ADDENDUM #1
Public Works – Building Services
Boulder County Jail Generator
BID # 7280-21

December 27, 2021

The attached addendum supersedes the original Information and Specifications regarding BID # 7280-21 where it adds to, deletes from, clarifies or otherwise modifies. All other conditions and any previous addendums shall remain unchanged.

Please note: Due to COVID-19, BIDS will only be accepted electronically by emailing purchasing@bouldercounty.org.

1. Question: For crane purposes, will we need to provide an FAA Permit since project is near the airport?

   ANSWER: The Airport will tell you if a permit is needed. We don't believe a permit has been issued in the past.

2. Question: What is the weight of the existing generator?

   ANSWER: No more the 14600 lbs. - no fuel, w/ coolant.

3. Question: Will lighting eyes of existing generator hold the weight of generator and fuel within fuel tank?

   ANSWER: We'll remove the fuel.

4. Question: Will there be enough room at new location to set the 600KW generator? We will need 40 feet from location to crane.

   ANSWER: There is plenty of room around the jail.

5. Question: Can I set up a site visit with crane company to review crane lifting procedures?

   ANSWER: Yes, please email Boulder County Purchasing at purchasing@bouldercounty.org to request a site visit.

   Please see the additional documents at the end of this addendum.

Submittal Instructions:

Submittals are due at the email box only, listed below, for time and date recording on or before **2:00 p.m. Mountain Time on January 4, 2022.**

Please note that email responses to this solicitation are limited to a maximum of 50MB capacity.

NO ZIP FILES OR LINKS TO EXTERNAL SITES WILL BE ACCEPTED. THIS INCLUDES GOOGLE DOCS AND SIMILAR SITES. ALL SUBMITTALS MUST BE RECEIVED AS AN ATTACHMENT (E.G. PDF, WORD, EXCEL).

Electronic submittals must be received in the email box listed below. Submittals sent to any other box will NOT be forwarded or accepted. This email box is only accessed on the due date of your questions or proposals. Please use the Delivery Receipt option to verify receipt of your email. It is the sole responsibility of the proposer to ensure their documents are received before the deadline specified above. Boulder County does not accept responsibility under any circumstance for delayed or failed email or mailed submittals.

Email purchasing@bouldercounty.org; identified as **BID # 7280-21** in the subject line.

All proposals must be received and time and date recorded at the purchasing email by the above due date and time. Sole responsibility rests with the Offeror to see that their bid is received on time at the stated location(s). Any bid received after due date and time will be returned to the bidder. No exceptions will be made.

The Board of County Commissioners reserve the right to reject any and all bids, to waive any informalities or irregularities therein, and to accept the bid that, in the opinion of the Board, is in the best interest of the Board and of the County of Boulder, State of Colorado.

RECEIPT OF LETTER
ACKNOWLEDGMENT

December 27, 2021

Dear Vendor:

This is an acknowledgment of receipt of Addendum #1 for BID #7280-21, Boulder County Jail Generator.

In an effort to keep you informed, we would appreciate your acknowledgment of receipt of the preceding addendum. Please sign this acknowledgment and email it back to purchasing@bouldercounty.org as soon as possible. If you have any questions, or problems with transmittal, please call us at 303-441-3525. This is also an acknowledgement that the vendor understands that **due to COVID-19, BIDS will only be accepted electronically by emailing purchasing@bouldercounty.org.**

Thank you for your cooperation in this matter. This information is time and date sensitive; an immediate response is requested.

Sincerely,

Boulder County Purchasing

Signed by: _____ Date: _____

Name of Company_____

End of Document

Generator set data sheet

Power Generation

Model:	**DQCB**
Frequency:	**60**
Fuel type:	**Diesel**
KW rating:	**750 standby**
	680 prime
Emissions level:	**EPA NSPS Stationary Emergency Tier 2**

Exhaust emission data sheet:	**EDS-1087**
Exhaust emission compliance sheet:	**EPA-1121**
Sound data sheet:	**MSP-1159**
Sound data sheet – with seismic feature codes L228-2 (IBC) and/or L225-2 (OSHPD):	**MSP-1013**
Cooling system data in various ambient conditions:	**MCP-248**
Cooling system data in various ambient conditions – with seismic feature codes L228-2 (IBC) and/or L225-2 (OSHPD):	**MCP-174**
Prototype test summary data sheet:	**PTS-160**

Fuel consumption

	Standby				Prime				Continuous
	kW (kVA)				kW (kVA)				kW (kVA)
Ratings	750 (938)				680 (850)				
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**Full**
US gph	16.0	28.0	40.0	51.0	15.0	25.0	36.5	48.0	
L/hr	60.6	106.0	151.4	193.1	56.8	94.6	138.2	181.7	

Engine

	Standby rating	Prime rating	Continuous rating
Engine manufacturer	Cummins Inc.		
Engine model	QSK23-G7 NR2		
Configuration	Cast Iron, in line, 6 cylinder		
Aspiration	Turbocharged and air-to-air aftercooled		
Gross engine power output, kWm (bhp)	910 (1220)	808 (1085)	
BMEP at set rated load, kPa (psi)	2435 (353)	2214 (321)	
Bore, mm (in)	170 (6.69)		
Stroke, mm (in)	170 (6.69)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	10.21 (2010)		
Compression ratio	16:1		
Lube oil capacity, L (qt)	102 (108)		
Overspeed limit, rpm	2100		
Regenerative power, kW	93		

Fuel flow

Maximum fuel flow, L/hr (US gph)	685 (181)	
Maximum fuel inlet restriction, kPa (in Hg)	13.44 (4)	
Maximum fuel inlet temperature, °C (°F)	71 (160)	

Air

	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	64 (2242)	62 (2189)	
Maximum air cleaner restriction, kPa (in H_2O)	6.2 (25)		
Alternator cooling air, m^3/min (cfm)	117 (4156)		

Exhaust

Exhaust flow at set rated load, m^3/min (cfm)	152 (5358)	146 (5147)	
Exhaust temperature, °C (°F)	476 (888)	458 (856)	
Maximum back pressure, kPa (in H_2O)	10.1 (40.8)		

Standard set-mounted radiator cooling (non-seismic)

Ambient design, °C (°F)	50 (122)		
Fan load, kW_m (HP)	24 (32)		
Coolant capacity (with radiator), L (US gal)	109.5 (29)		
Cooling system air flow, m^3/min (scfm)	998 (35233)		
Total heat rejection, MJ/min (Btu/min)	32.3 (30655)	29.6 (28065)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		
Maximum fuel return line restriction kPa (in Hg)	30.47 (9)		

Optional set-mounted radiator cooling (with seismic feature codes L228-2 (IBC) and/or L225-2 (OSHPD))

Ambient design, °C (°F)	50 (122)		
Fan load, kW_m (HP)	27 (36)		
Coolant capacity (with radiator), L (US gal)	89 (23.5)		
Cooling system air flow, m^3/min (scfm)	1252 (44183)		
Total heat rejection, MJ/min (Btu/min)	32.3 (30655)	29.6 (28065)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		
Maximum fuel return line restriction, kPa (in Hg)	30.47 (9)		

