Operator’s Manual

Model DKHA

01-07

981-0177

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.

⚠ WARNING ⚠

Do not use this genset on a boat
Such use may violate U. S. Coast Guard regulations and can result in severe personal injury or death from fire, electrocution, or carbon monoxide poisoning

Table of Contents

SECTION **PAGE**

SAFETY PRECAUTIONS

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

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

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

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

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

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

ENGINE EXHAUST IS DEADLY

Engine exhaust gases include CARBON MONOXIDE (CO), an odorless, colorless, poisonous gas that can cause severe personal injury or death. Symptoms of CO poisoning include:

- Dizziness, Headache or Throbbing Temples
- Weakness or Muscular Twitching
- Sleepiness or Confusion
- Nausea or Vomiting

If you or anyone else experiences any of these symptoms, get out into fresh air immediately and seek advice from poison control, medical center or 911. Do not operate the APU again until it has been repaired and inspected.

To reduce the risk of CO poisoning:

- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Never sleep in the vehicle while the APU is running unless the vehicle is equipped with a working carbon monoxide detector.
- Do not operate the APU when the vehicle is parked in a confined space, such as a garage.
- Disable AUTO before storing the vehicle or parking it in a garage or other confined space.
- The exhaust system must be installed in accordance with the APU Installation Manual.
- Do not use engine cooling air for heating the vehicle.

GENERATOR VOLTAGE IS DEADLY

- Disable AUTO, stop the APU and disconnect the battery cables (negative [–] first) from the batteries before servicing the APU.
- Generator electrical output connections must be made by a trained and experienced electrician in accordance with the APU Installation Manual and applicable codes.
- The improper transfer of loads between APU and shore power can lead to electrocution of utility line workers and damage to equipment. Connections must be made by a trained and experienced electrician in accordance with applicable codes.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disable AUTO, stop the APU and disconnect the battery cables (negative [–] first) from the batteries before servicing the APU.
- Do not wear loose clothing or jewelry near moving parts such as fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, and other moving parts.

BATTERY GAS IS EXPLOSIVE

- Do not smoke near batteries.
- Wear safety glasses when servicing batteries.
- Disable AUTO, stop the APU and disconnect the battery cables from the batteries before servicing the batteries.
- Always disconnect negative (–) first and reconnect last to prevent sparks between tools and vehicle frame.
- Secure battery terminal protective covers to prevent accidental shorting with metal tools.

DIESEL FUEL IS COMBUSTIBLE

- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flames, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

FLAMMABLE VAPORS CAN BE IGNITED BY VEHICLE ELECTRICAL SYSTEMS AND CAN CAUSE A DIESEL ENGINE TO OVERSPEED

- Disable AUTO and stop the APU before fueling the vehicle.
- Do not operate the diesel-powered APU where there are or can be flammable vapors created by fuel spills, gas leaks, etc. Flammable vapors drawn into a diesel engine air intake system can cause the engine to overspeed, which can result in fire, explosion and equipment damage. The owners and operators of the APU are solely responsible for safe operation.

GENERAL PRECAUTIONS

- Keep children away from the APU.
- Do not use evaporative starting fluids. They are highly explosive.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray out and cause severe burns.
- Keep the APU and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Make sure all fasteners are secure and torqued properly.
- Do not perform APU maintenance or service when mentally or physically fatigued or after having consumed alcohol or drugs.
- You must be trained and experienced to make adjustments while the APU is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some U. S. state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Ethylene glycol, used as engine antifreeze, is toxic to humans and animals. Clean up spills and dispose of used engine coolant in accordance with local environmental regulations.
- Keep a multi-class ABC fire extinguisher in the vehicle. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquids and gaseous fuels. Class C fires involve live electrical equipment. (ref. NFPA No. 10)
- APU installation and operation must comply with all applicable local, state and federal codes and regulations.

Mobile-9

1. Introduction

ABOUT THIS MANUAL

This is the Operator's Manual for the Auxiliary Power Units (APUs) listed on the front cover. Read and carefully observe all of the instructions and precautions in this manual. Keep this manual with the other vehicle manuals.

This *Introduction* section provides general information about the APU, emissions compliance and how to obtain service.

Section 3. Operator Panel is a guide for using the Operator Panel to operate, monitor and troubleshoot the APU.

Other sections cover the *Operation, Maintenance* and *Troubleshooting* necessary for operating the APU and maintaining top performance. The vehicle owner is responsible for performing maintenance in accordance with the PERIODIC MAINTENANCE SCHEDULE (p. 5-1).

ABOUT THE APU

The APU is a 4 kW, 120 VAC, diesel-powered generator set for supplying power to the vehicle. It can be enabled to start automatically to supply power for vehicle heating and air conditioning, main engine block heating and battery recharging. See Figure 1-1.

The APU can also be programmed on a 7-day cycle to start and run for 1 to 4 hours to maintain battery charge and reliable starting.

⚠WARNING ***This APU is not a life support system. It can stop without warning. Children, persons with physical or mental limitations, and pets could suffer personal injury or death. A personal attendant, redundant power or alarm system must be used if APU operation is critical.***

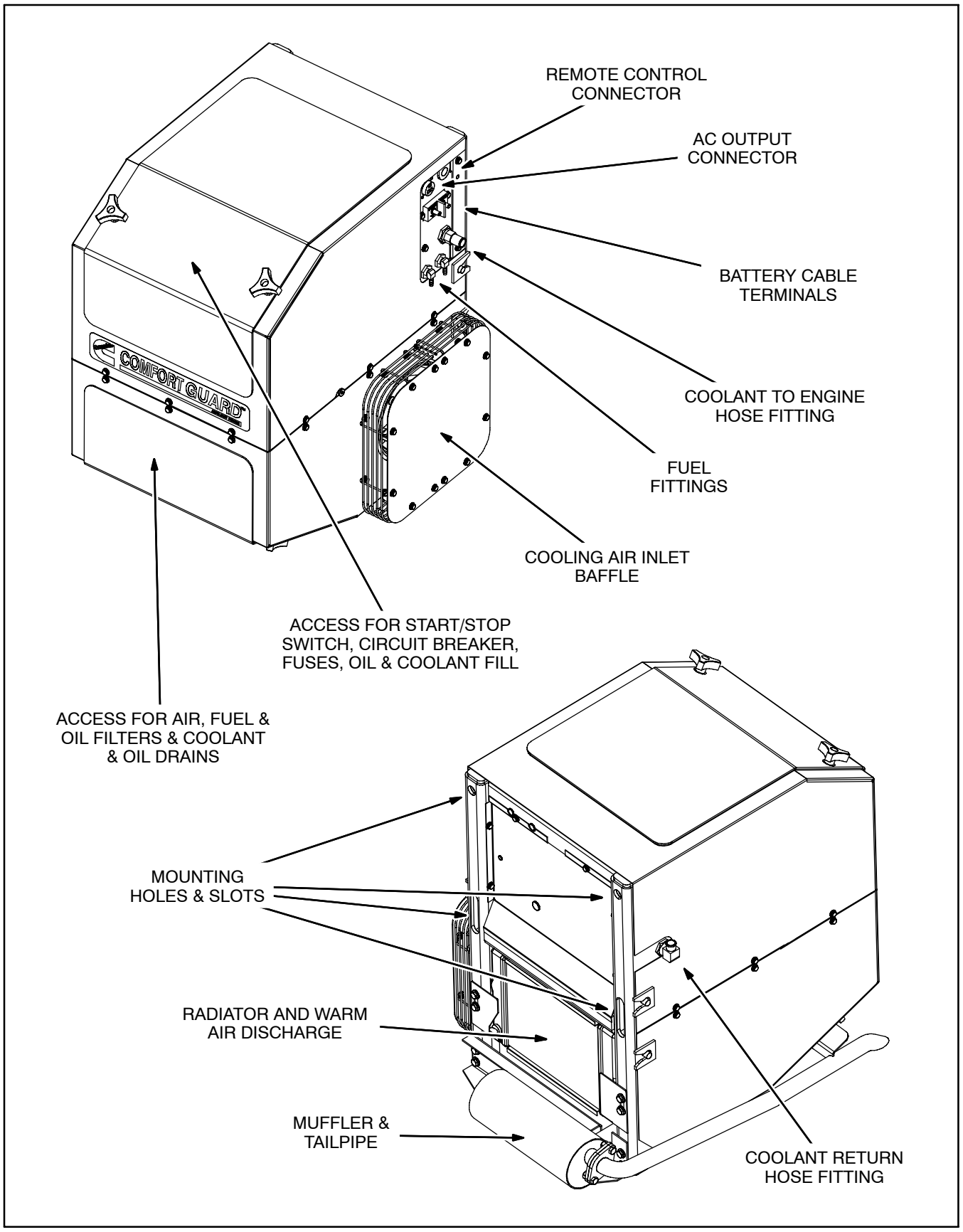

FIGURE 1-1. TYPICAL APU

NAMEPLATE

⚠WARNING ***Improper service or replacement of parts can lead to severe personal injury or death and to damage to equipment and property. Service personnel must be qualified to perform electrical and mechanical service.***

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.

Be ready to provide the APU model and serial numbers on the nameplate when contacting Cummins for parts, service or information. Figure 1-2 illustrates the nameplate and its location. The gray boxes illustrate where to look for the model and serial numbers.

Record these numbers in Figure 1-3 so that they are easy to find when needed. Each character in these numbers is significant. The last character of the model number is the specification letter, which is important for obtaining the right parts. Genuine Cummins replacement parts are recommended for best results. Refer to the APU Parts Catalog.

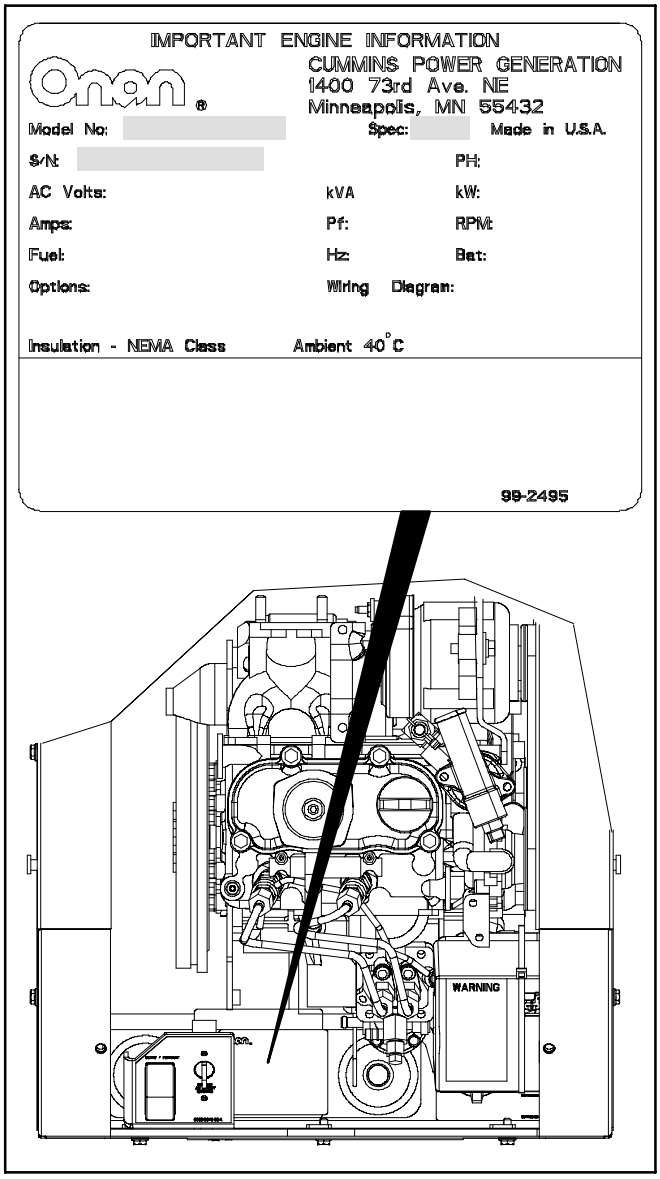

FIGURE 1-2. TYPICAL APU NAMEPLATE

FIGURE 1-3. RECORD APU NUMBERS HERE

HOW TO OBTAIN SERVICE

For APU parts, service, and product information (such as the Service Manual), contact the nearest authorized Cummins distributor.

In North America

Call 1-800-888-6626 to contact the nearest Cummins distributor in the United States or Canada. (This automated service utilizes touch-tone phones only). Select OPTION 1 (press 1) to be automatically connected to the distributor nearest to you.

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

GENERATORS – ELECTRIC,
ENGINES – GASOLINE OR DIESEL, or
RECREATIONAL VEHICLES – EQUIPMENT, PARTS AND SERVICE.

If you have difficulty in arranging service or resolving a problem, please contact the Service Manager at the nearest Cummins distributor for assistance.

Outside North America

If you are outside North America, call Cummins Inc. at 1–763–574–5000 from 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday, or fax 1–763–574–5294

Information to Have Ready

Before calling for service, have the following information available:

1. *The complete APU model number and serial number (Page 1-3).*
2. *The date of purchase*
3. *The nature of the problem. See Section 6. Troubleshooting.*

ENGINE EMISSIONS LABEL

The label that states compliance with applicable engine emissions regulations is located on the engine valve cover (Figure 1-4). Refer also to the FEDERAL EMISSION DESIGN AND DEFECT LIMITED WARRANTY FOR C. I. ENGINES (DIESELS) that was shipped in the same package as the genset Operator's Manual.

