Installation Manual

QSB5 G5 and QSB5 G6 Engines with PowerCommand® 2.3 Control

C50D6C (Spec A)
C60D6C (Spec A)
C80D6C (Spec A)
C100D6C (Spec A)
C125D6C (Spec A)

English
Original Instructions

2-2017

A055H194 (Issue 3)

California

Proposition 65 Warning

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

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1 Important Safety Instructions

Save these instructions. This manual contains important instructions that should be followed during installation and maintenance of the generator set.

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

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

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

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

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

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

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

1.2 General Information

This manual should form part of the documentation package supplied by Cummins Power Generation with specific generator sets. In the event that this manual has been supplied in isolation please contact your authorized dealer.

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

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1.3 General Precautions

- Keep ABC fire extinguishers accessible.
- Make sure that all fasteners are secure and torqued properly.
- Keep the generator set and its compartment clean. Do not store any items in the generator set compartment.
- Before working on the generator set, make sure the generator set is shut down and disabled.
  1. Press the generator set's "O" (Off) button or the red STOP button on the local display (whichever is applicable) to stop the generator set. Allow the generator set to thoroughly cool to the touch.
  2. If applicable, turn off and disconnect the battery charger from the AC source before disconnecting the battery cables.
  3. Disconnect the negative (–) cable from the battery and secure it from contacting the battery terminals to prevent accidental starting.
- Use caution when making adjustments when the generator set is running, hot, or when parts are electrically live, as all situations may cause personal injury or death.
- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or come into contact with used oil or its vapors.
- Do not work on the generator set when mentally or physically fatigued or after consuming alcohol or drugs.

NOTICE
Only trained and authorized personnel shall maintain or service the generator set.

NOTICE
The installation of the generator set shall provide enough ventilation to ensure that gases generated by vented batteries during charging, or caused by equipment malfunction, are removed.

General Safety Precautions

⚠ WARNING
Hot Pressurized Liquid ***Contact with hot liquid can cause severe burns.*** ***Do not open the pressure cap while the engine is running. Let the engine cool down before removing the cap. Turn the cap slowly and do not open it fully until the pressure has been relieved.***

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⚠ WARNING

Moving Parts

Moving parts can cause severe personal injury.

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

⚠ WARNING

Toxic Hazard

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

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

⚠ WARNING

Electrical Generating Equipment

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

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

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

⚠ WARNING

Toxic Gases

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

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

⚠ WARNING

High Noise Level

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

Wear appropriate ear protection at all times.

⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

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⚠ WARNING

Toxic Hazard

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

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

⚠ WARNING

Combustible Liquid

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

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

⚠ WARNING

Combustible Gases

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

Wear appropriate eye and ear protection at all times.

⚠ WARNING

Combustible Gases

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

Do not operate the generator set with any doors open.

⚠ WARNING

Fire Hazard

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

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

⚠ WARNING

Automated Machinery

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

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

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NOTICE

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

NOTICE

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

NOTICE

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

1.4 Generator Set Voltage Is Deadly

- Generator set output connections must be made by a trained and experienced electrician in accordance with all applicable codes.
- This generator set and the public utility may only be connected to house circuits by means of the automatic transfer switch.

⚠ CAUTION

Improper connections can lead to electrocution of utility workers and damage to equipment. Make sure that the connections are installed properly by a trained technician.

- Use caution when working on live electrical equipment. Remove jewelry, and make sure clothing and shoes are dry. Stand on a dry wooden platform.

1.5 Exhaust Precautions

⚠ WARNING

Hot Exhaust Gases
Contact with hot exhaust gases can cause severe burns.
Wear personal protective equipment when working on equipment.

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⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

⚠ WARNING

Toxic Gases

Inhalation of exhaust gases can cause asphyxiation and death.

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

⚠ WARNING

Fire Hazard

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

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

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

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

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

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

1.6 Fuel and Fumes Are Flammable

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

- DO NOT permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the generator set or fuel system.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines because copper will become brittle if continuously vibrated or repeatedly bent.
- Be sure all fuel supplies have a positive shutoff valve.

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- Be sure the battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

1.7 Starting Batteries

⚠ WARNING

Toxic Hazard

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

Always:

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

1.8 Batteries Can Explode

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

⚠ WARNING

Combustible Gases

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

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

⚠ WARNING

Electric Shock Hazard

Batteries present the risk of high short circuit current.

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

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NOTICE

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

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

1.9 Vented Batteries

⚠ WARNING

Toxic Hazard

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

Always:

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

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1.10 Moving Parts Can Cause Severe Personal Injury or Death

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

1.11 The Hazards of Carbon Monoxide

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

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

Special Risks of CO near the Home

⚠ WARNING

Toxic Gases

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

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

Protecting Yourself from CO Poisoning

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

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2 Introduction

2.1 About This Manual

⚠ WARNING

Improper installation can result in severe personal injury, death and damage to equipment. The installation must comply with all applicable building codes (including project permits and inspections). The installer should be properly trained and licensed to perform electrical and mechanical equipment installations (including gaseous fuel installation).

NOTICE

Manuals are updated from time to time to reflect changes in the equipment and its specifications. The most up-to-date version of this manual is found on the QuickServe website (https://quickserve.cummins.com/info/index.html).

This manual is a guide for the installation of the generator set models listed on the front cover. Proper installation is essential for top performance, reliable operation, and safety. Read through this manual before starting the installation. This manual covers outdoor applications only; for other installations, refer to the T-030: Liquid-Cooled Generator Set Application Manual available from your Cummins distributor.

NOTICE

The installation must comply with all applicable building codes.

See the generator set's specific Operator Manual for operation and maintenance and specific Service Manual for service.

Refer to the Model Specifications section for specific information about the system and its components.

Refer to the Outline and System Drawings appendix and the Wiring Diagrams appendix for specific information about installation and wiring connections.

2.2 Related Literature

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

A generator set must be operated and maintained properly if you are to expect safe and reliable operation. The Operator manual includes a maintenance schedule and a troubleshooting guide. The Health and Safety manual must be read in conjunction with the Operator manual for the safe operation of the generator set.

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The following documents are shipped with the generator set:

- Installation Manual for QSB5 Engine with PC 2.3 Control (A055H194)
- Operator Manual for QSB5 Engine with PC 2.3 Control (A055H195)
- Health and Safety Manual (A007W058 [0908-0110-00])
- Warranty Manual (A040W374)
- Global Commercial Warranty Statement (A028U870)
- All Engines Worldwide Generator Drive Warranty (EPA warranty statement) (A056N379 [3381307])

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

- Generator Set Service Manual for QSB5 Engine with PC 2.3 Control (A055H196)
- Controller Service Manual for PowerCommand 2.3 Controller (A030F082 [0900-0666])
- Engine Operation and Maintenance Manual (4021531)
- Recommended Spares List (RSL) for each model:
  - C50D6C (A054H261)
  - C60D6C (A054H263)
  - C80D6C (A054H265)
  - C100D6C (A055J379)
  - C125D6C (A055J386)
- Parts Manual for QSB5 Engine with PC 2.3 Control (A055J388)
- InPower User Manual (0901-0108)
- Universal Annunciator Owner Manual (0900-0301)
- Standard Repair Times - AO Family (A055J390)
- Service Tool Manual (A043D529)
- Failure Code Manual (F1115C)
- Engineering Application Manual *T-030: Liquid Cooled Generator Sets* (A040S369)

2.3 Before Installation

Before beginning the installation of the generator set, verify that the unit was correctly selected. Check the following features:

- Model
- Specifications
- Options

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- Fuel Supply

2.4 Model Specifications

TABLE 1. MODEL VARIATIONS (ALL MODELS 60 HZ)

Model	kW	Phase	Amps	Voltage (L-N/L-L) V
C50D6C	50	3	173	120/208
		3	164	127/220
		3	150	120/240
		3	75	277/480
		3	60	347/600
		1	208	120/240
C60D6C	60	3	208	120/208
		3	197	127/220
		3	180	120/240
		3	90	277/480
		3	72	347/600
		1	250	120/240
C80D6C	80	3	278	120/208
		3	262	127/220
		3	241	120/240
		3	120	277/480
		3	96	347/600
		1	333	120/240
C100D6C	100	3	347	120/208
		3	328	127/220
		3	301	120/240
		3	150	277/480
		3	120	347/600
		1	417	120/240

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Model	kW	Phase	Amps	Voltage (L-N/L-L) V
C125D6C	125	3	434	120/208
		3	410	127/220
		3	376	120/240
		3	188	277/480
		3	150	347/600
		1	521	120/240

TABLE 2. COLD WEATHER SPECIFICATIONS (ALL MODELS)

Temperature	Description	Battery Type	Group
Above 10 °C (50 °F)	No starting aids required.	Standard	34
-17 to 10 °C (0 to 50 °F)	All starting aids (battery heater, 1000 W coolant heater, battery charger) recommended. Factory options available.	2 Standard	34
Below -17 °C (0 °F)	All starting aids (battery heater, 1500 W coolant heater, battery charger) recommended. Factory options available.	2 Standard	34

NOTICE

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

TABLE 3. FUEL SPECIFICATIONS (PER HOUR)

Full Load Rating	C50D6C	C60D6C	C80D6C	C100D6C	C125D6C
Standby	50	227.1 L (60 gal)	303 L (80 gal)	379 L (100 gal)	473.1 L (125 gal)
Prime	45	204.4 L (54 gal)	273 L (72 gal)	341 L (90 gal)	426 L (112.5 gal)

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TABLE 4. FUEL TANK PART NUMBERS

Option	Tank Type	Capacity Min. (Hr)	C50 D6	C60 D6	C80 D6	C100 D6	C125 D6
C301-2	Regional	24	A053L909	A053L909	A053L909	A053L909	A053L909
C303-2	Regional	48	A053L911	A053L911	A053L911	A053L911	A053L912
C305-2	Regional	72	A053L911	A053L912	A053L912	A053L912	-
C307-2	Regional	96	A053L912	A053L912	-	-	-
C319-2	Basic	24	A053H409	A053H409	A053H409	A053H409	A053H409
C320-2	Basic	48	A053H409	A053H411	A053H411	A053H412	A053H412

TABLE 5. ENGINE SPECIFICATIONS (ALL MODELS)

Type	Specification
Engine	4 Cylinder-in-line, liquid-cooled, 4-stroke • *QSB5 G5:* C50D6C, C60D6C, C80D6C, and C100D6C • *QSB5 G6:* C125D6C only
Aspiration	Turbocharged and charge air cooled
Displacement	4500 cc (272 in^3)
Compression Ratio	17.3:1
Fuel	ASTM number 2D fuel (refer to the engine operator and maintenance manual)
Coolant	50/50 coolant solution (50% pure water and 50% anti-freeze)
Coolant Fill Rate	Maximum 3 GPM
Fuel Flow	Maximum fuel flow: • *C50D6C. C60D6C, C80D6C, and C100D6C:* 133 L/hr (35 gal/hr) • *C125D6C only:* 95 L/hr (25 gal/hr)
	Maximum fuel inlet restriction with clean filter: 17 kPa (5 in. Hg)
	Maximum return restriction: 20 kPa (6 in. Hg)

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TABLE 6. LUBRICATING OIL SYSTEM SPECIFICATIONS (ALL MODELS)

Type	Value
Lubricating Oil Pressure at Rated Speed (Minimum)	*G5 engine:* 310 kPa (45 psi) *G6 engine:* 344.7 kPa (50 psi)
Oil Recommendation	15W40 (refer to the engine operator and maintenance manual)
Lubricating Oil Capacity:	
--Full at High Mark on Dipstick	11.0 L (11.6 qt)
--Low Mark on Dipstick	9 L (9.5 qt)

TABLE 7. GENERATOR SET SIZE (ALL MODELS) (L X W X H)

Enclosure Type	in	mm
Open/Weather (Short) (does not include exhaust discharge elbow)	98 x 40 x 58	2489 x 1016 x 1473
Sound Level 1 (Long)	119 x 40 x 58	3023 x 1016 x 1473
Sound Level 2 (Long)	136 x 40 x 58	3454 x 1016 x 1473

TABLE 8. GENERATOR SET WET WEIGHT (INCLUDING BATTERY)

Model	kg	lb
C50D6C, C60D6C	998	2200
C80D6C	1044	2300
C100D6C	1089	2400
C125D6C	1180	2600

TABLE 9. ALTERNATOR SPECIFICATIONS 60 HZ, 1800 RPM

	C50D6C	C60D6C	C80D6C	C100D6C	C125D6C
Alternator	Brushless, 4-pole rotating field, single bearing				
Power (kVA) 1Phase/3 Phase - Standby	50/62.5	60/75	80/100	100/125	125/156
Power (kVA) 1Phase/3 Phase - Prime	45/56	55/69	72/90	90/112.5	113/141

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	C50D6C	C60D6C	C80D6C	C100D6C	C125D6C
Rated Voltages (V) (Line to Neutral/Line to Line)	120/240				
	120/208				
	127/220				
	277/480				
	347/600				

NOTICE
Maximum I_2= 8%.

TABLE 10. GENERATOR SET DERATING GUIDELINES (STANDBY)

Model	Engine Power Available Up To...		Derate At...	
	Elevation	Ambient Temperature	Elevation (per 300 m/1000 ft)	Temperature (per 10 °C/18 °F)
C50D6C	2012 m (6600 ft)	40 °C (104 °F)	17%	19%
C60D6C	1890 m (6200 ft)			
C80D6C	1585 m (5200 ft)			
C100D6C	1280 m (4200 ft)			
C125D6C	1097 m (3600 ft)		35%	58%

TABLE 11. GENERATOR SET DERATING GUIDELINES (PRIME)

Model	Engine Power Available Up To...		Derate At...	
	Elevation	Ambient Temperature	Elevation (per 300 m/1000 ft)	Temperature (per 10 °C/18 °F)
C50D6C	2073 m (6800 ft)	40 °C (104 °F)	17%	19%
C60D6C	1951 m (6400 ft)			
C80D6C	1707 m (5600 ft)			
C100D6C	1463 m (4800 ft)			
C125D6C	1158 m (3800 ft)		35%	58%

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TABLE 12. CONTROL SPECIFICATIONS (ALL MODELS)

Control
PowerCommand® 2.3 integrated, microprocessor-based engine/alternator/transfer switch controller, including Engine Control Module (ECM) CM850

TABLE 13. DC SYSTEM SPECIFICATIONS (ALL MODELS)

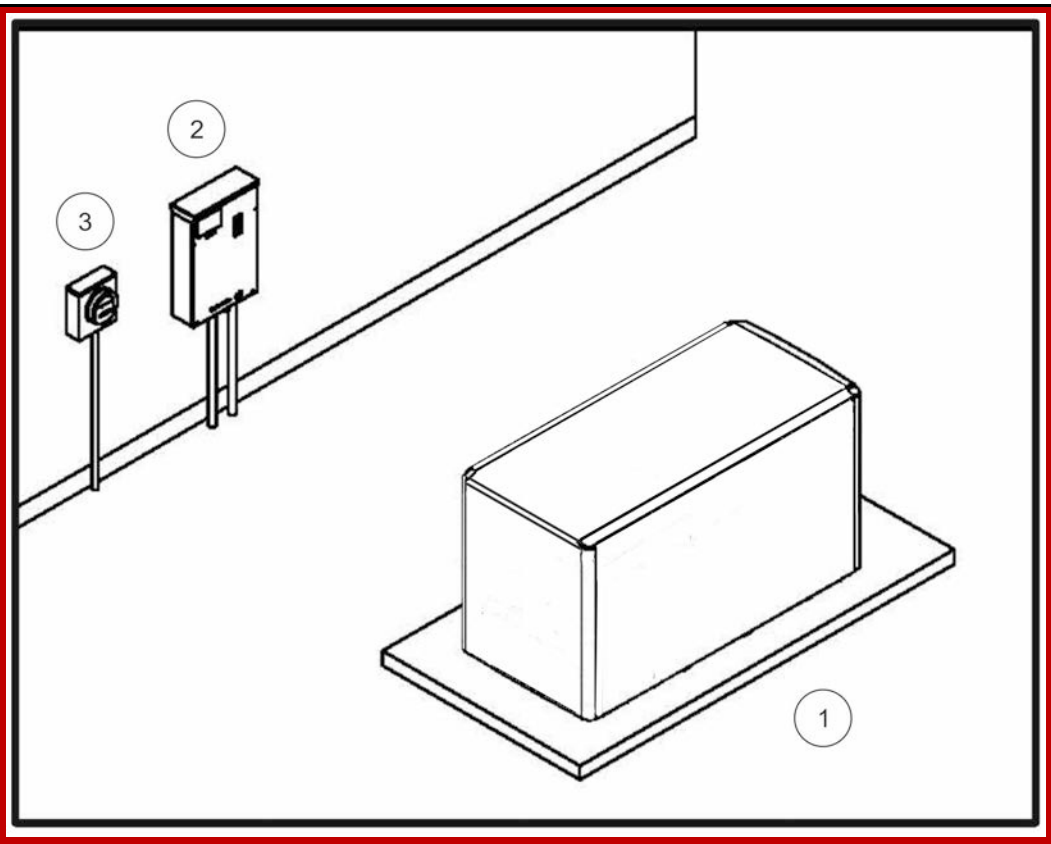
Type	Value
Nominal Battery Voltage (VDC)	12
Battery Group	34
Battery Type	Lead acid (wet)
Minimum Cold Crank Amps (CCA)	2 batteries x 850 CCA (per battery) = Total 1700 CCA

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3 Pre-Installation Considerations

3.1 Pre-Installation Considerations Introduction

Before installation begins, certain items must be considered. Prior coordination reduces delays and the amount of time power has to be interrupted.



No.	Description	No.	Description
1	Generator Set	3	Transfer Switch
2	Electrical Meter		

FIGURE 1. SITE PREPARATION EXAMPLE

Areas of consideration:

- Location of the generator set - this is one of the first decisions to be made, as it affects all other aspects of the installation, such as:
  - Length of electric wiring
  - Length of fuel lines
  - Site preparation:
    - Access to the site

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  - Trenches
  - Site preparation materials needed
- Automatic transfer switch location and connections
- Tools and materials required
- Accessories required (if any) for the customer's application (utility power may be required at the generator set; make plans accordingly)

NOTICE
Depending on the locality and use of the generator set, it may be necessary to obtain an air quality emissions permit before installation begins. Check with local pollution control or air quality authority to determine permit requirements.

3.2 Installation Codes and Standards for Safety

NOTICE
The generator set installer bears sole responsibility for following all applicable local codes and regulations.

The following list of codes and standards may apply to the installation and operation of the generator set. This list is for reference only and not intended to be inclusive of all applicable codes and standards. The address of each agency is listed so that copies of the codes may be obtained for reference. Installation codes and recommendations are subject to change, and may vary by location or over time.

TABLE 14. INSTALLATION CODES AND STANDARDS FOR SAFETY RECOMMENDATIONS

NFPA 70 - National Electrical Code NFPA 37 - Installation and Use of Stationary Combustion Engines and Gas Turbines NFPA 110 - Standard for Emergency and Standby Power Systems	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
CSA Electrical Bulletin CSA 22.1 Canadian Electrical Code CSA B139 Installation Code for Oil-Burning Equipment CSA C22.2 No. 100 Motors and Generators CSA C22.2 No. 14 Industrial Control Equipment	Canadian Standards Association Housing and Construction Materials Section 178 Rexdale Blvd. Rexdale, Ontario, Canada M9Q 1R3

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California Administrative Code - Title 25 Chapter 3	State of California Documents Section P.O. Box 1015 North Highlands, CA 95660

3.3 Required Items for Installation

Tools and materials are used for the installation of this generator set. These items are identified in the following sections. Please refer to local codes and standards, because they may affect the materials required.

Materials Required

NOTICE
Refer to local codes and standards, which may affect material requirements.

NOTICE
If a 100% rated breaker is used, 90 °C wire must be used for L1, L2, and L3 with the wire size determined by the 75 °C ampacity tables.

NOTICE
A UL-listed grounding electrode terminal within its ratings and suitable for the application must be installed and labeled “Grounding Electrode Terminal”.

Electrical Materials:

NOTICE
Class 1 wiring methods must be used for connecting the generator set.

- Four code compliant AC power wires will be needed: L1, L2, N and Gnd (add another wire for 3-phase for a total of 5 AC wires)
- For RA switches, 4 DC control wires will be needed from the generator to the transfer switch.
- Wire sizes (DC control and power and AC sense only):
  - DC control or AC sense wires under 1000 feet circuit length => 18-14 AWG of the insulation type below

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  - DC control or AC sense wires 1000 - 2000 feet circuit length => 10-14 AWG of the insulation type below
- All AC and DC wires and cables must be rated 75 °C minimum, stranded copper, and rated for wet locations.
  - For wire sizes 14 AWG and larger, use insulation types: RHW, RHW-2, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, USE-2, ZW-2
  - For wire sizes 16 and 18 AWG, use insulation types: FFH-2, KFF-2, PAFF, PFF, PGFF, PTFF, RFH-2, RFHH-2, RFHH-3, SFF-2, TFF, TFFN, ZFF
- Code compliant 20 A, 120 VAC, GFCI protected circuit for alternator heater, battery charger, coolant heater, oil heater, and/or battery heater (if equipped)
- Code compliant conduit for all wires

Mounting Materials:

- Four base tie-down bolts

NOTICE
Regional fuel tanks require six bolts to attach to the ground.

NOTICE
Seismic zone installations require compliance to specific mounting configurations.

Fuel Materials:

- Flexible fuel line (provided with generator)
- UL listed pipe thread sealant
- Fuel pipe to the remote tank

Tools Required

Use appropriate lifting techniques to position the generator set in place.

Transfer Switch Requirements

A transfer switch must be a part of every generator set installation. Transfer switches transfer loads to the generator set during power outages.

NOTICE
Cummins offers a variety of transfer switches, including residential and light commercial options.

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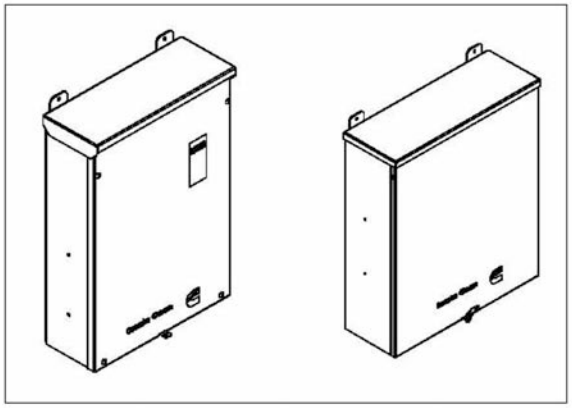


FIGURE 2. EXAMPLE OF CUMMINS TRANSFER SWITCH

Before beginning the installation of the transfer switch, verify that the unit was correctly selected. Check the following features:

- Specifications (voltage, amperage, frequency, poles, and phases)
- Enclosure (indoor vs. outdoor)
- Model

Refer to the specific transfer switch owner or operator manual for more detailed information. Cummins transfer switches are the recommended switches for use with these generators.

Choosing a Transfer Switch

This section includes examples of block diagrams showing partial or full load coverage for the Cummins transfer switches.

NOTICE
These generator sets can be used with either service entrance transfer switches or non-service entrance transfer switches.

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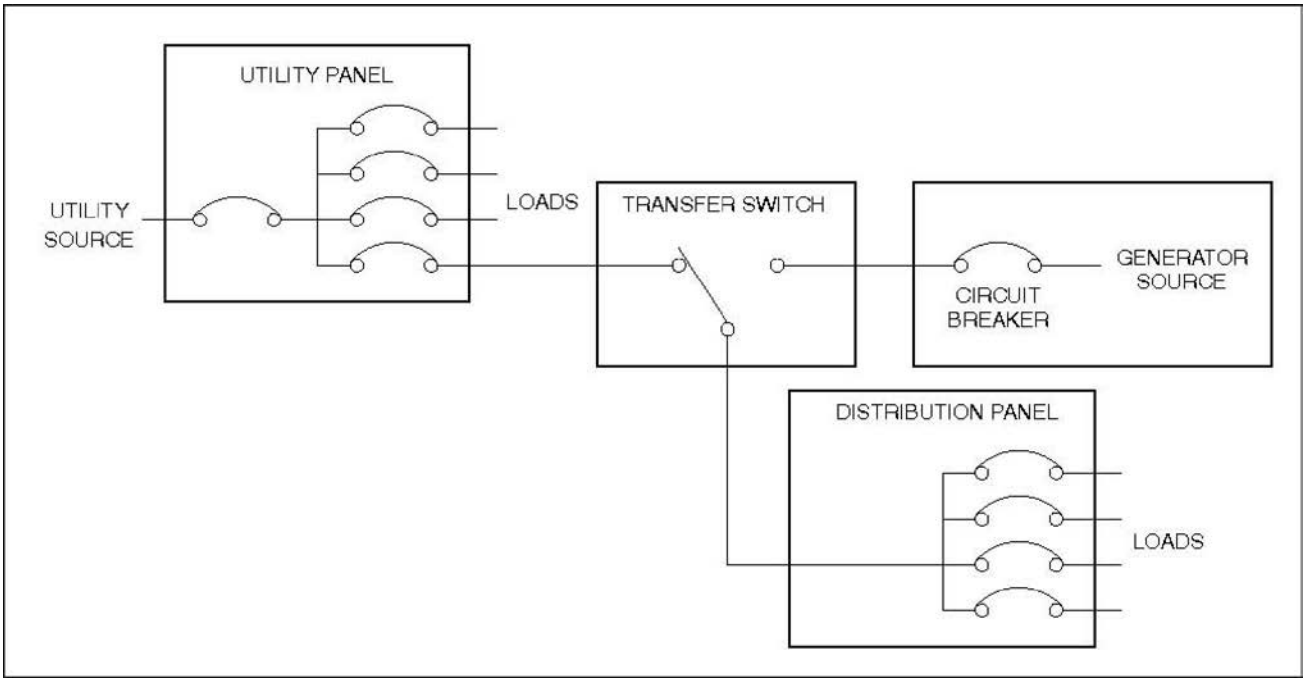


FIGURE 3. EXAMPLE OF TRANSFER SWITCH CONNECTIONS FOR PARTIAL COVERAGE LOAD

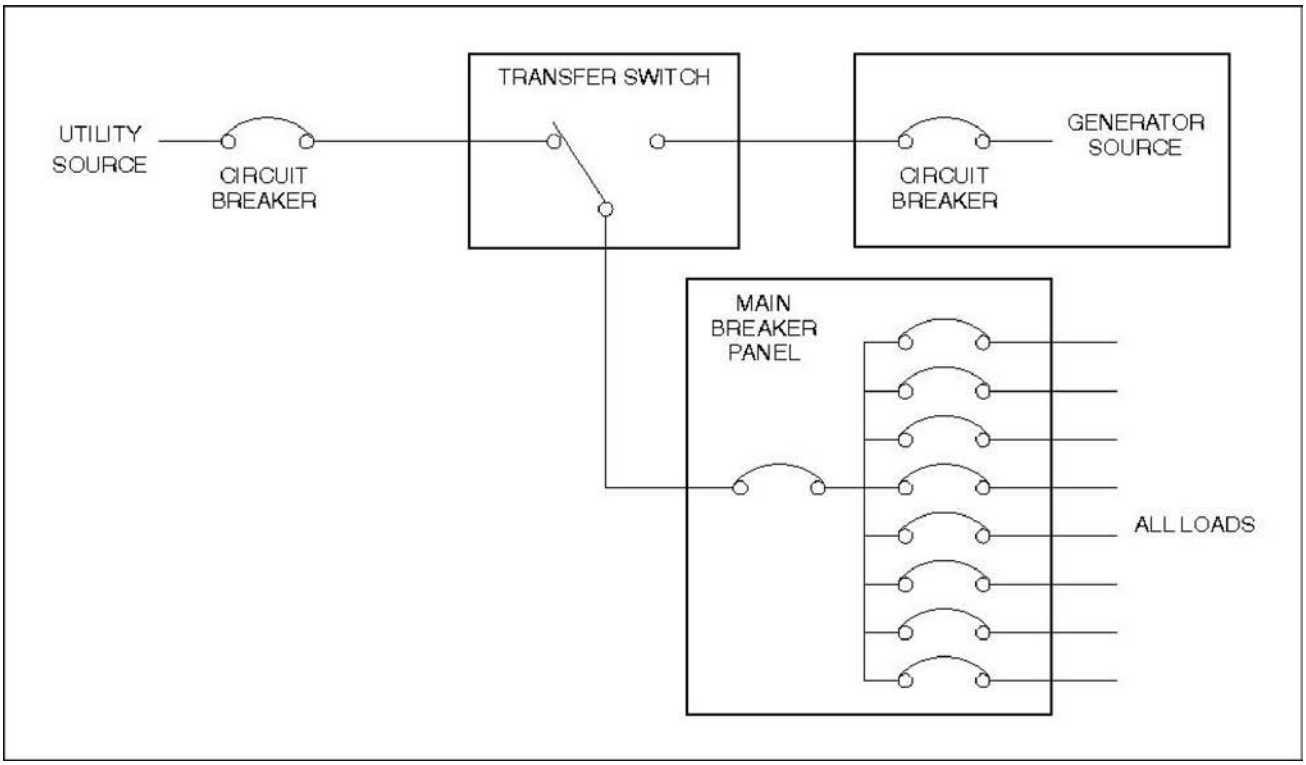


FIGURE 4. EXAMPLE OF TRANSFER SWITCH CONNECTIONS FOR FULL COVERAGE LOAD

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Loose Parts Shipped With the Generator Set

The following loose parts are shipped with the generator set:

- Flexible fuel hose assemblies (attached to the radiator guard)
- One enclosure key (where applicable)
- Battery tie-down
- Sound level 2 baffle (where applicable)
- Fuel tank vent extensions (where applicable)
- Fuel tank riser blocks (where applicable)
- Literature - Operator Manual, Installation Manual, Health and Safety Manual, and Warranty Statements

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4 Installation

4.1 Site Assessment and Preparation

Proper component location and site preparation have a very important impact on completing a successful installation. The major components and sources of power needed for installation include the following items:

- Generator set
- Transfer switch
- Electrical utility
- Fuel source
- Accessories (may be required under certain conditions)

Generator Set Installation Suggestions and Guidelines

- Locate the generator set on stable ground, not subject to flooding. Generator set should not be installed where significant water runoff from a roof or downspouts is present. Sump pump discharge should be routed away from the generator set.
- Locate and orient the generator set such that prevailing winds will carry exhaust gases and fuel leaks away from the house or occupied areas.
- This unit is to be installed so that the risk of contact by people is minimized.

Picking a Location

⚠ WARNING

Exhaust gas is deadly. Locate the generator set away from doors, windows, and other openings to the house and where exhaust gases will disperse away from the house.

Generator set location is critical for safety and performance. Follow the guidelines below:

- Must comply with applicable codes (NFPA, NEC, IBC, etc.).
- This manual only covers outdoor installations with Cummins factory installed enclosures. For other installation types, contact your local Cummins dealer or reference the Application Manual at the following link: *http://www.cumminspower.com/www/literature/applicationmanuals/t030.pdf*
- Consider access to utilities (electric meters, transfer switch, remote fuel tank location, etc.).
- Call the local utilities to mark the locations of buried utility services (gas, electric, or telephone) before digging.

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- Verify the locations of any other buried components (gas, electric or telephone) with the homeowner before digging.

Clearances:

- The exhaust side of the generator set must be located at a minimum of 5 feet from combustible materials (NFPA 37) and any opening in a wall (window, door, vent, etc.).
- The generator set must be located such that the exhaust is not able to accumulate in an occupied area.
- The generator set must have enough room for installation, service, and maintenance.
- The generator set must be located to ensure ventilation openings are not blocked.
- Position the generator set so that cooling air is free to enter and leave the area.
- Locate and position the generator set so that prevailing winds carry exhaust gases and potential fuel leaks away from the house or occupied area.

NOTICE
For all clearance requirements, refer to the Outline and System Drawings section.

Laying the Foundation

When laying the foundation:

1. Clear obstructions, and make sure that there is adequate clearance for access.
2. Level the ground, and make sure that the ground is compact and settled. Ensure that it is stable ground, not subject to flooding.
3. Prepare the concrete pad.
   - The pad should be constructed of reinforced concrete with a 28-day compressive strength of at least 2500 psi (17,237 kPa).
   - The pad dimensions should be the same as those indicated in the Outline and System Drawings appendix.

