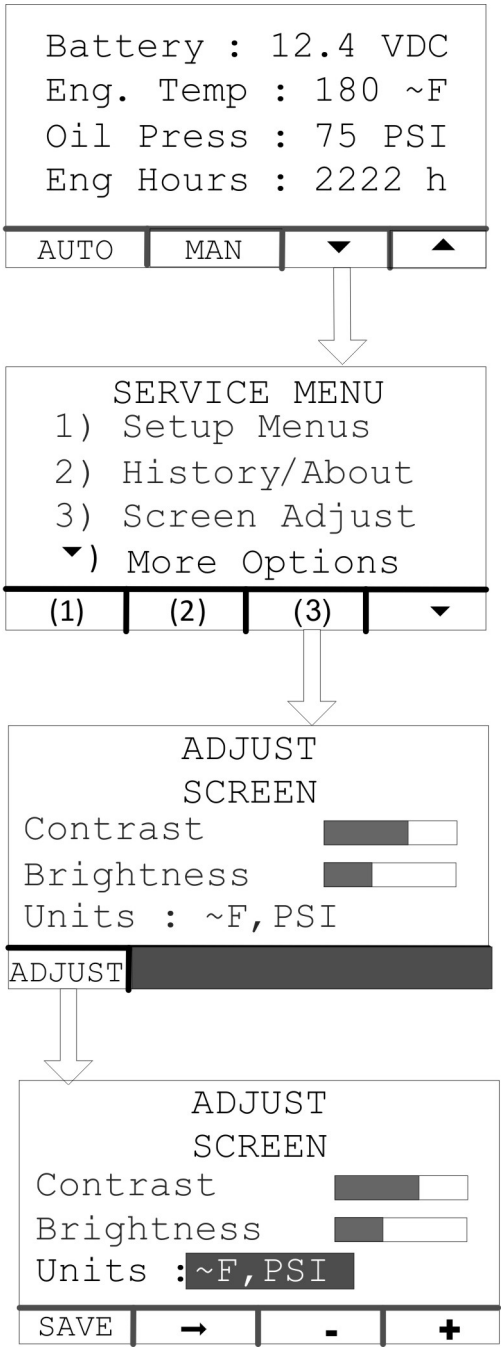



**FIGURE 9. BRIGHTNESS AND CONTRAST SCREEN NAVIGATION**

***NOTICE***

**Adjusting the brightness on the operator panel adjusts the brightness of both the LCD backlight and the LEDs on the display. The contrast should never be 0 or 100% on any of the screens. The default value for Brightness is 50%.**

# 3.6 History and About Menu

To access the History/About screen:

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Select **History/About**.
3. Advance through the screens to view information about the generator set, control, and display.

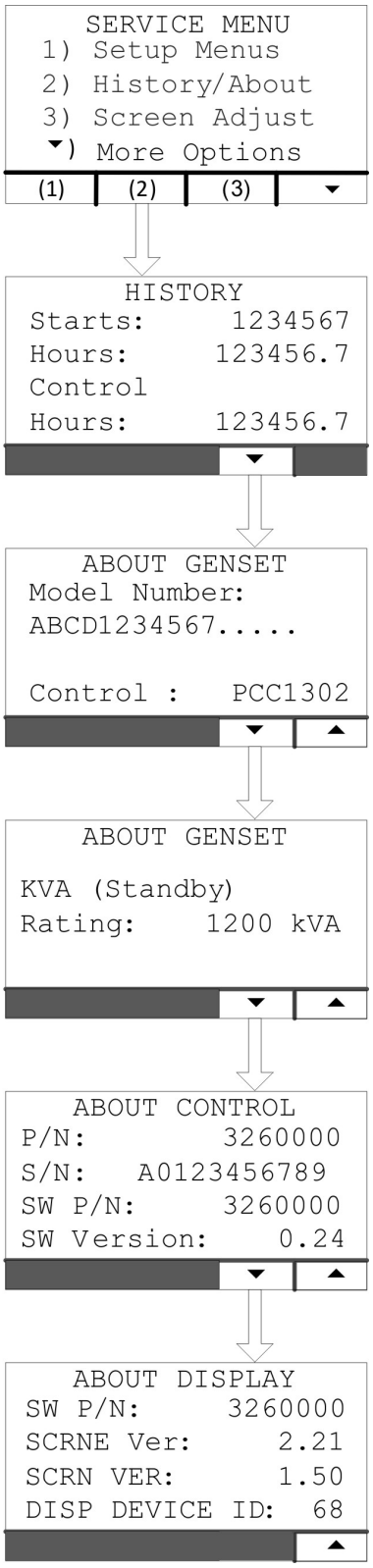



**FIGURE 10. HISTORY/ABOUT MENU**

# 3.7 Fault Log

To check the fault log:

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Select **Fault History**.

| *NOTICE* |
| --- |
| **The active faults are displayed first. If there are no active faults, this screen is skipped. Following the Active Faults screen are the Fault History screens. These screens display the faults in chronological order from newest to oldest.** |

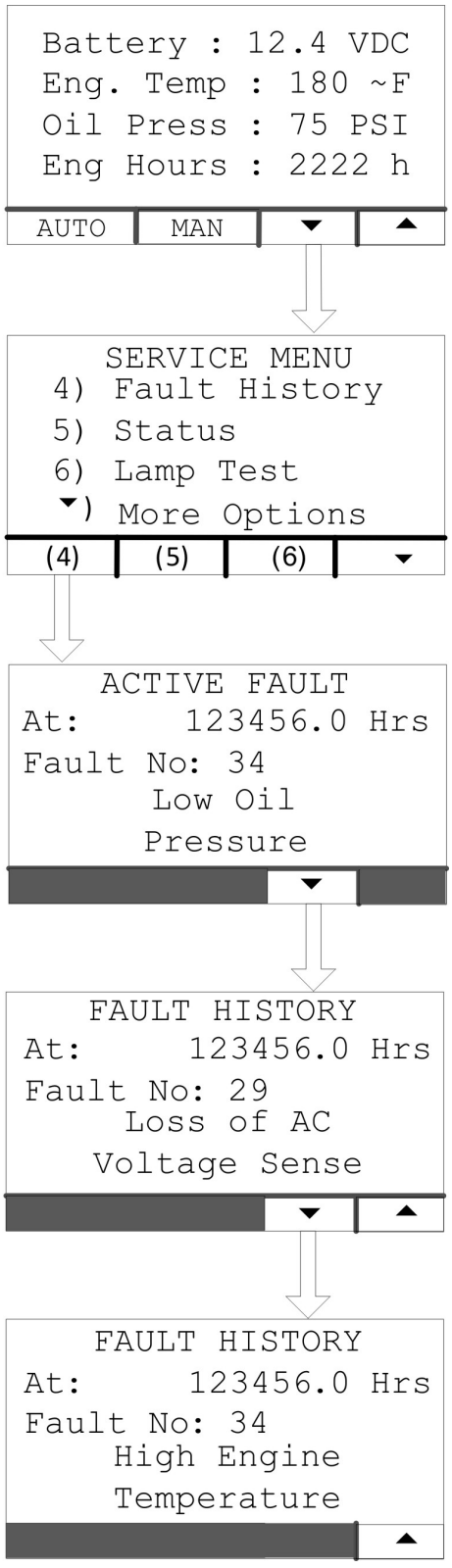



**FIGURE 11. FAULT LOG SCREEN**

# 3.8 Operating Modes

The generator set's PowerCommand® control has **Manual Run**, **Off**, and **Auto** operating modes that are available from the operator panel.

## 3.8.1 Off Mode

When in the Off mode, the control does not allow the generator set to start.

If the generator set is running in either Manual Run or Auto mode and the Off button is pressed, the control immediately stops the generator set, and the control transitions to the Off mode.

Pressing the Off mode button resets all active faults.

## 3.8.2 Manual Run Mode

When in Manual Run mode, the generator set starts and continues to run until the control is put into the Off mode. While in Manual Run mode, the remote start signal is ignored.

## 3.8.3 Manual Run Mode

When in Manual Run mode, the generator set starts and continues to run until the control is put into the Off mode. Pressing the **Off** button initiates a normal shutdown sequence that does not include a time delay stop. While in the Manual Run mode, any remote start signal is ignored.

## 3.8.4 Auto Mode

When in Auto mode, the control allows the generator set to be started at any time with a remote signal only. When a remote start signal is received, the generator set starts after a time delay start is completed (default delay is zero seconds).

When all remote start signals are removed, the control performs a normal shutdown sequence which includes a time delay stop (default delay is five minutes).

If the generator set is running in Auto mode and the Off button is pressed, the control immediately stops the generator set and the control transitions to the Off mode.

## 3.8.5 Sleep Mode

The PowerCommand® control enters a low power (Sleep) mode of operation where the current draw is less than 60 milliamps (DC) at normal battery voltage levels. Sleep mode is automatically disabled. If enabled, the operator panel turns itself off after five minutes of keypad inactivity in the Off or Auto mode. It awakes from the Sleep mode if any button is pressed.

| *NOTICE* |
| --- |
| **Sleep mode can be enabled; contact your authorized dealer.** |

# 3.9 Selecting Operating Modes

## 3.9.1 Selecting Manual Run Mode

**⚠ WARNING**

***Electrical Generating Equipment***

***When changing modes, the generator set can start or stop without warning (for example, Auto Mode may have been selected with no mains (utility) power available).***

***Make sure there is no danger to personnel or equipment, if the generator set starts or stops when changing modes.***

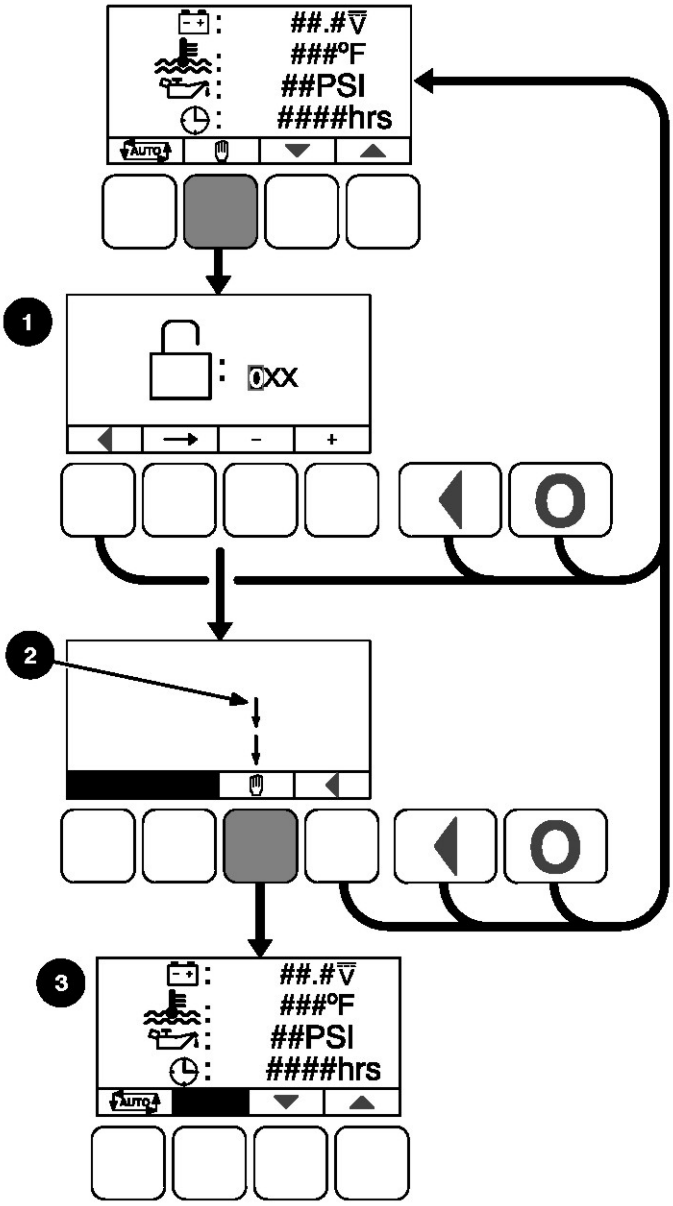
1. Before proceeding to change the mode, make sure that it is safe to do so.
2. Press the  Manual Run button on any of the Operator menus or the "Establishing/Re-establishing communication with control" menus.
3. If the Mode Change Access Code menu is enabled, the Mode Change Access Code is displayed. Enter the Mode Change Access Code.
4. A menu with alternating arrows is displayed above a second  symbol.
5. Press the second  Manual Run button, and the generator set will now begin the Manual start sequence. The Operator menu that was displayed before Manual Run mode was selected is re-displayed, but with the  symbol blacked out.

***NOTICE***

**To disable Manual Run mode, press the Off button.**

***NOTICE***

**Auto mode can also be selected while in Manual Run mode. Switching to Auto mode may result in the generator set shutting down.**




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Menu Displayed Only When the Mode Change Access Code Feature Is Enabled | 3 | Manual Run Mode Selected |
| 2 | Alternating Arrows Displayed | | |

**FIGURE 12. SELECTING MANUAL RUN MODE**

## 3.9.2 Selecting Auto Mode

**⚠ WARNING**

***Electrical Generating Equipment***

***When changing modes, the generator set can start or stop without warning (for example, Auto Mode may have been selected with no mains (utility) power available).***

***Make sure there is no danger to personnel or equipment, if the generator set starts or stops when changing modes.***

To switch to Auto mode (see **Figure 13 on page 41**),

1. Ensure that it is safe to do so before proceeding to change the mode.
2. Press the AUTO Auto button on any of the Operator menus, or the 'Establishing/Re-establishing communication with control' menus.
3. If the mode change access code feature is enabled, the Mode Change Access Code menu is displayed. Enter the Mode Change Access Code.
4. A menu with alternating arrows will then be displayed above a second AUTO Auto symbol.
5. Press this second AUTO Auto button. The Operator menu that was displayed before Auto mode was selected is re-displayed, but with the AUTO Auto symbols blacked out and Manual Run symbols visible.

To disable Auto mode, press the Off button.

