Installation Manual

Model DKHA

11-09 Customer: APU SN: 981-0644 (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.

⚠ 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

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1. SAFETY PRECAUTIONS

INTRODUCTION

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.

⚠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.***

Exhaust, electricity, moving parts, batteries and fuel present hazards that can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Keep children away from the APU.
- Do not use evaporative starting fluids, such as ether. They are highly explosive and can cause engine damage.
- 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.

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

Disable AUTO and stop the APU before fueling the vehicle.

FLAMMABLE VAPORS CAN CAUSE A DIESEL ENGINE TO OVERSPEED

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.

2. 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)	See Nameplate
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
APU Weight: 375 lbs (170 kg)	
APU Dimensions: (L x W x H): 25 x 21.2 x 28.8 in (635 x 539 x 732 mm)	
Total Combined Weight of APU and HVAC System (Typical): 525 lbs (239 kg)	

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3. Introduction

GENERAL

These are the instructions for installing the Model DKHA Auxiliary Power Unit (APU). Proper installation is essential for top performance and safe operation. Read through this section before starting the installation.

See the Operator's Manual for operation and maintenance instructions.

Note: Manuals are updated from time to time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the genset should be used as a guide for the installation.

INSTALLATION APPROVALS

The builder of the vehicle bears sole responsibility for the selection of the appropriate equipment, for its proper installation and for obtaining approvals from the authorities (if any) having jurisdiction over the installation.

⚠WARNING ***The 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 an alarm system must be used if genset operation is critical.***

INSTALLATION DRAWINGS

See *Section 10. Wiring Diagrams and Outline Drawings* for installation details: mounting bolt hole locations, weight, overall dimensions, connection points (fuel, battery, exhaust, remote control, AC output), sizes and types of fittings and maintenance access points.

⚠WARNING ***Improper installation can result in severe personal injury, death and equipment damage. The installer must be qualified to perform the installation of electrical and mechanical equipment.***

⚠CAUTION ***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.***

REQUIRED TOOLS

Check for the availability of the following tools before starting the installation:

- Engine hoist or transmission jack
- Wrenches and Sockets: Standard and Metric, from 10 mm to 1–1/2 inch
- Screwdrivers: Standard and Philips
- Drill and Hole Saws: 1/2, 3/4, 1, 1/14, 2, 3, 3-1/4 inch
- Cutoff Wheel

INSTALLATION ACCESSORY KITS

See Publication F–1816—ComfortGuard APU System Accessories, Kits and Filter Part Numbers—for an illustrated list of available installation kits, including:

- Fuel Pickup Adapter Kit 0541–1426
- Offset Spacer Bracket Kit 0541–1425

INTEGRATED DPF KITS

Three kits are available for APU Model Specs 4DKHA–6204 and 4DKHA–7108 to integrate the APU exhaust system with the vehicle engine DPF (Diesel Particulate Filter). The kits are: 0541–1643, 0541–1644 and 0541–1682.

STAND-ALONE COOLING SYSTEMS

Stand-Alone Coolant Kit 0541–1429 must be used to convert the APU for stand-alone cooling.

INTEGRATED COOLING SYSTEM CONNECTION HARDWARE

The following hardware will be required to integrate the APU cooling system with the main engine cooling system:

- Coolant Hose: 3/4 inch ID by 50 feet
- Hose Loom or Conduit: 3/4 inch ID by 50 feet
- Four (4) Coolant Hose Clamps: 1–1/2 inch
- Brass Coolant Fittings. Kit 0541–1546–01 is available for ISX engines, and Kit 0541–1546–02 for ISM engines. Alternatively, see Table 3-1 for the coolant fittings required.

TABLE 3-1 Brass Coolant Fittings

Part	Part Description	Parker Part Number	Cummins Part Number
ISX Engine Adapter	Port O-Ring Fitting to 1/2 inch NPT Female	222P–8–M127	
Hose Barb Fittings:			
1/2 NPT Male to 3/4 Hose Barb	Straight	68HB–12–8	0502–1031
1/2 NPT Male to 3/4 Hose Barb	90 Degree	269HB–12–8	0502–1030
Ball Valves:			
1/2 NPT Female to Female	3.96 inch Handle, 5 inch overall	XV500P–8	
1/2 NPT Female to Female	Tee-Handle, 2.5 inch overall	XV500P–8–04	
1/2 NPT Male to Female	3.96 inch Handle, 5.75 inch overall*	XV501P–8	
1/2 NPT Male to Female	2.95 inch Tee-Handle, 2.95 inch overall*	XV501P–8–04	
Elbow and Tees:			
1/2 NPT All Female Union Tee		1203P–3	
1/2 NPT Male to 1/2 NPT Female	90 Degree Street Elbow	2202P–8–8	
1/2 NPT Female to 1/2 NPT Female		2200P–8–8	
* – Includes male thread section			

4. Location and Mounting

The APU is designed for mounting on the vehicle frame rail on either side. There must be clearance on the sides of the APU for making exhaust, coolant, fuel, battery, AC and control connections, and access from the front for removing the top and bottom access panels to perform scheduled maintenance in accordance with the Operator Manual.

Remove the top access cover and top half of the housing (9 screws) and insert the mounting bolts through the holes in the frame. Use both lifting eyes on the engine head or a forklift under the shipping pallet to raise the APU to its mounting position. Raise the elevation of the APU so that the mounting bolts pull straight across the top and bottom of the frame rail flanges.

After all four bolts have been snugged up even and straight, torque the nuts to 100 ft-lb (135N-m). Re-install the top half of the housing and torque the housing screws to 8 ft-lb (11 N-m).

Offset Spacer Bracket Kit 541-1425 is available to clear bolt heads and other protrusions on the frame rail.

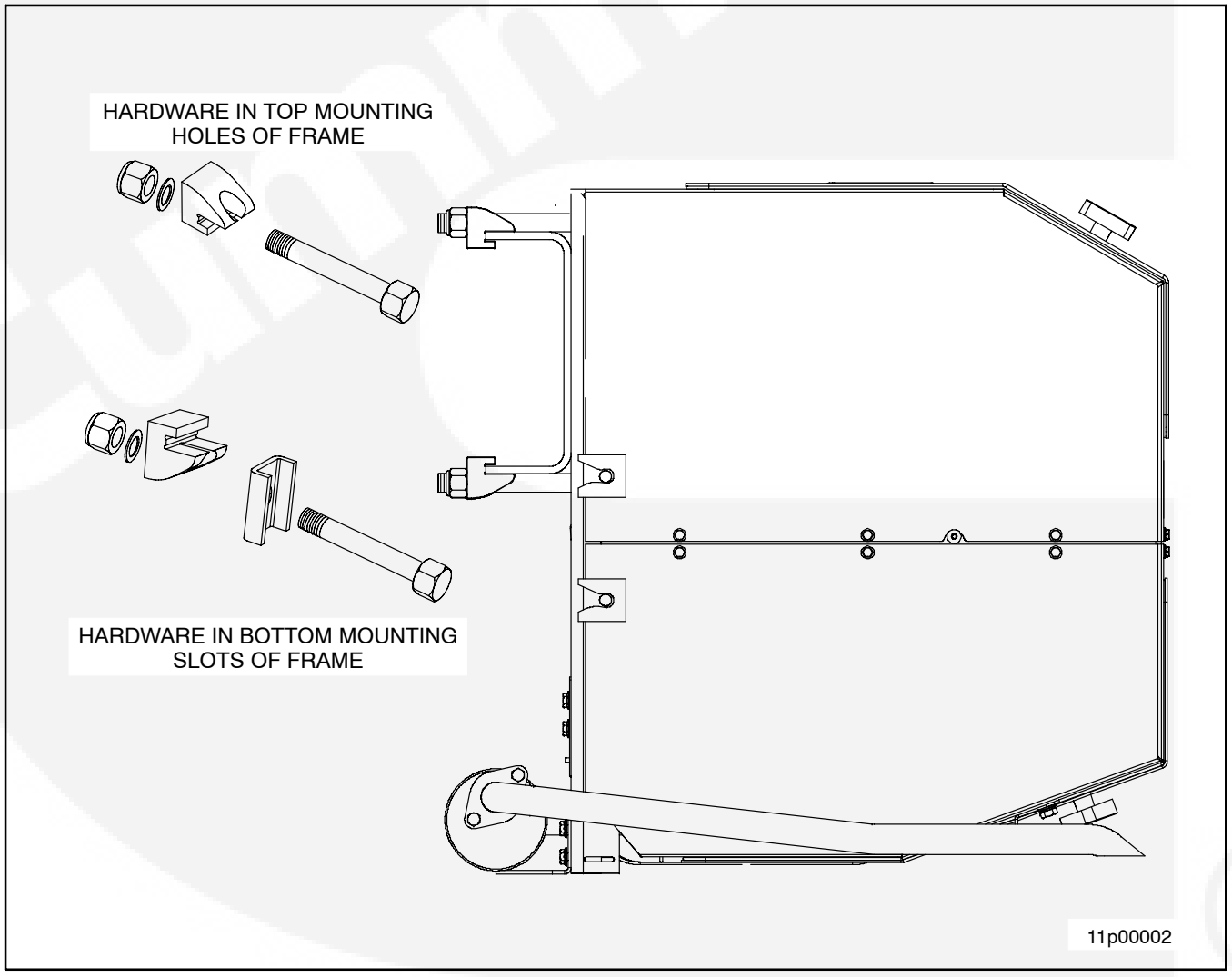


FIGURE 4-1 MOUNTING APU

5. Exhaust Connections

⚠WARNING ***EXHAUST GAS IS DEADLY! The APU must be installed with a tailpipe to direct exhaust gases away from the vehicle.***

⚠CAUTION ***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.***

STAND-ALONE DPF MODELS

The APU must be installed with the tailpipe provided. Mount the APU and remove the shipping pallet before mounting the tailpipe. The flange gasket and screws are packaged with the tailpipe. Torque the flange and bracket screws to 19 ft-lb (26 N-m). Make sure to use the flange gasket.