NOTICE
Seismic installations may require a different pad and securing devices.

NOTICE
Local codes and standards may have different requirements.

4. Lift the generator set onto the pad, and secure it.

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Lifting and Moving the Generator Set

⚠ WARNING

Heavy Load

The generator set is heavy. Handle with care.

Dropping the generator set can cause severe personal injury or death. Use appropriate lifting techniques to move the generator set. Keep feet and hands clear when lifting the generator set.

⚠ CAUTION

The generator set is shipped with oil in the engine crankcase. Keep the generator set upright.

Mounting the Generator Set

Positioning of cast-in bolts can be problematic since even small errors in location can cause time consuming redrilling of the skid base. Some generator set designs allow use of concrete anchor bolts.

Mount the generator set on a substantial and level base such as a concrete pad. A non-combustible material must be used for the pad. Verify that the mounting pad is level lengthwise, widthwise, and diagonally.

NOTICE

Seismic installation may require specific anchorage.

Securing the Generator Set to the Mounting Pad

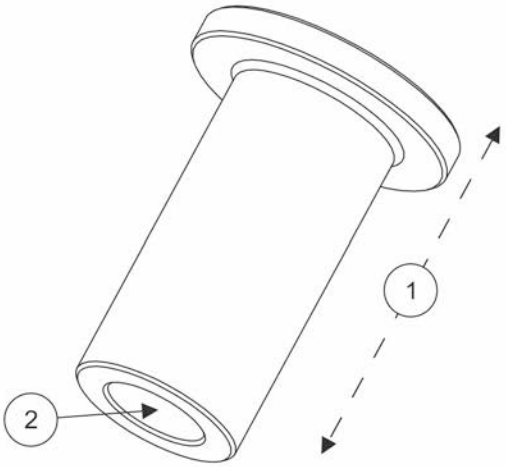
The generator set should be securely attached to either a poured concrete slab or prefabricated mounting pad (accessory pad) made of non-combustible material.

NOTICE

An accessory mounting pad is available that includes ½ -13 UNC x 1.25 inch mounting holes located in the proper location for these generator sets. Two hex head cap screws (½-13 x 3 inch long) and flat washers are needed with this accessory pad.

1. Position the two spacers (which were shipped with the generator set) appropriately on the generator set base.

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No.	Description	No.	Description
1	Spacer Length (2.18 in [55.4 mm])	2	Spacer Through-Hole Diameter (0.59 in)

FIGURE 5. MOUNTING SPACER

2. *Prefabricated pad only:* Install the bolts into the prefabricated pad and tighten. Torque value: 37 ft-lb (50 Nm).
3. *Poured slab only:*
   a. Mark the location for the anchor bolts with the generator set in place.
   b. Install the anchor bolts per the manufacturer's recommendation for both embedment and tightening torque.

NOTICE

There are several styles of anchor bolts available. Follow the anchor bolt manufacturer's requirements for hole size and depth. The length of the anchor bolt must accommodate:

- **The embedment length of the bolt into the pad**
- **The length of the spacer**
- **The thickness of the washer and**
- **The thickness of the nut (if used)**

4. Install the chassis plugs in the generator set's lifting holes after the unit is in its final position.

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4.2 Fuel System

NOTICE
The factory-installed sub-base fuel tanks meet the fuel system requirements. Please verify that they also meet local codes and standards.

Cummins engines normally use a diesel fuel specified to ASTM D975 grade 2. Refer to the Engine Operator Manual for additional information.

In all fuel system installations, cleanliness is of the utmost importance. Make every effort to prevent entrance of moisture, dirt, or contaminants of any kind into the fuel system. Clean all fuel system components before installing.

NOTICE
A fuel filter/strainer/water separator of 100-120 mesh or equivalent (approximately 150 microns nominal) must be fitted between the main tank and day tank if a factory sub-base tank is used as a day tank.

Use only compatible metal fuel lines to avoid electrolysis when fuel lines must be buried. Buried fuel lines must be protected from corroding.

NOTICE
Never use galvanized or copper fuel lines, fittings, or fuel tanks. Condensation in the tank and lines combines with the sulfur in diesel fuel to produce sulfuric acid. The molecular structure of the copper or galvanized lines or tanks reacts with the acid and contaminates the fuel, resulting in possible engine damage.

An electric solenoid valve in the supply line is recommended for all installations and required for indoor automatic or remote starting installations that do not use the factory sub-base fuel tank. Connect the solenoid wires to the generator set “Switched B+” circuit to open the valve during generator set operation.

NOTICE
Never install a shutoff device in fuel return line(s). If the fuel return line(s) is blocked or exceeds fuel restriction limit, engine damage will occur.

NOTICE
A base mounted fuel tank may be part of the generator set build. An additional external fuel system may be required if the onboard fuel capacity is not sufficient for the application.

Fuel Selection and Recommendations

For fuel specifications, see the Model Specifications section.

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NOTICE

Fuel systems must be installed by qualified service technicians. Improper installation presents hazards of fire and improper operation, resulting in severe personal injury or property damage.

In all fuel system installations, cleanliness is extremely important.

- Make every effort to prevent fuel contamination from:
  - Moisture
  - Dirt
  - Excess thread sealant
  - Contaminants of any kind
- Clean all fuel system components before installing.

If applicable, refer to the Engine Operator Manual for complete fuel requirements.

⚠ WARNING

The generator set is heavy. Dropping the generator set can cause severe injury or death. Do not lift the generator set with fuel in the tank (where applicable). Keep hands and feet clear when lifting the generator set.

⚠ WARNING

Do not mix gasoline, alcohol, or gasohol with diesel fuel. This can cause an explosion.

⚠ CAUTION

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

Fuel Return Restrictions (or Pressure) Limit

Fuel return drain restriction (consisting of friction head and static head) between the engine injector return line connection and the fuel tank must not exceed the limit stated in the Model Specifications. Fuel return lines must not contain a shutoff device. Engine damage will occur if the engine is run with the return fuel lines blocked or restricted.

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Fuel Lines Routing

⚠ WARNING

Explosive hazard.

Fuel leaks create fire and explosion hazards which can result in severe personal injury or death.

Always use flexible tubing between the engine and fuel supply to avoid line failure and leaks due to vibration. The fuel system must meet all application codes.

⚠ WARNING

Sparks and hot surfaces.

Sparks and hot surfaces can ignite fuel, leading to severe personal injury or death.

Do not route fuel lines near electrical wiring or hot exhaust parts.

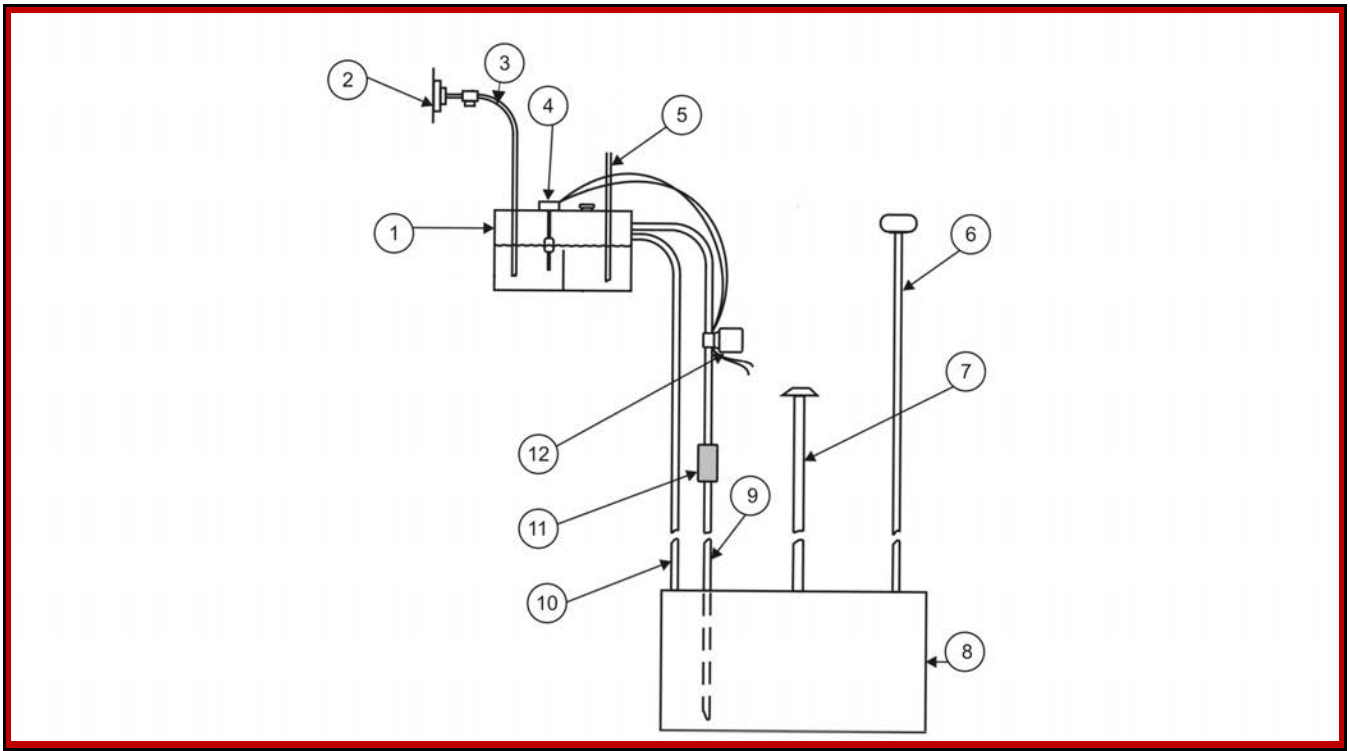
NOTICE

Fuel lines must be routed and secured to maintain a 12.7 mm (½ inch) minimum clearance from electrical wiring and a 51 mm (2 inch) minimum clearance from hot exhaust parts.

A flexible fuel hose(s) or section of flexible fuel hose(s) must be used between the engine's fuel system and fuel supply and return line(s) to protect the tank's fuel system from damage caused by vibration, expansion, and contraction. Flexible lines for connecting between the engine and the fuel tank are included as standard equipment.

Modification of the fuel hoses must be done according to all applicable codes and standards, and installation recommendations provided by the manufacturer. The supplied flexible hoses are approved by the hose manufacturer for use with the generator set fuel type and product application.

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No.	Description	No.	Description
1	Day Tank (Sub-Base)	7	Fill Pipe
2	Engine Fuel Pump	8	Main Fuel Tank
3	Supply Line	9	Supply Line
4	Float Switch	10	Overflow Line
5	Return Line	11	120 Mesh Fuel Strainer
6	Vent Pipe	12	Fuel Transfer Pump Electric Motor Driven

FIGURE 6. TYPICAL FUEL SUPPLY INSTALLATION (USING FACTORY SUB-BASE TANK AS DAY TANK)

Engine Fuel Connections

Identification tags are attached to the fuel supply line and fuel return line connections. All models require a fuel return line from the injectors to the tank.

Supply Tank

Locate the fuel tank as close as possible to the generator set and within the restriction limitations of the fuel pump.

Install a fuel tank that has sufficient capacity to supply the generator set operating continuously at full rated load for the planned period of operation or power outage.

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If the fuel inlet restriction exceeds the defined limit due to the distance/customer-supplied plumbing between the generator set and the main fuel tank, a transfer tank (sometimes referred to as a day tank) and auxiliary pump will also be required. If an overhead main fuel tank is installed, a transfer tank and float valve will be required to prevent fuel head pressures from being placed on the fuel system components.

Fuel Inlet Pressure/Restriction Limit

Engine performance and fuel system durability is compromised if the fuel inlet pressure or restriction limits are not adhered to. Fuel inlet pressure or restriction must not exceed the limits stated in the model-specific generator set *Specification Sheet*.

Day Tank

Some generator set installations may include a fuel day tank. They are used when fuel inlet restriction limits cannot be met, or the supply tank is overhead and presents problems of high fuel head pressure for the fuel inlet and return lines.

Supply Tank Lower Than Engine

⚠ WARNING

Fuel spillage.

Spilled fuel presents the hazard of fire or explosion which can result in severe personal injury or death.

Provide an overflow line to the supply tank from the day tank.

NOTICE

The supply tank top must be below the day tank top to prevent siphoning from the fuel supply to the day tank.

With this installation, the day tank is installed near the generator set, below the fuel injection system and within the fuel inlet restriction limit. Install a fuel transfer pump, to pump fuel from the supply tank to the day tank. A float switch in the day tank controls operation of the auxiliary fuel pump.

Provide a return line from the engine injection system return connection to the day tank. Plumb the return line to the bottom of day tank. Provide a day tank overflow line to the supply tank in case the float switch fails to shut off the fuel transfer pump.

Supply Tank Higher Than Engine

With this installation, the day tank is installed near the generator set, above the fuel injection system and within the fuel return restriction limit. Include an automatic fuel shutoff valve in the fuel line between the fuel supply tank and the day tank to stop fuel flow when the generator set is off.

Provide a return line from the engine injection system return connection to the day tank. Plumb the return line to the bottom of day tank.

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NOTICE

Spilled fuel can create environmental hazards. Check local requirements for containment and prevention of draining to sewer and ground water.

4.3 Engine Exhaust

The exhaust system for this generator set is complete and was designed specifically for this generator set. Do not modify or add to the exhaust system of this generator set.

⚠ WARNING

Exhaust gas is deadly. Make sure that the exhaust system terminates away from building vents, windows, doors, and sheltered spaces that may not have ample fresh air ventilation.

⚠ WARNING

Engine discharge air and exhaust carry carbon monoxide gas (odorless and invisible) which can cause asphyxiation and death. Never use engine discharge air or exhaust for heating a room or enclosed space.

4.4 Electrical Connections

⚠ WARNING

Improper installation can lead to electrocution and damage to property. Electrical connections must be made by a licensed electrician.

⚠ WARNING

Automatic startup of the generator set during installation can cause severe personal injury or death. Make sure the generator set is shut down and disabled:

1. ***Press the generator set's "O" (Off) button to stop the generator set. Allow the generator set to thoroughly cool to the touch.***
2. ***Turn off and disconnect the battery charger from the AC source before disconnecting the battery cables.***
3. ***Disconnect the negative (–) cable from the battery and secure it from contacting the battery terminals to prevent accidental starting.***

NOTICE

Refer to regional codes and the National Electrical Code (NFPA 70) for all electrical installation requirements.

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NOTICE

Class 1 wiring methods must be used for connecting the generator set.

Electrical Preparations

1. Run all wires through a single conduit (unless prohibited by the authority having jurisdiction).

   NOTICE

   Be sure to account for any needed accessories, such as a remote display, etc.

2. Connect the conduit to the generator set. Refer to the specific outline drawing in the Outline and System Drawings section for the size and location of the hole provided for electrical conduit connection. The existing hole may be increased in size to match conduit used.

AC Connections

⚠ WARNING

Automatic startup of the generator set during installation can cause severe personal injury or death.

Make sure the generator set is shut down and disabled:

1. ***Push the control switch OFF to stop the generator set. Allow the generator set to thoroughly cool to the touch.***
2. ***Turn off and disconnect the battery charger from the AC source before disconnecting the battery cables.***
3. ***Disconnect the negative (–) cable from the battery and secure it from contacting the battery terminals to prevent accidental starting.***

NOTICE

If a 100% rated breaker is used, 90 °C wire must be used for L1, L2, and L3 with the wire size determined by the 75 °C ampacity tables.

NOTICE

When using a circuit breaker with an adjustable, electronic trip unit, the amperage and trip curve settings may need adjustment to match the generator set load wiring, or downstream loads and circuit breakers. An accessory seal kit (part number A026M166 is available to tamper-proof the adjustable settings.

For grounding and neutral connections, look for the following symbols on the generator set circuit breaker box.

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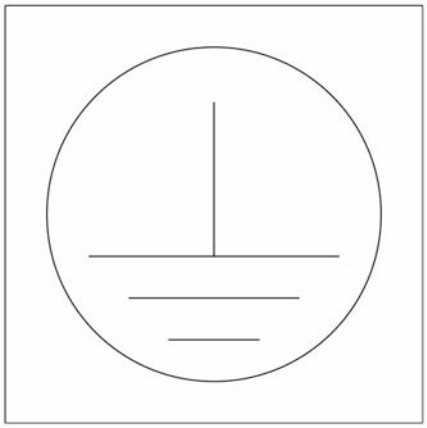
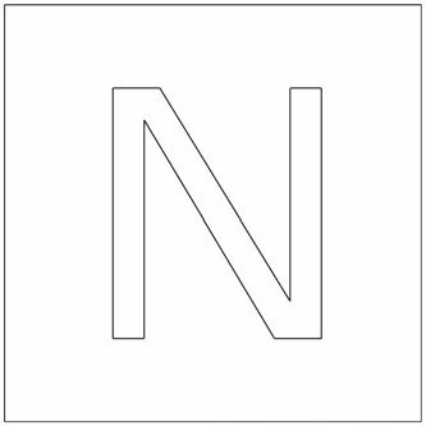
Equipment Grounding Conductor Symbol	Equipment Neutral Connection Symbol
	

FIGURE 7. SYMBOLS ON CIRCUIT BREAKER BOX

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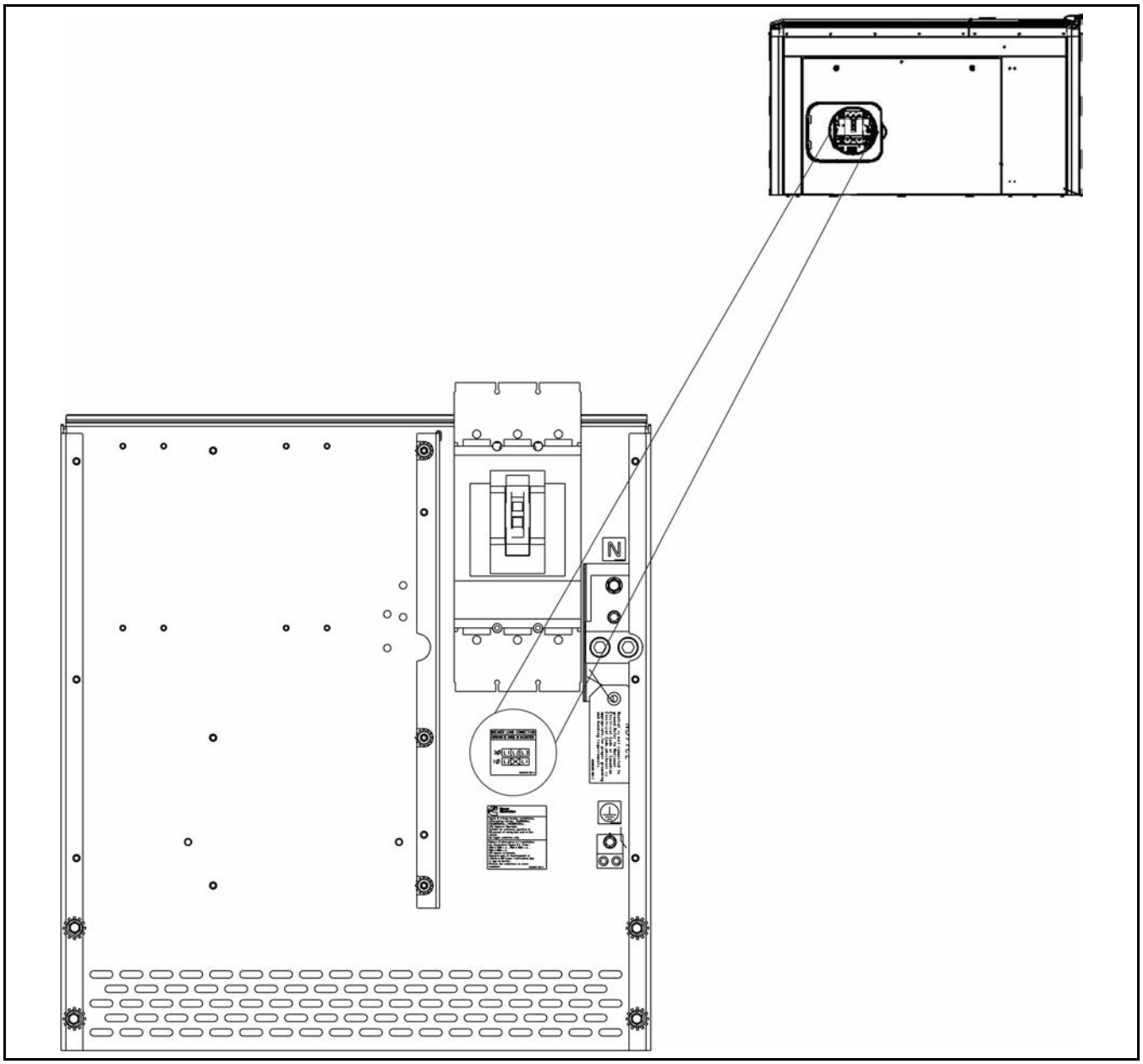


FIGURE 8. CIRCUIT BREAKER AC LOAD CONNECTIONS LOCATION

For connection to the generator set, AC load connections are made in the circuit breaker box. To access:

1. Remove the enclosure side panel to gain access to main circuit breaker box.
2. Place the circuit breaker handle in the OFF position.
3. Remove the four bolts holding the circuit breaker cover.
4. Install the conductors to the circuit breaker load-side terminals, neutral lug, and equipment grounding lug.
5. Torque the circuit breaker terminals per specifications on the circuit breaker label.

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6. Torque the neutral lug to 275 inch-pounds (31.1 Nm).
7. Torque the equipment grounding lug to 120 inch-pounds (13.8 Nm).
8. Fill in the stub-up openings with an approved duct seal or mastic tape to keep out insects and rodents.
9. Install the circuit breaker cover.

Automatic Transfer Switch AC Connections

⚠ WARNING

Failure to use an approved transfer switch can lead to the electrocution of personnel working on the utility lines, damage to equipment, fire, or personal injury. An approved switching device must be used to prevent interconnection to the public utility.

Refer to the specific transfer switch owner or operator manual for more detail about installing the ATS.

Customer AC Connections

The customer supplied AC circuit is used to power the following components:

- Alternator heater (if applicable)
- Battery charger (standard)
- Battery heater (if applicable)
- Engine coolant heater (if applicable)
- Engine oil heater (if applicable)

The AC circuit must be 120 VAC, 20 Amp protected. The wires from this customer supplied circuit are terminated within the enclosure at the five place connectors labeled "Ground", "Line" and "Neutral". Follow regional regulations and applicable electrical codes for installation.

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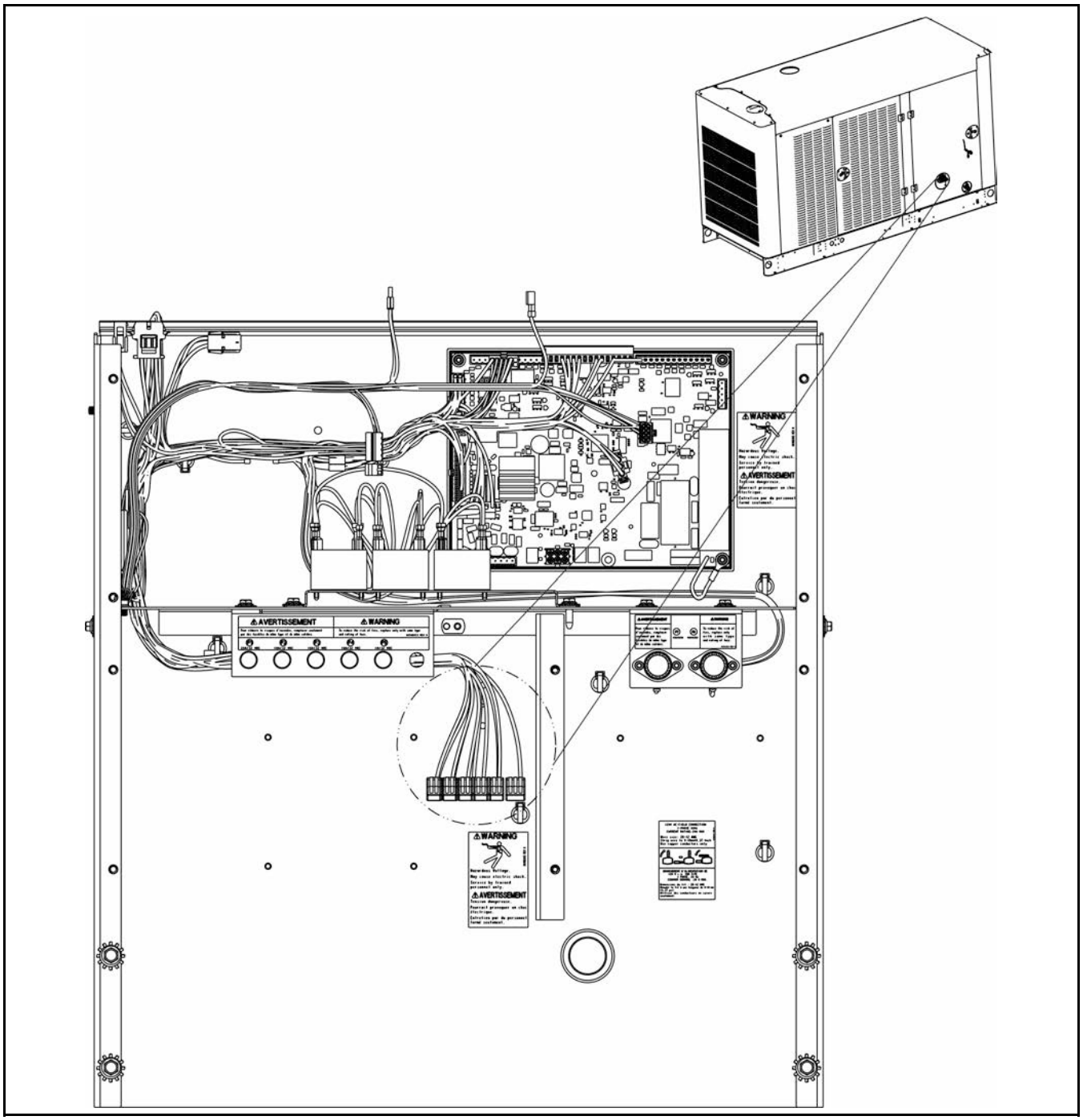


FIGURE 9. CUSTOMER AC CONNECTIONS

Factory Option and Accessory Connections

NOTICE
Use copper conductors only.

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The available AC powered options or accessories are the following:

- Alternator heater
- Battery charger
- Battery heater
- Engine coolant heater
- Engine oil heater

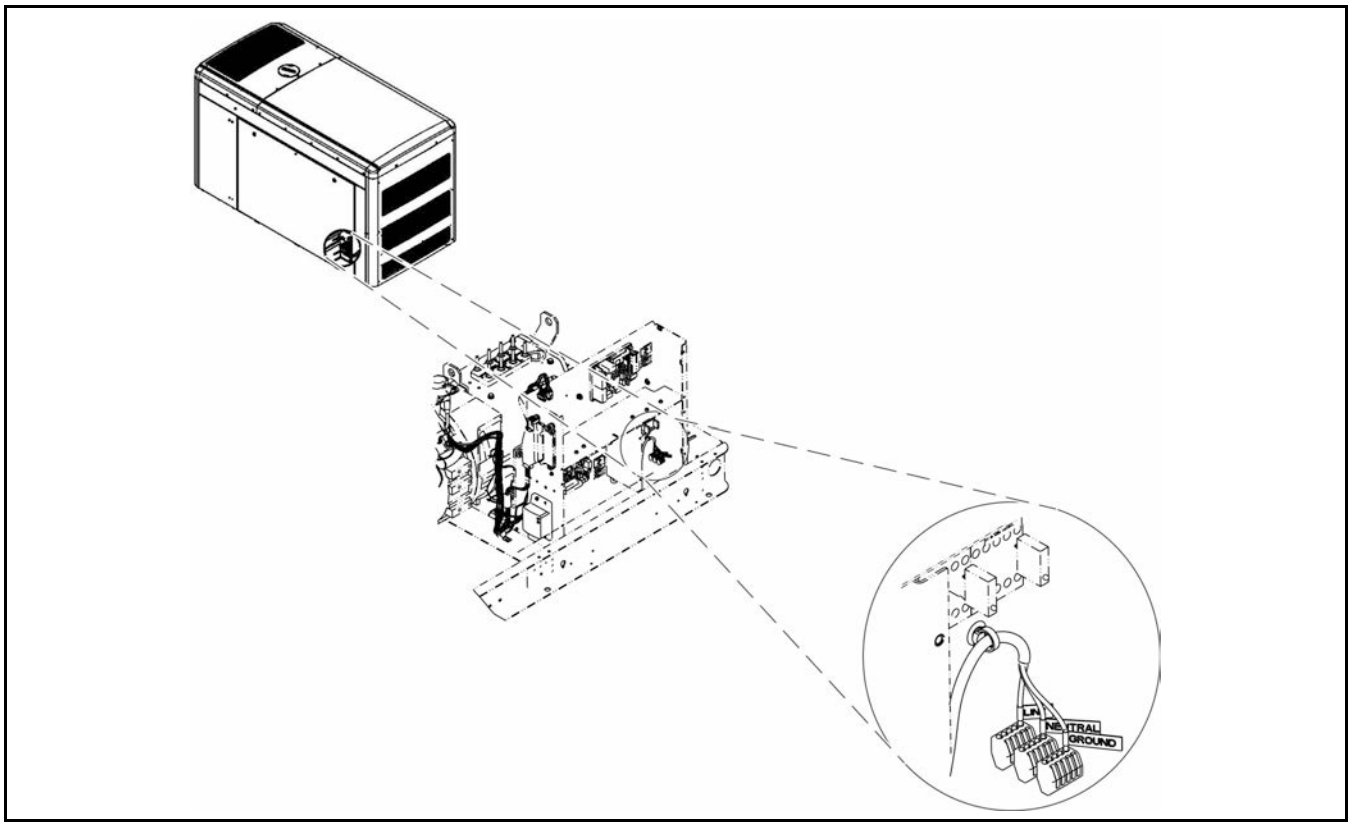


FIGURE 10. AC ACCESSORY CONNECTIONS

The alternator heater, battery charger, battery heater, engine coolant heater, and engine oil heater require power from a 120 VAC, 20 Amp protected circuit from the main distribution panel. Use 12 AWG 167 °F (75 °C) conductors to make connections to the generator set AC distribution connector.

DC Connections

NOTICE
When selecting and installing conduit to the generator set, account for any needed accessories, such as a remote display, etc.

