



Installation Manual

QSB5-G5, QSB5-G6, and QSB5-G13 Engines with PowerCommand® 1.1/2.3 Control

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

Table of Contents

1. IMPORTANT SAFETY INSTRUCTIONS	1
1.1 Warning, Caution, and Note Styles Used in This Manual	1
1.2 General Information	1
1.3 General Precautions	2
1.4 Generator Set Voltage Is Deadly	5
1.5 Exhaust Precautions.....	5
1.6 Fuel and Fumes Are Flammable	6
1.7 Starting Batteries	7
1.8 Batteries Can Explode	7
1.9 Vented Batteries	8
1.10 Moving Parts Can Cause Severe Personal Injury or Death	9
1.11 The Hazards of Carbon Monoxide.....	9
2. INTRODUCTION.....	11
2.1 About This Manual.....	11
2.2 Related Literature	11
2.3 Before Installation	12
2.4 Model Specifications	13
3. PRE-INSTALLATION CONSIDERATIONS.....	19
3.1 Pre-Installation Considerations Introduction	19
3.2 Installation Codes and Standards for Safety	20
3.3 Required Items for Installation.....	21
4. INSTALLATION.....	27
4.1 Site Assessment and Preparation	27
4.2 Fuel System.....	31
4.3 Engine Exhaust.....	36
4.4 Electrical Connections	36
5. STARTUP AND CONFIGURATION PCC 1.1.....	49
5.1 Operator Panel.....	49
5.2 InPower Service Tool.....	69
6. STARTUP AND CONFIGURATION PCC 2.3.....	71
6.1 Operator Panel.....	71
6.2 InPower Service Tool.....	80
6.3 Checklist	80
6.4 Before Starting.....	82
APPENDIX A. DIESEL FUEL PIPING	91
A.0 Diesel Fuel Piping Requirements	92
APPENDIX B. OUTLINE AND SYSTEM DRAWINGS.....	95

APPENDIX C. WIRING DIAGRAMS.....	111
C.0 Wiring Diagrams.....	112
APPENDIX D. SEISMIC REQUIREMENTS.....	129
D.1 Seismic Installation Instructions	131

1 IMPORTANT SAFETY INSTRUCTIONS

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

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

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

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

1.2 General Information

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

NOTICE

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

1.3 General Precautions

- Keep multi-type 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 (–) cables 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.

⚠ WARNING***Moving Parts***

Moving parts can cause severe personal injury.

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

⚠ WARNING***Toxic Hazard***

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

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

⚠ WARNING***Electrical Generating Equipment***

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

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

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

⚠ WARNING***Toxic Gases***

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

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

⚠ WARNING***High Noise Level***

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

Wear appropriate ear protection at all times.

⚠ WARNING***Hot Surfaces***

Contact with hot surfaces can cause severe burns.

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

⚠ WARNING**Toxic Hazard**

Ethylene glycol, used as an engine coolant, is toxic to humans and animals. Wear appropriate PPE. Clean up coolant spills and dispose of used coolant in accordance with local environmental regulations.

⚠ WARNING**Combustible Liquid**

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

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

⚠ WARNING**Combustible Gases**

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

Wear appropriate eye and ear protection at all times.

⚠ WARNING**Combustible Gases**

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

Do not operate the generator set with any doors open.

⚠ WARNING**Fire Hazard**

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

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

⚠ WARNING**Automated Machinery**

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

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

NOTICE

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

NOTICE

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

NOTICE

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

1.4 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.

⚠ WARNING**Hot Surfaces**

Contact with hot surfaces can cause severe burns.

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

⚠ WARNING**Toxic Gases**

Inhalation of exhaust gases can cause asphyxiation and death.

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

⚠ WARNING**Fire Hazard**

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

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

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

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

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

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

1.6 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.

- 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. Do not charge frozen batteries.

WARNING

Electric Shock Hazard

Batteries present the risk of high short circuit current.

When servicing the generator set:

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

NOTICE

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

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

1.9 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.***

1.10 Moving Parts Can Cause Severe Personal Injury or Death

- Do not wear loose clothing or jewelry near moving parts, such as cooling 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.

The following documents are shipped with the generator set:

- Installation Manual for QSB5 Engine with PC 1.1/2.3 Control (A055H194)
- Operator Manual for QSB5 Engine with PC 2.3 Control (A055H195)
- Health and Safety Manual (A007W058 [0908-0110-00])
- Warranty Administration Manual (4021290)
- 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 1.1 Control (A061C653)
- Generator Set Service Manual for QSB5 Engine with PC 2.3 Control (A055H196)
- Controller Owners Manual for PowerCommand 1302 (0900-0661)
- 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 1.1/2.3 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
- 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

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	20.06 L	23.09 L	27.63 L	33.69 L	38.99 L
	5.30 gal	6.10 gal	7.30 gal	8.90 gal	10.30 gal
Prime	17.79 L	20.82 L	26.87 L	29.15 L	35.20 L
	4.70 gal	5.50 gal	7.10 gal	7.70 gal	9.30 gal

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	<p>4 Cylinder-in-line, liquid-cooled, 4-stroke</p> <ul style="list-style-type: none"> • QSB5-G5: C50D6C (Spec A), C60D6C (Spec A), C80D6C (Spec A), and C100D6C (Spec A) • QSB5-G6: C125D6C only • QSB5-G13: C50D6C (Spec B), C60D6C (Spec B), C80D6C (Spec B), and C100D6C (Spec B)
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	<p>Maximum fuel flow:</p> <ul style="list-style-type: none"> • C50D6C, C60D6C, C80D6C, and C100D6C: 133 L/hr (35 gal/hr) • C125D6C only: 95 L/hr (25 gal/hr) <p>Maximum fuel inlet restriction with clean filter: 17 kPa (5 in. Hg)</p> <p>Maximum return restriction: 20 kPa (6 in. Hg)</p>

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) G13 engine: 276 kPa (40 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

	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 I₂ = 8%.

TABLE 10. GENERATOR SET DERATING GUIDELINES (STANDBY)

Model	Spec	Above	Derate At (per 10 °C/18° F)	Above	Derate At (per 300 m/1000 ft)	Until	Derate At (per 300 m/1000 ft)
C50D6C	A	40 °C	19%	2012 m (6600 ft)	17%	x	
C60D6C	A			1890 m (6200 ft)			
C80D6C	A			1585 m (5200 ft)			
C100D6C	A			1280 m (4200 ft)			
C125D6C	A			1097 m (3600 ft)			
C50D6C	B	40 °C	16.10%	4648 m (15250 ft)	2.20%	1707 m (5600 ft)	2.20%
C60D6C	B			3581 m (11750 ft)			
C80D6C	B			1524 m (5000 ft)	17.50%		
C100D6C	B			1295 m (4250 ft)			

TABLE 11. GENERATOR SET DERATING GUIDELINES (PRIME)

Model	Spec	Above	Derate At (per 10 °C/18° F)	Above	Derate At (per 300 m/1000 ft)	Until	Derate At (per 300 m/1000 ft)
C50D6C	A	40 °C	19%	2073 m (6800 ft)	17%	x	
C60D6C	A			1951 m (6400 ft)			
C80D6C	A			1707 m (5600 ft)			
C100D6C	A			1463 m (4800 ft)			
C125D6C	A			1158 m (3800 ft)			
C50D6C	B	16.10%		5258 m (17250 ft)	2.30%		
C60D6C	B			4343 m (14250 ft)			
C80D6C	B			1753 m (5750 ft)			
C100D6C	B			1448 m (4750 ft)	17.50 %		

TABLE 12. CONTROL SPECIFICATIONS (ALL MODELS)

Control
PowerCommand® 1.1
PowerCommand® 2.3

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

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.

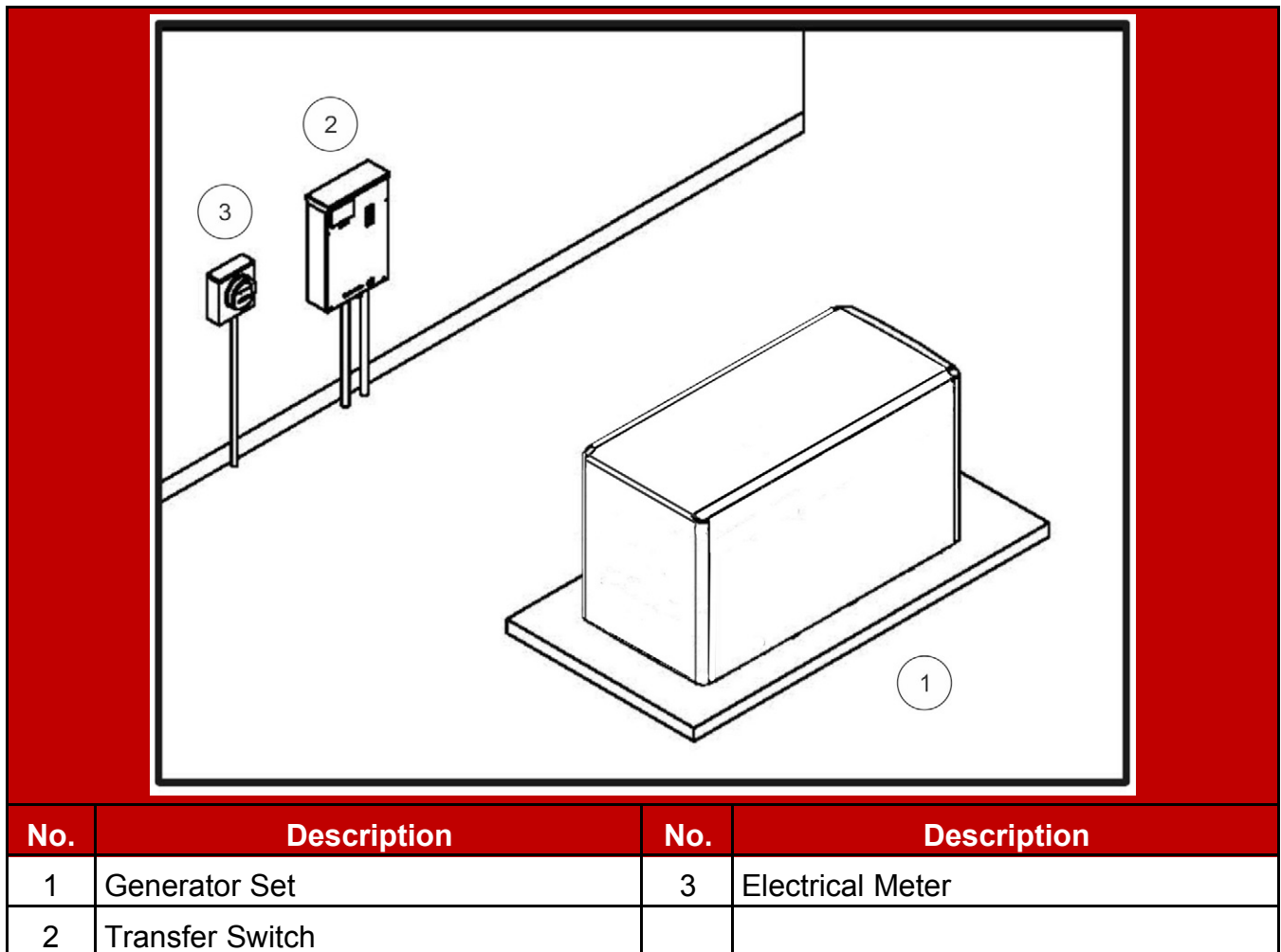


FIGURE 1. SITE PREPARATION EXAMPLE

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

- 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

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

- 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, PTFE, 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
- 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.

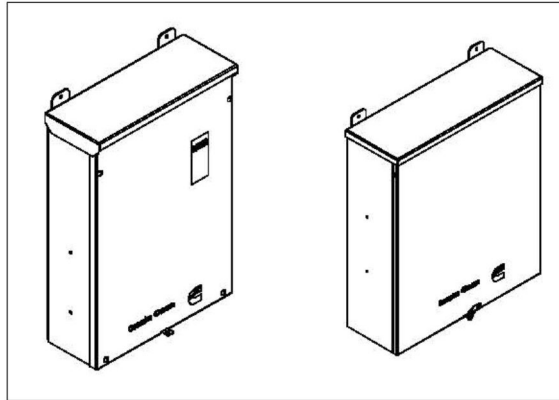


FIGURE 2. EXAMPLE OF CUMMINS TRANSFER SWITCH

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.

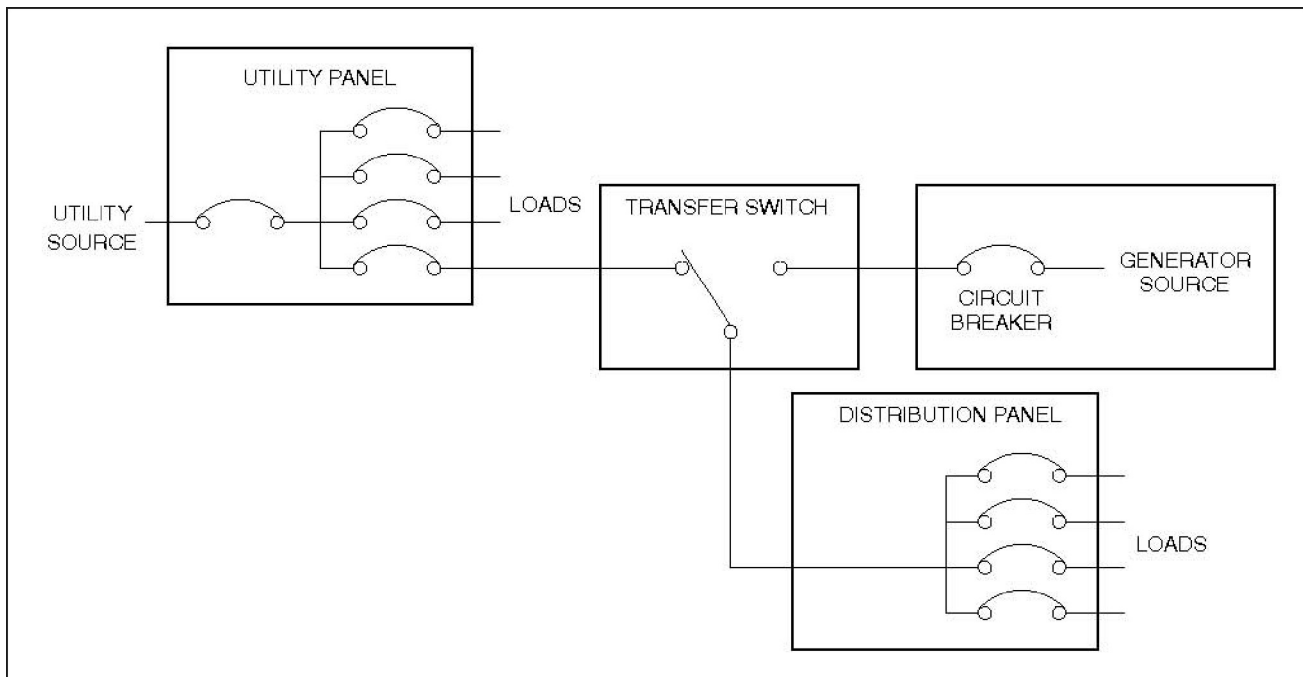


FIGURE 3. EXAMPLE OF TRANSFER SWITCH CONNECTIONS FOR PARTIAL COVERAGE LOAD

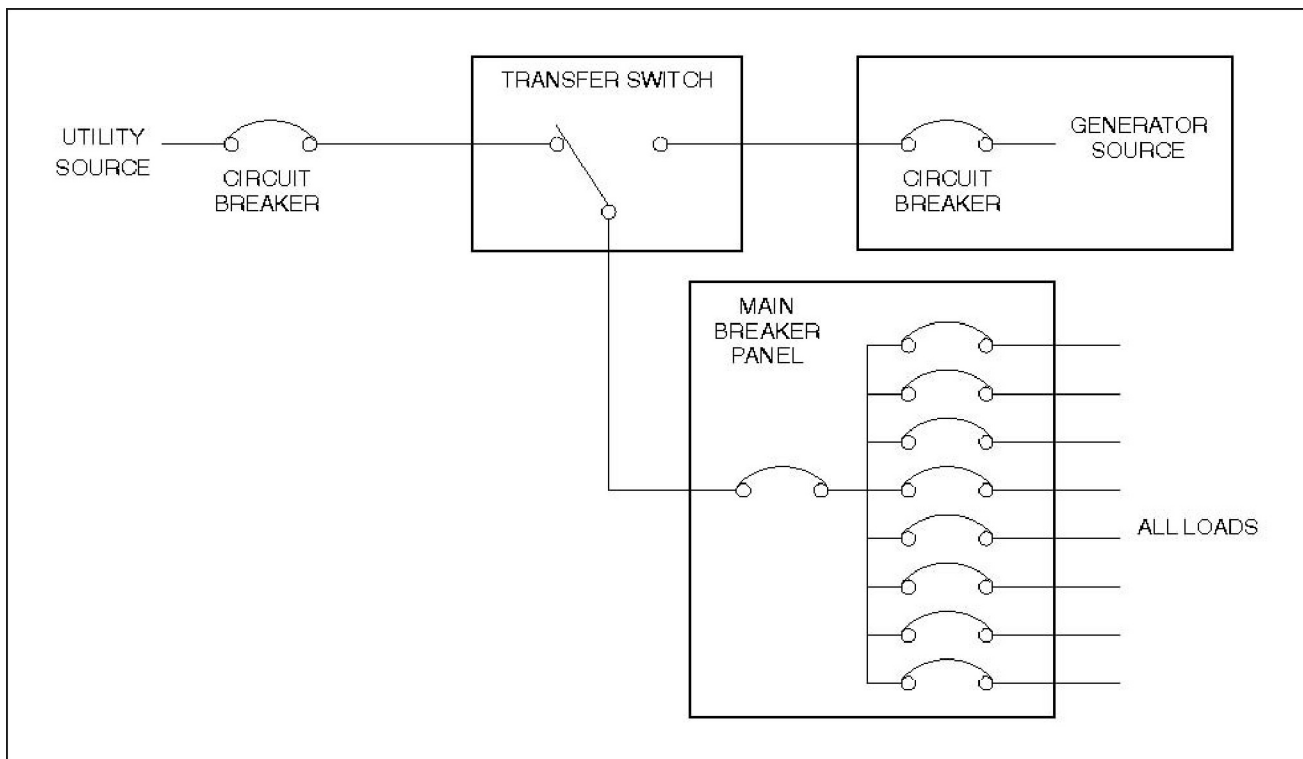


FIGURE 4. EXAMPLE OF TRANSFER SWITCH CONNECTIONS FOR FULL COVERAGE LOAD

Loose Parts Shipped With the Generator Set

The following loose parts are shipped with the generator set:

- 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.

- 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.

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

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 by length, by width, 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) provided with the accessory mounting pad and flat washers are needed with this accessory pad. The flat washers are included with the installation package provided with the generator set.

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

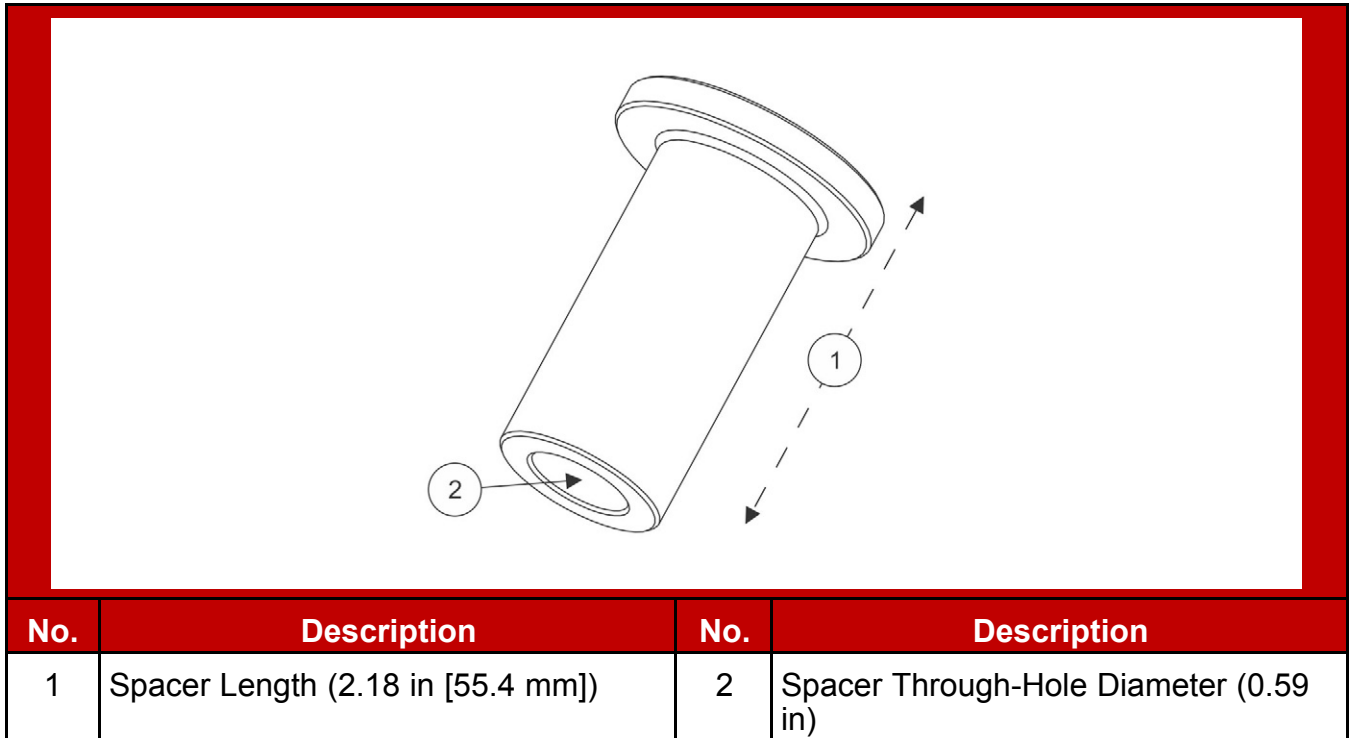


FIGURE 5. MOUNTING SPACER

2. *Prefabricated pad only:* Install the bolts with the washer under the head through the spacer and 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
<p>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:</p> <ul style="list-style-type: none"> • 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.

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.

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.

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 (1/2 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. The fuel hose must be installed according to all applicable codes and standards.

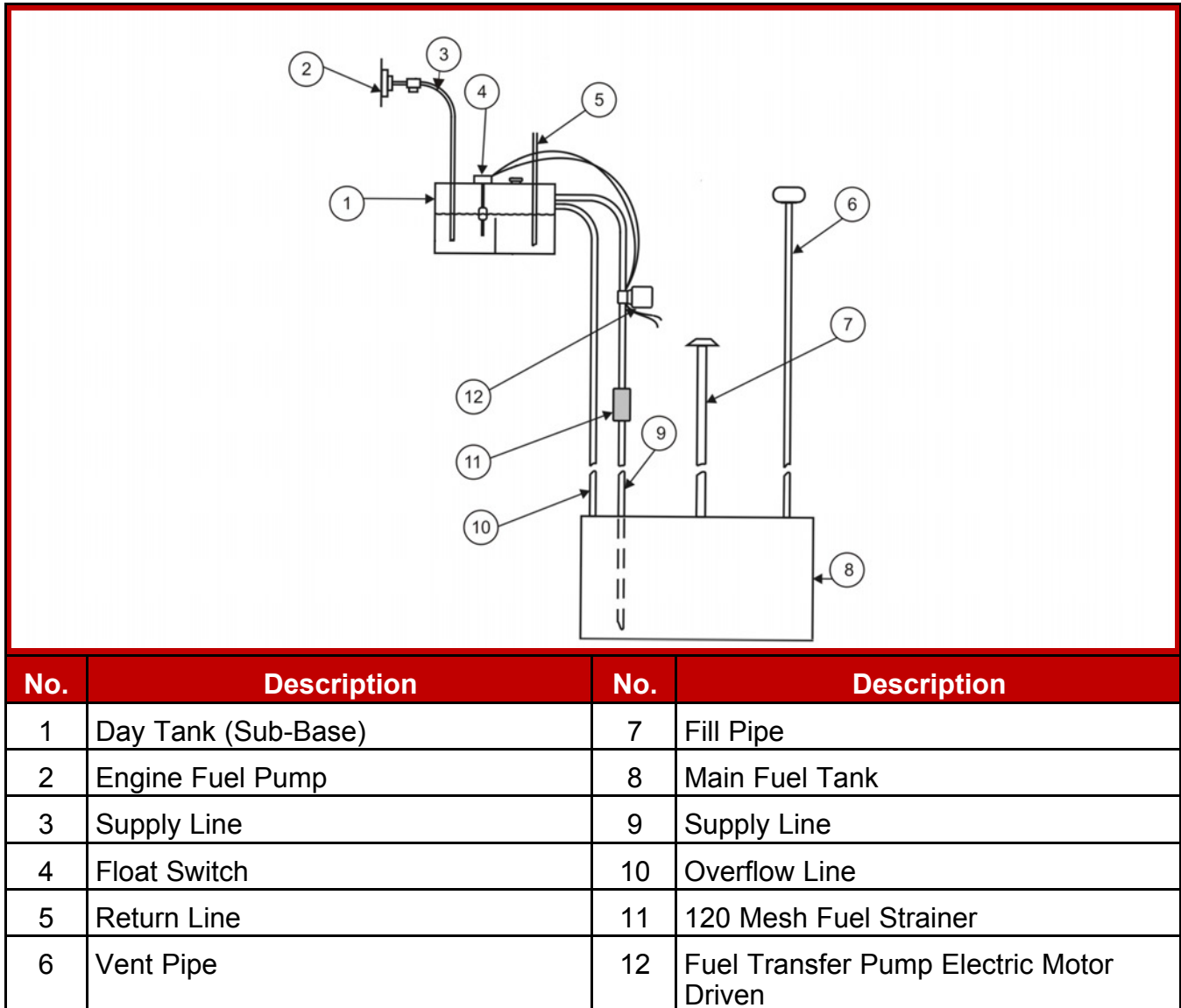


FIGURE 6. TYPICAL FUEL SUPPLY INSTALLATION (USING FACTORY SUB-BASE TANK AS DAY TANK)

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.

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.

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.

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.