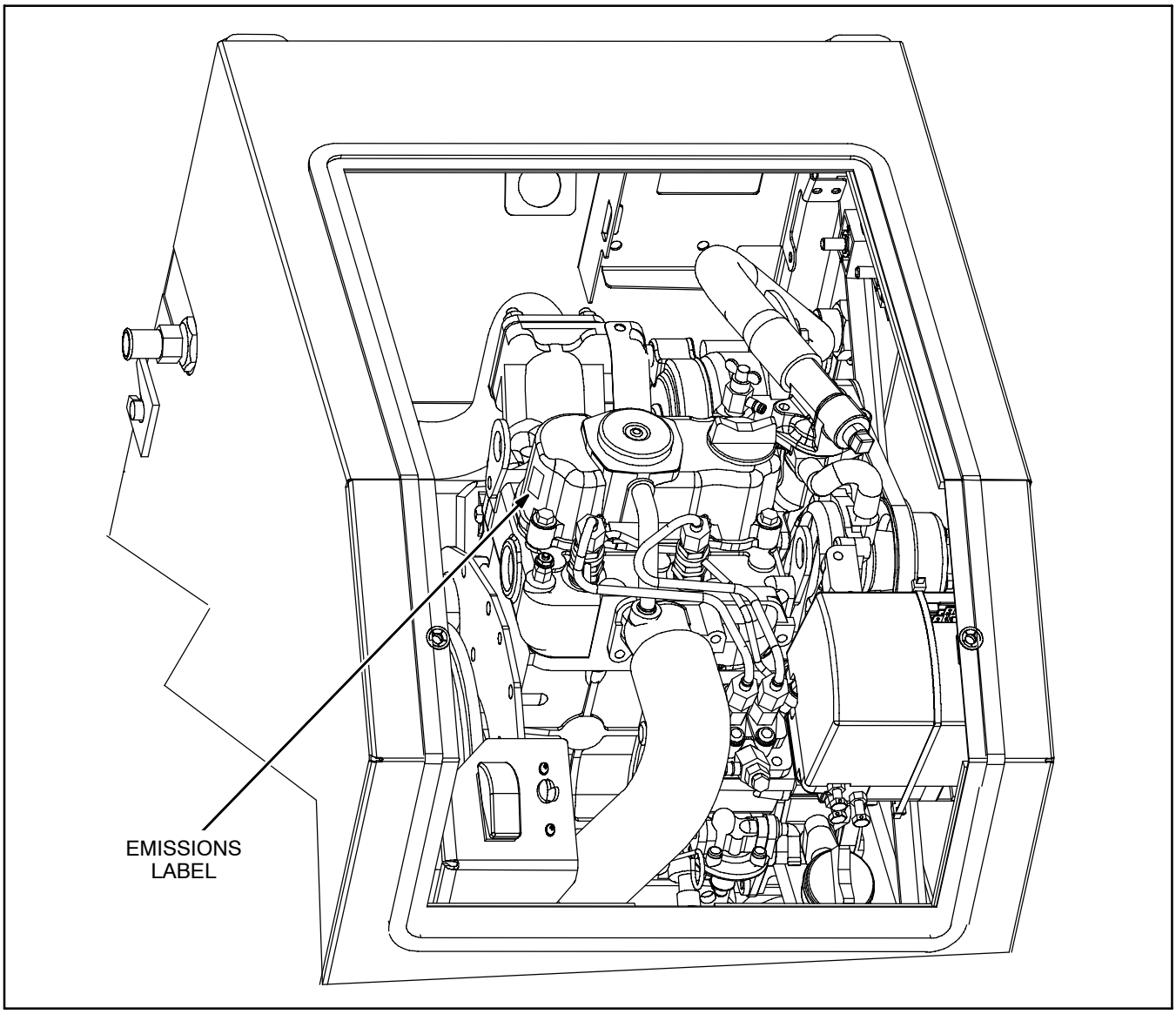

FIGURE 1-4. ENGINE EMISSIONS LABEL

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2. Operation

RECOMMENDED FUEL

⚠WARNING ***Diesel fuel is combustible and can cause severe personal injury or death. Do not smoke near fuel tanks or fuel-burning equipment or in areas sharing ventilation with such equipment. Keep flames, sparks, pilot flames, electrical arcs and switches and all other sources of ignition well away. Keep a multi-class ABC fire extinguisher handy.***

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

Note: Ultra Low Sulfur Diesel (ULSD) fuel that meets the ASTM D975 standard for lubricity is suitable for use with this engine. The 1 to 2 percent less energy content of the fuel can have a slight effect on maximum engine power.

Note: B5 Bio-Diesel fuel that meets industry specifications and quality is suitable for use with this engine.

RECOMMENDED COOLANT

When APU Is Not Connected to Main Engine Cooling System

Use the best quality ethylene glycol antifreeze solution available. It should be fully formulated with rust inhibitors and coolant stabilizers. Use fresh water that is low in minerals and corrosive chemicals. Distilled water is best.

See *Section 7. Specifications* for APU coolant capacity.

When APU Shares Main Engine Cooling System

Follow the specifications of the main engine manufacturer. See *Section 7. Specifications* for APU coolant capacity.

RECOMMENDED ENGINE OIL

Use API (American Petroleum Institute) performance Class **CH-4** engine oil or better. Also look for the SAE (Society of Automotive Engineers) viscosity grade. Referring to Figure 2-1, choose the viscosity grade appropriate for the ambient temperatures expected until the next scheduled oil change. Multi-grade oils such as SAE 15W-40 are recommended for year-round use.

See *Section 7. Specifications* for APU oil capacity.

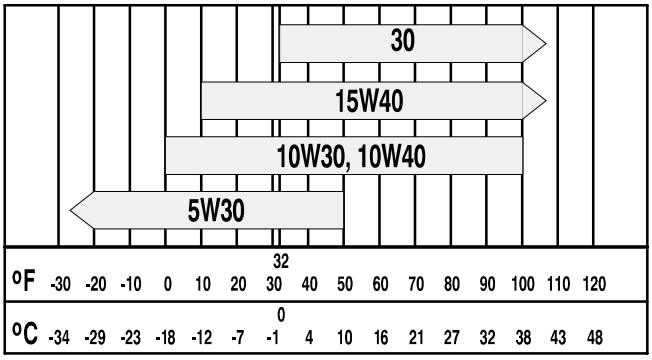

FIGURE 2-1. OIL VISCOSITY VS. TEMPERATURE

⚠WARNING ***ENGINE EXHAUST IS DEADLY. Engine exhaust gases include CARBON MONOXIDE (CO), an odorless, colorless, poisonous gas that can cause severe personal injury or death. Symptoms of CO poisoning include:***

- ***Dizziness, Headache or Throbbing Temples***
- ***Weakness or Muscular Twitching***
- ***Sleepiness or Confusion***
- ***Nausea or Vomiting***

IF YOU OR ANYONE ELSE EXPERIENCES ANY OF THESE SYMPTOMS, GET OUT INTO FRESH AIR IMMEDIATELY and seek advice from poison control, medical center or 911. Do not operate the APU again until it has been repaired and inspected.

Never sleep in the vehicle while the APU is running unless the vehicle has a working carbon monoxide detector. The exhaust system must be installed in accordance with the APU Installation Manual. Make sure there is ample fresh air when operating the APU in a confined area.

PRE-START CHECKS

Before the first start of the day and after every eight hours of operation, inspect the APU as instructed under GENERAL INSPECTION (p. 5-2). Keep a log of maintenance and the hours run and perform any maintenance that may be due. See Returning the APU to Service (p. 2-6) if the vehicle has been in storage.

1. Make sure all vehicle carbon monoxide (CO) detectors are working.
2. Check for fuel, coolant, oil and exhaust leaks and damage to the exhaust system.

MANUAL STARTING

The APU can be started and stopped by the **Start** and **Stop** buttons on the operator panel in the cab. See *Section 3. Operator Panel* for details. The APU can also be started and stopped by the control switch on the APU control panel. See *Section 4. APU Control Panel* for details.

1. Perform the PRE-START CHECKS and turn off the air conditioner or heater.
2. Touch the **Start** button. The status light will come on when the APU starts and will stay on while it runs. The light flashes rapidly while starting indicating that preheating and cranking are taking place. (Depending on how cold it is, preheating can take up to 15 seconds, extending the time that the lamp flashes.)
3. See *Section 6. Troubleshooting* if the APU does not start after several tries.
4. Let the APU warm up a few minutes until it is running smoothly before turning on the air conditioner or heater.
5. Check for fuel, oil, coolant and exhaust leaks. Stop the APU immediately if there is a leak and have it repaired.

MANUAL STOPPING

Run the APU under no load for a few minutes to allow the engine to cool down and then touch the **Stop** button.

AUTOMATIC STARTING (AUTO)

⚠WARNING ***ENGINE EXHAUST IS DEADLY. MOVING PARTS and ELECTRICITY can cause severe personal injury or death. To reduce exposure to these hazards, always disable AUTO before:***

- ***Sleeping in vehicle, unless CO detector works***
- ***Parking vehicle in garage or confined space***
- ***Parking vehicle for storage***
- ***Servicing APU***
- ***Servicing batteries***
- ***Servicing electrical appliances***
- ***Fueling vehicle***

Number of Starting Attempts

The APU will start and stop automatically when in AUTO mode (p. 3-4). Three attempts will be made to start before declaring an Over Crank Fault (Code No. 4).See *Section 6. Troubleshooting.*

Note: An alarm inside the APU sounds for 5 seconds before each start attempt.

Demand for Heating or Air Conditioning

If the Operator Panel HEAT A/C lamp is on, the APU will start and run when there is a demand for heating or air conditioning. It will run for an additional 15 minutes after the heater or air conditioner cycles off. (This reduces the number of APU starts and stops when the heater or air conditioner is cycling on and off.)

See Page 3-4 to enable.

Low Battery Voltage

If the operator panel ROAD READY lamp is on, the APU will start and run for the pre-set amount of time (1 to 4 hours) when battery voltage drops below a pre-set level for 5 minutes.

See Page 3-4 to enable.

Low Coolant Temperature

If the operator panel ROAD READY lamp is on, the APU will start and run for the pre-set amount of time (1 to 4 hours) when coolant temperature drops below a pre-set value.

See Page 3-4 to enable.

Programmed Start

The APU can be programmed to run for 1 to 4 hours on a 7-day cycle to maintain battery charge and reliable starting.

See Page 3-4 to enable.

STOPPING AND DISABLING AUTO

Touch **Stop** to stop any automatic starting sequence and disable AUTO.

APU ELECTRICAL LOADS

The APU powers the air conditioning and heating system and appliances connected to the AC power outlet receptacles. It may also power the main engine block heaters. How much appliance load* can be powered depends upon the APU power rating. The APU will shut down or its circuit breakers will trip if the sum of the loads exceeds APU power.

To avoid overloading the APU and causing shutdowns, compare the sum of the loads of the appliances that are likely to be used at the same time to the power rating of the APU. ***It may be necessary to use fewer appliances at the same time.***

The power requirement for starting the air conditioner is much greater than required to keep it running, once started. ***It may be necessary to use fewer appliances when the air conditioner is cycling on and off.***

Maximum power decreases as altitude increases, because air density decreases. For every 1000-foot (305 m) increase in elevation you can expect power to decrease approximately 3.5 percent. Table 2-1 shows the results of typical calculations. ***It may be necessary to use fewer appliances at higher altitudes.***

TABLE 2-1. POWER VS. ALTITUDE

Elevation above Sea Level	Maximum Power
at/below 500 ft (152 m)	4000 W (rated)
at 2500 ft (762 m)	3760 W
at 5500 ft (1676 m)	3400 W
above 5500 ft (1676 m)	3400 W minus 120 W every 1000 ft (305 m)

* Appliance load and APU power are measured in terms of watts (W) or kilowatts (kW), where 1 kilowatt (kW) = 1000 watts (W).

RESETTING CIRCUIT BREAKERS

If a circuit breaker in the main power distribution panel of the vehicle or on the APU (Figure 4-1) trips, either a circuit shorted or too many appliances were being used at the same time. Note that the APU will continue to run after a circuit breaker trips.

If a circuit breaker trips, disconnect or turn off as many loads as possible and reset the circuit breaker. (Push the circuit breaker **OFF** to reset it and then **ON** to reconnect the circuit.) If the circuit breaker trips right away, either the electrical distribution system has a short or the circuit breaker is faulty. Call a trained and experienced electrician.

If the circuit breaker does not trip right away, reconnect the appliances, one by one, up to a total load that does not overload the APU or cause the circuit breaker to trip. If a circuit breaker trips right away when an appliance is connected, the appliance probably has a short.

Electrical appliances and tools must be used and maintained properly and be properly grounded to cause the line circuit breakers to trip when short circuits occur.

⚠WARNING ***Short circuits in electrical appliances and tools can cause fire and electrical shock leading to severe personal injury or death. Read and follow the equipment and tool manufacturer's instructions and warnings regarding use, maintenance and proper grounding.***

CONNECTING SHORE POWER

When the vehicle has provisions for connecting to shore power, such as a cord for plugging into a power outlet receptacle, it must also have an approved device to keep the APU and shore power from being interconnected. See the genset Installation Manual for more information.