INTEGRATED DPF MODELS

Three kits are available for APU Model Specs 4DKHA–6204 and 4DKHA–7108 to integrate the APU exhaust system with the vehicle engine DPF (Diesel Particulate Filter). The kits are: 0541–1643, 0541–1644 and 0541–1682. Install the kits in accordance with the kit instructions.

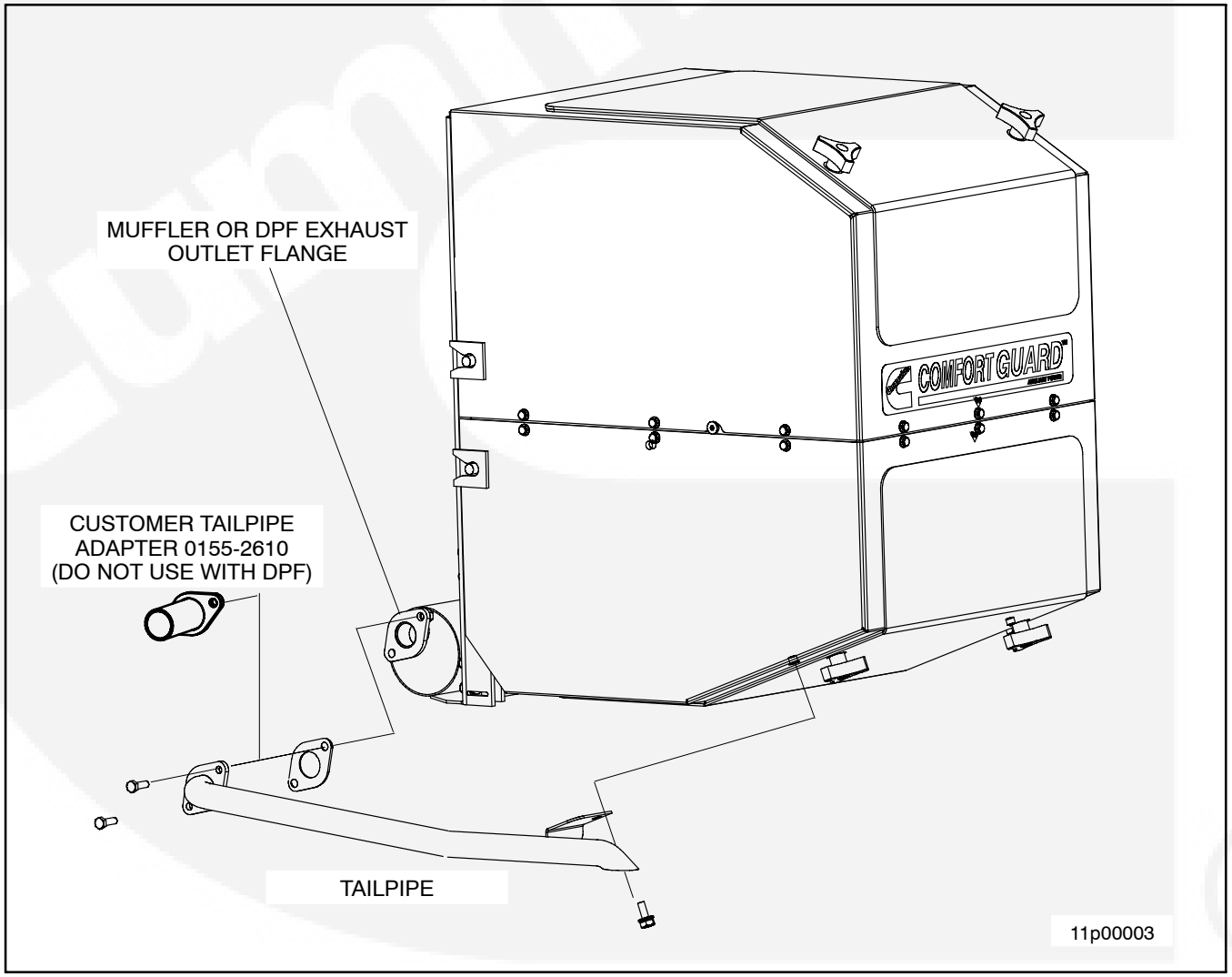


FIGURE 5-1 EXHAUST TAILPIPE

NON-DPF MODELS

The APU must be installed with the tailpipe provided or with a customer supplied tailpipe using tailpipe adapter 0155-2610.

Factory Provided Tailpipe

Mount the APU and remove the shipping pallet before mounting the tailpipe. The flange gasket and screws are packaged with the tailpipe. Torque the flange and bracket screws to 19 ft-lb (26 N-m). Make sure to use the flange gasket.

Customer Supplied Tailpipe

Tailpipe adapter 155-2610 must be used with a customer fabricated tailpipe. Mount the adapter on the muffler outlet flange using the flange gasket and screws packaged with the tailpipe adapter. Torque the flange and bracket screws to 19 ft-lb (26 N-m). Make sure to use the flange gasket. Install the tailpipe as follows:

- For the tailpipe, use 1-3/8 inch I. D. aluminized steel tubing or equivalent .
- Use U-bolt muffler clamps to connect sections of tailpipe. It is recommended that the overlapping pipe be slotted.
- Support the tailpipe every 2 to 3 feet (60 to 90 cm).
- Do not terminate the tailpipe underneath the vehicle cab or living space.
- Do not route the tail pipe near fuel lines or fuel tanks or terminate it below or near a fuel fill opening.
- Route the tailpipe such that it is visible along its entire length and accessible for replacement.
- Route the tailpipe such that it will not likely be struck when the vehicle is moving.
- *Exhaust back pressure under full load must not exceed 2 inches (51 mm) water column (WC) as measured within 6 inches (154 mm) of the muffler outlet flange.*

⚠ CAUTION ***Excessive back pressure can cause loss of performance and engine damage.***

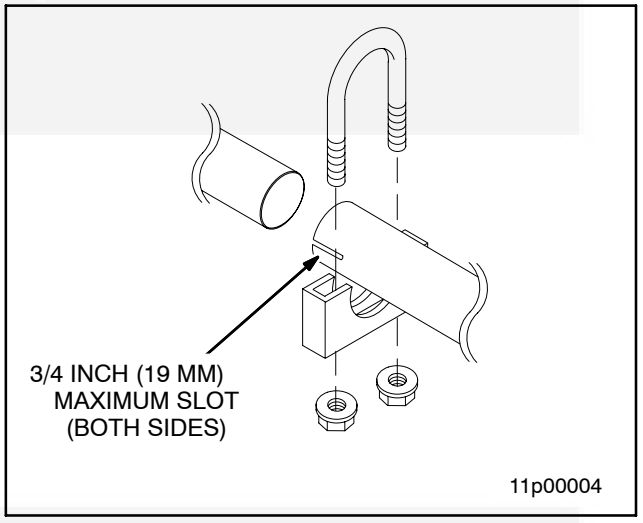


FIGURE 5-2 EXHAUST TAILPIPE CONNECTIONS

CONFIGURE DPF TYPE

The default DPF Type setting is “Standalone.” The DPF Type setting must be changed to “None” when installing a Standard Model with muffler or an Integrated DPF Model.

Press the AUTO button on the Operator Panel Home screen to go to the Automatic Setup screen (Figure 5-3). Hold the blank button down for 10 seconds and then press the enter button while still holding down the blank button.

On the Automatic Start screen (Figure 5-4) select “Standalone” or “None” in the DPF Type field.