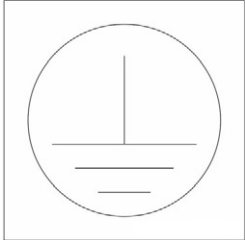
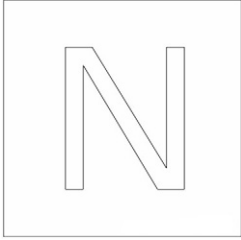
Equipment Grounding Conductor Symbol	Equipment Neutral Connection Symbol
	

FIGURE 7. SYMBOLS ON CIRCUIT BREAKER BOX

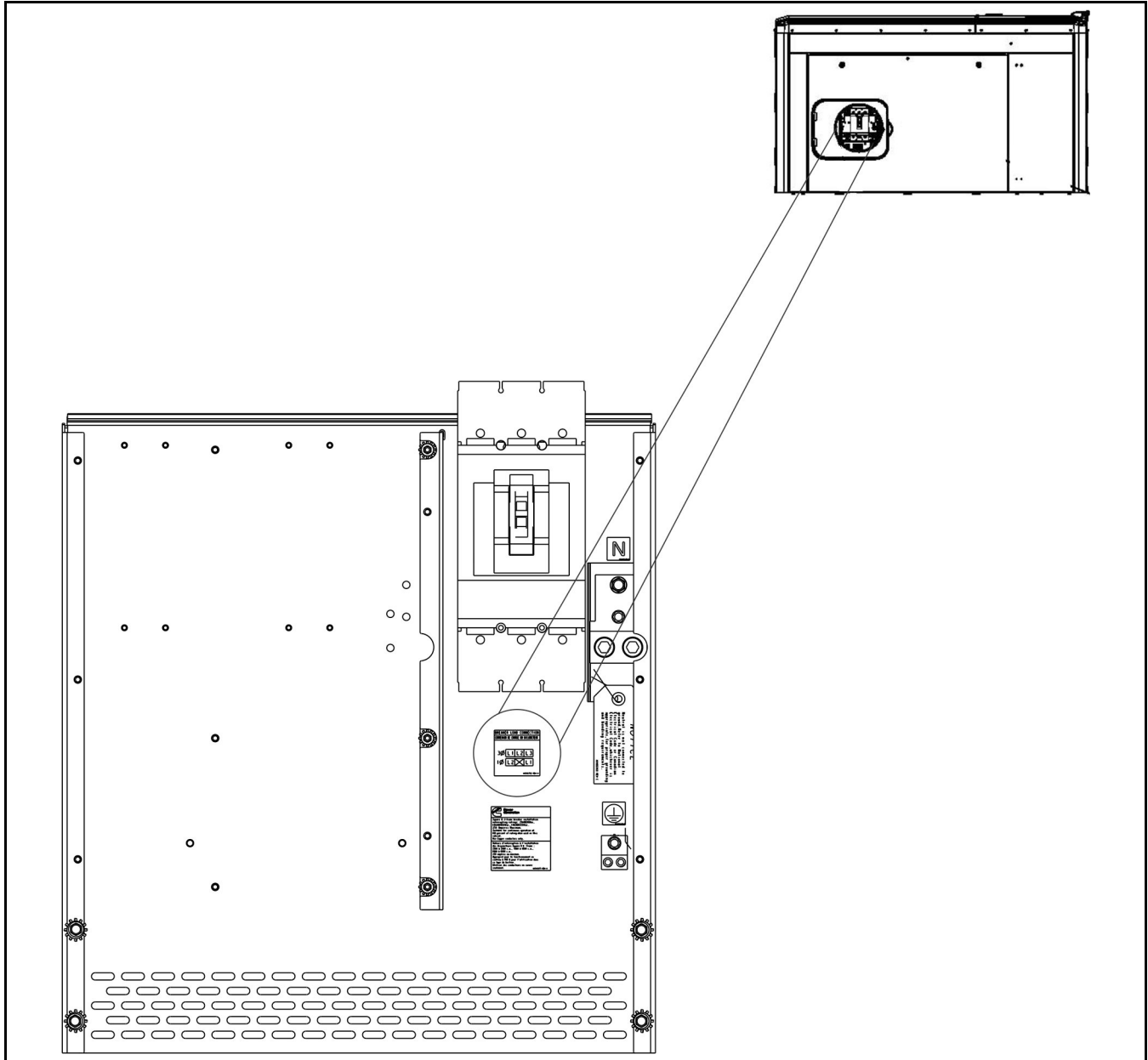


FIGURE 8. CIRCUIT BREAKER AC LOAD CONNECTIONS LOCATION

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.

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.

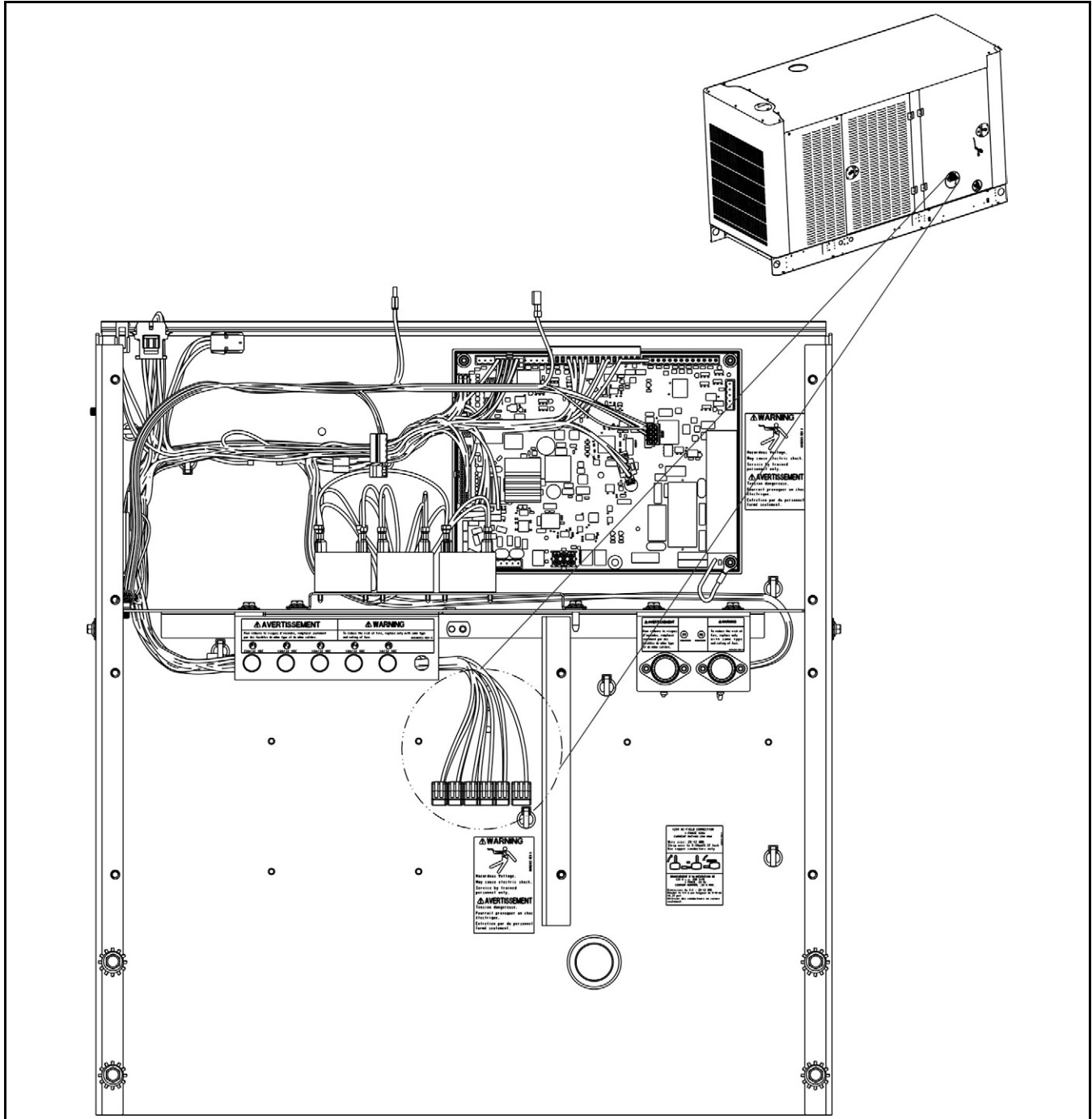
Refer to the specific transfer switch owner or operator manual for more detail about installing the ATS.

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.



**FIGURE 9. CUSTOMER AC CONNECTIONS
Factory Option and Accessory Connections**

NOTICE

Use copper conductors only.

The available AC powered options or accessories are the following:

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

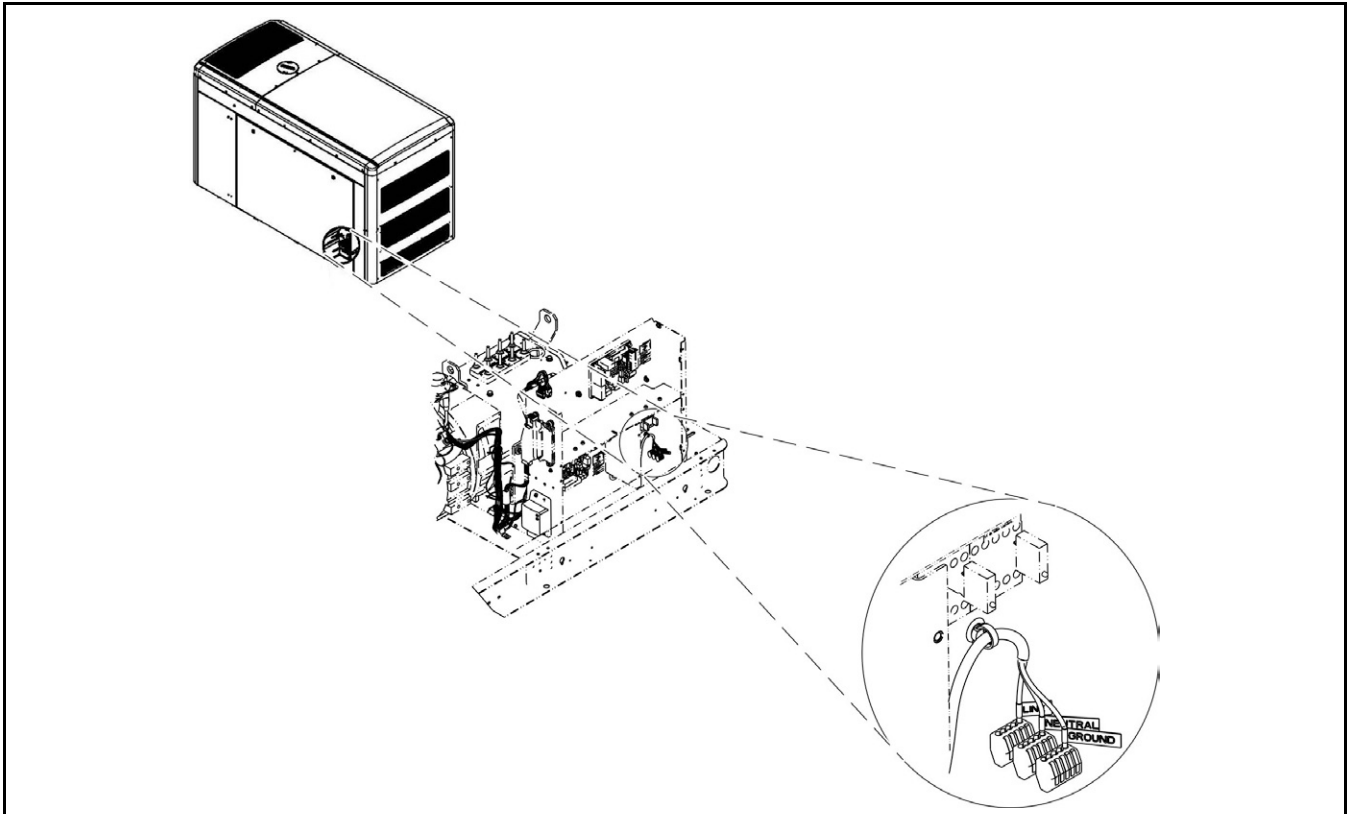


FIGURE 10. AC ACCESSORY CONNECTIONS

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.

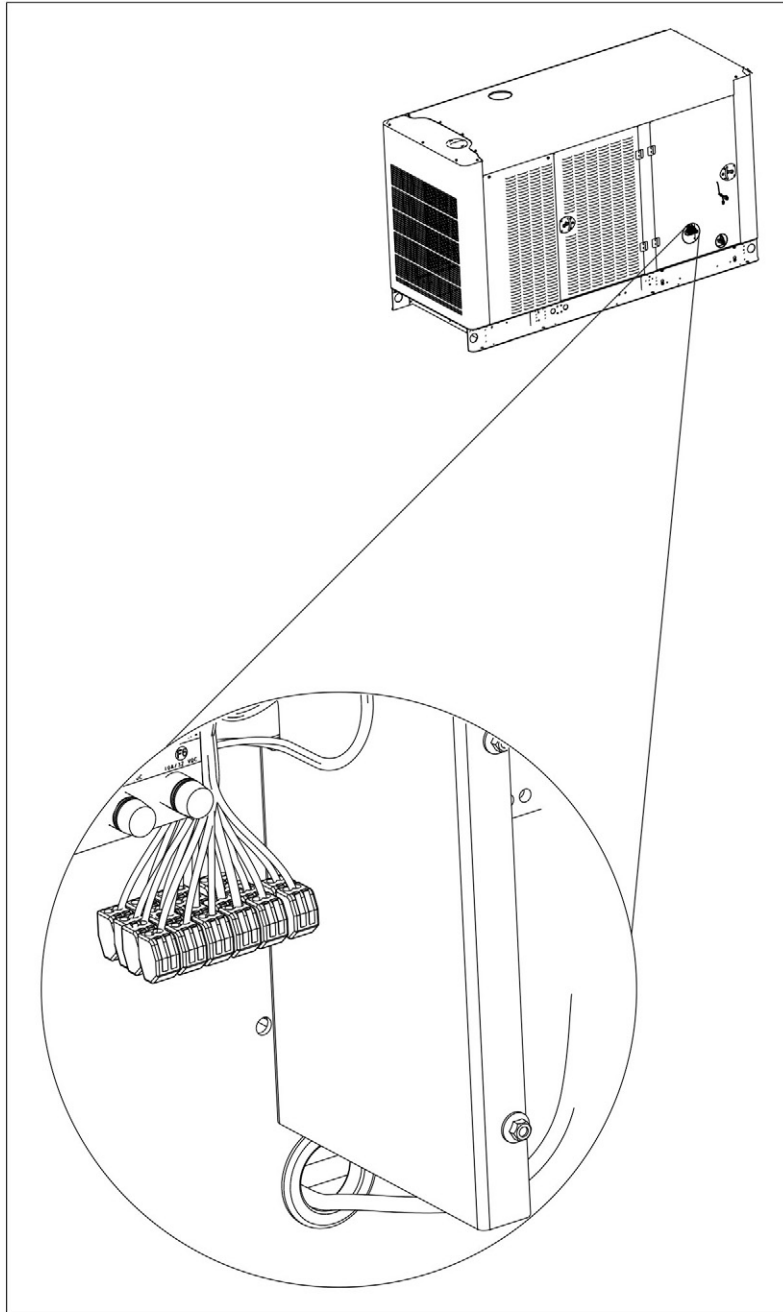


FIGURE 11. DC CUSTOMER CONNECTIONS
Automatic Transfer Switch DC Connections

⚠ 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.

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.

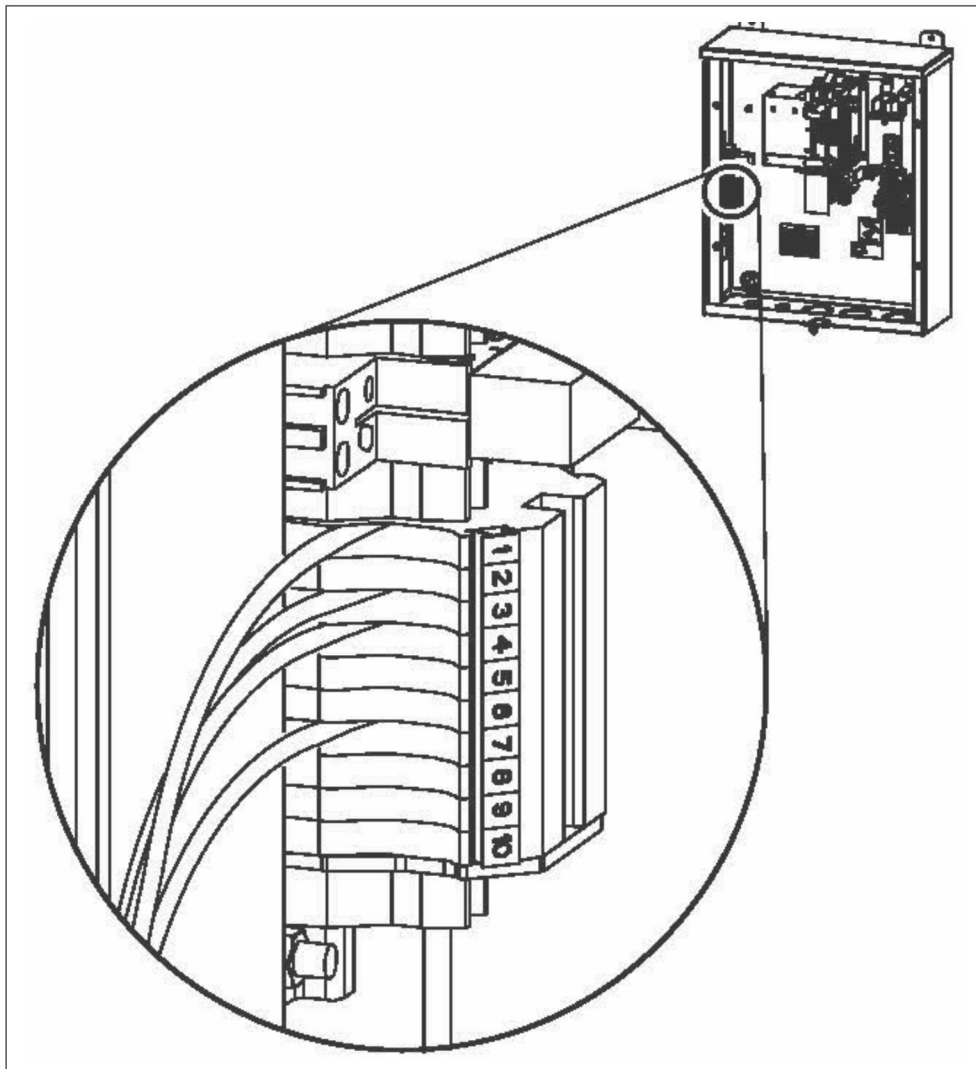


FIGURE 12. EXAMPLE OF TRANSFER SWITCH DC CONNECTIONS LOCATION

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.

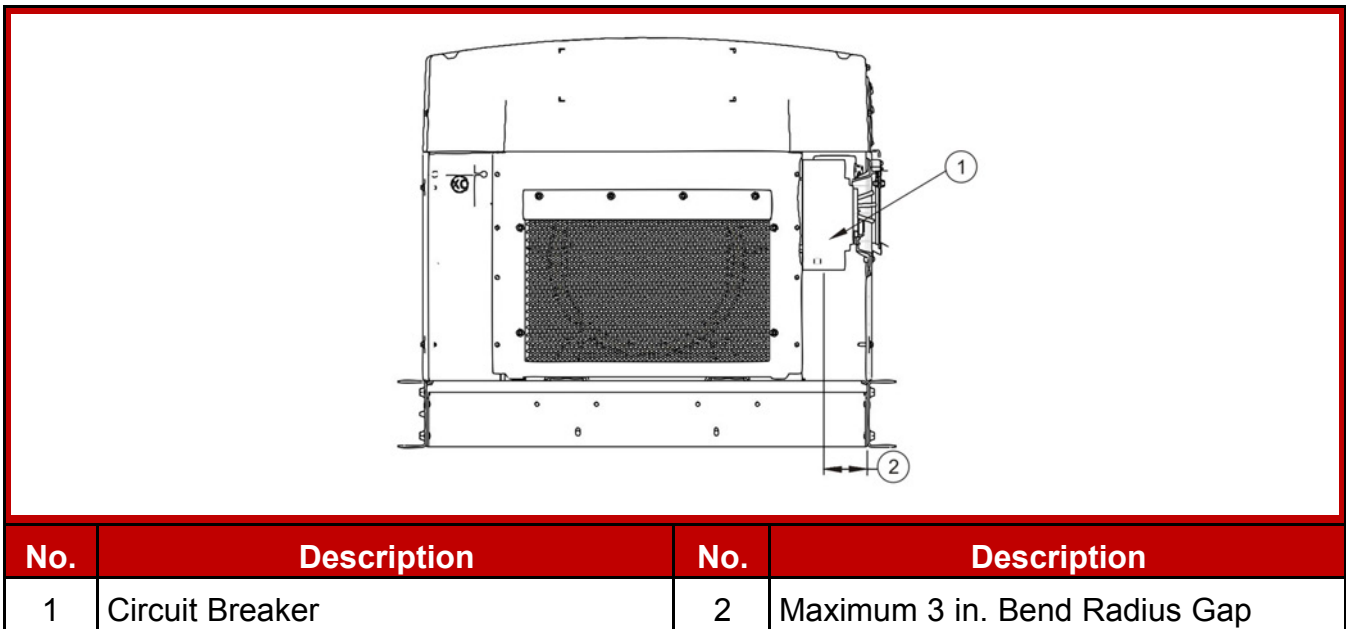


FIGURE 13. CABLING ROOM FOR CIRCUIT BREAKER

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.

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.

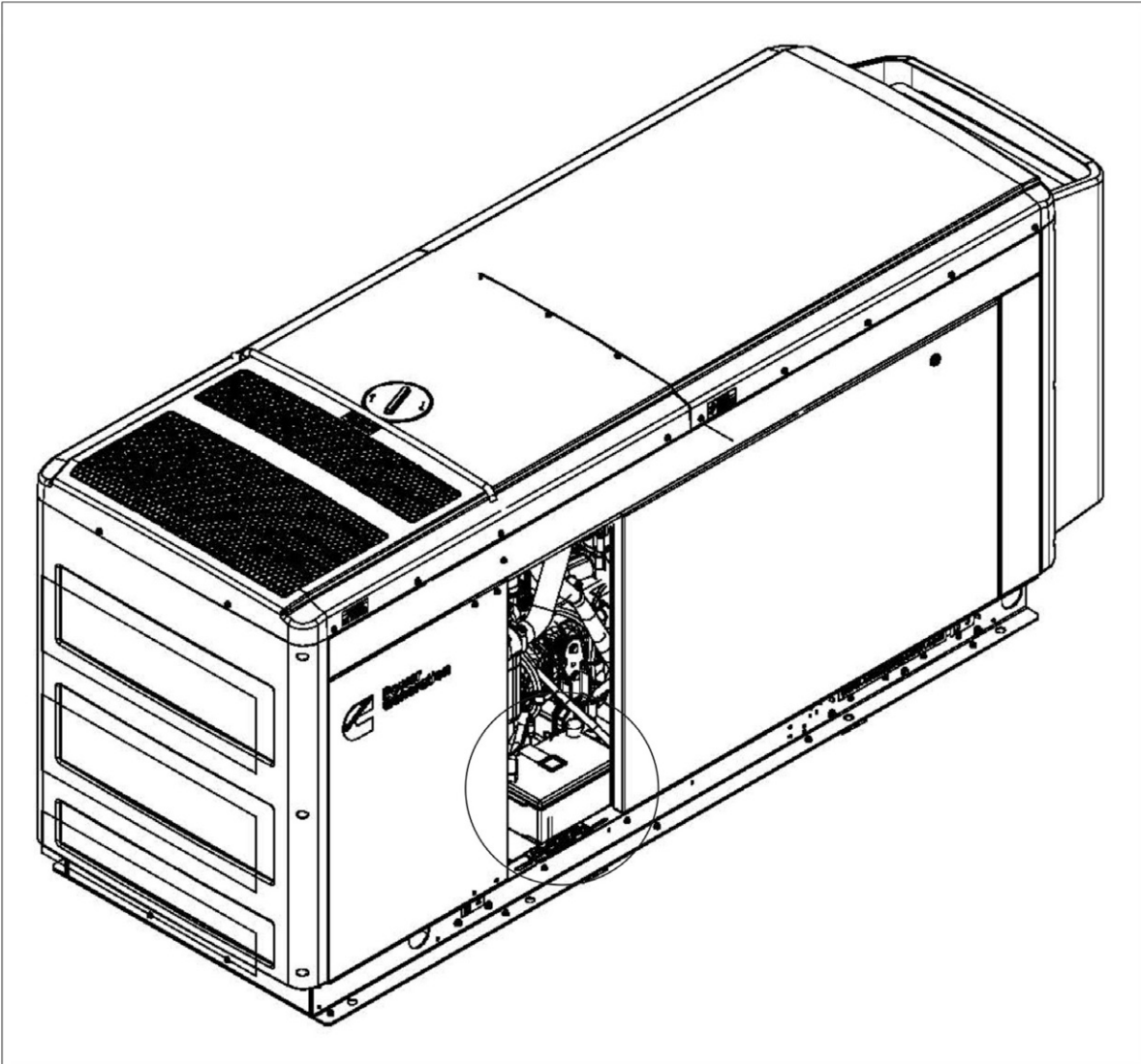


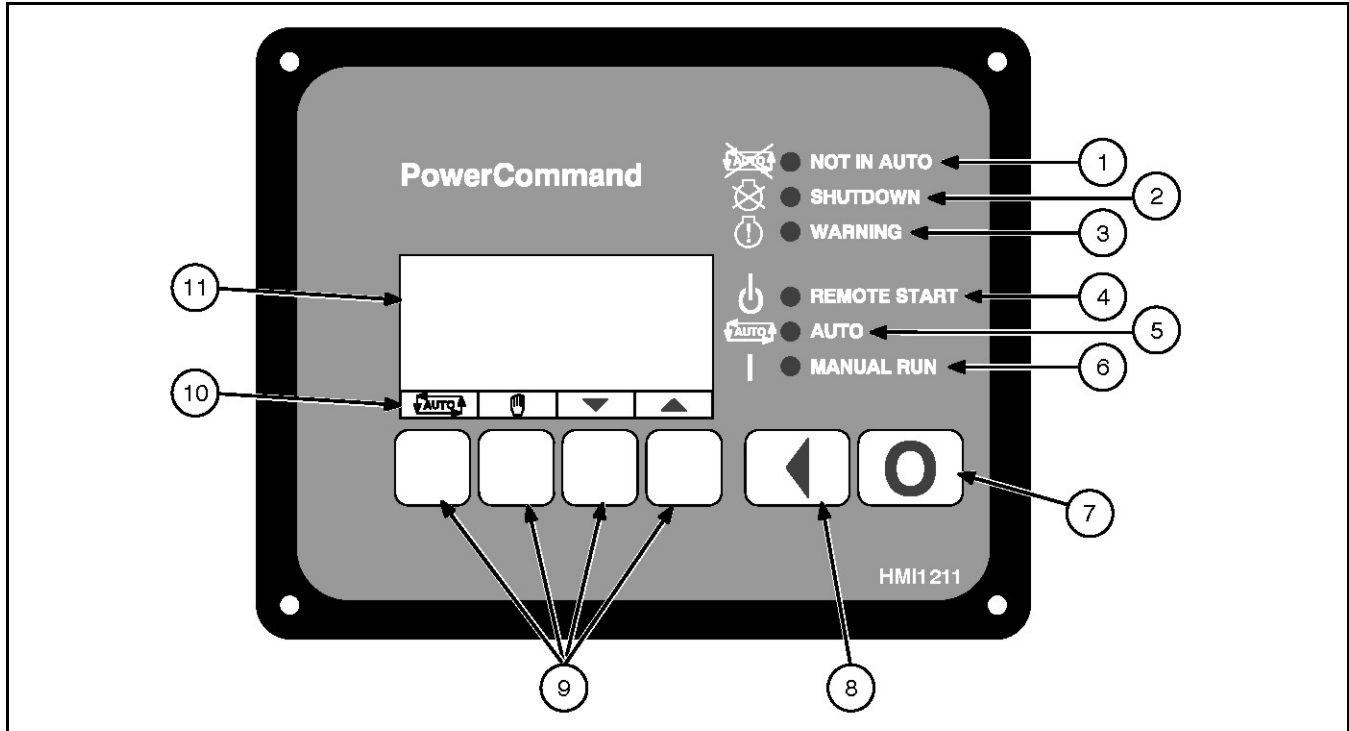
FIGURE 14. TYPICAL BATTERY LOCATION

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5 Startup and Configuration PCC 1.1

5.1 Operator Panel

Figure 15 on page 49 shows the features of the front panel. It includes six LED indicators, the graphical display, and six buttons used to navigate through the menus and adjust parameters.