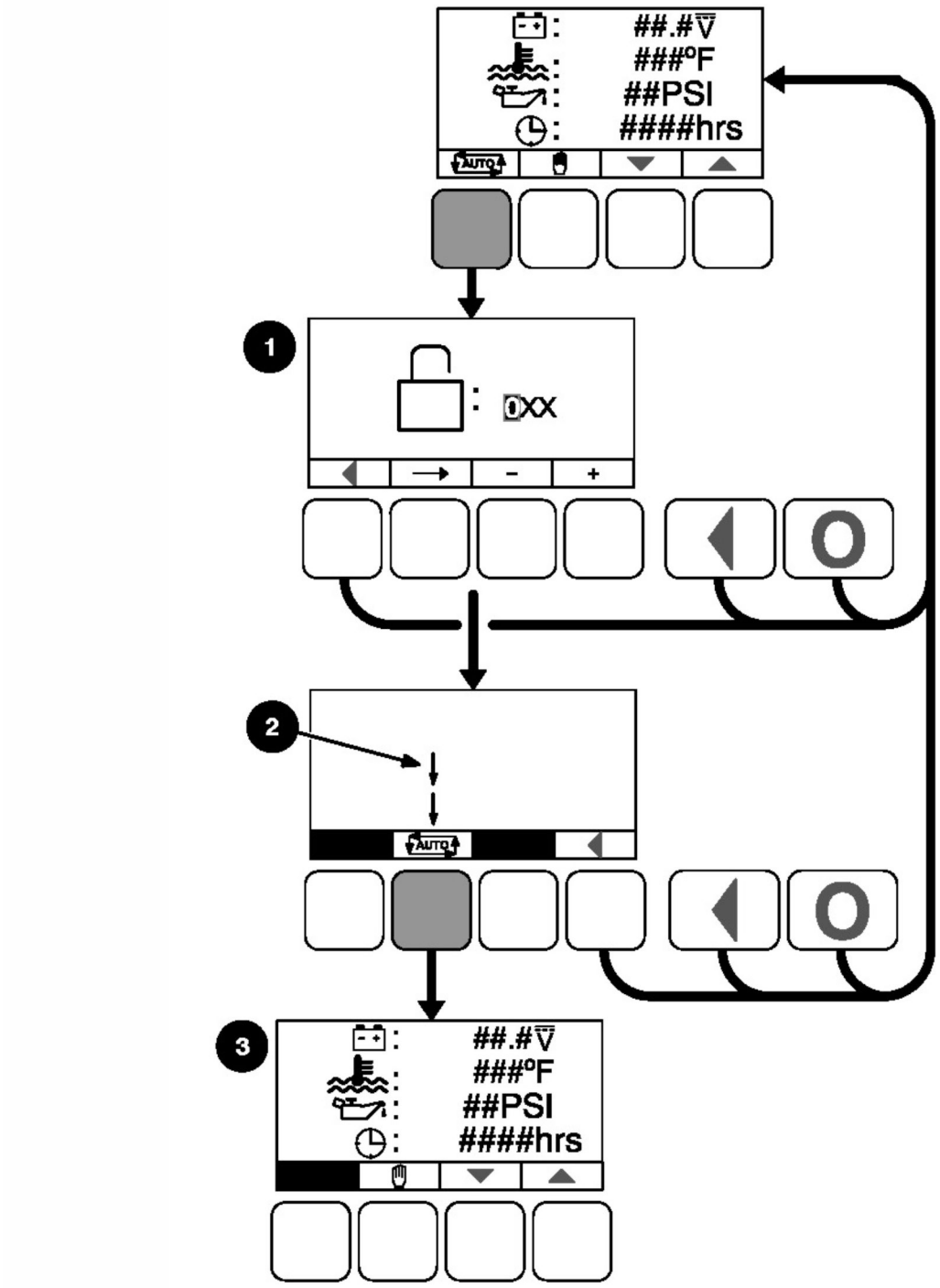
The generator set is now ready to receive a remote start signal that will initiate the Auto run mode.

**⚠ WARNING**

***Should a remote start signal be received, the generator set starts automatically. Make sure there is no danger to personnel or equipment should the generator set start without warning.***

***NOTICE***

**Manual Run mode can also be selected FROM Auto mode. Switching to Manual Run mode results in the generator set starting up.**




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | This Menu Is Displayed Only if the Mode Change Access Code Feature Is Enabled | 3 | Auto Mode Selected |
| 2 | Alternating Arrows Are Displayed | | |

**FIGURE 13. SELECTING AUTO MODE**

## 3.9.3 Selecting Off Mode

**⚠ WARNING**

***Electrical Generating Equipment***

***When changing modes, the generator set can start or stop without warning (for example, Auto Mode may have been selected with no mains (utility) power available).***

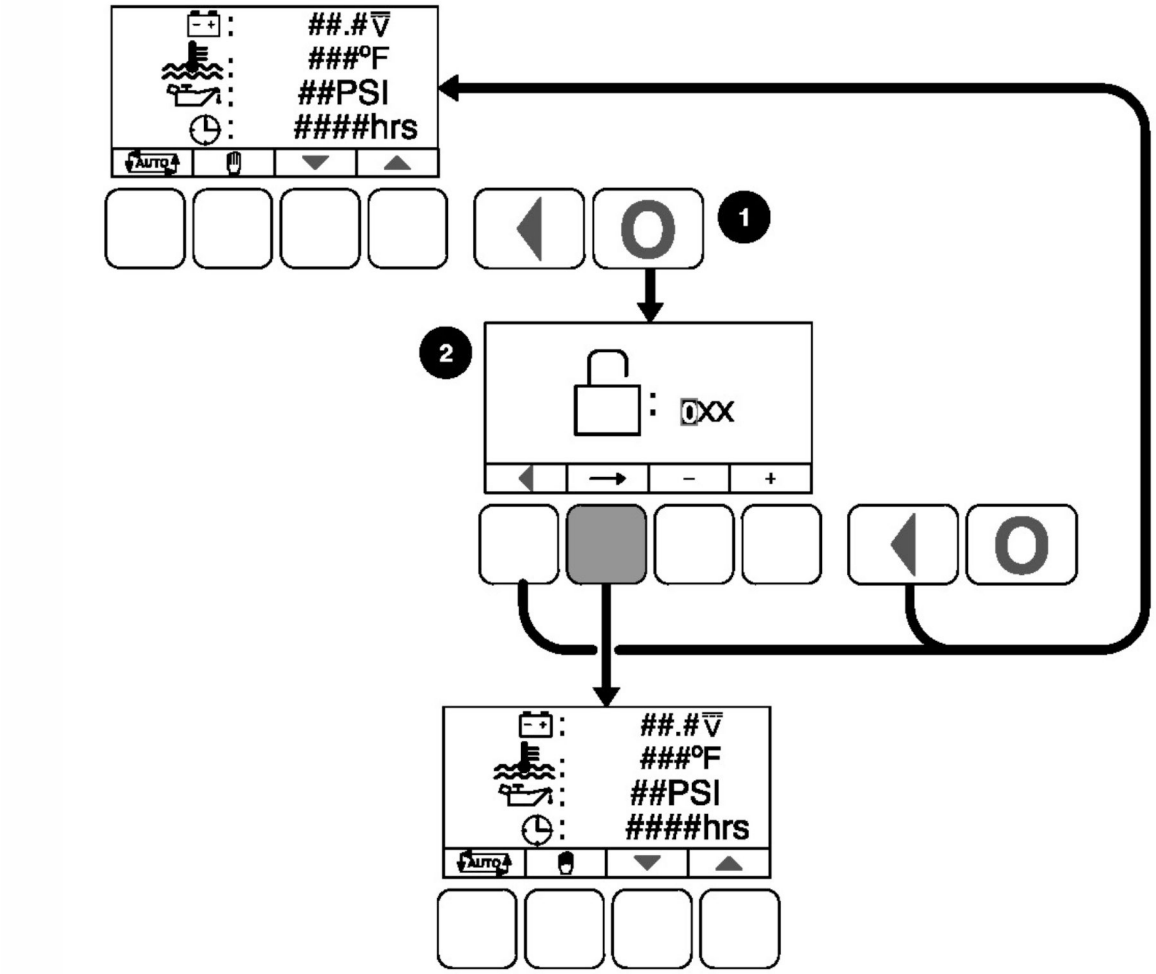
***Make sure there is no danger to personnel or equipment, if the generator set starts or stops when changing modes.***

To switch to Off mode (see the figure below),

1. Make sure that it is safe to do so before proceeding to stop the set.
2. Press the Off button on any of the Operator menus or the "Establishing/Re-establishing communication with control" menus.
3. If the Mode Change Access Code is enabled, the Mode Change Access Code will be displayed. Enter the Mode Change Access Code.
4. On entering the last correct digit, the basic screen will re-appear, and the set will stop without a Time Delay to Stop.

***NOTICE***

**Make sure that there is no danger to personnel or equipment if the generator set is stopped.**



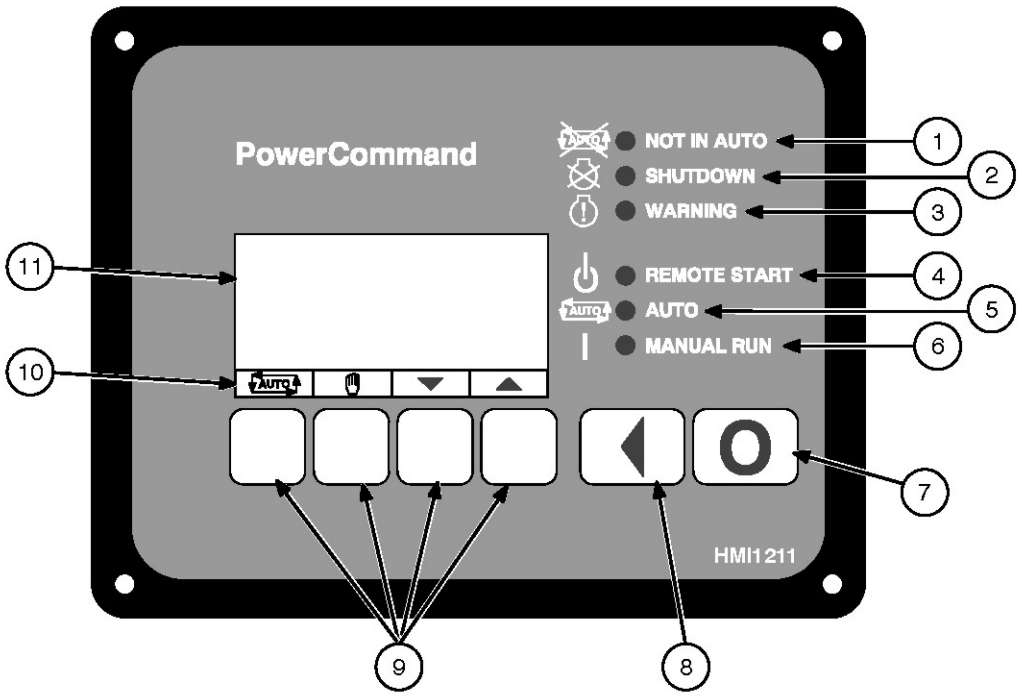

| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Off Button | 2 | This Mode Is Displayed Only if the Mode Change Access Code Feature Is Enabled |

**FIGURE 14. SELECTING OFF MODE**

# 3.10 Operator Panel

Figure 15 on page 44 shows the features of the front panel. It includes six LED indicators, the graphical display, and six buttons used to navigate through the menus and adjust parameters.




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | LED Indicator – Not in Auto | 7 | Generator Set Off Mode Button |
| 2 | LED Indicator – Shutdown | 8 | Previous Screen Button |
| 3 | LED Indicator – Warning | 9 | Selection Buttons (four) (for use with Item 10) |
| 4 | LED Indicator – Remote Start | 10 | Menu Bar (provision for four symbols) |
| 5 | LED Indicator – Auto | 11 | Graphical LCD Display |
| 6 | LED Indicator – Manual Run | | |

**FIGURE 15. OPERATOR PANEL**

## 3.10.1 LED Indicators

[Figure 15 on page 44](#) shows the front panel of the Operator Panel. It includes six LED indicators, the graphical display and six buttons used to navigate through the menus and adjust parameters.

### 3.10.1.1 Not in Auto

This red lamp is lit when the control is not in Auto.

### 3.10.1.2 Auto

This green lamp indicates the control is in **Auto** mode. **Auto** mode can be selected by pressing the selection button from any of the Operator menus.

### 3.10.1.3 Shutdown Status

This red lamp is lit when the control detects a Shutdown condition. The generator set cannot be started when this lamp is on. After the condition has been corrected, the lamp can be reset by pressing the **Off** button.

| *NOTICE* |
| --- |
| **When Battle Short mode has been enabled and an overridden shutdown fault occurs, the Shutdown lamp will be lit even though the generator set will continue to run.** |

### 3.10.1.4 Shutdown Status

This red lamp is lit when the control detects a Shutdown condition. The generator set cannot be started when this lamp is on. After the condition has been corrected, the lamp can be reset by pressing the Off button.

### 3.10.1.5 Warning

This yellow lamp is lit whenever the control detects a Warning condition. This lamp is automatically shut off when the Warning condition no longer exists.

### 3.10.1.6 Remote Start

This green lamp indicates the control is receiving a Remote Run signal.

### 3.10.1.7 Manual Run

This green lamp indicates the control is in the **Manual Run** mode. **Manual Run** can be selected by pressing the selection button from any of the Operator menus.

## 3.10.2 Default Settings

The Operator Panel can display SAE or Metric units of measurement and should be set during the initial setup of the generator set. Only trained and experienced personnel are allowed to change the default setting. Contact your authorized dealer.

## 3.10.3 Display Menu Selection Buttons

Four momentary soft-key buttons are used to step through the various menus and to adjust parameters. These selection buttons are "active" when a word or symbol in the graphical display is shown above the button. Some submenus do not include any active buttons.

The function of the four selection buttons varies with each menu.

- When the AUTO symbol is displayed, the selection button can be used to switch to Auto mode.
- When the symbol is displayed, the selection button can be used to switch to Manual Run mode.
- When the up and down triangles (▲ and ▼) are displayed, the selection buttons are used to navigate between a series of submenus.

**NOTICE**

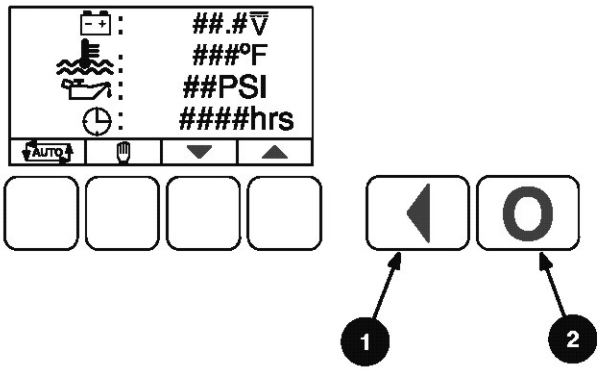
**When any Operator menu is displayed, a series of Service menus can be viewed by simultaneously pressing the ▲ and ▼ selection buttons for two seconds.**

- When a ◄ symbol is displayed, the selection button can be used to abort the Auto or Manual Run mode and return to the Operator menu that was displayed before the Auto or Manual Run mode was selected.
- When **ADJUST** is displayed, the selection button is used to display an adjustable menu. When the **ADJUST** button is pressed, the first adjustable parameter or value in the submenu is highlighted.
- When the → symbol is displayed, the selection button is used to navigate to an editable field within a menu.
- When the **+** and **-** symbols are displayed, the selection buttons are used to increase or decrease a parameter or value shown on the screen.

  When changing values, pressing the button below the + symbol increase the value and pressing the button below the - symbol decreases the value.
- When **SAVE** is displayed, the selection button is used to save changes made in a submenu. **If the Previous Menu button is pressed before pressing SAVE, the changes are not saved.**
- Some menus include a list of numbered subjects. These menus include numbers in parenthesis (for example, **(1)**) displayed above the selection buttons. The selection buttons are then used to display submenus of the subjects included in the list.
- When a black box [■] is displayed, the selection button has no function.

## 3.10.4 Control Buttons

The figure below illustrates the six control buttons - four selection buttons, the **Previous Menu** button, and the **Off** button.




| No. | Description |
|---|---|
| 1 | Previous Menu Button |
| 2 | Off Button |

**FIGURE 16. CONTROL BUTTONS**

### 3.10.4.1 Previous Main Menu Button

Press the [◄] button to view the previous main menu.

**NOTICE**

**In the Screen Adjust menu, settings are not saved when the button is pressed.**

The button is also used to acknowledge warning and shutdown messages after the fault has been corrected. Pressing this button clears the fault from the front panel display and the previous menu is redisplayed.