Optional heat exchanger cooling

Set coolant capacity, L (US gal)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum raw water pressure, jacket water circuit, kPa (psi)			
Maximum raw water pressure, aftercooler circuit, kPa (psi)			
Maximum raw water pressure, fuel circuit, kPa (psi)			
Maximum raw water flow, jacket water circuit, L/min (US gal/min)			
Maximum raw water flow, aftercooler circuit, L/min (US gal/min)			
Maximum raw water flow, fuel circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (US gal/min)			
Raw water delta P at min flow, jacket water circuit, kPa (psi)			
Raw water delta P at min flow, aftercooler circuit, kPa (psi)			
Raw water delta P at min flow, fuel circuit, kPa (psi)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			
Maximum fuel return line restriction, kPa (in Hg)			

Optional remote radiator cooling[1]

	Standby rating	Prime rating	Continuous rating
Set coolant capacity, L (US gal)			
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)			
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum friction head, jacket water circuit, kPa (psi)			
Maximum friction head, aftercooler circuit, kPa (psi)			
Maximum static head, jacket water circuit, m (ft)			
Maximum static head, aftercooler circuit, m (ft)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum fuel flow, L/hr (US gph)			
Maximum fuel return line restriction, kPa (in Hg)			

Weights[2]

Unit dry weight kgs (lbs)	6075 (13395)
Unit wet weight kgs (lbs)	6337 (13973)

Notes:
[1] For non-standard remote installations contact your local Cummins Power Generation representative.
[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Standby	Engine power available up to 1371 m (4497 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 4.4% per 305 m (1000 ft). Above 40 °C (104 °F) derate 10% per 10 °C (18 °F).
Prime	*Engine power available up to 1084 m (3555 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 4.5% per 305 m (1000 ft). Above 40 °C (104 °F) derate 20.9% per 10 °C (18 °F).*
Continuous	

Ratings definitions

Emergency standby power (ESP):	**Limited-time running power (LTP):**	**Prime power (PRP):**	**Base load (continuous) power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature Code
380-480	Wye	125/105	S/P		3313	312	ADS-310	B282-2
220/380	Wye	105/80	S/P		4234	311	ADS-312	B599-2
480	Wye	105/80	S/P		3313	312	ADS-310	B600-2
480	Wye	80	S		3866	312	ADS-311	B601-2
600	Wye	105/80	S/P		3313	7	ADS-310	B603-2
600	Wye	80	S/P		3866	7	ADS-311	B604-2
380	Wye	80	S		4234	312	ADS-312	B660-2
480	Wye	125	P		2944	312	ADS-309	B718-2
600	Wye	125	P		2944	7	ADS-309	B720-2
190-480	Wye	125/105	S/P		2944	311	ADS-309	B731-2
208/416	Wye	105/80	S/P		3866	311	ADS-311	B733-2
208/416	Wye	80	S		4234	311	ADS-312	B734-2
400	Wye	105	S		3866	312	ADS-311	B735-2
480	Wye	125	S		2944	312	ADS-309	B738-2
600	Wye	125	S		2944	7	ADS-309	B739-2
416	Wye	125/105	S/P		3313	312	ADS-310	B741-2

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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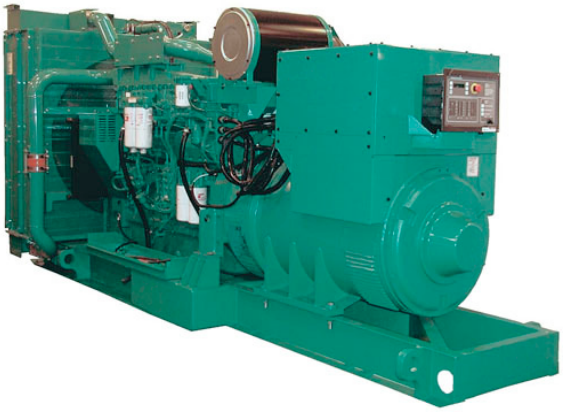
D-3353h (3/14)

Power Generation

cumminspower.com

Specification sheet

Diesel generator set QSK23 series engine



545 kW - 800 kW

Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications.

Features

Cummins® heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Permanent magnet generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DQCA	600 (750)		545 (681)				D-3352	
DQCB	750 (938)		680 (850)				D-3353	
DQCC	800 (1000)		725 (906)				D-3354	

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Generator set specifications

Governor regulation class	ISO 8528 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9

Engine specifications

Bore	169.9 mm (6.69 in)
Stroke	169.9 mm (6.69 in)
Displacement	23.15 litres (1413 in3)
Configuration	Cast iron, in line 6 cylinder
Battery capacity	1400 amps minimum at ambient temperature of 0 °C to 10 °C (32 °F to 50 °F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Direct injection: number 2 diesel fuel, fuel filter, automatic electric fuel shutoff
Fuel filter	Spin-on fuel filters with water separator
Air cleaner type	Dry replaceable element with restriction indicator
Lube oil filter type(s)	Fleetguard dual venturi spin-on, combination full flow and bypass filters
Standard cooling system	High ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Single bearing flexible discs
Insulation system	Class H
Standard temperature rise	125 °C standby at 40 °C ambient
Exciter type	PMG (permanent magnet generator)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion	< 5% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 50 per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3

Available voltages

60 Hz line-neutral/line-line				50 Hz line-neutral/line-line
• 110/190	• 127/220	• 230/380	• 277/480	
• 115/200	• 139/240	• 240/416	• 347/600	
• 120/208	• 220/380	• 255/440		

Note: Consult factory for other voltages.

Generator set options and accessories

Engine
- ☐ 208/240/480 V coolant heater for ambient above 4.5 °C (40 °F)
- ☐ Fuel/water separator
- ☐ Heavy duty air cleaner

Control Panel
- ☐ 120/240 V 100 W control anti-condensation heater
- ☐ Paralleling configuration
- ☐ Remote fault signal package
- ☐ Run relay package

Alternator
- ☐ 80 °C rise
- ☐ 105 °C rise
- ☐ 125 °C rise
- ☐ 120/240 V anti-condensation heater
- ☐ Temperature sensor - alternator bearing RTD

Cooling system
- ☐ 50 °C ambient

Exhaust System
- ☐ Industrial grade exhaust silencer
- ☐ Residential grade exhaust silencer
- ☐ Critical grade exhaust silencer

Generator set
- ☐ AC entrance box
- ☐ Battery
- ☐ Battery rack with hold-down - floor standing
- ☐ Circuit breaker - set mounted
- ☐ Disconnect switch - set mounted
- ☐ PowerCommand Network
- ☐ Remote annunciator panel
- ☐ Spring isolators
- ☐ 2 year warranty
- ☐ 5 year warranty
- ☐ 10 year major components warranty

Note: Some options may not be available on all models - consult factory for availability.

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Control system PCC2100 or PCC3201

PowerCommand control is an integrated generator set control system providing governing, voltage regulation, engine protection and operator interface functions. Major features include:

- Integral AmpSentry™ Protective Relay providing a full range of alternator protection functions that are matched to the alternator provided.
- Battery monitoring and testing features and smart starting control system.
- Three phase sensing, full wave rectified voltage regulation system, with a PWM output for stable operation with all load types.
- Standard PCCNet™ and optional Echelon® LonWorks® network interface.
- Control suitable for operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.