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
















FIGURE 15. OPERATOR PANEL

Display Text or Symbolic Version

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

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

TABLE 15. SYMBOLS

Symbol	Text
	Generator Warning Fault
	Generator Shutdown Fault
	Coolant Temperature
	Oil Pressure
	Voltage Alternating Current (VAC)
	Voltage Direct Current (VDC)
	AC Current
Hz	Frequency
	Battery
	Out of Range
	High or Pre-High
	Low or Pre-Low
	Annunciator
	Over Speed
	Crank Fail
	Emergency Stop

LED Indicators

[Figure 15 on page 49](#) shows the front panel of the Operator Panel. It includes six LED indicators, the graphical display and six buttons used to navigate through the menus and adjust parameters.

Not in Auto

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

Shutdown Status

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


Warning

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


Remote Start

This green lamp indicates the control is receiving a **remote run** signal.

Auto

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

Manual Run

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





Default Settings

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

Display Menu Selection Buttons




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

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

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

NOTICE

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

- When a  symbol is displayed, the selection button can be used to abort the Auto or Manual Run mode and return to the Operator menu that was displayed before the Auto or Manual Run mode was selected.
- When **ADJUST** is displayed, the selection button is used to display an adjustable menu. When the **ADJUST** button is pressed, the first adjustable parameter or value in the submenu is highlighted.
- When the  symbol is displayed, the selection button is used to navigate to an editable field within a menu.
- When the **+** and **-** symbols are displayed, the selection buttons are used to increase or decrease a parameter or value shown on the screen.
When changing values, pressing the button below the **+** symbol increase the value and pressing the button below the **-** symbol decreases the value.
- When **SAVE** is displayed, the selection button is used to save changes made in a submenu. **If the Previous Menu button is pressed before pressing SAVE, the changes are not saved.**
- Some menus include a list of numbered subjects. These menus include numbers in parenthesis (for example, **(1)**) displayed above the selection buttons. The selection buttons are then used to display submenus of the subjects included in the list.
- When a black box  is displayed, the selection button has no function.

Control Buttons

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

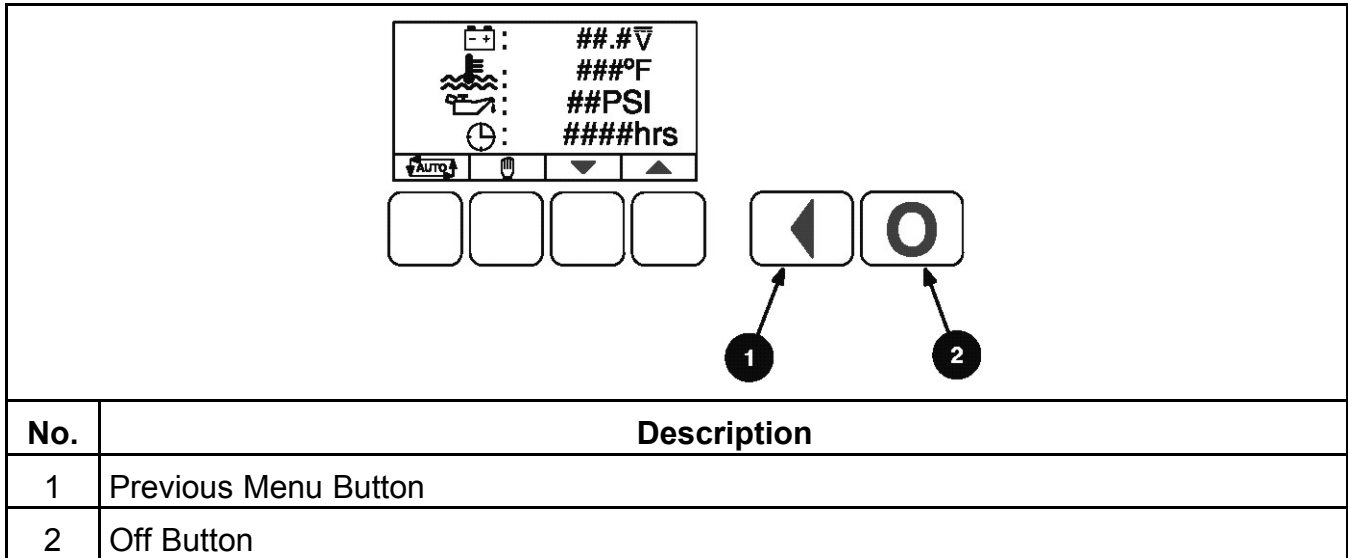



FIGURE 16. CONTROL BUTTONS

Previous Main Menu Button

Press the  button to view the previous main menu.

NOTICE

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

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

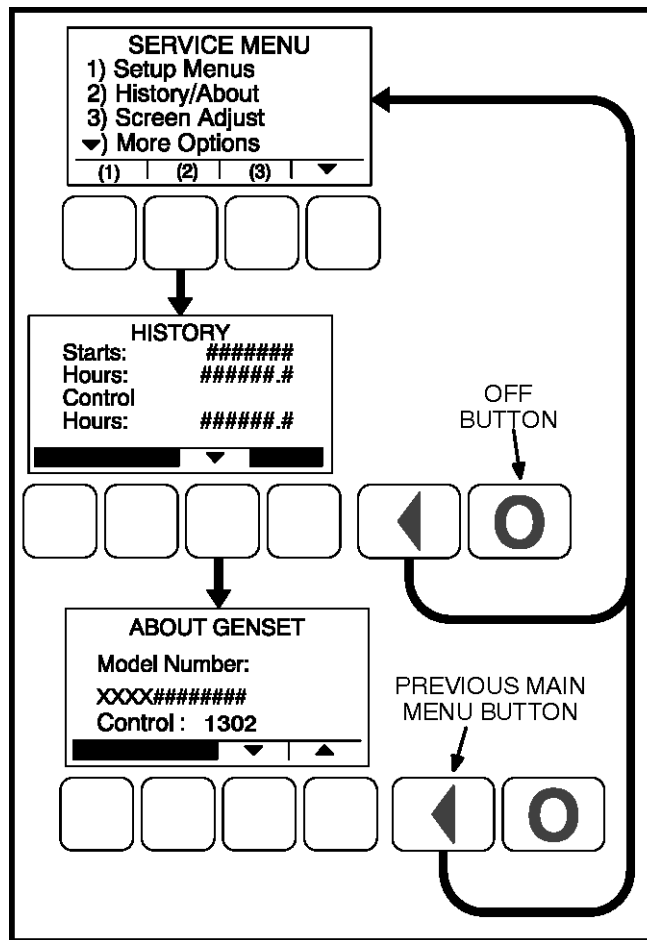


FIGURE 17. PREVIOUS MAIN MENU AND OFF BUTTONS

Off Button 

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

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

NOTICE

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

Exercise Settings

NOTICE

When battery power is lost, these settings must be reset.

NOTICE

Not applicable without a single phase RA series transfer switch.

To access the Clock/Exerciser Menu:

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

NOTICE

The following screens represent the standard operator panel (that is, HMI211). If using an in-home operator panel, which may be additionally purchased as an option, the screens may look slightly different. This procedure applies to both operator panels.

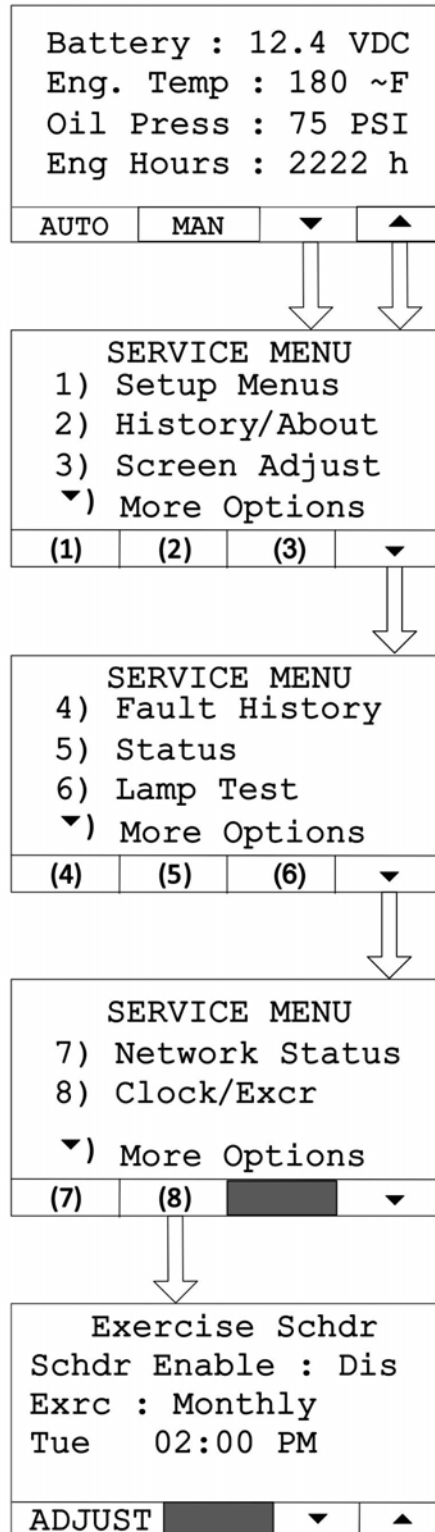


FIGURE 18. CLOCK/EXERCISER MENU NAVIGATION

Updating Exercise Frequency (1-Phase ATS)

NOTICE

Not applicable without a single phase RA series transfer switch.

To update the exercise frequency and dates on the Clock/Exerciser Menu:

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

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

- The horizontal right arrow key is used to select successive blocks for editing settings on the screen.
- Use the + or - keys to edit the following settings:
 - Schdr Enable: Enable or Disable
 - Exercise Schedule: Semi-Annual (every six months), Quarterly, Monthly, Bi-Monthly (the first and third week of every month based on the time set when the Bi-Monthly option is selected), or Weekly
 - Exercise Schedule: Day, Hours, Minutes, AM/PM
- Press **Save** to save any changes. After saving, the Save button changes to the Adjust button.

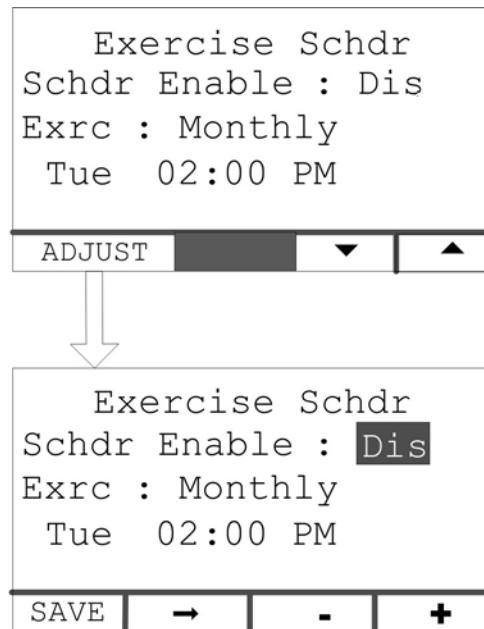


FIGURE 19. EXERCISE FREQUENCY NAVIGATION

Updating Exercise Duration (1-Phase ATS)

NOTICE

Not applicable without a single phase RA series transfer switch.

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

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

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

- The horizontal right arrow key is used to select the duration block for editing exercise duration.
- Use the + or - keys to edit the exercise duration minutes.

- Press **Save** to save any changes. After saving, the Save button changes to the Adjust button.

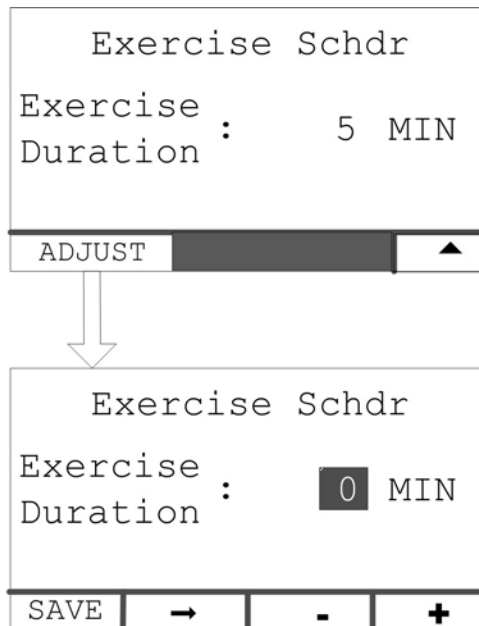


FIGURE 20. EXERCISE DURATION NAVIGATION

Time Setup (1-Phase ATS)

NOTICE

When battery power is lost, these settings must be reset.

NOTICE

Not applicable without a single phase RA series transfer switch.

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

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

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

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

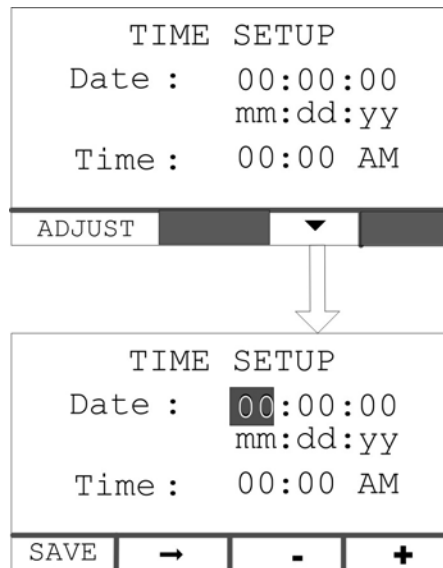


FIGURE 21. TIME SETUP SCREEN

Updating Daylight Saving Adjust Screens

Update Values on the Daylight Saving Adjust Screen

1. From any Information Menu, hold down the up and down arrows simultaneously for two seconds. The Service Menu appears.
2. Navigate to the Genset Service Menu.
3. Select **Clock Exerciser** to access the Time Setup screen.
4. Press the down key on the Time Setup screen to access the Daylight Saving Adjust screen.
5. Select **Adjust**. When updating these settings, the functions of the keys are as follows:

TABLE 16. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST SCREEN

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

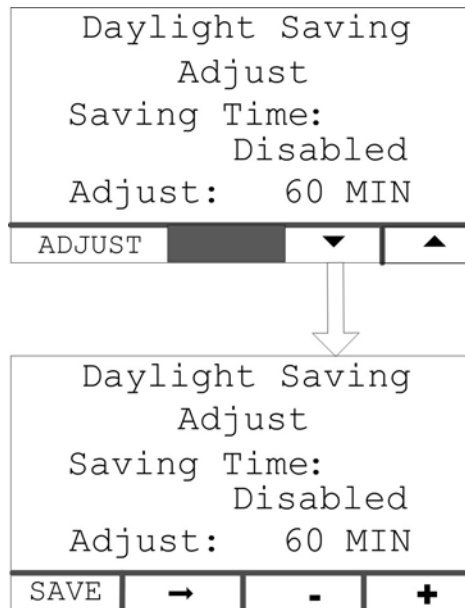


FIGURE 22. "DAYLIGHT SAVING ADJUST SAVING TIME" SCREEN NAVIGATION

Access and Update the Daylight Saving Adjust Start Screen

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

TABLE 17. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST START SCREEN

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

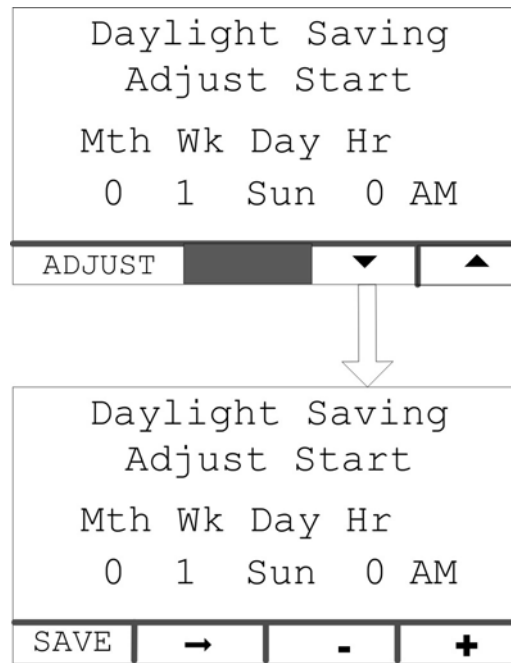


FIGURE 23. DAYLIGHT SAVING ADJUST START SCREEN

Update the Daylight Saving Adjust End Screen

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

TABLE 18. KEY FUNCTIONS ON THE DAYLIGHT SAVING ADJUST END SCREEN

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

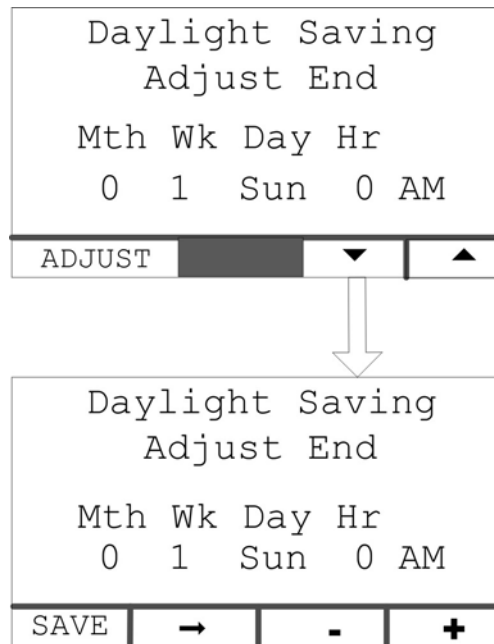


FIGURE 24. DAYLIGHT SAVING ADJUST END SCREEN

Brightness and Contrast

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

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

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

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

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

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

NOTICE

The following screens represent the standard operator panel (HMI211). If using an in-home operator panel, which may be additionally purchased as an option, the screens may look slightly different. This procedure applies to both operator panels.

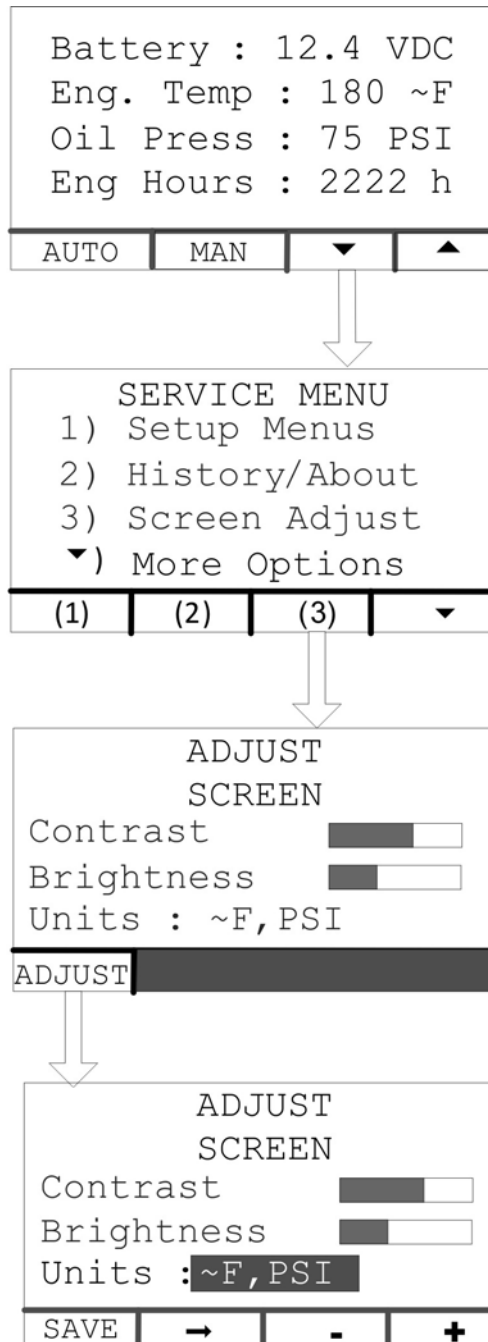


FIGURE 25. BRIGHTNESS AND CONTRAST SCREEN NAVIGATION

NOTICE

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

History and About Menu

To access the History/About screen:

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

NOTICE

The following screens represent the standard operator panel (HMI211). If using an in-home operator panel, which may be additionally purchased as an option, the screens may look slightly different. This procedure applies to both operator panels.

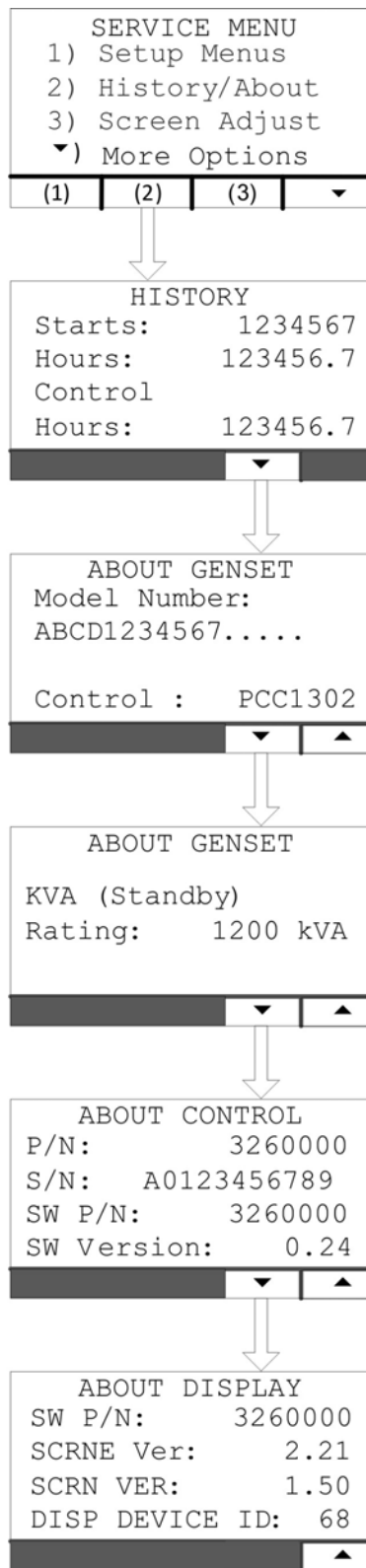


FIGURE 26. HISTORY/ABOUT MENU

Startup

⚠ WARNING
<p><i>Automated Machinery</i> <i>Accidental or remote starting of the generator set can cause severe personal injury or death.</i> <i>Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables, negative (-) cable first.</i></p>

After verifying that the installation was completed correctly, start and test the system. Make sure to connect the battery cables to the battery with the positive (+) cable first.

Read through the Operator Manual and perform the maintenance and pre-start checks as instructed.

The following information applies to C70 N6, C80 N6, and C100 N6 generator set models only: Adaptive learn is an engine ECM function that allows the generator set to "learn" its environment. There are small differences in the performance of each engine and fuel system component, so the ECM uses inputs from the engine sensors to adjust running conditions to operate more consistently for each individual generator set. After installation is complete and while testing the overall system function, the generator set must be run with no active faults under load (that is, transfer switch connected to maximum customer load available) until the engine temperature reaches 80 °C (175 °F) to allow the adaptive learn function to initialize.

The generator set is shipped from the factory with the proper level of engine oil and coolant, but each should be checked before the generator set is started. Start and operate the generator set following all the instructions and precautions in the Operator Manual. Ensure that the bonding bolts are installed into the service panels before leaving the site.

NOTICE
<p>Before leaving the site, if the generator set is ready to be placed in service, put the generator set in Auto mode to provide automatic standby power.</p>

NOTICE
<p>Contact your local Cummins service representative if you encounter a fault code.</p>

Installation Checklist

Tick	General Items
	Generator set wattage capacity is sufficient to handle maximum anticipated load.
	At least 5 feet of clearance (or greater for housing door) is provided around the entire generator set for service and ventilation.

Tick	General Items
	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.
	Cooling air outlet is on downwind side of building (if not, wind barrier is constructed).
	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 (if applicable).
	Strainer or fuel screen (100 to 200 mesh) is installed in the fuel supply line to protect the 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 (if applicable).
	No shutoff valves are installed on engine fuel return line.
	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.
	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)

Tick	General Items
	Operators are thoroughly briefed on the dangers of carbon monoxide gas.
	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.
	AC and DC Wiring
	Wire sizes, insulation, conduits and connection methods all meet applicable codes.
	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.
	Phase rotation is correct.
	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 (if applicable).
	Battery charger is configured for the proper DC battery voltage, battery type, and float voltage (if applicable).
	Batteries are properly installed, serviced and charged.
	Engine coolant heater is connected and operational (if applicable).
	All generator set covers and safety shields are installed correctly.
	All fuel and coolant shutoff valves are operational (if applicable).