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

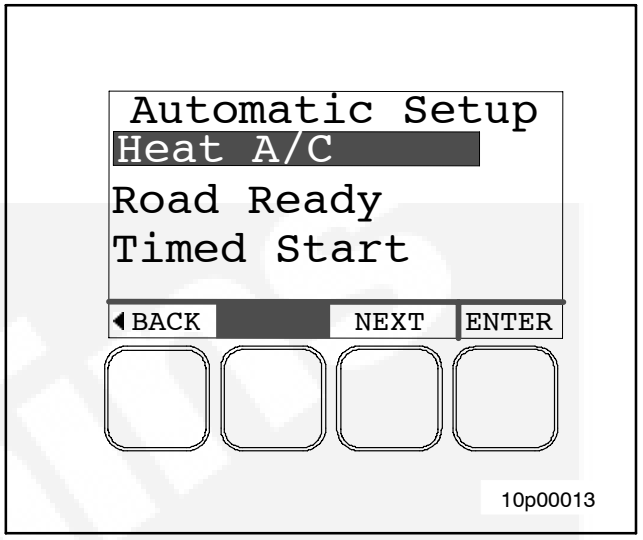


FIGURE 5-3 AUTOMATIC SETUP SCREEN

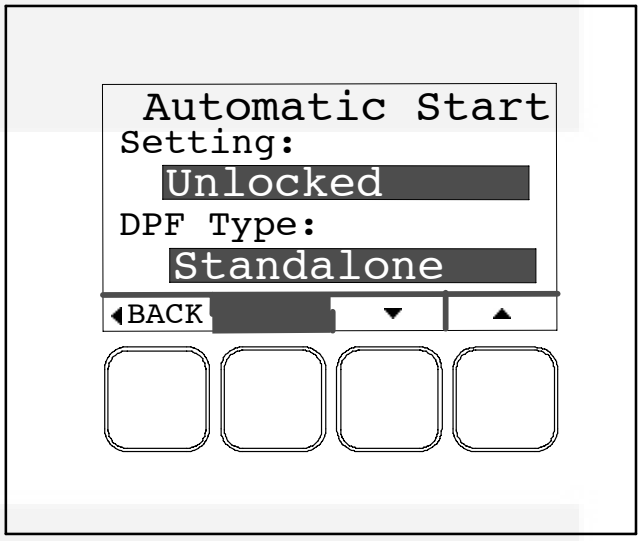


FIGURE 5-4 CONFIGURE DPF TYPE

6. Coolant Connections

Only models with external coolant fittings require coolant connections to the vehicle engine. Coolant must flow from the APU to the inlet of the vehicle engine coolant pump so that the pumps work together, and not against each other.

The fittings at the vehicle engine should have ball valves to isolate the APU if it is necessary to run the vehicle engine while servicing the APU.

Use 3/4 inch I. D. SAE 20R3 Class D2 coolant hose, which is available as Coolant Hose Kit 0541−1547. For easier system filling and air bleeding, route the hoses as directly and as straight as possible, without dips and air traps. They must be accessible for inspection and replacement, protected from damage, kept away from hot exhaust pipes, and secured to prevent kinking and sagging, contact with sharp edges and chafing due to vibration.

There must be enough slack in the hoses at the vehicle engine to take up engine movement without stretching or compressing the hoses.

Fill and bleed the coolant system in accordance with the Operator's Manual.

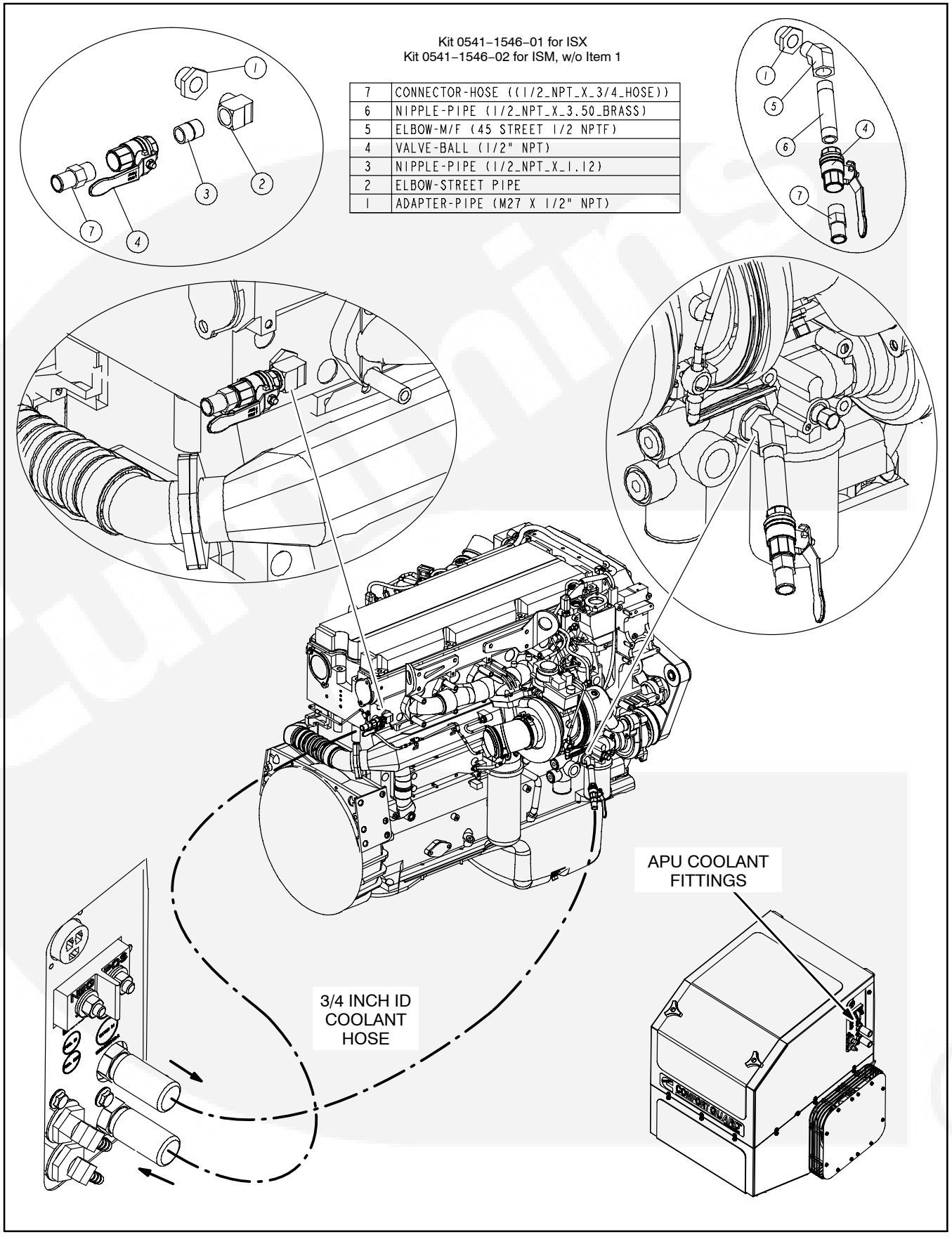


FIGURE 6-1 COOLANT CONNECTIONS WITH MAIN ENGINE—SHOWING KIT BALL VALVES

7. Fuel Connections

⚠WARNING ***Diesel fuel is a combustible and can cause severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment, electrical switch or other ignition source around fuel or fuel components, or in areas sharing ventilation. Keep a type ABC fire extinguisher handy.***

Do not interconnect APU and vehicle engine fuel lines.

⚠CAUTION ***Either or both engines could starve for fuel if the APU and vehicle engine fuel lines are interconnected. Always use separate fuel pickup tubes and fuel lines.***

Install the fuel kit in the top of the closest fuel tank. The longer 5/16 inch pickup tube is for fuel supply and the shorter 1/4 inch dip tube is for fuel return. Follow the instructions in the kit.

If the tank has a five-bolt sender port, use Fuel Pickup Adapter Kit 0541-1426 for mounting the pickup tube assembly.

In a 24 inch diameter fuel tank, the pickup tube extends down to approximately 3 inches from the bottom. To prevent the APU from running the vehicle out of fuel, it is recommended that the pickup tube be cut, if necessary, so that it is shorter than the vehicle engine pickup tube. If it is necessary to extend the fuel pickup tube, use 5/16 inch SAE J30R7 hose and a stainless steel hose clamp.

For easier fuel priming, route the fuel hoses as directly and as straight as possible, without dips and air traps. They must be accessible for inspection and replacement, protected from damage, kept away from hot exhaust pipes, electrical wiring and battery cables, and secured to prevent kinking and sagging, contact with sharp edges and chafing due to vibration.