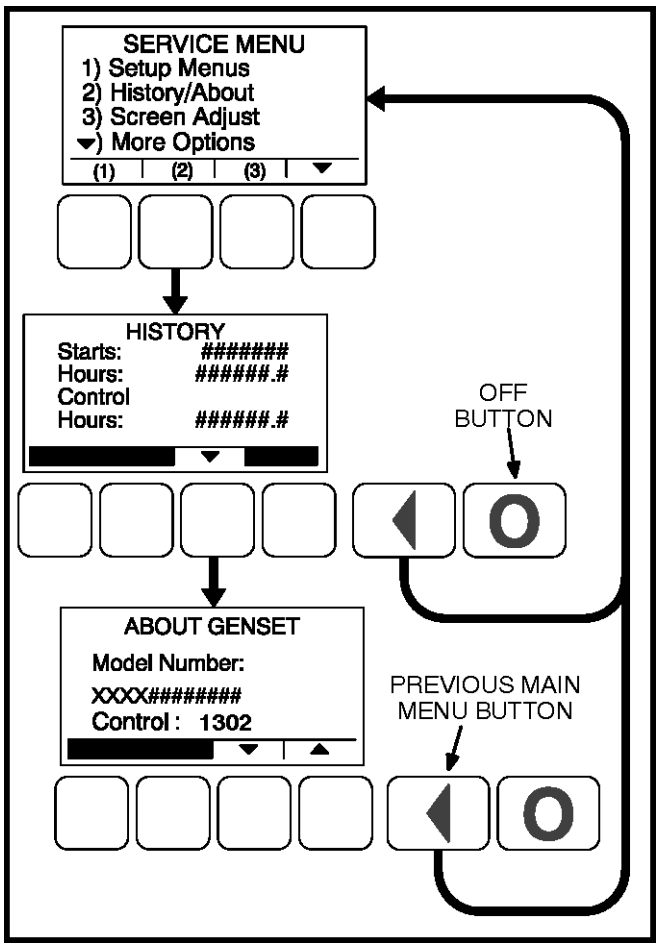



**FIGURE 17. PREVIOUS MAIN MENU AND OFF BUTTONS**

## 3.10.4.2 Off Button

Press this button to switch to Off mode. Off mode disables the control's Auto or Manual Run modes. Pressing the **Off** button resets the control.

If the **Off** button is pressed during generator set operation (manual or remote start), the engine immediately shuts down. If possible, hot shutdown under load should be avoided to help prolong the reliability of the generator set.

**NOTICE**

**Switching to Off mode can be restricted to authorized personnel. If a control panel is set-up with the mode change access code feature enabled, an access code must first be entered before the mode can be changed.**

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# 4 Operation - PowerCommand 1.1

## 4.1 Introduction

This section describes the operation of the generator set. The text should be read in conjunction with the Control System section of this manual.

All indicators, control switches/buttons, and graphical display are located on the face of the Operator Panel.

## 4.2 General Operating Conditions

The area surrounding the generator set is critical for safety and its performance. Follow the guidelines below.

- Do not stack anything on top of the generator set.
- Do not store anything inside of the generator set.
- Keep areas clear in front of the cool air in and hot air out (free of obstructions, debris, plants, etc.).

| ***NOTICE*** |
| --- |
| **All maintenance procedures must be performed or supervised by authorized and trained service personnel only.** |

## 4.3 Generator Set Operation

| **⚠ WARNING** |
| --- |
| ***Combustible Vapors*** <br> ***Do not operate an engine where there are or can be combustible vapors.*** <br> ***These vapors can be sucked through the air intake system and cause engine acceleration and overspeeding, which can result in a fire, an explosion, personal injury and extensive property damage.*** |

Correct care of your engine will result in longer life, better performance, and more economical operation.

Cummins does not know how you will use your generator set. The equipment owner and operator, therefore, is responsible for safe operation in the installation site environment. Consult your authorized Cummins dealer for further information.

| ***NOTICE*** |
| --- |
| ***Diesel engines only:*** **Cummins recommends the installation of an air intake shutoff device or a similar safety device to minimize the risk of overspeeding where an engine will be operated in a combustible environment.** |

 

**NOTICE**

**Long periods of idling (more than ten minutes) can damage an engine. Do not idle the engine for excessively long periods.**

## 4.3.1 Sequence of Operation

**NOTICE**

**The following sequences are based on an approximate time duration. Your generator set may vary slightly from the timing diagrams in this manual. All referenced times are based on default control settings. The following sequences are applicable to generator sets connected to an RA series transfer switch.**

### 4.3.1.1 Power Outage Sequence

The sequence of operation after a power outage (when the generator set is in Auto Mode) is as follows:

1. In normal operation, the utility power is running to the transfer switch and then to the building load, and the generator set is off.
2. The utility power turns off (power outage).
3. One second after the power outage, the transfer switch sends the command to the generator set to start.
4. After the generator set ramps up to rated speed, the generator set provides voltage to the transfer switch, but the transfer switch does not switch (allowing the voltage to go to the building) until after a delay.

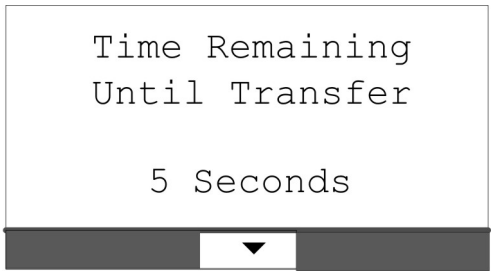


**FIGURE 18. TIME REMAINING UNTIL TRANSFER SCREEN**

5. Five seconds after starting, the generator set provides a signal to the transfer switch to transfer the building load to the generator set.

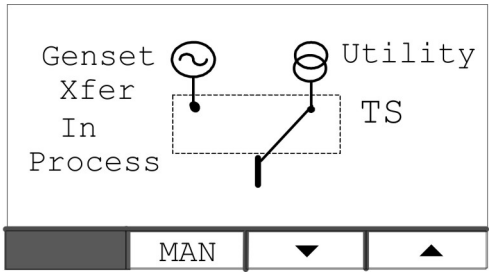


**FIGURE 19. BUILDING LOAD TRANSFER IN PROCESS**

6. The transfer switch switches the generator set power to the building load. The building is now running on generator power.

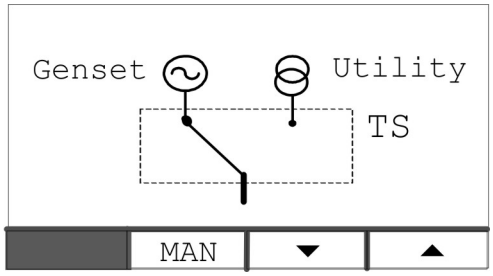


**FIGURE 20. GENERATOR SET POWERING BUILDING LOAD**

7. When the utility power is back and providing voltage to the transfer switch, the transfer switch waits for utility power stability.

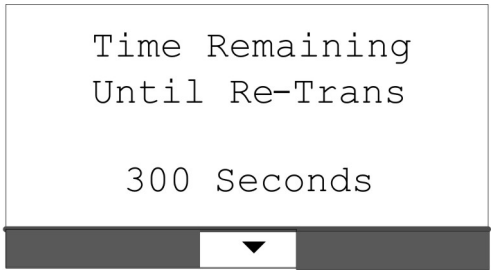


**FIGURE 21. TIME REMAINING UNTIL RE-TRANSFER**

8. When the utility power is stable for 5 minutes, the transfer switch switches back to utility power.

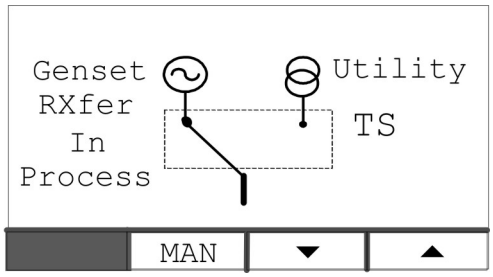


**FIGURE 22. BUILDING LOAD TRANSFER IN PROCESS**

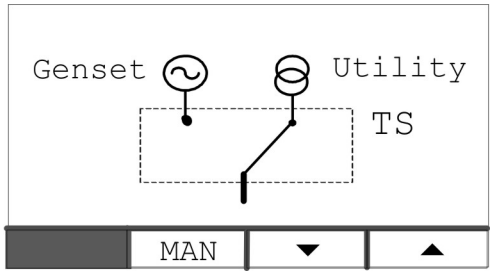


**FIGURE 23. UTILITY POWERING BUILDING LOAD**

9. The generator set runs for a 5-minute cooldown and shuts off.

 

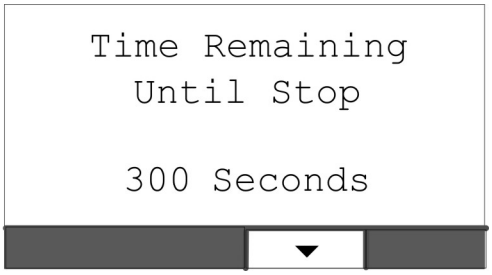


**FIGURE 24. TIME REMAINING UNTIL STOP**

10. Normal operation resumes.

### 4.3.1.2 Exercise Sequence

The exercise sequence when the programmed exercise time is realized (the generator set is in Auto Mode) is as follows:

1. The generator set starts and runs.
2. The Exerciser Scheduler On screen displays every 3 seconds and toggles between the existing Information screen that is displayed for 1 second.

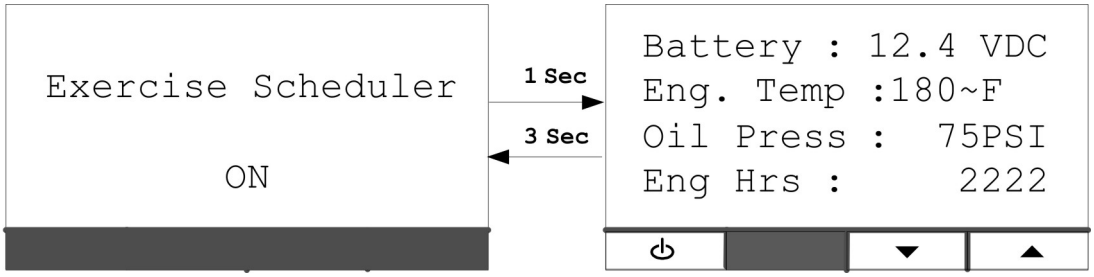


**FIGURE 25. EXERCISER SCHEDULER SCREEN AND INFORMATION SCREEN TOGGLE - EXAMPLE**

3. The transfer switch is not commanded to switch the building load to the generator set.

| *NOTICE* |
| --- |
| **The user may navigate to other screens from the Information screens during this duration. No functional keys are active on the Exerciser Scheduler On screen.** |

4. The generator set stops after programmed exercise run time.

### 4.3.1.3 Manually Starting the Generator Set Sequence

If the generator set is manually started with the standard operator panel, HMI211 (the generator set is in Man Mode), the sequence is as follows:

| *NOTICE* |
| --- |
| **Open the generator set main line circuit breaker to prevent the transfer switch from transferring building load to the generator set. The generator set display will still show the RA series ATS transfer; however, the switch will not transfer if the generator set breaker is open.** |

1. In normal operation, the utility power is running to the transfer switch and then to the building load, and the generator set is off.
2. Manually start the generator set via the standard control (HMI211) mounted on the generator set.

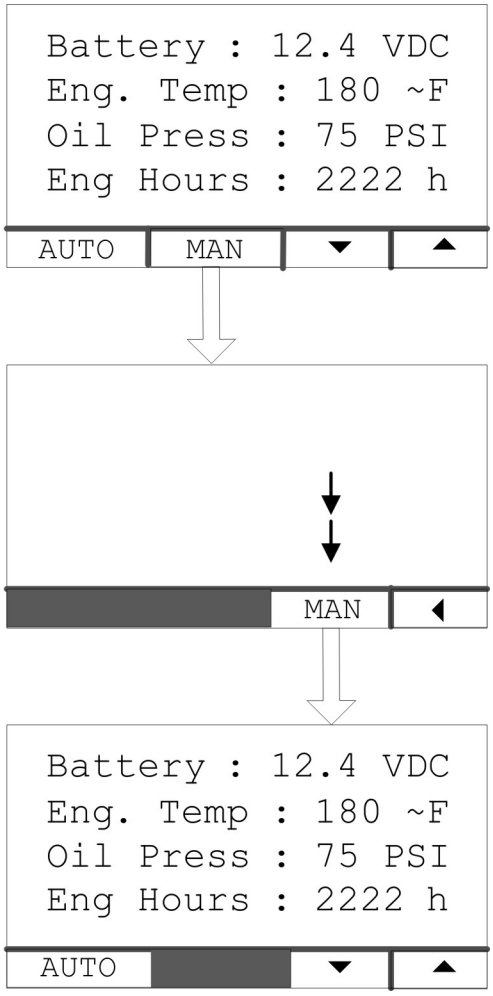


**FIGURE 26. MANUAL START SCREEN, STANDARD OPERATOR PANEL**

3. The generator set starts.
4. The generator set provides voltage to the transfer switch. (However, the transfer switch does not transfer in manual mode.)

 

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# 5 Maintenance

## 5.1 Maintenance Safety

**⚠ WARNING**

***Automated Machinery***

***Accidental or remote starting of the generator set can cause severe personal injury or death.***

***Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).***

**⚠ WARNING**

***Hydrogen Gas***

***Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury or death. Arcing can occur when cables are removed or replaced, or when the negative (–) battery cable is connected and a tool used to connect or disconnect the positive (+) battery cable touches the frame or other grounded metal part of the generator set.***

***Insulated tools must be used when working in the vicinity of the batteries. Always remove the negative (–) cable first and reconnect last.***

**⚠ WARNING**

***Explosive Fumes***

***Arcing can ignite explosive fumes causing severe personal injury or death.***

***Make sure hydrogen from the battery, engine fuel and other explosive fumes are fully dissipated before working on the generator set.***

**⚠ WARNING**

***Working at Heights***

***Using the incorrect equipment when working at heights can result in severe personal injury or death.***

***Suitable equipment for performing these tasks must be used in accordance with the local guidelines and legislation. Failure to follow these instructions can result in severe personal injury or death.***

**⚠ WARNING**

***Access***

***Using the generator set or part of as a means of access when attaching lifting shackles, chains, or other lifting aids, may damage the generator set, causing severe personal injury or death.***

***Do not use the generator set as a means of access. Failure to follow these instructions can result in severe personal injury or death.***

 

**⚠ WARNING**

***Exposed Terminations***

***Some panel internal components may have live exposed terminations even if the generator set is not running. Voltages are present which can cause electrical shock, resulting in personal injury or damage to equipment.***

***Isolate all external electrical supplies prior to access of the control panel***

***NOTICE***

**Only authorized and qualified maintenance technicians who are familiar with the equipment and its operation should carry out maintenance.**

***NOTICE***

**Dependent upon the control system fitted, this unit may operate automatically and could start without warning.**

***NOTICE***

**Always disconnect a battery charger from its AC source before disconnecting the battery cables. Failure to do so can result in voltage spikes high enough to damage the DC control circuits of the generator set.**

All maintenance tasks must be performed, but be sure to assess them for health and safety risks before starting. For example, perform a task with someone present if doing so will add significantly to the safety of the task.

Read, understand, and comply with all Caution, Warning, and Danger notes in this section, the Important Safety Instructions section, and the documentation supplied with the generator set.

Make sure that adequate lighting is available.

## 5.1.1 Locking the Generator Set Out of Service

***NOTICE***

**Automated Machinery**

**Accidental or remote starting of the generator set can cause severe personal injury or death.**

**Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables, negative (–) cable first.**

Before any work is carried out for maintenance, etc., the generator set must be immobilized. Even if the generator set is put out of service by pressing the Off switch on the Operator Panel (or the STOP button if applicable), the generator set cannot be considered safe to work on until the engine is properly immobilized, as detailed in the following procedure.

***NOTICE***

**Refer also to the engine-specific Operator Manual, if applicable. This manual contains specific equipment instructions that may differ from the standard generator set.**

To immobilize the generator set:

1. Press the Off switch from the display and then press the E-Stop button to shut down the engine. This will prevent the starting of the generator set regardless of the Start signal source and will therefore provide an additional safety step for immobilizing the generator set. Alternatively, make sure the generator set is in manual mode (which allows it to be started by manually pushing the buttons).

| ***NOTICE*** |
| --- |
| **When the E-Stop button is pressed, the Operator Panel indicates the Shutdown condition by illuminating the red Shutdown status LED  and displaying a message on the graphical LCD display.** |

2. Thoroughly ventilate the generator set before disconnecting any leads.
3. Turn off and disconnect the heater (where fitted) from the AC source before disconnecting the battery cables.
4. Turn off and disconnect the battery charger (where fitted) from the AC source before disconnecting the battery cables.
5. Turn off the fuel supply to the engine.
6. Disconnect the battery. Disconnect the negative (**–**) cable first, using an insulated wrench.
7. Place warning notices at each of the above locations that state, "Maintenance in Progress – Immobilized for Safe Working."