⚠WARNING ***Interconnecting the APU and shore power can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.***

OPERATING IN COLD WEATHER

1. Make sure engine oil viscosity is appropriate for the ambient temperatures. See ENGINE OIL RECOMMENDATIONS (Page 2-1). Be sure to change the oil if a sudden drop in temperature occurs.
2. Keep the APU clean.
3. Perform maintenance due. See PERIODIC MAINTENANCE SCHEDULE (Page 5-1).

OPERATING IN HOT WEATHER

Pay particular attention to the following items when operating the APU in hot weather:

1. Make sure nothing blocks airflow to and from the APU.
2. Make sure engine oil viscosity is appropriate for the ambient temperatures. See ENGINE OIL RECOMMENDATIONS (Page 2-1).
3. Keep the APU clean.
4. Perform maintenance due. See PERIODIC MAINTENANCE SCHEDULE (Page 5-1).

OPERATING AT HIGH ALTITUDE

For the effect of altitude on maximum power, see LOADING THE APU (Page 2-4).

OPERATING IN DUSTY ENVIRONMENTS

Pay particular attention to the following items when operating the APU in dusty environments:

1. Do not let dirt and debris accumulate inside the APU compartment. Keep the APU clean.
2. Perform air cleaner maintenance more often. See PERIODIC MAINTENANCE SCHEDULE (Page 5-1).
3. Change engine oil more often. See PERIODIC MAINTENANCE SCHEDULE (Page 5-1).
4. Keep containers of engine oil that have been opened tightly closed to keep out dust.

BREAKING IN NEW ENGINE

Proper engine break-in on a new APU or on one with a rebuilt engine is essential for top engine performance and acceptable oil consumption. Run the APU at approximately 1/2 rated power for the first 2 hours and then at 3/4 rated power for 2 more hours. See LOADING THE APU (Page 2-4).

Proper engine oil and oil level are especially critical during break-in because of the higher engine temperatures that can be expected. Change the oil if not appropriate for the ambient temperatures during break-in. See ENGINE OIL RECOMMENDATIONS (Page 2-1). Check oil level twice a day or every 4 hours during the first 24 hours of operation and change the oil and oil filter after the first 50 hours of operation.

EXERCISING THE APU

It is highly recommended that the APU be programmed to cycle on once a week. Exercising the APU drives off moisture, re-lubricates the engine, removes oxides from electrical contacts and recharges the vehicle batteries. The result is better starting, more reliable operation and longer engine life.

STORING THE APU

Proper storage is essential for preserving top APU performance and reliability when the APU cannot be exercised regularly and will be idle for more than 120 days.

Storing the APU

1. Disable AUTO.

   ⚠WARNING ***CARBON MONOXIDE is deadly and can accumulate to dangerous levels in garages and other confined spaces. Disabled AUTO before storing the vehicle.***

2. Change the engine oil and attach a tag indicating oil viscosity. See ENGINE OIL RECOMMENDATIONS (Page 2-1).
3. Plug the exhaust tail pipe to keep out dirt, moisture, bugs, etc.
4. Close the fuel supply valve (if so equipped).

Returning the APU to Service

1. Check the oil tag on the APU and change the oil if the viscosity indicated is not appropriate for the temperatures expected. See ENGINE OIL RECOMMENDATIONS (Page 2-1).
2. Remove the plug from the exhaust tailpipe.
3. Change the air filter element if it is dirty (Page 5-5).
4. Open the fuel supply valve (if so equipped).
5. Inspect the APU. See GENERAL INSPECTION (Page 5-2).

3. Operator Panel

GENERAL

The Operator's Panel has an LCD display screen with four navigation buttons, five status lamps, and three action buttons: BRIGHT, START and STOP (Figure 3-1).

ACTION BUTTONS

BRIGHT Button

The LCD screen has four levels of brightness. Each time the BRIGHT button is pressed brightness increases to the next level or starts over again at the lowest level. Adjust screen brightness to suit.

START Button

One touch starts the APU See MANUAL STARTING (p. 2-2).

STOP Button

One touch stops the APU See MANUAL STOPPING (p. 2-2).

STATUS LAMPS

RUNNING Status Lamp

This status lamp (green) comes on and stays on when the APU is running.

FAULT Status Lamp

This status lamp (red) comes on and stays on when a fault shutdown occurs.

AUTO CONTROL Status Lamps (Three)

These status lamps (yellow) comes on when each respective automatic function is enabled. See Automatic Setup (p. 3-4).

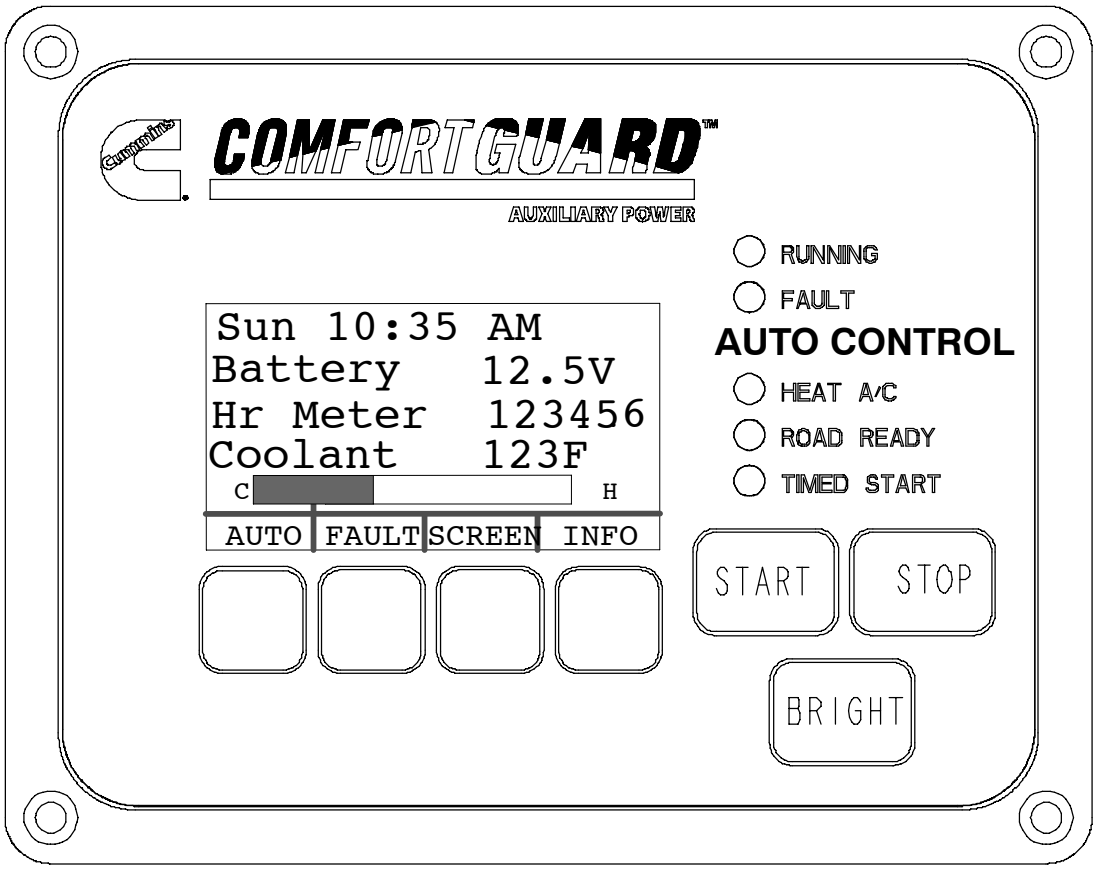

FIGURE 3-1. OPERATOR'S PANEL SHOWING A TYPICAL HOME SCREEN

DISPLAY SCREENS

Home Screen

Screen Display: The home screen (Figure 3-2) displays the following:

- **Day of week and time** – To reset the day of the week and/or time, press the SCREEN button to go to Display Setup (p. 3-6). The current day and time need to display correctly for Timed Start to occur when expected (p. 3-6).
- **Battery voltage** – The APU monitors battery voltage and displays it here. Press the AUTO button to go to the screens where automatic starting of the APU can be enabled to recharge the batteries (p. 3-5).
- **Hour Meter** – The total number of APU running hours is displayed here. Use this screen to schedule APU maintenance in accordance with Table 5-1. Periodic Maintenance Schedule.
- **Coolant temperature** – The APU monitors engine coolant temperature and displays it here. Press the AUTO button to go to the screens where automatic starting of the APU can be enabled to keep main engine coolant warm enough for easy starting (p. 3-5).

AUTO Button: Press the AUTO button to go to the Automatic Setup screens (p. 3-4).

FAULT Button: Press the FAULT button to go to the fault history screens (p. 3-4).

SCREEN Button: Press the SCREEN button to go to the Display Setup screen (p. 3-6).

INFO Button: Press the INFO button to go to the System Info screen (p. 3-6).

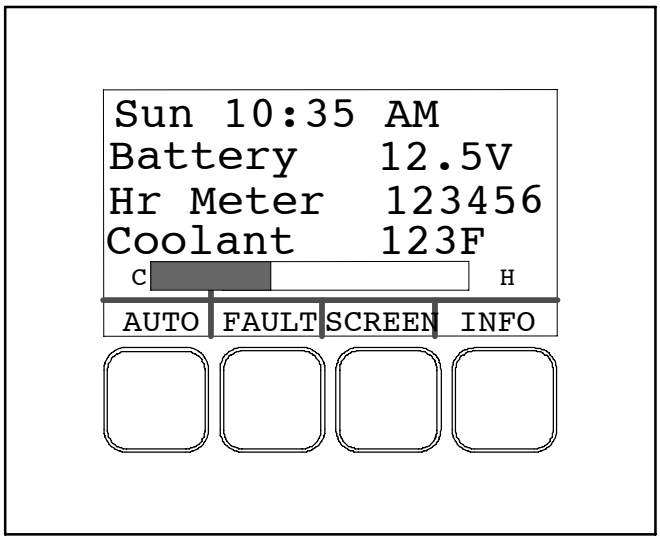

FIGURE 3-2. TYPICAL HOME SCREEN

Run Start-Stop Screen

Screen Display: While the APU is running the screen displays whether it was started manually or automatically and the time it started (Figure 3-3). If it was started automatically the reason for the start will be displayed. When the APU is stopped, the time it was stopped will also be displayed.

Manual Starting: *Manual Start* will display with the day of the week and time of day it was started and stopped.

Automatic Starting: The reason for starting will display on the first line followed by *Auto Start* and the day of the week and time of day it was started and stopped. One of the following reasons for starting will be displayed:

- **Coolant Temp** – Coolant temperature fell below the point set on the Road Ready screen (p. 3-5).
- **Battery Voltage** – Battery voltage fell below the point set on the Road Ready screen (p. 3-5).
- **Heat AC Demand** – The heating and air conditioning unit sent a signal to start the APU.
- **Timed Start** The day and time set for automatic starting of the APU arrived (p. 3-6).

Press the BACK button to go back to the Home screen.

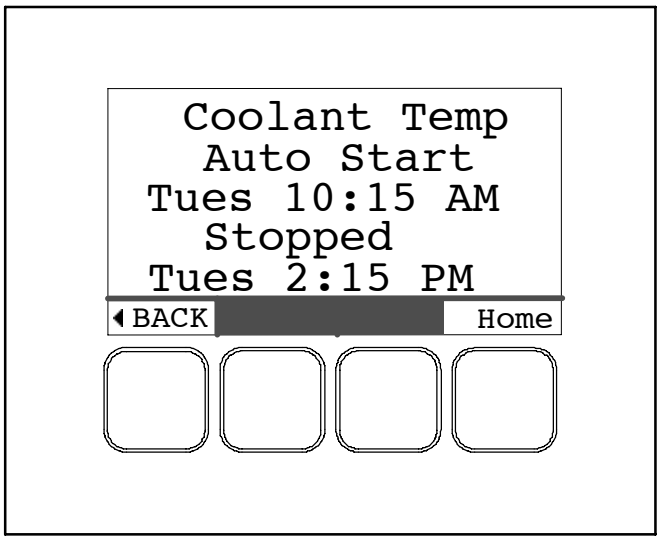

FIGURE 3-3. TYPICAL RUN START-STOP SCREEN

Fault Screen

If a fault shutdown occurs the FAULT status lamp comes on and the Fault Screen displays a description of the Fault, the Fault Number and the hour in total APU running time when the Fault occurred (Figure 3-4). Refer to TABLE 6-1. TROUBLESHOOTING to diagnose and correct the problem.

Press the BACK button to clear the fault and go back to the home screen or the HIST button to review the last five faults.