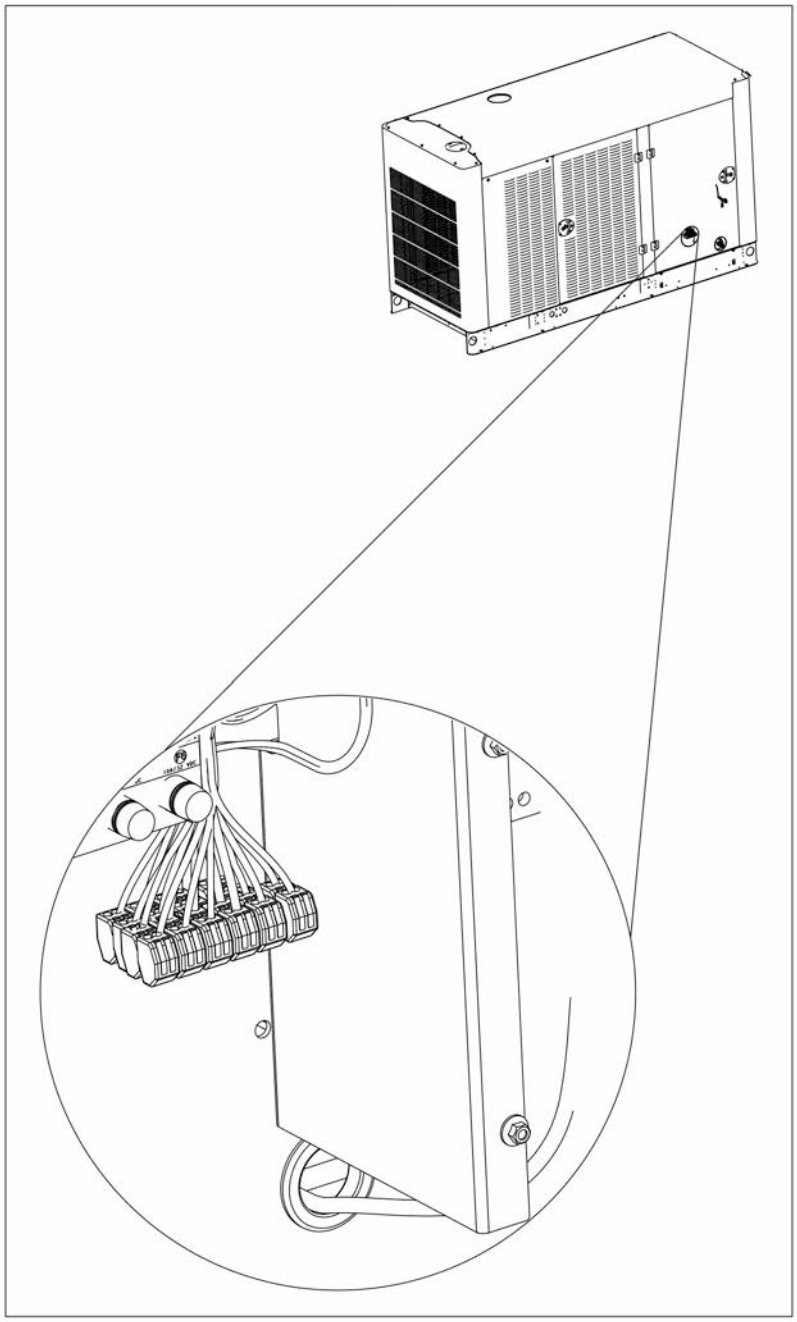


FIGURE 11. DC CUSTOMER CONNECTIONS

Automatic Transfer Switch DC Connections

⚠ WARNING

Failure to use an approved transfer switch can lead to the electrocution of personnel working on the utility lines, damage to equipment, fire, or personal injury. An approved switching device must be used to prevent interconnection to the public utility.

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Install the transfer switch in accordance with the specific transfer switch owner or operator manual.

The following image is an example that shows the location of the connectors in the generator set where the ATS DC control wires terminate. This is also the location of the connectors where load management control wires (if applicable) terminate.

NOTICE
Class 1 wiring methods should be used for connecting the generator set and transfer switch signal wiring.

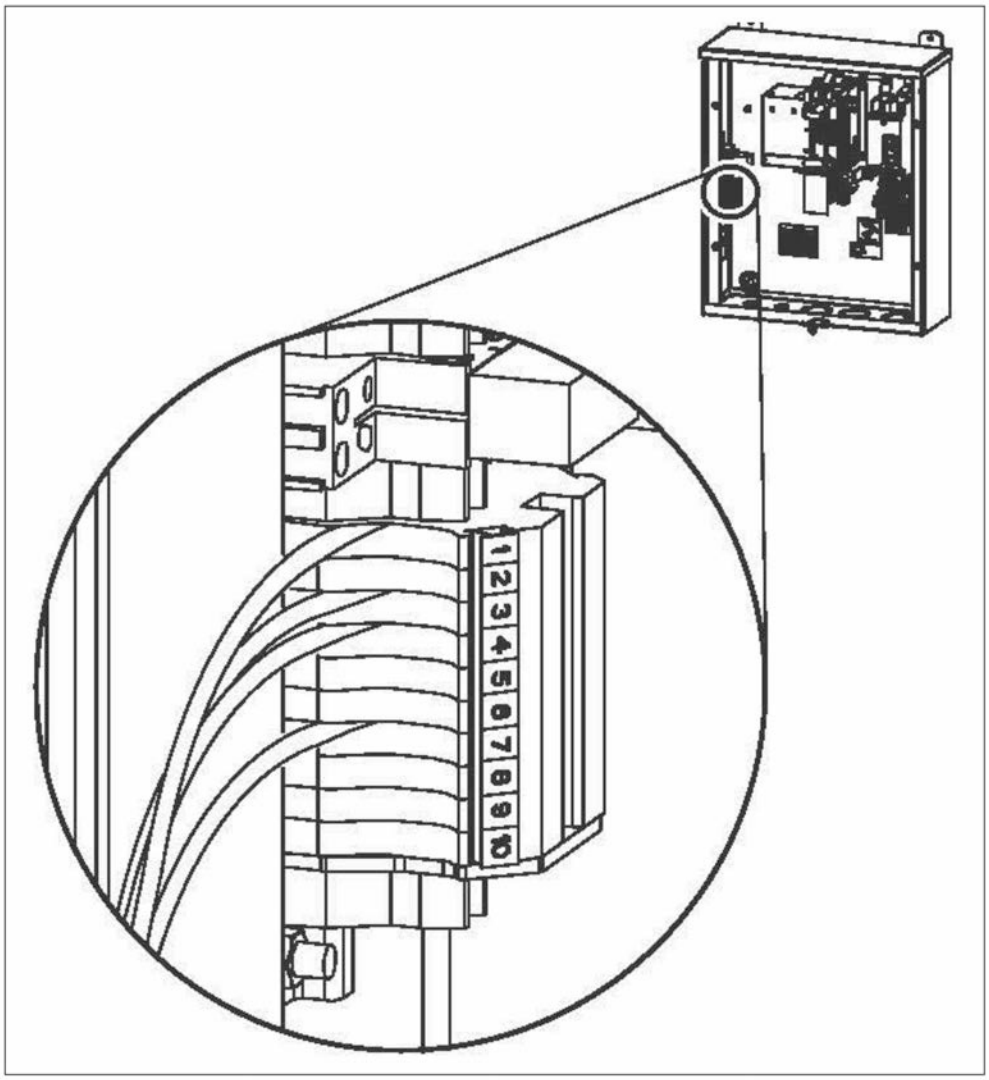
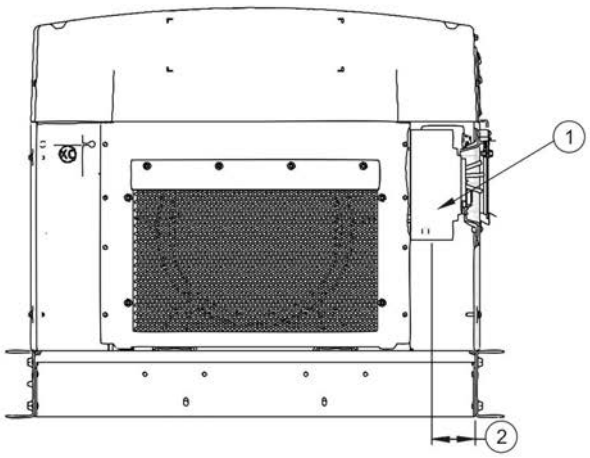


FIGURE 12. EXAMPLE OF TRANSFER SWITCH DC CONNECTIONS LOCATION

Drilling Locations for Electrical Connections

Route the electrical leads vertically through conduit that is installed in the mounting pad that terminates in the electrical connection areas. Refer to the Outline and system Drawings appendix for the location of electrical connection areas. Comply with NEC and local codes and standards for the installation of wires for electrical circuits. Refer to NEC standards for required wire bend radius and ampacity of load leads.



No.	Description	No.	Description
1	Circuit Breaker	2	Maximum 3 in. Bend Radius Gap

FIGURE 13. CABLING ROOM FOR CIRCUIT BREAKER

Grounding

NOTICE
The generator set is shipped from the factory with the neutral and equipment ground not bonded together.

Refer to local codes and standards for grounding procedures.

Battery

⚠ CAUTION
Ensure that the AC power to the battery charger is disconnected when installing the battery.

⚠ CAUTION
Wear proper safety protection when working around batteries. Keep open flames and sparks away from the equipment.

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NOTICE

Only personnel knowledgeable of batteries and required precautions should perform or supervise battery servicing.

NOTICE

See the Important Safety Instructions section for complete battery-related safety information.

The generator set requires a 12V battery (negatively grounded) for engine cranking and powering the electronic control system. When the generator set is running, the battery is charged from the engine-driven battery alternator. When the set is not running, an AC powered battery charger is needed to keep the battery charged.

As part of the installation, make sure that the battery is secured to the battery tray with the strap provided.

To connect the battery:

1. Connect the positive battery terminal.
2. Connect the negative battery terminal.
3. Make sure that the black and red battery cable boots are in place.

Refer to the Model Specifications section for battery specifications.

An optional thermostatically controlled battery heater is available for more reliable starting.

To prevent injury due to accidental startup:

- Do not connect the battery cables to the battery until the installation has been completed;
- Make sure tools, rags, and body parts are kept away from any rotating parts or electrically live parts; and
- Make sure it is time to start the generator set.

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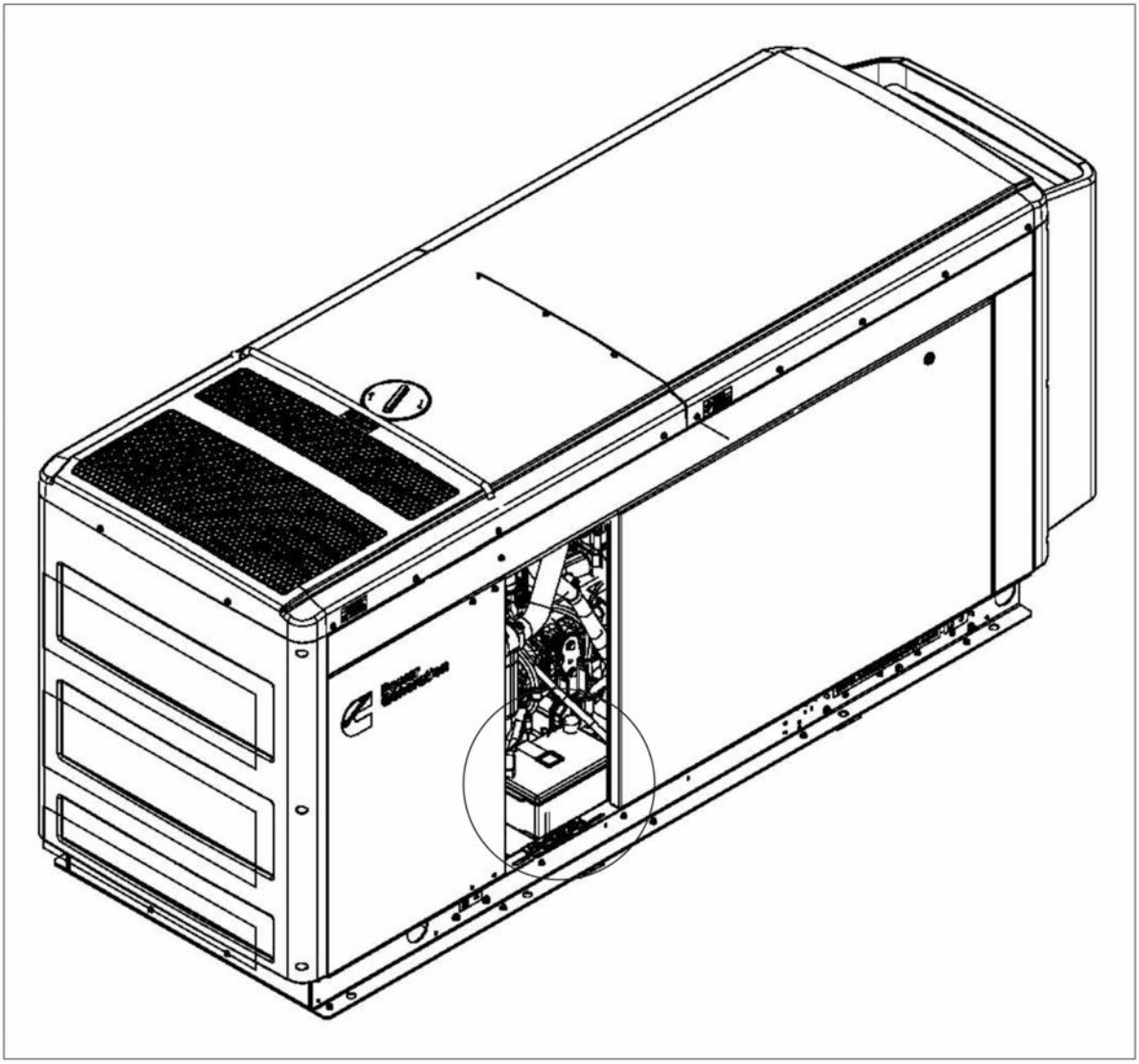


FIGURE 14. TYPICAL BATTERY LOCATION

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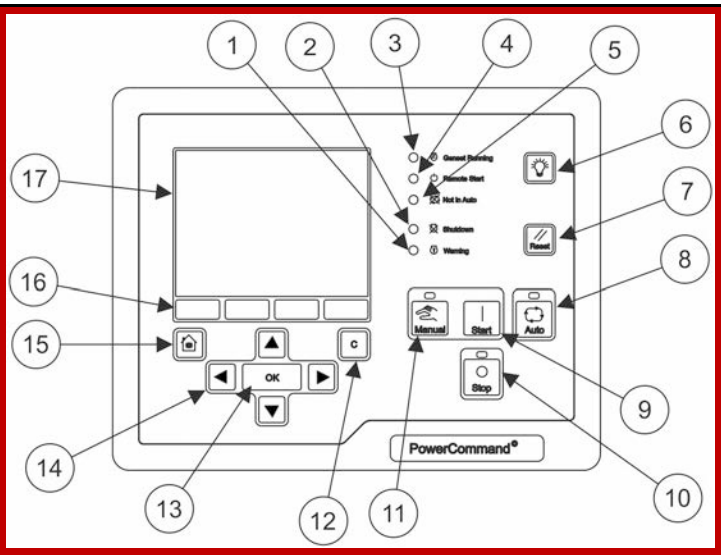
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5 Startup and Configuration

5.1 Operator Panel

The figure below shows the features of the front panel. It includes five lamp indicators; the graphical display with four menu select and seven menu navigation buttons; and six control mode buttons. This display panel enables the operator to look at the status, adjust the settings, and start and stop the generator set.



No.	Description	No.	Description
1	Indicator Lamp – Warning	10	Stop Button
2	Indicator Lamp – Shutdown	11	Manual Button
3	Indicator Lamp – Genset Running	12	Previous Menu Button (or Clear)
4	Indicator Lamp – Remote Start	13	Item Select Button (OK)
5	Indicator Lamp – Not in Auto	14	Menu Navigation Buttons (Up, Down, Left, Right)
6	Lamp Test Button	15	Home Button
7	Reset Button	16	Menu Select Buttons (for use with Item 17)
8	Auto Mode Button	17	Graphical Display
9	Start Button		

FIGURE 15. OPERATOR PANEL

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Operator Panel - Initial Operator Menu

Figure 16 on page 51 shows the initial menu which is displayed over two pages. Use the soft-key buttons below the up and down arrows (▲ and ▼) to toggle between the two pages.

Use the soft-key buttons below Genset, Alternator, or Engine to short-cut to those menus.

Pressing the **Home** button  from any screen will return the display to the main menu screens.

Initial Menu Data

This menu displays the information available through the menus.

TABLE 15. INITIAL DATA MENU

Name	Description	
History/About	Use this screen to view historical information about your generator set.	
Faults:	If there are no active Faults, these screens will not be available.	
	Active Shutdowns	Use this screen to view active Shutdown faults.
	Active Warning	Use this screen to view active Warning faults.
	History	Use this screen to view faults that have been cleared.
Genset Data	Use this screen to view the status of the generator set.	
Alternator Data	Use this screen to view the status of the alternator.	
Engine Data	Use this screen to view the status of the engine.	
Advanced Status:	---	
	Genset	Use this screen to view power, energy, phase difference, and other detailed generator set information.
	Controller	Use this screen to view sequences of operation, configurable inputs and outputs, and other detailed controller information.
	Engine	Use this screen to view pressures, voltages, temperatures, and other detailed engine information.
Help	Use this screen to obtain more information regarding the operator panel.	

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Name	Description
Adjust	The use of these screens is restricted to authorized personnel only.
Genset Setup	
Paralleling Basic Setup	
OEM Setup	
PCCnet Setup	
Modbus Setup	
Display Options	
Clock Setup	
Configurable IO	
Calibration	
Save/Reserve	

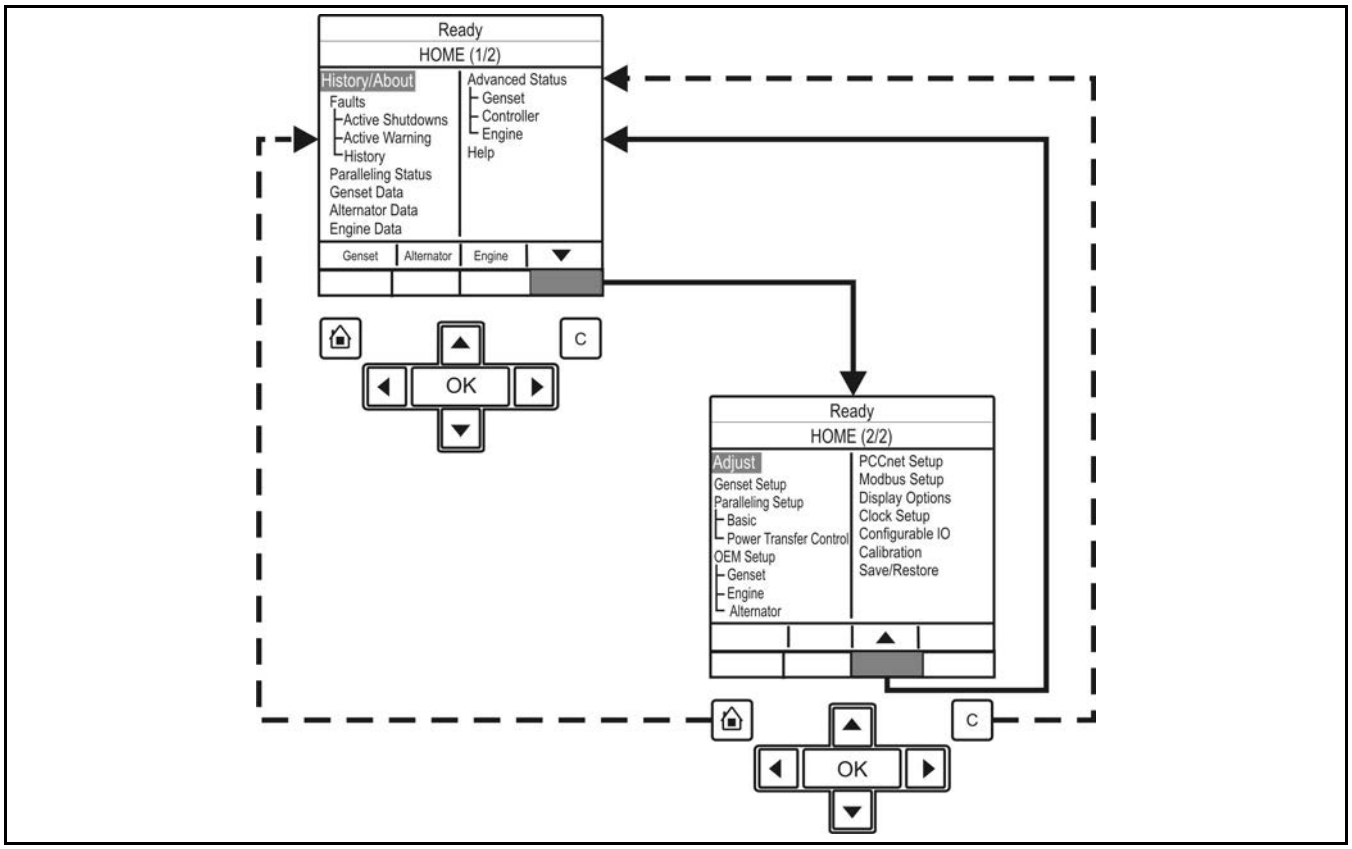


FIGURE 16. INITIAL OPERATOR MENU

- Press the **Home** Button to return to the main menu at any time.

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- Press the **C** Button [C] to return to the previous menus. Settings will not be saved when this button is pressed.

Operator Panel - Engine Data Operator Menu

The Engine Data Menu - Typical Data figure shows a block representation of a typical Engine Data menu. To navigate from the Home menu (HOME [1/2]), press the soft-key button below the function button indicating Engine. This will take you directly to the Engine menu.

The Engine Data menu is displayed on one page.

Engine Data

Use this menu to look at the status of the engine.

Name	Description	Allowed Values
Pressure		
Oil	Monitor point for Oil Pressure	0 to ~993 kPa (0 to ~145 PSI)
Boost	Monitor point for Boost Absolute Pressure	0 to ~1014 kPa (0 to ~148 PSI)
Fuel Rail	Monitor point for Fuel Outlet Pressure	0 to ~249364 kPa (0 to ~36404 PSI)
Fuel Inlet	Monitor point for Fuel Supply Pressure	0 to ~993 kPa (0 to ~145 PSI)
Coolant	Monitor point for Coolant Pressure	0 to ~993 kPa (0 to ~145 PSI)
Crankcase	Monitor point for Crankcase Pressure	-244 to ~260 kPa (-35.67 to ~38 PSI)
Ambient	Monitor point for Barometric Absolute Pressure	0 to ~253 kPa (0 to ~37 PSI)
Temperature		
Coolant	Monitor point for Coolant Temperature	N/A
Oil	Monitor point for Oil Temperature	-40 to ~210 °C (-40 to ~410 °F)
Manifold	Monitor point for Intake Manifold Temperature	-40 to ~210 °C (-40 to ~410 °F)
Fuel Inlet	Monitor point for Fuel Temperature	-40 to ~210 °C (-40 to ~410 °F)
Aftercooler	Monitor point for Aftercooler Temperature	-40 to ~210 °C (-40 to ~410 °F)
Other		
Engine Hrs	Total engine run time	
Engine Speed	Monitor point for Average Engine Speed	
Batt Voltage	Battery voltage value	

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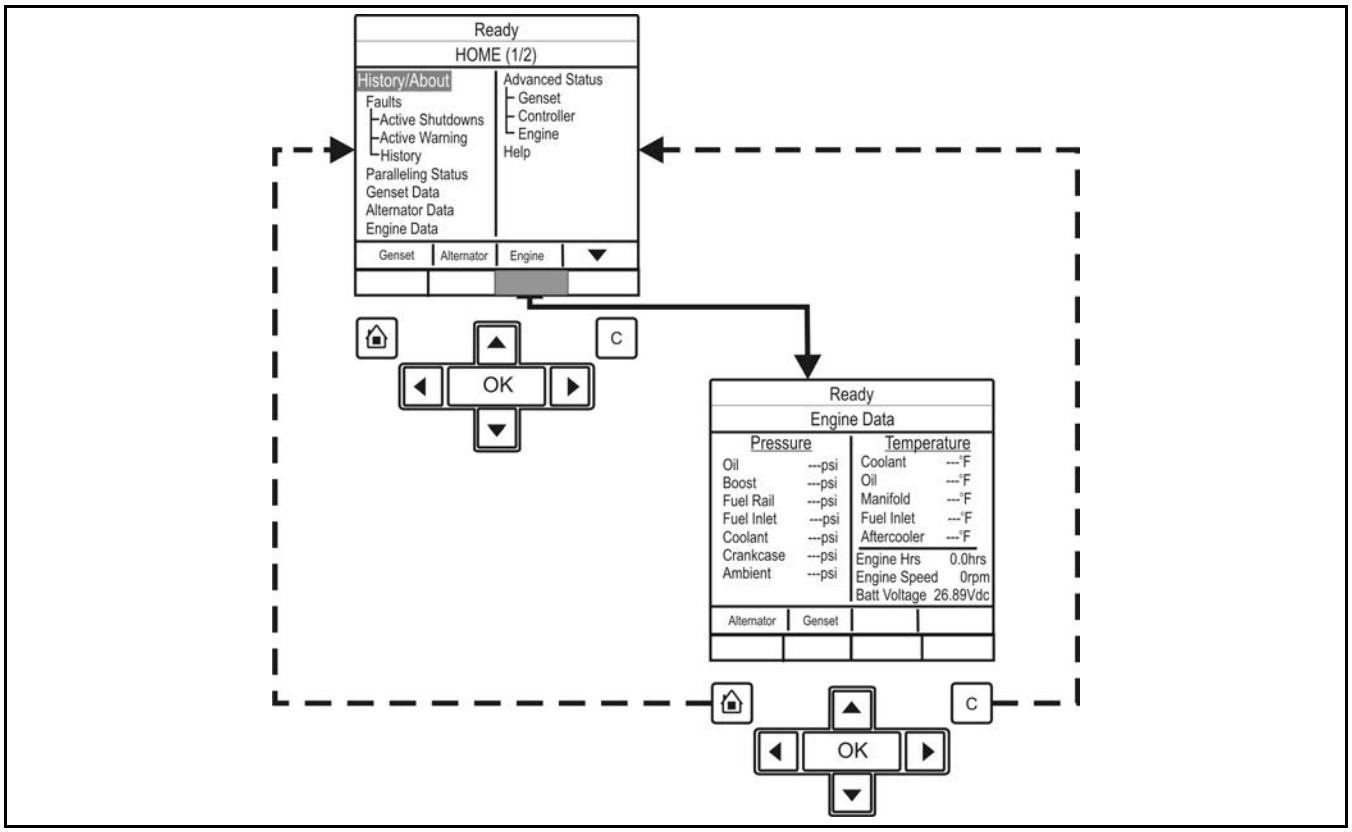


FIGURE 17. ENGINE DATA MENU - TYPICAL DATA

- Press the **Home** Button to return to the main menu at any time.
- Press the **C** Button to return to the previous menus. Settings will not be saved when this button is pressed.

History/About Menu

Figure 18 on page 55 shows a block representation of a typical History/About menu.

To navigate from the Home menu, toggle down until the History/About line of text is highlighted, and press the OK button. This information is displayed over three pages. Use the two soft-key buttons below the up and down arrows (▲ and ▼) to toggle between the pages.

This screen displays the historical information about the generator set.

Name	Description
Starts	Total number of start attempts.
Runs	Total number of generator set runs.
Engine Hours	Total engine run time.
Control Hours	Controller ON time in seconds. Upper limit is 136 years.

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Name	Description
Kw Hours	Generator set total net kWh accumulation.
Gen Mod #	Number identifying the model of the generator set. (Password level: 2)
Gen Ser #	Serial number identifying the generator set.
Nominal Voltage	Generator set nominal Line-to-Line voltage.
Wye/Delta	Delta or Wye for Generator set connection.
Rating Select	Selects Standby/Prime/Base application rating.
Contr Type	Used by the PC tool.
Firmware Ver	Version of software loaded into the control. Obtained from PowerCommand® 2.3 Filename.
Calib Part	The unique calibration part number loaded into the control.
Calib Date	The revision date of the calibration part number loaded into the control.
ECM Code	The calibration coded the ECM is sending.
HMI Firm Ver	Parameter: HMI Local Parameter.
HMI Boot Ver	Parameter: HMI Local Parameter.
50 Hz Load Profile*	This shows how long the generator set has been running (50 Hz operation) at various percentages of its rated load.
60 Hz Load Profile*	This shows how long the generator set has been running (60 Hz operation) at various percentages of its rated load.
* When using the Load Profile Graph table (for 50 Hz or 60 Hz), the upper line's value indicates 100% of table.	

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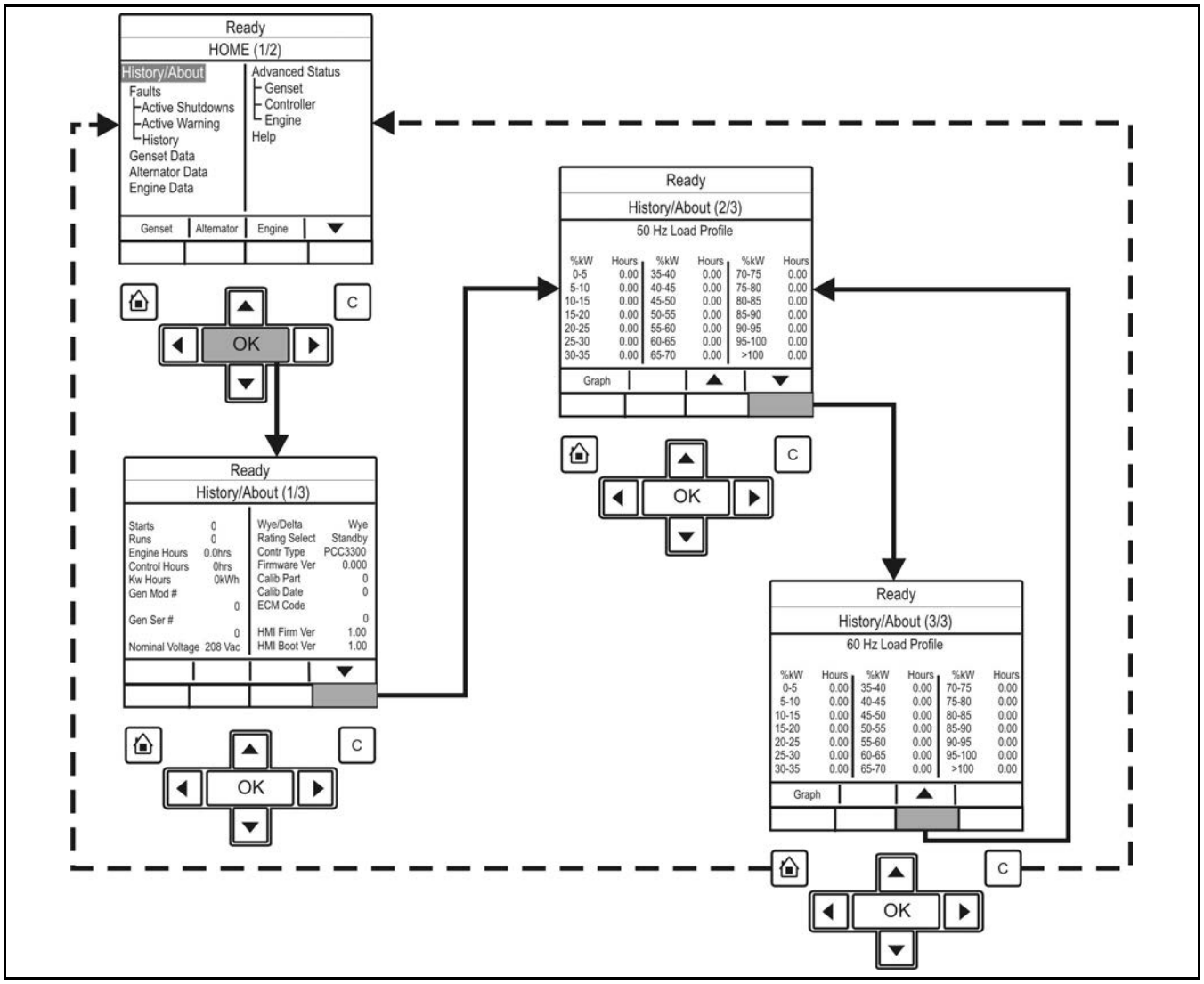


FIGURE 18. HISTORY/ABOUT MENU - TYPICAL DATA

- Press the **Home** Button [⌂] to return to the main menu at any time.
- Press the **C** Button [C] to return to the previous menus. Settings will not be saved when this button is pressed.

Genset Setup Menu

Use the Genset Setup menu to view generator setup data. The figure below shows block representations of the Genset Setup menu and sub-menus.