# 5.2 Periodic Maintenance

The periodic maintenance procedures should be performed at whichever interval occurs first. At each scheduled maintenance interval, perform all previous maintenance checks that are due for scheduled maintenance.

The tabular data that follows gives the recommended service intervals for a generator set on Standby service. If the generator set will be subjected to Prime usage or extreme operating conditions, the service intervals should be reduced accordingly.

Some of the factors that can affect the maintenance schedule are:

- Use for continuous duty (prime power)
- Extremes in ambient temperature
- Exposure to elements
- Exposure to salt water
- Exposure to windblown dust or sand

Consult with an authorized distributor if the generator set will be subjected to any extreme operating conditions and determine if extra protection or a reduction in service intervals is needed. Use the running time meter to keep an accurate log of all service performed for warranty support. Perform all service at the time period indicated, or after the number of operating hours indicated, whichever comes first.

 

## 5.2.1 Periodic Maintenance Schedule

**TABLE 18. PERIODIC MAINTENANCE SCHEDULE 8 TO 500 HOURS**

| MAINTENANCE ITEMS | Daily or after 8 Hours | Weekly or after 50 Hours | Monthly or after 100 Hours | Yearly or after 250 Hours | Yearly or after 500 Hours |
|---|---|---|---|---|---|
| **Perform maintenance tasks as specified using Daily or Hourly periods – whichever is the sooner** | | | | | |
| General Genset Inspection | X[1, 2] | | | | |
| Check Coolant Heater | X | | | | |
| Check Oil Level | X | | | | |
| Check Coolant Level | X | | | | |
| Check Fuel Level | X | | | | |
| Check Charge Air Piping | | X[1] | | | |
| Check Air Cleaner | | X[3] | | | |
| Check Battery Charging System | | X | | | |
| Drain Fuel Filter(s) | | X[1, 5] | | | |
| Drain Water and Sediment from Fuel Tank | | | X[5] | | |
| Drain Exhaust Condensate Trap | | | X | | |
| Check Starting Batteries | | | X | | |
| Check Drive Belt | | | X[4] | | |
| Replace lubricant oil and filters | | | | X[1] | |
| Check Anti-freeze and DCA Concentration | | | | X[1] | |
| Check Radiator Hoses for Wear and Cracks | | | | X | |
| Change Air Cleaner Element | | | | X[3] | |
| Change Crankcase Oil and Filter | | | | | X[6] |
| Change Fuel Filters | | | | | X[1] |
| Clean Cooling System | | | | | X[1, 3] |
| Test Rupture Basin Leak Detect Switch | | | | | X[8] |
| Check Valve Lash | **After 5000 hours[1, 7]** | | | | |

| MAINTENANCE ITEMS | Daily or after 8 Hours | Weekly or after 50 Hours | Monthly or after 100 Hours | Yearly or after 250 Hours | Yearly or after 500 Hours |
|---|---|---|---|---|---|
| 1. Refer to Cummins Engine Owners Manual for maintenance information.<br>2. Check for oil, fuel, cooling and exhaust system leaks. Check exhaust system audibly and visually with set running and repair any leaks immediately.<br>3. Perform more often in dusty conditions.<br>4. Visually check belt for evidence of wear or slippage. Replace if hard or brittle.<br>5. Drain 1 cup or more of fuel to remove water and sediment.<br>6. If used for prime power application, refer to Cummins Engine Owners Manual for maintenance interval.<br>7. Contact an authorized service center for service.<br>8. Check leak detect switch in sub-base fuel tank, once a year or as required by safety code. Contact your authorized service center. | | | | | |

## 5.2.2 Maintenance Record

Record all periodic and unscheduled maintenance and service. See the Periodic Maintenance Schedule for a list of scheduled maintenance frequency.

| Date | Engine Hours Meter Reading | Maintenance or Service Performed |
|---|---|---|
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Record the name, address, and phone number of your authorized Cummins service center:

| Name | Address | Phone |
|---|---|---|
| | | |

## 5.2.3 Exercising the Generator Set

| NOTICE |
|---|
| **Audible engine RPM variation may be heard when there is no load applied. This is normal and does not affect the generator set performance.** |

Exercising the generator set drives off moisture, relubricates the engine, and removes oxides from electrical contacts. The result is better starting, more reliable operation and longer engine life.

The generator set exerciser mode defaults are as follows.

- **Day:** Tuesday
- **Time:** 2:00 pm
- **Period:** Monthly
- **Run Time:** 5 minutes

Refer to the Exercise Settings section of this manual for more information on setting up the exerciser.

## 5.2.4 Maintenance Procedures - Daily or When Refueling

Monitor fluid levels, oil pressure, and coolant temperature frequently. During operation, be alert for mechanical problems that could create unsafe or hazardous conditions. The following sections cover several areas that should be frequently inspected for continued safe operation.

| NOTICE |
|---|
| **Components that have guards against inadvertent touching must be visually inspected only. Do not remove the guards to do the inspection.** |

### 5.2.4.1 General Information

Preventive maintenance begins with day-to-day awareness of the condition of the generator set. Before starting the generator set, check and look for:

- Oil and coolant levels
- Leaks
- Loose or damaged parts
- Worn or damaged belts
- Any change in engine noise or performance
- Generator set appearance

### 5.2.4.2 Engine Operation Report

The engine must be maintained in good mechanical condition if the operator is to obtain optimum satisfaction from its use. Running reports are necessary to enable programmed or emergency servicing to be carried out.

Comparison and intelligent interpretation of the running report, together with a practical follow-up action will eliminate most failures and emergency repairs.

Most engine problems give an early warning. Look and listen for changes in engine performance, sound, or appearance that can indicate service or repair is needed. Some engine changes to look for and report on are:

- Low lubricating oil pressure
- Low power
- Abnormal water or oil temperature
- Unusual engine noise
- Excessive use of coolant, fuel or lubricating oil
- Any coolant, fuel, or lubricating oil leaks
- Misfire
- Unexplained frequency fluctuation
- Significant vibration
- Excessive white and/or black exhaust smoke.

# 5.3 Cooling System

| *NOTICE* |
| --- |
| **Loss of coolant can allow the engine to overheat if it does not have the protection of a shutdown device. This can cause severe damage to the engine. Maintain coolant level for proper operation of high engine temperature shutdown system. If applicable, see the Model Specifications section for more information.** |

## 5.3.1 Radiator Check

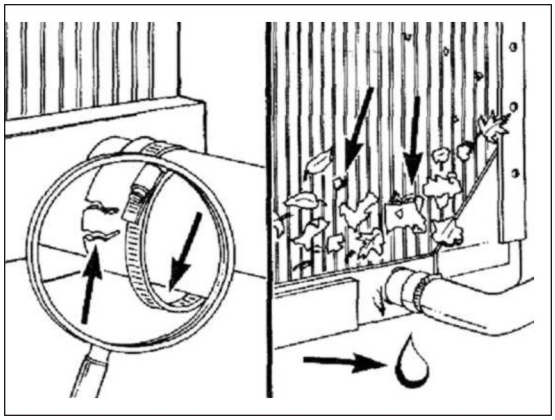


**FIGURE 27. RADIATOR CHECK**

Check for damaged hoses and loose and damaged hose clamps.

Inspect the exterior of the radiator (through the guarding) for obstructions. During the service life of a radiator a buildup of foreign matter can obstruct the flow of air through the radiator cores, reducing the cooling capability. To continue the efficiency of the radiator, the core will require cleaning.

Cleaning of the radiator core must only be undertaken by suitably trained and experienced service personnel.

## 5.3.2 Cooling Fan Inspection

**⚠ WARNING**

***Fan Blade Damage***

***Personal injury can result from a fan blade that has become damaged.***

***Never pull or pry on the fan; this can damage the fan blade(s) and cause fan failure.***

A visual inspection of the cooling fan is required daily. Check for loose rivets or retaining bolts (1), for cracks (2), and bent or loose blades (3).

Contact your authorized dealer if the fan is damaged.

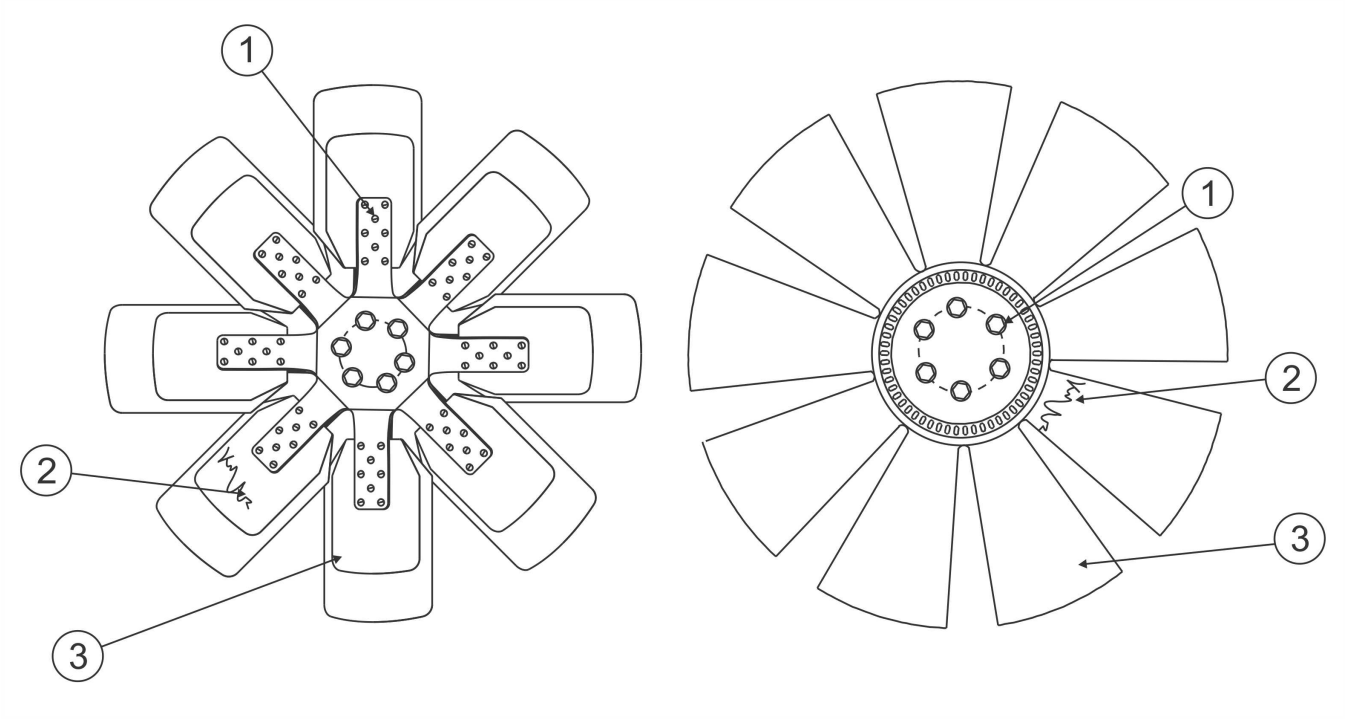



**FIGURE 28. COOLING FAN INSPECTION**

# 5.4 Engine Oil

## 5.4.1 Recommended Engine Oil

Check the oil level prior to starting the generator set to verify that the oil level is between the High and Low marks.

## 5.4.2 Checking Engine Oil Level

**⚠ WARNING**

***State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Avoid skin contact and breathing of vapors. Use rubber gloves and wash exposed skin. Accidental or remote starting of the generator set can cause severe personal injury or death. Disconnect the negative (-) battery cable and place the control switch in its OFF position before starting work.***

**⚠ WARNING**

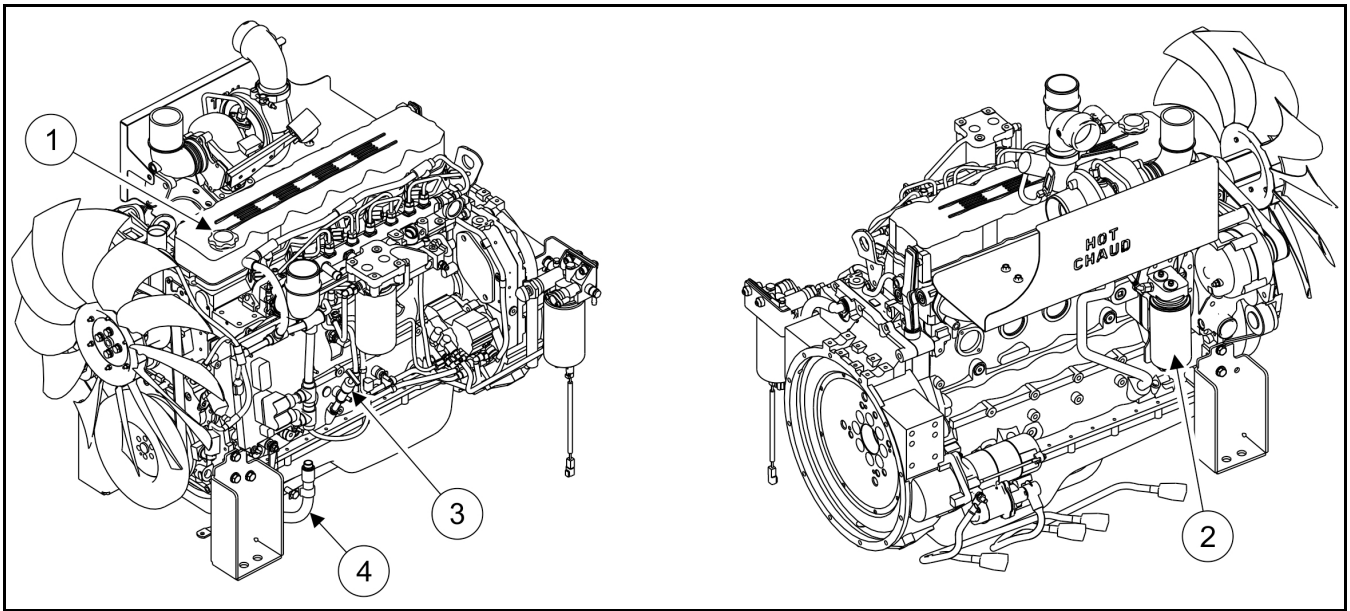
***Crankcase pressure can blow out hot oil and cause severe burns. Do NOT check oil while the engine is operating.***

***NOTICE***

**Check the engine oil level when the engine is not running and is out of Auto mode.**

***NOTICE***

**Overfilling can cause foaming or aeration of the oil, and operation below the low mark may cause loss of oil pressure. Do not operate the engine with the oil level below the low mark or above the high mark.**




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Oil Fill | 3 | Dipstick |
| 2 | Oil Filter | 4 | Oil Drain |

**FIGURE 29. ENGINE OIL COMPONENTS**

To check the engine oil level:

1. Make sure that the engine has not been running for approximately five minutes.
2. Clean off the area surrounding the dipstick port to prevent entry of debris into the oil pan.
3. Pull out the dipstick and wipe it clean.
4. Reinsert and fully seat the dipstick.
5. Remove the dipstick and check the oil level.
6. Reinsert and fully seat the dipstick.

If the engine oil level check shows excessive or insufficient levels of oil (oil level line above the High mark or below the Low mark), oil must be drained or added. Refer to the following sections for instructions and guidelines for draining and adding oil.

## 5.4.3 Adding or Draining Oil

**⚠ WARNING**

***Hot Surfaces***

***Contact with hot surfaces can cause severe burns. Wear appropriate PPE when working on hot equipment and avoid physical contact with hot surfaces.***

**⚠ WARNING**

***Hot Engines***

***Contact with hot engines can cause severe burns. Ensure that the generator set engine has cooled down before adding or draining the oil.***

***NOTICE***

**Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the High and Low marks on the dipstick.**

### 5.4.3.1 Adding Oil

If the oil level is found to be insufficient, oil must be added.