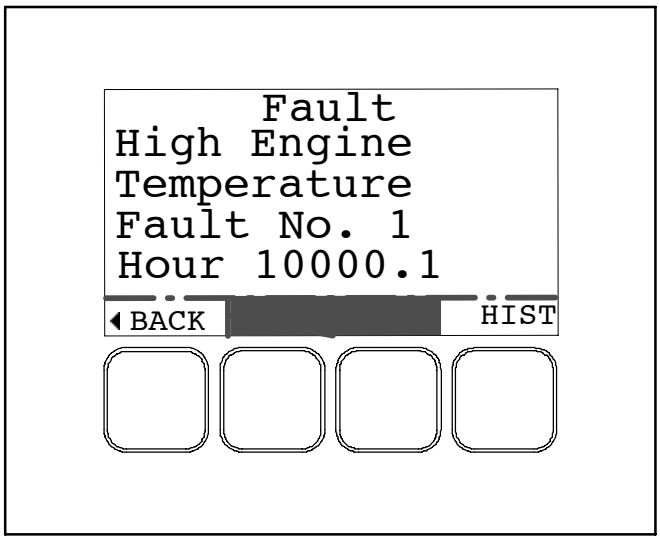

FIGURE 3-4. TYPICAL FAULT SCREEN

Fault History

To display any of the last five faults, press the FAULT button on the Home screen (p. 3-2). Then press the HIST button.

The FAULT HISTORY screen will display a description of the last Fault, the Fault Number and the hour in total genset running time when the fault occurred. Press the double arrows to toggle between the last five faults. If there are no faults, the FAULT HISTORY screen will display *No Stored Faults*.

Press the BACK button to go back to the home screen.

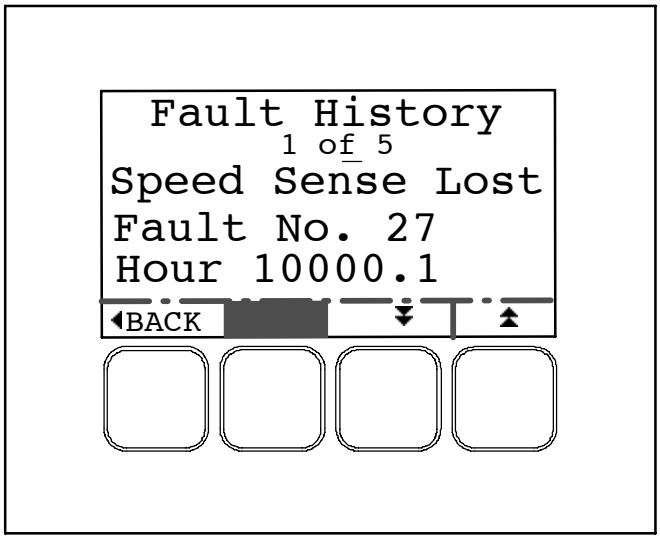

FIGURE 3-5. TYPICAL FAULT HISTORY SCREEN

Automatic Setup Screen

Press the AUTO button on the Home screen to go to the Automatic Setup screen (Figure 3-6) to enable or disable automatic starting of the APU, when:

- The heating and air conditioning unit sends a signal to start the APU (Heat A/C)
- Battery charge or engine coolant temperature falls below the minimum setting (Road Ready)
- Timed Start becomes effective

Press the NEXT button to select the automatic feature to enable or disable and then the ENTER button to go to the selected feature screen.

Press the BACK button to go back to the home screen.

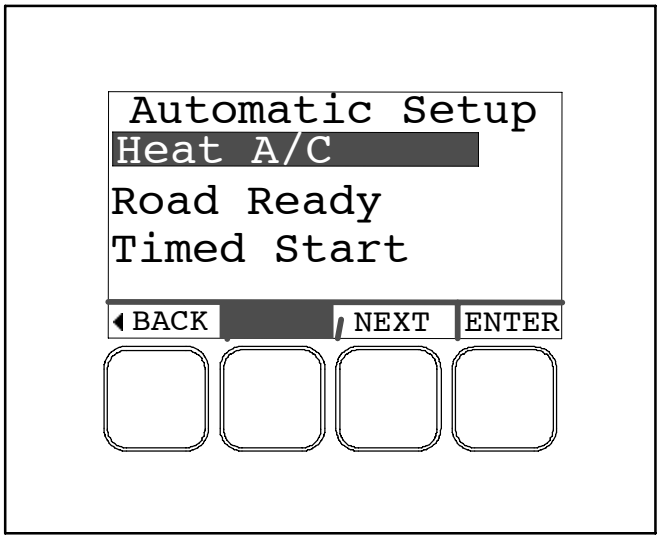

FIGURE 3-6. AUTOMATIC SETUP SCREEN

Heat A/C Screen

SELECT and ENTER Heat A/C on the Automatic Setup screen to go to the Heat A/C screen (Figure 3-7).

Press the up/down arrow buttons to toggle Automatic On of OFF. By toggling Automatic ON, the APU is enabled to automatically start when it receives a start signal from the thermostatically controlled heating and air conditioning unit.

The yellow Heat A/C lamp on the operator panel will also come on when enabled.

Press the BACK button to save the setting and go back to the home screen.

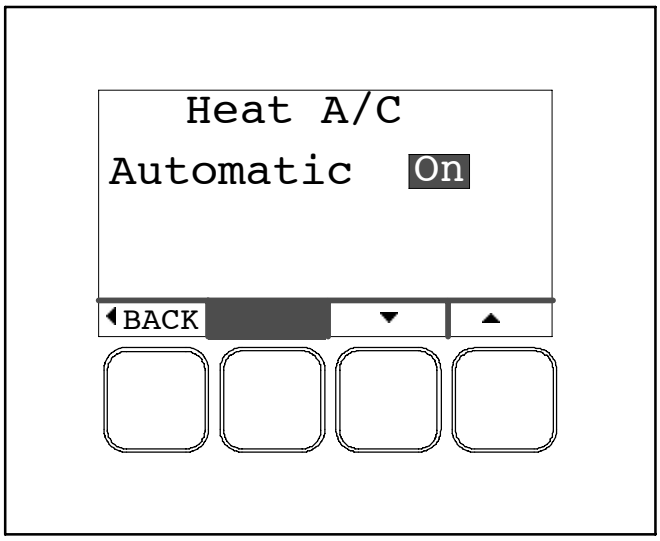

FIGURE 3-7. HEAT A/C SCREEN

Road Ready Screen

SELECT and ENTER Road Ready on the Automatic Setup screen to go to the Road Ready screen (Figure 3-8).

On this screen you enable or disable automatic starting of the APU to maintain battery charge and engine temperature, set the minimum voltage and temperature values that initiate starting and the APU run time.

Press the NEXT button to select the field to change and then the up/down arrow buttons to change the value in the field.

Note: For reliable main engine starting, it is highly recommended that minimum battery voltage not be set to less than 12.5 or coolant temperature to less than 45° F (7° C).

The yellow Road Ready lamp on the operator panel will also come on when enabled.

Press the BACK button to save the setting and go back to the home screen.

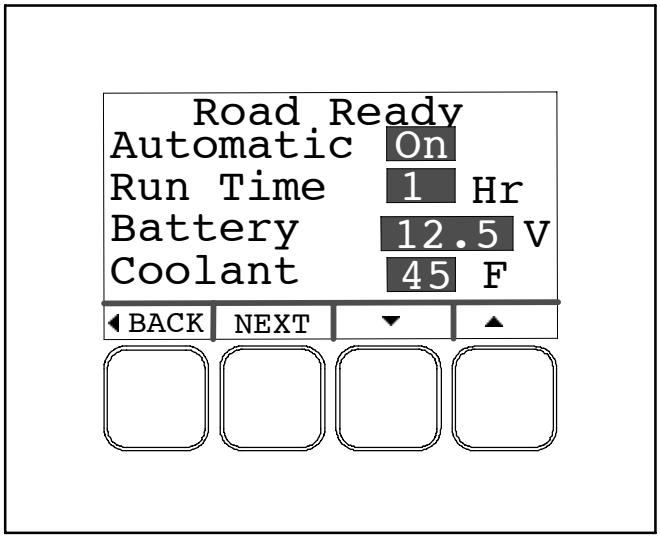

FIGURE 3-8. ROAD READY SCREEN

Timed Start Screen

SELECT and ENTER Timed Start on the Automatic Setup screen to go to the Timed Start screen (Figure 3-9).

On this screen you enable or disable automatic starting of the APU on a daily or weekly schedule on a specific day and specific time of day to maintain battery charge.

Press the NEXT button to select the field to change and then the up/down arrow buttons to change the value in the field.

The yellow Timed Start lamp on the operator panel will also come on when enabled.

Press the BACK button to save the settings and go back to the home screen.

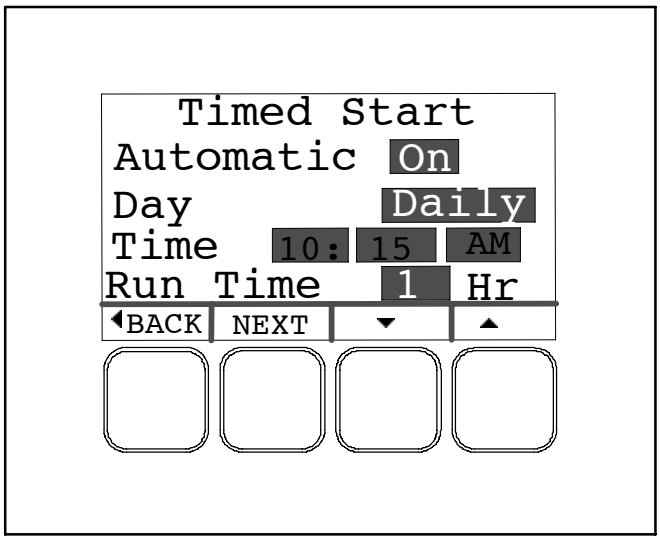

FIGURE 3-9. TIMED START SCREEN

Display Setup

Press the SCREEN button on the Home screen to go to the Display Setup screen (Figure 3-10).

Current Day of Week and Time: Press the NEXT button to select the field to change and then the up/down arrow buttons to change the value in the field.

Note: Correct Timed Start operation depends on correct day and time settings.

Contrast: Press the NEXT button to select the screen Contrast field and then the up/down arrow buttons to increase or decrease contrast to suit.

Temperature Degree Units: Press the NEXT button to select the Degrees field and then the up/down arrow buttons to toggle between F (Fahrenheit) and C (Centigrade).

Press the BACK button to save the settings and go back to the home screen.

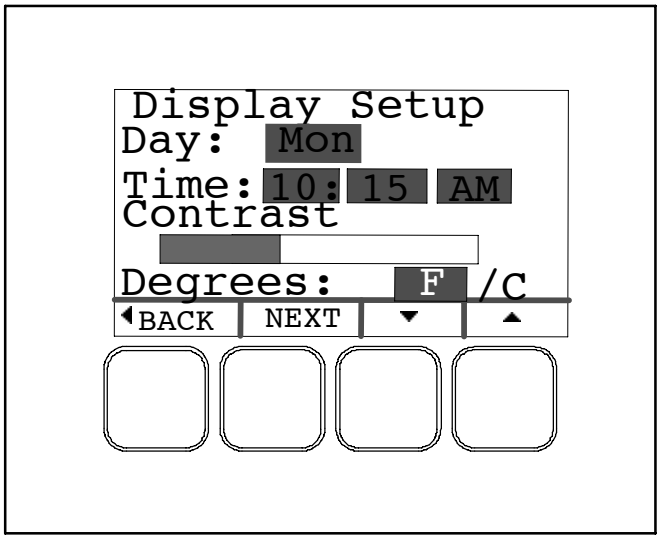

FIGURE 3-10. DISPLAY SETUP SCREEN

System Info Screen

Press the INFO button on the Home screen to go to the System Info screen (Figure 3-11).

This screen displays the genset (APU) and display (operator panel) software numbers and software version numbers. This information may be requested when you call for service.

Press the BACK button to go back to the home screen.

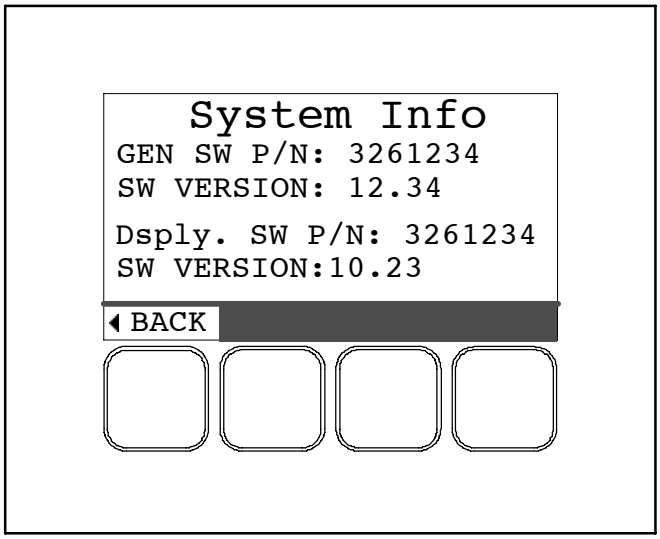

FIGURE 3-11. SYSTEM INFO SCREEN

4. APU Control Panel

CONTROL SWITCH

The APU control panel (Figure 4-1) has a control switch with a built-in status light. Use this switch for for service and maintenance operations.

Control Switch – This switch is used to manually Start and Stop the APU and restore the last fault code (flashing status light). One touch Starts or Stops the APU.

Status Light – This light is in the control switch. It:

- Flashes rapidly during preheat and cranking. Rapid flashing before cranking starts indicates that the glow plugs are preheating the combustion chambers. The time varies based on engine temperature.
- Stays on continuously while the APU is running
- Flashes a numerical fault code in the event the APU shuts down (see *Section 6. Troubleshooting*)

OUTPUT CIRCUIT BREAKER

This circuit breaker protects the APU power output leads and provides a means for disconnecting power output.