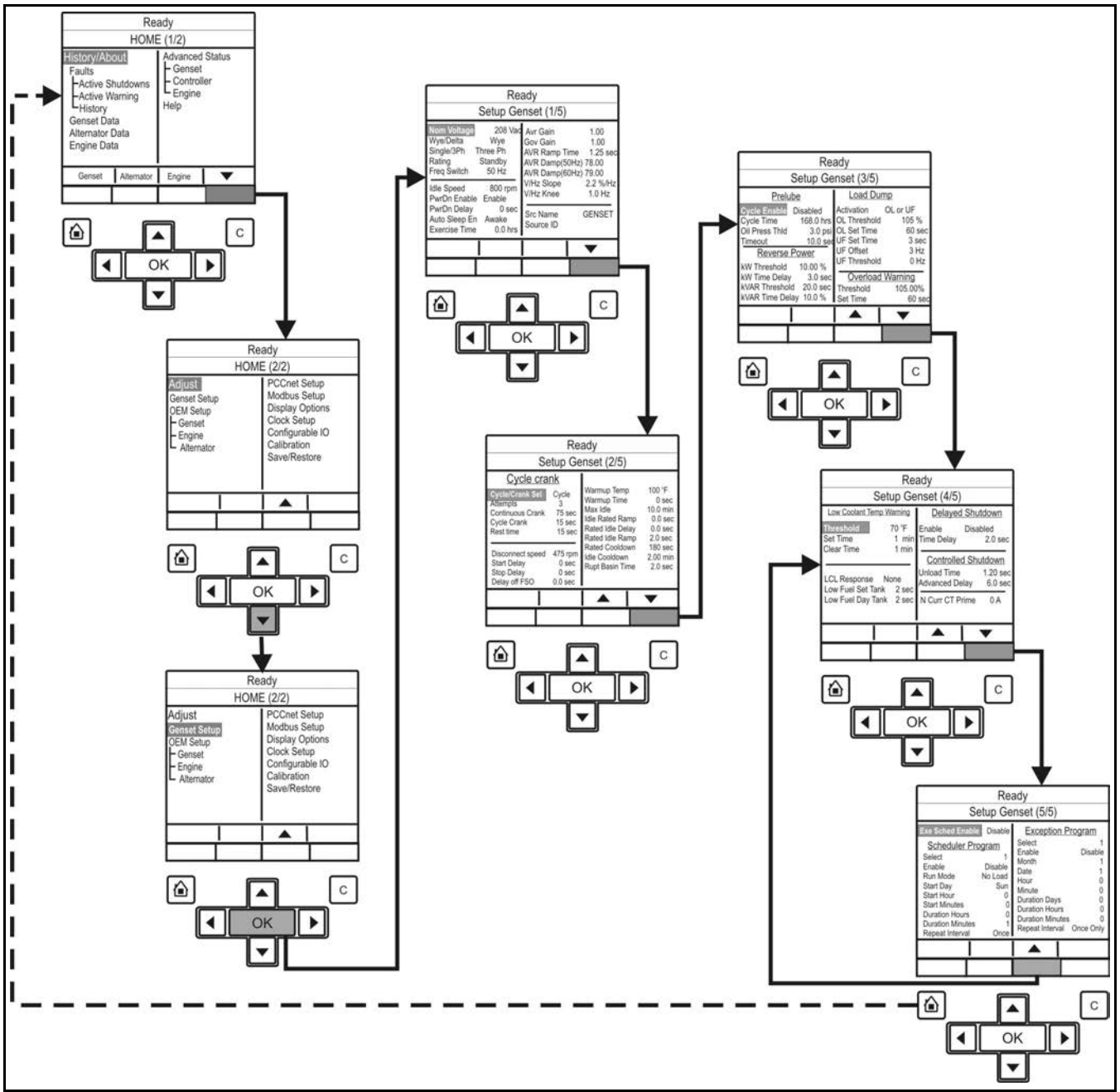
1. Use the two soft-key buttons below the up and down arrows (▲ and ▼) to page down to the second page of the HOME (2/2) menu.
2. In the HOME (2/2) menu, use the up and down arrows (▲ and ▼), to highlight the Genset Setup text.
3. With the Genset Setup text highlighted, press the **OK** button. This will display the Setup Genset menu.

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4. Use the two soft-key buttons below the up and down arrows (▲ and ▼) to page through the five pages of generator setup data.

NOTICE
If any of these settings need to be changed, please contact your authorized service center.

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Press the **Home** Button to return to the main menu at any time.

Press the **C** Button to return to the previous menus. Settings will not be saved when this button is pressed.

FIGURE 19. GENSET SETUP MENU - TYPICAL DATA

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5.2 InPower Service Tool

The InPower™ service tool can be used in troubleshooting to perform tests, verify control inputs and outputs, and test protective functions. Refer to the InPower User's Guide, provided with the InPower software for test procedures.

5.3 Checklist

Tick	General Items
	Generator set wattage capacity is sufficient to handle maximum anticipated load.
	At least 3 feet (914.4 mm) of clearance (or greater for housing door) is provided around the entire generator set for service and ventilation.
	The generator set is located in an area not subject to flooding.
	All operating personnel have read and are familiar with the generator set Operator manual, all health and safety procedures, warnings, cautions, precautions, and the other documentation supplied with the generator set.
	All operators have been thoroughly briefed on preventative maintenance procedures.
	All operators have read and understand all important safety instructions.
	Generator Set Support
	The floor, roof, or earth on which the generator set rests is strong enough and will not allow shifting or movement. Observe local codes on soil bearing capacity due to freezing and thawing.
	The generator set is properly supported and retained to an approved base
	The supporting base is large enough and is of non-combustible material, extending 6 inches (152.4 mm) all around the generator set.
	Cooling Air Flow
	Generator set air inlet is faced into direction of strongest, prevailing winds.
	Air inlet openings are unrestricted and are at least 1 to $1^{1}/_{2}$ times larger than air outlet area.
	Cooling air outlet is on downwind side of building (if not, wind barrier is constructed).
	Proper ducting material (sheet metal, canvas) is used between radiator and air outlet.
	Diesel Fuel System
	Fuel tanks meet or exceed all Local, State, or National codes (if applicable).
	Fuel lines are properly installed, supported, and protected against damage.
	The fuel filters have been installed.

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	Approved flexible fuel line is installed between the main fuel supply and the generator set's fuel system near the generator set, to protect it against damage caused by vibration, expansion, and contraction.
	Strainer or fuel screen (100 to 200 mesh) is installed in the fuel supply line to protect the fuel lift pump, day tank transfer pump, or float valve seat from fuel tank debris (if applicable).
	The fuel filter assembly shipped with the generator set is installed and operational (if applicable).
	Fuel supply shutoff valves are installed to prevent fuel flow in case of leaks.
	No shutoff valves are installed on engine fuel return line (if applicable).
	External fuel pumps are connected and operational at all times - generator set started or shut down (if applicable).
	Fuel tanks are filled with the correct grade / type of fuel (if applicable).
	Fuel system is properly primed.
	No fuel leaks are found in supply line or engine fuel system.
	Exhaust System
	The breather tube routing is set up to blow the fumes away from the generator set (if applicable)
	Operators are thoroughly briefed on the dangers of carbon monoxide gas.
	If the installation includes a heavy duty air cleaner, it has been installed.
	Areas around generator set are well ventilated. No possibility of exhaust fumes entering building doors, windows, or intake fans.
	Exhaust gases are piped safely outside and away from building.
	The correct length of approved rigid pipe is connected to the generator set flexible pipe using approved securing methods with no weight resting on engine exhaust components. There are no bends in flex section.
	Condensation drain is provided in lowest section of exhaust piping.
	Exhaust piping is insulated to guard against burns to personnel.
	Exhaust piping passing through walls or ceilings have approved fire-proof materials and are in compliance with all codes.
	Exhaust piping is large enough in diameter to prevent excessive back pressure on engine.
	Verify that the pyrometer meters are functioning.
	AC and DC Wiring
	For bottom entry circuit breaker installations, the cable chute has been installed (if applicable).
	Wire sizes, insulation, conduits and connection methods all meet applicable codes.

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	AC and DC wires are separated in their own conduit to prevent electrical induction.
	All load, line and generator connections are well made and correct.
	Flexible conduit is used between the generator and the building or surrounding structure.
	Check phase rotation.
	Generator Set Pre-Start
	Generator set engine is properly serviced with oil and coolant.
	Battery charger is installed using the appropriate cable size and is operational.
	Battery charger is configured for the proper DC battery voltage, battery type, and float voltage.
	Batteries are properly installed, serviced and charged.
	Battery temperature sensor is connected and operational (if applicable).
	Engine coolant heater is connected and operational.
	All generator set covers and safety shields are installed correctly.
	All fuel and coolant shutoff valves are operational.
	Radiator fan and other external moving parts including drive belts are unrestricted.

5.4 Starting

NOTICE
One operator should be in complete charge, or working under the direction of someone who is in charge. Remember that, upon starting the engine, cables and switchgear will become energized, possibly for the first time. Furthermore, equipment that does not form part of the generator set installation may become electrically charged. Only authorized and competent personnel should carry out this work.

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

NOTICE
Avoid off-load running for other than short periods. A minimum loading of 30% is recommended. The engine must be shut down as soon as possible after the appropriate functions have been checked.

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Before attempting to start the generator set, the operator should read through this entire manual and the specific literature provided as part of the documentation pack supplied with the generator set. It is essential that the operator be completely familiar with the generator set and the PowerCommand® control.

The following sub-sections cover the systems used to start and stop the generator set.

Before starting the generator set, make sure that exhaust and fuel fittings are tight and properly positioned, and that proper maintenance and pre-start checks have been performed.

During starting automatic checks are carried out for the integrity of various protection systems. The PowerCommand® control will not allow the generator set to continue the starting sequence if the integrity of a sensor is considered to be in doubt.

The generator set can be configured for a number of starting cycles (one to seven) with set times for crank and rest periods for all starting modes (manual/remote). The default setting is for three start cycles, composed of fifteen seconds of cranking and 30 seconds of rest.

NOTICE

The number of starting cycles, and the crank and rest times are set from within the Setup menu. Trained and experienced service personnel are required to change the default setting. Contact your authorized distributor.

Initial Pre-Start Checks

⚠ WARNING

Electric Shock Hazard

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

Make sure that only personnel who are trained and experienced work with distribution voltages. Even after generator set shutdown, an electrical shock hazard may still exist, caused by induced or residual voltage within the alternator or cables. Some interfaces may display zero voltage even when voltages are present.

⚠ WARNING

Hot Pressurized Liquid

Contact with hot liquid can cause severe burns.

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

Before starting, be sure competent personnel have made the following checks to ensure that the unit is ready for operation:

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TABLE 16. INITIAL PRE-START CHECKS

<table>
<tr><th>Check</th><th>Description</th></tr>
<tr><td>Generator Set Grounding</td><td>Grounding (earthing) must be checked prior to performing service or inspection procedures that may expose personnel to conductors normally energized with voltages greater than 600 Volts. Contact your authorized distributor.</td></tr>
<tr><td>Megger and Insulation Testing</td><td>This must be performed on all generator sets before initial start-up and after the generator set Grounding Procedure has been completed. Insulation testing for low voltage (less than 600 Volts) generator sets is recommended by Cummins Power Generation. These tests are used to verify that the windings are dry before the generator set is operated, and to develop a base line for future test comparisons. Contact your authorized distributor.

NOTICE
When Megger-testing an alternator, failure to protect the voltage regulator, control and diodes could result in permanent damage to one or more of the electronic components.</td></tr>
<tr><td>Lubrication</td><td>Check the engine lubrication oil level and ensure that the correct level is always maintained.

NOTICE
Generator sets may be shipped dry. They must be filled with the correct type and quantity of oil before use. Be sure to check oil level before initial start. Failure to fill to the recommended level can result in equipment damage.</td></tr>
<tr><td>Coolant</td><td>Check the engine coolant level and ensure that the level is always maintained. Fill the cooling system to the bottom of the fill neck in the radiator fill or expansion tank. Do not check the level while the engine is hot.

NOTICE
You must comply with Cummins Power Generation’s requirements for the correct type and concentration of anti-freeze and DCA inhibitor. Warranty claims for damage will be rejected if the incorrect mix has been used. Consult your authorized distributor for the correct anti-freeze specifications and concentration for your operating conditions.

NOTICE
Some radiators have two fill necks, both of which must be filled after the cooling system has been drained.</td></tr>
</table>

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Generator sets may be shipped dry. They must be filled with the correct type and quantity of coolant before use. Be sure to check coolant level, or levels, before initial start.

Operator's Pre-Start Checks

⚠ WARNING

Arc Flash and Shock Hazard
Electric arc flash can cause electrical shock, severe burns, or death.
Make sure the alternator is dry before the generator set is operated.

⚠ WARNING

Hot Pressurized Liquid
Contact with hot liquid can cause severe burns.
Do not open the pressure cap while the engine is running. Let the engine cool down before removing the cap. Turn the cap slowly and do not open it fully until the pressure has been relieved.

NOTICE

Some radiators have two fill necks, both of which must be filled when the cooling system has been drained.

TABLE 17. OPERATOR'S PRE-START CHECKS

Check	Description
Fuel Supply	Make sure: that the fuel tank is filled to the normal level with clean water-free fuel and that the fuel system is primed; that all the valves required for operation are open; and that there are no leaks and that all fittings are tight.
Lubrication	With the engine stationary, check the engine lubrication oil level and make sure that the correct level is always maintained.
Coolant	Check the engine coolant level and make sure that the level is always maintained at the coolant expansion tank. Fill the cooling system to the bottom of the fill neck in the radiator fill or expansion tank. Do not check while the engine is hot.
Cooling Air Inlet/Outlets	Make sure that the cooling air inlets/outlets are unobstructed.

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Check	Description
Exhaust Outlet	Make sure: that exhaust components are secured and not warped; that the exhaust outlet is unobstructed; that no combustible materials are near the system; that gases are discharged away from building openings; and that there are no leaks and that all fittings are tight.
Batteries	Make sure that the batteries are charged, and that all connections are correct and tight.
Auxiliary AC Supplies	Make sure that all auxiliary equipment is receiving power from the customer's supply.
Emergency Stop	Make sure that the emergency stop button is fully operational.

Starting at the Operator Panel (Manual Run Mode)

NOTICE
Make sure that all Pre-start Checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity of the generator set and connected load equipment that the generator set is about to start.

STARTING IN MANUAL RUN MODE

1. Make sure the main circuit breaker is in the open position.
2. To start the generator set in the **Manual Run** mode:
   a. Press the **Manual** button 

on the operator panel.
   b. Press the **Start** button 

within ten seconds.

NOTICE
Failure to press the Start button within this time will result in the generator set changing to the Off mode. Refer also to the Selecting Manual Run Mode section.

NOTICE
If the mode change access code feature has been enabled, enter the access code when prompted. See the Passwords and Mode Change Access section.

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3. The PowerCommand® control will initiate a starter cranking signal and will perform an automatically sequenced manual start, under a complete engine protection system combined with full monitoring capability. This will activate the engine control system and the starting procedure. The starter will begin cranking and, after a few seconds, the engine will start and the starter will disconnect.

   If the engine fails to start, the starter will disengage after a specified period of time and the control will indicate a Fail to Start shutdown.

   To clear a Fail to Start shutdown:

   a. Press the **Stop** button. 

   b. Press the **Reset** button. 

4. Before attempting to re-start, wait a minimum of two minutes for the starter motor to cool and then repeat the starting procedure. If the engine does not run after a second attempt, refer to the Troubleshooting section of the operator manual.

DISABLING MANUAL MODE

To disable Manual mode, change to **Auto** or **Off** mode. If the generator set is running when it leaves **Manual** mode, it will continue to run if **Auto** mode has been selected and the remote start signal is active. If there is no active remote start signal, the generator set will stop.

Starting from Remote Location (Auto Mode)

NOTICE
Make sure that all Pre-start Checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity that the generator set is about to start.

1. To start the generator set in the **Auto Run** mode, select the **Auto** button from the operator panel. 

Refer also to the Selecting Auto Mode section.

   Once the PowerCommand® control receives a remote start signal, and after a Time Delay to Start, the control will initiate the starting sequence as above. The Remote Start LED will be lit.

NOTICE
If the mode change access code feature has been enabled, enter the access code when prompted. See the Passwords and Mode Change Access section.

NOTICE

When the generator set is operating in the Remote Start mode, removing the Remote Start command does not shut off the engine if the load is more than 10%, the cooldown timer is set to zero, and the control is configured for a single unit (not in parallel). The generator set continues to operate until it runs out of fuel, the E-stop button is used, or the load is removed.

2. To disable **Auto** mode, change to **Manual** or **Off** mode.

Cold Starting with Loads

NOTICE

Make sure that all pre-start checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity that the generator set is about to start.

Use a coolant heater if a separate source of power is available. The optional heater available from Cummins Power Generation will help provide reliable starting under adverse weather conditions. Be sure the voltage of the separate power source is correct for the heater element rating.

Cummins Power Generation recommends equipping standby generator sets (life safety systems) with engine water jacket coolant heaters to maintain the coolant at a minimum of 32 °C (90 °F) and, for most applications, accept the emergency load in ten seconds or less. Although most Cummins Power Generation generator sets will start in temperatures down to -32 °C (-25 °F) when equipped with engine water jacket coolant heaters, it might take more than ten seconds to warm the engine up before a load can be applied when ambient temperatures are below 4 °C (40 °F).

To advise the Operator of a possible delay in accepting the load, the **Low Coolant Temp (code 1435)** message, in conjunction with illumination of the **Warning** LED, is provided. The engine cold sensing logic initiates a warning when the engine water jacket coolant temperature falls below 21 °C (70 °F). In applications where the ambient temperature falls below 4 °C (40 °F), a cold engine may be indicated even though the coolant heaters are connected and functioning correctly. Under these conditions, although the generator set may start, it may not be able to accept load within ten seconds. When this condition occurs, check the coolant heaters for correct operation. If the coolant heaters are operating correctly, other precautions may be necessary to warm the engine before applying a load.

Checking Coolant Heater Operation

⚠ WARNING

Hot Surfaces
Contact with the hot surfaces can cause severe burns.
Avoid contact with hot parts. Allow hot parts to completely cool.

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Do not touch the cooling system outlet hose. The coolant heater is operating if radiant heat can be felt with your hand held close to the outlet hose and the engine is not running.

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Appendix A. Diesel Fuel Piping

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Table 19. Minimum Fuel Hose and Pipe Sizes; Up to 50 Feet (15 Meters) Equivalent Length. 71

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A.0 Diesel Fuel Piping Requirements

- Diesel fuel lines should be constructed from black iron pipe. Cast iron and aluminum pipe and fittings must not be used because they are porous and can leak fuel. Galvanized fuel lines, fittings, and tanks must not be used because the galvanized coating is attacked by the sulfuric acid that forms when the sulfur in the fuel combines with tank condensate, resulting in debris that can clog fuel pumps and filters. Copper lines should not be used because fuel polymerizes (thickens) in copper tubing during long periods of disuse and can clog fuel injectors. Also, copper lines are less rugged than black iron, and thus more susceptible to damage.

NOTICE
Never use galvanized or copper fuel lines, fittings or fuel tanks. Condensation in the tank and lines combines with the sulfur in the diesel fuel to produce sulfuric acid. The molecular structure of the copper or galvanized lines or tanks reacts with the acid and contaminates the fuel.

- Approved flexible fuel hose must be used for connections at the engine to take up generator set movement and vibration.
- Piping from a day tank to the engine should run “downhill" all the way from the tank to the engine, with no overhead loops that can allow air to be entrained in the system.
- Fuel system piping should be properly supported to prevent vibration and breakage due to vibration. The piping should not run close to heating pipes, electrical wiring, or engine exhaust system components. The piping system design should include valves at appropriate locations to allow isolation of system components for repair without draining the entire fuel system.
- Piping systems should be regularly inspected for leaks and general condition. The piping system should be flushed before operation of the engine to remove dirt and other impurities that could damage the engine. Use of plugged “T" connections rather than elbows allows for easier cleaning of the piping system.
- The engine manufacturer's data indicates the maximum fuel inlet and return restrictions, the maximum fuel flow, supply and return, and the fuel consumption. The table below indicates minimum hose and pipe sizes for connections to a supply tank or day tank when it is within 50 feet (15 meters) of the set and at approximately the same elevation.

Hose and pipe size should be based on the maximum fuel flow rather than on the fuel consumption. It is highly recommended that the fuel inlet and return restrictions be checked before the generator set is placed in service.

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TABLE 19. MINIMUM FUEL HOSE AND PIPE SIZES; UP TO 50 FEET (15 METERS) EQUIVALENT LENGTH.

Max Fuel Flow Rate GPH (L/hr)	Flex Hose No.*	NPS Pipe Size (in)	DN Pipe Size (mm)
Less than 80 (303)	10	½	15
81-100 (304-378)	10	½	15
101-160 (379-604)	12	¾	20
161-230 (605-869)	12	¾	20
231-310 (870-1170)	16	1	25
311-410 (1171-1550)	20	1-1/4	32
411-610 (1550-2309)	24	1-1/2	40
611-920 (2309-3480)	24	1-1/2	40

* Generic fuel hose suppliers' size specification.

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Appendix B. Outline and System Drawings

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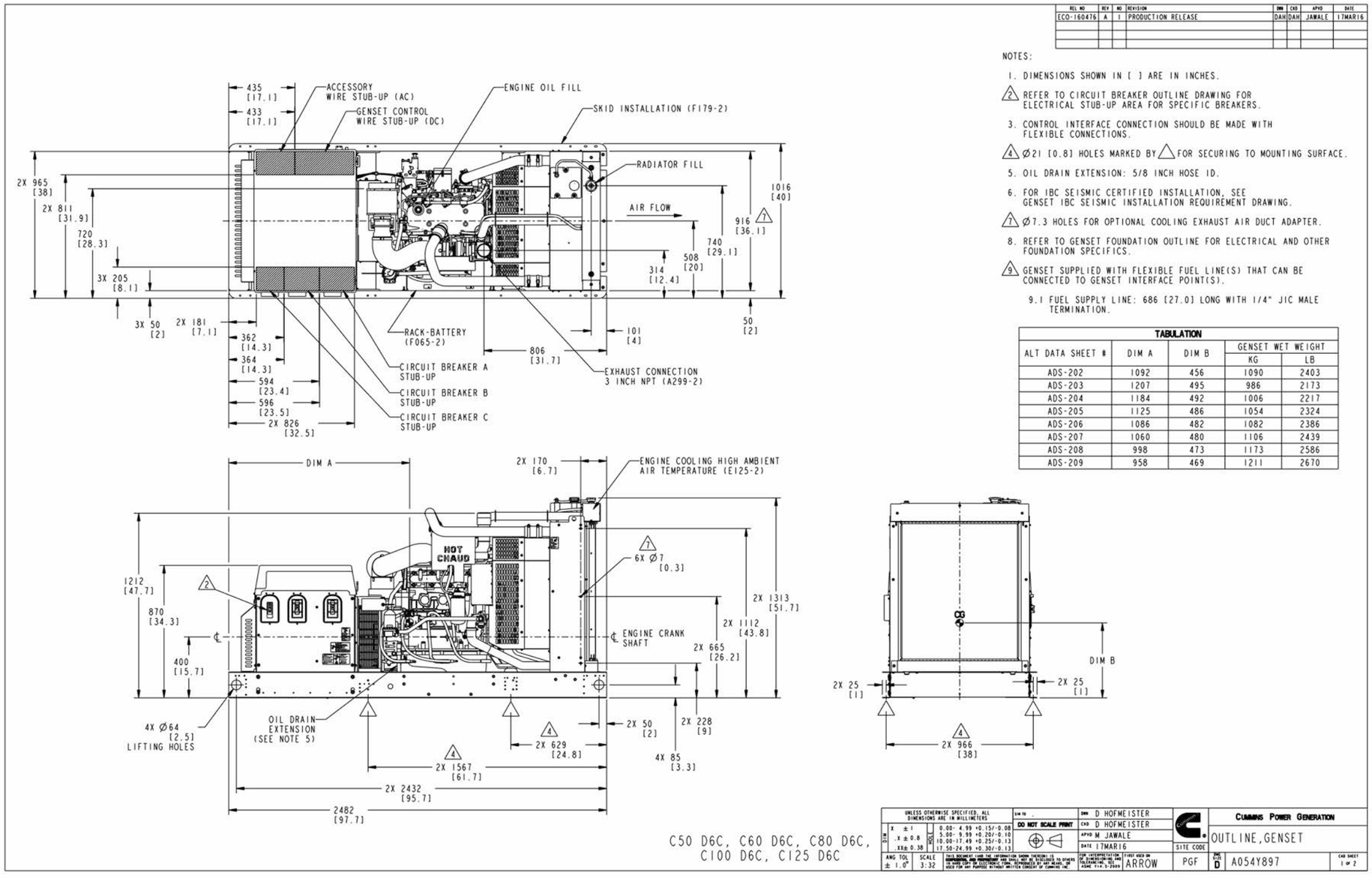
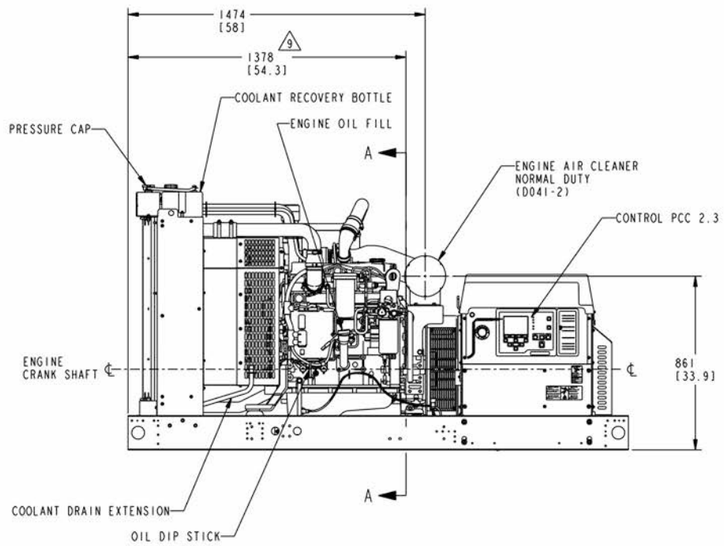
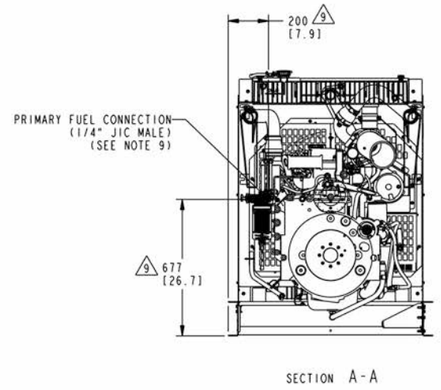


FIGURE 20. GENERATOR SET OUTLINE, OPEN (SHEET 1 OF 2)

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REL NO	REV	NO	REVISION	DRN	CKD	APVD	DATE
ECO-160476	A	1	PRODUCTION RELEASE	DAH	DAH	JAWALE	17MAR16





C50 D6C, C60 D6C, C80 D6C,
C100 D6C, C125 D6C

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1; .X ±0.8; .XX ±0.38
TOL: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL ± 1.0° | SCALE 3:32
DO NOT SCALE PRINT
DRN D HOFMEISTER | CKD D HOFMEISTER | APVD M JAWALE | DATE 17MAR16
FIRST USED ON ARROW
CUMMINS POWER GENERATION
SITE CODE PGF
SIZE D | A054Y897 | CAD SHEET 2 OF 2
OUTLINE,GENSET

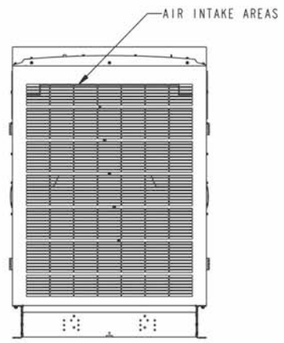
FIGURE 21. GENERATOR SET OUTLINE, OPEN (SHEET 2 OF 2)

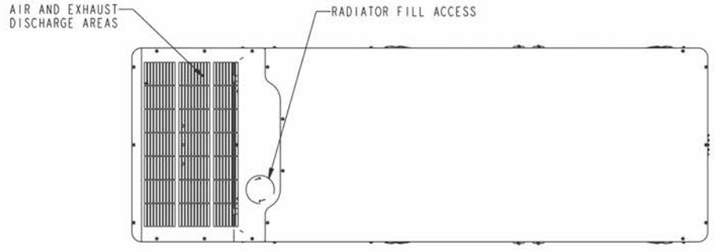
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REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-152551	A	1	PRODUCTION RELEASE	CG	NK	M.WICKMANN	14MAY15

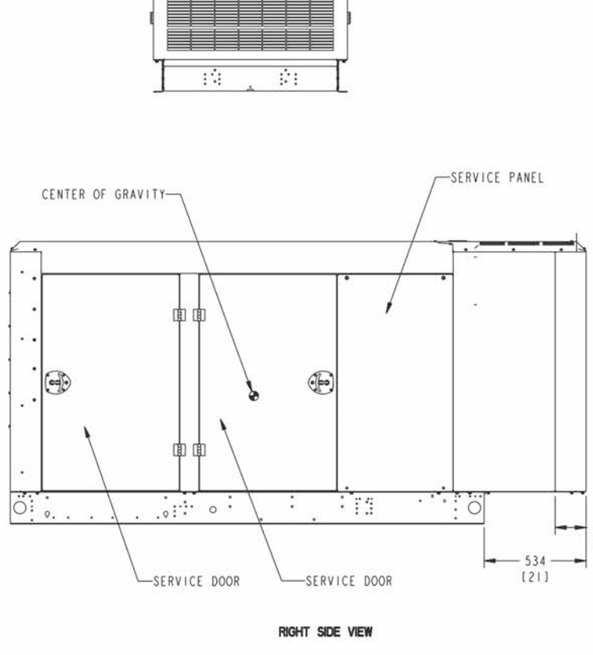
NOTES:

1. DIM [] IN INCHES
2. WHEN THE HOUSING INSTALLED ON AN OPEN GENERATOR SET, THE TOTAL WEIGHT WILL INCREASE BY 131.5 KG (290 LBS). THIS INCLUDES THE MUFFLER.
3. THE CENTER OF GRAVITY(CG) OF THE GENERATOR SET WHEN EQUIPPED WITH THIS HOUSING SHIFTS APPROXIMATELY 65mm (2.55 inch) TOWARDS THE AIR DISCHARGE END OF THE HOUSING AND 42MM (1.66 INCH) HIGHER FROM THE GROUND. COMPARED TO THE EQUIVALENT NON-HOUSED PRODUCT WITH THE F179 SKID. SEE HOUSING READY SKID BASE OUTLINE DRAWING FOR CG LOCATION OF NON HOUSED PRODUCT.