1. Ensure that the oil fill cap area is clean, and prevent debris from entering the engine.
2. Add the appropriate amount of oil, based on the engine oil level check. Refer to the Checking Engine Oil Level section and the Model Specifications section.
3. Recheck the engine oil level. Based on the results, add or drain oil.
4. Clean up and dispose of any oil in accordance with local/state regulations.

### 5.4.3.2 Draining Oil

If the oil level is found to be excessive, oil must be drained from the engine.

1. Detach the oil drain hose from the side of the engine.
2. Place the end of the drain hose into an appropriate container.

Refer to local regulations to determine the appropriate container for used oil.

- Open the oil drain valve to release oil from the engine into the appropriate container.
- Recheck the engine oil level. Based on the results, add or drain oil.

- When a sufficient amount of oil has been drained from the system:
  1. Close the oil drain valve.
  2. Wipe the oil drain valve clean.
  3. Re-attach the drain hose to the side of the engine.
  4. Dispose of the used oil in accordance with local/state regulations.

## 5.4.4 Changing Engine Oil and Oil Filter

**NOTICE**

**Automated Machinery**

**Accidental or remote starting of the generator set can cause severe personal injury or death.**

**Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables, negative (–) cable first.**

**⚠ WARNING**

***Toxic Hazard***

***State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity.***

***Avoid skin contact and breathing of vapors. Use rubber gloves and wash exposed skin.***

**NOTICE**

**If the oil and/or oil filter are not reused, dispose of them in accordance with local environmental regulations.**

**NOTICE**

**Change the engine oil and filter when the generator set is not running and is out of Remote mode.**

**NOTICE**

**Change the oil more often in hot and dusty environments.**

**NOTICE**

**Cummins highly recommends that any service or maintenance work be performed by qualified technicians.**

1. Open the generator set's circuit breaker to prevent the ATS from transferring to generator set source when manually starting.
2. Before changing the oil, manually start the generator set.
3. Allow the generator set to run for 2 to 5 minutes to warm the engine oil.
4. Make sure the generator set is shut down and disabled:
   a. Press the generator set's "O" (Off) button to stop the generator set. Allow the generator set to thoroughly cool to the touch.
   b. Turn off and disconnect the battery charger from the AC source before disconnecting the battery cables.

c. Disconnect the negative (–) cable from the battery and secure it from contacting the battery terminals to prevent accidental starting.

d. If applicable, disconnect the oil heater from its AC power source (or turn off power).

5. Remove the access panels to get to the drain hose.
6. Open the oil drain cap to release oil from the engine into the appropriate container.

| NOTICE |
| --- |
| **Refer to local regulations to determine the appropriate container for used oil.** |

7. Close the oil drain cap.
8. Wipe the oil drain cap clean.
9. Place an appropriate container below the oil filter to collect oil as the filter is being removed.
10. Remove the oil filter by turning it counterclockwise.
11. Remove the old gasket if it remains on the engine.
12. Clean the filter mounting surface on the engine block.
13. Make sure the gasket is in place on the new filter and apply a thin film of clean oil to the gasket.
14. Install the new filter until the gasket just touches the block. Turn it an additional 1/2 to 3/4 turn. Do not over-tighten.
15. Remove the container used to collect oil when removing the oil filter.
16. Add the appropriate amount of oil.

| NOTICE |
| --- |
| **Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the High and Low marks.** |

17. Check the engine oil level. Based on the results, add or drain oil.
18. Remove any oil that has spilled on the generator set during this procedure.
19. Make sure the generator set breaker is open.
20. Reconnect the cables and battery charger:

    a. Reconnect the engine battery cables, positive (+) cable first.

    b. Reconnect the battery charger to its AC power source.

21. Reconnect the oil heater AC power or energize its AC circuit.
22. Operate the generator set with no load for approximately 5 minutes to check for leaks at the oil filter or oil drain hose.
23. Shut down the generator set, wait 5 minutes, and then confirm that the correct oil level is in the pan.
24. Check for leaks and repair any that are identified.
25. Dispose of the used oil and oil filter according to local environmental regulations.
26. Re-install the access panels. Torque the fasteners 5.0–6.6 Nm (3.5–5.0 ft-lb).
27. Restore the original generator set settings.
28. Close the generator set breaker.

# 5.5 Diesel Fuel System Safety and Requirements

**⚠ WARNING**

***Fuel Ignition***

***Ignition of fuel can cause serious personal injury or death by fire or explosion.***

***DO NOT permit any flame, cigarette, or other igniter near the fuel system, or in areas sharing ventilation.***

**⚠ WARNING**

***Fuel Mixtures***

***Mixing gasoline or alcohol with diesel fuel, can cause an explosion which may result in severe personal injury or death.***

***Do not mix gasoline or alcohol with diesel fuels.***

***NOTICE***

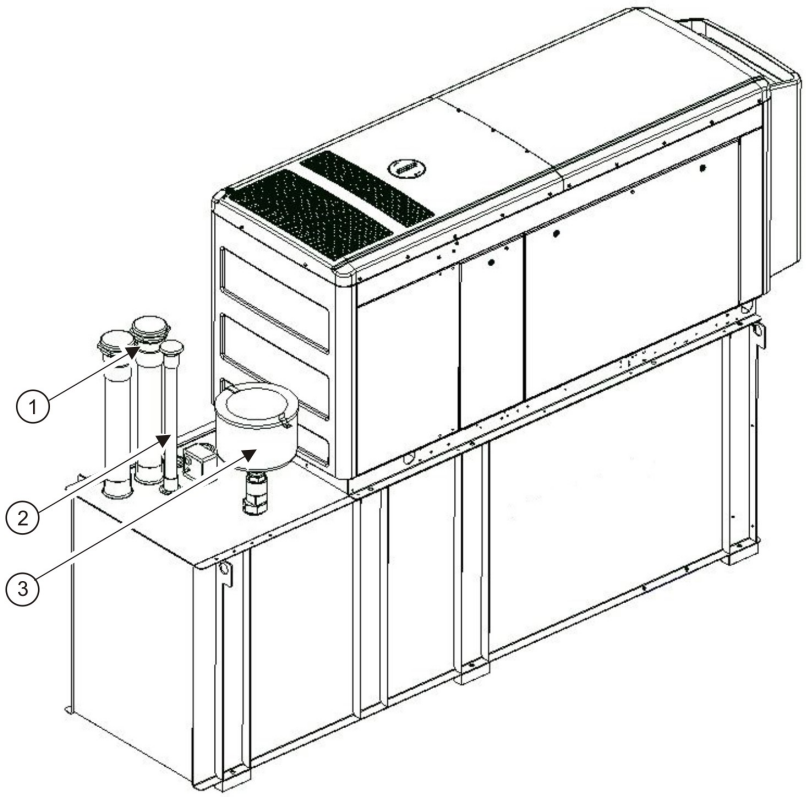
**Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the injection pump and the injection nozzles.**

See the *Model Specifications* section for fuel requirements.

## 5.5.1 Fuel Level

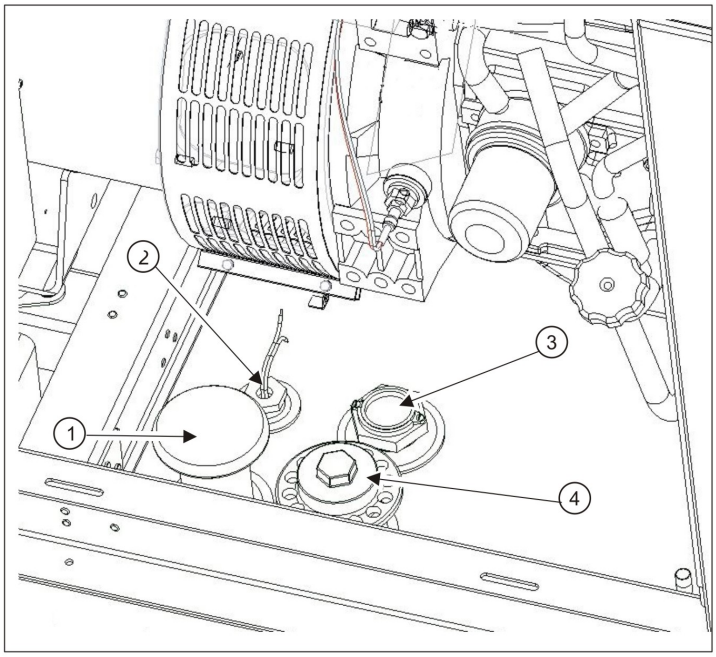
To avoid condensation problems, keep fuel supply tanks as full as possible by filling them each time the generator set is used. Condensation (water) can cause clogging of the fuel filters, as well as possible freezing problems. In addition, water mixing with the sulfur in the fuel forms acid which can corrode and damage engine parts.




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Emergency Vents | 3 | Fuel Fill (shown with spill box) |
| 2 | Normal Vent | | |

**FIGURE 30. EXAMPLE OF REGIONAL FUEL TANK OPTION**




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Normal Vent | 3 | Fuel Gauge |
| 2 | Fuel Low Level Switch | 4 | Fuel Fill |

**FIGURE 31. EXAMPLE OF BASIC FUEL TANK OPTION**

## 5.5.2 Fuel/Water Separator (Spin-On Type)

A set-mounted integral fuel/water separator is fitted to provide protection for the engine fuel injection system as water-free fuel supplies cannot be guaranteed.

Drain the water and sediment from the separator daily.

1. Turn off the generator set.
2. Wait 1 minute to remove any pressure in the fuel line.
3. Place a suitable container under the fuel filter.

| *NOTICE* |
|---|
| **If more than 60 ml (2 oz) is drained, refilling of the filter is required to prevent hard starting.** |

4. Turn the valve counterclockwise, four complete turns, until the valve drops down approximately one inch. Drain the filter sump of water until clear fuel is visible.

| *NOTICE* |
|---|
| **Do not over tighten the valve. Over tightening can damage the threads.** |

5. When clear fuel begins to flow out of the drain, push the valve up and turn the valve counterclockwise to close drain valve.

6. Before starting the engine, be sure to remove the container and clean up any fuel spillage.
7. Start the engine and check for any leaks.

| *NOTICE* |
| --- |
| **The drained liquids must be disposed of in accordance with local environmental regulations.** |

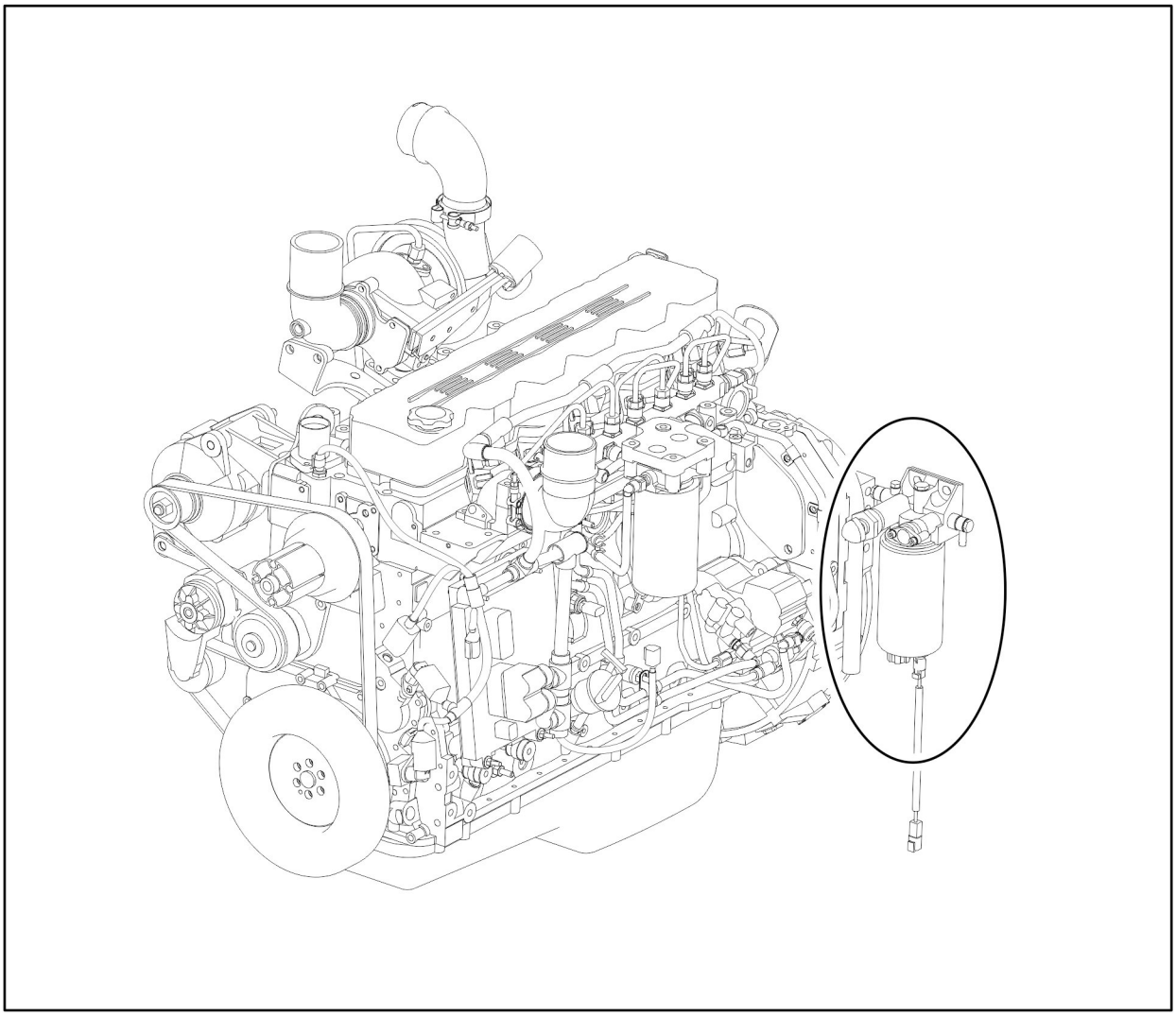


**FIGURE 32. FUEL/WATER SEPARATOR LOCATION ON QSB7**

## 5.5.3 Fuel Filter Maintenance

### 5.5.3.1 Fuel Filter - Element Replacement

**⚠ WARNING**

***Fuel Is Flammable***

***When inspecting or performing service or repairs on the fuel system, to reduce the possibility of fire and resulting severe personal injury, death, or property damage.***

***Never smoke or allow sparks or flames (such as pilot lights, electrical switches, or welding equipment) in the work area.***

***NOTICE***

**Fuel filter replacement includes the appropriate o-ring and sealing grommet. The o-ring and grommet must be replaced with the filter element to make sure of proper operation.**