⚠WARNING ***Routing battery cables and AC wiring with fuel lines can lead to fire and severe personal injury or death. Keep battery cables and AC wiring away from fuel lines.***

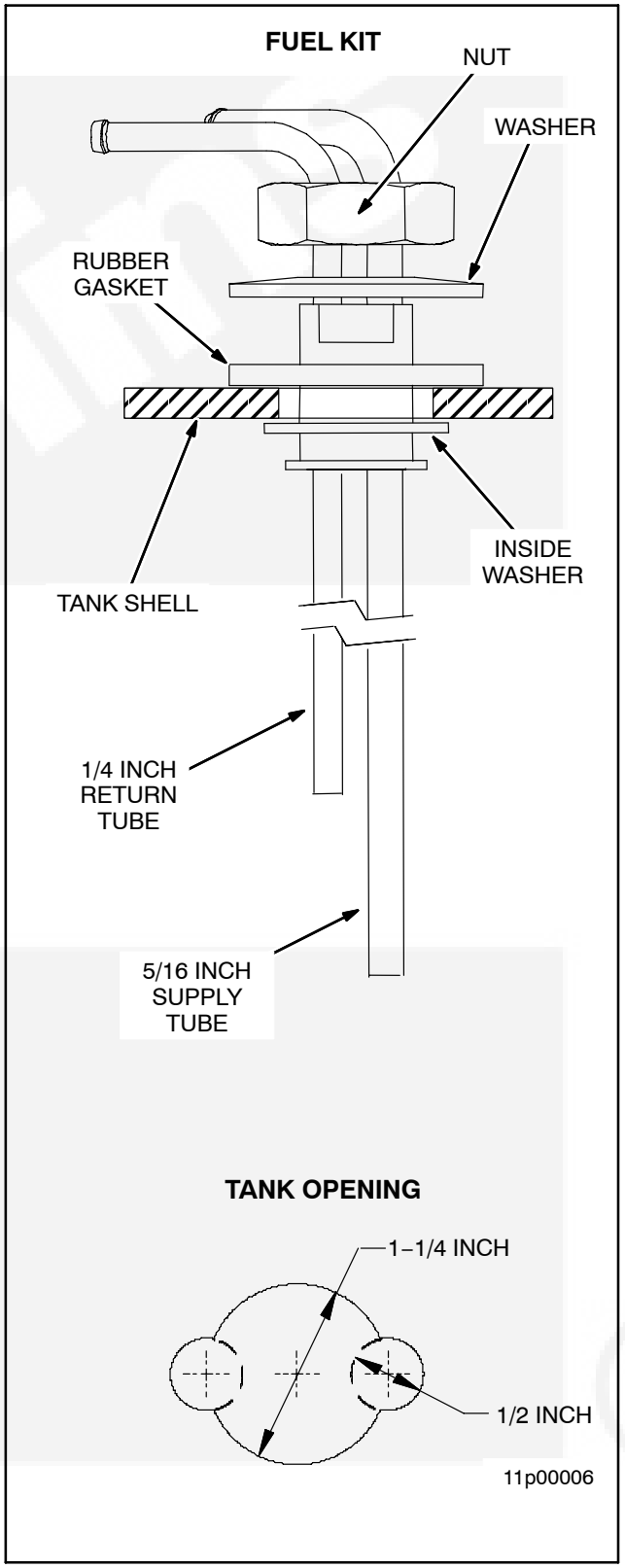


FIGURE 7-1 FUEL PICKUP TUBE ASSEMBLY

8. Electrical Connections

AC POWER CONNECTIONS

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Until the APU is ready for startup, ensure that the APU's remote control connector is disconnected, the circuit breaker is OFF and that both negative (–) and positive (+) battery cables are disconnected at the batteries.***

Connectors and Breaker Box

The APU has a sealed connector for AC power output connections. Packaged with the APU is a 30 amp load center breaker box with a 16 foot cord and APU connector mate. All APU power is distributed through the load center breaker box. The HVAC unit power cord and all convenience outlets plug into the load center breaker box.

Wiring Methods

Mount the load center breaker box in a compartment that affords protection from rain and road splash and that is within reach of the power cord (48 inches) from the HVAC unit. There must be access for making connections and resetting the circuit breakers.

A convenience outlet box and wiring harness are provided and one more is available for connection to the load center breaker box.

Seal all wiring openings into the vehicle interior to keep out exhaust gas. Apply silicone rubber or equivalent sealant.

⚠WARNING ***EXHAUST GAS IS DEADLY! Seal all wiring openings into the vehicle interior to keep out exhaust gas.***

Route or protect AC wiring so that it will not be cut or abraded, exposed to hot surfaces or damaged by road debris. Keep AC wiring away from fuel lines, control wiring and battery cables.

⚠WARNING ***Routing AC wiring with fuel lines can lead to fire and severe personal injury or death. Keep AC wiring away from fuel lines.***

The load center breaker box has a grounding lead which should be grounded to the vehicle chassis as required by code.

Shore Power

Shore Power Kit 0541-1511 is available. Install the kit and make connections in accordance with the kit instructions.

See REMOTE CONTROL CONNECTIONS regarding shore power interlock connections.

⚠WARNING ***Interconnecting the APU and shore power can lead to electrocution of utility line workers, equipment damage and fire. Use an approved switching device to prevent interconnections.***

Battery Charger

Battery Charger Kit 0541-1512 is available for installation in conjunction with shore power. Install the kit and make connections in accordance with the kit instructions. The kit has a plug-in wiring harness that plugs into Shore Power Kit 0541-1511.

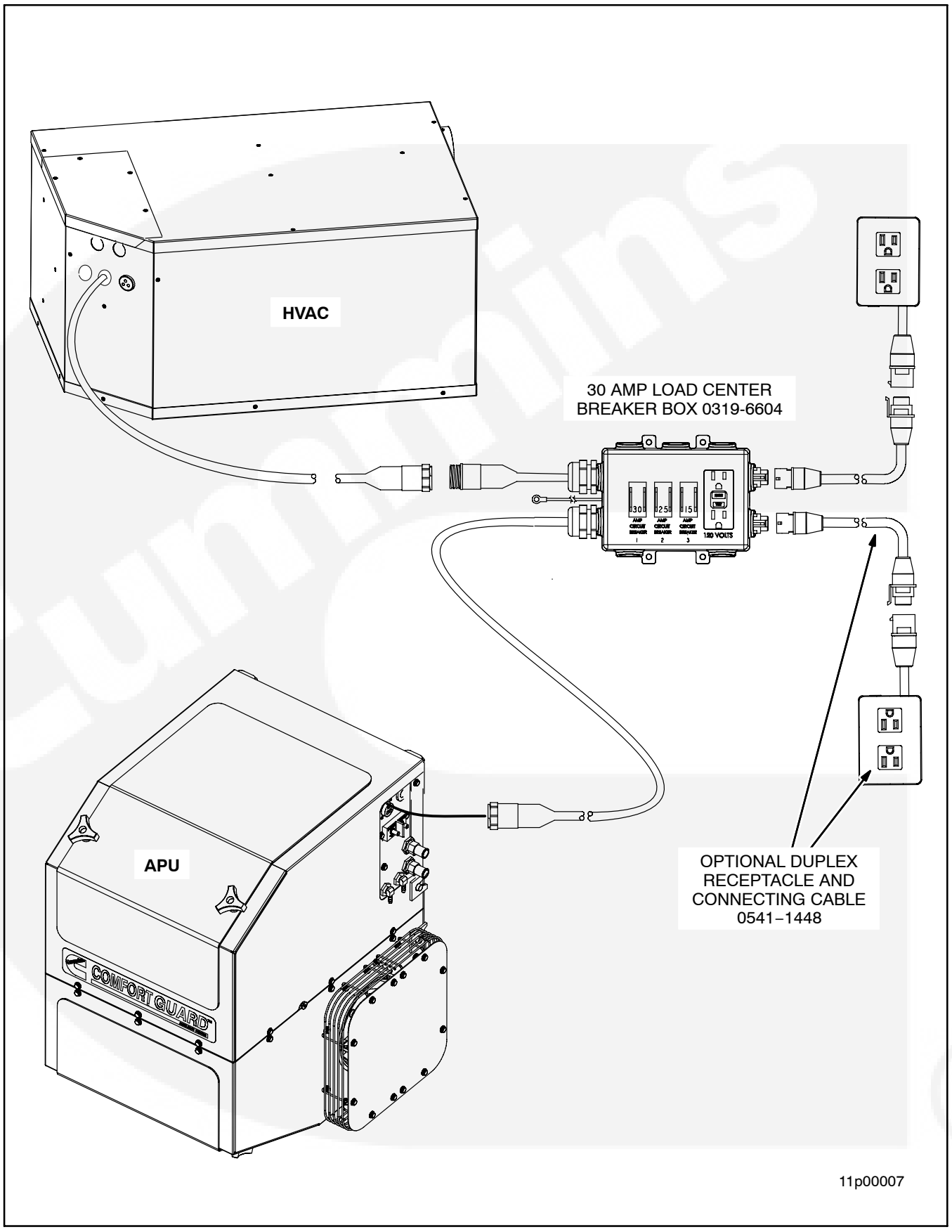


FIGURE 8-1 AC CONNECTIONS

REMOTE CONTROL CONNECTIONS

Wiring Harnesses

Two wiring harnesses are packaged with the APU for remote control connections. Use them to:

- Connect the APU to the operator panel
- Provide **B+** and **B–** for HVAC unit control through connector **P7** and the APU
- Provide for a start signal from the HVAC unit to the APU when there is a demand for heating or air conditioning.
- Provide for shutting down the APU with ignition and shore power interlocks.

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Until the APU is ready for startup, ensure that the APU's remote control connector is disconnected, the circuit breaker is OFF and that both negative (–) and positive (+) battery cables are disconnected at the batteries.***

Operator Panel

Mount the Operator Panel at a convenient location for the user, preferably on the same panel as the HVAC control panel. Follow the instructions in the kit.