Operator/display panel

- Off/manual/auto mode switch
- Manual run/stop switch
- Panel lamp test switch
- Emergency stop switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments
- LED lamps indicating genset running, not in auto, common warning, common shutdown
- Configurable for local language

Engine protection

- Overspeed shut down
- Low oil pressure warning and shut down
- High coolant temperature warning and shut down
- High oil temperature warning (some models)
- Low coolant level warning or shut down
- Low coolant temperature warning
- High and low battery voltage warning
- Weak battery warning
- Dead battery shut down
- Fail to start (overcrank) shut down
- Fail to crank shut down
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Lube oil temperature (some models)
- Engine speed

AmpSentry AC protection

- Over current and short-circuit shut down
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shut down
- Over and under frequency shut down
- Overload warning with alarm contact
- Reverse power and reverse Var shut down
- Excitation fault

Alternator data

- Line-to-line and line-to-neutral AC volts
- Three phase AC current
- Frequency
- Total and individual phase power factor, kW and kVA

Other data

- Genset model data
- Start attempts, starts, running hours
- kW hours (total and since reset)
- Fault history

Governing

- Digital electronic isochronous governor
- Temperature dynamic governing
- Smart idle speed mode
- Glow plug control (some models)

Voltage regulation

- Digital PWM electronic voltage regulation
- Three phase line-to-neutral sensing
- Suitable for PMG or shunt excitation
- Single and three phase fault regulation
- Configurable torque matching

Control functions

- Data logging on faults
- Fault simulation (requires InPower)
- Time delay start and cooldown
- Cycle cranking
- Configurable customer inputs (4)
- Configurable customer outputs (4)
- Configurable network inputs (8) and outputs (16) (with optional network)
- Remote emergency stop

Paralleling (Option)

- Active digital phase lock loop synchronizer
- Isochronous kW and kVar load sharing controls
- kW import/export and kVar/PF control for utility (mains) paralleling

Options

- ☐ PCC 3201 paralleling control
- ☐ LED bargraph AC data display
- ☐ Thermostatically controlled space heater
- ☐ Key-type mode switch
- ☐ Ground fault module
- ☐ Auxiliary relays (3)
- ☐ Echelon LONWORKS interface
- ☐ Modion Gateway to convert to Modbus (loose)
- ☐ PowerCommand iWatch web server for remote monitoring and alarm notification (loose)
- ☐ Digital input and output module(s) (loose)
- ☐ Remote annunciator (loose)

For further detail on PCC 2100 see document S-1409.
For further detail on PCC 3201 see document S-1444.

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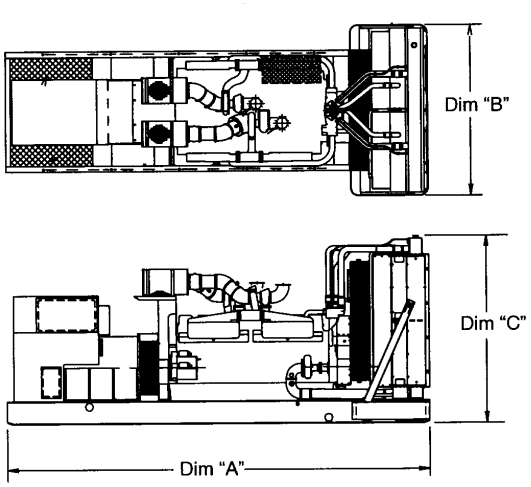
Emergency standby power (ESP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-time running power (LTP):
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime power (PRP):
Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base load (continuous) power (COP):
Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Dimensions and weights with standard cooling system

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set Weight* dry kg (lbs)	Set Weight* wet kg (lbs)
DQCA	4395.4 (173)	1855.5 (73)	2065.7 (81)	6075 (13395)	6337 (13973)
DQCB	4395.4 (173)	1855.5 (73)	2065.7 (81)	6075 (13395)	6337 (13973)
DQCC	4395.4 (173)	1855.5 (73)	2065.7 (81)	6075 (13395)	6337 (13973)

Dimensions and weights with optional cooling system with seismic feature codes L228-2 and/or L225-2

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set Weight* dry kg (lbs)	Set Weight* wet kg (lbs)
DQCA	4395.4 (173)	1715 (68)	2060.1 (81.1)	6377 (14061)	6518 (14372)
DQCB	4395.4 (173)	1715 (68)	2060.1 (81.1)	6377 (14061)	6518 (14372)
DQCC	4395.4 (173)	1715 (68)	2060.1 (81.1)	6377 (14061)	6518 (14372)

* Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.		The generator set is available listed to UL 2200, Stationary Engine Generator Assemblies for all 60 Hz low voltage models. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.
	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.	**U.S. EPA**	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards, 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
	All low voltage models are CSA certified to product class 4215-01.	**International Building Code**	The generator set package is available certified for seismic application in accordance with the following International Building Code: IBC2000, IBC2003, IBC2006, IBC2009 and IBC2012.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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S-1551j (3/14)

Power Generation

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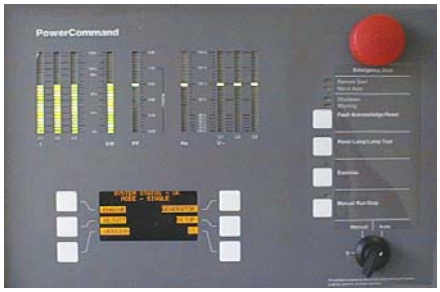
PowerCommand® 3201 digital generator set control



> Specification sheet

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Description

The PowerCommand® 3201 Control is a microprocessor-based generator set monitoring, metering and control system. The control provides an operator interface to the genset, digital voltage regulation, digital governing and generator set protective functions. It may incorporate optional automatic digital paralleling controls and/or power transfer controls. The integration of all the functions into a single control system provides enhanced reliability and performance compared to conventional control systems.

The PowerCommand control is designed for mounting on the generator set and is suitable for use on generator sets ranging in size from 20 kW to 4000 kW. It will directly read AC voltages up to 600 VAC and can be configured for any frequency, voltage and power connection configuration from 120 to 13,800 VAC. The operator panel may be remote-mounted from the generator set and connected via an RS485 network connection.

The control offers a wide range of standard control and digital display features so custom control configurations are not needed to meet application requirements and system reliability is not compromised by use of untested special components.

Power for PowerCommand Control is usually derived from the generator set starting batteries. It functions over a voltage range from 8 VDC to 35 VDC.

Features

Digital full authority electronic engine controls - Provide engine monitoring, protection and governing. These functions are integrated with voltage regulation and paralleling functions for optimum system performance.

Digital voltage regulation - Provides fast, controlled response to load changes and high levels of immunity to the effects of non-linear loads.

AmpSentry™ protective relay - UL Listed, true alternator overcurrent protection.

AC output metering - Includes analog and digital display.

Battery monitoring system - Senses and warns against weak battery condition that is not detected by conventional DC over and undervoltage monitoring.

Message display - Digital alarm and status.

Generator set monitoring - Displays status of all critical engine and alternator generator set functions.

Smart starting control system - Integrated fuel ramping to limit black smoke and frequency overshoot, in addition to optimized cold weather starting.

Advanced serviceability - Utilizes InPower™, a PC-based software service tool.

Digital power transfer control - Optional control functions that allow operation in open transition, closed transition or soft (ramping) transfer modes.