***NOTICE***

**The drained liquids must be disposed of in accordance with local environmental regulations.**

1. Remove the existing filter.

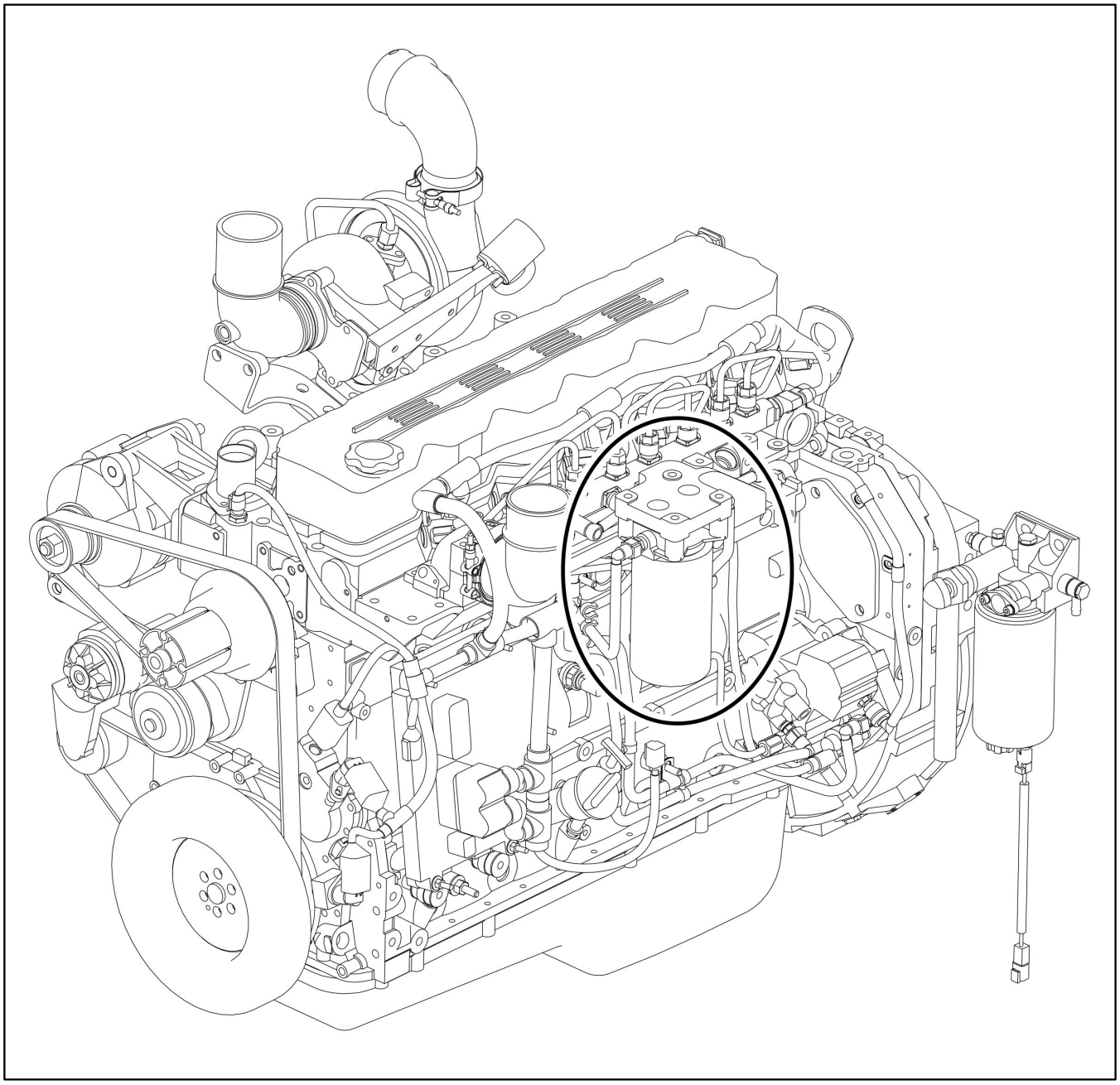


**FIGURE 33. FUEL FILTER LOCATION ON QSB7**

2. Fill the fuel filter with clean fuel.
3. Install the o-ring.
4. Install the fuel filter as specified by the filter manufacturer.

## 5.5.4 Hoses and Fuel Lines Check

**⚠ WARNING**

***Moving Parts***

***Moving parts can cause severe personal injury or death.***

***Use extreme caution around moving parts. To prevent personal injury, turn off and remove power while troubleshooting.***

**⚠ WARNING**

***Hot Surfaces***

***Contact with the hot surfaces can cause severe burns.***

***Wear appropriate PPE when working on hot equipment and avoid physical contact with hot equipment where possible.***

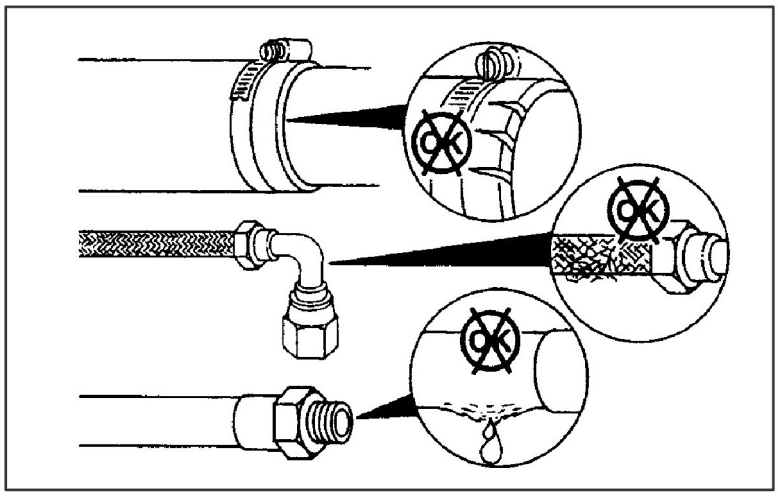



**FIGURE 34. HOSES AND FUEL LINE INSPECTION**

1. Inspect the fuel lines, filters, and fittings for leaks.
2. Check any flexible sections for cuts, cracks and abrasions and ensure they are not rubbing against anything that could cause breakage.
3. If any leaks are detected, shut down the generator set (if possible). Contact your authorized dealer and have the leaks corrected immediately.

# 5.6 Air Intake System

The direct flow air cleaner consists of a primary filter and a secondary filter within the air cleaner housing. The air cleaner has been designed for a maximum restriction, at which point the filter elements should be changed. Refer to the Model Specifications section.

# 5.6.1 Normal Duty Air Cleaner

## 5.6.1.1 Normal Duty Air Cleaner Element Replacement

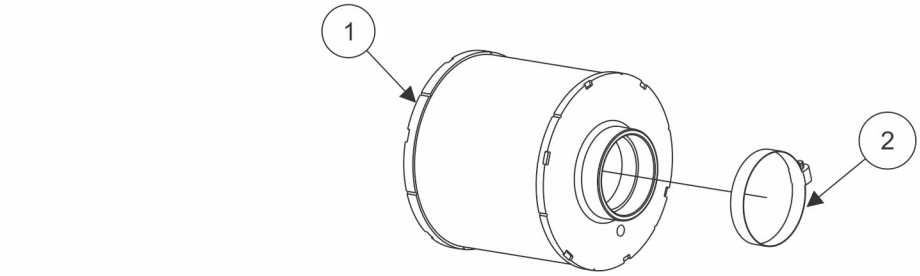
**NOTICE**

**Holes, loose-end seals, dented sealing surfaces, corrosion of pipes, and other forms of damage render the air cleaner inoperative and require immediate element replacement or engine damage can occur.**

**NOTICE**

**Cummins does not recommend cleaning paper-type air cleaner elements.**

1. Remove the existing air cleaner:
   a. Loosen the strap clamp (2).
   b. Wipe away any debris accumulated around the air cleaner connection to the engine. Ensure that no debris is allowed to enter the body of the air cleaner or the connection on the engine.
   c. Remove the dirty air cleaner (1).
   d. Dispose of the dirty element in accordance with local environmental agency requirements.
2. Install the replacement air cleaner (1) as follows:
   a. Install the air cleaner (1).
   b. Tighten strap clamp (2). Torque to 2.5 - 3.3 ft-lb (4.3 - 4.65 Nm).




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Air Cleaner | 2 | Strap Clamp |

**FIGURE 35. EXAMPLE OF NORMAL DUTY AIR CLEANER**

# 5.6.2 Heavy Duty Air Cleaner

## 5.6.2.1 Air Cleaner Service Indicator

**⚠ WARNING**

***Hot exhaust components.***

***Exhaust components become very hot when the generator set is in use and remain hot for a period of time after the generator set has been shut down. These components can cause severe personal injury or death from contact.***

***Allow these components to cool completely before performing any maintenance tasks.***

**⚠ WARNING**

***Moving parts.***

***Moving parts can cause severe personal injury or death.***

***Use extreme caution around hot manifolds, moving parts, etc.***

The air cleaner service indicator, available only on heavy duty air cleaners, is located on the air cleaner assembly.

Check the air cleaner service indicator. If the gauge has crossed the red mark, replace the filter element.

## 5.6.2.2 Heavy Duty Air Cleaner Maintenance

**⚠ WARNING**

***Fall Hazard***

***Falls can result in severe personal injury or death.***

***Make sure that suitable equipment for performing tasks at height are used in accordance with local guidelines and legislation.***

There is a dust ejector valve (DEV) on the bottom of each filter pre-cleaner that should be checked periodically to make sure it is free of dust and dirt.

When there is a filter pre-cleaner, it includes a primary and secondary element that is checked periodically to make sure they are clean. Refer to the *Periodic Maintenance Schedule* table for additional information.

## 5.6.2.3 Heavy Duty Air Cleaner Element Replacement

**⚠ CAUTION**

***Holes, loose-end seals, dented sealing surfaces, corrosion of pipes, and other forms of damage render the air cleaner inoperative and require immediate element replacement or engine damage can occur.***

***NOTICE***

**Cummins does not recommend cleaning paper-type air cleaner elements.**

1. To remove the existing air cleaner element:
   a. Before disassembly, wipe dirt from the cover and the upper portion of the air cleaner.
   b. Lift the latch (3) and turn the end cover (4) counterclockwise.

c. Pull the end cover (4) away from the housing (1).

d. Remove the air filter element (2) from the housing (1).

e. Dispose of the dirty element in accordance with local environmental agency requirements.

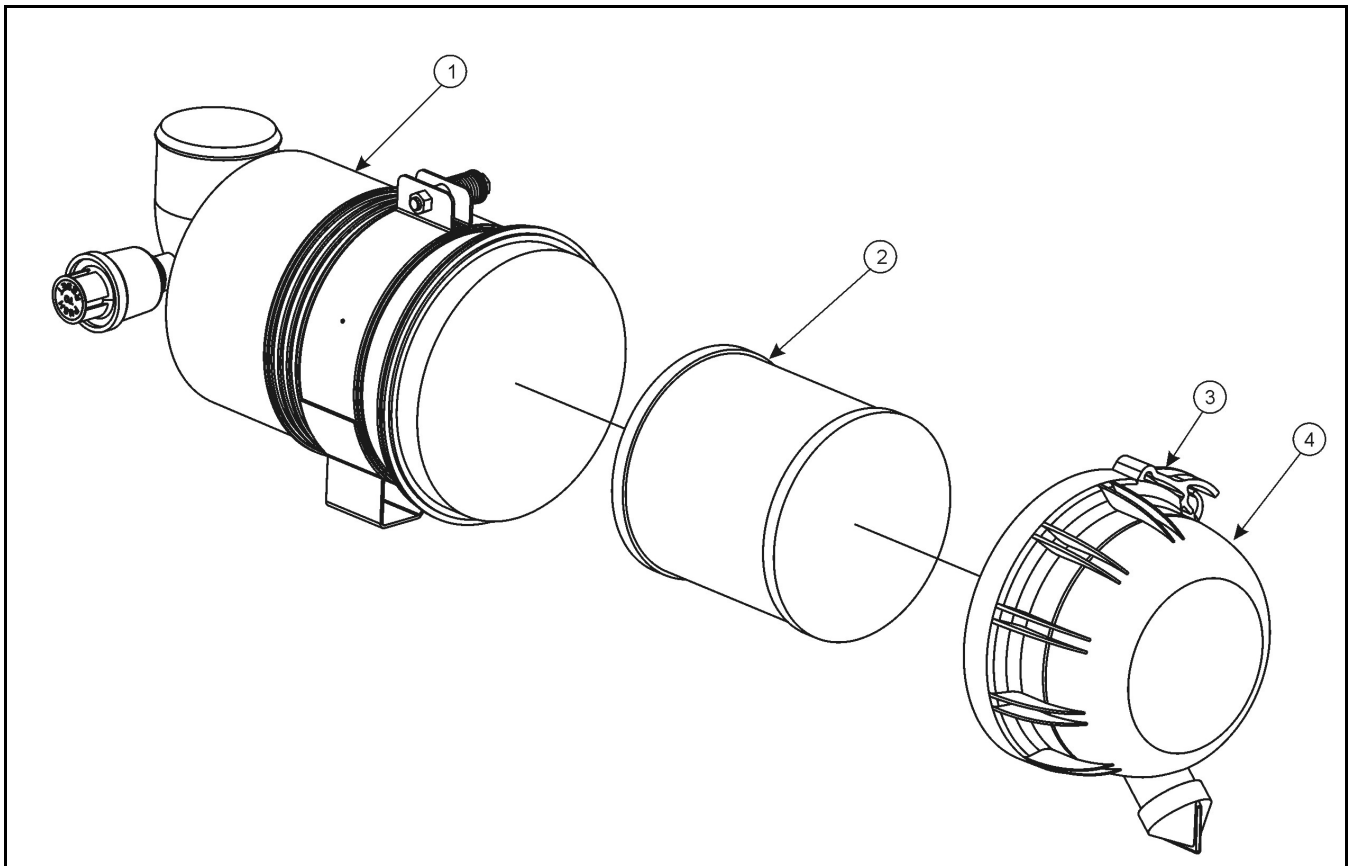
2. To install the replacement air cleaner element:

a. Ensure that no debris enters the filter element or connection point on the air cleaner housing.

b. Insert the air filter element (2) into the housing (1).

c. Install the end cover (4) onto the housing (1).

d. Turn the end cover (4) clockwise until the latch (3) snaps into place.




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Housing | 3 | Latch |
| 2 | Air Filter Element | 4 | End Cover |

**FIGURE 36. EXAMPLE OF HEAVY DUTY AIR CLEANER**

# 5.7 Exhaust System Maintenance

**⚠ WARNING**

***Hot Exhaust Components***

***Exhaust components become very hot when the generator set is in use and remain hot for a period of time after the generator set has been shut down. These components can cause severe personal injury or death from contact.***

***Allow these components to cool completely before performing any maintenance tasks.***

**⚠ WARNING**

***Inhalation of Exhaust Gases***

***Inhalation of exhaust gases can result in serious personal injury or death.***

***Be sure deadly exhaust gas is piped outside and away from windows, doors or other inlets to buildings. Do not allow to accumulate in habitable areas.***

**⚠ WARNING**

***Moving Parts***

***Moving parts can cause severe personal injury or death.***

***Use extreme caution around moving parts, etc.***

With the generator set operating, inspect the entire exhaust system visually and audibly including the exhaust manifold, muffler, and exhaust pipe without removing guarding and panels. Check for leaks at all connections, welds, gaskets and joints, and ensure that exhaust pipes are not heating surrounding areas excessively. If any leaks are detected, shut down the generator set (if possible). Contact your authorized dealer and have the leaks corrected immediately.