Shore Power Interlock

If provision has been made for connecting shore power, an approved transfer switch must be installed to disconnect the APU when shore power is connected.

To shut down the APU when shore power is connected, connect the yellow leads in APU remote harness 338-4873 to normally open (NO) relay contacts that close when shore power is connected.

⚠WARNING ***Interconnecting the APU and shore power can lead to electrocution of utility line workers, equipment damage and fire. Use an approved switching device to prevent interconnections.***

Ignition Interlock

If it is desired to always shut down the APU when the vehicle engine is started, connect the blue leads in APU remote harness 338-4873 to normally open (NO) relay contacts that close when the vehicle engine is started.

Note: APU models equipped for integrated DPF must be installed with the ignition interlock. See the integrated DPF Installation Instructions.

Wiring

Open the wiring junction box in the upper corner of the HVAC unit. Route the wiring harnesses through their respective bulkhead bushings and plug the mating connectors together.

The insulated, color-coded, crimp-on butt connectors in harness 338–4874 are for connection of the ignition and shore power interlock circuits. They need not be connected for the APU to run. Secure the junction box cover when all connections inside have been made.

Route or protect control wiring so that it will not be cut or abraded, exposed to hot surfaces or damaged by road debris. Keep control wiring away from AC power leads and radio and CB antennas to reduce the possibility of erratic operation due to induced signals.

Seal all wiring openings into the vehicle interior to keep out exhaust gas. Apply silicone rubber or equivalent sealant.

⚠WARNING ***EXHAUST GAS IS DEADLY! Seal all wiring openings into the vehicle interior to keep out exhaust gas.***

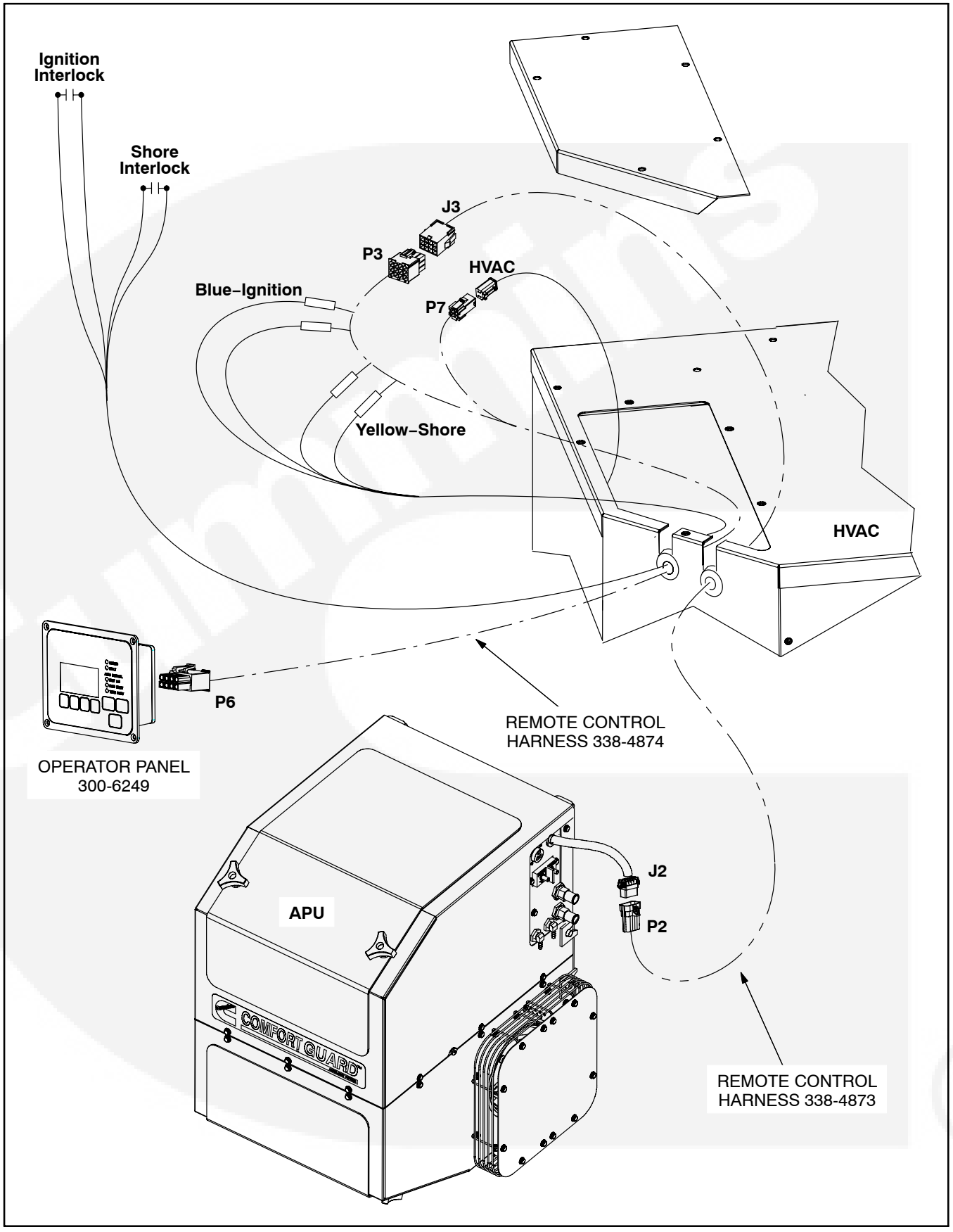


FIGURE 8-2 REMOTE CONTROL CONNECTIONS

BATTERY CONNECTIONS

Battery Charging Function

One of the functions of the APU is to maintain vehicle battery charge when the vehicle engine is not running. If AUTO is enabled, the APU will start and recharge the batteries when it senses that voltage has dropped to a preset level.

Battery Cables

The battery cables with ring terminal connectors and protective convoluted sheathing are packaged with the APU.

Route battery cables away from fuel lines, AC wiring and hot engine exhaust components. Battery cables should be accessible for inspection and replacement, protected from damage and secured to prevent chafing due to vibration.

⚠WARNING ***Routing battery cables with fuel lines can lead to fire and severe personal injury or death. Keep battery cables away from fuel lines.***

If the cables are too long to stow safely, they may be cut to proper length. Use a proper crimping tool to crimp on the extra terminals. Insulate the terminal shanks with heat-shrink insulating tubing so that loose cable strands will not contact other terminals. Mark cable polarity: positive (+) or negative (–).

Note: Connect the APU cables at the same terminals as the main engine cables so that all batteries are recharged uniformly when the APU is running.

Connecting Battery Cables

Connect the battery cable harness to the terminals on the APU. Torque the terminals to 7.5 ft-lbs (10 N-m) and cover the positive (+) terminal with its boot. Terminal grease is recommended to prevent corrosion.

Do not connect the cables to the vehicle batteries until the APU is ready for startup.

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Until the APU is ready for startup, ensure that the APU's remote control connector is disconnected, the circuit breaker is OFF and that both negative (–) and positive (+) battery cables are disconnected at the batteries.***