PowerCommand LonWorks® network - Optional network interface providing expanded input/output capability, remote monitoring and control by annunciators and other equipment, and easier installation.

Warranty - Backed by a comprehensive warranty and worldwide distributor service network.

Operator panel

The operator panel provides the user with a complete package of easy to view and use information. It includes an enhanced graphical operator panel that allows the user to view up to 9 lines of information, as well as graphical displays of system data. Connections to the operator panel are sealed, locking plug interfaces for reliable, vibration-resistant interconnection to the generator set wiring harness.

Control switches and functions

Off/manual/auto mode control switch - The *not in auto* lamp will flash when the control is in the *manual* or *off* mode. In the *auto* mode, the generator set can be started using the exercise push-button or with a start signal from a remote device, such as automatic transfer switches.

Manual run/stop control switch and indicating LED - When the mode control switch is in the *manual* position and the *manual run/stop* switch is pressed, the generator set will start, bypassing all time delay starts. (Time delay idle can also be bypassed with another control action.) If the generator set is running in the *manual* mode, pressing the *run/stop* switch will cause the generator set to shut down. An LED (light emitting diode) lamp adjacent to the switch will light to indicate the generator set is in manual mode.

Exercise control switch and indicating LED - When the mode control switch is in the *auto* position the *exercise* control switch is used to complete a pre-programmed exercise sequence. All exercise functions are disabled when an emergency start command is received by the control. An LED lamp adjacent to the switch will light to indicate the generator set is in exercise mode.

Panel lamp/lamp test control switch.

Fault acknowledge/reset switch - The control includes a fault acknowledge function to allow the operator to reset the fault condition. If the fault condition is not corrected, the fault will reappear, but will not be logged as a separate event. Multiple faults can be logged and displayed at one time.

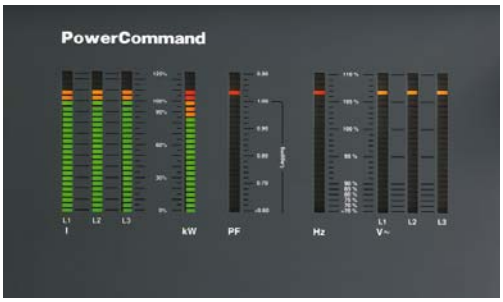
Emergency stop control switch.

Operator adjustments - The control includes provisions for many set up and adjustment functions via raise/lower switches on the operator panel. Functions that can be adjusted by the operator include:

- Time delay start (0-300 seconds)
- Time delay stop (0-600 seconds)
- Alternator voltage (±5%)
- Alternator frequency (±3 Hz)

The operator panel can be configured to require an access code prior to adjusting these values. A second access code is used to protect the control from unauthorized service level adjustments. Voltage and frequency adjustments are disabled during operation in parallel with a system bus to prevent inadvertent misadjustment of the paralleling load sharing functions.

Analog AC metering panel



The PowerCommand control is equipped with an analog AC metering panel that simultaneously displays 3-phase line-to-line AC volts and current, kW, power factor and frequency.

The meter panel is composed of a series of LEDs configured in bar graphs for each function. The LEDs are color coded with green indicating normal range values, amber for warning levels and red for shutdown conditions. Scales for each function are in % of nominal rated values.

Graphical display panel

The PowerCommand control is provided with a graphical display capable of displaying up to 9 lines of data with approximately 27 characters per line. The graphical display is accompanied by a set of six tactile-feel membrane switches that are used by the operator to navigate through control menus and to make control adjustments. Display is configurable for multiple languages. It is configurable for units of measurement. The display incorporates three levels of operation and adjustability. All data on the control can be viewed by

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scrolling through screens with the navigation keys. The top three lines of the display are allocated to mode and status messages that continuously display the operating mode of the control system, as well as any faults or warning conditions that may be present on the controller. If more than one fault or warning message is present, the messages will scroll to allow the operator to view all active messages in the system.

Screen-saver mode - The operator panel can be programmed to automatically switch off to reduce battery voltage drain when the control is not being used and the generator set is not running. Depressing any button on the operator panel, new fault conditions or receipt of a remote signal at the control will "wake up" the control.

Generator set data

Generator set hardware data - Generator set rating in kVA, complete generator set model number and serial number, engine model and serial number and alternator model and serial number. The control also displays the part number of the control and the software version present in the control.

Data logs - Number of start attempts and number of start attempts since reset. Number of times generator set has run and number of times since reset. Duration of generator set running time and duration of running time since last reset. Generator set kWh produced and kWh produced since last reset.

Adjustment history - Record of adjustment and setting changes made on the control, identifies whether adjustment was made via the operator panel or with a service tool. If a service tool is used, the control provides a record of the serial number of the tool used. This information is read with InPower.

Fault history - Record of the most recent fault conditions with time stamp, along with the number of times each fault has occurred. At least 20 events are stored in the control memory.

Load profile data - Data indicating the total operating hours at percent of load in 10% increments and since reset.

Generator set AC data

Generator set output frequency, voltage and current - All phases (line-to-line and line-to-neutral for voltage. Accuracy 1%.

Generator set power output - PowerCommand displays generator set kW and kVA output (average phase, individual phase and direction of flow) and power factor with leading/lagging indication. Accuracy 5%.

Generator set kWh energy output - Total kWh produced and total produced since last reset with time stamp of time of last reset.

Digital synchroscope - Bus voltage and frequency, generator set bus voltage and frequency, the phase angle displacement and a signal indicating "ready to close". A breaker control switch is included on this panel for convenient operation of the equipment without switching between viewing screens.

Engine data

Basic engine data - Engine starting battery voltage, engine lube oil pressure and engine coolant temperature.

Engine service data - Varies with engine used, but typically includes: Engine coolant pressure, engine fuel rail temperature and pressure, engine fuel input and output temperature, intake manifold temperature and pressure, ambient air pressure, crankcase blowby flow and aftercooler inlet coolant temperature.

Engine fuel consumption - The fuel consumed by the engine is calculated by the control based on fuel flow into the engine and returned by the engine, and the temperature of the two flow streams. Accuracy is $\pm$ 5% over 500 hours of operation. Data provided includes overall average fuel consumed and consumption since reset. This information is read with InPower.

Engine exhaust temperature (optional).

Power transfer control data (optional)

Utility (mains) source data - Displays line-to-line and line-to-neutral voltage of utility (mains) source, frequency and estimated amps, and kW and kVA supplied by utility (mains) source (optional when power transfer control is used).

System status information - Provides graphical system status display showing availability of sources and positions of each contactor.

System control - Allows operator to view status of system and manually control operation of the system. Provides manual adjustment capability for time delay start, stop, transfer and retransfer, as well as time delays for program transition (when used) and power transfer overlap time.

Internal control functions

General functions

System control voltage - The control operates on 24 VDC from the generator set starting batteries. Control functions are fully operational over a voltage range of 8 VDC to 36 VDC.

Emergency start mode - PowerCommand accepts a ground signal from remote devices or a network signal to automatically start the generator set and immediately accelerate to rated speed and voltage.

PowerCommand includes a smart starting system that is designed to quickly start the engine, minimize black smoke, minimize voltage and frequency overshoot, and

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oscillations on starting. The control system does this by careful simultaneous control of the engine fuel system and alternator excitation system.