5.2 InPower Service Tool

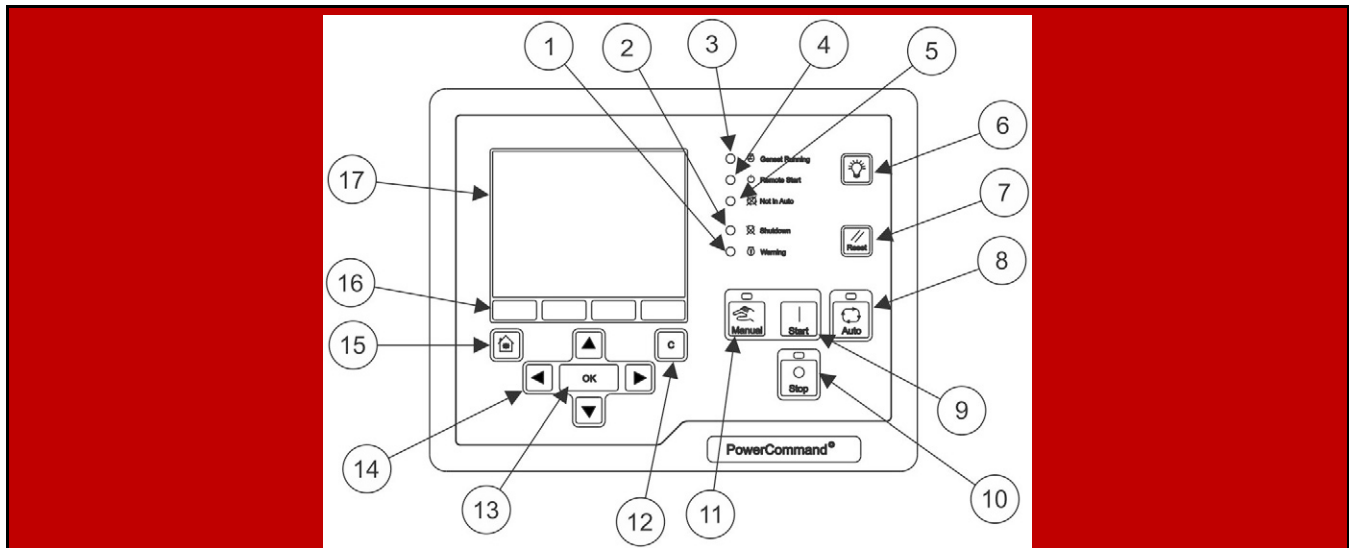
The InPower™ service tool can be used in troubleshooting to perform tests, verify control inputs and outputs, and test protective functions. Refer to the InPower User's Guide, provided with the InPower software for test procedures.

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6 Startup and Configuration PCC 2.3

6.1 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/Panel Lamp On-Off	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 27. OPERATOR PANEL

Operator Panel - Initial Operator Menu

[Figure 28 on page 73](#) 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 19. 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.	

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	

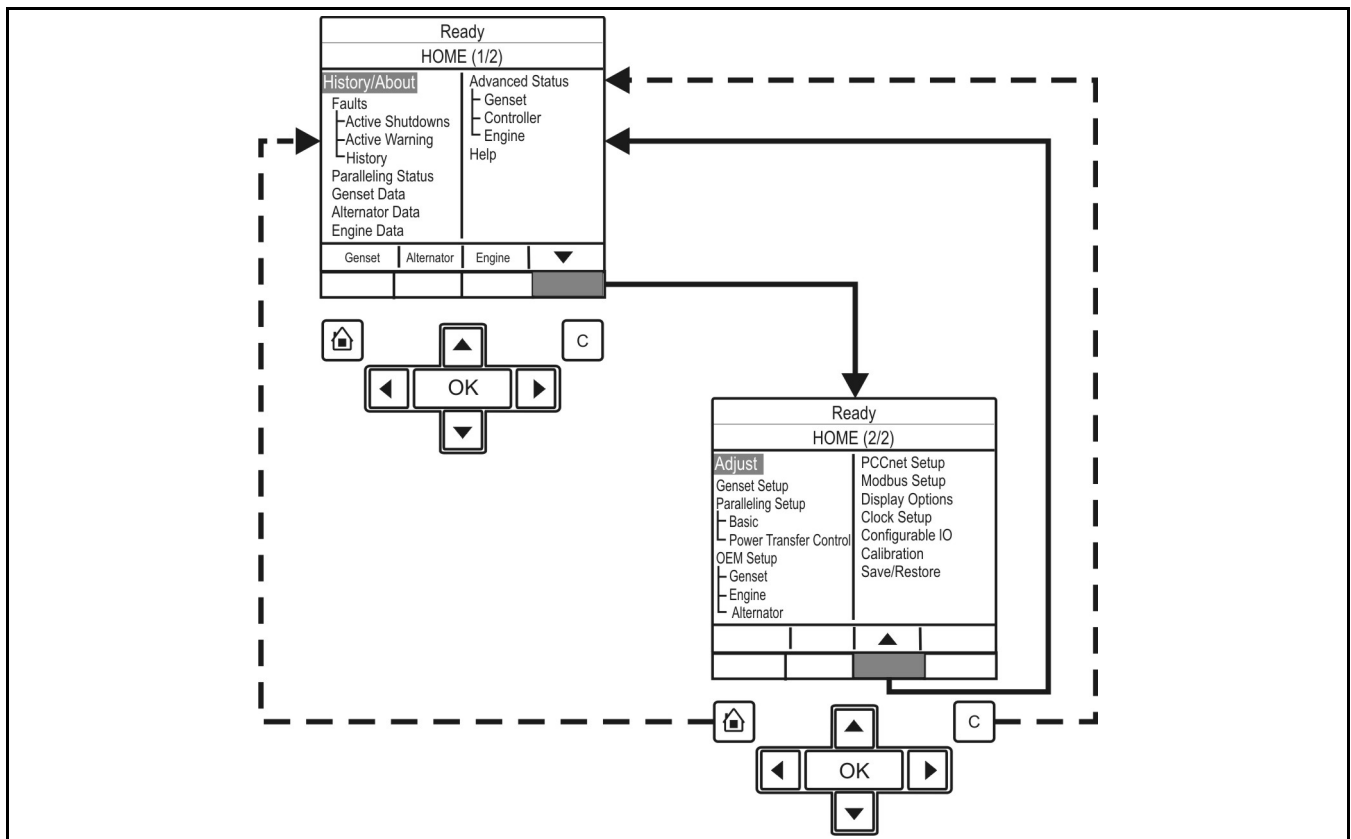



FIGURE 28. INITIAL OPERATOR MENU

- 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.

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 Menu

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

TABLE 20. ENGINE DATA MENU

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

Name	Description	Allowed Values
Batt Voltage	Battery voltage value	

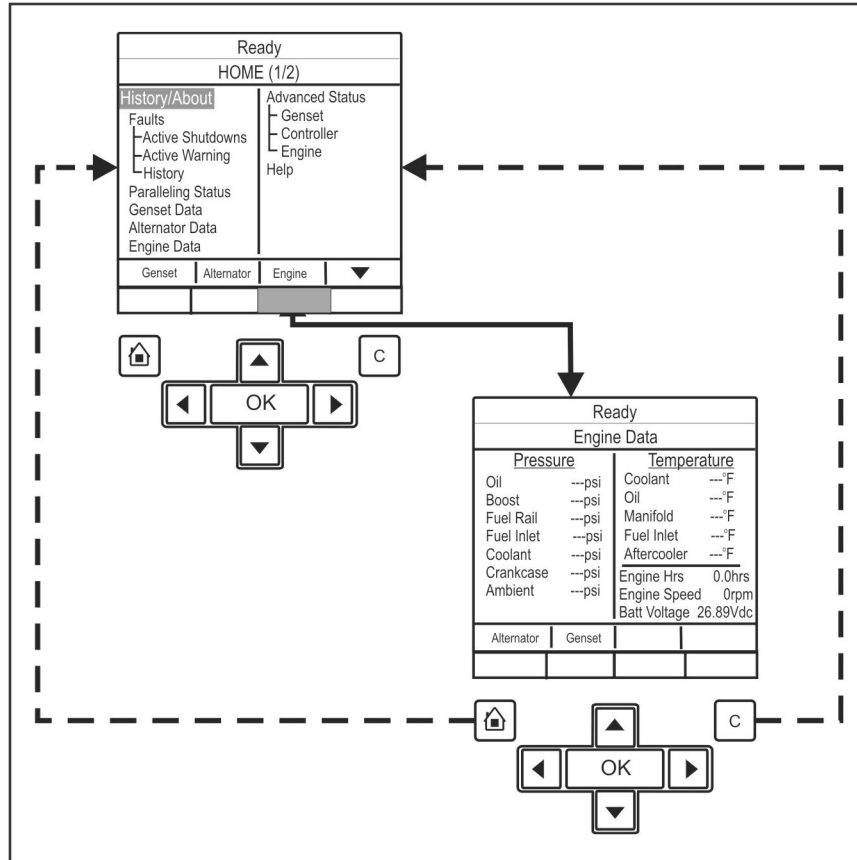




FIGURE 29. ENGINE DATA MENU - TYPICAL DATA

- 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 30 on page 77](#) 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.

TABLE 21. HISTORY/ABOUT MENU

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.
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.	

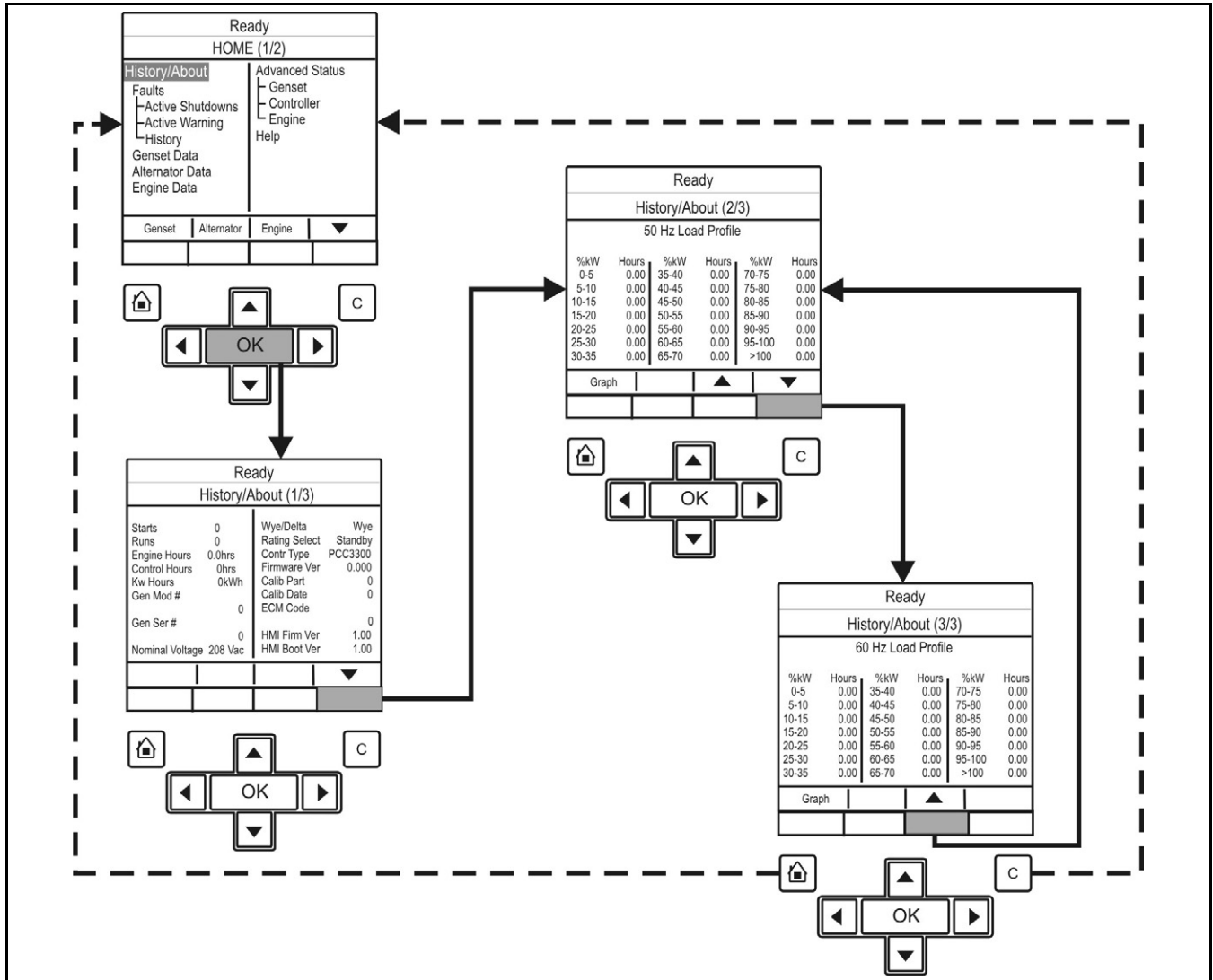




FIGURE 30. HISTORY/ABOUT MENU - TYPICAL DATA

- 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.

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.

-
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.

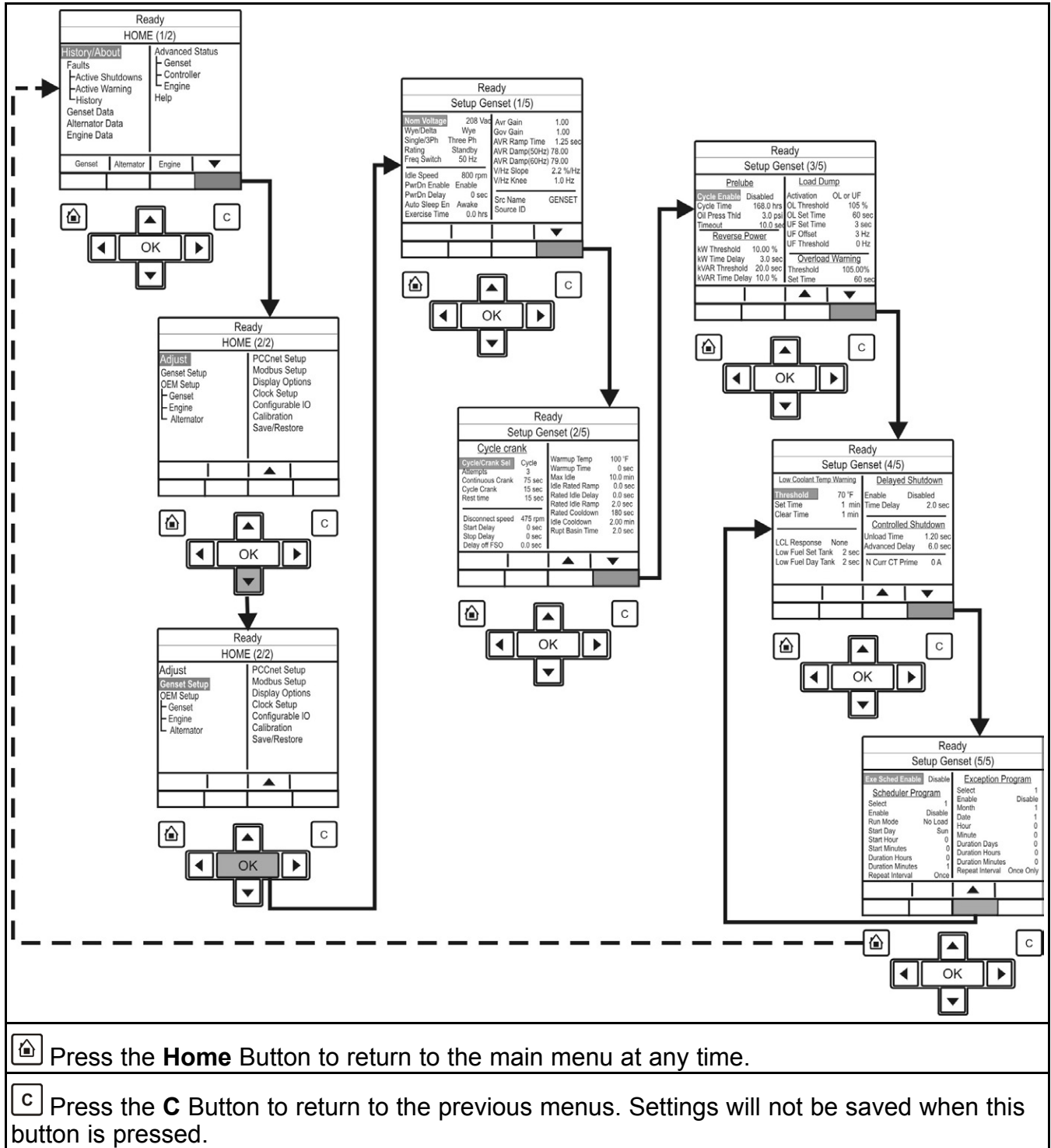


FIGURE 31. GENSET SETUP MENU - TYPICAL DATA

6.2 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.

6.3 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 1½ 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.

Tick	General Items
	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).

Tick	General Items
	Wire sizes, insulation, conduits and connection methods all meet applicable codes.
	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.

6.4 Before 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

***Diesel engines only:* 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.**

NOTICE

***Gaseous engines only:* Avoid running the generator set at no-load and light-loads for extended periods.**

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 sub-sections below 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 Cummins 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, competent personnel must make the following checks to make sure that the unit is ready for operation:

TABLE 22. INITIAL PRE-START CHECKS

Check	Description
Generator Set Grounding	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 Cummins distributor.
Insulation Testing ¹	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. 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 Cummins distributor.
Lubrication ²	Check the engine lubrication oil level and ensure that the correct level is always maintained.
Coolant ^{3,4,5}	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.
<p>¹When wire insulation-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.</p> <p>²<i>Generator sets shipped dry only:</i> They must be filled with the correct type and quantity of oil before use. Be sure to check the oil level before initial start. Failure to fill to the recommended level can result in equipment damage.</p> <p>³<i>Generator sets that require a mix of anti-freeze and DCA inhibitor only:</i> You must comply with Cummins requirements for the correct type and concentration of anti-freeze and DCA inhibitor. Warranty claims for damage will be rejected if the incorrect mix is used. Consult your authorized Cummins distributor for the correct anti-freeze specifications and concentration for your operating conditions.</p> <p>⁴<i>Radiators with two fill necks only:</i> Both fill necks must be filled after the cooling system has been drained.</p> <p>⁵<i>Generator sets shipped dry only:</i> The engine must be filled with the correct type and quantity of coolant before use. Be sure to check coolant level(s), before the initial start.</p>	

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

Radiators with two fill necks only: Both fill necks must be filled when the cooling system has been drained.

TABLE 23. OPERATOR'S PRE-START CHECKS

Check	Description
Fuel Supply (Diesel Only)	Make sure that: <ul style="list-style-type: none"> • The fuel tank is filled to the normal level with clean water-free fuel and that the fuel system is primed; • All the valves required for operation are open; • There are no leaks and that all fittings are tight; and • If equipped, the auxiliary fuel system is properly connected.
DEF Supply (If Equipped)	Make sure that: <ul style="list-style-type: none"> • The DEF tank is filled to the normal full level with DEF, and • If equipped, the auxiliary DEF system is properly connected.
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.

Check	Description
Exhaust Outlet	Make sure that: <ul style="list-style-type: none"> • Exhaust components are secured and not warped; • The exhaust outlet is unobstructed; • No combustible materials are near the system; • Gases are discharged away from building openings; and • There are no leaks and that all fittings are tight.
Batteries	Make sure that the batteries are charged, and that all connections are clean, correct and tight (if applicable).
Auxiliary Powered 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.

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 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 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 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).

The **Low Coolant Temp** (Code 1435) message along with the lighting of the **Warning** LED are provided to alert the operator of a possible delay in accepting the load. 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.

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

Table of Contents

Table 25. Minimum Fuel Hose and Pipe Sizes; Up to 50 Feet (15 Meters) Equivalent Length. 93

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.

TABLE 25. 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

Table of Contents

Figure 32. Generator Set Outline, Open (Sheet 1 of 2)	97
Figure 33. Generator Set Outline, Open (Sheet 2 of 2)	98
Figure 34. Long Enclosure Outline, Sound Attention Level 1 and Level 2 (Sheet 1 of 2)	99
Figure 35. Long Enclosure Outline, Sound Attention Level 1 and Level 2 (Sheet 2 of 2)	100
Figure 36. Short Enclosure Outline, Weather (Sheet 1 of 1)	101
Figure 37. Foundation Outline, Without Fuel Tank (Sheet 1 of 1)	102
Figure 38. Foundation Outline, With Regional Fuel Tank (Sheet 1 of 4)	103
Figure 39. Foundation Outline, With Regional Fuel Tank (Sheet 2 of 4)	104
Figure 40. Foundation Outline, With Regional Fuel Tank (Sheet 3 of 4)	105
Figure 41. Foundation Outline, With Regional Fuel Tank (Sheet 4 of 4)	106
Figure 42. Foundation Outline, With Basic Fuel Tank (Sheet 1 of 3)	107
Figure 43. Foundation Outline, With Basic Fuel Tank (Sheet 2 of 3)	108
Figure 44. Foundation Outline, With Basic Fuel Tank (Sheet 3 of 3)	109

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

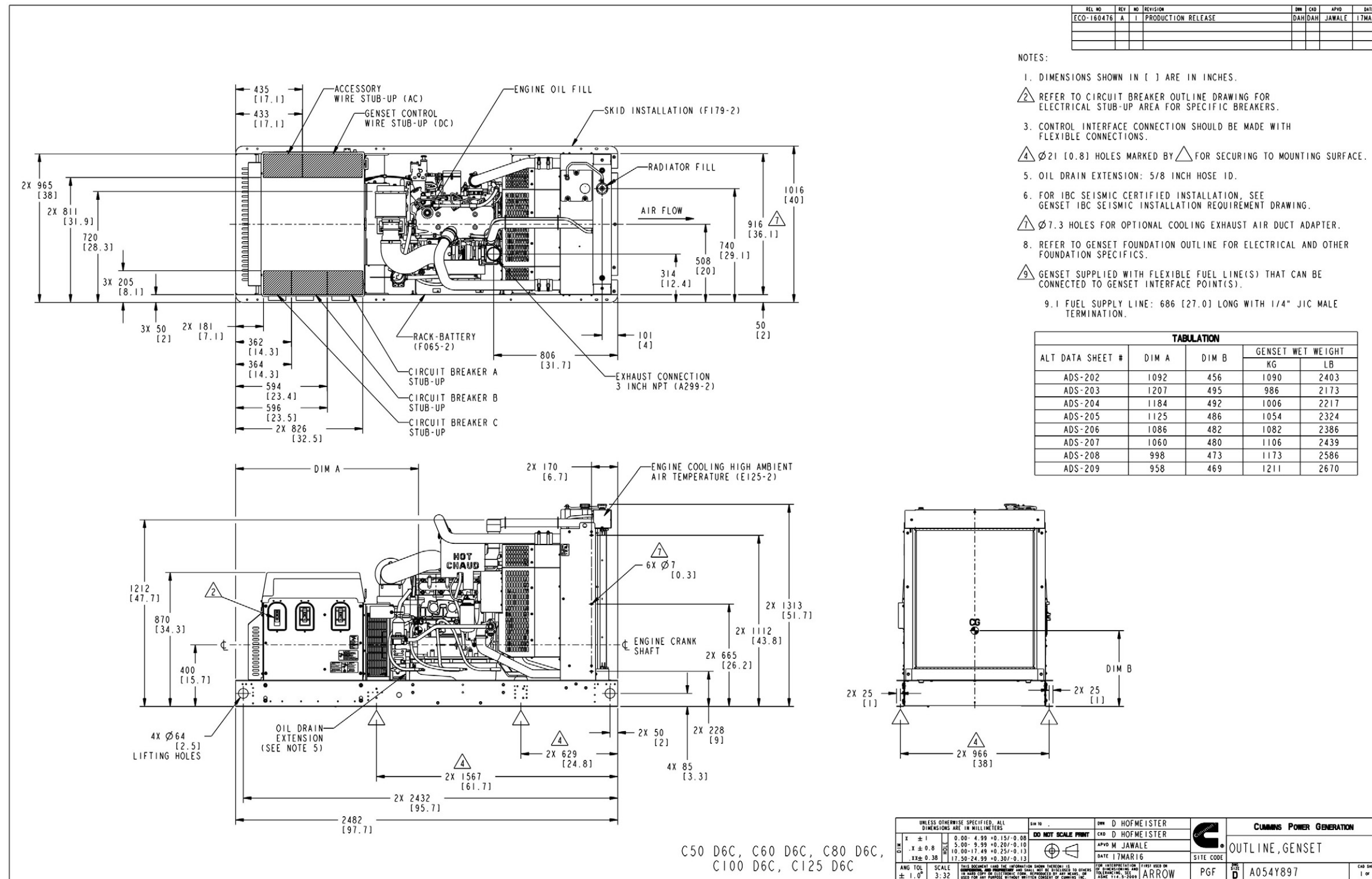


FIGURE 32. GENERATOR SET OUTLINE, OPEN (SHEET 1 OF 2)

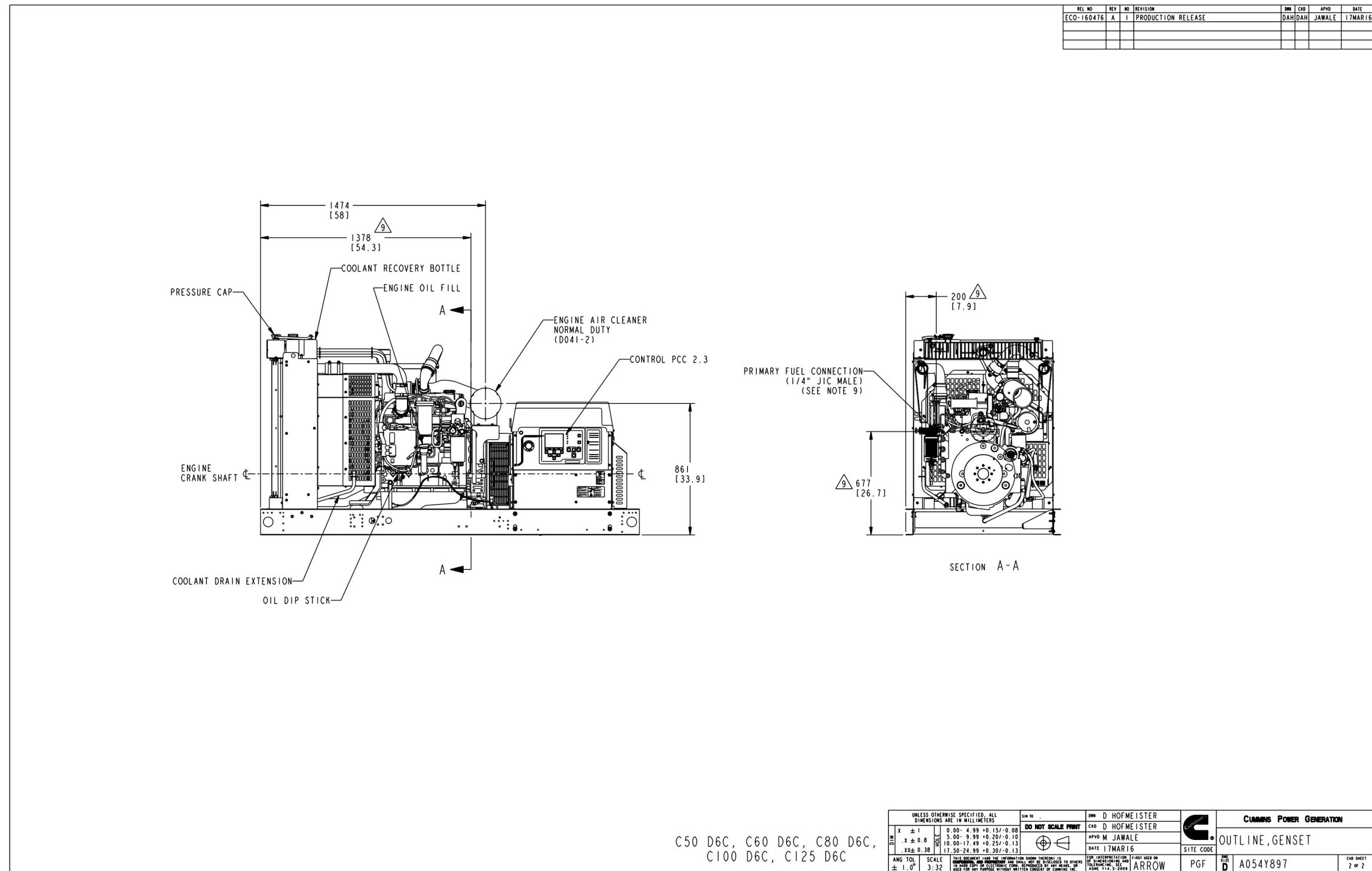


FIGURE 33. GENERATOR SET OUTLINE, OPEN (SHEET 2 OF 2)