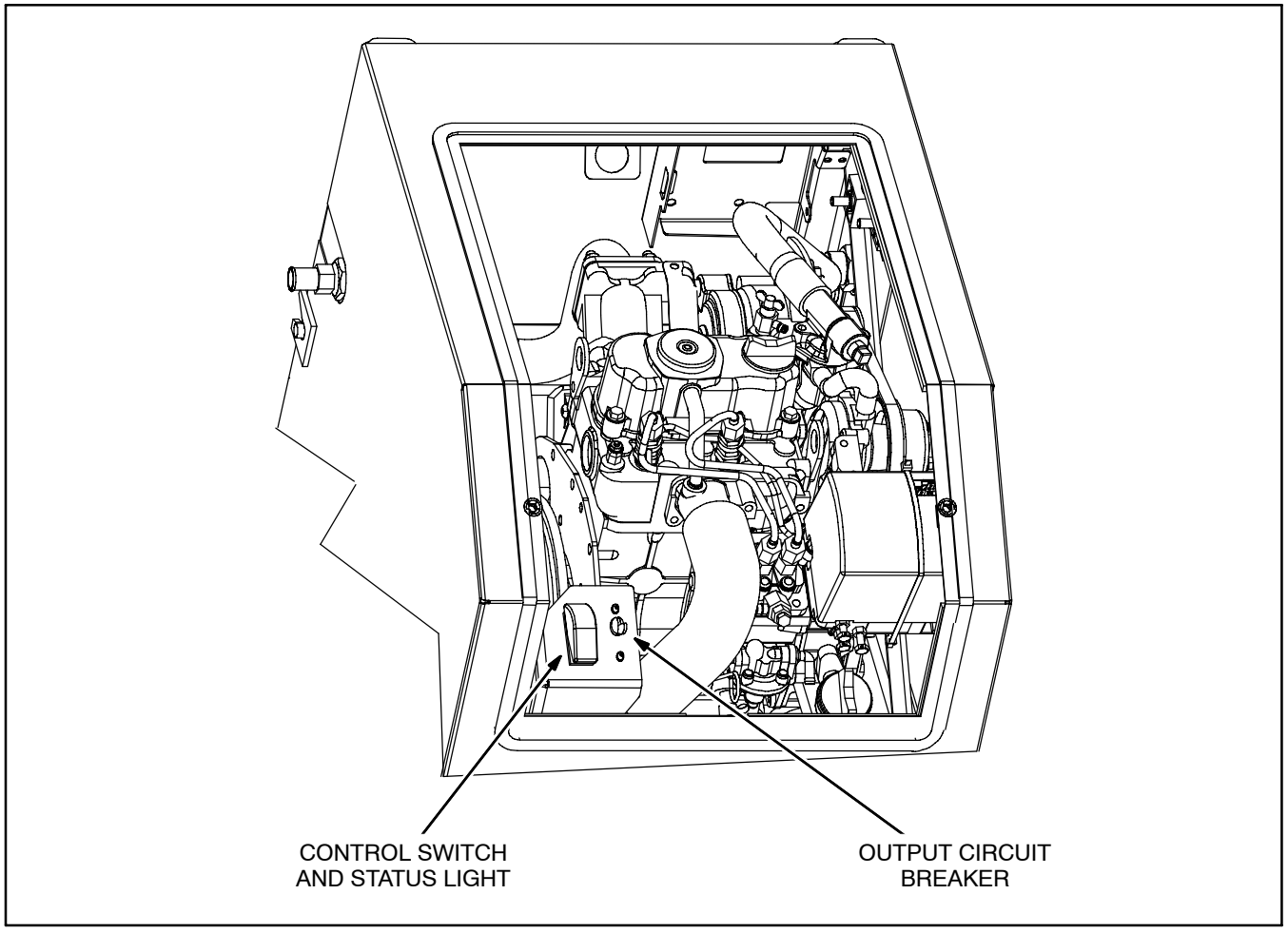

FIGURE 4-1. APU CONTROL PANEL

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5. Periodic Maintenance

Periodic APU maintenance is essential for top performance and long APU life. Use Table 5-1 as a guide for normal periodic maintenance. In hot and dusty environments some maintenance procedures should be performed more frequently, as indicated by the footnotes in the table.

Maintenance, replacement or repair of emission control devices and systems may be performed by any engine repair establishment or individual. However, warranty work must be completed by an authorized Cummins dealer.

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Disable AUTO, stop the APU and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative [–] first and reconnect last to prevent sparks between tools and vehicle frame.)***

TABLE 5-1. PERIODIC MAINTENANCE SCHEDULE

MAINTENANCE TASK	FREQUENCY						
	After First 50 Hrs	Weekly	Monthly	Every 500 Hrs	Every 1000 Hrs	Every Three Years	Page
General Inspection		x					5-2
Check Engine Oil Level		x					5-3
Check Coolant Level[1]		x					5-8
Check Vehicle Batteries[2]			x				5-6
Change Engine Oil & Oil Filter[2, 3, 4]	x			x			5-4
Replace Engine Air Filter[3, 4]				x			5-5
Check Engine V-Belt[6]				x			
Replace Fuel Filters[4]				x			5-7
Check Coolant Anti-Freeze Protection[1, 4]				x			5-8
Adjust Valve Lash[6]					x		–
Inspect Slip Rings and Brushes[6]					x		–
Inspect the Generator Bearing[6]					x		–
Replace the Poly-V Drive Belt[6]						x	–
Replace Coolant, Pressure Cap, Hoses[1, 5]						x	5-8

1. For Stand-Alone Cooling System only. For Shared Cooling System, see Vehicle Manufacturer's instructions.
2. Perform more often when operating in hot weather.
3. Perform more often when operating in dusty conditions.
4. Perform at least once a year.
5. Perform at least once every two years.
6. Must be performed by trained and experienced personnel (authorized Cummins service representatives).

GENERAL INSPECTION

Inspect the APU once a week.

Oil Level

Check engine oil level (Figure 5-1).

Stand-Alone Cooling System

⚠CAUTION ***Operating the APU when coolant level is low can cause serious damage to the engine.***

Operating the APU with the maintenance access covers off can lead to overheating and possible damage to the APU.

Check the engine coolant level and look for coolant leaks in, around and below the APU. Minor leaks that can be replenished by daily additions of coolant to the recovery tank should be repaired by a qualified service technician as soon as possible. Larger leaks are cause for shutting down the APU until it can be repaired.

Shared Cooling System

Check the engine coolant level and look for coolant leaks in, around and below the APU and the hoses connecting the APU to the main engine.

Exhaust System

⚠WARNING ***EXHAUST GAS IS DEADLY! Do not operate the APU if there is an exhaust leak or any danger of exhaust gases entering or being drawn into the vehicle.***

Look and listen for exhaust system leaks while the APU is running. Shut down the APU if a leak is found and have it repaired before operating the APU again.

Look for openings or holes between the APU compartment and vehicle cab if the APU engine sounds louder than usual. Have all such openings or holes closed off or sealed to prevent exhaust gases from entering the vehicle.

Replace dented, bent or severely rusted sections of the tailpipe and make sure the tailpipe extends at least 1 inch (25.4 mm) beyond the perimeter of the vehicle.

⚠WARNING ***Do not park the vehicle in high grass or brush. Contact with the exhaust system can cause a fire.***

Park the vehicle so that the APU exhaust gases can disperse away from the vehicle. Barriers such as walls, snow banks, high grass and brush and other vehicles can cause exhaust gases to accumulate in and around the vehicle.

Do not operate power ventilators or exhaust fans while the vehicle is standing with the APU running. The ventilator or fan can draw exhaust gases into the vehicle.

Fuel System

Check for leaks at hose, tube and pipe fittings in the fuel supply system while the APU is running and while it is stopped. Check flexible fuel hose sections for cuts, cracks, and abrasions. Make sure the fuel line is not rubbing against other parts. Replace worn or damaged fuel line parts before leaks occur.

⚠WARNING ***Diesel fuel leaks can lead to fire. Do not operate the APU if operation causes fuel to leak.***

Battery Connections

Check the battery terminals for clean, tight connections. Loose or corroded connections have high electrical resistance which makes starting harder. See MAINTAINING THE BATTERY AND BATTERY CONNECTIONS (p. 5-6).

Mechanical

Look for mechanical damage and listen for unusual noises. Check the APU mounting bolts.

To prevent overheating and to reduce fouling with dust and debris, make sure the APU's normal ground clearance is not being reduced by sloping ground, curbs, logs or other objects. Repark the vehicle if necessary and/or remove any objects blocking the air inlet or air outlet.

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.***

1. Park the vehicle on level ground, shut down the APU. The oil level dip stick and oil fill caps are accessible through the top access opening (Figure 5-1).
2. Pull out the oil dip stick, wipe it clean, reinsert it and pull it out again to check the oil level.
3. Add or drain oil as necessary. See RECOMMENDED ENGINE OIL (p. 2-1). Keep the oil level between the FULL and ADD marks.

   ⚠CAUTION ***Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the FULL and ADD marks.***
4. Reinsert the dipstick and secure the oil fill cap and top access cover.

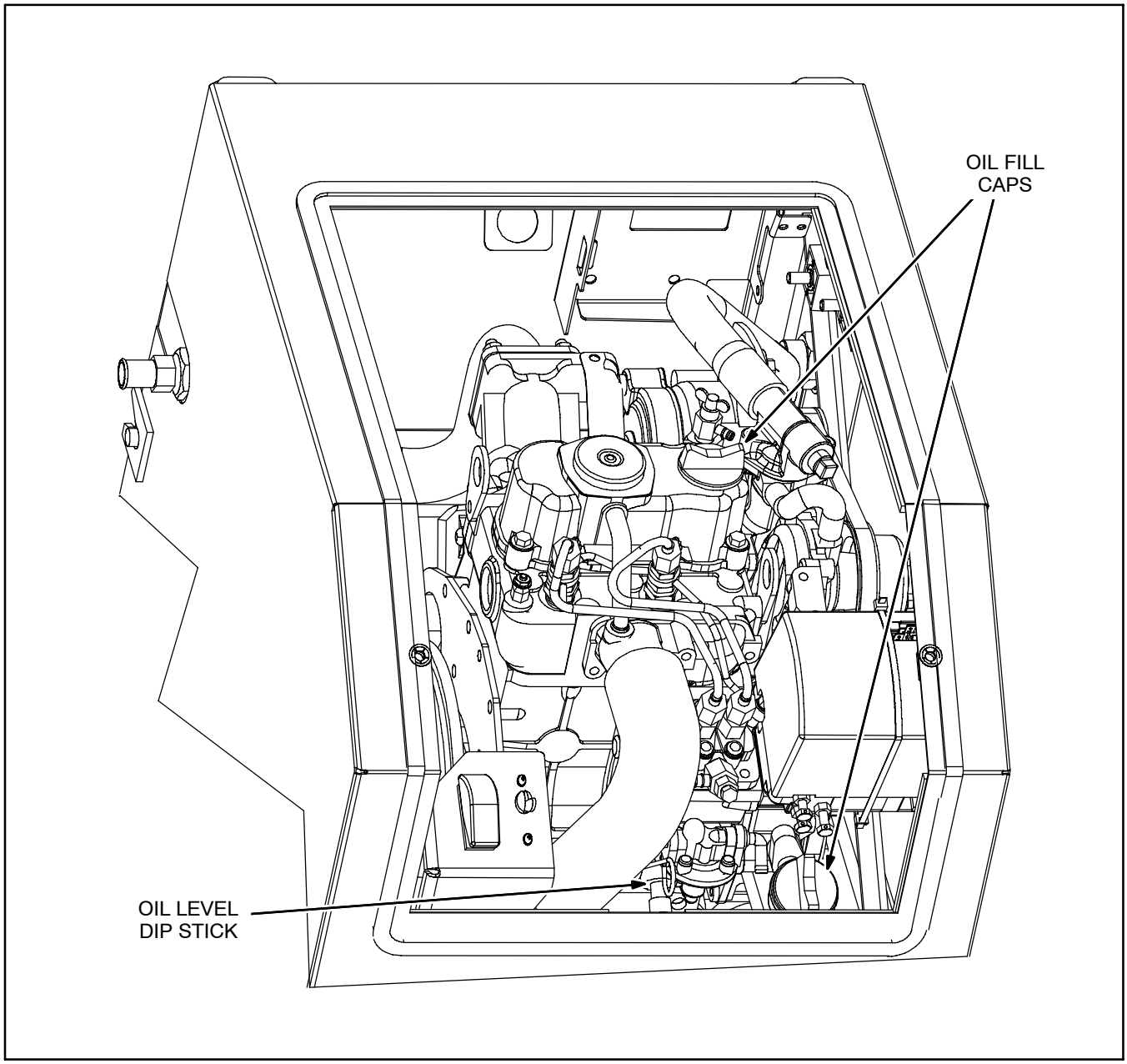

FIGURE 5-1. CHECKING ENGINE OIL LEVEL

CHANGING ENGINE OIL AND OIL FILTER

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Disable AUTO, stop the APU and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative (–) first and reconnect last to prevent sparks between tools and vehicle frame.)***

⚠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.***

Refer to Table 5-1 for scheduled engine oil change. Change oil more often in hot and dusty environments. The oil filter and drain plug are accessible through the bottom access opening (Figure 5-2).