Non-emergency start mode - The control is provided with a separate remote start input or a network signal to start the generator set via the programmable idle control. Using the non-emergency mode, the generator set takes longer to start, but there is less wear on the engine. In this start mode, the generator set will start, operate at idle speed for a predefined time period or until the engine reaches operating temperature (whichever time is shorter), and then ramp to rated speed and voltage. Time delay is adjustable from 0-300 seconds and default is 10 seconds. The control also monitors and records the source of start signals, when that information is available. The control automatically exits idle mode if an emergency remote start signal is received at the control.

Data logging - The control maintains a record of manual control operations, warning and shutdown conditions and other events. It uses the control *"on"* time as the time-stamp means when a real time clock is not included with the control. The control also stores critical engine and alternator data before and after a fault occurs, for use by InPower and the technician in evaluating the root causes for the fault condition.

Fault simulation mode - PowerCommand, in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of critical protective functions of the control by simulating failure modes or by forcing the control to operate outside of its normal operating ranges. InPower also provides a complete list of faults and settings for the protective functions of the specific generator set it is communicating with.

Built in test - The control system automatically tests itself, and all the sensors, actuators and harnesses in the control system, on a startup signal. The test can also be initiated from InPower and can be accomplished either locally to the generator set or remotely.

Engine control

Engine starting - The control operates a factory-supplied fuel valve that enables engine starting.

Cycle cranking - Configurable for number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging. Default setting is for (3) start cycles composed of 15 seconds of cranking and 15 seconds of rest.

Programmable idle speed control - In this mode the generator set would start and run to idle speed. It would operate at that speed for a programmed time period, then ramp to rated speed. When the control gets a signal to stop, it will ramp to idle, operate for the programmed period at idle and then shut down. During idle mode, engine protective functions are adjusted for the lower engine speed and alternator function is disabled.

Time delay start and stop (cool down) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal in normal operation modes and for time delay of 0-600 seconds prior to ramp-to-idle or shutdown after signal to stop in normal operation modes. The generator set control will monitor the load during operation of the generator set, and if the total load on the set is less than 10% of rated it will reduce the operation time for the time delay stop in order to prevent extended operation of the engine at very light load levels. Default for both time delay periods is 0 seconds.

Engine governing

Isochronous governing - Controls engine speed within ± 0.25% for any steady state load from no load to full load. Frequency drift will not exceed ± 0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Droop governing - Control can be adjusted to droop from 0 to 10% from no load to full load, using InPower.

Temperature dynamics - Modifies the engine fuel system control parameters as a function of engine temperature. Allows engine to be more responsive when warm and more stable when operating at lower temperature levels.

Isochronous load sharing control - See *Paralleling Functions/Load sharing controls*.

Droop load sharing control - See *Paralleling Functions/Load sharing controls*.

Idle mode - Engine governing can be regulated at an idle speed for a programmed period on start or stop of the engine. When the engine is operating at idle speed, the alternator excitation is automatically switched off.

Alternator control

Digital output voltage regulation - PowerCommand will regulate output voltage to within 0.5% for any loads between no load and full load. Voltage drift will not exceed ± 0.5% for a 33 °C (60 °F) change in temperature in an 8 hour period. On engine starting, or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e., the slope of the V/Hz curve) is adjustable in the control. This function is automatically disabled when the control is in a synchronizing mode.

Fault current regulation - PowerCommand will regulate the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. In conjunction with a permanent magnet generator, it will provide 3 times rated current on all phases for motor starting and short circuit coordination purposes.

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Isochronous (kVar) load sharing control - See *Paralleling Functions/Load sharing controls*.

Droop (kVar) load sharing control - See *Paralleling Functions/Load sharing controls*.

Protective functions

On a warning condition, the control will indicate a fault by lighting the warning LED on the control panel and displaying the fault name and code on the operator display panel. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided.

On a shutdown condition, the control will light the shutdown LED on the control panel, display the fault name and code, initiate shutdown and lock out the generator set. The shutdown sequence of the generator set includes programmable cooldown at idle for fault conditions that do not endanger the engine. The control maintains a data log of all fault conditions as they occur and time stamps them with the controller run time and engine operating hours data. Adjustments to most set points are made using the InPower service tool.

The control system includes a *"fault bypass"* mode that forces the system to function regardless of the status of protective functions. In this mode, the only protective functions that are operational are over speed, loss of both speed sensors, moving the control switch to the *off* position or pressing the *emergency stop* switch. The control maintains a record of the time that the mode is enabled and of all warning or shutdown conditions that have occurred while in the "*fault bypass*" mode.

Many protective functions within the control system are configurable for warning, shutdown or both (2 levels). Exceptions to this include functions such as over speed conditions, and loss of speed sensing. In addition, some warning functions can incorporate control functions as a consequence of a fault.

System protective functions:

Ground fault warning (option - 600 VAC class generator sets) - Ground (earth) fault sensing is adjustable over a range of 100-1200 amps with time delays of 0-1 second. May be configured for shutdown rather than alarm.

Configurable alarm and status inputs - PowerCommand will accept up to four alarm or status inputs (contact closed to ground) to indicate customer-specified conditions. The control is programmable for warning, shutdown or status indication and for labeling the input (up to 24 characters). Sixteen additional faults can be input to the control via the network.

Breaker fail to close and breaker auxiliary contact warning or shutdown - When the paralleling control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has connected the generator set to the system bus. If the control does not sense a breaker closure within 0.5 second of the close signal, the control will monitor the phase relationship between the generator set and the bus. If this indicates that the generator set is not closed to the bus, the *"breaker fail to close"* alarm will be indicated, the breaker will be opened and the generator set shut down. If the phase relationship monitor indicates that the generator set is in parallel with the bus, "circuit breaker auxiliary contact failure" will be indicated and the generator set will continue to run in normal operation mode.

Breaker fail to open warning - The control system monitors the operation of breakers that have been signaled to open. If the breaker does not open within 1 second of initiation of signal, a *"breaker fail to open"* warning is initiated. The control will logically allow the generator set to continue to run if shutdown of the generator set with the breaker closed will cause potential damage or operating problems.

Bus or generator set PT input calibration error - The control system monitors the sensed voltage from the bus and generator set output voltage-potential transformers. When the paralleling breaker is closed, it will indicate a warning condition when they read different values.

Emergency stop - Annunciated whenever the local or remote emergency stop signal is received. Alarm panel distinguishes between local or remote operation.

AmpSentry protective relay

AmpSentry protective relay is a UL Listed comprehensive monitoring and control system integral to the PowerCommand Control System that guards the electrical integrity of the alternator and power system by providing protection against a wide array of fault conditions in the generator set or in the load. It also provides single and three phase fault current regulation so that downstream protective devices have the maximum current available to quickly clear fault conditions without subjecting the alternator to potentially catastrophic failure conditions. See document R1053 below for a full size time over current curve. The control does not include protection required for interconnection to a utility (mains) service.

Over current warning - Output current on any phase at more than 110% of rating for more than 60 seconds.

Over current shutdown (51V) - Output current on any phase is more than 110%, less than 175% of rating and approaching thermal damage point of alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time. The control does not include instantaneous trip functions, as they are not necessary for alternator protection and complicate short circuit coordination (discrimination).