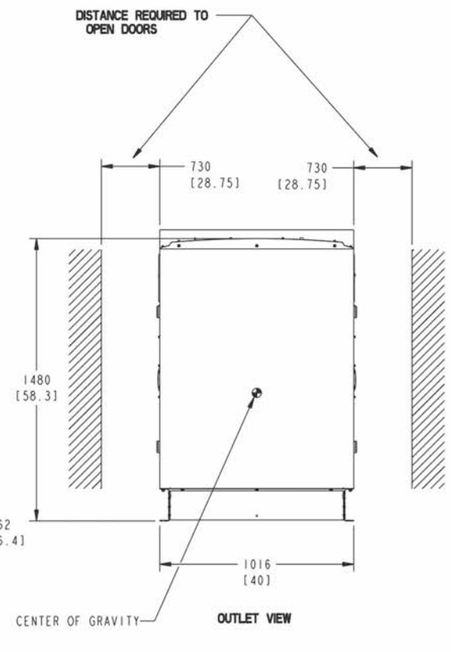




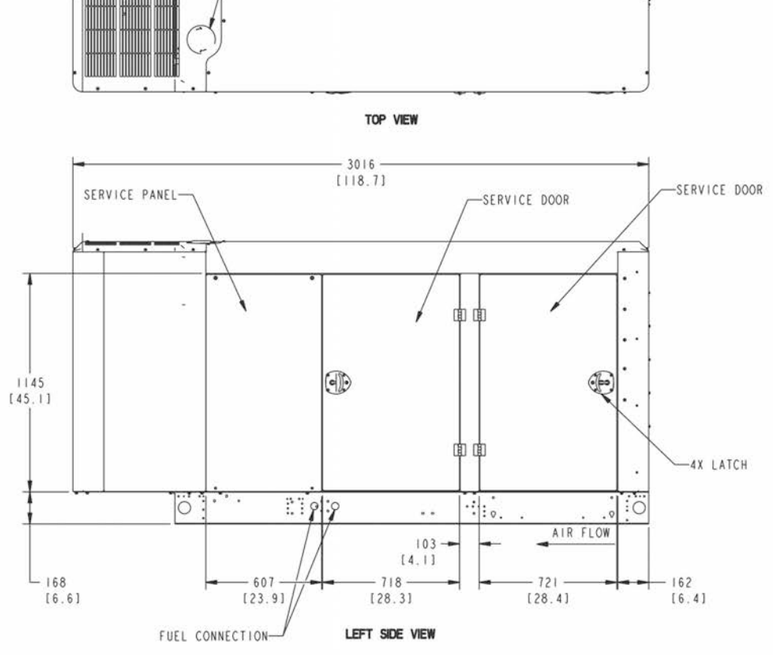
TOP VIEW



RIGHT SIDE VIEW



OUTLET VIEW



LEFT SIDE VIEW

F231-2 ENCLOSURE CONFIGURATION

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO: NONE	DRN C_GADE		CUMMINS POWER GENERATION
DIM: X ±1, .X ±0.8, .XX± 0.38 / HOLE: 0.00-4.99 +0.15/-0.08, 5.00-9.99 +0.20/-0.10, 10.00-17.49 +0.25/-0.13, 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD N_KASIBHOTLA		OUTLINE, ENCLOSURE
		APVD M_WICKMANN		
		DATE 14MAY15	SITE CODE	
ANG TOL: ± 1.0° / SCALE: ~3/32	* CONFIDENTIAL * PROPERTY OF CUMMINS POWER GENERATION GROUP	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, REF ASME Y14.5M-1994 / FIRST USED ON ARROW	PGF	SIZE D / A051P365 / SHEET 1 of 2 / DRG REV A

FIGURE 22. LONG ENCLOSURE OUTLINE, SOUND ATTENTION LEVEL 1 AND LEVEL 2 (SHEET 1 OF 2)

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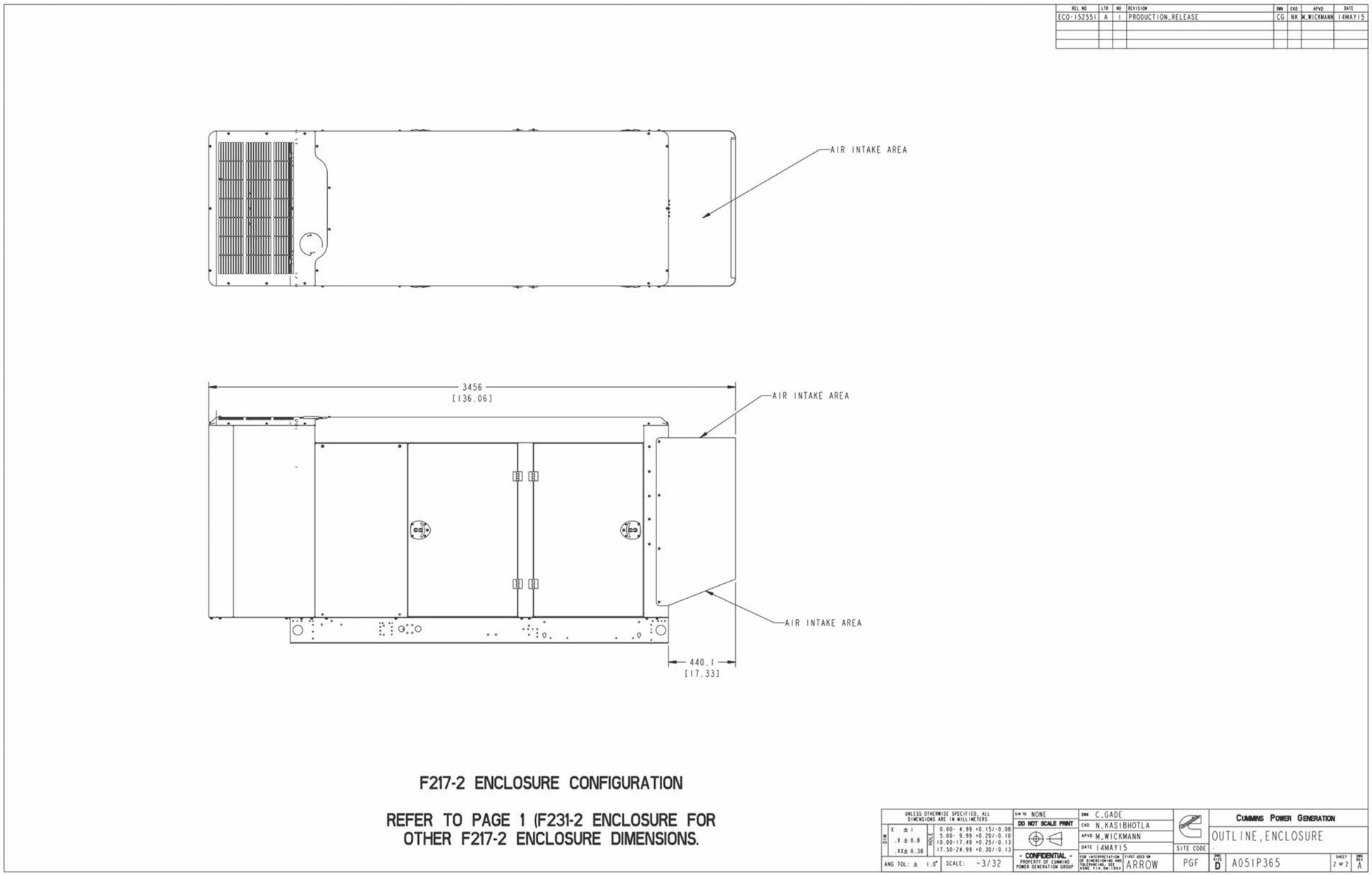


FIGURE 23. LONG ENCLOSURE OUTLINE, SOUND ATTENTION LEVEL 1 AND LEVEL 2 (SHEET 2 OF 2)

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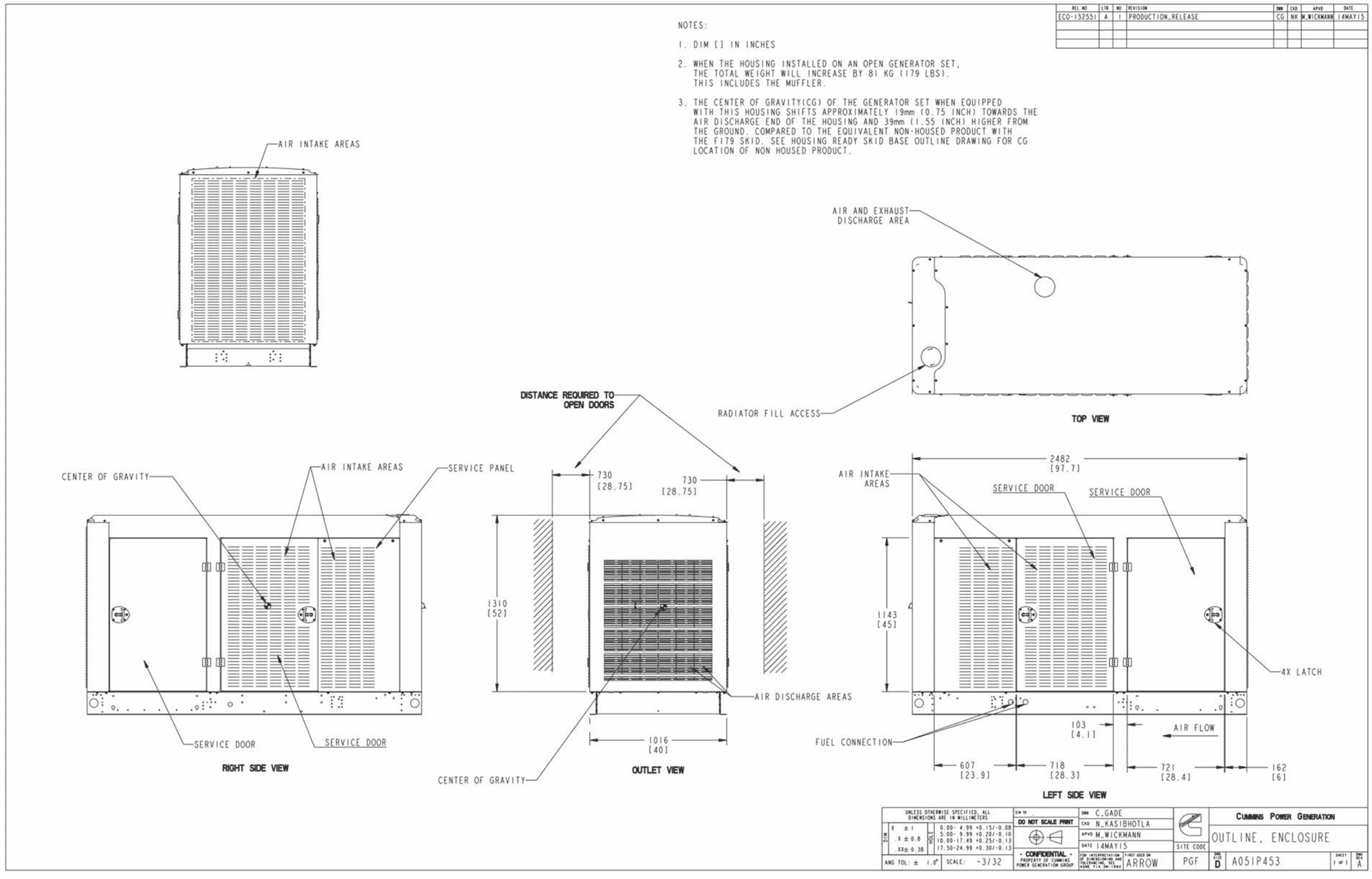


FIGURE 24. SHORT ENCLOSURE OUTLINE, WEATHER (SHEET 1 OF 1)

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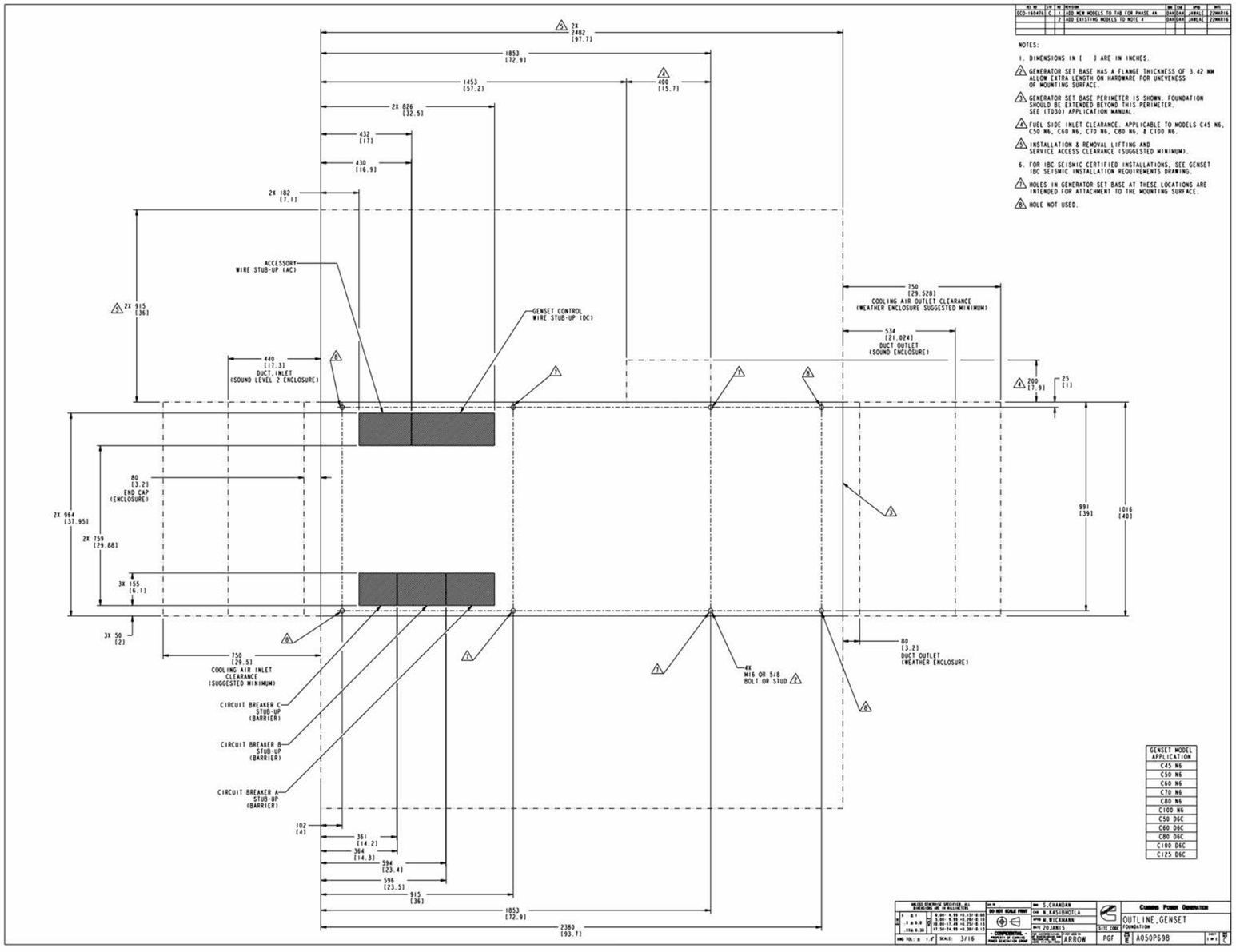
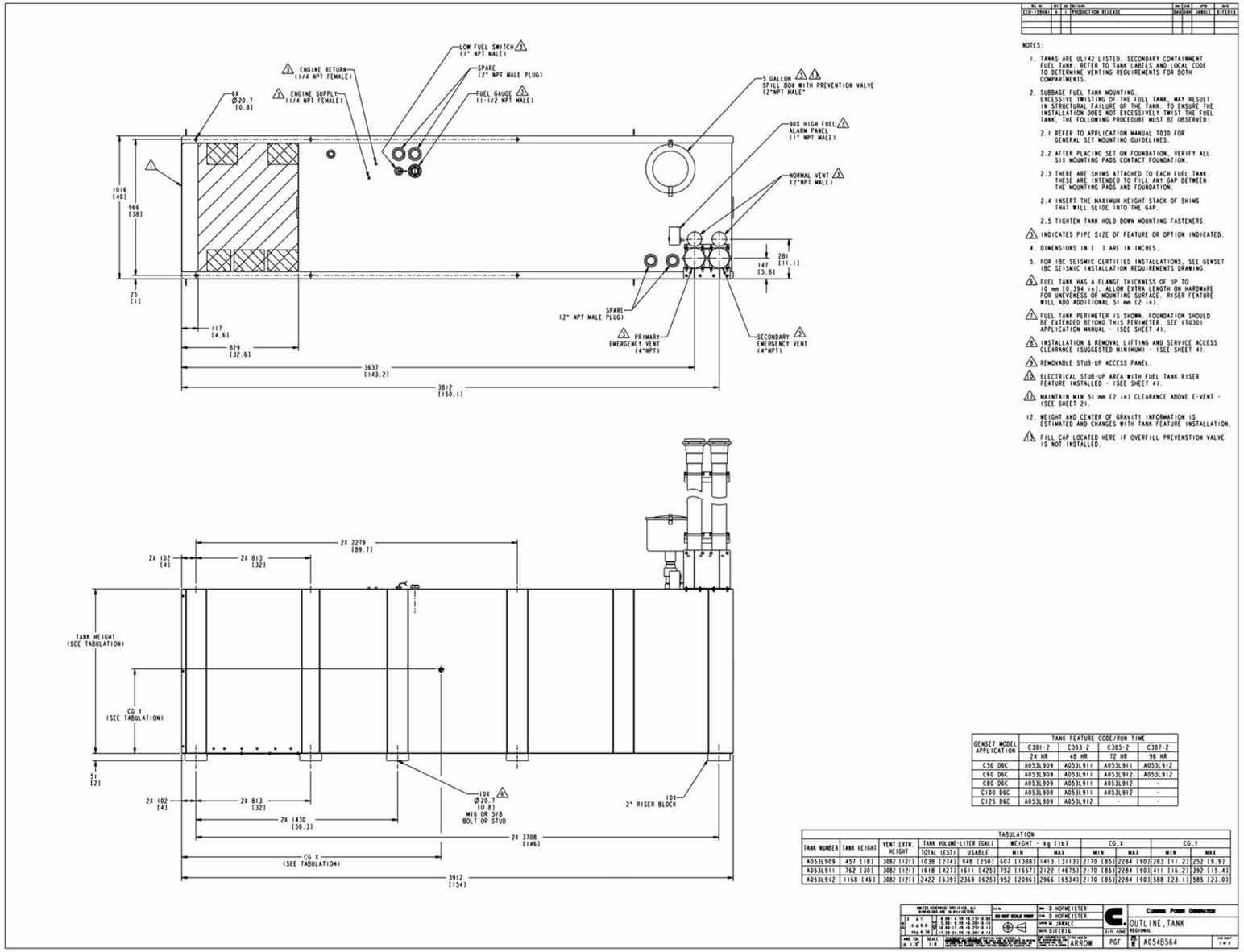


FIGURE 25. FOUNDATION OUTLINE, WITHOUT FUEL TANK (SHEET 1 OF 1)

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ECN	REV	BY	REVISION	DR	CHK	APVD	DATE
ECO-139661	A	1	PRODUCTION RELEASE	DANSHAW	JARRALE	DIFEBIG	

NOTES:

1. TANKS ARE UL142 LISTED. SECONDARY CONTAINMENT FUEL TANK. REFER TO TANK LABELS AND LOCAL CODE TO DETERMINE VENTING REQUIREMENTS FOR BOTH COMPARTMENTS.
2. SUBBASE FUEL TANK MOUNTING. EXCESSIVE TWISTING OF THE FUEL TANK, MAY RESULT IN STRUCTURAL FAILURE OF THE TANK. TO ENSURE THE INSTALLATION DOES NOT EXCESSIVELY TWIST THE FUEL TANK, THE FOLLOWING PROCEDURE MUST BE OBSERVED:
   - 2.1 REFER TO APPLICATION MANUAL T030 FOR GENERAL SET MOUNTING GUIDELINES.
   - 2.2 AFTER PLACING SET ON FOUNDATION, VERIFY ALL SIX MOUNTING PADS CONTACT FOUNDATION.
   - 2.3 THERE ARE SHIMS ATTACHED TO EACH FUEL TANK. THESE ARE INTENDED TO FILL ANY GAP BETWEEN THE MOUNTING PADS AND FOUNDATION.
   - 2.4 INSERT THE MAXIMUM HEIGHT STACK OF SHIMS THAT WILL SLIDE INTO THE GAP.
   - 2.5 TIGHTEN TANK HOLD DOWN MOUNTING FASTENERS.
3. ⚠1 INDICATES PIPE SIZE OF FEATURE OR OPTION INDICATED.
4. DIMENSIONS IN [ ] ARE IN INCHES.
5. FOR IBC SEISMIC CERTIFIED INSTALLATIONS, SEE GENSET IBC SEISMIC INSTALLATION REQUIREMENTS DRAWING.
6. ⚠2 FUEL TANK HAS A FLANGE THICKNESS OF UP TO 10 mm [0.394 in]. ALLOW EXTRA LENGTH ON HARDWARE FOR UNEVENESS OF MOUNTING SURFACE. RISER FEATURE WILL ADD ADDITIONAL 51 mm [2 in].
7. ⚠3 FUEL TANK PERIMETER IS SHOWN. FOUNDATION SHOULD BE EXTENDED BEYOND THIS PERIMETER. SEE (T030) APPLICATION MANUAL - (SEE SHEET 4).
8. ⚠4 INSTALLATION & REMOVAL LIFTING AND SERVICE ACCESS CLEARANCE (SUGGESTED MINIMUM) - (SEE SHEET 4).
9. ⚠5 REMOVABLE STUB-UP ACCESS PANEL.
10. ⚠6 ELECTRICAL STUB-UP AREA WITH FUEL TANK RISER FEATURE INSTALLED - (SEE SHEET 4).
11. ⚠7 MAINTAIN MIN 51 mm [2 in] CLEARANCE ABOVE E-VENT - (SEE SHEET 2).
12. WEIGHT AND CENTER OF GRAVITY INFORMATION IS ESTIMATED AND CHANGES WITH TANK FEATURE INSTALLATION.
13. ⚠8 FILL CAP LOCATED HERE IF OVERFILL PREVENSTION VALVE IS NOT INSTALLED.

GENSET MODEL APPLICATION	TANK FEATURE CODE/RUN TIME			
	C301-2	C303-2	C305-2	C307-2
	24 HR	48 HR	72 HR	96 HR
C50 D6C	A053L909	A053L911	A053L911	A053L912
C60 D6C	A053L909	A053L911	A053L912	A053L912
C80 D6C	A053L909	A053L911	A053L912	-
C100 D6C	A053L909	A053L911	A053L912	-
C125 D6C	A053L909	A053L912	-	-

TABULATION

TANK NUMBER	TANK HEIGHT	VENT EXTN. HEIGHT	TANK VOLUME-LITER [GAL]		WEIGHT - kg [lb]		CG,X		CG,Y	
			TOTAL (EST)	USABLE	MIN	MAX	MIN	MAX	MIN	MAX
A053L909	457 [18]	3082 [121]	1038 [274]	948 [250]	607 [1388]	1413 [3113]	2170 [85]	2284 [90]	283 [11.2]	252 [9.9]
A053L911	762 [30]	3082 [121]	1618 [427]	1611 [425]	752 [1657]	2122 [4675]	2170 [85]	2284 [90]	411 [16.2]	392 [15.4]
A053L912	1168 [46]	3082 [121]	2422 [639]	2369 [625]	952 [2096]	2966 [6534]	2170 [85]	2284 [90]	588 [23.1]	585 [23.0]

DRAWN	D HOFMEISTER	CUMMINS POWER GENERATION	
CHECKED	D HOFMEISTER	OUTLINE, TANK REGIONAL	
APVD M JARRALE			
DATE DIFEBIG		SIZE CODE	DWG NO
MFG ARROW		PGF	A054B564

FIGURE 26. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 1 OF 4)

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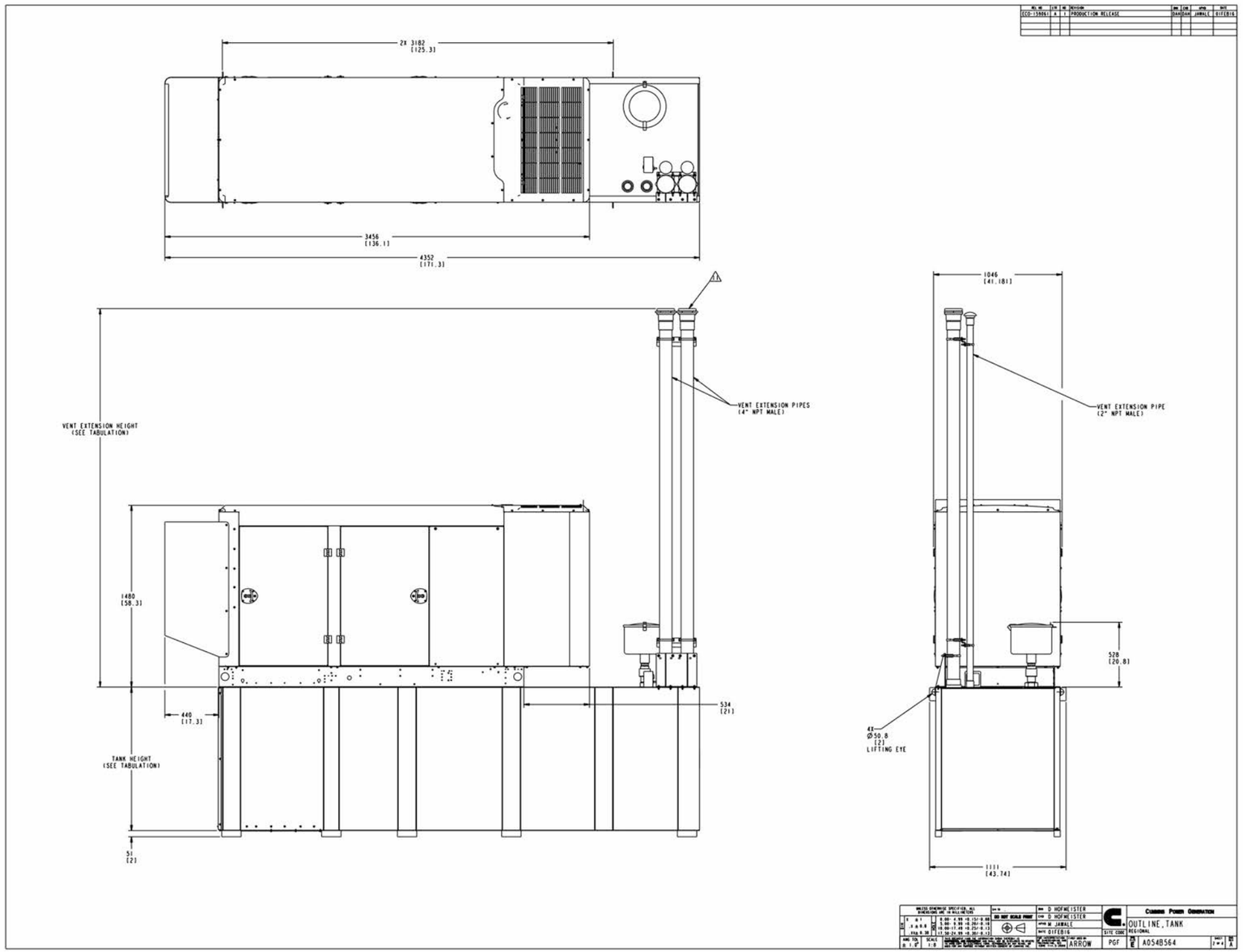


FIGURE 27. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 2 OF 4)

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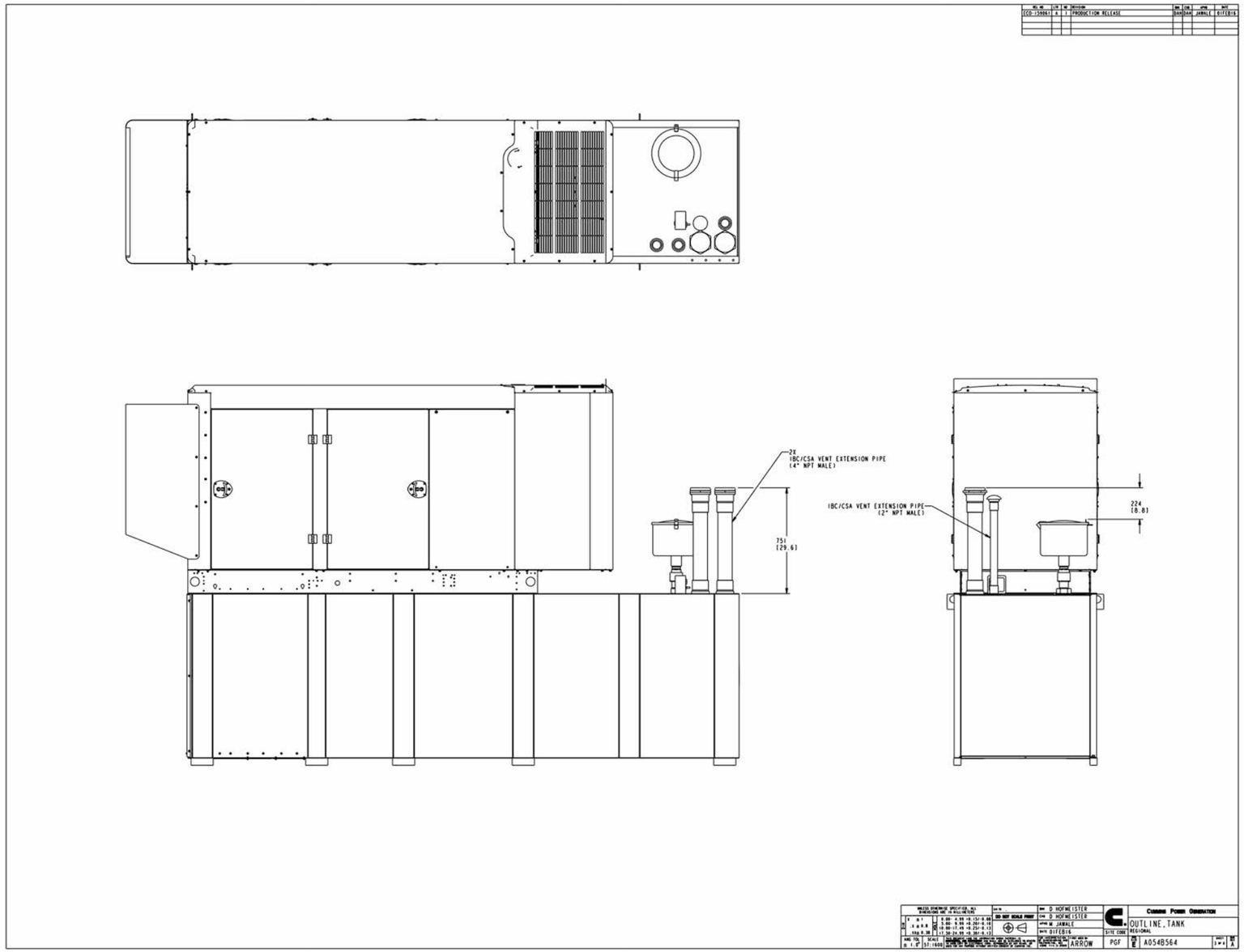


FIGURE 28. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 3 OF 4)