1. Place a pan under the oil drain plug, run the APU until warm and shut it off.
2. Unscrew the oil fill cap and dipstick, unscrew the oil drain plug and drain all the oil from the engine. ***Reinstall the oil drain plug securely***.
3. Spin off the oil filter canister and clean the filter mounting surface on the engine block. Remove the old gasket if it remains.
4. Make sure the gasket is in place on the new filter and apply a thin film of clean oil to the gasket. Spin the new filter on until the gasket just touches the block. Turn it an additional 1/2 to 3/4 turn. Do not overtighten.
5. Refill with oil and check oil level. See *Section 7. Specifications* for oil capacity.

   ⚠CAUTION ***Too much oil can cause high oil consumption. Too little oil can cause severe engine damage. Keep the oil level between the FULL and ADD marks.***
6. Reinsert the dipstick and screw the oil fill cap back on securely. Secure the access covers.
7. Dispose of the used oil and oil filter according to local environmental regulations.

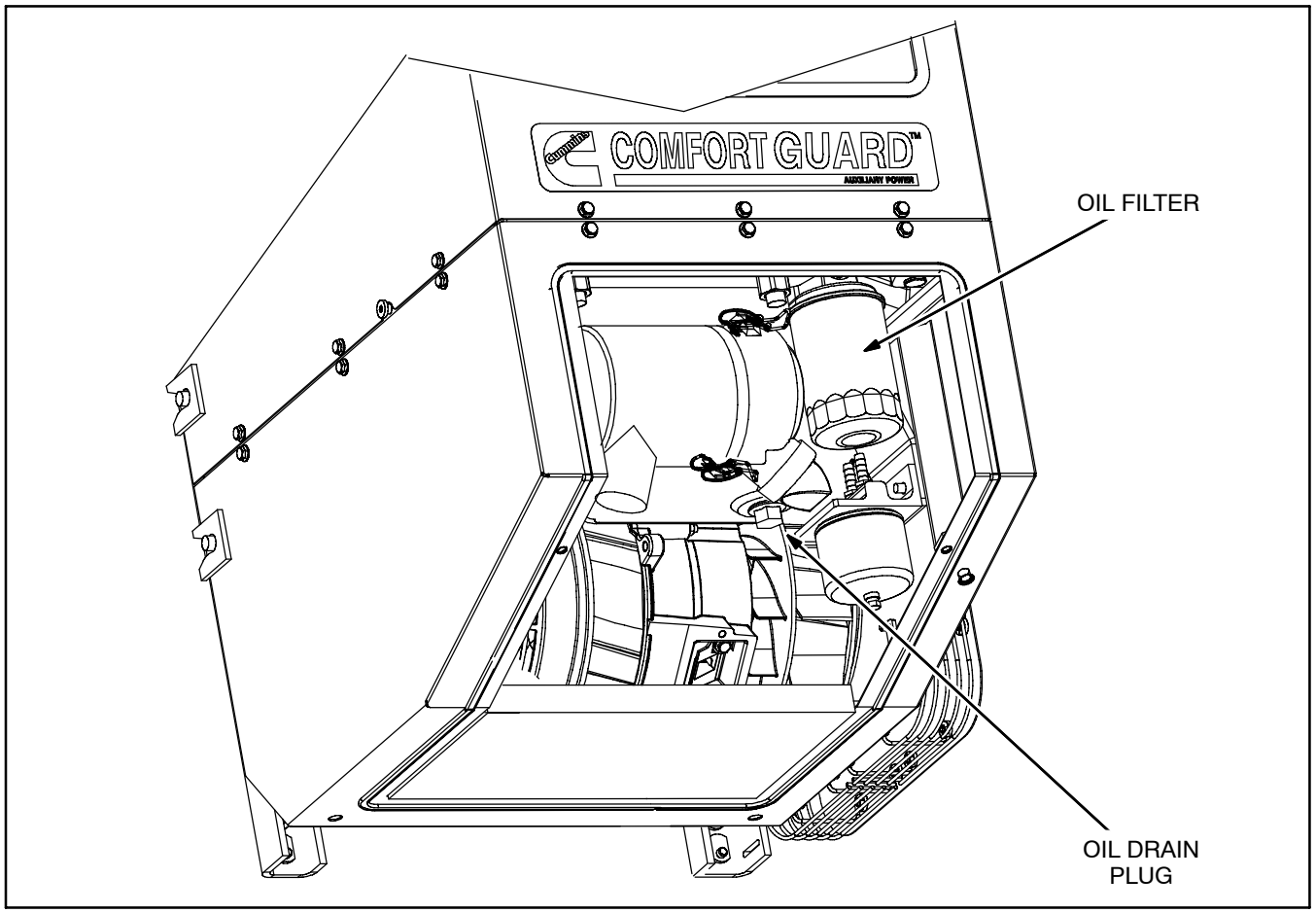

FIGURE 5-2. OIL DRAIN PLUG AND OIL FILTER

REPLACING THE AIR FILTER ELEMENT

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Disable AUTO, stop the APU and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative (–) first and reconnect last to prevent sparks between tools and vehicle frame.)***

Refer to Table 5-1 for scheduled air filter replacement. Replace it more often in dusty environments.

The air filter is accessible through the bottom access opening (Figure 5-3). To change the filter element unlatch the spring clips that hold the filter housing cap on and reassemble with a new air filter element.

Secure the access covers.

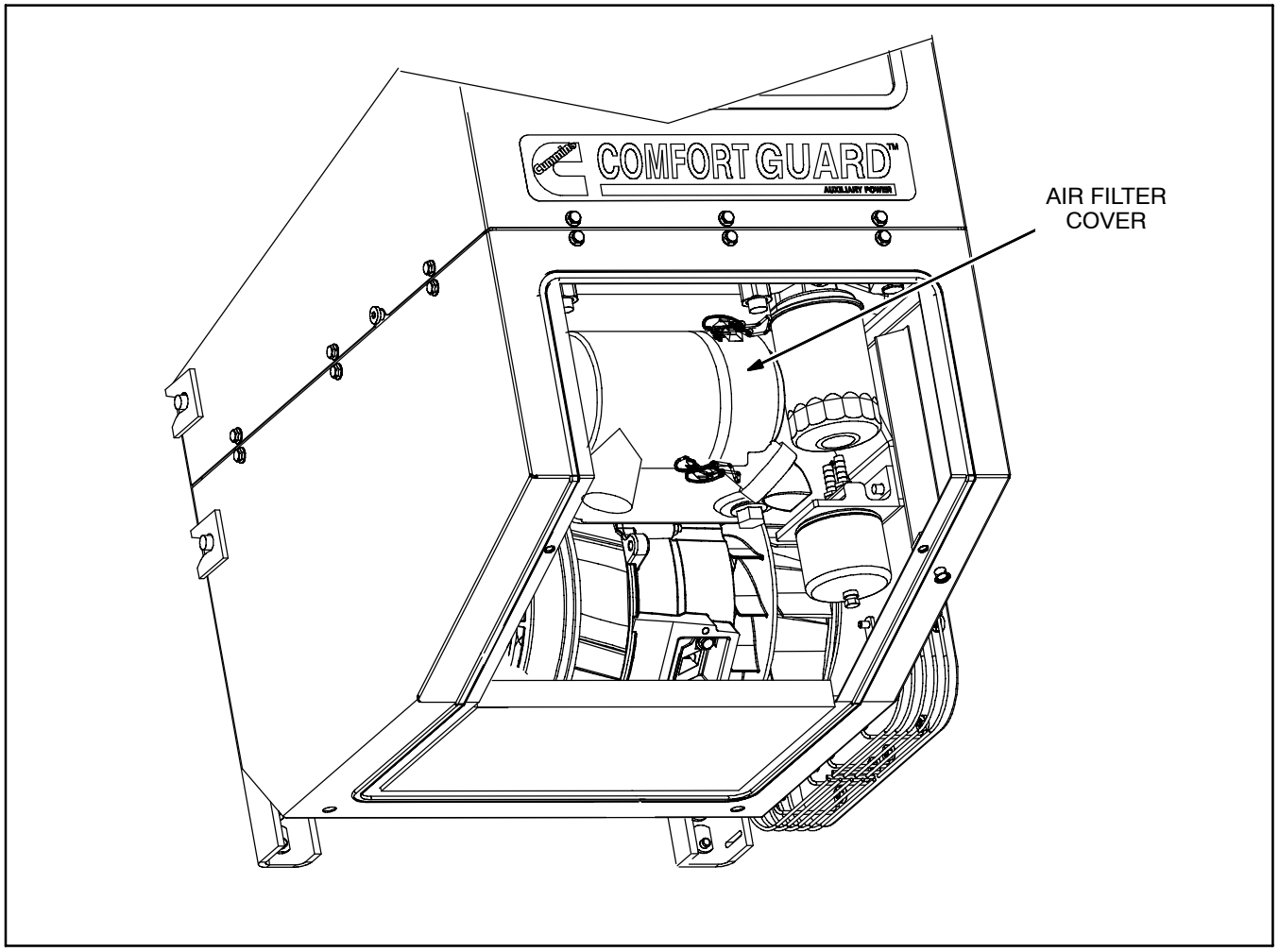

FIGURE 5-3. REPLACING AIR FILTER ELEMENT

MAINTAINING THE VEHICLE BATTERIES AND BATTERY CONNECTIONS

⚠WARNING ***Arcing at battery terminals or in light switches or other equipment, and flames or sparks, can ignite battery gas causing severe personal injury—Ventilate battery area before working on or near battery—Wear safety glasses—Do not smoke—Switch work light ON or OFF away from battery—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.***

Refer to Table 5-1 for scheduled battery maintenance, and follow the battery and or vehicle manufacturer's instructions. Have the main engine or APU battery charging system serviced if DC system voltage is consistently low or high. Always:

1. Keep the battery case and terminals clean and dry and the terminals tight.
2. Remove battery cables with a battery terminal puller. Torque threaded stud battery terminals as recommended by the battery manufacturer. Torque the battery cable terminals on the APU to 7.5 lb-ft (10 N-m). See Figure 5-4.
3. 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.

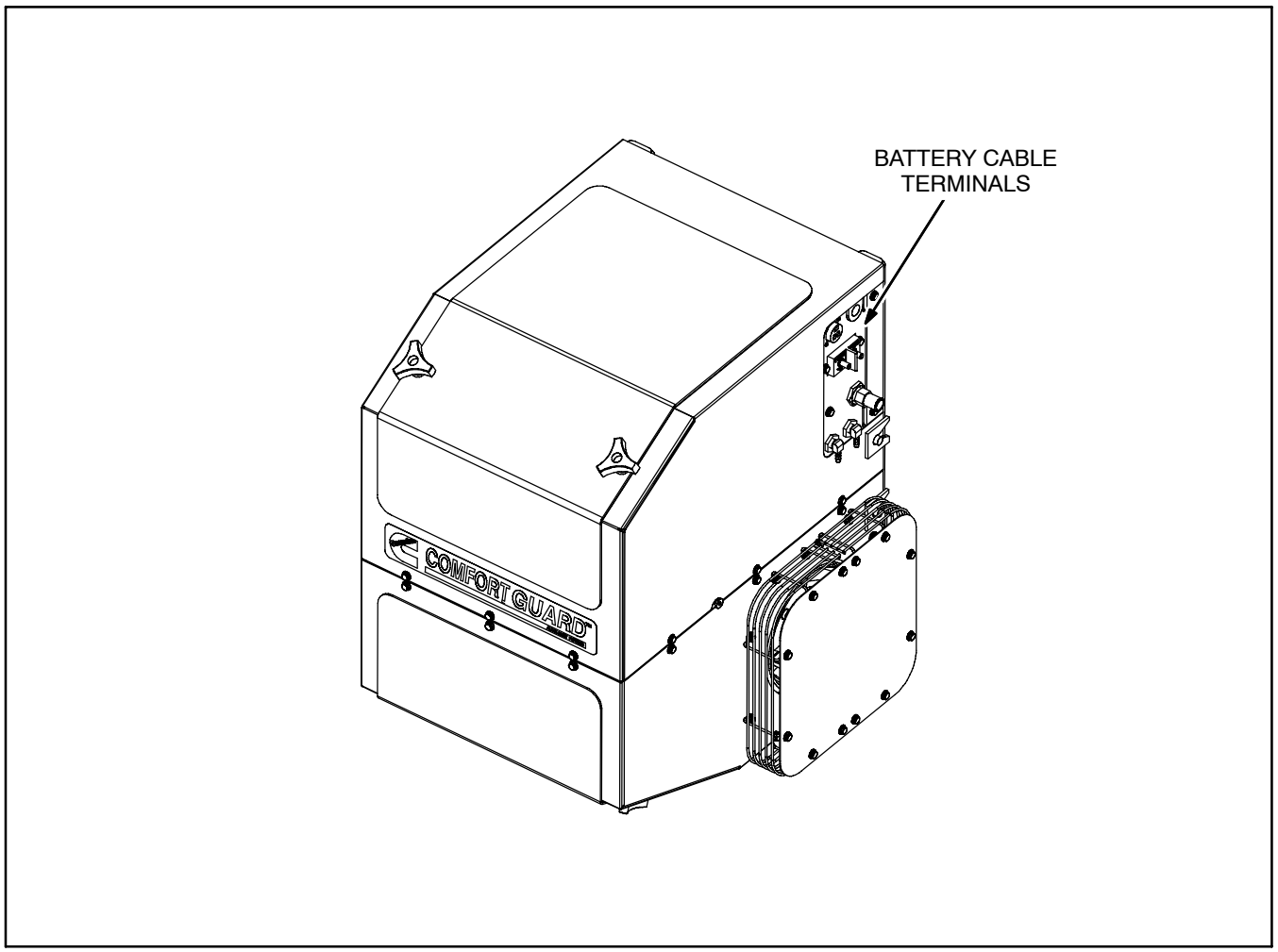

FIGURE 5-4. BATTERY CABLE TERMINALS

REPLACING THE FUEL FILTERS

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Disable AUTO, stop the APU and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative (–) first and reconnect last to prevent sparks between tools and vehicle frame.)***

See Table 5-1 for scheduled fuel filter replacement. A dirty fuel filter may be the cause of a failure to start. The fuel filters are accessible through the bottom access opening (Figure 5-5).