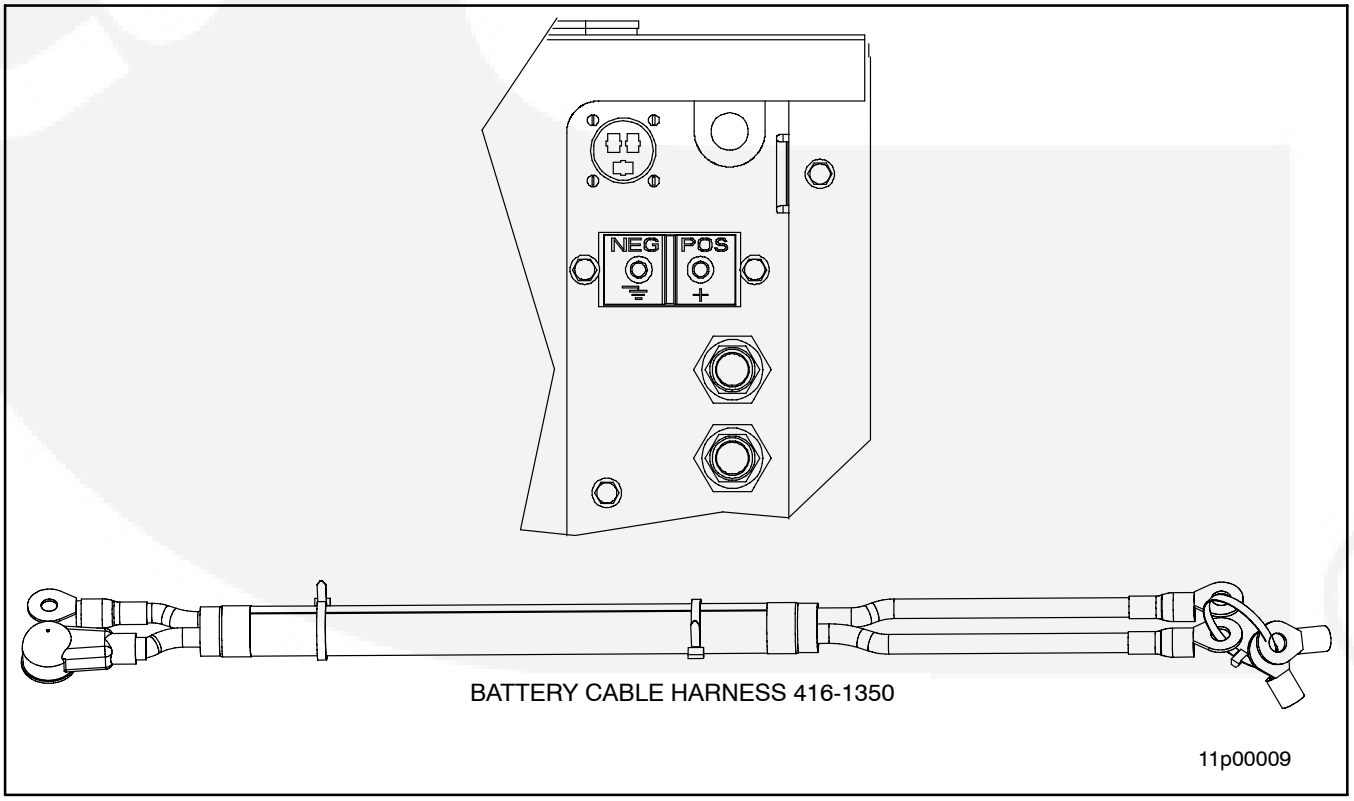


FIGURE 8-3 BATTERY CABLES

9. Installation Review and Startup

Pre-Start Checks

⚠WARNING ***Accidental starting of the APU can cause severe personal injury or death. Until the APU is ready for startup, ensure that the APU's remote control connector is disconnected, the circuit breaker is OFF and that both negative (–) and positive (+) battery cables are disconnected at the batteries.***

Review the following pre-start checks and make necessary repairs and reconnections.

- The APU is securely bolted to the vehicle frame rail ahead of the rear wheels.
- There is clearance to connect and disconnect coolant lines, fuel lines, AC wiring, remote control wiring and battery cables.
- The control panel on the APU is accessible for starting and stopping the APU and resetting the circuit breaker.
- There is access for checking, adding and draining engine oil and coolant.
- There is access for replacing the oil, fuel and air filters.
- The air inlet and outlet openings are free of obstructions.
- The exhaust tailpipe is connected and secure.
- The fuel dip tubes in the main fuel tank have been properly installed.
- The fuel hoses are routed as directly and as straight as possible, without dips and air traps. They are accessible for inspection and replacement, protected from damage, kept away from hot exhaust pipes, electrical wiring and battery cables, and secured to prevent kinking and sagging, contact with sharp edges and chafing due to vibration.
- The fuel tank is at least half full to make sure that the APU can prime fuel and run for at least two hours.
- The hoses in an integrated cooling system are routed as directly and as straight as possible, without dips and air traps. They are accessible for inspection and replacement, protected from damage, kept away from hot exhaust pipes, and secured to prevent kinking and sagging, contact with sharp edges and chafing due to vibration.
- AC wiring, remote control wiring and battery cables have been routed and secured at sufficient intervals to prevent chaffing and contact with sharp edges and hot exhaust parts.
- The HVAC unit has been installed in accordance with its installation instructions.
- The transfer switch has been installed in accordance with its installation instructions when provision is made shore power.
- A Standard Model with muffler or an Integrated DPF Model has had the DPF Type changed to "None."

Oil and Coolant

Read the Operator Manual and perform the pre-start checks instructed. If the APU shares the cooling system with the main vehicle engine fill and bleed the system in accordance with the Operator Manual. The APU is shipped from the factory with the proper level of engine oil.

⚠WARNING ***EXHAUST GAS IS DEADLY! Do not operate the APU when the vehicle is indoors unless there is ample fresh air ventilation.***

Startup

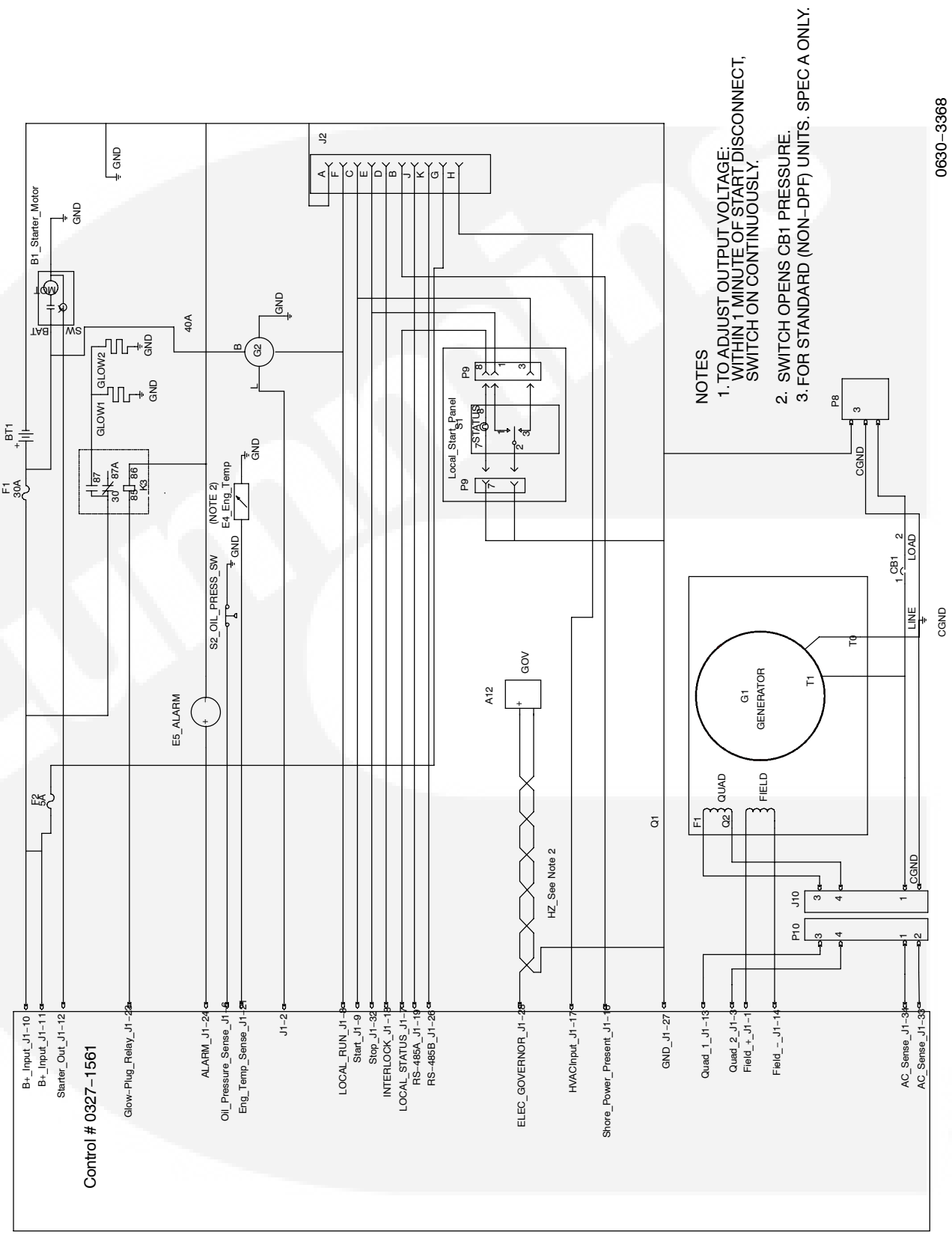
Connect the battery cables to the batteries, positive (+) cable first, and start the APU with its control switch. It may take several tries until the fuel line is primed. If the APU does not start, or keeps shutting down, bleed the fuel system with an electric or manual pump until no air bubbles are visible coming from the fuel return port.

Connect the APU's remote control connector and push the circuit breaker ON. Conduct the following checks with the APU running and make necessary repairs and reconnections.