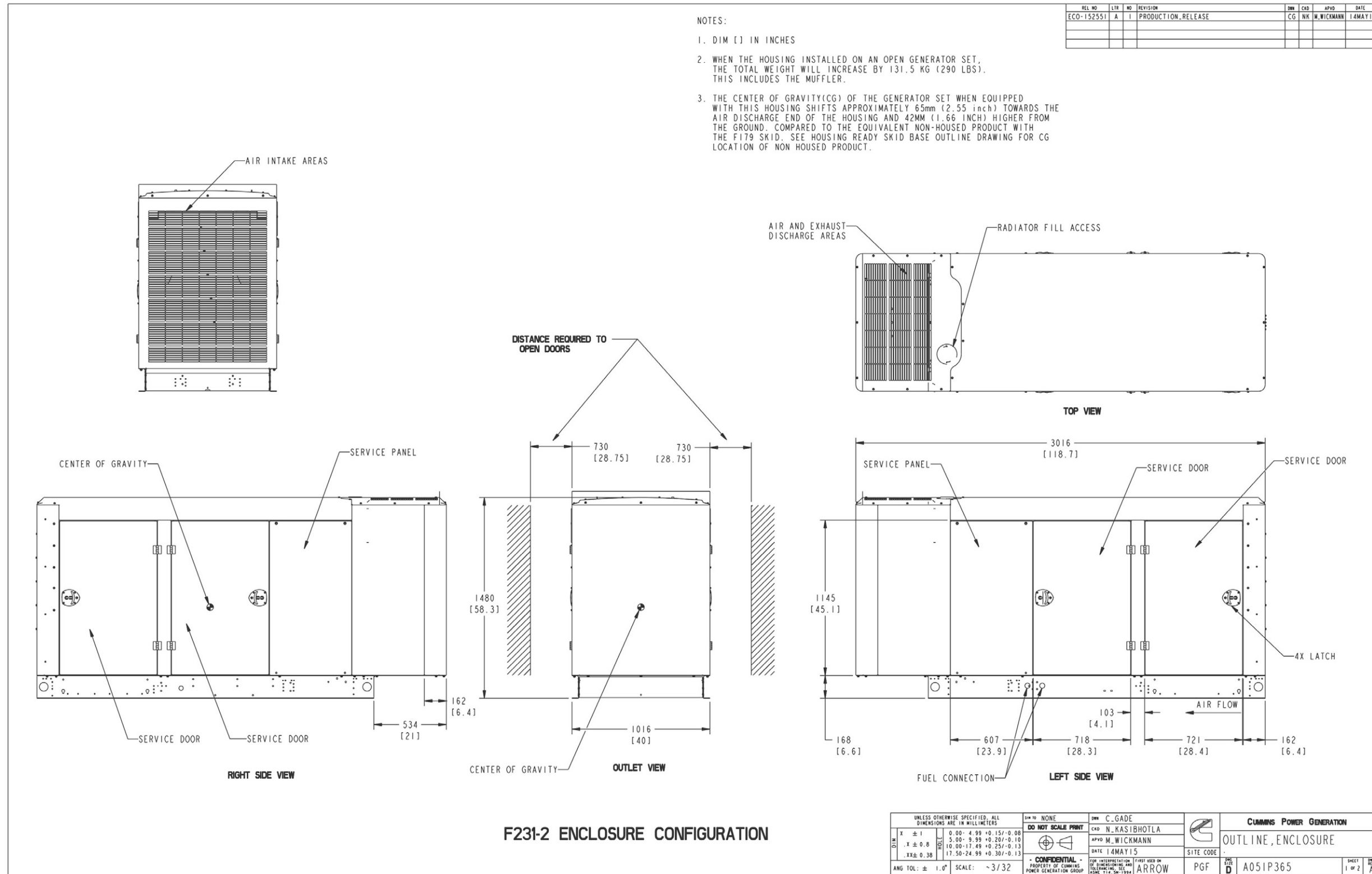


FIGURE 34. LONG ENCLOSURE OUTLINE, SOUND ATTENTION LEVEL 1 AND LEVEL 2 (SHEET 1 OF 2)

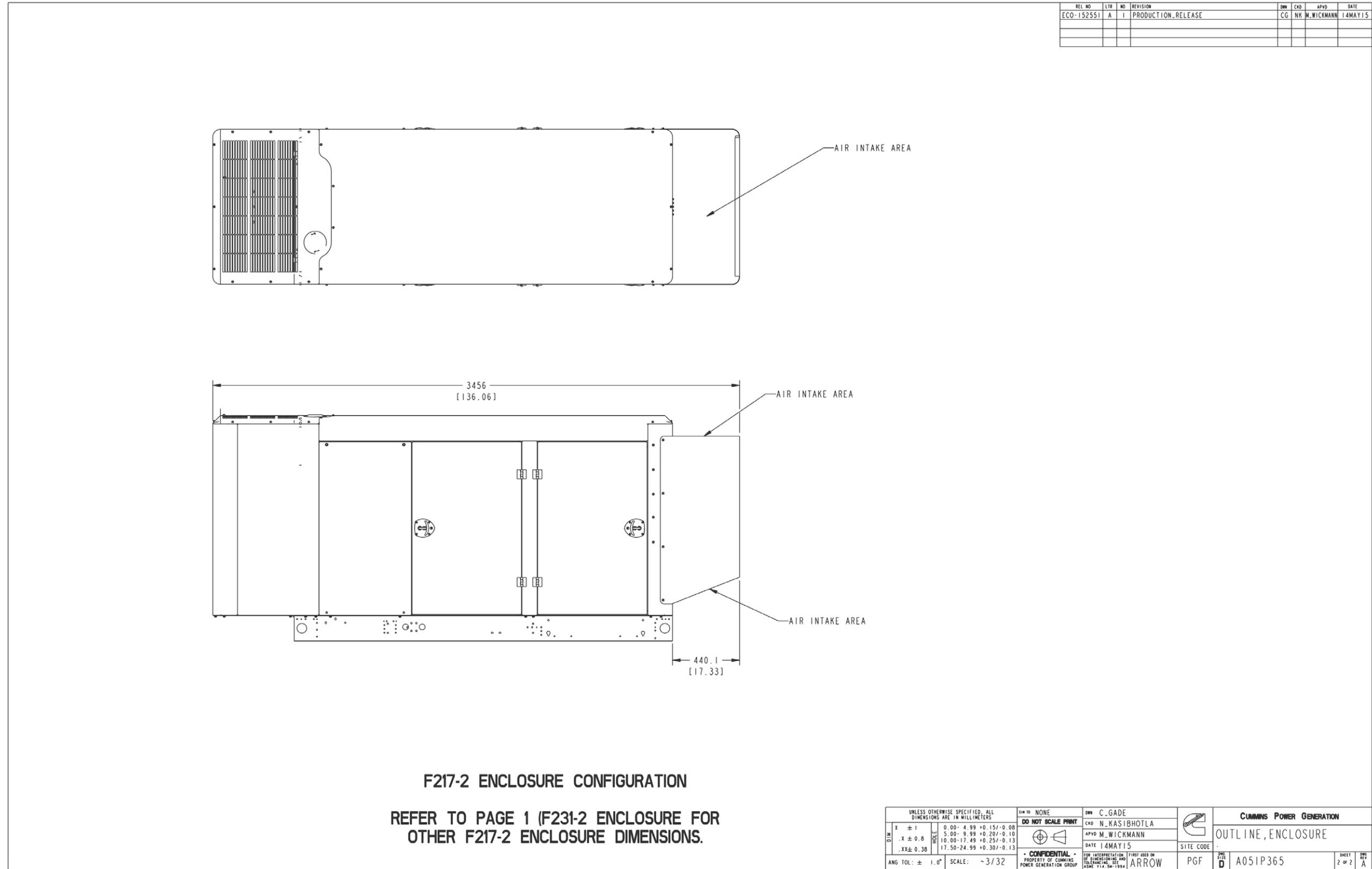


FIGURE 35. LONG ENCLOSURE OUTLINE, SOUND ATTENTION LEVEL 1 AND LEVEL 2 (SHEET 2 OF 2)

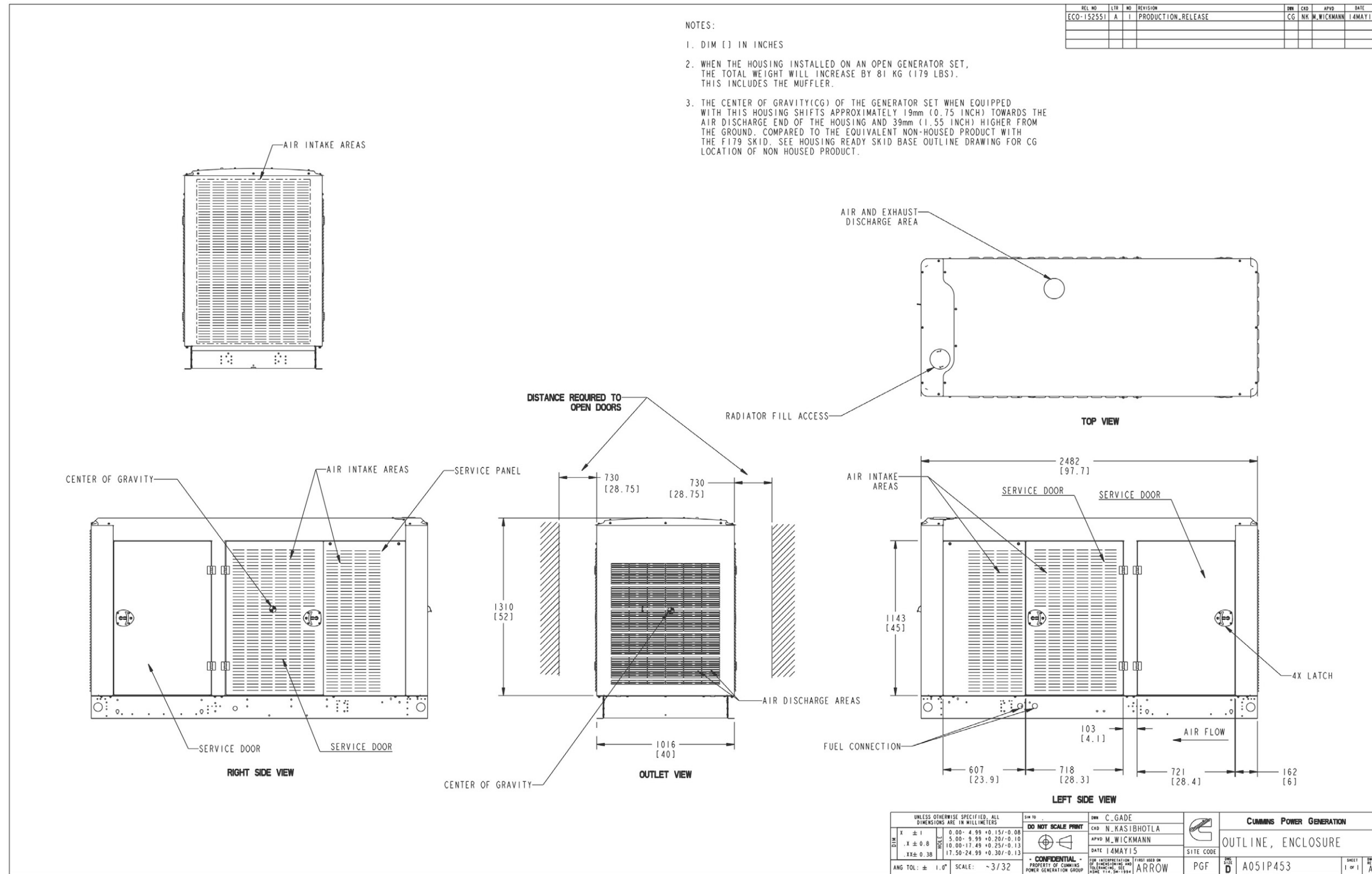
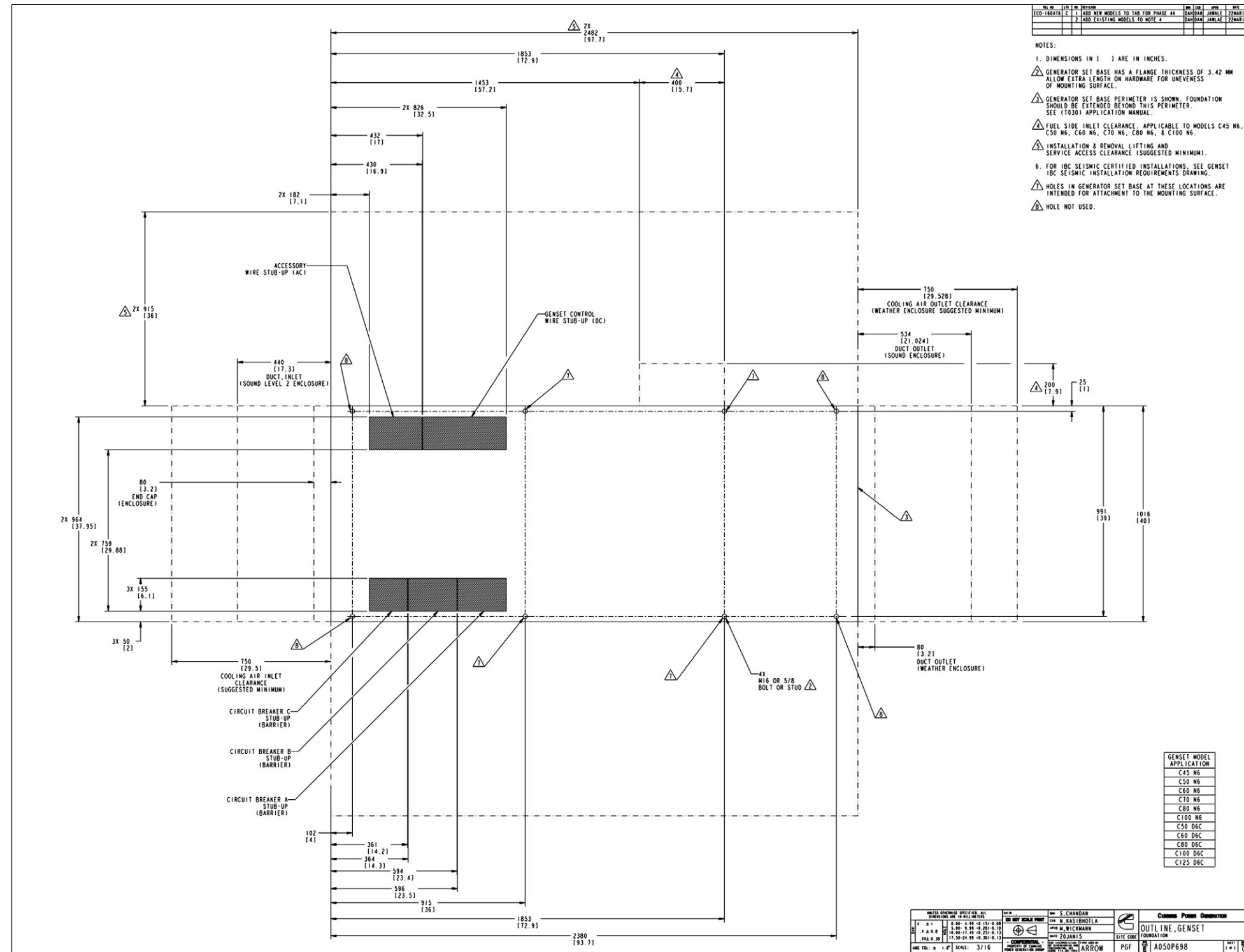


FIGURE 36. SHORT ENCLOSURE OUTLINE, WEATHER (SHEET 1 OF 1)



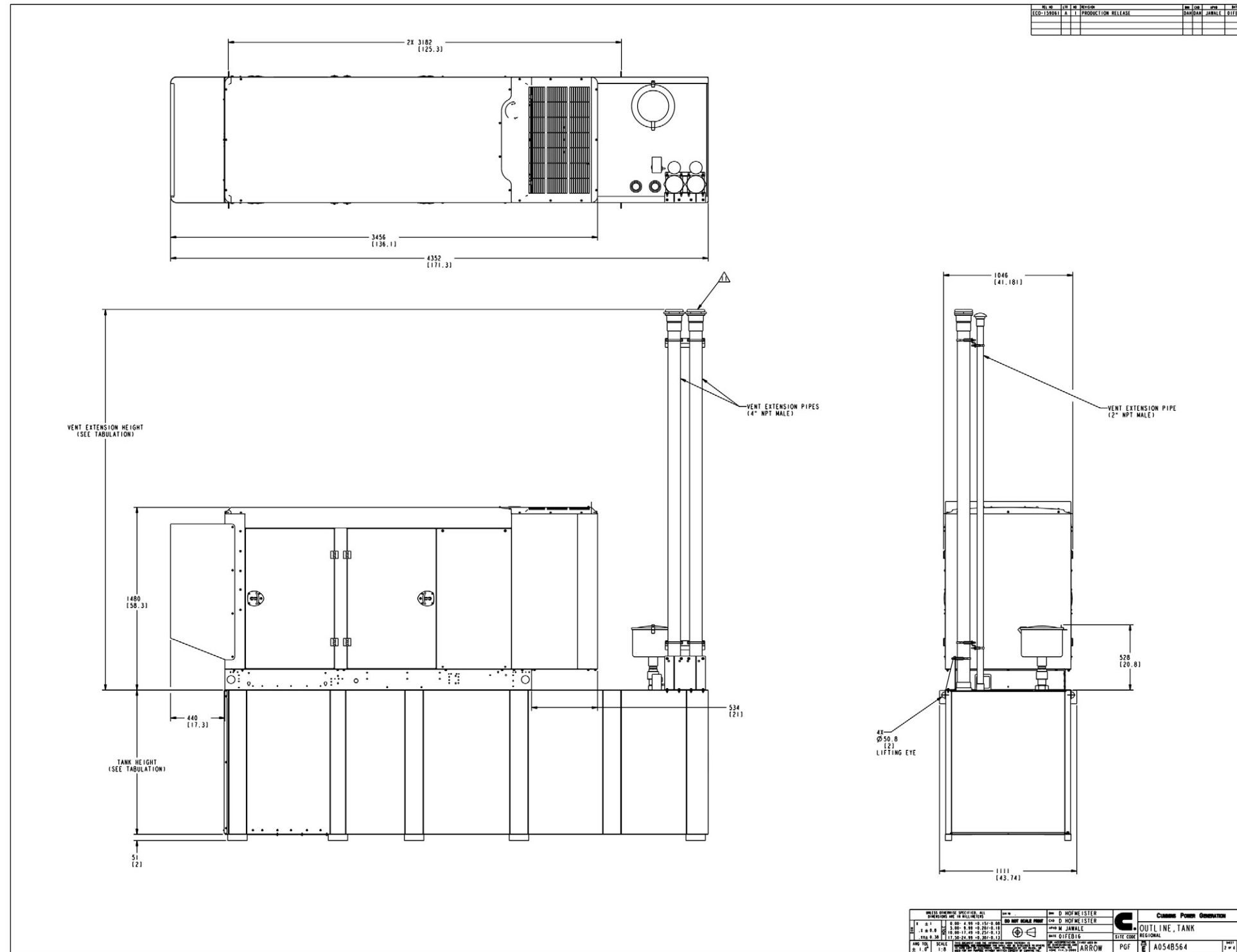


FIGURE 39. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 2 OF 4)

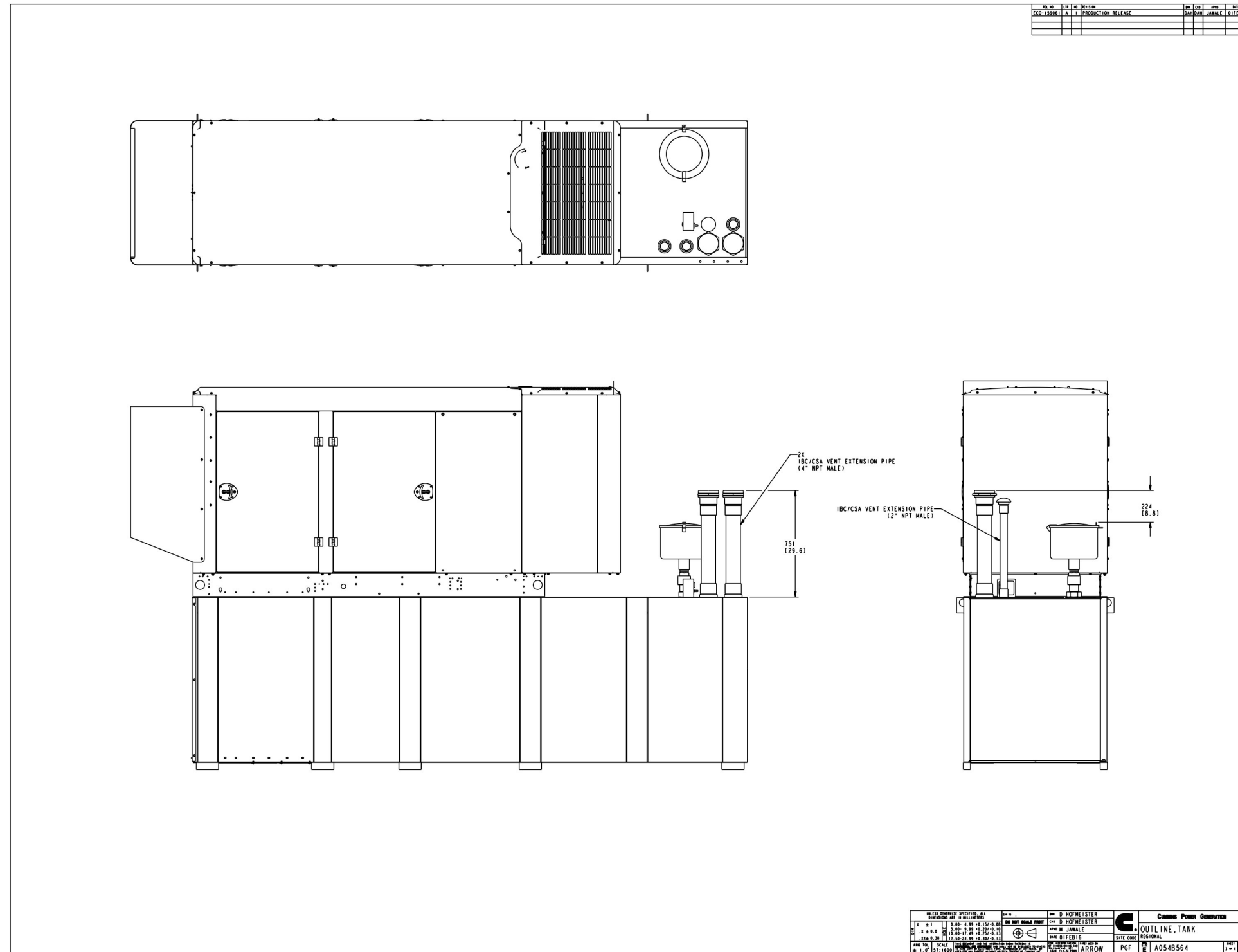


FIGURE 40. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 3 OF 4)

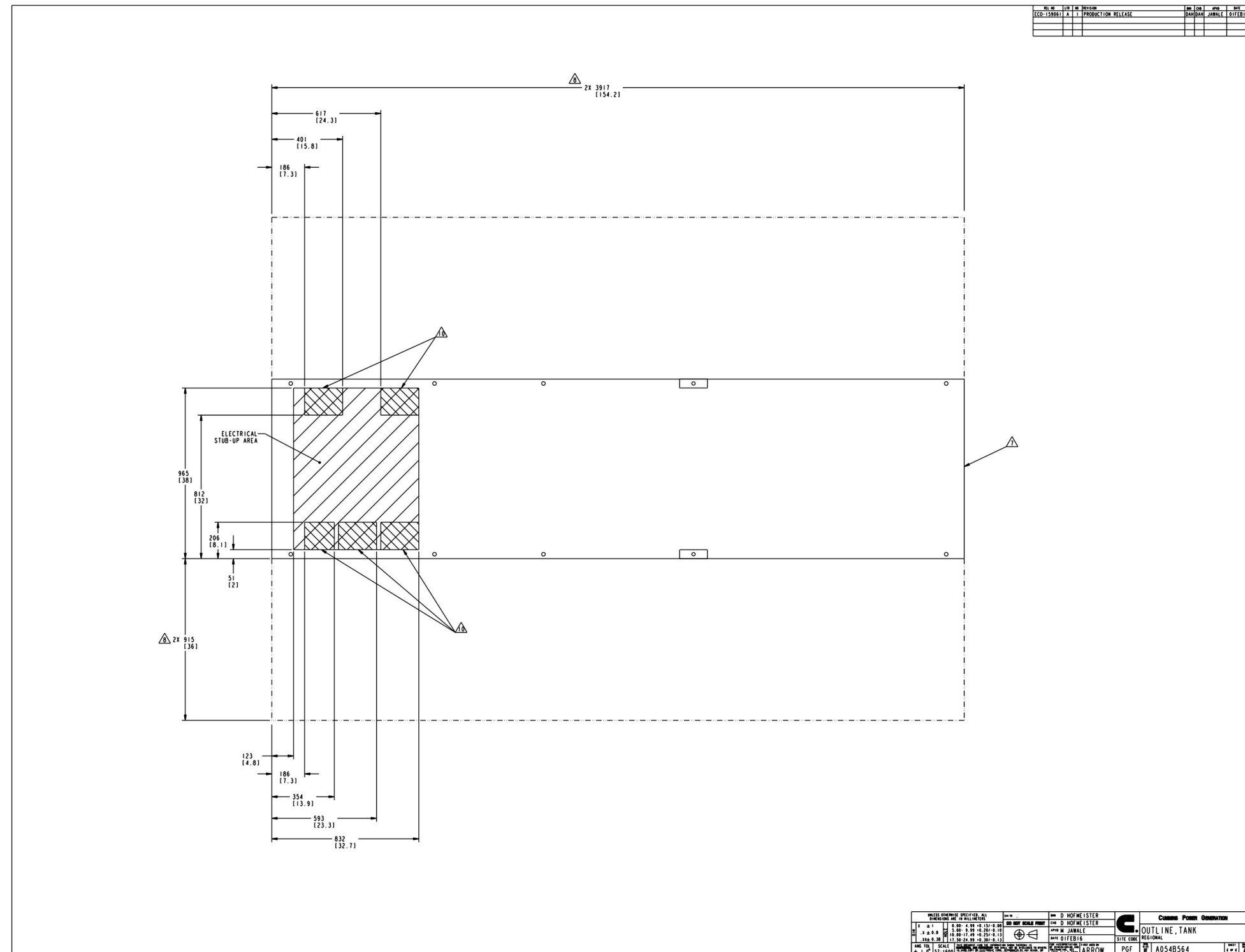


FIGURE 41. FOUNDATION OUTLINE, WITH REGIONAL FUEL TANK (SHEET 4 OF 4)