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

⚠CAUTION ***Wipe dirt off the fuel filters so as to keep dirt out of the fuel system.***

Canister Fuel Filter

Spin off the old canister filter with a filter wrench. Clean the contact surface on the filter base, lubricate the new filter gasket and spin the new filter on hand tight.

Inline Fuel Filter

Before removing the inline fllter be prepared to clamp off both hoses connected to the filter to prevent fuel siphoning. When replacing the inline filter use stainless steel stepless ear hose clamps: Onan P/N 0503-1951-13, Oetiker P/N 16700013, or equivalent.

Filter Disposal

Dispose of the used filters in accordance with local environmental regulations.

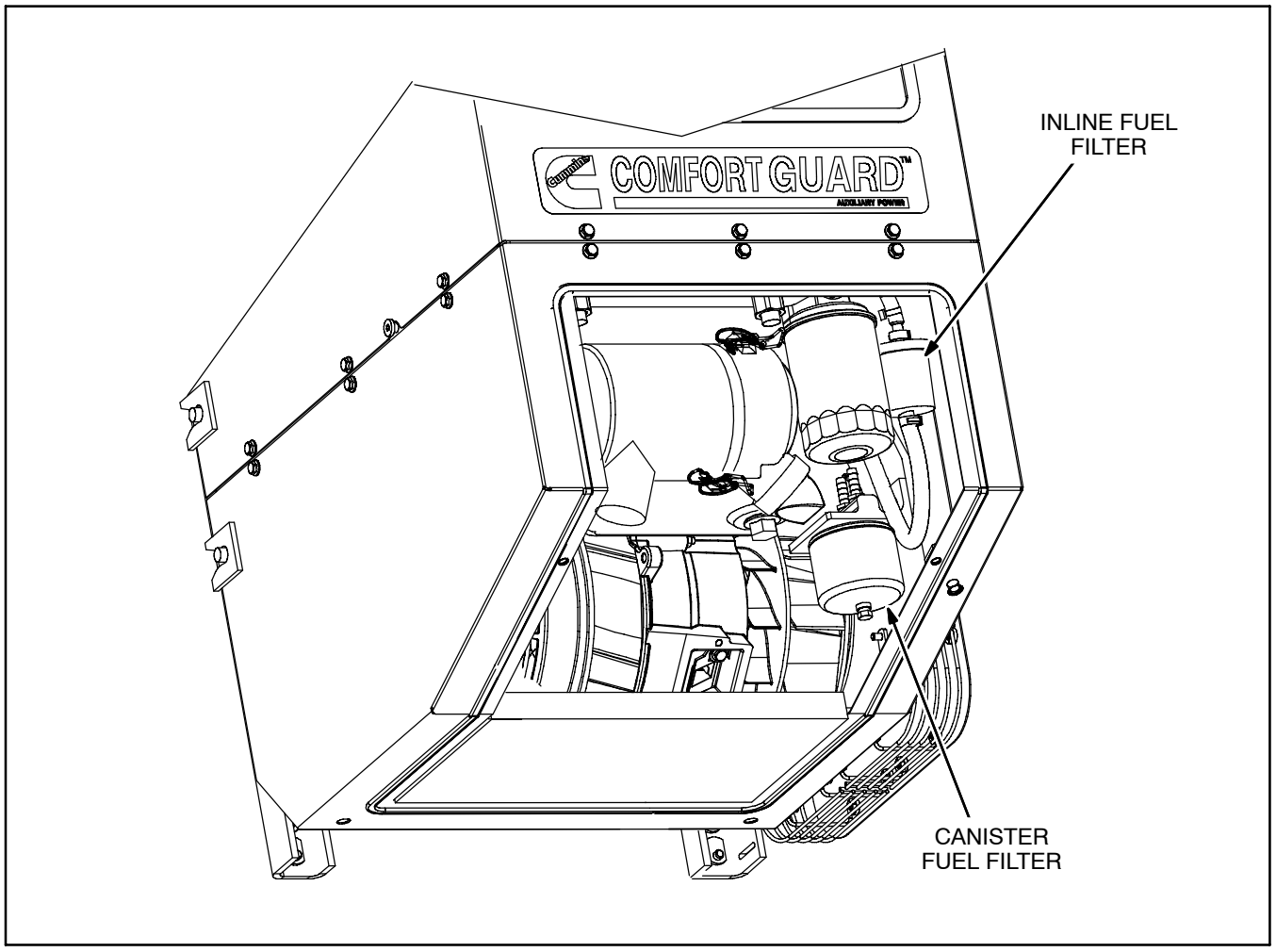

FIGURE 5-5. FUEL FILTERS

MAINTAINING STAND-ALONE COOLING SYSTEM

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Disable AUTO, stop the APU and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative (–) first and reconnect last to prevent sparks between tools and vehicle frame.)***

Refer to Table 5-1 for scheduled maintenance. The engine cooling system is filled with a 50/50 mixture of ethylene glycol anti-freeze and water when the APU leaves the factory, which is suitable for temperatures down to -34° F (-37° C).

Recommended Coolant

See RECOMMENDED COOLANT (p. 2-1).

Pressure Cap

Replace the pressure cap every two years (seals deteriorate and leak). Proper cooling system pressure (14 psi) is essential for optimal engine cooling and minimal coolant loss.

Draining and Cleaning Cooling System

⚠WARNING ***Hot coolant spray can cause severe burns. Let the engine cool before releasing the pressure cap or removing the drain cap.***

The cooling system components are accessible through the top and bottom access openings. Let the engine cool before removing the pressure cap. Relieve any remaining pressure by turning the pressure cap slowly, without pushing down. When the pressure has been relieved, push down on the cap, turn it the rest of the way and withdraw it. Then open the coolant drain valve on the APU engine block and radiator and collect the coolant in a suitable container for disposal.

⚠WARNING ***Ethylene glycol antifreeze is considered toxic. Dispose of it according to local regulations for hazardous substances.***

Flush and clean the cooling system before refilling. Radiator cleaning chemicals are available at local auto parts stores. Follow the instructions for cleaning and flushing that come with the cleaning solution.

Refilling Cooling System

Refilling System: Close the coolant drain valve. Pull the hose connected to the pressure cap out as far and as high as it will go and fill the system with coolant. When the coolant level reaches the fill opening, start and operate the APU for a few minutes and shut it down. Add more coolant if necessary and secure the pressure cap.

Refilling Recovery Tank: Fill the recovery tank with coolant mixture to the COLD mark.

Weekly Coolant Level Check: Check coolant level in the recovery tank (Figure 5-6) and fill to the COLD mark if necessary.

MAINTAINING SHARED COOLING SYSTEM

Draining and Cleaning Cooling System

Drain and clean the shared cooling system in accordance with the vehicle manufacturer's instructions. To drain coolant from the APU, open the coolant drain valve on the APU engine block and radiator and collect the coolant in a suitable container for disposal.

Refilling Cooling System

Close the APU coolant drain valves and follow the vehicle manufacturer's instructions. To fill the APU engine block with coolant, run the main vehicle engine at idle. As the main engine is running open the coolant air vent valve on the APU to let trapped air escape (Figure 5-6). Close the valve as soon as coolant starts to escape. Do this several times, pausing a few minutes between valve openings. Refill the main radiator as necessary.

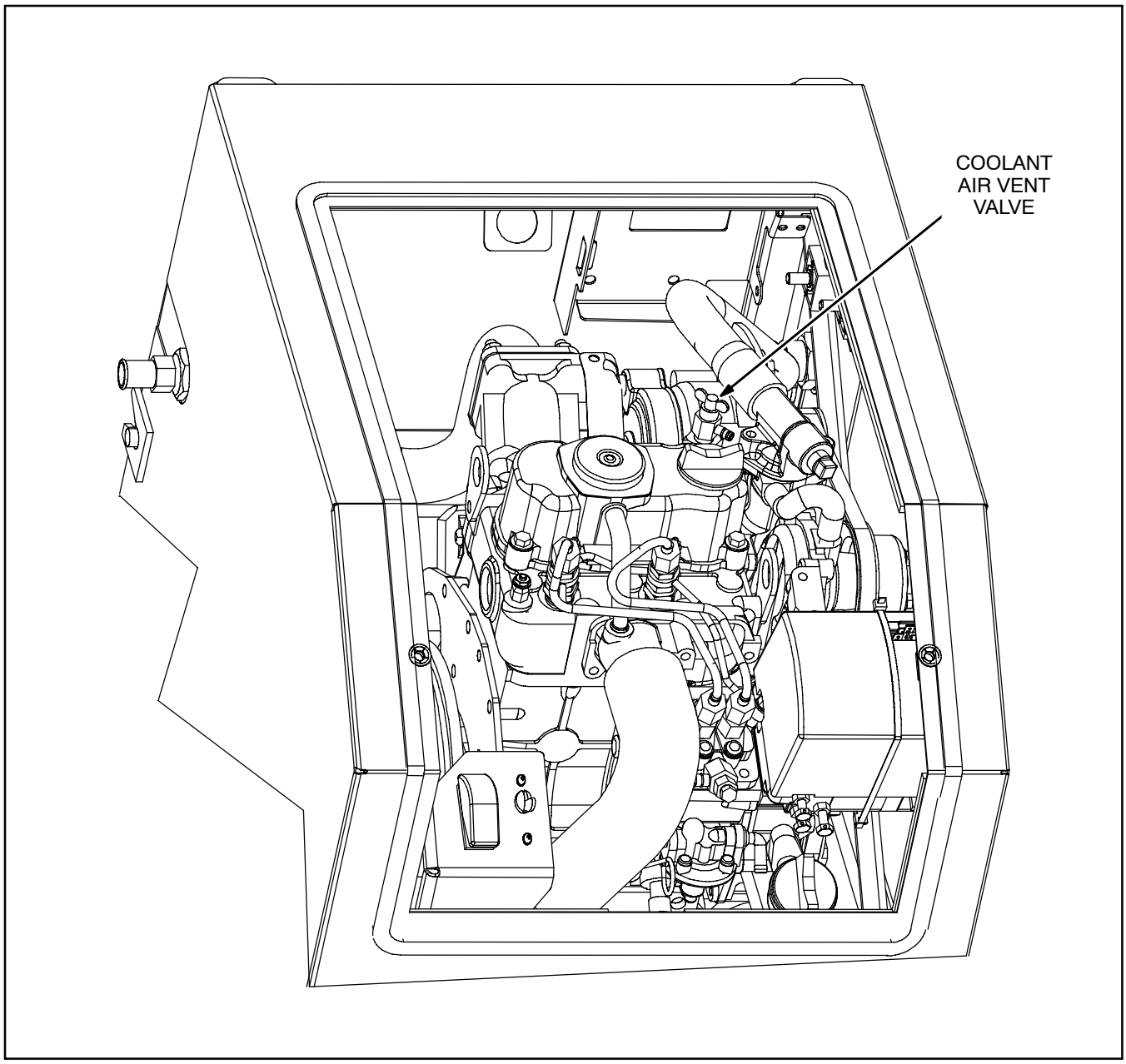

FIGURE 5-6. COOLANT AIR VENT VALVE

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6. Troubleshooting

TROUBLESHOOTING FROM OPERATOR PANEL

If a fault shutdown occurs the FAULT status lamp on the operator panel will come on and the LCD screen will display the a description of the Fault, the Fault Number, and the hour in total genset running time when the Fault occurred. See Page 3-4.

TABLE 6-1. TROUBLESHOOTING lists the shutdown codes in numerical order along with step-by-step corrective actions. If you are unable to resolve the problem after taking the corrective actions suggested, contact an authorized Cummins Dealer. See HOW TO OBTAIN SERVICE (Page 1-4).

First note the following:

- Maintaining engine oil and coolant levels, keeping battery connections clean and tight, watching the fuel gauge, not overloading the APU, keeping the air inlet and outlet openings clear, etc. will prevent most shutdowns.
- When the APU and vehicle engine share a common fuel tank the fuel dip tubes are usually arranged so that the APU will run out of fuel first. Marking the APU empty point on the fuel gauge will make it easier to tell when to stop the APU before running it out of fuel.