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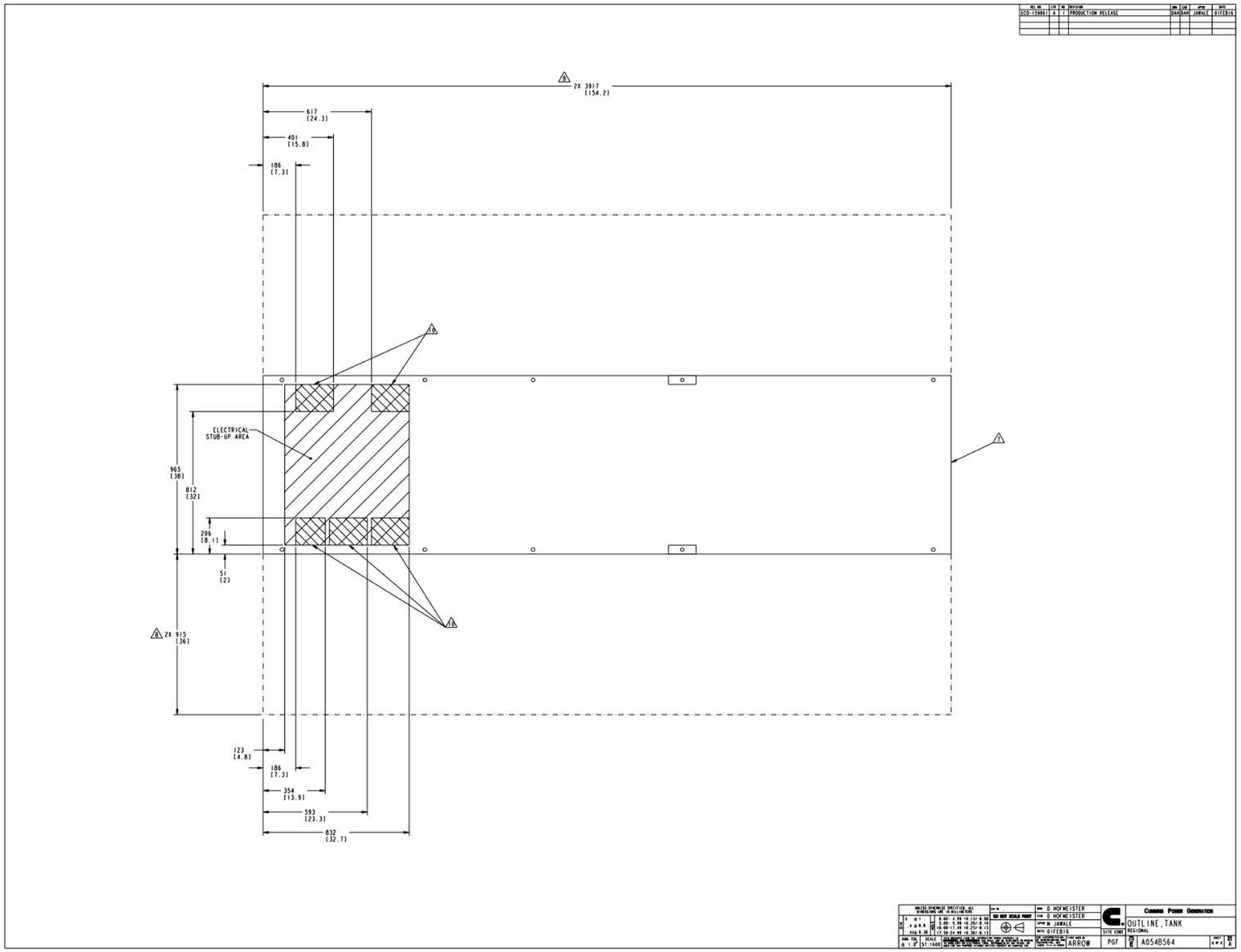
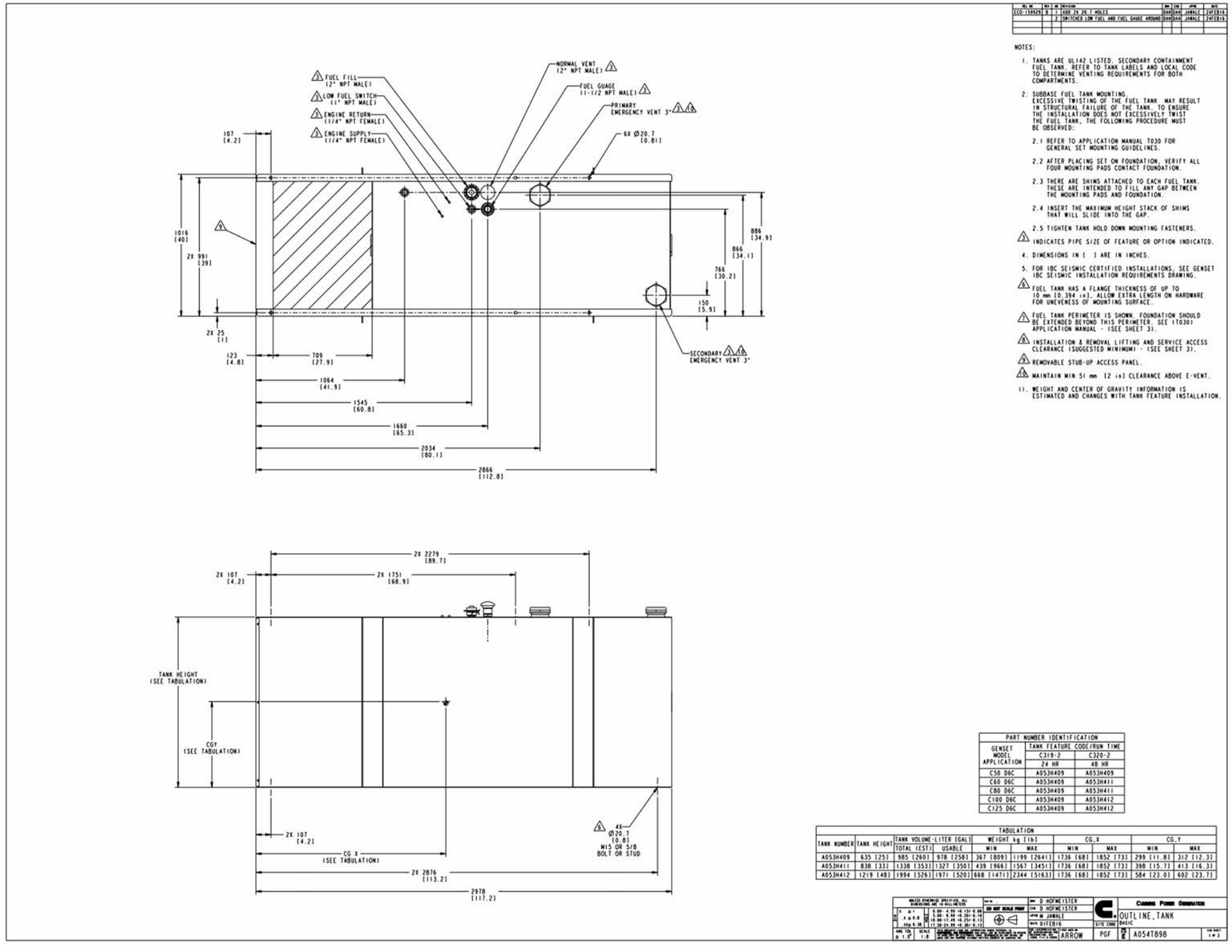


FIGURE 29. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 4 OF 4)

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ECO	REV	DESCRIPTION	BY	CHK	APVD	DATE
ECD-159529	B	1 ADD 2X 20.7 HOLES	SANDAK	JARALE	24FEB16	
		2 SWITCHED LOW FUEL AND FUEL GAUGE AROUND	SANDAK	JARALE	24FEB16	

NOTES:

1. TANKS ARE UL142 LISTED, SECONDARY CONTAINMENT FUEL TANK. REFER TO TANK LABELS AND LOCAL CODE TO DETERMINE VENTING REQUIREMENTS FOR BOTH COMPARTMENTS.
2. SUBBASE FUEL TANK MOUNTING. EXCESSIVE TWISTING OF THE FUEL TANK MAY RESULT IN STRUCTURAL FAILURE OF THE TANK. TO ENSURE THE INSTALLATION DOES NOT EXCESSIVELY TWIST THE FUEL TANK, THE FOLLOWING PROCEDURE MUST BE OBSERVED:
   - 2.1 REFER TO APPLICATION MANUAL T030 FOR GENERAL SET MOUNTING GUIDELINES.
   - 2.2 AFTER PLACING SET ON FOUNDATION, VERIFY ALL FOUR MOUNTING PADS CONTACT FOUNDATION.
   - 2.3 THERE ARE SHIMS ATTACHED TO EACH FUEL TANK. THESE ARE INTENDED TO FILL ANY GAP BETWEEN THE MOUNTING PADS AND FOUNDATION.
   - 2.4 INSERT THE MAXIMUM HEIGHT STACK OF SHIMS THAT WILL SLIDE INTO THE GAP.
   - 2.5 TIGHTEN TANK HOLD DOWN MOUNTING FASTENERS.
3. INDICATES PIPE SIZE OF FEATURE OR OPTION INDICATED.
4. DIMENSIONS IN [ ] ARE IN INCHES.
5. FOR IBC SEISMIC CERTIFIED INSTALLATIONS, SEE GENSET IBC SEISMIC INSTALLATION REQUIREMENTS DRAWING.
6. FUEL TANK HAS A FLANGE THICKNESS OF UP TO 10 mm [0.394 in]. ALLOW EXTRA LENGTH ON HARDWARE FOR UNEVENESS OF MOUNTING SURFACE.
7. FUEL TANK PERIMETER IS SHOWN. FOUNDATION SHOULD BE EXTENDED BEYOND THIS PERIMETER. SEE (T030) APPLICATION MANUAL - (SEE SHEET 3).
8. INSTALLATION & REMOVAL LIFTING AND SERVICE ACCESS CLEARANCE (SUGGESTED MINIMUM) - (SEE SHEET 3).
9. REMOVABLE STUB-UP ACCESS PANEL.
10. MAINTAIN MIN 51 mm [2 in] CLEARANCE ABOVE E-VENT.
11. WEIGHT AND CENTER OF GRAVITY INFORMATION IS ESTIMATED AND CHANGES WITH TANK FEATURE INSTALLATION.

PART NUMBER IDENTIFICATION		
GENSET MODEL APPLICATION	TANK FEATURE CODE/RUN TIME	
	C319-2	C320-2
	24 HR	48 HR
C50 D6C	A053H409	A053H409
C60 D6C	A053H409	A053H411
C80 D6C	A053H409	A053H411
C100 D6C	A053H409	A053H412
C125 D6C	A053H409	A053H412

TABULATION									
TANK NUMBER	TANK HEIGHT	TANK VOLUME-LITER [GAL]		WEIGHT kg [lb]		CG,X		CG,Y	
		TOTAL (EST)	USABLE	MIN	MAX	MIN	MAX	MIN	MAX
A053H409	635 [25]	985 [260]	978 [258]	367 [809]	1199 [2641]	1736 [68]	1852 [73]	299 [11.8]	312 [12.3]
A053H411	838 [33]	1338 [353]	1327 [350]	439 [966]	1567 [3451]	1736 [68]	1852 [73]	398 [15.7]	413 [16.3]
A053H412	1219 [48]	1994 [526]	1971 [520]	668 [1471]	2344 [5163]	1736 [68]	1852 [73]	584 [23.0]	602 [23.7]

D HOFMEISTER | D HOFMEISTER | JARALE | WITH DIFEBIA | ARROW | CUMMINS POWER GENERATION | OUTLINE, TANK | BASIC | PGF | A054T898

FIGURE 30. FOUNDATION OUTLINE, WITH BASIC FUEL TANK (SHEET 1 OF 3)

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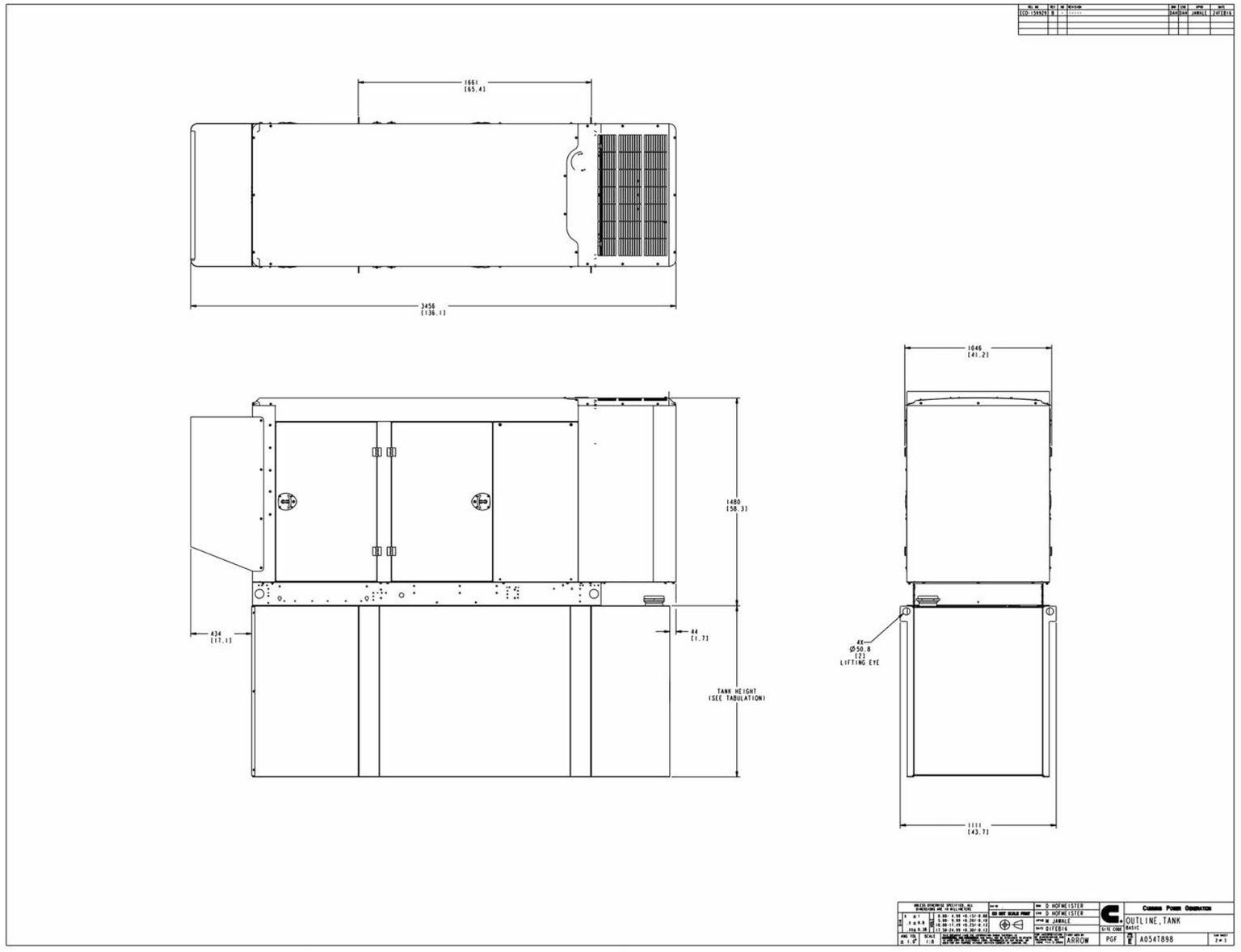


FIGURE 31. FOUNDATION OUTLINE, WITH BASIC FUEL TANK (SHEET 2 OF 3)

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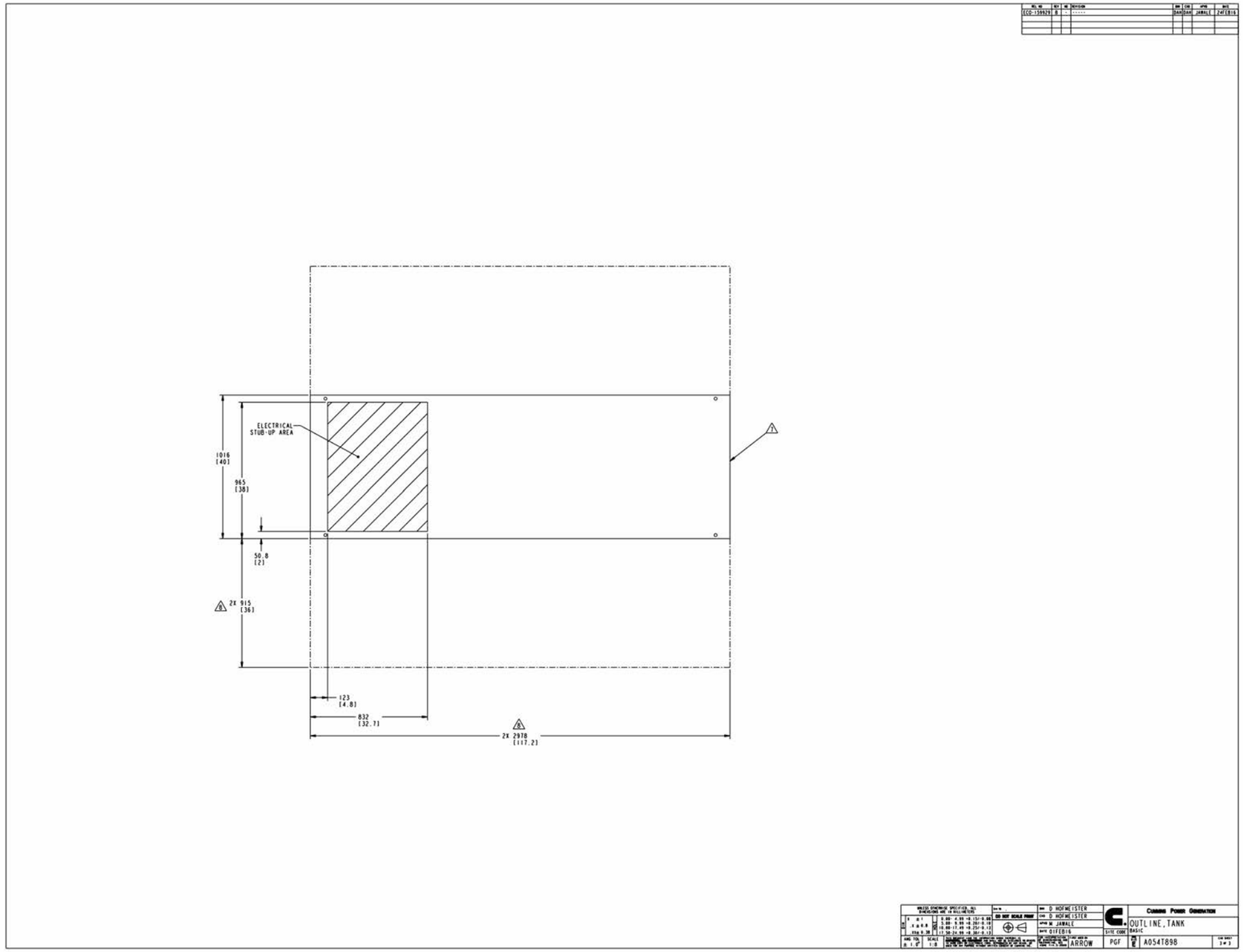


FIGURE 32. FOUNDATION OUTLINE, WITH BASIC FUEL TANK (SHEET 3 OF 3)

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Appendix C. Wiring Diagrams

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Figure 42. Harness, Control (Sheet 3 of 4) **100**
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C.0 Wiring Diagrams

The drawings included in this section are representative. For current complete information, refer to the drawing package that was shipped with the unit.

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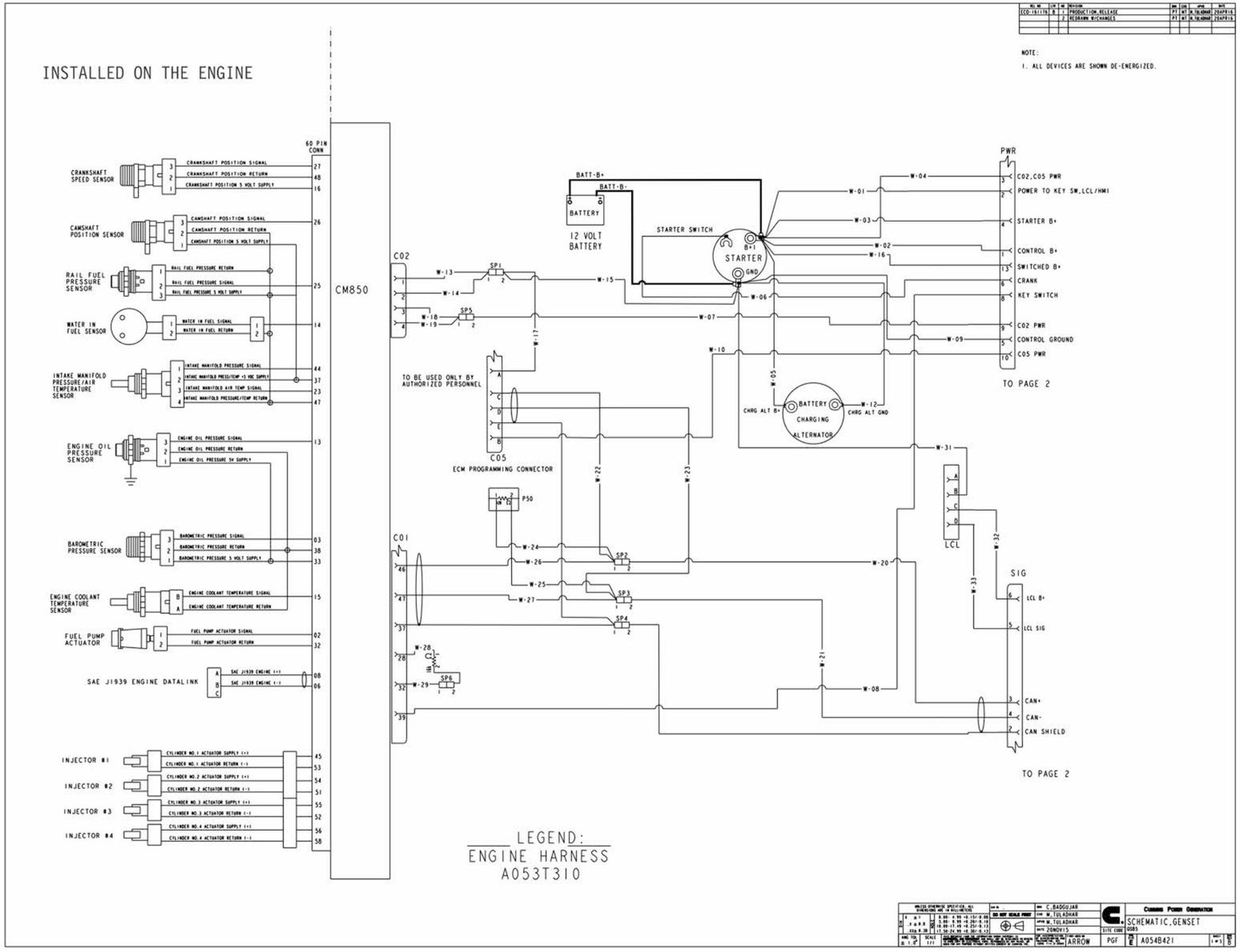


FIGURE 33. WIRING DIAGRAM (SHEET 1 OF 5)

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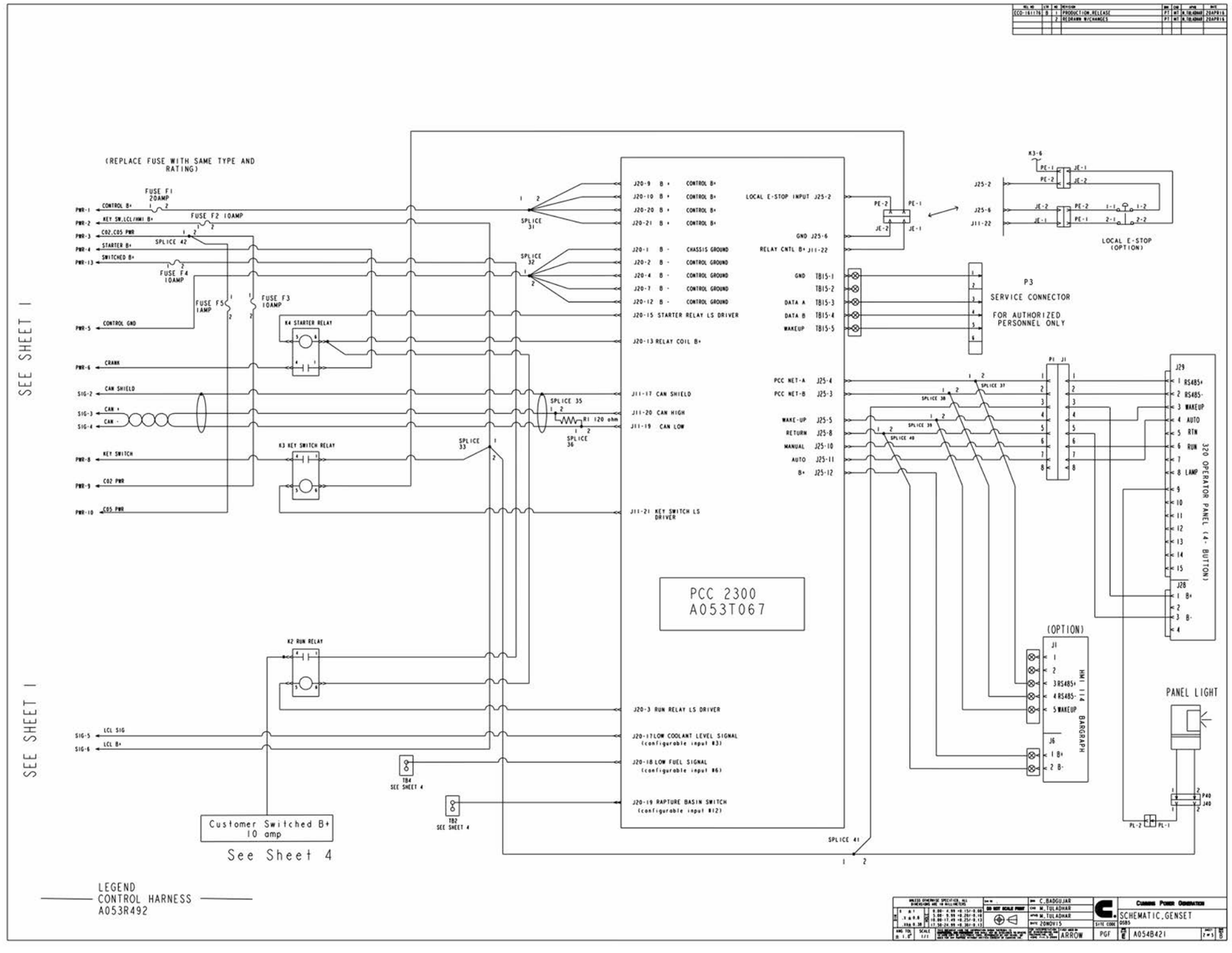


FIGURE 34. WIRING DIAGRAM (SHEET 2 OF 5)

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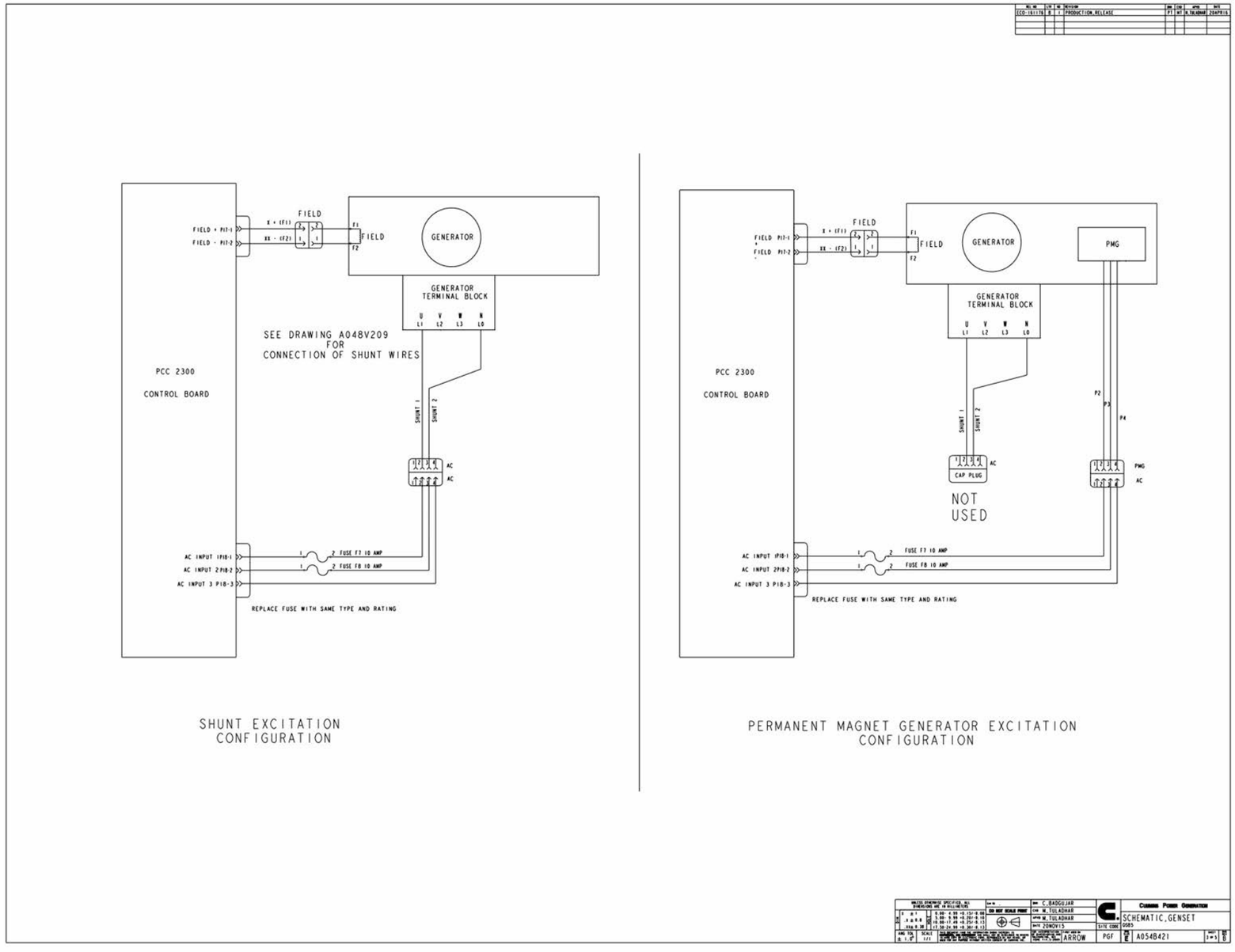
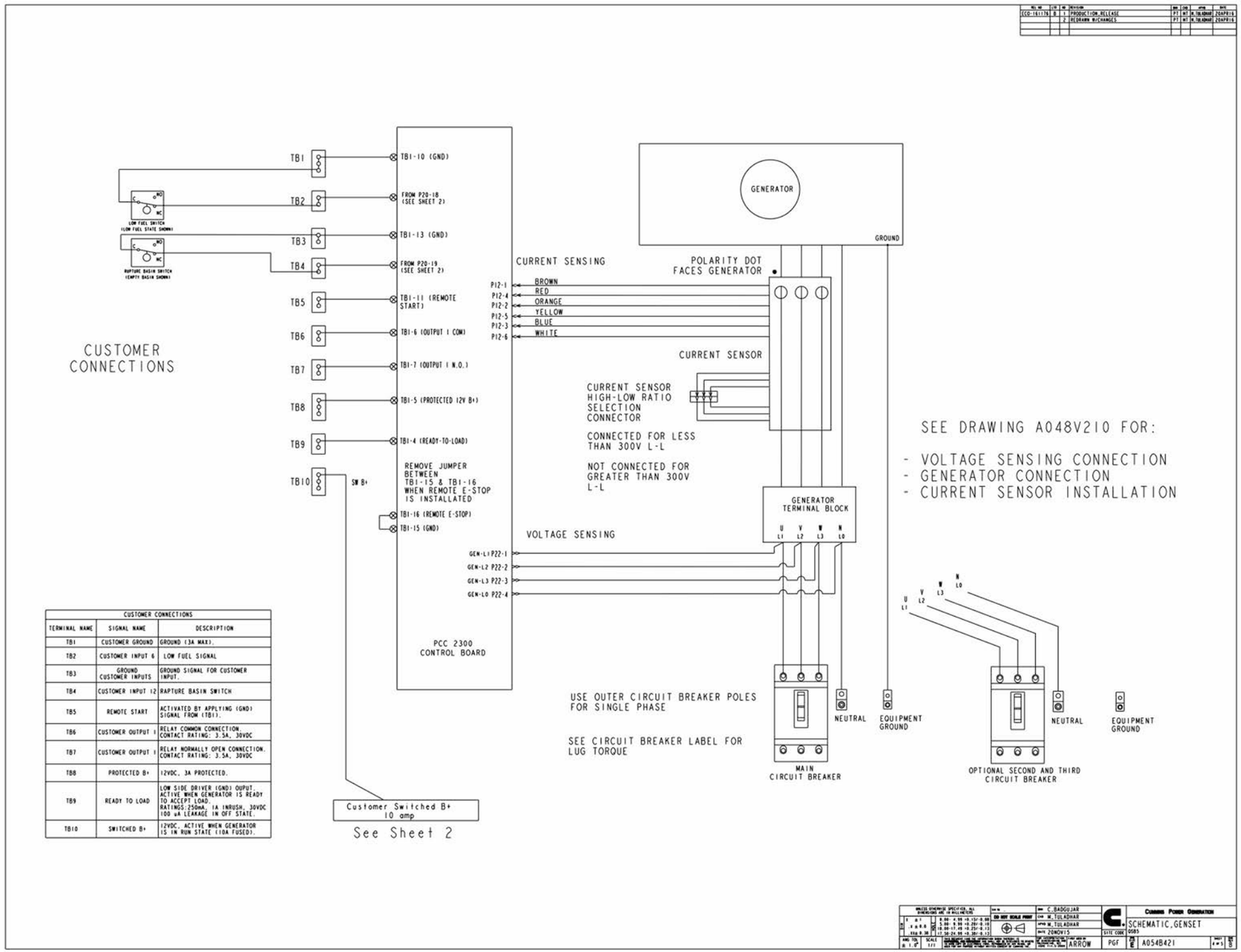


FIGURE 35. WIRING DIAGRAM (SHEET 3 OF 5)

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CUSTOMER CONNECTIONS		
TERMINAL NAME	SIGNAL NAME	DESCRIPTION
TB1	CUSTOMER GROUND	GROUND (3A MAX).
TB2	CUSTOMER INPUT 6	LOW FUEL SIGNAL
TB3	GROUND CUSTOMER INPUTS	GROUND SIGNAL FOR CUSTOMER INPUT.
TB4	CUSTOMER INPUT 12	RAPTURE BASIN SWITCH
TB5	REMOTE START	ACTIVATED BY APPLYING (GND) SIGNAL FROM (TB1).
TB6	CUSTOMER OUTPUT 1	RELAY COMMON CONNECTION. CONTACT RATING: 3.5A, 30VDC
TB7	CUSTOMER OUTPUT 1	RELAY NORMALLY OPEN CONNECTION. CONTACT RATING: 3.5A, 30VDC
TB8	PROTECTED B+	12VDC, 3A PROTECTED.
TB9	READY TO LOAD	LOW SIDE DRIVER (GND) OUPUT. ACTIVE WHEN GENERATOR IS READY TO ACCEPT LOAD. RATINGS:250mA, 1A INRUSH, 30VDC 100 uA LEAKAGE IN OFF STATE.
TB10	SWITCHED B+	12VDC, ACTIVE WHEN GENERATOR IS IN RUN STATE (10A FUSED).