# 5.8 Generator Set Output - AC Electric System Checks

1. Check the following while the generator set is operating.

**TABLE 19. AC ELECTRIC SYSTEM CHECKS**

| Check | Description |
|---|---|
| Frequency | The generator set frequency should be stable and the reading should be the same as the generator set nameplate rating. See the Model Specifications section. |
| AC Voltage | At no load, the line-to-line voltage, or voltages, should be the same as the generator set nameplate rating. |
| AC Ammeter | At no load, the current readings should be zero. With a load applied, each line current should be similar. |
| Panel Lamps | When the operating panel is first connected to the DC supply, the system runs a check by illuminating each of the indicator lamps in turn. |

2. If all of the LEDs do not illuminate, replace the operator panel.

# 5.9 DC Electrical System

**⚠ WARNING**

***Combustible Gases***

***Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.***

***Do not smoke, or switch the trouble light ON or OFF near a battery. Touch a grounded metal surface first before touching batteries to discharge static electricity. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last.***

1. Check the harness connections. If any harness connections are damaged, contact your service representative.

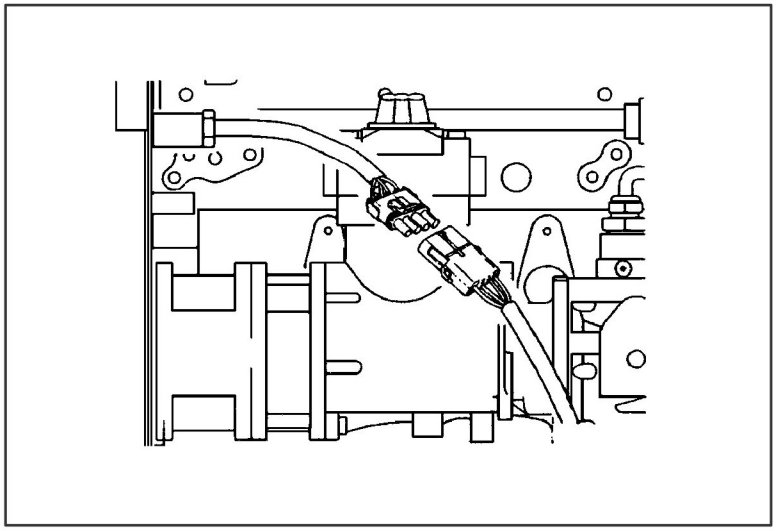


**FIGURE 37. CHECK HARNESS CONNECTIONS**

2. Check the terminals on the batteries for clean and tight connections. Loose or corroded connections create resistance, which can hinder starting. Clean and reconnect the battery cables if loose, using an insulated wrench. Always disconnect both ends of the negative battery cable. Reconnect one end of the cable to the negative battery terminal and the other end to ground. This will make sure that any arcing will be away from the battery and least likely to ignite explosive battery gases.
3. Check connections at the battery charging alternator.
4. Visually inspect the alternator belt to make sure it is not loose or cracked.

# 5.10 Batteries

Batteries are an essential part of any standby generator set system. A significant amount of generator set failures are due to battery issues.

It is therefore vital that batteries are stored, commissioned, and maintained as detailed here. Reference should also be made to the battery manufacturer’s instructions.

Maintenance free batteries (if supplied with the generator set) need no maintenance for commissioning.

## 5.10.1 Storage

Batteries must be stored in a cool, dry, well-ventilated place, in the upright position, and with the vent caps securely in place.

Batteries must never be stacked on top of each other and must be protected from the floor by a wooden pallet or suitably thick cardboard sheet.

## 5.10.2 Safety Precautions

Servicing of batteries are to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

### 5.10.2.1 General Precautions for Maintenance-Free Batteries

Handling and proper use of batteries is not hazardous if the correct precautions are observed and personnel are trained in their use.

**⚠ WARNING**

***Arcing Hazard***

***Laying tools or metal objects across the battery can cause arcing that may ignite battery gases causing explosions resulting in personal injury.***

***Never lay tools or metal objects across the top of the battery.***

**⚠ WARNING**

***Electric Shock Hazard***

***Voltages and currents present an electrical shock hazard that can cause severe burns or death.***

***Use tools with insulated handles to prevent the risk of electric shock.***

**⚠ CAUTION**

***Toxic Hazard***

***Electrolyte is a dilute sulphuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive.***

***Wear full eye protection and protective clothing. If electrolyte contacts the skins, wash it off immediately with water. If electrolyte contacts the eyes, flush thoroughly and immediately with water and seek medical attention. Wash spilled electrolyte with an acid neutralizing agent.***

***NOTICE***

**Keep batteries upright to prevent spillage.**

### 5.10.2.2 Fire Hazard

**⚠ WARNING**

***Combustible Gases***

***Lead acid batteries present a risk of fire because they generate hydrogen gas.***

***Do not smoke near the batteries. Do not cause flame or spark in the battery area. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface.***

**⚠ WARNING**

***Before disconnecting a battery, always remove power from the AC powered battery charger.***

**⚠ WARNING**

***When putting a battery into service on a generator set, connect the negative lead LAST; when removing the battery, disconnect the negative lead FIRST.***

### 5.10.2.3 Vented Batteries

**⚠ WARNING**

***Toxic Hazard***

***The electrolyte in vented batteries is a dilute sulfuric acid that is harmful to the skin and eyes. It is also electrically conductive and corrosive.***

***Always:***

1. ***Wear full eye protection and protective clothing;***
2. ***If the electrolyte contacts the skin, wash it off immediately with water;***
3. ***If the electrolyte contacts the eyes, flush them thoroughly and immediately with water and seek medical attention; and***
4. ***Wash spilled electrolyte down with an acid neutralizing agent. A common practice is to use a solution of one pound (500 grams) bicarbonate of soda (also known as baking soda or sodium bicarbonate) to one gallon (4 liters) of water.***
5. ***Continue to add the bicarbonate of soda solution until the evidence of reaction (that is, foaming) has stopped.***
6. ***Flush the resulting liquid with water and dry the area.***

## 5.10.3 Battery Maintenance

**⚠ WARNING**

***Automated Machinery***

***Accidental or remote starting of the generator set can cause severe personal injury or death. Arcing at battery terminals or in light switches or other equipment, and flames or sparks can ignite battery gas causing severe personal injury.***

***Always follow these procedures to avoid injury and/or damage:***

- ***Ventilate the battery area before working on or near the battery.***
- ***Wear safety glasses.***
- ***Do not smoke.***
- ***Switch a work light on or off away from the battery.***

***Make sure the generator set is shut down and disabled:***

1. ***Press the generator set's red STOP button on the local display to stop the generator set. Allow the generator set to thoroughly cool to the touch.***
2. ***Turn off and disconnect the battery charger from the AC source before disconnecting the battery cables.***
3. ***Disconnect the negative (–) cable from the battery and secure it from contacting the battery terminals to prevent accidental starting.***
4. ***Once work is complete, reconnect the negative (–) battery cable last.***

Always:

- Keep the battery case and terminals clean and dry and the terminals tight.
- Remove battery cables with an insulated wrench or battery terminal puller.
- Make sure which terminal is positive (+) and which is negative (–) before making battery connections, always removing the negative (–) cable first and reconnecting it last to reduce arcing.

| NOTICE |
| --- |
| **If the battery needs to be replaced, make sure that the replacement battery specifications match those found in the Model Specifications in this manual.** |

### 5.10.4 Charging

Where a consistent source of AC power is available, Cummins recommends the use of a battery charger to maintain battery condition and charge. Cummins offers several battery chargers.

Where generator sets are used infrequently and a consistent source of AC power is not available, battery recharging must be put on a recharge schedule to ensure that a fully charged condition is maintained.

| NOTICE |
| --- |
| **NEVER allow a battery to become completely flat (fully discharged), or to stand in a discharged condition, or damage will result.** |

Follow the battery charger operating instructions for proper use.

### 5.10.5 Battery Replacement

| ⚠ WARNING |
| --- |
| ***Combustible Liquid*** |
| ***Burning the battery may cause an explosion. Damage to the casing will release electrolytes which is harmful to the skin and eyes.*** |
| ***When disposing of a battery, do not mutilate or burn it. Comply with all local health and safety regulations/codes during handling or disposal.*** |

Always replace the starting battery with the same number and type (e.g., vented, lead acid, maintenance free) as listed in the specifications section of this document. Properly dispose of battery in accordance with local environment agency requirements.

Always use correct handling techniques to lift and move a battery.

## 5.11 Cleaning the Generator Set Housing

The housing of the generator set housing can be damaged by pressure washing or solvents and other cleaning agents. Only use soap and water or an “all citrus degreaser" to clean the housing.

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# 6 Troubleshooting

## 6.1 Avoiding Generator Set Shutdowns

By regularly performing the following periodic maintenance and guidelines, you will greatly reduce the chances of a generator set shutdown:

- Maintain an appropriate oil level.
- Keep battery connections clean and tight.
- Do not overload the generator set.
- Keep the air inlet and outlet openings clear.

Refer to the Maintenance section for more information.

## 6.2 Control System

The generator set control system continuously monitors engine sensors for abnormal conditions, such as low oil pressure and high coolant temperature. If any of these conditions occur, the control will light a yellow Warning lamp or a red Shutdown lamp and will display a message on the graphical display panel. In the event of an engine shutdown fault (red Shutdown LED), the control will stop the engine immediately.

## 6.3 Fault Finding

**⚠ WARNING**

***Troubleshooting procedures.***

***Troubleshooting procedures present hazards that can result in severe personal injury or death.***

***Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures.***

***Review safety precautions listed in this manual together with the documentation supplied with the generator set.***

For any symptom not listed, contact your authorized dealer for assistance.

Before starting any fault finding, ensure that the following basic checks are carried out:

- All switches and controls are in their correct positions
- Fuel system is connected and fuel is available
- The lubricating oil level is correct
- The coolant level is correct
- The radiator cooling air flow is free from obstruction
- The battery charge condition is satisfactory and the connections are secure
- The generator set electrics and alternator connections are secure
- The panel connections are secure
- The protection circuits have been reset
- Blown fuses have been replaced

 

- Tripped contactors or circuit breakers have been reset

# 6.4 Troubleshooting by Symptom

## 6.4.1 Engine Is Difficult to Start or Does Not Start

***Possible Causes:***

1. Battery voltage problem(s)
2. Fuel system issue(s)
3. Air intake restriction above specification

***Diagnosis and Repair:***

1. Battery voltage problem(s)
    a. If battery voltage is low, interrupted, or open, check:
        - Battery connections
        - Unswitched battery supply circuit
        - Fuses
2. Fuel system issue(s)
    a. Verify that the manual fuel shutoff valve is open.
3. Air intake restriction above specification
    a. Inspect air filter for obstruction. Replace if necessary.

## 6.4.2 Engine Does Not Crank in Manual Mode (No Fault Message)

***Possible Cause:***

1. Battery voltage

***Diagnosis and Repair:***

1. Battery voltage.
    a. Check the battery connections.
    b. Verify the battery charge.

# 6.5 Fault/Status Codes - PowerCommand 1.1

## 6.5.1 Fault Code Introduction

Fault code information, together with warning and shutdown information, is provided in this section to assist in locating and identifying the possible causes of faults in the generator set system.

Refer also to the engine-specific operator manual, if it exists. The engine operator manual contains additional information regarding the running and care of the generator set as well as specific equipment instructions that may differ from the standard generator set.

For any fault codes that occur but are not listed, contact your Cummins service representative.

## 6.5.2 Fault/Status Codes Warnings

**⚠ WARNING**

***Electrical Generating Equipment***

***Incorrect installation or servicing can result in severe personal injury or death.***

***Make sure that only suitably trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards perform electrical and/or mechanical service.***

**⚠ WARNING**

***Automated Machinery***

***Accidental or remote starting of the generator set can cause severe personal injury or death.***

***Prevent accidental starting by disconnecting the starting battery cables, negative (–) cable first.***

## 6.5.3 Code 143 - Engine Oil Pressure Low (Warning)

***Logic:*** Engine oil pressure is below the low oil pressure shutdown threshold.

***Possible Cause:***

1. Low lubricating oil level
2. External leak

***Diagnosis and Repair:***

1. Low lubricating oil level
    a. Check the oil level. Add or drain oil, if necessary.
2. External leak
    a. Inspect the engine and surrounding area for external oil leaks.
    b. Contact your local dealer if a leak is present.

## 6.5.4 Code 146 - Engine Coolant Temperature Above Normal (Warning)

***Logic:***

Engine coolant temperature has exceeded the alarm (warning) threshold for high coolant temperature.

***Possible Cause:***

1. High ambient temperature
2. Coolant level is below specification
3. Cooling system components are damaged or obstructed

***Diagnosis and Repair:***

1. High ambient temperature
    a. Reduce loads or recirculation of discharge air to generator in elevated ambient.
2. Coolant level is below specification
    a. Inspect the engine, cooling system, and surrounding area for external coolant leaks.
        i. Add coolant as necessary.

 

ii. Contact your local dealer if a leak is present.

3. Cooling system components are damaged or obstructed
   a. Inspect radiator, charge air cooler, and other cores (if used).
      i. Check for damaged fins.
      ii. Inspect for dirt, debris, or obstructions.
      iii. Remove blockages.
   b. Inspect fan shroud and air recirculation baffles for damage and clearance.
      i. Contact your local dealer if repair or replacement is required.
   c. Inspect fan belt(s) for damage, wear, and proper tension. Inspect pulleys and belt tensioner for damage or wear.
      i. Contact your local dealer if repair or replacement is required.
   d. Inspect radiator cap and gasket for damage and proper pressure operation.
      i. Contact your local dealer if repair or replacement is required.
   e. Inspect upper and lower radiator hoses for collapse, distortion, or fluid leaks.
      i. Contact your local dealer if repair or replacement is required.
   f. Inspect cooling system components for internal contaminates (dirt, scale, or sludge) and clean as required.
      i. Open the radiator cap and inspect for contaminated coolant and scale.
      ii. Contact your local dealer if flushing of cooling system is required.

## 6.5.5 Code 151 - Engine Coolant Temperature High (Shutdown)

***Logic:***

Engine coolant temperature has exceeded the alarm (shutdown) threshold for high coolant temperature.

***Possible Cause:***

1. High ambient temperature
2. Coolant level is below specification
3. Cooling system components are damaged or obstructed

***Diagnosis and Repair:***

1. High ambient temperature
   a. Reduce loads or recirculation of discharge air to generator in elevated ambient.
2. Coolant level is below specification
   a. Inspect the engine, cooling system, and surrounding area for external coolant leaks.
      i. Contact your local dealer if a leak is present.
   b. Verify the coolant level is correct via the sight glass.
      i. Add coolant as necessary.
3. Cooling system components are damaged or obstructed
   a. Inspect the radiator, charge air cooler, and other cores (if used).
      i. Inspect for damaged fins.
      ii. Inspect for dirt, debris, or obstructions.

iii. Remove blockage.

b. Inspect the fan shroud and air recirculation baffles for damage and clearance.

i. Contact your local dealer if repair or replacement is required.

c. Inspect the fan belt(s) for damage, wear, and proper tension. Inspect pulleys and belt tensioner for damage or wear.

i. Contact your local dealer if repair or replacement is required.

d. Inspect the radiator cap and gasket for damage and proper pressure operation.

i. Contact your local dealer if repair or replacement is required.

e. Inspect upper and lower radiator hoses for collapse, distortion, or fluid leaks.

i. Contact your local dealer if repair or replacement is required.

f. Inspect cooling system components for external contaminates and clean as required.

i. Open the radiator cap and inspect for contaminated coolant and scale.

ii. Contact your local dealer if flushing of cooling system is required.

## 6.5.6 Codes 146 and 151 - Engine Coolant Temperature High (Warning or Shutdown)

**Logic:**

- *Code 146:* Engine coolant temperature has exceeded the warning threshold and duration parameters set in the ECM or control.
- *Code 151:* Engine coolant temperature has exceeded the shutdown (alarm) threshold for high coolant temperature.

**Possible Causes:**

1. High ambient temperature
2. Enclosure air intake blocked
3. Coolant level below specification
4. Blocked radiator
5. Blocked enclosure air discharge
6. Broken or loose fan belt

**Diagnosis and Repair:**

1. High ambient temperature
    a. Reduce loads or recirculation of discharge air to generator set.
2. Blocked enclosure air discharge
    a. Inspect for dirt, debris, or obstructions.
    b. Remove blockage or snow/ice buildup if applicable.
3. Coolant level below specification
    a. Check coolant level.
    b. Add coolant if applicable.
4. Blocked radiator
    a. Inspect for dirt, debris, or obstruction.

 

b. Remove blockage or winterfront if applicable.

5. Enclosure air discharge blocked
    a. Inspect for dirt, debris, or obstructions.
    b. Remove blockage or snow/ice buildup if applicable.
6. Broken or loose fan belt
    a. Inspect belt(s) for damage, wear, and proper tension.
    b. Repair or replace belt(s) if damaged or worn.

## 6.5.7 Code 197 - Coolant Level Low (Warning)

**Logic:** Coolant level sensor signal is showing a low coolant level for greater 10 seconds.

**Possible Cause:**

1. Low coolant

**Diagnosis and Repair:**

1. Low coolant
    a. Remove radiator cap and check that coolant is up to the required level.

## 6.5.8 Code 359 - Fail to Start

***Logic:***

This indicates that the engine failed to start after the expiration of crank time.