TROUBLESHOOTING WITH FLASHING INDICATOR LIGHT

The APU causes the status indicator light on the Control Switch to flash the *first-level* diagnostic fault code when a fault shutdown occurs. See *Section 4. APU Control Panel* for details. The status indicator light will repeatedly flash 1, 2, 3 or 4 flashes at a time.

- **One flash** indicates shut down due to high temperature.
- **Two flashes** indicate shutdown due to a loss of engine oil pressure.
- **Three flashes** indicate a service fault. Press **Stop** once to cause the two-digit, *second-level* shutdown code to flash. (Pressing **Stop** again will stop the flashing.) The two-digit code consists of 1, 2, 3, 4 or 5 flashes, a brief pause, and then 1 to 9 flashes. The first set of flashes represents the tens digit and the second set of flashes the units digit of the shutdown code number. For example, **shutdown code No. 36** appears as:

  flash-flash-flash—*pause*—flash-flash-flash-flash-flash-flash—*long pause*—repeat

- **Four flashes** indicate that cranking exceeded a preset time (20 seconds if ambient temperature is above 32° F[0° C], 30 seconds if below) without starting.
- **Note: Fault Codes 33 and 44 have not been assigned so as to avoid the confusion of wrongly interpreting Fault Codes 3 and 4, which are *first-level* faults.**

Restoring Shutdown Code flashing – The shutdown code stops flashing after five minutes. Press **Stop** three times within three seconds to restore flashing. ***Note that the last fault logged will flash, even after the condition that caused the shutdown has been corrected.***

TABLE 6-1. TROUBLESHOOTING

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***

DEAD DIGITAL DISPLAY

(Poor connections, faulty wiring or dead battery)

Corrective Action:

1. Try starting with the control switch inside the APU.
2. Clean and tighten the battery cable connections at the battery and at the APU.
3. Recharge or replace the battery. Refer to the battery manufacturer's recommendations.
4. Program the APU to start and run on a 7-day cycle to keep the batteries charged (Page).

THE STARTER ENGAGES AND DISENGAGES

(Cranking voltage dips below 6 volts because of low battery charge or poor connections)

Corrective Action:

1. Clean and tighten the battery cable connections at the battery and at the APU.
2. Recharge or replace the battery. Refer to the battery manufacturer's recommendations.
3. Program the APU to start and run on a 7-day cycle to keep the batteries charged (Page).

THE STARTING BATTERIES DO NOT MAINTAIN A CHARGE

(The batteries, battery connections or APU or Main Engine charging systems are in marginal condition)

Corrective Action:

1. Clean and tighten the battery cable connections at the battery and at the APU.
2. Recharge or replace the battery. Refer to the battery manufacturer's recommendations.
3. Program the APU to start and run on a 7-day cycle to keep the batteries charged (Page).

APU DOES NOT START AS REQUIRED WHEN AIR CONDITIONING IS DEMANDED

(Faulty HVAC to APU signal connections)

Corrective Action: See an authorized Cummins or Vehicle Manufacturer's Dealer.

APU DOES NOT START AS REQUIRED TO KEEP MAIN ENGINE WARM FOR STARTING

(Faulty APU temperature sense)

Corrective Action: See an authorized Cummins Dealer.

APU DOES NOT STOP (IN ONE MINUTE) WHEN MAIN ENGINE IS STARTED

(Faulty interlock connections)

Corrective Action: See an authorized Cummins or Vehicle Manufacturer's Dealer.

TABLE 6-1. TROUBLESHOOTING (CONT.)

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***

APU DOES NOT STOP WHEN SHORE POWER IS CONNECTED

(Faulty interlock connections)

Corrective Action: See an authorized Cummins or Vehicle Manufacturer's Dealer.

THERE IS NO POWER WHEN THE APU IS RUNNING

(A line circuit breaker is OFF, tripped or malfunctioning)

Corrective Action:

1. Reset or turn ON the line circuit breaker on the APU.
2. Reset or turn ON any other circuit breaker in the power supply system.

THE APU WILL NOT STOP RUNNING (RUN LIGHT OFF)

(The governor mechanism is stuck or binding)

Corrective Action: Close the fuel supply valve, if provided, or squeeze off the fuel supply line.

HIGH TEMPERATURE FAULT—CODE NO. 1

(First-level fault code—engine coolant temperature exceeded 230° F [110° C])

Corrective Action:

1. Check the engine coolant level and add coolant as necessary (Page 5-8).
2. Check for and remove any objects blocking the air inlet or outlet openings in the bottom and sides of the APU.
3. Flush the coolant system to remove coolant passage fouling (Page 5-8).

LOW OIL PRESSURE FAULT—CODE NO. 2

(First-level fault code—the low oil pressure cutoff switch is open)

Corrective Action:

1. Check the engine oil level and add oil as necessary (Page 5-4).
2. Drain the excess oil if the oil level is above the Full mark on the dipstick. (The oil will foam if the level is too high and result in possible loss of oil pressure.)

SERVICE CHECK—CODE NO. 3

(First-level fault code—a second-level fault occurred)

Corrective Action: Check the *second-level* fault code by momentarily pressing Stop. The *second-level* fault will be one of the following in this table.

TABLE 6-1. TROUBLESHOOTING (CONT.)

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***

OVERCRANK FAULT—CODE NO. 4

(First-level fault code—Cranking without starting exceeded 20 to 30 seconds, depending on ambient)

Corrective Action:

1. Check the fuel level and refill as necessary. (Note: The APU fuel pickup is probably higher than the vehicle engine fuel pickup.)
2. Check for fuel (air) leaks at all fuel fittings and tighten as necessary. Prime the engine fuel system by holding the control switch at **Stop** for one minute.
3. Check the engine air filter (Page 5-5) and remove any blockage.
4. Check for mechanical damage.
5. Replace the fuel filter (Page 5-7).

OVERVOLTAGE FAULT—CODE NO. 12

(The controller is not able to regulate to rated voltage)

Corrective Action: See an authorized Cummins Dealer.

UNDERVOLTAGE FAULT—CODE NO. 13

(The controller is not able to regulate to rated voltage)

Corrective Action: Turn OFF the APU circuit breaker. If the APU now runs, run it with fewer connected loads.

OVERFREQUENCY FAULT—CODE NO. 14

(The controller is not able to regulate to rated frequency)

Corrective Action:

1. Check for a tripped APU circuit breaker, reset it if necessary, and run with fewer connected loads. (A breaker tripping under load can cause frequency to overshoot.)
2. Check for fuel (air) leaks at all fuel fittings, tighten as necessary. (Air bubbles can disrupt frequency.)

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***

UNDERFREQUENCY FAULT—CODE NO. 15

(The controller is not able to regulate to rated frequency)

Corrective Action:

1. Turn OFF the APU circuit breaker. If the APU now runs, run it with fewer connected loads, especially when the air conditioner is running.
2. Check the fuel level and refill as necessary. (Note: The APU fuel pickup is probably higher than the vehicle engine fuel pickup.)
3. Check for fuel (air) leaks at all fuel fittings, tighten as necessary. (Air bubbles can disrupt frequency.)
4. Check the engine air filter (Page 5-5) and remove any blockage.
5. Check for mechanical damage.
6. Replace the fuel filter (Page 5-7).

GOVERNOR ACTUATOR FAULT—CODE NO. 19

(The controller sensed that the actuator circuit is either open or shorted)

Corrective Action: See an authorized Cummins Dealer.

GOVERNOR OVERLOAD FAULT—CODE NO. 22

(The actuator was at full-duty cycle for 60 seconds)

Corrective Action:

1. Reduce the number of appliances running at the same time, especially when the air conditioner is running.
2. Check for fuel (air) leaks at all fuel fittings and tighten as necessary. Prime the engine fuel system by holding the control switch at **Stop** for one minute.
3. Replace the engine air filter (Page 5-5).
4. Replace the fuel filter (Page 5-7).

TEMPERATURE SENDER FAULT—CODE NO. 24

(The controller sensed that the temperature sender circuit is open)

Corrective Action: See an authorized Cummins Dealer.

AC VOLTAGE SENSE FAULT—CODE NO. 27

(The controller was unable to sense output voltage)

Corrective Action: See an authorized Cummins Dealer.

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***

HIGH BATTERY VOLTAGE FAULT—CODE NO. 29

(The controller sensed battery system voltage greater than 19 volts for 1 second)

Corrective Action:

1. Check battery bank connections and reconnect, if necessary, so that the 12 volt batteries are connected in parallel (12 volt) rather than in series (24 volt).
2. Select a lower battery booster charge rate.

STARTING FAULT—CODE NO. 32

(Cranking speed less than 100 rpm [2.5 Hz, generator] for more than 12 seconds)

Corrective Action:

1. Clean and tighten the battery cable connections at the battery and at the APU.
2. Recharge or replace the battery. Refer to the battery manufacturer's recommendations.
3. Replace engine oil with oil of proper viscosity for ambient temperatures. (High oil viscosity can slow down cranking speed.)

CONTROL CARD FAULT—CODE NO. 35

(Microprocessor EEPROM error during self-test)

Corrective Action: See an authorized Cummins Dealer.

ENGINE STOPPED FAULT—CODE NO. 36

(The APU stopped without a command from the controller)

Corrective Action:

1. Check the fuel level and refill as necessary. (Note: The APU fuel pickup is probably higher than the vehicle engine fuel pickup.)
2. Check for fuel (air) leaks at all fuel fittings and tighten as necessary.
3. Check the engine air filter (Page 5-5) and remove any blockage.
4. Check for mechanical damage.
5. Replace the fuel filter (Page 5-7).

FIELD OVERLOAD FAULT—CODE NO. 38

(Field voltage exceeded 180 VDC for 10 seconds)

Corrective Action: Have the air conditioner and other appliances checked for proper operation. (A locked air conditioner compressor rotor could cause a very low power factor to which the genset would respond by increasing field voltage over normal levels.)

TABLE 6-1. TROUBLESHOOTING (CONT.)

⚠ WARNING ***Some APU service procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform APU service. See Safety Precautions.***
SHORTED ROTOR FAULT—CODE NO. 41 (The rotor circuit is shorted to ground) **Corrective Action:** See an authorized Cummins Dealer.
PROCESSOR FAULT—CODE NO. 42 (Microprocessor ROM error during self-test) **Corrective Action:** See an authorized Cummins Dealer.
PROCESSOR FAULT—CODE NO. 43 (Microprocessor RAM error during self-test) **Corrective Action:** See an authorized Cummins Dealer.
SPEED SENSE FAULT—CODE NO. 45 (Controller unable to sense quadrature frequency) **Corrective Action:** See an authorized Cummins Dealer.
PROCESSOR FAULT—CODE NO. 48 (Loss of Field Sense) **Corrective Action:** See an authorized Cummins Dealer.
ALTERNATOR FAILURE—CODE NO. 75 (Failure of APU battery charging alternator) **Corrective Action:** See an authorized Cummins Dealer.

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7. Specifications

APU CONTROLLER: Integrated Microprocessor Based Engine and Generator Controller	
GENERATOR: Two-Bearing, Two-Pole Rotating Field, 3600 RPM, "Poly-Vee" Belt Drive	
Power (@1.0 power factor)	4000 W
Voltage	120
Frequency	60 Hz
Number of Phases	1
Current	33 amps
Line Circuit Breaker	30 amps
FUEL CONSUMPTION:	
No-load Half-load Full-load	0.25 gph (0.93 lph) 0.35 gph (1.32 lph) 0.55 gph (2.08 lph)
ENGINE: 2-Cylinder In-Line, Water-Cooled, Indirect-Injection, 2374 RPM, 4-Stroke Cycle Diesel	
Bore	2.64 in (67 mm)
Stroke	2.68 in (68 mm)
Displacement	29.23 in^3 (479 cc)
Compression Ratio	23 : 1
Fuel Injection Timing (BTDC)	18°–20°
Injection Order	1–2
Fuel Nozzle Injection Pressure	1991 psi (13.73 mPa)
Valve Lash: Intake & Exhaust (cold)	0.0059 – 0.0073 inch (0.145 – 0.185 mm)
Oil Capacity (with filter)	3.2 quart (3.0 liter)
Cooling System Capacity	2.5 quart (2.4 liter)
Lubricating Oil Pressure	14 to 64 psi over speed range
Cylinder Compression Pressure	414 to 469 psi, 327 psi minimum
DC SYSTEM:	
Nominal Battery Voltage	12 volts
Minimum Battery Capacity CCA (Cold Cranking Amps)	475 amps down to 0° F (–17° C) 650 amps down to –20° F (–29° C)
Battery Charging Capacity	40 Amperes
Fuse F1 (control, start and glow plug circuits)	30 amp mini-bayonet
Fuse F2 (Remote B+)	5 amp mini-bayonet
WEIGHT: 375 lbs (170 kg)	
SIZE (L x W x H): 25 x 21.2 x 28.8 in (635 x 539 x 732 mm)	
SOUND LEVEL: TBD dB(A) @ 10 ft (3m) in typical installation	

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8. Maintenance Record

Record all periodic and unscheduled maintenance and service. See *Section 5. Periodic Maintenance.*

DATE	HOUR METER READING	MAINTENANCE OR SERVICE PERFORMED

Record the name, address, and phone number of your authorized Onan service center.

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