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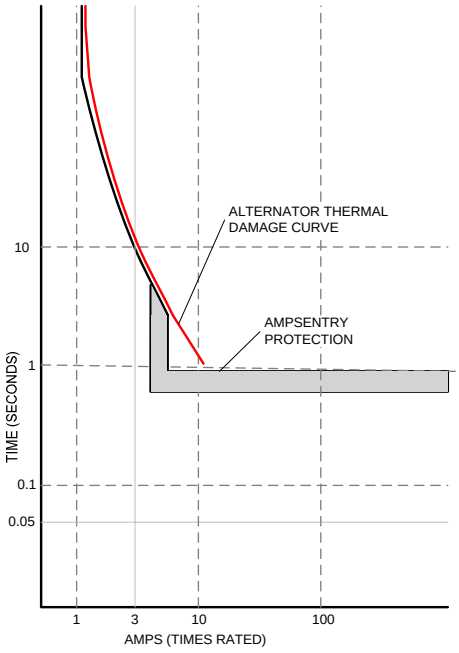

Short circuit shutdown (51) -Output current on any phase is more than 175% of rating at time of shutdown. The control replicates the function of a 51V relay by discriminating between short circuit conditions and shutdown conditions, and shutting down the genset as fast as is necessary on a short circuit condition while operating as long as is possible on an overload condition. Control includes algorithms to protect alternator from repeated over current conditions over a short time.

High AC voltage shutdown (59) - Output voltage on any phase exceeds preset values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 0.25-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of reference voltage, time delay 2-10 seconds. Default value is 85% for 10 seconds. Function tracks reference voltage. Control does not nuisance trip when voltage varies due to the control directing voltage to drop, such as during a voltage roll-off during synchronizing.

Under frequency shutdown (81u) - Generator set output frequency cannot be maintained. Settings are adjustable from 0-10 Hz below nominal governor set point, for a 0-20 second time delay. Default: 6 Hz, 10 seconds. Under frequency protection is disabled when excitation is switched off (such as when engine is operating in idle speed mode or the synchronizer is enabled).

Over frequency shutdown/warning (81o) - Generator set is operating at a potentially damaging frequency level. Defaults: Disabled.

Over load (kW) warning - Provides a warning indication when engine is operating at a load level over a set point. Adjustment range: 80-140% of rated kW, 0-120 second delay. Defaults: 105%, 60 seconds.

Reverse power shutdown (32) - Adjustment range: 5-20% of standby kW rating, delay 1-15 seconds. Defaults: 10%, 3 seconds.

Sync check (25) - Verifies that the generator set is operating in synchronism with the system bus prior to allowing the paralleling breaker to close. Includes dead bus sensing capability.

Fail to synchronize warning or shutdown - Indicates that the generator set could not be brought to synchronization with the system bus. Configurable for warning or shutdown and adjustable for time delay of 10-120 seconds. Default is 120 seconds.

Phase sequence sensing shutdown - Verifies that the generator set phase sequence matches the bus prior to allowing the paralleling breaker to close. The generator set will shutdown if the generator set and bus phase sequence do not match.

Reverse Var shutdown - Shutdown level is adjustable: 15-50% of rated Var output, delay 10-60 seconds. Defaults: 20%, 10 seconds.

High alternator temperature (option).

Engine protection

Over speed shutdown - Default setting is 115% of nominal.

Low lube oil pressure shutdown - Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.

Low lube oil pressure warning - Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.

High coolant temperature shutdown.

High coolant temperature warning.

Low coolant pressure warning/shutdown.

Low coolant level warning/shutdown.

Low coolant temperature warning - Indicates that engine temperature may not be high enough for a 10 second start or proper load pickup.

Low and high battery voltage warning - Indicates battery charging system failure by continuously monitoring battery voltage and indicating a problem when voltage is outside a preset acceptance band.

Discharged battery protection - When DC voltage is below a preset threshold, the control will shut down to avoid completely discharging the battery.

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Weak battery warning - The control system will test the battery bank each time the generator set is signaled to start and indicate a warning if the generator set battery indicates impending failure.

Fail to start (overcrank) shutdown.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

Redundant starter disconnect.

Redundant speed sensors - Loss of one sensor results in a mag pickup sensor warning. Loss of both sensors results in mag pickup failure.

Low fuel day tank and low fuel main tank warning.

Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Sensor failure indication - All analog sensors are provided with sensor failure logic to indicate if the sensor or interconnecting wiring has failed. Separate indication is provided for fail high or low.

High crankcase blowby level warning.

High fuel temperature warning.

High intake manifold temperature/pressure.

Aftercooler cooler inlet over temperature.

Paralleling functions (optional)

First Start Sensor™ System - PowerCommand provides a unique control function that positively prevents multiple generator sets from simultaneously closing to an isolated bus under black start conditions. The First Start Sensor system is a communication system between generator sets that allows the generator sets to work together to determine which generator set in a system should be the first to close to the bus. The system includes an independent backup function, so that if the primary system is disabled the required functions are still performed.

Synchronizer - PowerCommand incorporates a digital synchronizing function to force the generator set to match the phase relationship and voltage of the generator set output with the system bus or utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer includes adjustments for phase angle window (5°-20°) and time delay (0.5-5 seconds). The synchronizer is 3-phase sensing, and includes controls to directly operate a paralleling breaker. The breaker controls include fail to open and fail to close protection.

Load sharing controls - The generator set control includes an integrated load sharing control system for both real (kW) and reactive (kVar) loads when the generator set(s) are operating on an isolated bus. The control system determines kW load on the engine and kVar load on the alternator as a percent of generator set capacity, and then regulates fuel and excitation systems to maintain system and genset at the same percent of load without impacting voltage or frequency regulation. The control can also be configured for operation in droop mode for kW or Kvar load sharing.

Load govern controls - When PowerCommand receives a signal indicating that the generator set is paralleled with an infinite source such as a utility (mains) service, the generator set will operate in load govern mode. In this mode the generator set will synchronize and close to the bus, ramp to a pre-programmed kW and kVar load level, and then operate at that point. Control is adjustable for kW values from 0-100% of standby rating, and 0.7-1.0 power factor (leading). Default setting is 80% of standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load sharing level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control.

Load demand control - The control system includes the ability to respond to an external signal to initiate load demand operation. On command, the generator set will ramp to no load, open its paralleling breaker, cool down, and shut down. On removal of the command, the generator set will immediately start, synchronize, connect, and ramp to its share of the total load on the system.

Power transfer control (optional)

The Power transfer control feature allows PowerCommand to provide integrated automatic power transfer functions including source availability sensing and transfer device (circuit breaker) monitoring and control. The control is configurable for open transition, fast transfer (100 mS), or soft (ramping) sequences of operation. Standard functions include:

- 3-phase (line-to-neutral) close differential under voltage sensing for utility (mains) service. Sensing for pickup in an adjustable range from 85-100% of nominal, with default at 95% of dropout setting. Dropout is configurable 75-98% of pickup, with default at 85%.
- 3-phase over voltage sensing for normal utility service adjustable for pickup at 95-105% of dropout and dropout configurable for 105-135% of nominal. Time delay is adjustable in a range of 0.5-120 seconds. Default is disabled and is enabled using InPower.
- Under frequency sensing for normal utility service. Adjustment range is 80-95% of nominal. Default is disabled and is enabled using InPower.
- Configurable sequence of operation with or without adjustable program-transition capability. Adjustment range is 0-60 seconds.
- Remote exercise feature accepts a remote signal to initiate with or without load testing, or testing can be

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initiated by the operator. Test sequence may include a programmed idle period prior to acceleration to rated voltage and frequency, and after cool down. Test may be configured to be performed with load or without load.