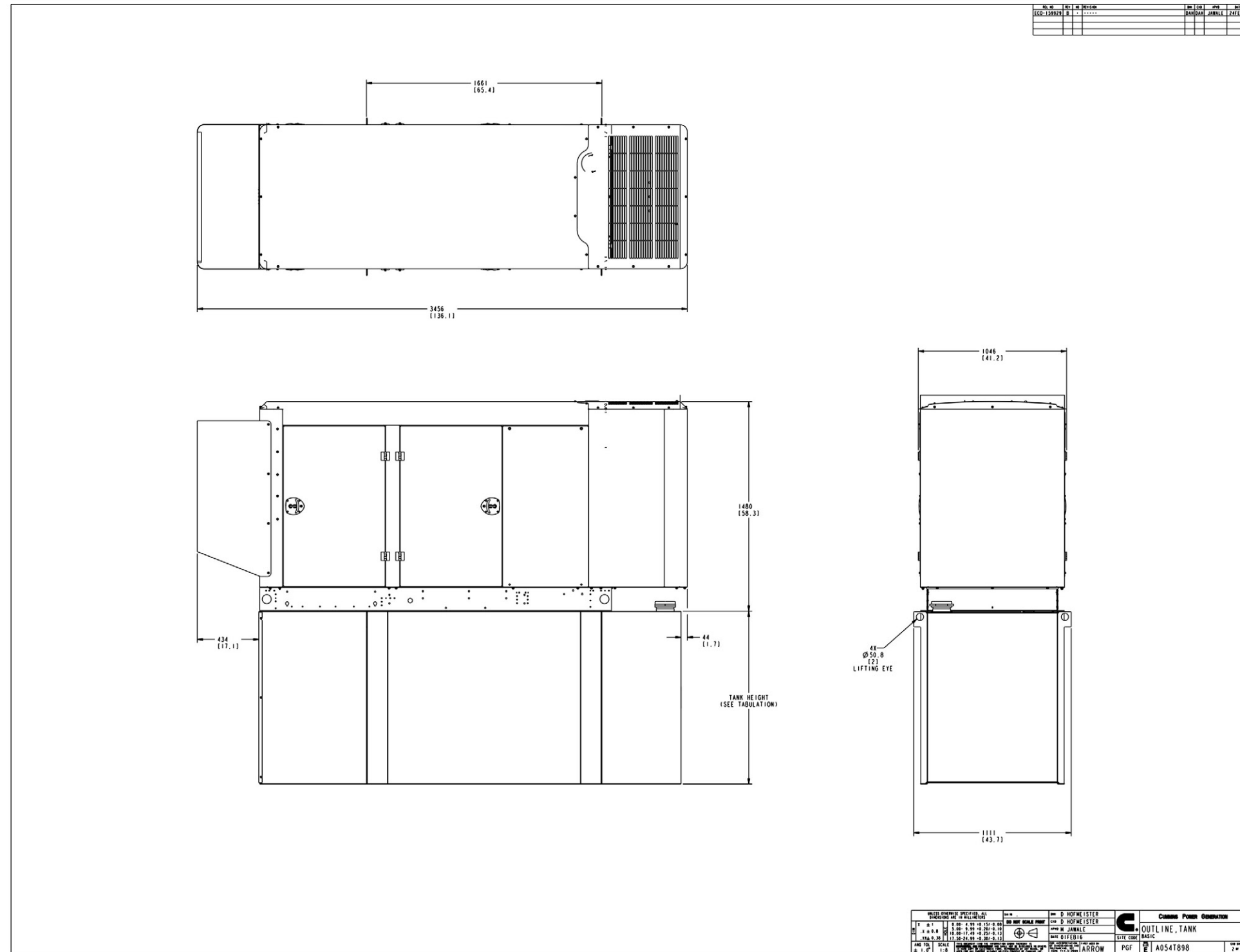


FIGURE 43. FOUNDATION OUTLINE, WITH BASIC FUEL TANK (SHEET 2 OF 3)

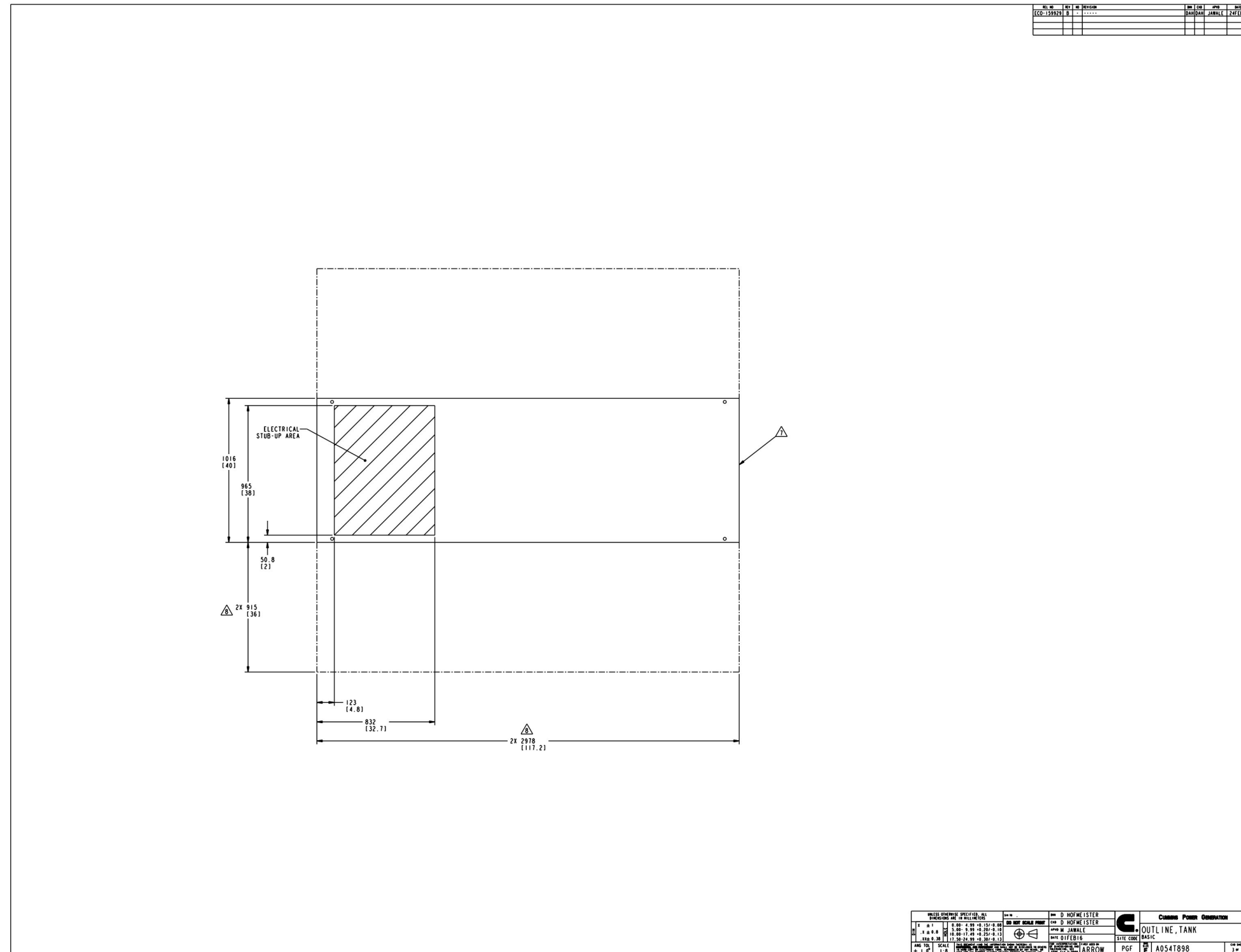


FIGURE 44. FOUNDATION OUTLINE, WITH BASIC FUEL TANK (SHEET 3 OF 3)

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Appendix C. Wiring Diagrams

Table of Contents

Figure 45. Wiring Diagram PC 1.1 (Sheet 1 of 5)	113
Figure 46. Wiring Diagram PC 1.1 (Sheet 2 of 5)	114
Figure 47. Wiring Diagram PC 1.1 (Sheet 3 of 5)	115
Figure 48. Wiring Diagram PC 1.1 (Sheet 4 of 5)	116
Figure 49. Wiring Diagram PC 1.1 (Sheet 5 of 5)	117
Figure 50. Wiring Diagram PC 2.3 (Sheet 1 of 5)	118
Figure 51. Wiring Diagram PC 2.3 (Sheet 2 of 5)	119
Figure 52. Wiring Diagram PC 2.3 (Sheet 3 of 5)	120
Figure 53. Wiring Diagram PC 2.3 (Sheet 4 of 5)	121
Figure 54. Wiring Diagram PC 2.3 (Sheet 5 of 5)	122
Figure 55. Harness, Engine (Sheet 1 of 2)	123
Figure 56. Harness, Engine (Sheet 2 of 2)	124
Figure 57. Harness, Control (Sheet 1 of 4)	125
Figure 58. Harness, Control (Sheet 2 of 4)	126
Figure 59. Harness, Control (Sheet 3 of 4)	127
Figure 60. Harness, Control (Sheet 4 of 4)	128

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.

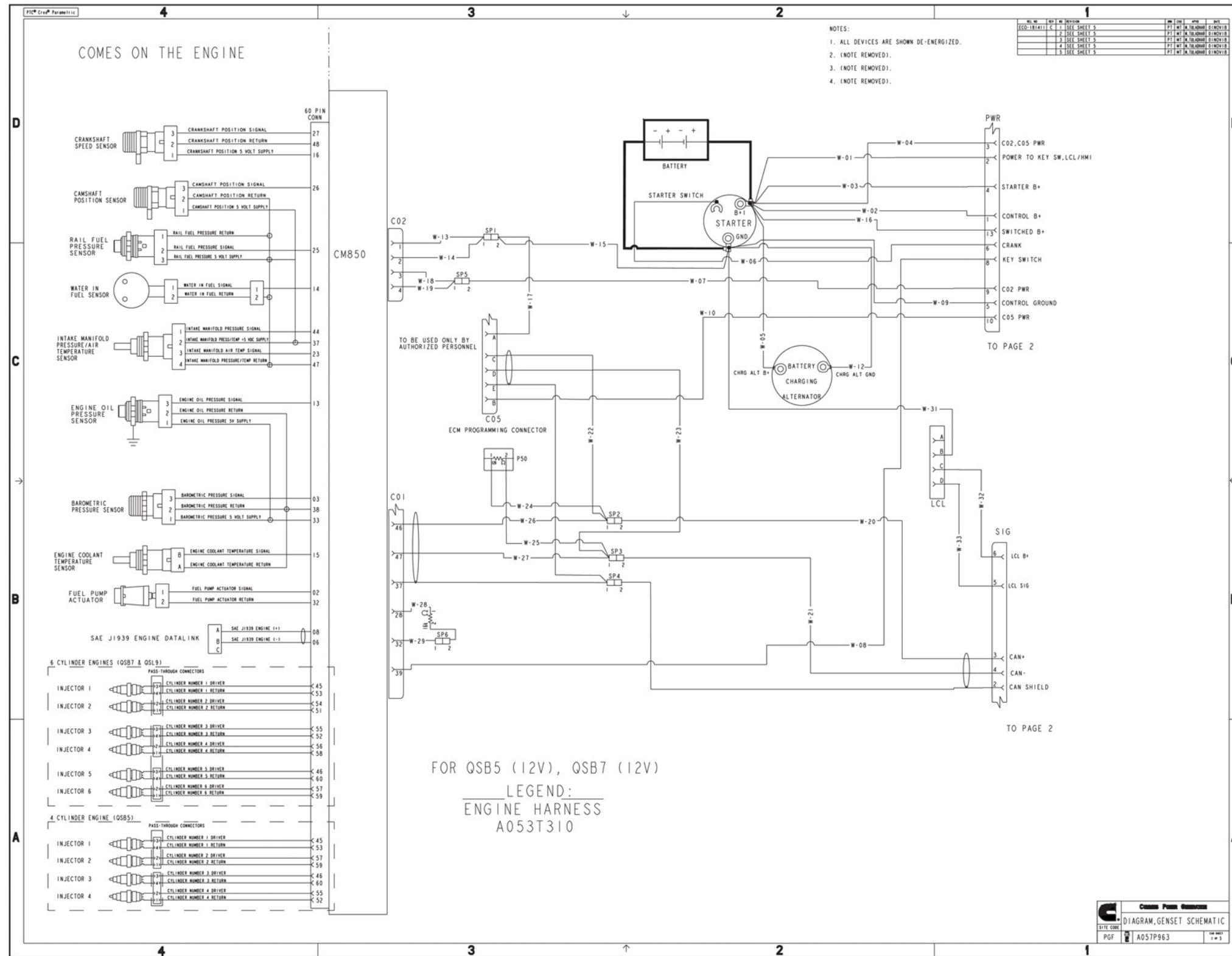


FIGURE 45. WIRING DIAGRAM PC 1.1 (SHEET 1 OF 5)

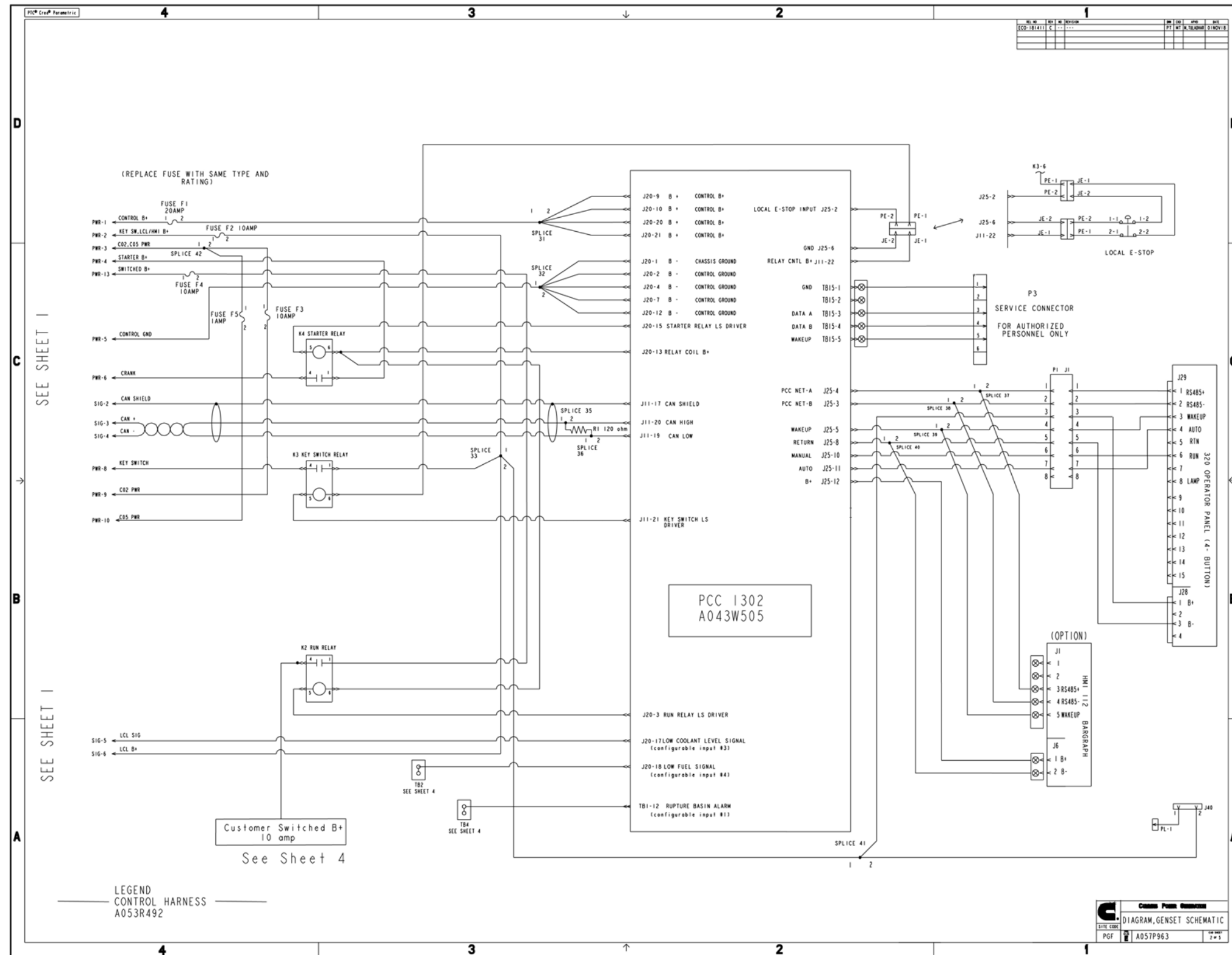


FIGURE 46. WIRING DIAGRAM PC 1.1 (SHEET 2 OF 5)

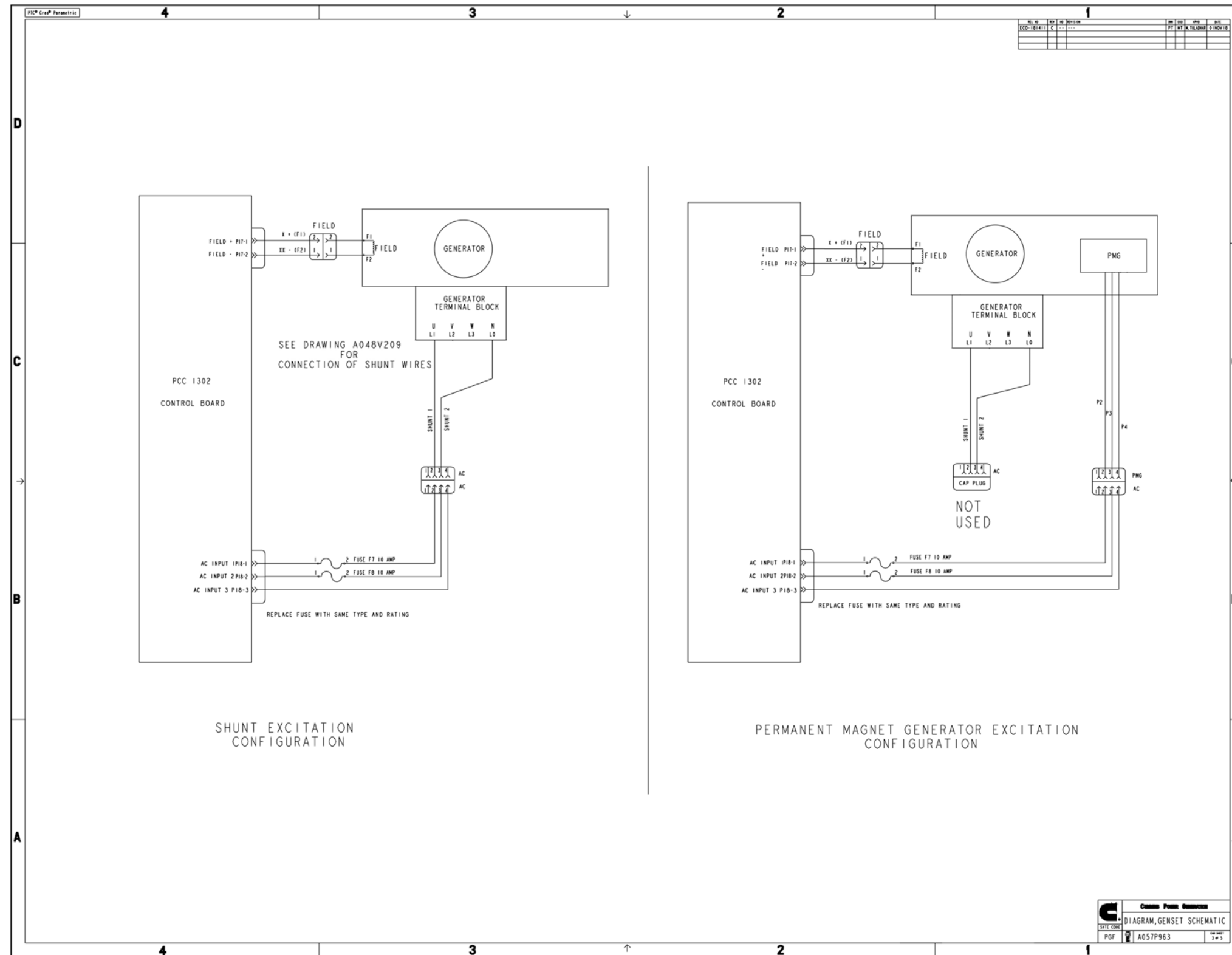


FIGURE 47. WIRING DIAGRAM PC 1.1 (SHEET 3 OF 5)

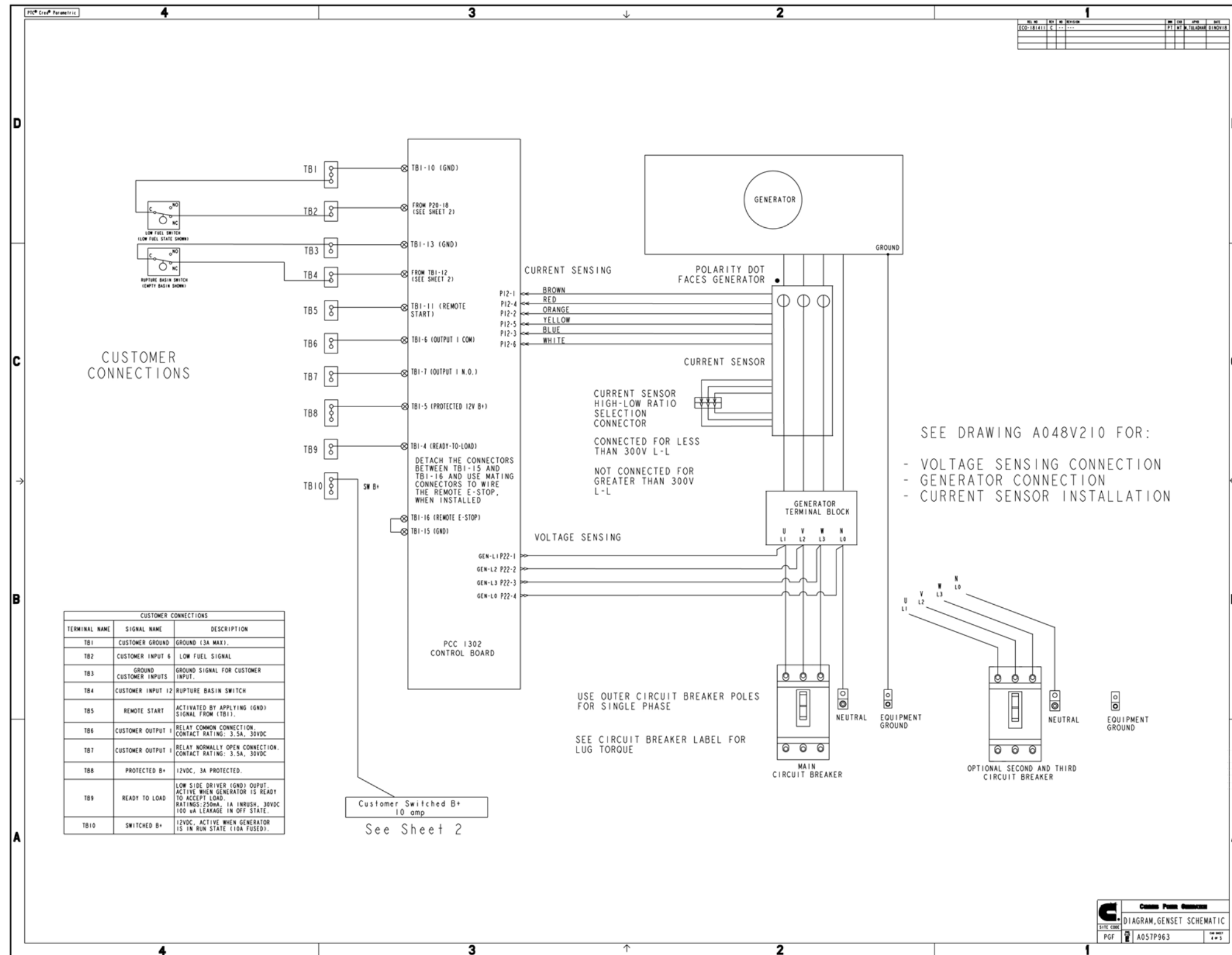


FIGURE 48. WIRING DIAGRAM PC 1.1 (SHEET 4 OF 5)