FIGURE 36. WIRING DIAGRAM (SHEET 4 OF 5)

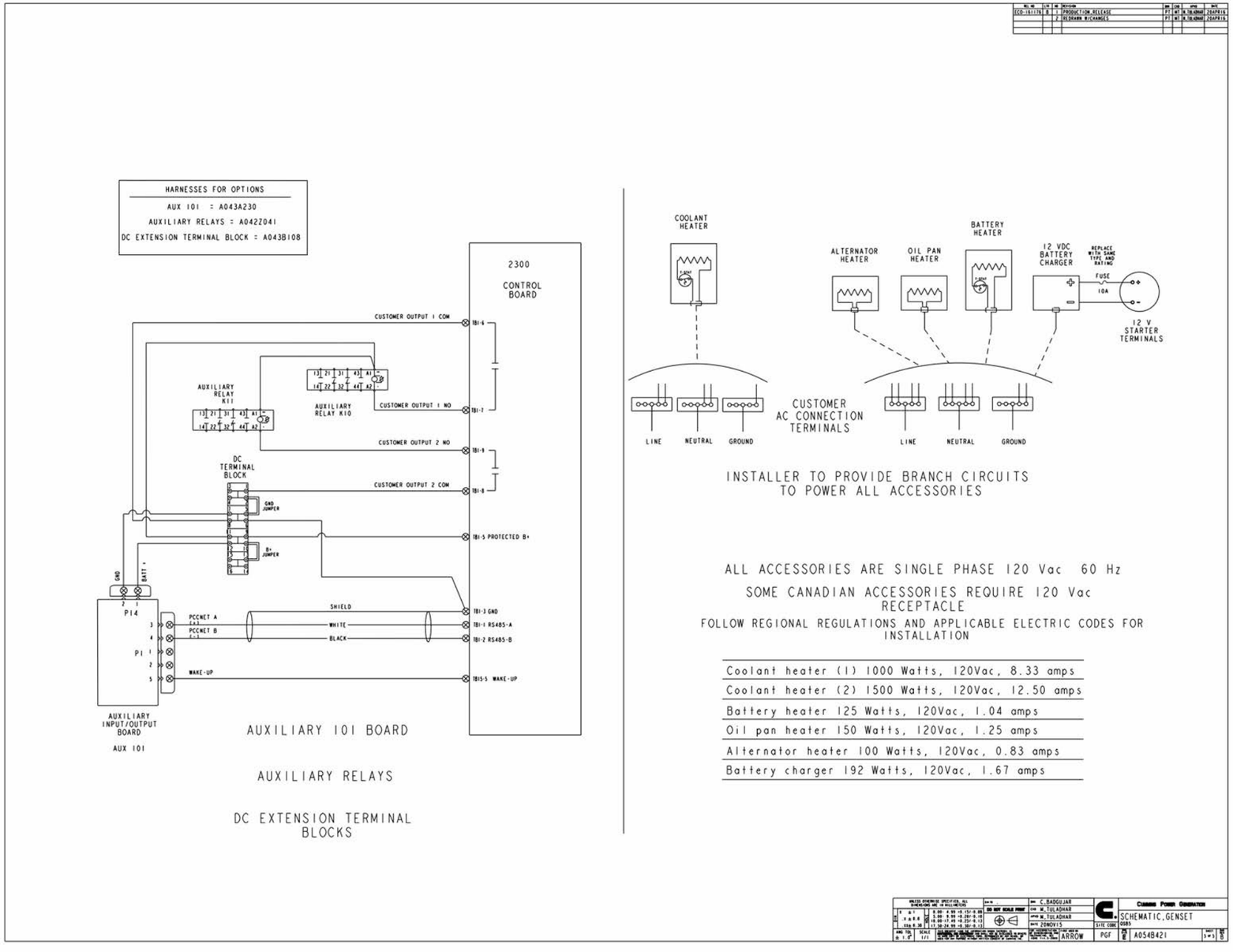


FIGURE 37. WIRING DIAGRAM (SHEET 5 OF 5)

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CABLE/WIRE LIST INFORMATION FOR DIAGRAM A053T310

CABLE/WIRE NAME	FROM	CONNECTOR FROM	FROM PIN	TO	CONNECTOR TO	TO PIN	WIRE GAUGE	COLOR	SPOOL NAME
W-01	PWR1-2	A043G960	A043U712				16	WHITE	0334-0758
W-02	PWR1-1	A043G960	A043U712				16	WHITE	0334-0758
W-03	PWR1-4	A043G960	A043U712	STARTER B+	0332-4248-01	NOT APPLY	16	WHITE	0334-0758
W-04	PWR1-3	A043G960	A050F507				12	WHITE	0334-0760
W-05	ALT B+	0332-1302	NOT APPLY				8	WHITE	0334-0762
W-06	PWR1-6	A043G960	A050F507	STRT SW	0332-0543	NOT APPLY	12	WHITE	0334-0760
W-07	SP5-2	0332-3638	NOT APPLY	PWR1-9	A043G960	A050F507	12	WHITE	0334-0760
W-08	C01-39	0323-2439	0323-1752	PWR1-8	A043G960	A043U712	18	WHITE	0334-0757
W-09	PWR1-5	A043G960	A043U712	STRT GND	0332-3593	NOT APPLY	16	WHITE	0334-0758
W-10	C05-B	0323-1920	0323-1491	PWR1-10	A043G960	A043U712	16	WHITE	0334-0758
W-12	ALT GND	A045T836	NOT APPLY	STRT GND	0332-3593	NOT APPLY	8	WHITE	0334-0762
W-13	C02-1	0323-2437	0323-2165	SP1-1	0332-3638	NOT APPLY	14	WHITE	0334-0759
W-14	C02-2	0323-2437	0323-2165	SP1-1	0332-3638	NOT APPLY	14	WHITE	0334-0759
W-15	SP1-2	0332-3638	NOT APPLY	STRT GND	0332-3593	NOT APPLY	12	WHITE	0334-0760
W-16	PWR1-13	A043G960	A043U712	STARTER B+	0332-4248-01	NOT APPLY	16	WHITE	0334-0758
W-17	SP1-2	0332-3638	NOT APPLY	C05-A	0323-1920	0323-1491	18	WHITE	0334-0757
W-18	C02-3	0323-2437	0323-2165	SP5-1	0332-3638	NOT APPLY	14	WHITE	0334-0759
W-19	C02-4	0323-2437	0323-2165						0334-0759
W-20	SIG1-3	A043M727	A043U707	SP2-2	0332-3638	NOT APPLY	18	SHIELDED CABLE1 (WHITE)	0334-1354
W-21	SIG1-4	A043M727	A043U707	SP3-2	0332-3638	NOT APPLY	18	SHIELDED CABLE1 (BLACK)	
DRAIN WIRE	SIG1-2	A043M727	A043U707	SP4-2	0332-3638	NOT APPLY	18	SHIELDED CABLE1 (DRAIN WIRE)	
W-22	C05-C	0323-1920	0323-1491	SP2-1	0332-3638	NOT APPLY	18	SHIELDED CABLE2 (WHITE)	0334-1354
W-23	C05-D	0323-1920	0323-1491	SP3-1	0332-3638	NOT APPLY	18	SHIELDED CABLE2 (BLACK)	
DRAIN WIRE	C05-E	0323-1920	0323-1491	SP4-1	0332-3638	NOT APPLY	18	SHIELDED CABLE2 (DRAIN WIRE)	
W-24	SP2-1	0332-3638	NOT APPLY	P50-1	0323-2514	0323-2513	18	WHITE	0334-0757
W-25	SP3-1	0332-3638	NOT APPLY	P50-2	0323-2514	0323-2513	18	WHITE	0334-0757
W-26	C01-46	0323-2439	0323-1752	SP2-1	0332-3638	NOT APPLY	18	SHIELDED CABLE3 (WHITE)	0334-1354
W-27	C01-47	0323-2439	0323-1752	SP3-1	0332-3638	NOT APPLY	18	SHIELDED CABLE3 (BLACK)	
DRAIN WIRE	C01-37	0323-2439	0323-1752	SP4-1	0332-3638	NOT APPLY	18	SHIELDED CABLE3 (DRAIN WIRE)	
W-28	C01- 32	0323-2439	0323-1752	SP6-1	0332-3638	NOT APPLY	18	WHITE	0334-0757
W-29	R01-1	0351-1597-29	NOT APPLY	SP6-2	0332-3638	NOT APPLY	-	-	-
W-30	C01-28	0323-2439	0323-1752	R01-2	0351-1597-29	NOT APPLY	-	-	-
W-31	LCL-B	0323-1765	0323-1709	STRT GND	0332-3593	NOT APPLY	18	WHITE	0334-0757
W-32	SIG1-6	A043M727	A043U707	LCL-C	0323-1765	0323-1709	18	WHITE	0334-0757
W-33	SIG1-5	A043M727	A043U707	LCL-D	0323-1765	0323-1709	18	WHITE	0334-0757

ECO NO	LTR	NO	REVISION	BY	CHK	APVD	DATE
ECO-160298	B	1	PRODUCTION RELEASE	PT	MT	M_TULADHAR	29MAR15
		2	REDESIGNED "HARNESS, ENGINE" SEE ECO	PT	MT	M_TULADHAR	29MAR15
		3	UPDATE CABLE WIRE LIST INFORMATION.	-	-	-	-
			NOTES, BOM & LABEL SEE ECO	PT	MT	M_TULADHAR	29MAR15
		4	SEE SHEET 2	PT	MT	M_TULADHAR	29MAR15

NOTES:

1. TOLERANCES: UP TO 500 +15/-5
   500 TO 1000 +30/-10
   1000 TO LONGER +40/-20
2. ALL LEADS/WIRES SHALL BE MARKED AT MAXIMUM OF 76 mm BEHIND THE CONNECTOR AND AT EVERY 30 mm INTERVAL WITH BOTH STATION NUMBERS LISTED IN THE "FROM-TO" TABULATION.
   MARKING SHALL BE PERMANENT AND LEGIBLE. WIRE MARKINGS NEED TO HAVE FULL VISUAL ACCESS. END MARKINGS ARE NOT TO BE VISUALLY OBSCURED AND MUST BE FULLY DISPLAYED.
   TO/FROM DESIGNATIONS ARE NOT TO BE FRAGMENTED. DESIGNATOR SHALL APPEAR IN FULL TEXT AND NOT IN BROKEN SEGMENTS.
3. USE CABLE TIES (0332-3388) AS REQUIRED TO SECURE WIRES.
4. HARNESS MUST BE PROCURED FROM A SUPPLIER QUALIFIED AS A UL RECOGNIZED HARNESS MANUFACTURER CATEGORY (ZPFW2). PACKAGING OF PARTS TO BE MARKED IN ACCORDANCE WITH REQUIREMENTS SPECIFIED BY SUPPLIERS UL PROGRAM.
5. STAGGER AND COVER ALL UNINSULATED FASTONS, SPLICES, RING TERMINALS & RESISTORS WITH HEAT SHRINK (0898-1337-03).
6. IF THE VALUE OF 0 (ZERO) IS USED IN THE BILL OF MATERIAL; THE QUANITY OF THE AFFECTED ITEMS SHALL BE DERIVED FROM THE DRAWING REQUIREMENTS.
7. USE TESA 51026 CLOTH WIRE HARNESS TAPE OR EQUIVALENT CLOTH TAPE TO COVER THE HARNESS.

⚠1 ATTACH A MASTER HARNESS LABEL WITH THE FOLLOWING INFORMATION: CUMMINS PART NUMBER, CUMMINS PART REVISION LEVEL, MANUFACTURER'S NAME, MANUFACTURER'S LOCATION, AND MANUFACTURER'S DATE OF MANUFACTURE IN THE FORMAT OF MONTH, DATE, LAST 2 YEAR DIGITS. LABEL MUST BE MADE FROM UL RECOGNIZED VINYL SELF LAMINATION LABEL SYSTEM.

⚠3 TWISTED WIRE PAIRS SHOULD HAVE MINIMUM OF 5 TWIST PER FOOT.

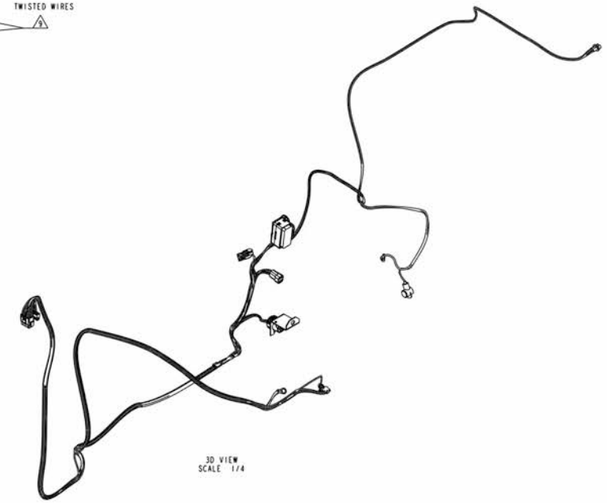
⚠4 COIL UP & TIE WRAP THE BRANCH TO THE MAIN BRANCH TO ALLOW BRANCH TO BE REPOSITIONED DURING GENSET INSTALLATION.

11. INK FOR HARNESS MARKING, MUST RESIST ERASER ABRASION TEST, ANTIFREEZE, MOTOR OIL, TRANSMISSION FLUID, GASOLINE, DIESEL FUEL & BRAKE FLUID.
12. CABLE AND HARNESS WORKMANSHIP SHALL COMPLY WITH IPC/WHMA-A-620 CLASS II REQUIREMENTS AND ACCEPTANCE FOR CABLE AND WIRE HARNESS ASSEMBLIES MOST CURRENT REVISION.
13. POINT TO POINT CONTINUITY TEST MUST BE PERFORMED ON THIS HARNESS ASSEMBLY.

⚠7 ATTACH A LABEL WITH UL MARK (UL SYMBOL AND OTHER UL REQUIRED INFORMATION) IN ACCORDANCE WITH REQUIREMENTS SPECIFIED BY THE SUPPLIER'S UL PROGRAM.

15. ELECTRICAL WORKMANSHIP SHALL COMPLY WITH IPC-A-610A CLASS II ACCEPTABILITY ELECTRONIC AND ELECTRICAL ASSEMBLIES MOST CURRENT REVISION.

⚠8 TORQUE TO 2.3 - 2.8 Nm.



DO NOT SCALE PRINT
DRN P_THEVAR
CHK M_TULADHAR
APVD M_TULADHAR
DATE 10NOV15
CUMMINS POWER GENERATION
HARNESS, ENGINE
SIZE PGF
DWG NO A053T310
REV B
SHEET 1 of 2

FIGURE 38. HARNESS, ENGINE (SHEET 1 OF 2)

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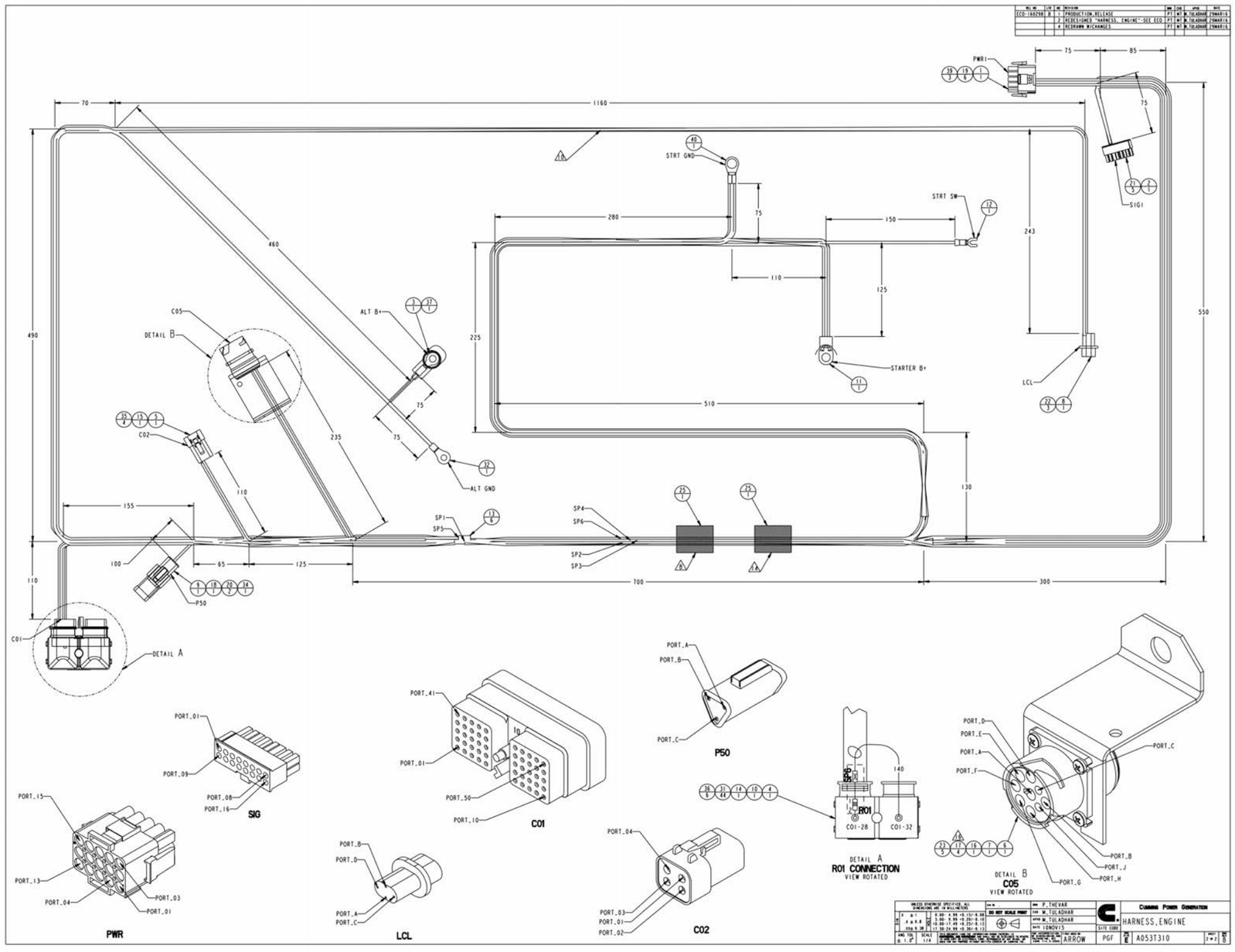


FIGURE 39. HARNESS, ENGINE (SHEET 2 OF 2)

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WIRE FROM / TO TABLE							
LEAD NO	FROM		TO		WIRE		
	STATION	CPG P/N	STATION	CPG P/N	WIRE SIZE	COLOR	CPG P/N
101	PWR 1	A050S773	FUSE F1-1	0332-1995	12	WHITE	0334-0760
102	SPLICE 31-1	0332-3638	FUSE F1-2	0332-1995	12	WHITE	0334-0760
103	SPLICE 31-2	0332-3638	P20-9	0323-2466	18	WHITE	0334-0757
104			P20-10	0323-2466	18	WHITE	0334-0757
105			P20-20	0323-2466	18	WHITE	0334-0757
106			P20-21	0323-2466	18	WHITE	0334-0757
107	PWR 2	A043U187	FUSE F2-1	0332-1993	16	WHITE	0334-0758
108	SPLICE 33-1	0332-3638	FUSE F2-2	0332-1993	16	WHITE	0334-0758
109	SPLICE 33-2	0332-3638	K3-1	0332-1993	16	WHITE	0334-0758
110			SIG 6	A043H311	18	WHITE	0334-0757
111			SPLICE 41-1	0332-3638	18	WHITE	0334-0757
112	PWR 3	A050S773	SPLICE 42-1	0332-3638	12	WHITE	0334-0760
113	PWR 5	A043U187	SPLICE 32-1	0332-3638	16	WHITE	0334-0758
114	P20-1	0323-2466	SPLICE 32-2	0332-3638	18	WHITE	0334-0757
115	P20-2	0323-2466			18	WHITE	0334-0757
116	P20-4	0323-2466			18	WHITE	0334-0757
117	P20-7	0323-2466			18	WHITE	0334-0757
118	P20-12	0323-2466			18	WHITE	0334-0757
119	PWR 6	A050S773	K4-4	0332-1995	12	WHITE	0334-0760
120	PWR 8	A043U187	K3-4	0332-1993	16	WHITE	0334-0758
121	SIG 5	A043H311	P20-17	0323-2466	18	WHITE	0334-0757
122	K2-5	0332-1992	P20-3	0323-2466	18	WHITE	0334-0757
123	K4-5	0332-1992	P20-15	0323-2466	18	WHITE	0334-0757
124	PWR 4	A050S773	K4-1	0332-1995	12	WHITE	0334-0760
125	K3-5	0332-1992	P11-21	0323-2466	18	WHITE	0334-0757
126	K4-6	0332-4041	P20-13	0323-2466	18	WHITE	0334-0757
127	SIG 2	A043H311	CAN SHIELD	-	18	-	0334-1354
128	CAN SHIELD		P11-17	0323-2466	18	-	0334-1354
129	SIG 3	A043H311	SPLICE 35-1	0332-3638	18	WHITE	0334-1354
130	R1-1	0351-1596-59			--	--	-
131	SIG 4	A043H311	SPLICE 36-1	0332-3638	18	BLACK	0334-1354
132	R1-2	0351-1596-59			--	-	-
133	SPLICE 35-2	0332-3638	P11-20	0323-2466	18	WHITE	0334-1354
134	SPLICE 36-2	0332-3638	P11-19	0323-2466	18	BLACK	0334-1354
135	K3-6	0332-1992	PE-1	0323-2332	18	WHITE	0334-0757
136	P11-22	0323-2466	JE-1	A040M659	18	WHITE	0334-0757
137	P25-2	0323-2466	PE-2	0323-2332	18	WHITE	0334-0757
138	P25-6	0323-2466	JE-2	A040M659	18	WHITE	0334-0757
139	TB15-1	0332-3491-01	P3-1	A040B973	18	WHITE	0334-0757
140	TB15-3	0332-3491-01	P3-3	A040B973	18	WHITE	0334-0757
141	TB15-4	0332-3491-01	P3-4	A040B973	18	WHITE	0334-0757
142	TB15-5	0332-3491-01	P3-5	A040B973	18	WHITE	0334-0757
143	P25-4	0323-2466	SPLICE 37-1	0332-3638	20	WHITE	0334-0756
144	OP P1-1	0323-2466	SPLICE 37-2	0332-3638	20	WHITE	0334-0756
145	BG P1-3	0332-3491-01			20	WHITE	0334-0756
146	P25-3	0323-2466	SPLICE 38-1	0332-3638	20	WHITE	0334-0756
147	OP P1-2	0323-2466	SPLICE 38-2	0332-3638	20	WHITE	0334-0756
148	BG P1-4	0332-3491-01			20	WHITE	0334-0756
149	P25-5	0323-2466	SPLICE 39-1	0332-3638	20	WHITE	0334-0756
150	OP P1-4	0323-2466	SPLICE 39-2	0332-3638	20	WHITE	0334-0756
151	BG P1-5	0332-3491-01			20	WHITE	0334-0756
152	P25-8	0323-2466	SPLICE 40-1	0332-3638	20	WHITE	0334-0756
153	OP P1-5	0323-2466	SPLICE 40-2	0332-3638	20	WHITE	0334-0756
154	BG P6-2	0332-3491-01			20	WHITE	0334-0756
155	P25-10	0323-2466	OP P1-6	0323-2466	20	WHITE	0334-0756
156	P25-11	0323-2466	OP P1-7	0323-2466	20	WHITE	0334-0756
157	P25-12	0323-2466	BG P6-1	0332-3491-01	20	WHITE	0334-0756
158	P18-1	0323-2332	FT-1	0332-1993	16	WHITE	0334-0758
159	F7-2	0332-1993	AC-P-2	A043L492	16	WHITE	0334-0758
160	P18-2	0323-2332	F8-1	0332-1993	16	WHITE	0334-0758
161	F8-2	0332-1993	AC-P-3	A043L492	16	WHITE	0334-0758
162	TB1-1	0332-3491-01	PCC-TB1-10	0332-3491-01	18	WHITE	0334-0757
163	TB5-1	0332-3491-01	PCC-TB1-11	0332-3491-01	18	WHITE	0334-0757
164	TB2-1	0332-3491-01	P20-19	0323-2466	18	WHITE	0334-0757
165	TB7-1	0332-3491-01	PCC-TB1-7	0332-3491-01	18	WHITE	0334-0757
166	PCC-TB1-15	0332-3491-01	PCC-TB1-16	0332-3491-01	18	WHITE	0334-0757
167	TB6-1	0332-3491-01	PCC-TB1-6	0332-3491-01	18	WHITE	0334-0757
168	TB8-1	0332-3491-01	PCC-TB1-5	0332-3491-01	18	WHITE	0334-0757
169	TB4-1	0332-3491-01	P20-18	0323-2466	18	WHITE	0334-0757
170	TB3-1	0332-3491-01	PCC-TB1-13	0332-3491-01	18	WHITE	0334-0757
171	TB9-1	0332-3491-01	PCC-TB1-4	0332-3491-01	18	WHITE	0334-0757
172	PWR-13	A043U187	FUSE F4-1	0332-1993	16	WHITE	0334-0758
173	FUSE F4-2	0332-1993	K2-1	0332-1993	16	WHITE	0334-0758
174	TB10-1	0332-3491-01	K2-4	0332-1993	16	WHITE	0334-0758
175	SPLICE 41-2	0332-3638	OP P1-3	0323-2466	20	WHITE	0334-0756
176			J40-2	0323-1859	18	WHITE	0334-0757
177	PL-1	0332-2430	J40-1	0323-1859	18	WHITE	0334-0757
178	P18-3	0323-2332	AC-P-4	A043L492	16	WHITE	0334-0758
179	FUSE F3-2	0332-1995	PWR-9	A050S773	12	WHITE	0334-0760
180	K2-6	0332-1992	K4-6	0332-4041	18	WHITE	0334-0757
181	SPLICE 42-2	0332-3638	FUSE F3-1	0332-1995	12	WHITE	0334-0760
182	SPLICE 42-2	0332-3638	FUSE F5-1	0332-1993	16	WHITE	0334-0758
183	FUSE F5-2	0332-1993	PWR-10	A043U187	16	WHITE	0334-0758

REL NO	REV	ECN	REVISION	BM	CHK	APVD	DATE
ECO-159956	B	1	PRODUCTION RELEASE	DH	DH	M.TULADHAR	01APR16
		2	REDESIGN AND REDRAWN CONTROL HARNESS	DH	DH	M.TULADHAR	01APR16

NOTES:

1. TOLERANCES: UP TO 500 +15/-5.
   500 TO 1000 +30/-10.
   1000 TO LONGER +40/-20.

2. ALL LEADS/WIRES SHALL BE MARKED AT MAXIMUM OF 76 mm BEHIND THE CONNECTOR AND AT EVERY 30 mm INTERVAL WITH BOTH STATION NUMBERS LISTED IN THE "FROM-TO" TABULATION.
   MARKING SHALL BE PERMANENT AND LEGIBLE. WIRE MARKINGS NEED TO HAVE FULL VISUAL ACCESS.END MARKINGS ARE NOT TO BE VISUALLY OBSCURED AND MUST BE FULLY DISPLAYED. TO/FROM DESIGNATIONS ARE NOT TO BE FRAGMENTED. DESIGNATOR SHALL APPEAR IN FULL TEXT AND NOT IN BROKEN SEGMENTS.

3. USE CABLE TIES (0332-3388) AT EVERY 200 mm AS NECESSARY TO SECURE WIRES.EXCEPT IN THOSE CABLE TIES EXPLICITLY DIMENSIONED IN THE DRAWING.

4. FOLD BACK SHIELD WIRE (0334-1354) AND SECURE TO CABLE WITH ELECTRICAL TAPE (0895-0030).

5. HARNESS MUST BE PROCURED FROM A SUPPLIER QUALIFIED AS A UL RECOGNIZED HARNESS MANUFACTURER CATEGORY (ZPMW2). PACKAGING OF PARTS TO BE MARKED IN ACCORDANCE WITH REQUIREMENTS SPECIFIED BY SUPPLIERS UL PROGRAM.

6. STAGGER THE SPLICES, RESISTORS & DIODE, COVER WITH HEAT SHRINK (0898-1337-03). PLACE THE SPLICES INLINE WITH BUNDLE.

7. LABEL MUST BE MADE FROM UL RECOGNIZED VINYL SELF LAMINATION LABEL SYSTEM.
   MARK FUSES ABOVE THE HOLDER ON THE BRACKET F1:20A, F2:10A, F3:10A ,F4:10A,F5:1A, F7:10A, F8:10A
   MARK RELAYS TOP-CENTER K2,K3 & K4 (DO NOT COVER TECHNICAL INFORMATION OF THE RELAY)

8. IF THE VALUE OF 0 (ZERO) IS USED IN THE BILL OF MATERIAL, THE QUANITY OF THE AFFECTED ITEMS SHALL BE DERIVED FROM THE DRAWING REQUIREMENTS.

9. SLEEVING MATERIAL SHOULD BE UL 94-V2 RATED & WITHSTAND UP TO -40°C TO 125°C OPERATING TEMPERATURE, CONTINUOUS USE 105°C. COLOR BLACK.

10. PLUG PE CONNECTOR IN TO JE CONNECTOR .

11. SHIPPING METHOD: BUNDLE THE WIRE WITH WIRE TIE (0332-3388).

12. INK FOR HARNESS MARKING,MUST RESIST ERASER ABRASION TEST,ANTIFREEZE,MOTOR OIL, TRANSMISSION FLUID,GASOLINE,DIESEL FUEL & BRAKE FLUID

13. SCREW TORQUE: 0.6-0.8 Nm.

14. CABLE AND HARNESS WORKMANSHIP SHALL COMPLY WITH IPC/WHMA-A-620 CLASS II REQUIREMENTS AND ACCEPTANCE FOR CABLE AND WIRE HARNESS ASSEMBLIES MOST CURRENT REVISION.

15. POINT TO POINT CONTINUITY TEST MUST BE PERFORMED ON THIS HARNESS ASSEMBLY.

16. ATTACH A MASTER HARNESS LABEL WITH THE FOLLOWING INFORMATION: CUMMINS PART NUMBER, CUMMINS PART REVISION LEVEL, MANUFACTURER'S NAME, MANUFACTURER'S LOCATION, AND MANUFACTURER'S DATE OF MANUFACTURE IN THE FORMAT OF MONTH, DATE, LAST 2 YEAR DIGITS.

17. PLACE INDIVIDUAL LABEL WITH FOLLOWING DETAIL

    TB1 : "GROUND".

    TB2 : "INPUT- RAPTURE BASIN".

    TB3 : "INPUTS RETURN".

    TB4 : "INPUT- LOW FUEL".

    TB5 : "REMOTE START".

    TB6 : "OUTPUT 1 COM".

    TB7 : "OUTPUT 1 N.O.".

    TB8 : "FUSE B+ (3A)".

    TB9 : "READY TO LOAD".