- Time delay start and stop as described in this document; time delay transfer adjustable in a range of 0-120 seconds and retransfer in a range of 0-1800 seconds; all in 1-second increments.
- Fail to disconnect timer is adjustable in a range of 0.1 to 120 seconds.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and for storage from -40 °C to +80 °C (-40 °F to +176 °F). Control will operate with humidity up to 95%, non-condensing and at altitudes up to 5000 m (13,000 ft).

The operator control panel has a single membrane surface which is impervious to the effects of dust, moisture, oil and exhaust fumes. The panel uses sealed membrane or oil-tight switches to provide long reliable service life in harsh environments.

The control system is specifically designed for resistance to RFI/EMI and to resist the effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

The control is mounted on a vibration-isolated structure attached to the generator set skid and includes all generator set wiring factory-installed.

Control interface

Input signals to the PowerCommand control include:

Remote start signal - May be connected via either discrete signal or Lon® Network or both for premium reliability. Discrete signal is normally open contact to ground or normally closed contact that opens to indicate start signal. Separate signal inputs available for emergency start and non-emergency start.

Remote emergency stop.

Low main or day tank fuel level warning.

Remote alarm reset.

Load demand stop.

Utility parallel (load govern) mode command.

Configurable customer inputs - Control includes provisions for (4) input signals from customer discrete devices. (16) additional input signals can be implemented with the use of external network modules.

Output signals from the control include:

Generator set running signal - Fused normally open contact rated 5 A at 30 VDC/180 VAC, closes to indicate generator set is running.

Generator set common shutdown signal - Self-protected relay driver.

Load shed signal - Self-protected relay driver. Operation is configurable for under frequency or over kW load or both. Adjustment range is 80-140% of standby rating with time delay of 0-120 seconds. Default settings are overload 105%, 60 sec, and under frequency 3 Hz below governor reference for 3 seconds.

Ready to load signal - Self-protected relay driver. Operates when the generator set has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.

Modem control signal - Self-protected relay driver.

Paralleling breaker interface - Fused normally open relay contact (5 A, 30 VDC/180 VAC) for parallel breaker close signal and normally open contact for parallel breaker open signal.

Control power for auxiliary devices is available from the controller.

Network connections include:

Serial interface - This communication port is to allow the control to communicate with a personal computer running InPower service and maintenance software.

Echelon® LonWorks interface (option) – System allows for fast, effective incorporation of auxiliary I/O, remote annunciation, redundant start commands from Cummins transfer switches, and other control functions.

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Software

InPower - An optional PC-based software service tool that is designed to directly communicate to PowerCommand generator sets and transfer switches to facilitate service and monitoring of these products.

PowerCommand for Windows® - An optional software tool that is used to remotely monitor and control generator sets, transfer switches and other on-site power system devices.

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

NFPA110: For Level 1 systems

UL508: Recognized or Listed and suitable for use on UL 2200 Listed generator sets

CSA C282-M: 1999 compliance

CSA 22.2 No. 14 M91: Industrial Controls

ISO 8528-4: 1993 compliance, Controls and Switchgear

NFPA99: Standard for Health Care Facilities

CE Mark

EN 50081-1: Residential, Commercial, Light Industrial

EN 50081-2: Industrial

EN 50082-1: Residential, Commercial, Light Industrial

EN 50082-2: Industrial

ISO 7637, pulses #2b, 4: DC Supply Surge Voltage Test

Mil Std 202C, Method 101: Salt Fog Test

ANSI C62.41: Surge Withstand

IEC 801.2, 3, 4, 5

ISO9001: PowerCommand control systems and generator sets are designed and manufactured in ISO9001 certified facilities.

Warranty

PowerCommand control systems are a part of complete power systems provided by Cummins Power Generation and are covered by a one year limited warranty as a standard feature.

Extended warranty options are available for coverage up to 10 years.

Options and accessories

- ❑ Isolated bus paralleling. Provides all automatic and manual paralleling functions for systems that operate isolated from the utility service.
- ❑ Full function paralleling. Provides all paralleling functions, including automatic and manual operation, protection, and other features described in this document.
- ❑ Open transition power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and a generator in a “break before make” sequence.
- ❑ Fast closed transition power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and generator in a “make before break” sequence between live sources, and “break before make” from a failed source. Overlap between sources is 100 mS or less.
- ❑ Closed transition (ramping) power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and generator in a “make before break” sequence between live sources, and “break before make” from a failed source. Overlap time between sources is configurable, and control ramps load from source to source to minimize disturbances on transfer.
- ❑ Key-type mode select switch.
- ❑ Ground fault alarm module.
- ❑ Exhaust temperature monitoring.
- ❑ Alternator temperature monitoring.
- ❑ Network Interface Module
- ❑ Digital remote annunciator. (See S-1343)
- ❑ Digital output relay module (See S-1431)
- ❑ Modbus® interface. (See S-1471)
- ❑ Cummins Power Generation iWatch™ remote monitoring system (S-1518)
- ❑ Cummins Power Generation iWatch Wireless™ remote monitoring system (S-1572)
- ❑ ILSI (isochronous load sharing interface). Allows PowerCommand to share real load with other load sharing systems that incorporate analog load sharing lines. See document C604 for more information.
- ❑ Utility protective relaying. Gensets can be provided with power switching mechanisms and utility grade protective relaying to meet local grid protection requirements.

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www.cumminspower.com

Power Generation

See your distributor for more information

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building electrical except through an approved device or after building main breaker is open.

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Cummins® Power Generation

PROTOTYPE TEST SUPPORT (PTS)
60 HZ TEST SUMMARY

GENERATOR SET MODELS		REPRESENTATIVE PROTOTYPE	
600DQCA	750DQCB	Model:	800DQCC
800DQCC		Alternator:	HC6H
		Engine:	QSK23-G3 NR1

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity. Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum Surge Power: **833 kW**

The generator set was evaluated to determine the stated maximum surge power.

Torsional Analysis and Testing:

The generator set was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1350 to 1950 RPM.

Cooling System: 50 °C Ambient
0.5 in. H2O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load in elevated ambient temperature under stated static restriction conditions.

Durability:

The generator set was subjected to a minimum 500 hour endurance test operating at variable load up to the standby rating based upon MIL-STD-705 to verify structural soundness and durability of the design.

Electrical and Mechanical Strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady State Performance:

The generator set was tested to verify steady state operating performance was within the specified maximum limits.