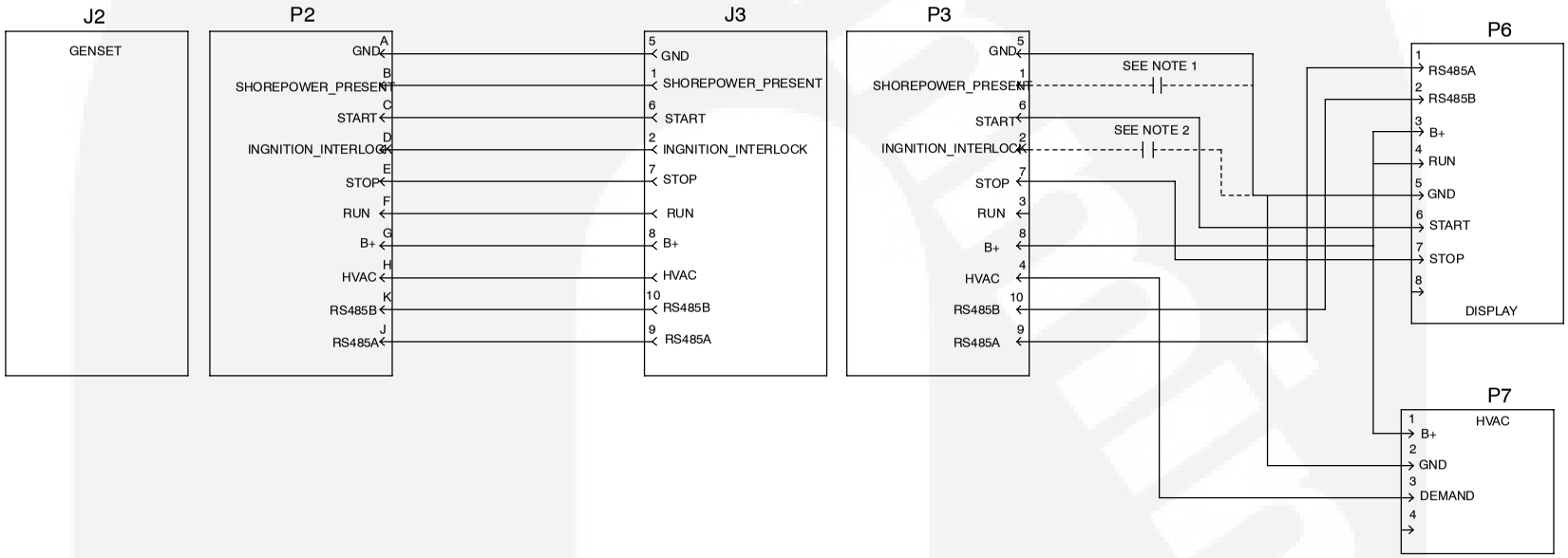
- The Operator Panel is properly mounted and communicates with the APU. Set up date and time in accordance with the Operator Manual. Check connector pins and rewire as necessary if the panel indicates that it cannot communicate.
- Pressing **START** starts the APU. Pressing **STOP** stops the APU.

- The transfer switch shuts down the APU when shore power is connected (when so equipped).
- (Optional, except for integrated DPF applications) The ignition key shuts down the APU when the main vehicle engine is started.
- For integrated DPF applications the ignition key always shuts down the APU when the main vehicle engine is started.
- The APU starts when **AUTO > Heat A/C** is enabled and the cab thermostat is turned up for heating or down for cooling.
- The APU continues to run and supply power to the HVAC unit for heating or cooling (the Load Center Breakers must be ON).
- The APU shuts down 15 minutes after the HVAC unit stops running (unless the HVAC unit cycles on again).
- AC power is available at all power outlets in the cab, as checked by plugging in a lamp or other appliance in each outlet. (The APU must be running and the Load Center Breakers must be ON.)
- If the main engine is so equipped, AC power is available to the block heater when the APU is running.
- All fuel, coolant, oil and exhaust leaks have been repaired and there are no unusual noises.
- The APU starts reliably and runs without nuisance shutdowns, as checked by running it for at least two hours under a full HVAC cooling load. This also serves to purge all residual air from the fuel system.
- The ComfortGuard Hand-Over Check List has been reviewed with the customer and has been signed.

10. Wiring Diagrams and Outline Drawings



CONTROL SCHEMATIC—SHEET 1 SPEC A



NOTES

1.TO INSTALL SHOREPOWER INTERLOCK;
INSTALL NORMALLY OPEN AC RELAY BETWEEN YELLOW LEADS.

2.TO INSTALL IGNITION INTERLOCK:
INSTALL NORMALLY OPEN SWITCH BETWEEN BLUE LEADS.

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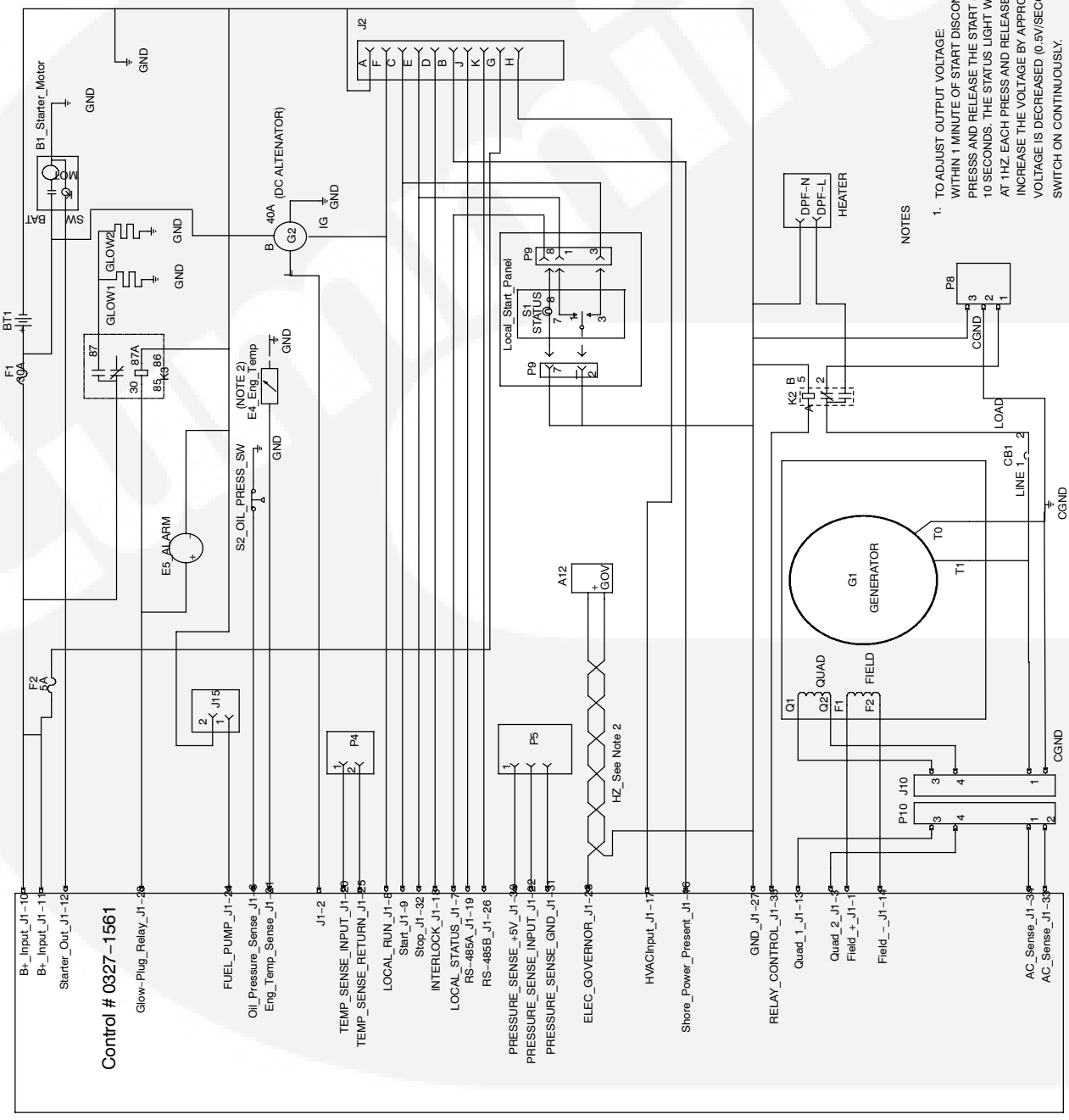