***Possible Causes:***

1. Fuel system issues
2. Incorrect starter disconnect speed

***Diagnosis and Repair:***

1. Fuel system issues
    a. Inspect fuel lines and fuel connections for leaks.
        i. Repair if leaks are found. Refer to the Fuel System section.
    b. The manual fuel shutoff (FSO) valve is closed.
        i. Open the valve.
    c. The FSO valve solenoids or circuit are malfunctioning.
        i. Check the FSO valve solenoids and circuit.
        ii. Correct or replace as necessary.
2. Incorrect starter disconnect speed
    a. Connect to the control via the InPower service tool. Make sure Starter Disconnect Speed is set to 400 RPM.

## 6.5.9 Code 415 - Engine Oil Pressure Low (Shutdown)

**Logic:** Engine oil pressure is below the low oil pressure shutdown threshold.

**Possible Causes:**

1. Lubricating oil level is low

2. External leak

**Diagnosis and Repair:**

1. Lubricating oil level is low
    a. Check the oil level. Add oil, if necessary.
2. External leak
    a. Inspect the engine and surrounding area for external oil leaks.
    b. If a leak is present, contact your Cummins service representative.

## 6.5.10 Code 421 - Engine Oil Temperature High (Warning)

**Logic:** The control has detected the engine oil temperature has exceeded the warning threshold.

**Possible Cause:**

1. High ambient temperature
2. Blocked enclosure air intake
3. Coolant level below specification

**Diagnosis and Repair:**

1. High ambient temperature
    a. Reduce loads or recirculation of discharge air to generator in elevated ambient.
2. Blocked enclosure air intake
    a. Inspect for dirt, debris, or obstructions.
    b. Remove blockage or snow/ice buildup as applicable.
3. Coolant level is below specification
    a. Check coolant level.
    b. Add coolant as necessary.

## 6.5.11 Code 441 - Battery Voltage Low (Warning)

**Logic:** Battery voltage is low.

**Possible Causes:**

1. Loose or damaged battery cable connections
2. Battery charger not connected (if equipped)
3. Battery not completely charged
4. Battery is old and does not maintain a charge

**Diagnosis and Repair:**

1. Loose or damaged battery cable connections
    - Inspect the battery cable connections for corrosion and loose connections. Adjust or repair if needed.
2. Battery charger not connected (if equipped)
    a. Make sure that the battery charger is connected to the AC power supply.
    b. Make sure that the battery charger is connected correctly to the battery.

 

3. Battery not completely charged
    - Using a voltmeter or multimeter, determine if the voltage is below 11 V. If so, recharge the battery.
4. Battery is old and does not maintain a charge
    - Replace the battery.

## 6.5.12 Code 442 - High Battery Voltage

**Logic:** Battery voltage is high.

**Possible Causes:**

1. Incorrect battery voltage setup
2. Battery voltage above high battery voltage threshold
3. Battery charger overcharging battery
4. Faulty engine DC alternator

**Diagnosis and Repair:**

1. Make sure the correct batteries are installed.
2. Make sure the correct battery charger is installed.
3. If the previous steps do not resolve the problem, contact your Cummins service representative.

## 6.5.13 Code 488 - Intake Manifold Temperature High (Warning)

***Logic:***

Engine intake manifold temperature has exceeded 185 °F (85 °C) for more than 90 seconds.

***Possible Cause:***

1. High ambient temperature
2. Enclosure air intake blocked
3. Coolant level is below specification
4. Radiator blocked
5. Enclosure air discharge blocked
6. Fan belt is broken or loose

***Diagnosis and Repair:***

1. High ambient temperature
    a. Reduce loads or recirculation of discharge air to generator in elevated ambient.
2. Enclosure air intake blocked
    a. Inspect for dirt, debris, or obstructions.
    b. Remove blockage or snow/ice buildup as applicable.
3. Coolant level is below specification
    a. Check coolant level.
    b. Add coolant as necessary.
4. Radiator blocked
    a. Inspect for dirt, debris or obstructions.

b. Remove blockage or winterfront as applicable.

5. Enclosure air discharge blocked
   a. Inspect for dirt, debris, or obstructions.
   b. Remove blockage or snow/ice buildup as applicable.
6. Fan belt is broken or loose
   a. Inspect belt(s) for damage, wear, and proper tension.
   b. Repair or replace if damaged or worn.

## 6.5.14 Code 1317 - Coolant Level Low (Warning or Shutdown)

***Logic:***

Coolant level sensor signal is showing a low coolant level for greater 10 seconds.

***Possible Causes:***

1. Low coolant

***Diagnosis and Repair:***

1. Low coolant
   a. Stop the engine and allow the engine to cool down.
   b. Visually inspect and verify that the engine coolant is at the appropriate level.
   c. If the coolant level is too low**,** add coolant per specifications.

## 6.5.15 Code 1318 - Low Fuel (Warning or Shutdown)

***Possible Causes:***

1. Low fuel level
2. Faulty or inoperable switch

***Diagnosis and Repair:***

1. Low fuel level
   a. Add the manufacturer's prescribed fuel.
2. Faulty or inoperable switch
   a. Remove the switch and verify proper switch operation. If either of the following conditions is demonstrated, the switch is defective:
      - When the float is at the bottom of the switch, the wires do not show continuity.
      - When the float is raised, the wires do not show an open circuit.
   b. Contact your local dealer if repair or replacement is required.

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## 6.5.16 Code 1433 or 1434 - Emergency Stop

The optional Local Emergency Stop button (or Remote Emergency Stop button) is located on the front of the operator panel. This is a mechanically latched switch that will unconditionally stop the engine when pressed, bypassing any time delay to stop. Push this button in for Emergency Shutdown of the engine.

**NOTICE**

**If the generator set is not running, pushing the Emergency Stop button in prevents the starting of the engine, regardless of the start signal source (Manual or Auto - remote).**

When the Emergency Stop Button is pressed, the display panel indicates the Shutdown condition by illuminating the red Shutdown status LED (shown below):

One of the following messages will appear on the graphical LCD display, depending on the button pushed:

- Fault Number: 1433 LOCAL EMERGENCY STOP
- Fault Number: 1434 REMOTE EMERGENCY STOP

To reset:

1. Pull (or twist and pull) the button out.
2. Press the Off button on the Operator Panel to acknowledge this action.
3. Press the Auto or Manual Run button, as previously determined.

**NOTICE**

**Do not use an Emergency Stop button to shut down an engine unless a serious fault develops. The Emergency Stop button must not be used for a normal shut-down because this will prevent a cooling down run in which the lubricating oil and engine coolant carry away heat from the engine combustion chamber and bearings in a safe manner.**

**NOTICE**

**Make sure the remote start control is not active; otherwise, when the Emergency Stop is reset, the generator set could start running.**

**NOTICE**

**Make sure that the cause of the emergency stop is fully investigated and remedied before a fault Reset and generator Start are attempted.**

## 6.5.17 Code 1435 - Low Coolant Temperature

**Logic:** Engine coolant temperature is below the low coolant temperature warning threshold.

**Possible Causes:**

1. Ambient temperature too cold for specified generator set
2. Coolant heater malfunction or not installed
3. Blockage in coolant system

**Diagnosis and Repair**:

1. Make sure the generator set meets its performance specifications.
2. Make sure the coolant heater is installed and powered.
3. If the previous steps do not resolve the problem, contact your Cummins service representative.

## 6.5.18 Code 1438 - Fail to Crank (Shutdown)

***Logic:***

The engine failed to crank after the generator control received a start signal.

***Possible Cause:***

1. Dead or weak battery
2. Failed starter

***Diagnosis and Repair:***

1. Dead or weak battery
    a. Verify battery voltage is at least 12 VDC (or 24 VDC if applicable).
    b. Charge or replace the battery as necessary.
2. Failed starter
    a. Press the Reset/Fault acknowledge button on the display.
    b. Attempt to start the generator and test for B+ at the starter supply lug.
    c. If B+ is present at the starter supply lug, the starter could be defective.

## 6.5.19 Code 1471 - High AC Current (Warning)

***Logic:***

The generator set output current has exceeded the warning limit threshold for greater than the fixed time delay.

***Possible Causes:***

1. Generator set overload

***Diagnosis and Repair:***

1. Generator set overload.
    a. Reduce the generator set load by powering off unnecessary electrical loads.

## 6.5.20 Code 1472 - High AC Current (Shutdown)

***Logic:***

The generator set output current has exceeded the shutdown limit threshold for greater than the fixed time delay.

***Possible Causes:***

1. Generator set overload

***Diagnosis and Repair:***

1. Generator set overload.
    a. Reduce the generator set load by powering off unnecessary electrical loads.

## 6.5.21 Code 5134 - Unknown Shutdown

***Logic:*** PCC has detected that engine RPM has decreased to zero, while not in run at rated mode

***Possible Causes:***

1. Incorrect calibration in the PowerCommand control

2. Air intake or exhaust restriction
3. MPU signal loss
4. Improper start disconnect
5. Fuel supply issue
6. Faulty control board

***Diagnosis and Repair:***

1. Incorrect calibration in the PowerCommand control
2. Air intake or exhaust restriction
    a. Intake restriction
        - Inspect air intake system and filter for debris.
    b. Exhaust restriction
        - Inspect exhaust system for debris or leaks.
3. MPU signal loss
    a. Faulty Magnetic Pickup (MPU) sensor connections and wiring.
        i. Inspect the MPU sensor and the main harness connector pins.
            A. Disconnect the main harness connector from the MPU sensor.
            B. Inspect for corroded, bent, broken, pushed back, expanded, or loose pins.
            C. Inspect for evidence of moisture in or on the connector. Dry the connectors with Cummins electronic cleaner, Part Number 3824510.
            D. Inspect for missing or damaged connector seals.
            E. Inspect for dirt or debris in or on the connector pins.
            F. Inspect the wiring for any damage or shorting
    b. Improper installation of the MPU sensor
        i. Inspect the installation of the MPU sensor.
            A. Check if the clearance between the MPU sensor tip and the flywheel teeth is correct.
            B. Adjust if not as per specification.
                A. Set the clearance from the MPU tip to the ring gear teeth to 0.5 - 0.6 mm.
                B. The preferred method of setting the MPU tip clearance is to use a feeler gauge.
                C. An alternate method is to rotate the flywheel until the ring gear tooth is directly over the center of the MPU hole; then gently rotate the MPU until it touches the tooth. Back off ¼ turn and tighten the jam nut.

| ***NOTICE*** |
| --- |
| ***Prevent the MPU from rotating when tightening the lock nut. Failure to do so may cause damage to the sensor tip.*** |

            C. Check for the correctness of orientation of the MPU sensor mounting as applicable. Verify linear alignment of the MPU sensor with the flywheel ring gear.

c. Faulty MPU sensor

i. Check the MPU sensor output voltage.

A. Disconnect the main harness connector from the MPU sensor.

B. Remove the MPU sensor connectors and check for 3.5 to 15 VAC at the MPU while cranking. If no output, check for damage or debris on the end of the MPU, and for proper installation of MPU (see above). If there is still no output, replace the MPU sensor.

d. Verify that the MPU sensor feature is enabled in calibration.

4. Improper start disconnect

a. One or more start disconnect signal is activating too soon after cranking, causing the starter to drop out, and the engine to stop.

i. Starter disconnect set incorrectly in InPower.

- 12V Charging Alternator Disconnect Voltage: 9 VDC
- Starter Disconnect Speed: 450 RPM
- Flywheel Teeth: 110

ii. Connect with InPower, and monitor Battery Charging Alternator Voltage during cranking. If voltage exceeds 9 VDC, increase 12V Charging Alternator Disconnect Voltage to just above the peak seen during cranking.

5. Fuel supply issue

a. Restricted fuel supply

i. The fuel level is below the pickup tube in tank.

- Add fuel if low. Prime the fuel system.

ii. The shutoff valve in the supply line is closed.

- Open any closed shutoff valve in the fuel line supplying the engine.

iii. The fuel filter or strainer is plugged.

- Replace the fuel filter or strainer

b. The fuel solenoid fuse is open.

i. Check fuse.

- Set multimeter to VDC.
- Attempt to start the engine and check for B+ at the fuel solenoid coil.
- If B+ is present, the fuel solenoid is defective and must be replaced.

c. There is air in the fuel system.

i. Bleed air from the fuel system.

d. Fuel injectors are clogged.

i. Refer to the engine service manual.

6. Faulty control board

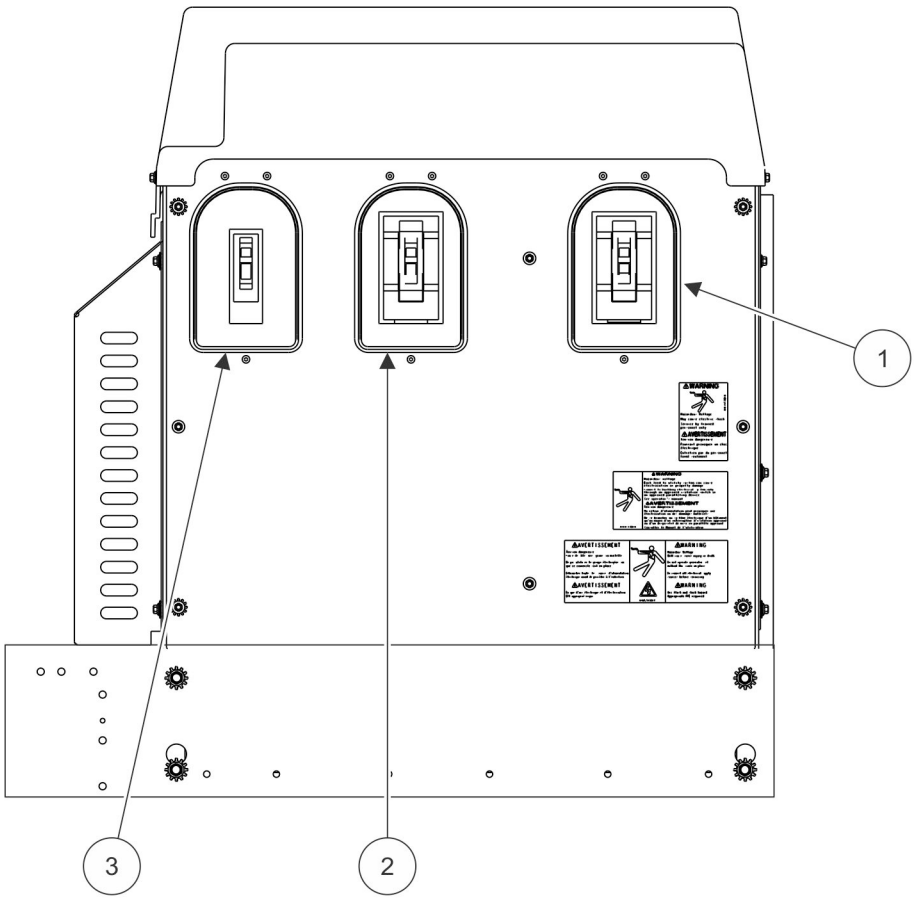
a. If none of the previous steps solved the issue, replace the PCC board.

# 6.6 Line Circuit Breaker

A line circuit breaker is mounted in the generator output box. If the load exceeds the circuit breaker current rating, the line circuit breaker will open, preventing the generator set from being overloaded. If the circuit breaker trips, locate the source of the overload or short circuit, and correct/eliminate the fault. Manually reset the breaker. Clear any fault messages and when safe to do so, reconnect the load to the generator.

## 6.6.1 Line Circuit Breaker Location




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | Circuit Breaker - Position A (Standard) | 3 | Circuit Breaker - Position C (Optional) |
| 2 | Circuit Breaker - Position B (Optional) | | |

**FIGURE 38. LINE CIRCUIT BREAKER LOCATION**

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