    TB10: "SW B+ (10A)"

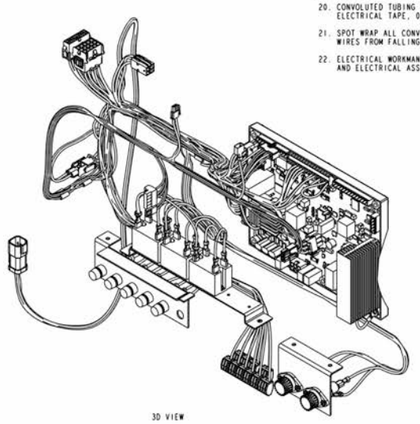
18. ATTACH A LABEL WITH UL MARK (UL SYMBOL AND OTHER UL REQUIRED INFORMATION) IN ACCORDANCE WITH REQUIREMENTS SPECIFIED BY THE SUPPLIER'S UL PROGRAM.

19. TORQUE TO 2.5-3.3 Nm.

20. CONVOLUTED TUBING ENDS SHALL BE WRAPPED WITH A MINIMUM OF 2 LAYERS OF BLACK ELECTRICAL TAPE, 0895-0030.

21. SPOT WRAP ALL CONVOLUTED TUBING WITH BLACK ELECTRICAL TAPE, 0895-0030 TO PREVENT WIRES FROM FALLING OUT.

22. ELECTRICAL WORKMANSHIP SHALL COMPLY WITH IPC-A-610A CLASS II ACCEPTABILITY ELECTRONIC AND ELECTRICAL ASSEMBLIES MOST CURRENT REVISION.



3D VIEW

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
X ±0.5
XX ±0.25
XXX ±0.127
ANG TOL ± 1.0°
SCALE 1/2
DO NOT SCALE PRINT
DRN C.BADGUJAR
CHK M.TULADHAR
APVD M.TULADHAR
DATE 17NOV15
ARROW
CUMMINS POWER GENERATION
HARNESS,GENERATOR ELECTRICAL CONTROL-0085 DIESEL
SITE CODE
PGF
SIZE A
A053R492
SHT 1 OF 4

FIGURE 40. HARNESS, CONTROL (SHEET 1 OF 4)

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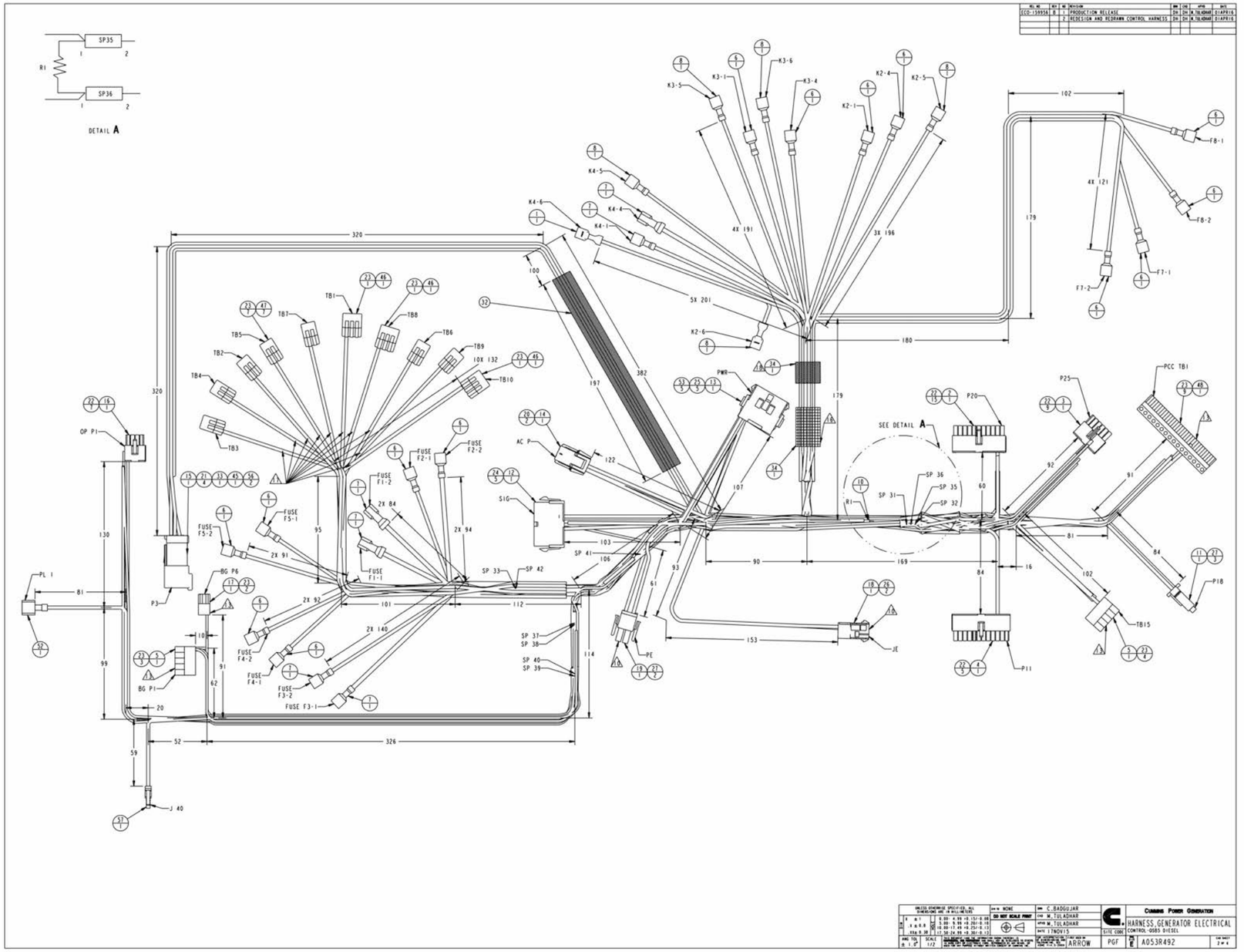


FIGURE 41. HARNESS, CONTROL (SHEET 2 OF 4)

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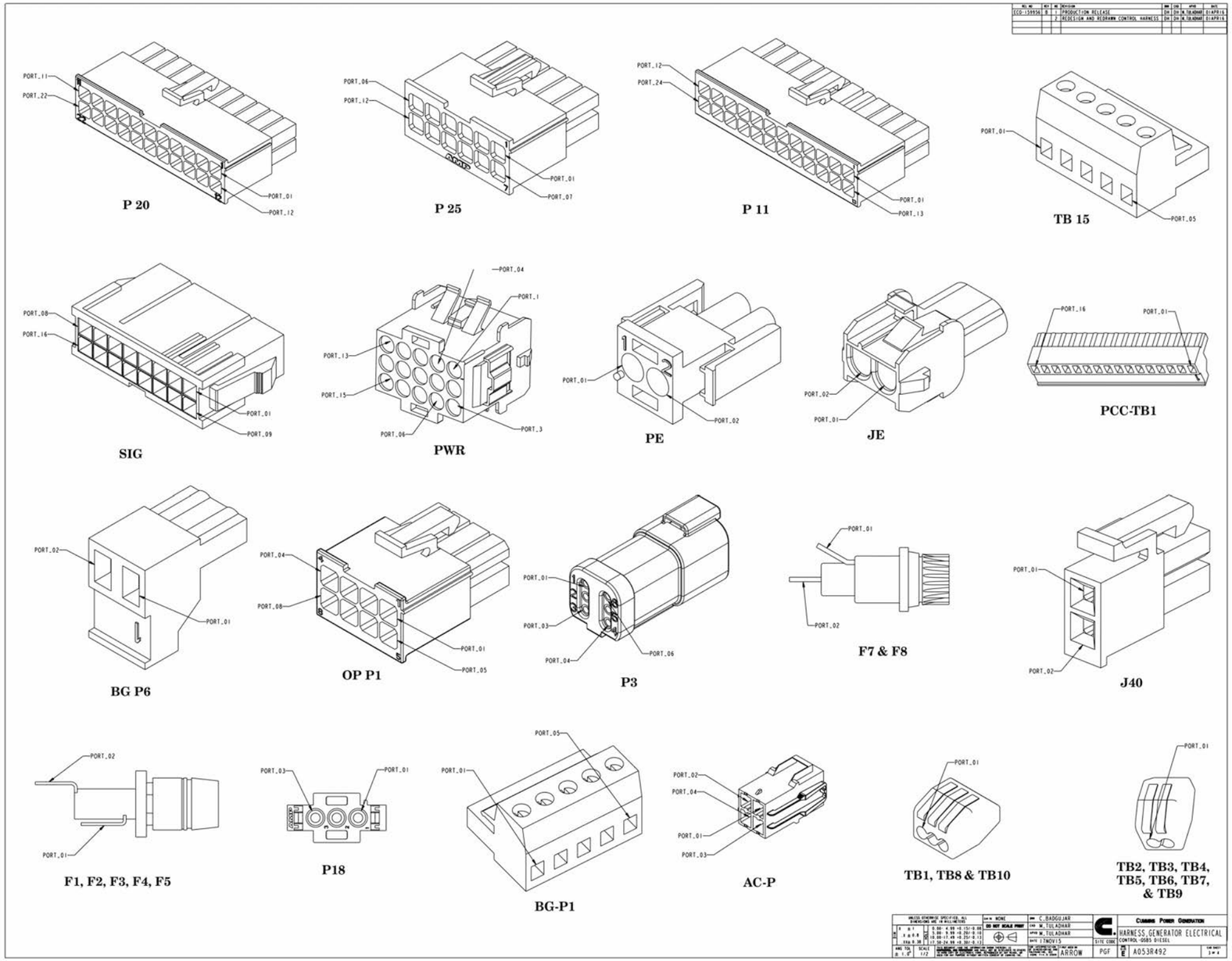


FIGURE 42. HARNESS, CONTROL (SHEET 3 OF 4)

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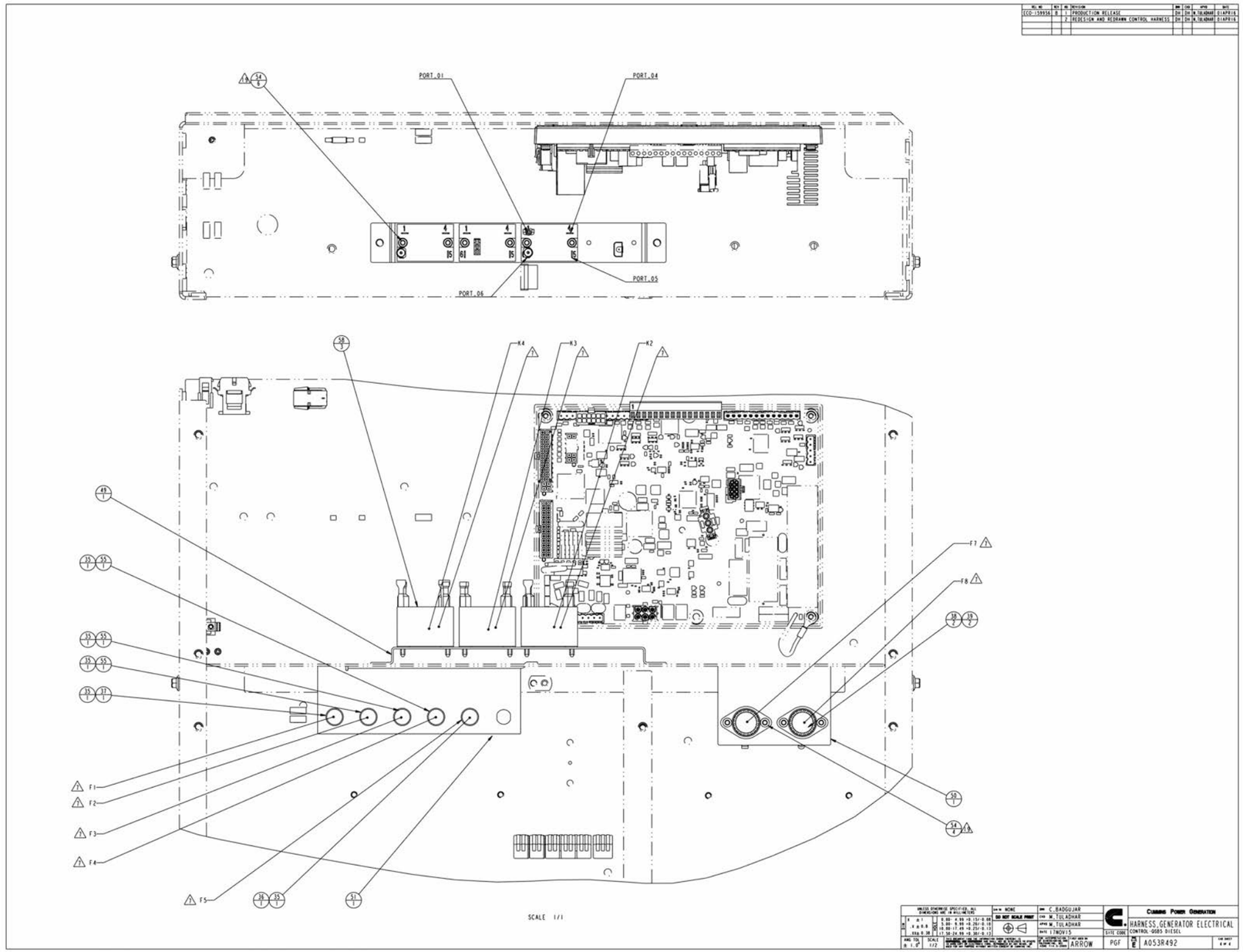


FIGURE 43. HARNESS, CONTROL (SHEET 4 OF 4)

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Appendix D. Seismic Requirements

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The drawings included in this section are representative. For current complete information, refer to the drawing package that was shipped with the unit.

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D.1 Seismic Installation Instructions

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-159499	A	1	PRODUCTION RELEASE	DAH	DAH	JAWALE	11FEB16

SEISMIC INSTALLATIONS NOTES:

1. THE DESIGN OF POST-INSTALLED ANCHORS IN CONCRETE USED FOR THE COMPONENT ANCHORAGE IS PRE-QUALIFIED FOR SEISMIC APPLICATIONS IN ACCORDANCE WITH "ACI 355.2-07" AND DOCUMENTED IN A REPORT BY A REPUTABLE TESTING AGENCY. (EX. THE EVALUATION SERVICE REPORT ISSUED BY THE INTERNATIONAL CODE COUNCIL)
2. ANCHORS MUST BE INSTALLED TO AN EMBEDMENT DEPTH AS RECOMMENDED IN THE PRE-QUALIFICATION TEST REPORT AS DEFINED IN NOTE 1. FOR "CBC 2013" APPLICATIONS.
3. ANCHORS MUST BE INSTALLED IN MINIMUM 3000 PSI COMPRESSIVE STRENGTH NORMAL WEIGHT STRUCTURAL CONCRETE. CONCRETE AGGREGATE MUST COMPLY WITH "ASTM C33".
4. ANCHORS MUST BE INSTALLED TO THE TORQUE SPECIFICATION AS RECOMMENDED BY THE ANCHOR MANUFACTURER.
5. ANCHORS MUST BE INSTALLED IN LOCATIONS SPECIFIED ON THIS INSTALLATION DRAWING.
6. WASHERS MUST BE INSTALLED AT EACH ANCHOR LOCATION BETWEEN THE ANCHOR HEAD AND EQUIPMENT FOR TENSION LOAD DISTRIBUTION. WASHERS MUST BE TYPE A OR B PLAIN WASHERS MEETING ASME B18.21.1-2009. WASHER SIZE TO MATCH ANCHOR DIAMETER.
7. CONCRETE FLOOR SLAB AND CONCRETE HOUSEKEEPING PADS MUST BE DESIGNED FOR SEISMIC APPLICATIONS IN ACCORDANCE WITH "ACI 318-11".
8. ALL HOUSEKEEPING PAD THICKNESSES MUST BE DESIGNED IN ACCORDANCE WITH THE PRE-QUALIFICATION TEST REPORT AS DEFINED IN NOTE 1 OR A MINIMUM OF 1.5X THE ANCHOR EMBEDMENT DEPTH, WHICHEVER IS LARGEST (UNLESS NOTED OTHERWISE).
9. ALL HOUSEKEEPING PADS MUST BE DOWELLED OR CAST INTO THE BUILDING STRUCTURAL FLOOR SLAB AND DESIGNED FOR SEISMIC APPLICATION PER "ACI 318-11" AND AS APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.
10. FLOOR MOUNTED EQUIPMENT (WITH OR WITHOUT A HOUSEKEEPING PAD) MUST BE INSTALLED TO A STEEL REINFORCED STRUCTURAL CONCRETE FLOOR THAT IS SEISMICALLY DESIGNED AND APPROVED BY THE ENGINEER OF RECORD TO RESIST ALL LOADS FROM EQUIPMENT BEING ANCHORED TO THE FLOOR.
11. COORDINATE REINFORCEMENT OF SUPPORT STRUCTURE WITH EQUIPMENT ANCHOR LOCATIONS.
12. ATTACHING SEISMIC CERTIFIED EQUIPMENT TO FLOOR OTHER THAN THOSE DESIGNED TO ACCEPT THE SEISMIC LOADS FROM CERTIFIED EQUIPMENT BY THE STRUCTURAL ENGINEER OF RECORD IS PROHIBITED.
13. INSTALLATION ONTO A STEEL ROOF STRUCTURE OR MANUFACTURED STEEL CURB SHALL BE COORDINATED WITH THE STRUCTURAL ENGINEER OF RECORD.
14. CONNECTIONS TO THE EQUIPMENT, INCLUDING BUT NOT LIMITED TO CONDUIT, WIRING FROM CABLE TRAYS, OTHER ELECTRICAL SERVICES OR OTHER CONNECTIONS, ARE THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR AND BEYOND THE SCOPE OF THIS DOCUMENT.
    FLEXIBLE ATTACHMENTS MUST BE USED FOR SEISMIC CONNECTIONS TO ISOLATED COMPONENTS OR ISOLATED EQUIPMENT.
    THE FLEXIBLE ATTACHMENT MUST PROVIDE FOR ENOUGH RELATIVE DISPLACEMENT TO REMAIN CONNECTED TO THE EQUIPMENT AND FUNCTIONAL DURING AND AFTER A SEISMIC EVENT.
15. REFER TO GENSET OUTLINE DRAWINGS FOR WEIGHT, CG AND CONFIGURATION SPECIFICS.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO A051N157	DRN D HOFMEISTER	CUMMINS POWER GENERATION
DIM: X ±1; .X ±0.8; .XX± 0.38 — DEC: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD D HOFMEISTER	INSTALLATION, GENSET SEISMIC REQUIREMENTS
ANG TOL: ± 1.0° SCALE: 1/1	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	APVD M. JAWALE; DATE 11FEB16; FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994; FIRST USED ON ARROW	SITE CODE PGF; SIZE D; A054T597; SHEET 1 OF 5; REV A

FIGURE 44. SEISMIC INSTALLATION SPECIFICATIONS (SHEET 1 OF 2)

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REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-159499	A	1	PRODUCTION RELEASE.	DAH	DAH	JAWALE	11FEB16

GRADE MOUNTED GENERATOR SETS

CUMMINS GENSET MODEL	CONFIGURATION	ATTACHMENT TO CONCRETE					
		EVALUATION PARAMETERS	CONCRETE ANCHORS	ANCHOR EMBEDMENT	ANCHOR SPACING	DISTANCE TO NEAREST EDGE	CONCRETE SLAB THICKNESS
C50 D6C C60 D6C C80 D6C C100 D6C C125 D6C	GENERATOR SET WITH OR WITHOUT ENCLOSURE	CBC 2013/IBC 2012 Sds <= 2.5 Ip <= 1.5 ap/Rp <= 2.5/2.0 z/h = 1.0 Ω = 2.5	SEE NOTE				

NOTE: TYPE OF ANCHOR, ANCHOR ATTACHMENT SPECIFICS AND MINIMUM SLAB THICKNESS TO BE DESIGNED BY ENGINEER OF RECORD.

GRADE/ROOF MOUNTED GENERATOR SETS

CUMMINS GENSET MODEL	CONFIGURATION	ATTACHMENT TO STEEL	
		EVALUATION PARAMETERS	STEEL BOLTS
C50 D6C C60 D6C C80 D6C C100 D6C C125 D6C	GENERATOR SET WITH OR WITHOUT ENCLOSURE	CBC 2013/IBC 2012 Sds <= 2.5 Ip <= 1.5 ap/Rp <= 2.5/2.0 z/h <= 1.0	(QTY 4) 5/8" DIAMETER ASTM A325N OR A490 BOLTS WITH WASHERS THROUGH THE BASE RAIL MOUNTING HOLES.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ± 1; .X ± 0.8; .XX ± 0.38
MULT: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/1
SHR TO A051N157 DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP
DRN D HOFMEISTER CKD D HOFMEISTER APVD M. JAWALE DATE 11FEB16
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCING, REF ASME Y14.5M-1994 FIRST USED ON ARROW
SITE CODE PGF
CUMMINS POWER GENERATION
INSTALLATION, GENSET SEISMIC REQUIREMENTS
ENG SIZE D A054T597 SHEET 2 OF 5 ENG REV A

FIGURE 45. SEISMIC INSTALLATION SPECIFICATIONS (SHEET 2 OF 2)

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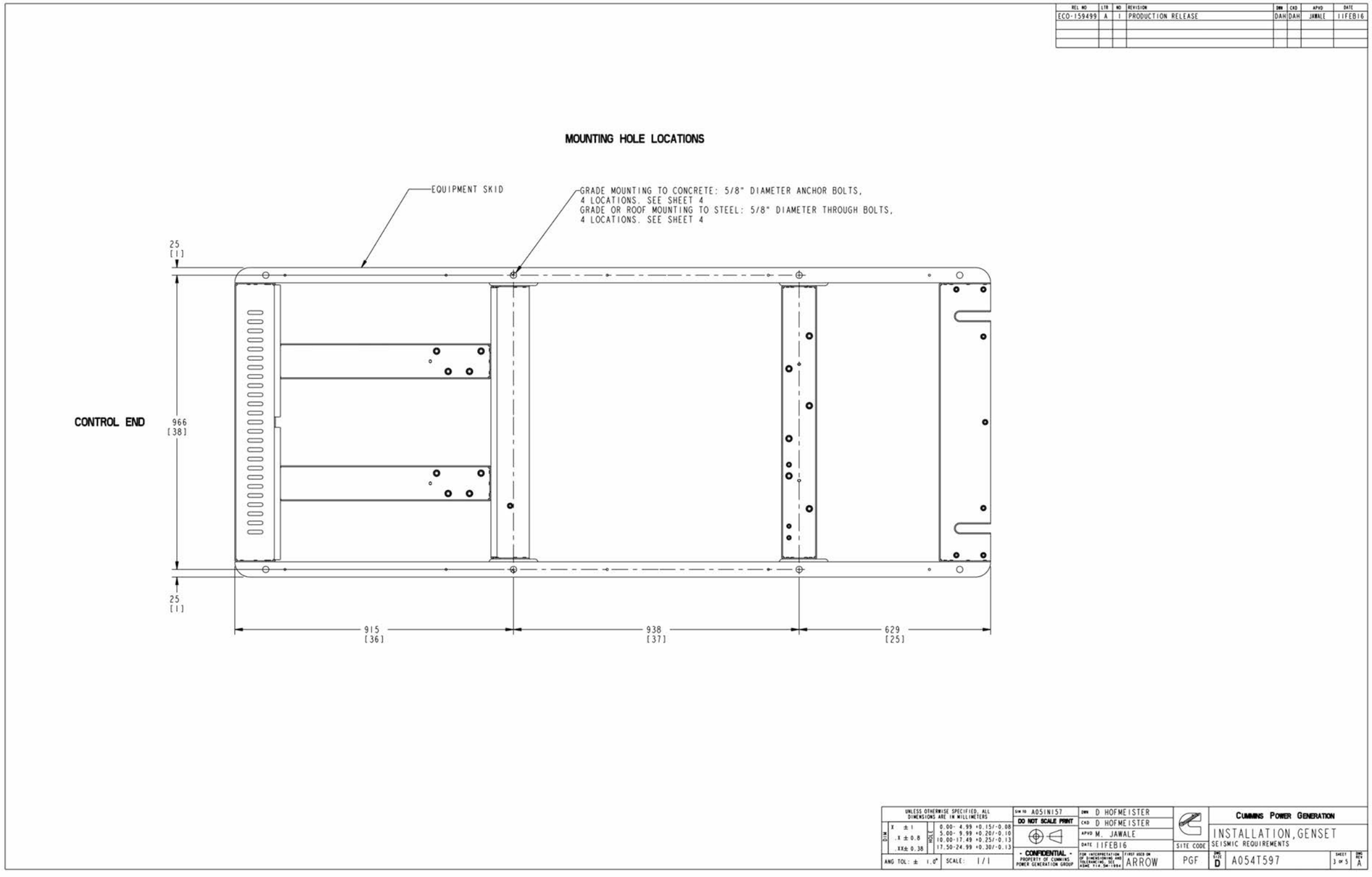
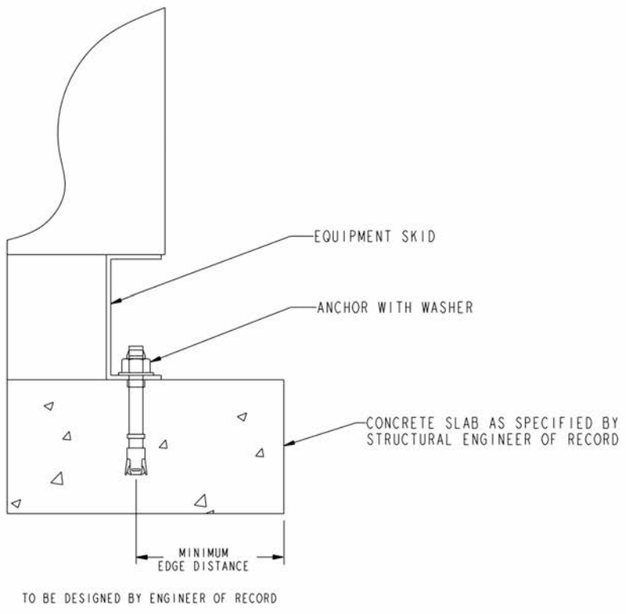


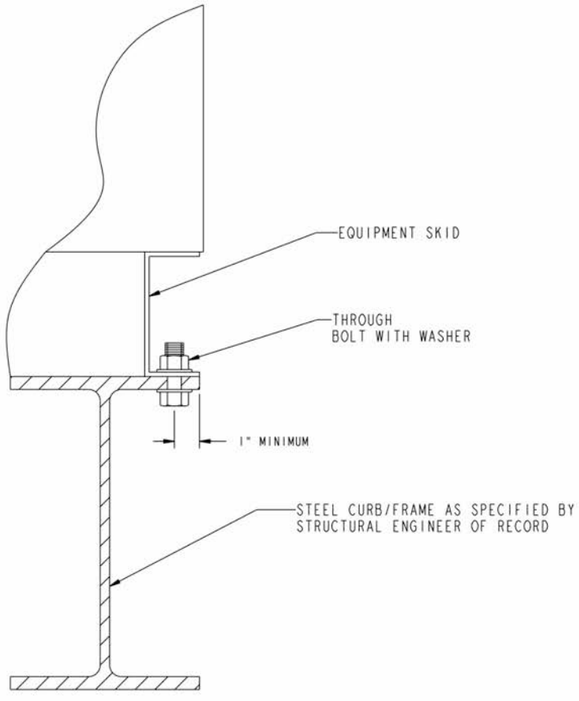
FIGURE 46. SEISMIC INSTALLATION MOUNTING HOLE LOCATIONS

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REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-159499	A	1	PRODUCTION RELEASE	DAH	DAH	JAWALE	11FEB16



CONCRETE CONNECTION



STEEL CONNECTION

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO A051N157	DRN D HOFMEISTER	CUMMINS POWER GENERATION
DIM: X ±1, .X ±0.8, .XX± 0.38 — REF: 0.00- 4.99 +0.15/-0.08, 5.00- 9.99 +0.20/-0.10, 10.00-17.49 +0.25/-0.13, 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD D HOFMEISTER	INSTALLATION, GENSET
		APVD M. JAWALE	SEISMIC REQUIREMENTS
		DATE 11FEB16	SITE CODE
ANG TOL: ± 1.0°	SCALE: 1/1	FIRST USED ON ARROW	PGF — SIZE D — A054T597 — SHEET 4 OF 5 — DRG REV A

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FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIGURE 47. SEISMIC INSTALLATION CONNECTIONS

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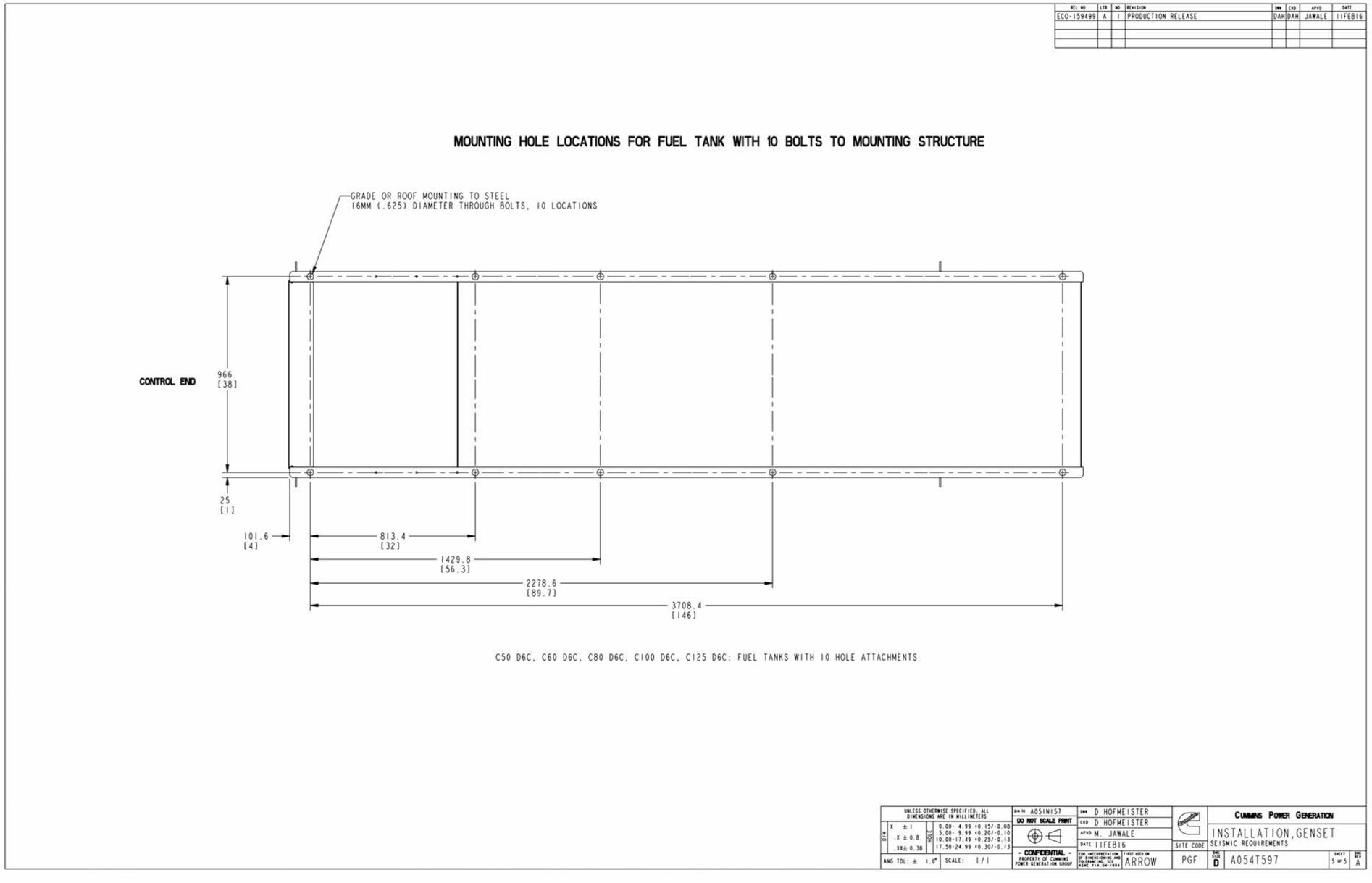


FIGURE 48. SEISMIC INSTALLATION MOUNTING HOLE LOCATIONS FOR FUEL TANK

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