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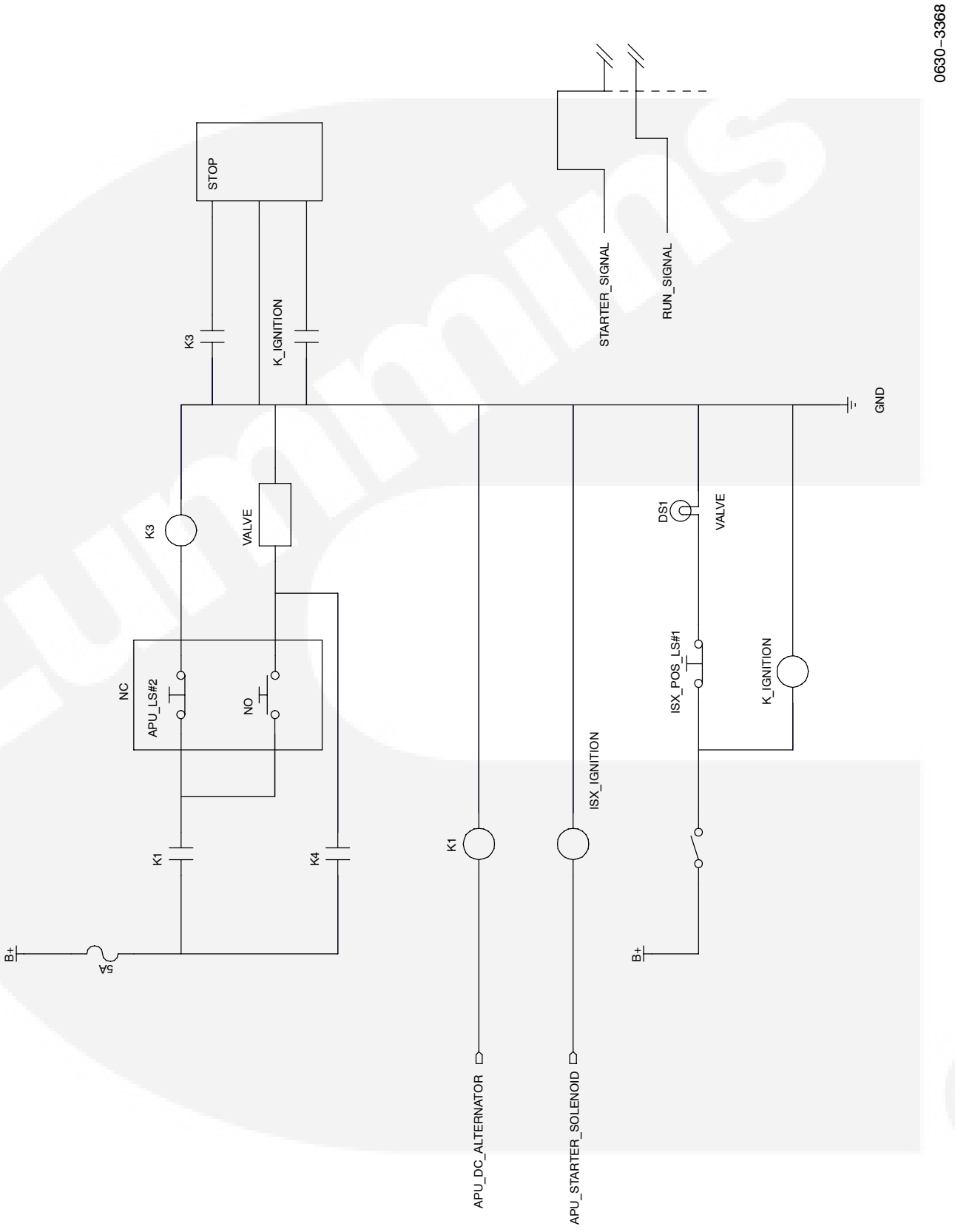
CONTROL SCHEMATIC—SHEET 3 SPEC B



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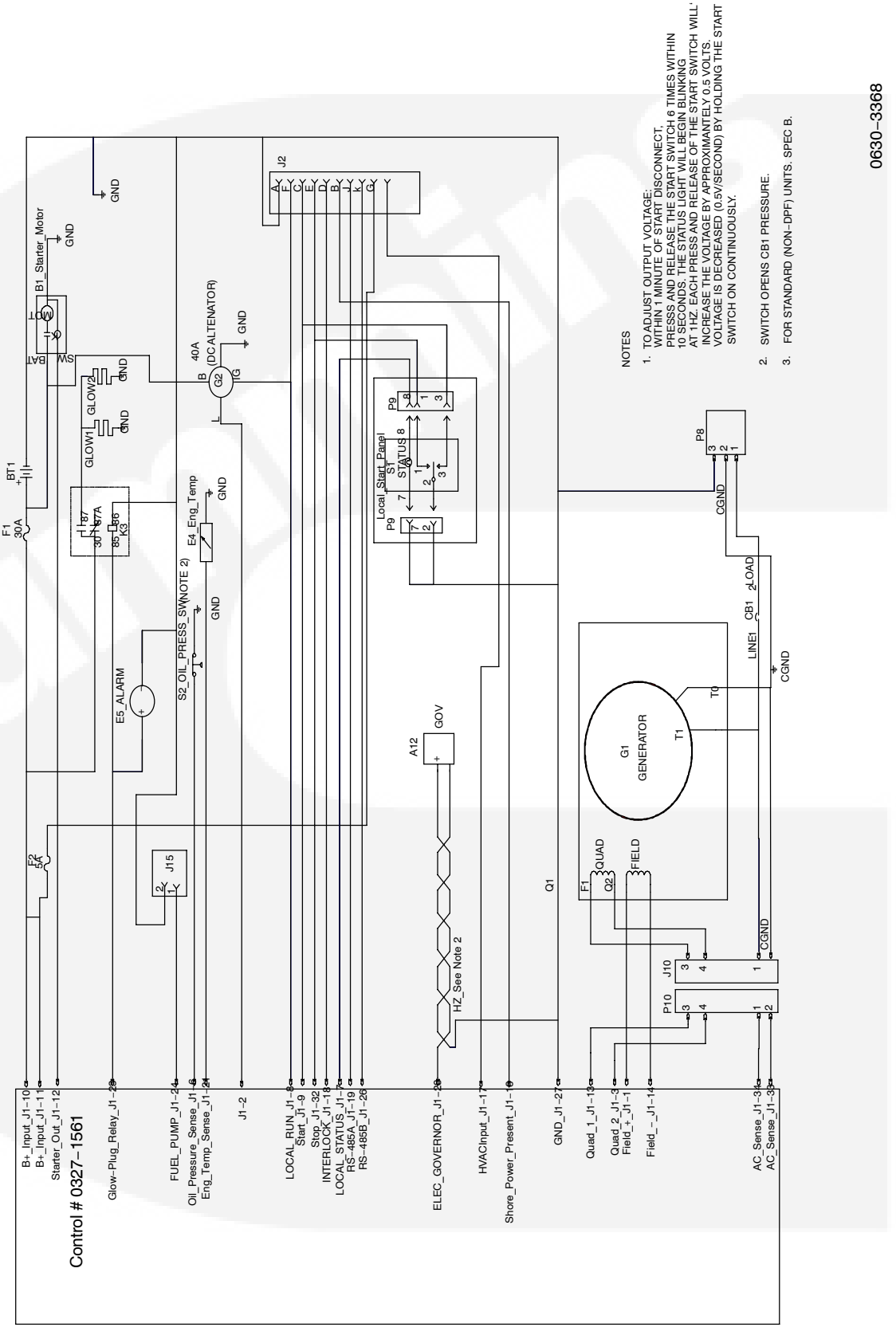

CONTROL SCHEMATIC—SHEET 5 SPEC B

11. Manufacturer’s Warranty Statement

This section contains the Installation Warranty Statement and the California Air Regulations Board Emissions Warranty Statement for the ComfortGuard Generator Set. Please review the statements(s) thorougly.

If you have questions regarding your warranty rights and responsibilities, contact Cummins Power Generation at 1 –800–888–6626 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363–7664, or electronic mail: helpline @ arb.ca.gov.

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Installation Warranty Statement For The ComfortGuard Generator Set

Your Warranty Rights and Obligations

Cummins Power Generation must warrant that the installation of a diesel emission control system is free from defects in workmanship or materials which cause the diesel emission control system to fail to conform to the emissions control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706. The warranty period and the extent of the warranty coverage provided by Cummins Power Generation must be the same as the warranty provided by the product manufacturer, and the same exclusions must apply.

Owner's Warranty Responsibility

As the vehicle, engine, or equipment owner, you are responsible for presenting you vehicle, engine, or equipment, and diesel emission control system to Cummins Power Generation as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact Cummins Power Generation at 1–800–888–6626 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363–7664, or electronic mail: helpline@arb.ca.gov.

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California Air Regulations Board (C.A.R.B.) Emissions Warranty Statement For The ComfortGuard Generator Set

Your Warranty Rights and Obligations

Cummins Power Generation must warrant the diesel emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the diesel emission control system which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, for the periods of time listed below, provided there has been no abuse, neglect, or improper maintenance of your diesel emission control system, vehicle or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine from damage caused by the diesel emission control system, subject to the same exclusions for abuse, neglect or improper maintenance of your vehicle or equipment.

Please review your owner's manual for other warranty information. Your diesel emission control system may include a core part (e.g., particulate filter, diesel oxidation catalyst, selective catalytic reduction converter) as well as hoses, connectors, a back pressure monitor (if applicable), and other emission related assemblies. Where a warrantable condition exists, Cummins Power Generation will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

Warranty Coverage

For a 479 cc diesel engine used in a ComfortGuard DPF System application, the warranty period will be 3 years or 1600 hours whichever occurs first. If any emission–related part of your diesel emission control system is defective in design, materials, workmanship, or operation of the diesel emission control system thus causing the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, within the warranty period, as defined above, Cummins Power Generation will repair or replace the diesel emission control system, including parts and labor.

In addition, Cummins Power Generation will replace or repair the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified diesel emission control strategy. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. Cummins Power Generation may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

Owner's Warranty Responsibility

As the (vehicle, engine, equipment) owner, you are responsible for performing the required maintenance described in your owner's manual. Cummins Power Generation recommends that you retain all maintenance records and receipts for maintenance expenses for your vehicle, engine, or equipment, and diesel emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, Cummins Power Generation may have grounds to deny warranty coverage.

You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to a Cummins Power Generation dealer as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact Cummins Power Generation at 1 –800–888–6626 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363–7664, or electronic mail: helpline @ arb.ca.gov.