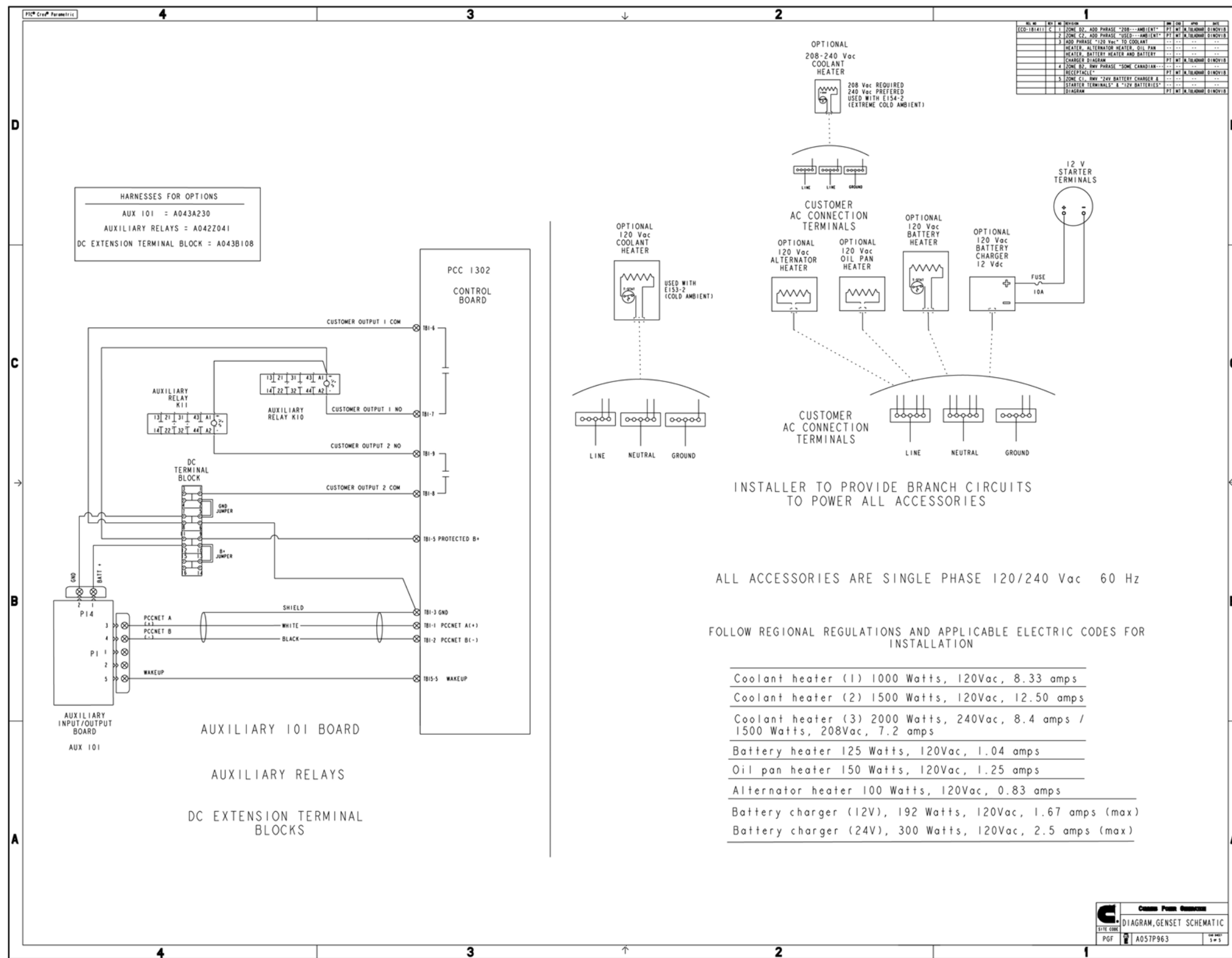


FIGURE 49. WIRING DIAGRAM PC 1.1 (SHEET 5 OF 5)

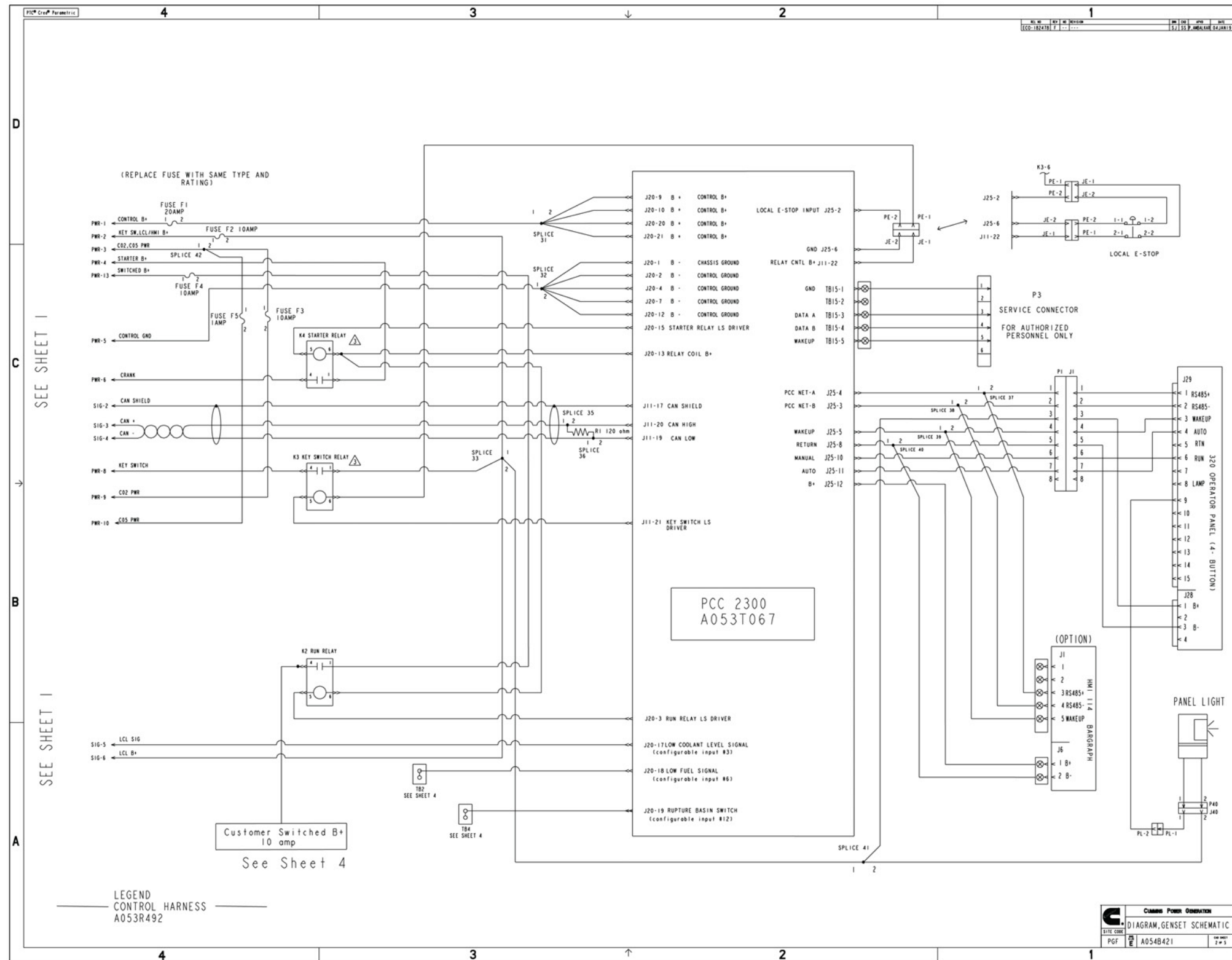


FIGURE 51. WIRING DIAGRAM PC 2.3 (SHEET 2 OF 5)

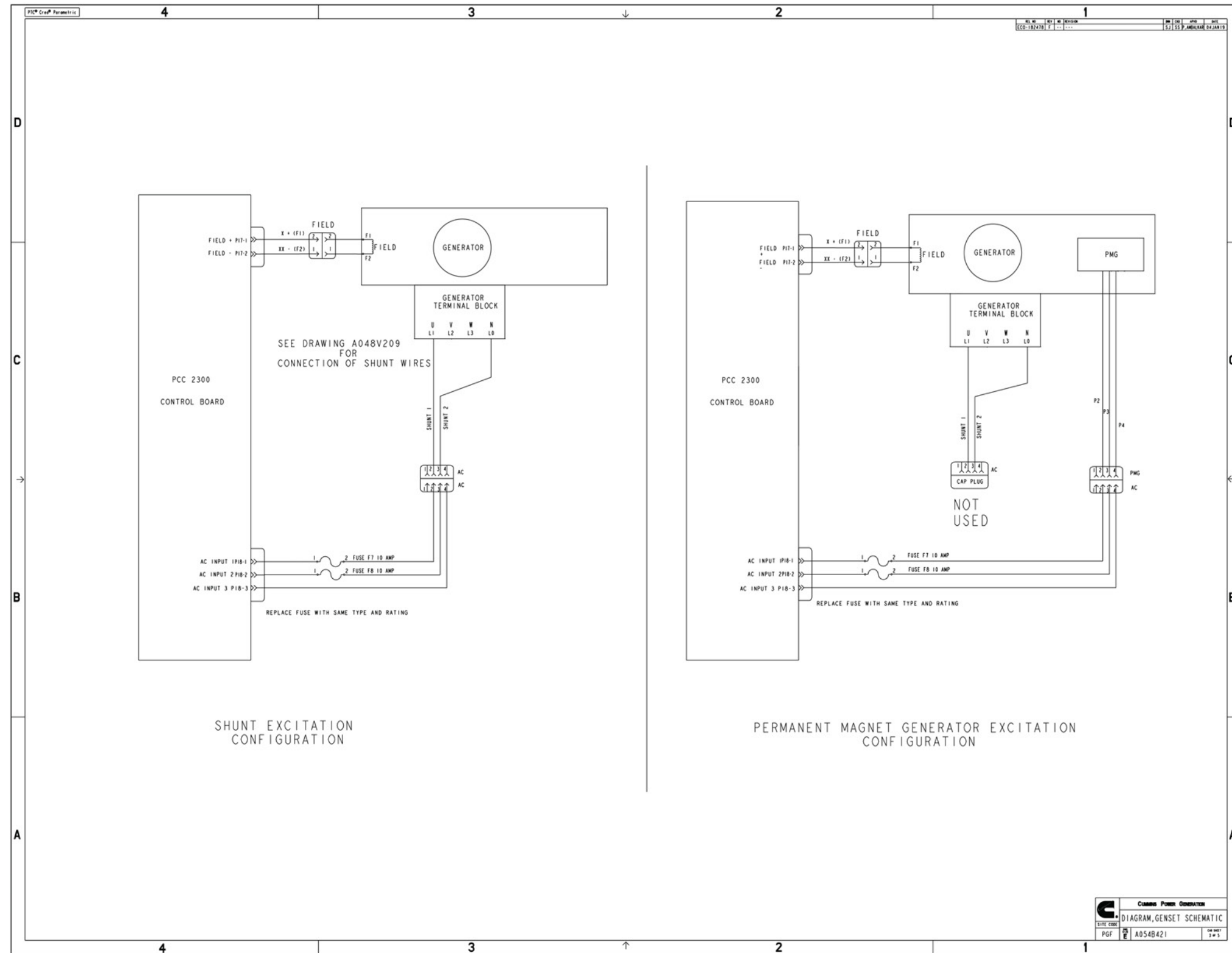


FIGURE 52. WIRING DIAGRAM PC 2.3 (SHEET 3 OF 5)

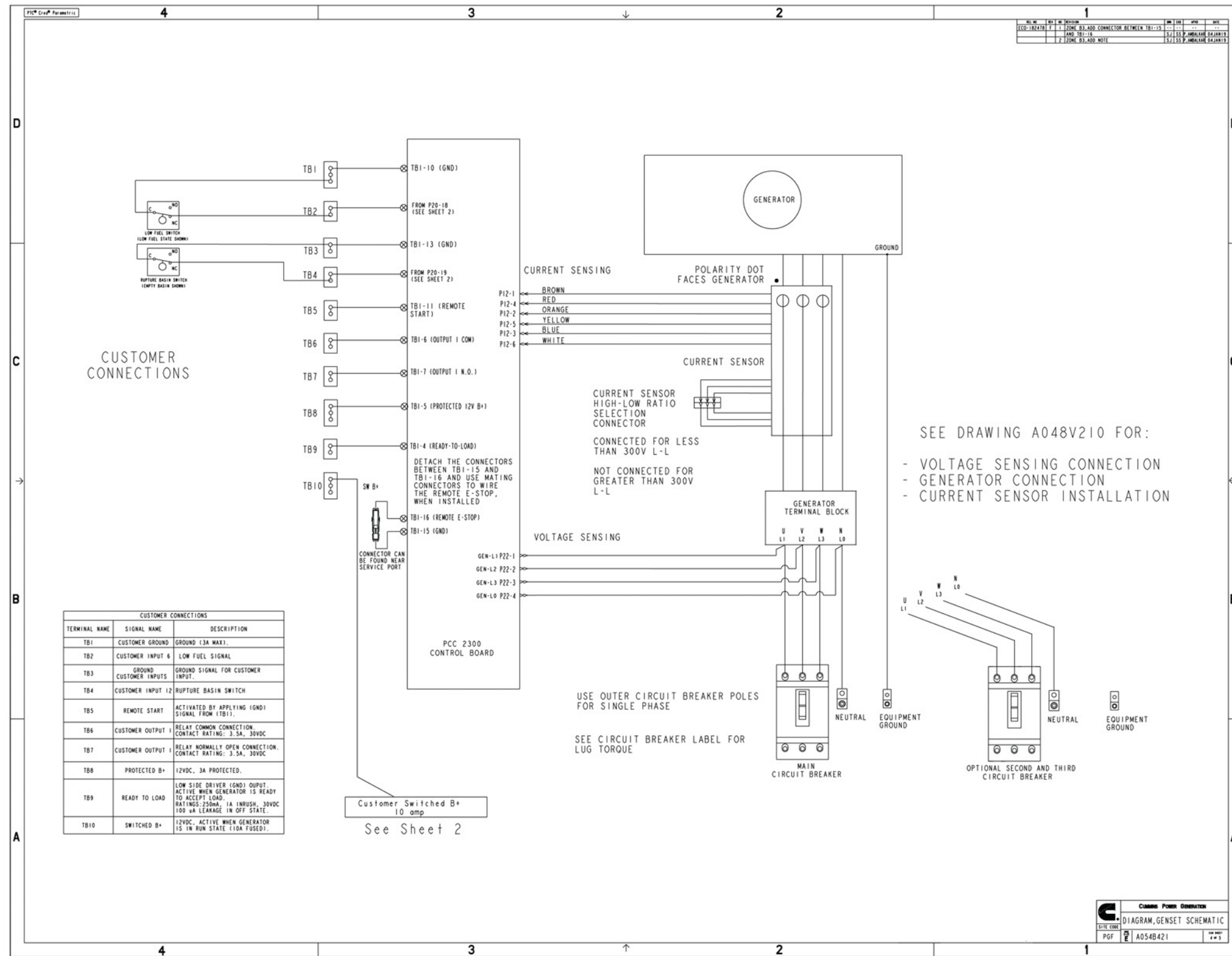


FIGURE 53. WIRING DIAGRAM PC 2.3 (SHEET 4 OF 5)

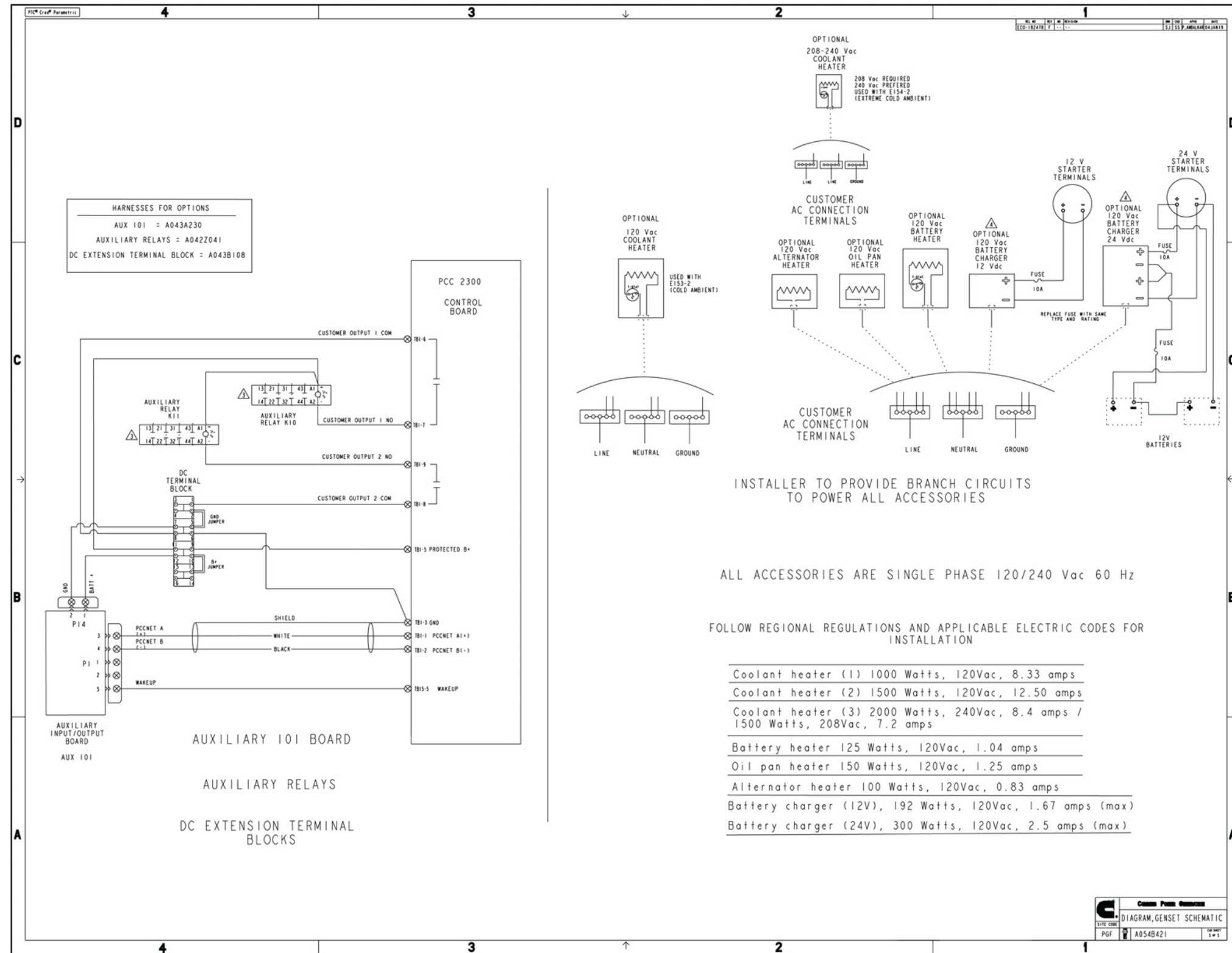


FIGURE 54. WIRING DIAGRAM PC 2.3 (SHEET 5 OF 5)

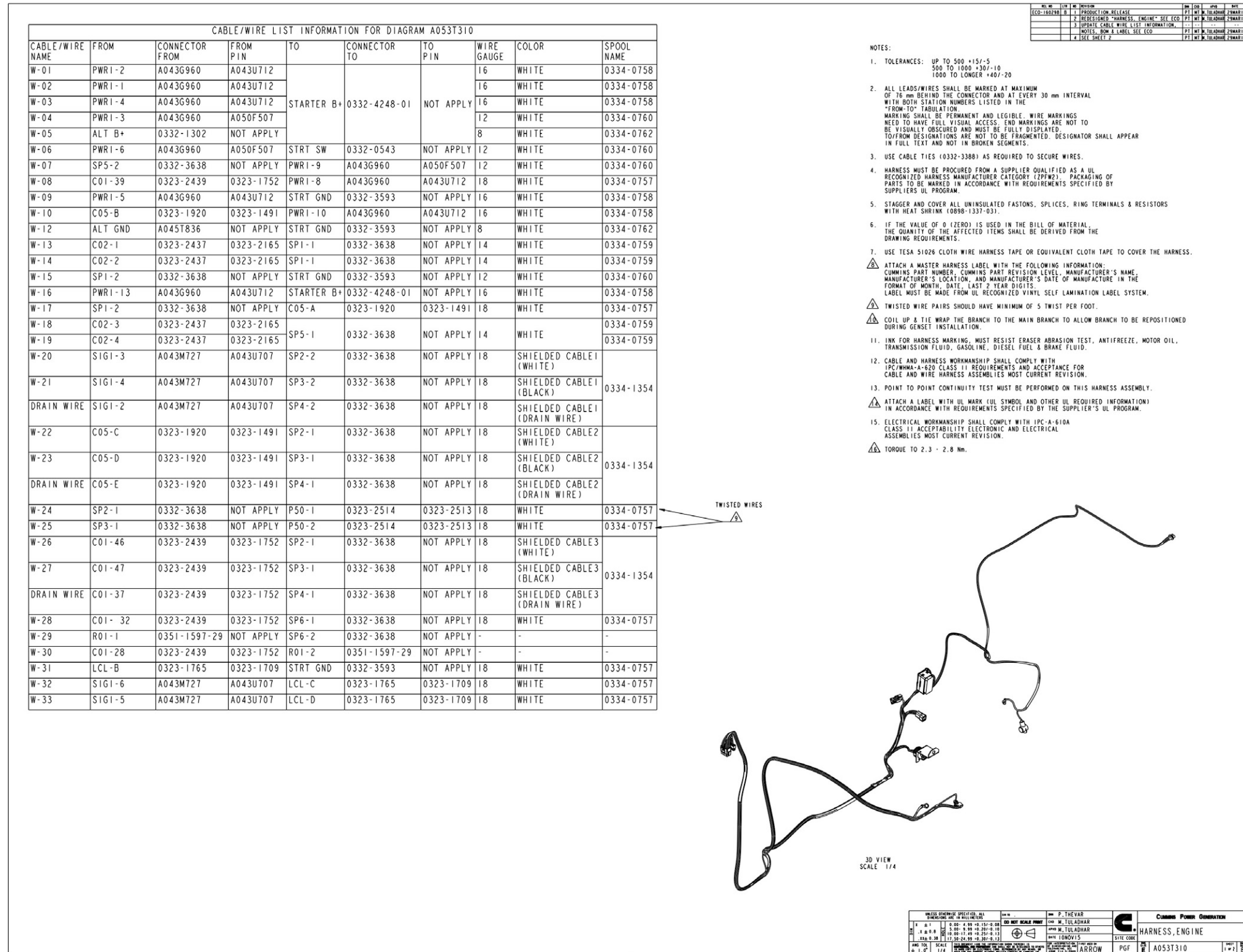


FIGURE 55. HARNESS, ENGINE (SHEET 1 OF 2)

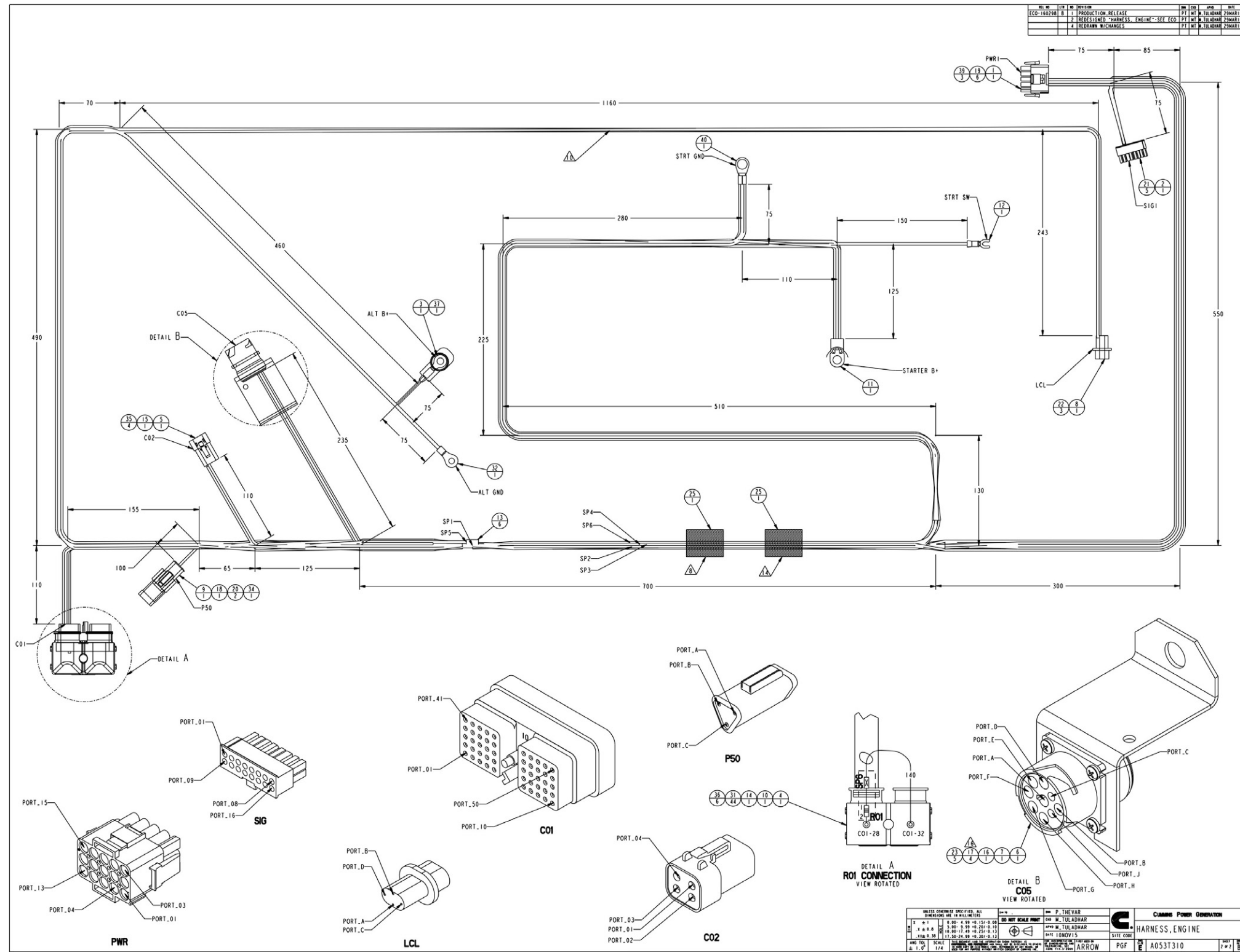
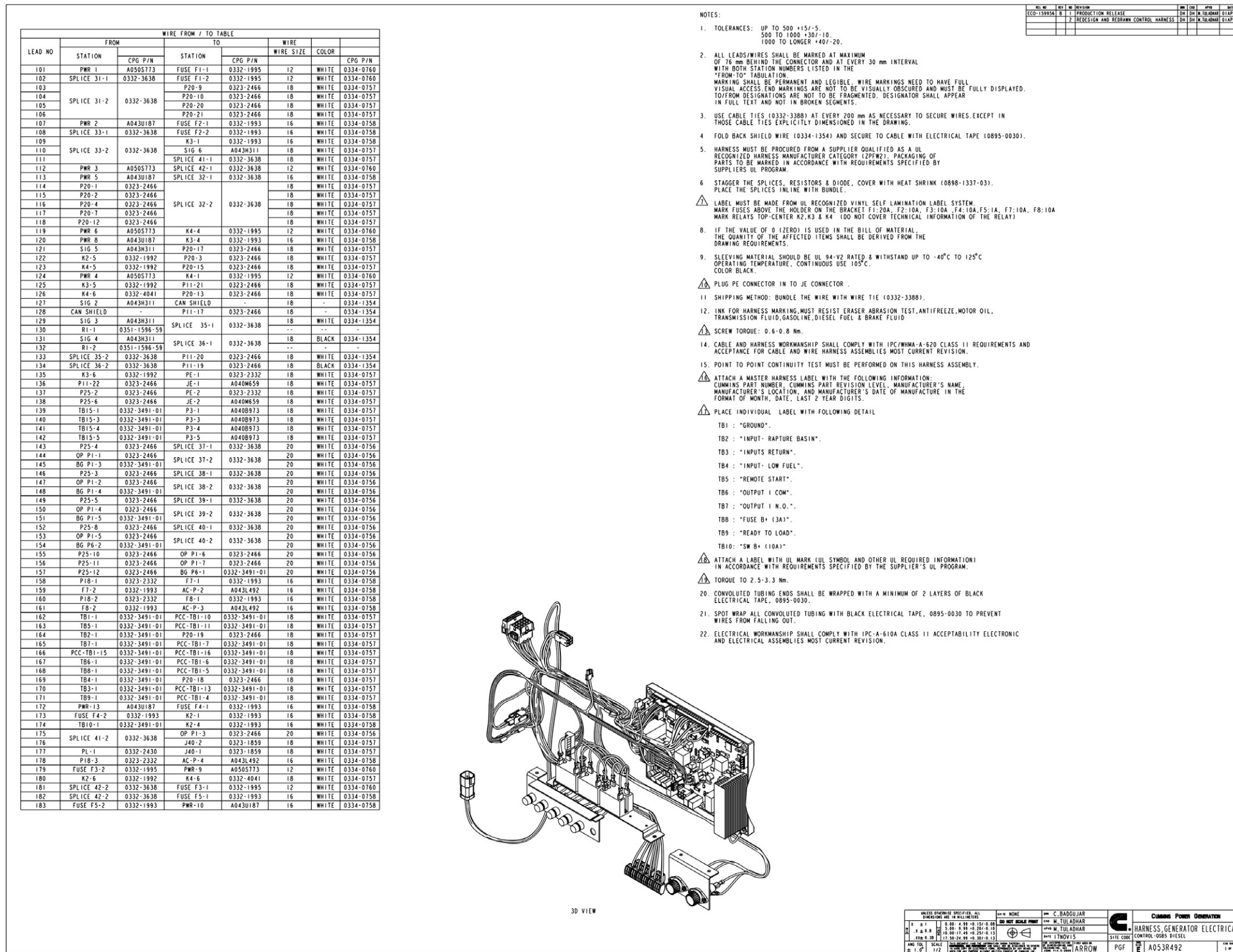


FIGURE 56. HARNESS, ENGINE (SHEET 2 OF 2)



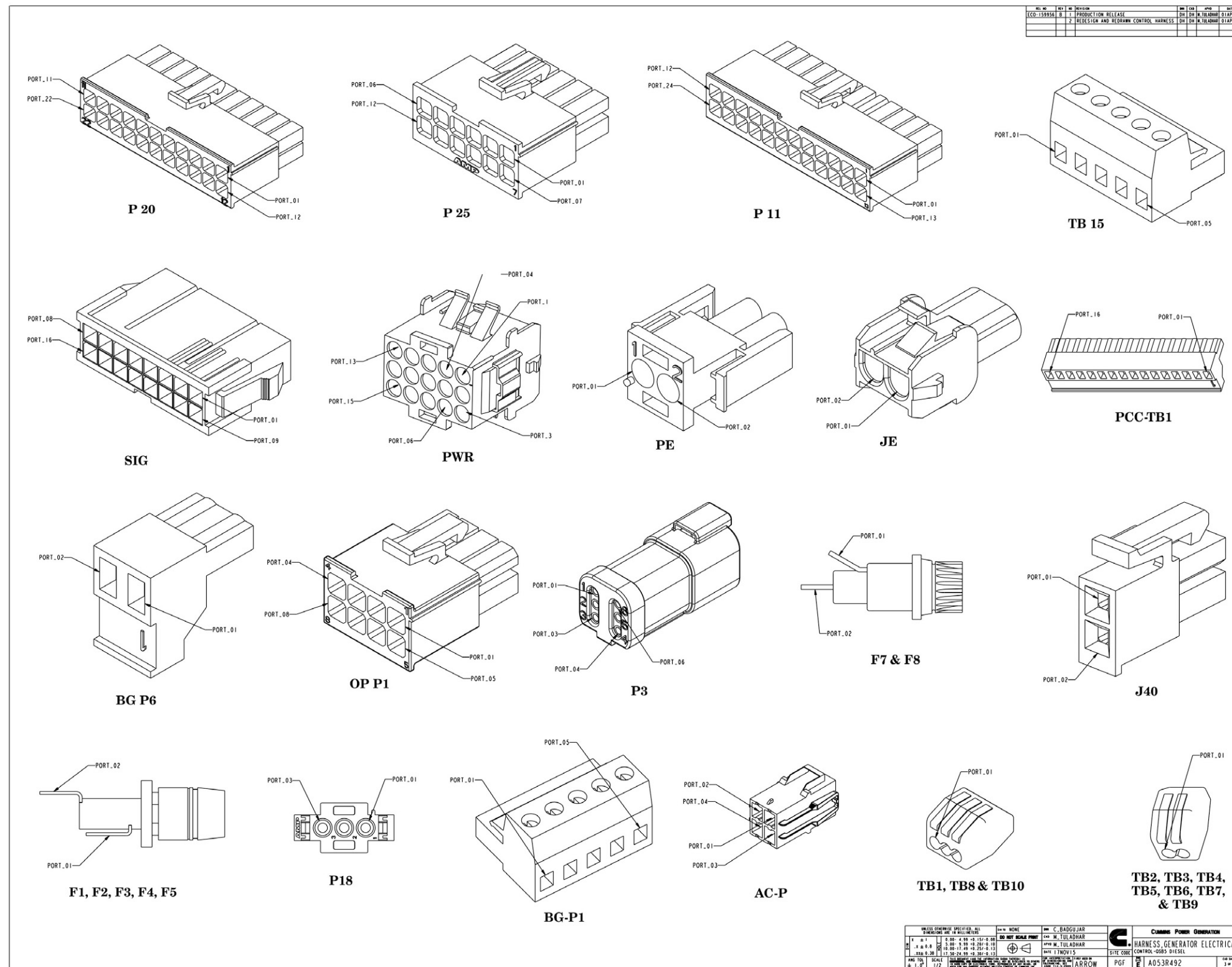


FIGURE 59. HARNESS, CONTROL (SHEET 3 OF 4)

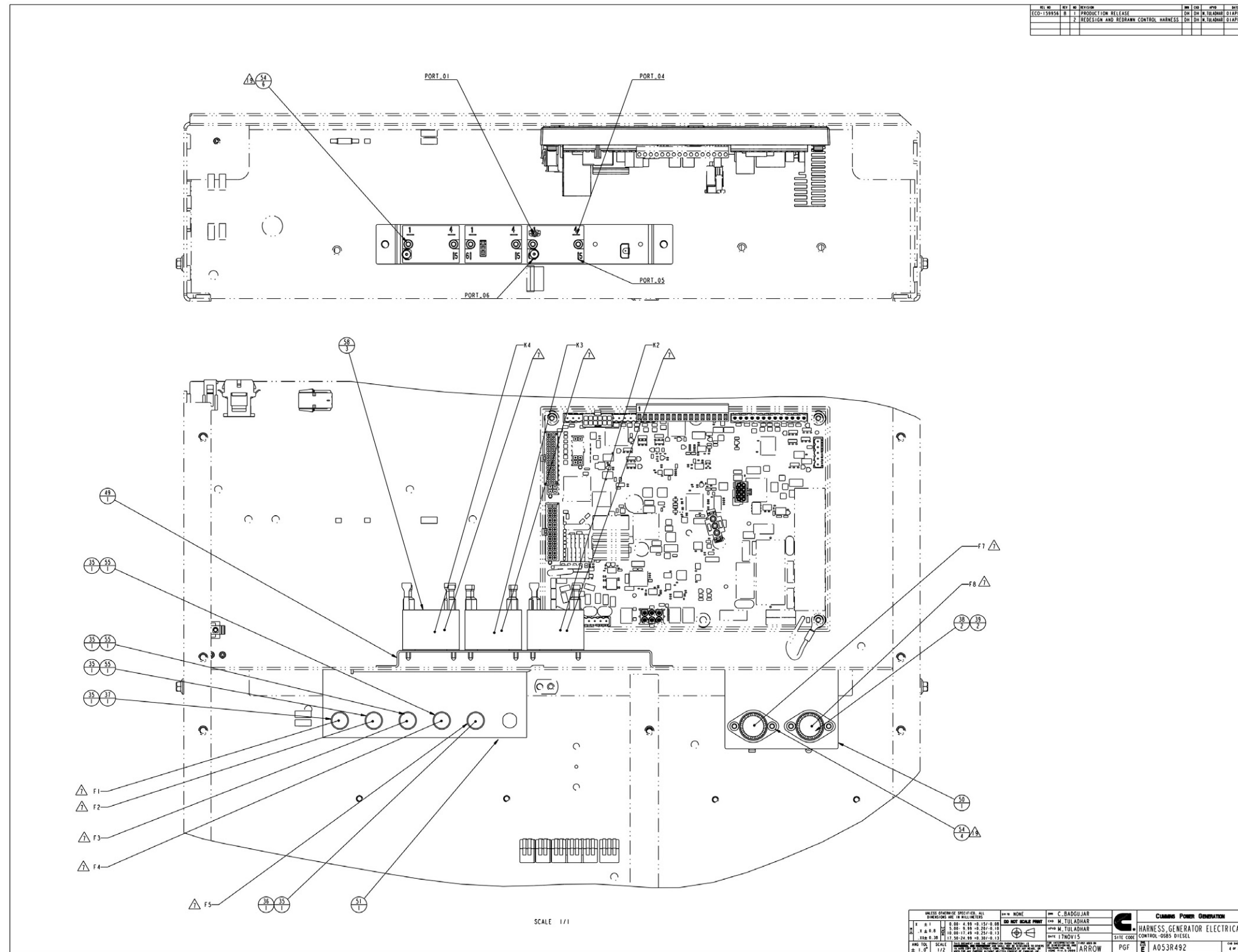


FIGURE 60. HARNESS, CONTROL (SHEET 4 OF 4)

Appendix D. Seismic Requirements

Table of Contents

Figure 61. Seismic Installation Specifications (Sheet 1 of 2)	131
Figure 62. Seismic Installation Specifications (Sheet 2 of 2)	132
Figure 63. Seismic Installation Mounting Hole Locations	133
Figure 64. Seismic Installation Connections	134
Figure 65. Seismic Installation Mounting Hole Locations for Fuel Tank	135

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

D.1 Seismic Installation Instructions

REL NO	LTN	NO	REVISION	DRN	CKD	APVD	DATE
ECO-159499	A	I	PRODUCTION RELEASE	DAH	DAH	JMWALE	11FEB16

SEISMIC INSTALLATIONS NOTES:

- 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)
- 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.
- ANCHORS MUST BE INSTALLED IN MINIMUM 3000 PSI COMPRESSIVE STRENGTH NORMAL WEIGHT STRUCTURAL CONCRETE. CONCRETE AGGREGATE MUST COMPLY WITH "ASTM C33".
- ANCHORS MUST BE INSTALLED TO THE TORQUE SPECIFICATION AS RECOMMENDED BY THE ANCHOR MANUFACTURER.
- ANCHORS MUST BE INSTALLED IN LOCATIONS SPECIFIED ON THIS INSTALLATION DRAWING.
- 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.
- CONCRETE FLOOR SLAB AND CONCRETE HOUSEKEEPING PADS MUST BE DESIGNED FOR SEISMIC APPLICATIONS IN ACCORDANCE WITH "ACI 318-11".
- 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).
- 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.
- 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.
- COORDINATE REINFORCEMENT OF SUPPORT STRUCTURE WITH EQUIPMENT ANCHOR LOCATIONS.
- 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.
- INSTALLATION ONTO A STEEL ROOF STRUCTURE OR MANUFACTURED STEEL CURB SHALL BE COORDINATED WITH THE STRUCTURAL ENGINEER OF RECORD.
- 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.
- REFER TO GENSET OUTLINE DRAWINGS FOR WEIGHT, CG AND CONFIGURATION SPECIFICS.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS		DRN: A05IN157	DRN: D HOFMEISTER	CUMMINS POWER GENERATION												
DO NOT SCALE PRINT		CKD: D HOFMEISTER	INSTALLATION, GENSET		SEISMIC REQUIREMENTS											
<table border="1"> <tr> <th>TOLERANCE</th> <th>0.00- 4.99</th> <th>+0.15/-0.00</th> </tr> <tr> <td>X ± 1</td> <td>5.00- 9.99 <td>+0.20/-0.10</td> </td></tr> <tr> <td>.X ± 0.6</td> <td>10.00-17.49</td> <td>+0.25/-0.13</td> </tr> <tr> <td>.XX ± 0.38</td> <td>17.50-24.99</td> <td>+0.30/-0.13</td> </tr> </table>		TOLERANCE	0.00- 4.99	+0.15/-0.00		X ± 1	5.00- 9.99 <td>+0.20/-0.10</td>	+0.20/-0.10	.X ± 0.6	10.00-17.49	+0.25/-0.13	.XX ± 0.38	17.50-24.99	+0.30/-0.13	APVD: M. JAWALE	DATE: 11FEB16
TOLERANCE	0.00- 4.99	+0.15/-0.00														
X ± 1	5.00- 9.99 <td>+0.20/-0.10</td>	+0.20/-0.10														
.X ± 0.6	10.00-17.49	+0.25/-0.13														
.XX ± 0.38	17.50-24.99	+0.30/-0.13														
ANG TOL: ± 1.0°	SCALE: 1/1	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP FOR INTERPRETATION FIRST USER OR TOLERANCES, SEE HOME: 774.541.594		ARROW	PGF	SHEET 1 OF 5 A										

FIGURE 61. SEISMIC INSTALLATION SPECIFICATIONS (SHEET 1 OF 2)

REL. NO.	LTR.	NO.	REVISION	DRW.	CAD.	APPD.	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 S _{ds} ≤ 2.5 I _p ≤ 1.5 o _p /R _p ≤ 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 S _{ds} ≤ 2.5 I _p ≤ 1.5 o _p /R _p ≤ 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		DRW. TO: A05IN157	DRW. D. HOFMEISTER	CUMMINS POWER GENERATION	
DO NOT SCALE PRINT		DRW. D. HOFMEISTER	APPD. M. JAWALE	INSTALLATION, GENSET	
DATE 11FEB16		DATE 11FEB16	SITE CODE	SEISMIC REQUIREMENTS	
ANG. TOL: ± 1.0°		SCALE: 1/1	FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES, SEE ASAC 114-56-1594	PGF	SHEET 2 OF 5
			ARROW	A054T597	A

FIGURE 62. SEISMIC INSTALLATION SPECIFICATIONS (SHEET 2 OF 2)

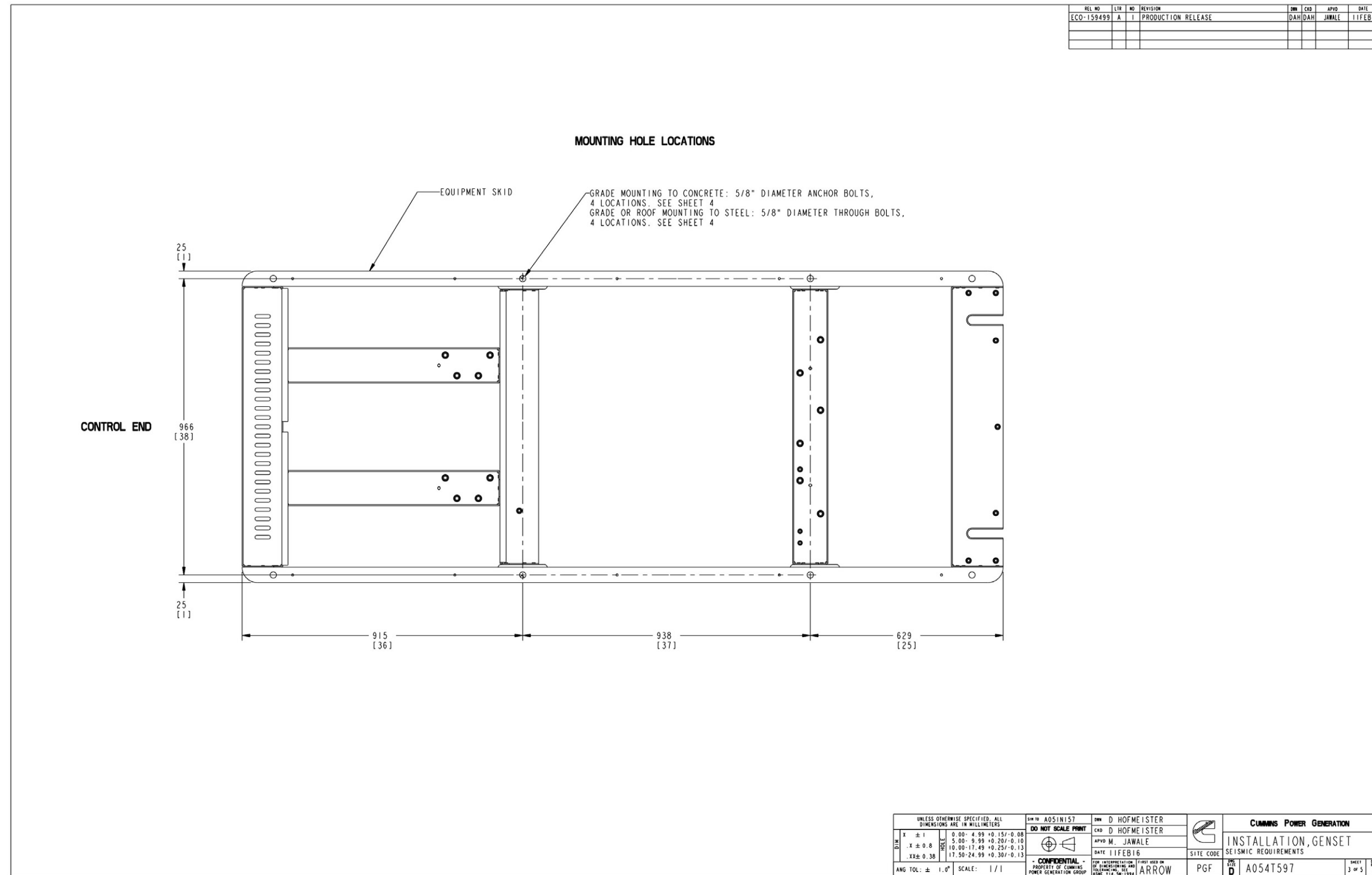


FIGURE 63. SEISMIC INSTALLATION MOUNTING HOLE LOCATIONS

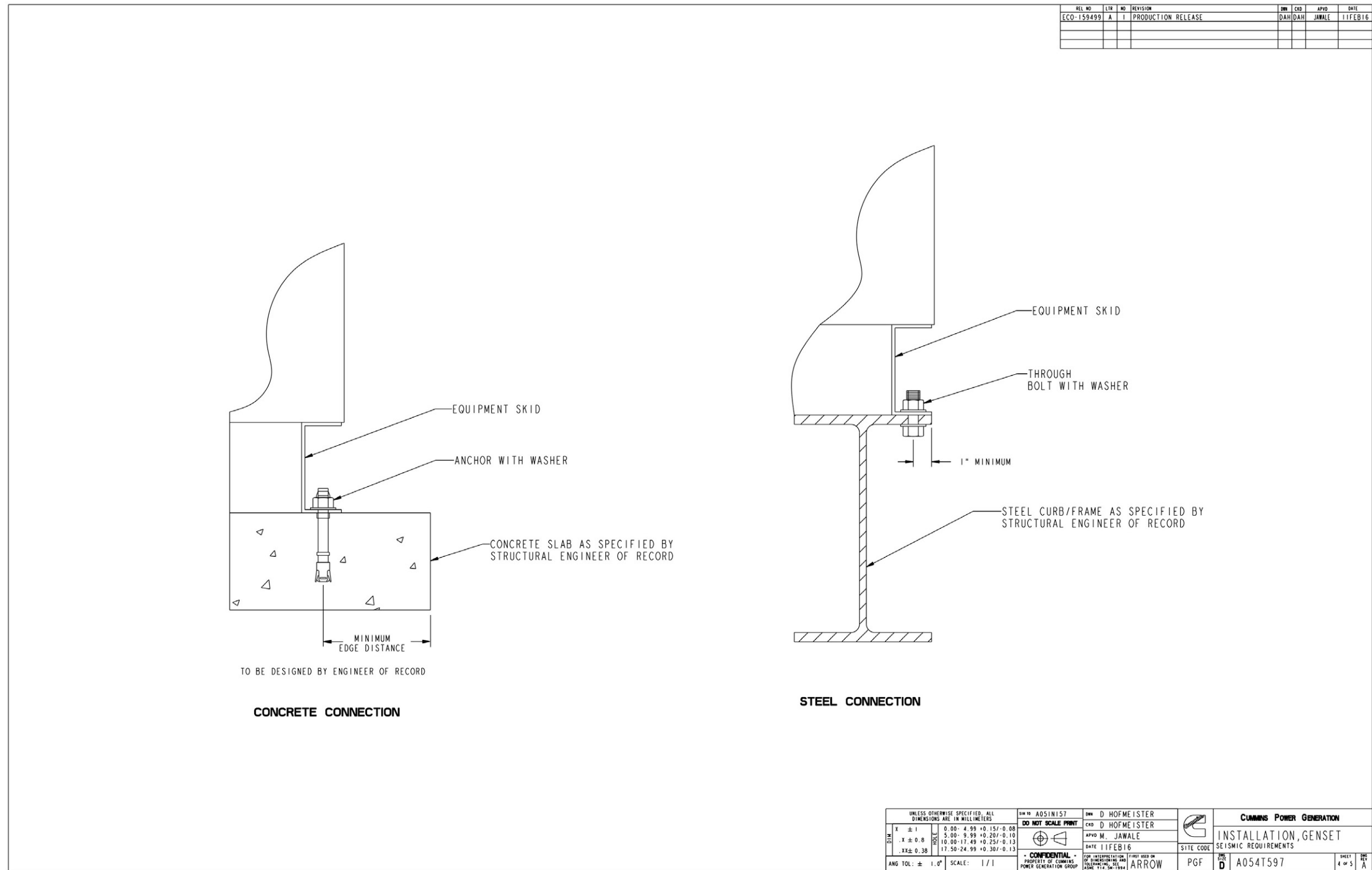


FIGURE 64. SEISMIC INSTALLATION CONNECTIONS

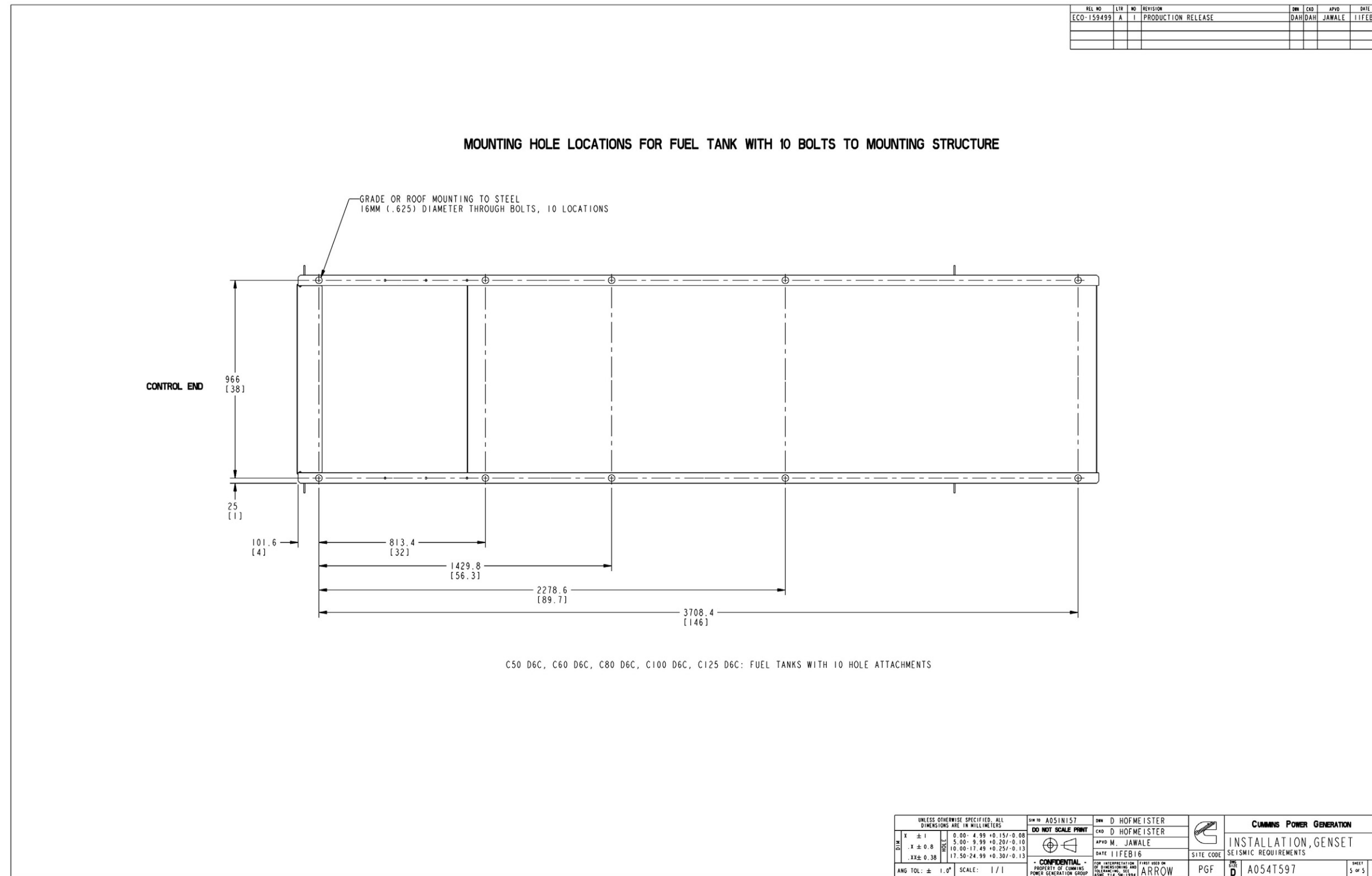


FIGURE 65. SEISMIC INSTALLATION MOUNTING HOLE LOCATIONS FOR FUEL TANK

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