Voltage Regulation:	±0.50%
Random Voltage Variation:	±0.50%
Frequency Regulation:	Isochronous
Random Frequency Variation:	±0.25%

Transient Performance:

The generator set was tested with the standard alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded:

Full Load Acceptance:		
Voltage Dip:	35.0	%
Recovery Time:	2.5	Second
Frequency Dip:	8.3	%
Recovery Time:	3.5	Second
Full Load Rejection:		
Voltage Rise:	24.1	%
Recovery Time:	1.2	Second
Frequency Rise:	3.8	%
Recovery Time:	1.6	Second

Harmonic Analysis:
(per MIL-STD-705B, Method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No Load	Full Load	No Load	Full Load
3	0.052	0.04	0.144	0.092
5	0.128	1.36	0.058	1.32
7	1	0.196	1	0.19
9	0.012	0.034	0.033	0.066
11	0.985	0.84	1.01	0.83
13	0.158	0.32	0.12	0.29
15	0	05	0.025	0.022

Cooling System Data
DQCB
EPA NSPS Stationary Emergency: Tier 2

High Ambient Air Temperature Radiator Cooling System

			Max Cooling @ Air Flow Static Restriction, Unhoused (inches water/mm water)				Housed in Free Air, No Air Discharge Restriction		
			0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	Weather	Sound Level1	Sound Level2
	Duty	Rating (kW)	**Maximum Allowable Ambient Temperature, Degree C**						
60 Hz	Standby	750	62.96	N/A	52.63	N/A	51.1	50.4	50.4
	Prime	680	60.70	N/A	52.91	N/A	51.3	50.7	50.7

Notes:

1. Data shown are anticipated cooling performance for typical generator set.
2. Cooling data is based on 1000 ft (305 m) site test location.
3. Generator set power output may need to be reduced at high ambient conditions. Consult generator set data sheet for derate schedules.
4. Cooling performance may be reduced due to several factors including but not limited to: Incorrect installation, improper operation, fouling of the cooling system, and other site installation variables.

2015 EPA Tier 2 Exhaust Emission Compliance Statement
750DQCB
Stationary Emergency
60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with Tier 2 emissions limit of U.S. EPA New Source Performance Standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO8178 D2.

Engine Manufacturer:	Cummins Inc
EPA Certificate Number:	FCEXL023.AAB-005
Effective Date:	07/21/2014
Date Issued:	07/21/2014
EPA Engine Family :	FCEXL023.AAB

Engine Information:

Model:	QSK23 / QSX23-G7 NR2	Bore:	6.69 in. (170 mm)
Engine Nameplate HP:	1220	Stroke:	6.69 in. (170 mm)
Type:	4 Cycle, In-line, 6 Cylinder Diesel	Displacement:	1413 cu. in. (23.2 liters)
Aspiration:	Turbocharged and CAC	Compression Ratio:	16.0:1
Emission Control Device:	Engine Design Modification	Exhaust Stack Diameter:	10 in.

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kWm-hr		
	NOx + NMHC	CO	PM	NOx + NMHC	CO	PM
Test Results - Diesel Fuel (300-4000 ppm Sulfur)	4.3	0.3	0.10	5.7	0.4	0.13
EPA Emissions Limit	4.8	2.6	0.15	6.4	3.5	0.20
Test Results - CARB Diesel Fuel (<15 ppm Sulfur)	3.9	0.3	0.085	5.2	0.4	0.11
CARB Emissions Limit	4.8	2.6	0.15	6.4	3.5	0.20

The CARB emission values are based on CARB approved calculations for converting EPA (500 ppm) fuel to CARB (15 ppm) fuel.
Test Methods: EPA/CARB Nonroad emissions recorded per 40CFR89 (ref. ISO8178-1) and weighted at load points prescribed in Subpart E, Appendix A for Constant Speed Engines (ref. ISO8178-4, D2)
Diesel Fuel Specifications: Cetane Number: 40-48. Reference: ASTM D975 No. 2-D.
Reference Conditions: Air Inlet Temperature: 25°C (77°F), Fuel Inlet Temperature: 40°C (104°F). Barometric Pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H2O/lb) of dry air; required for NOx correction, Restrictions: Intake Restriction set to a maximum allowable limit for clean filter; Exhaust Back Pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results.
Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Exhaust Emission Data Sheet
750DQCB
60 Hz Diesel Generator Set
EPA NSPS Stationary Emergency

Engine Information:

Model:	Cummins Inc QSK23-G7 NR2	Bore:	6.69 in. (170 mm)
Type:	4 Cycle, In Line, 6 Cylinder Diesel	Stroke:	6.69 in. (170 mm)
Aspiration:	Turbocharged and CAC	Displacement:	1413 cu. in. (23.1 liters)
Compression Ratio:	16.0:1		
Emission Control Device:	Turbocharged with Charge Air Cooled		

	1/4	1/2	3/4	Full	Full
PERFORMANCE DATA	**Standby**	**Standby**	**Standby**	**Standby**	**Prime**
Engine HP @ Stated Load (1800 RPM)	275	550	825	1100	989
Fuel Consumption (gal/hr)	15.2	27.6	39.5	50.5	46.5
Exhaust Gas Flow (CFM)	2270.8	3464.5	4460.2	5160.8	4864
Exhaust Temperature (°F)	623.6	726.9	786.2	840	815
EXHAUST EMISSION DATA					
HC (Total Unburned Hydrocarbons)	0.77	0.33	0.19	0.12	0.15
NOx (Oxides of Nitrogen as NO2)	2.91	3.31	4.15	5.87	5.27
CO (Carbon Monoxide)	0.95	0.37	0.19	0.28	0.25
PM (particular Matter)	0.27	0.1	0.05	0.05	0.05
SO2 (Sulfur Dioxide)	0.12	0.11	0.1	0.1	0.1
Smoke (Bosch)	0.84	0.5	0.35	0.38	0.36

All values are Grams per HP-Hour

TEST CONDITIONS

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (±2%). Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	46.5 Cetane Number, 0.035 Wt.% Sulfur; Reference ISO8178-5, 40CFR86.1313-98 Type 2-D and ASTM D975 No. 2-D.
Fuel Temperature:	99 ± 9 °F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 °F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here were taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

Power Generation

ALTERNATOR DATA SHEET

Frame Size: HC6H

CHARACTERISTICS

WEIGHTS:	Wound Stator Assembly	2109	lb	950	kg
	Rotor Assembly	1911	lb	861	kg
	Complete Alternator	4451	lb	2005	kg
MAXIMUM SPEED:		2250	rpm		
EXCITATION CURRENT:	Full Load	2.5	Amps		
	No Load	0.5	Amps		
INSULATION SYSTEM:	Class H Throughout				

3 Ø RATINGS (0.8 power factor)

(Based on specified temperature rise at 40ºC ambient temperature)

		60 Hz				50 Hz		
		110/190* 220/380	120/208* 240/416	139/240* 277/480	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
150ºC Rise Ratings	kW	795	870	950	900	768	768	736
	kVA	994	1088	1188	1125	960	960	920
125ºC Rise Ratings	kW	750	820	900	850	728	728	700
	kVA	938	1025	1125	1063	910	910	875
105ºC Rise Ratings	kW	690	730	820	770	664	664	640
	kVA	863	913	1025	963	830	830	800
80ºC Rise Ratings	kW	575	632	720	680	592	592	590
	kVA	719	790	900	850	740	740	738

REACTANCES (per unit, ±10%)

(Based on full load at 125ºC Rise Rating)

	110/190* 220/380	120/208* 240/416	139/240* 277/480	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
Synchronous	3.66	3.34	2.75	2.60	2.98	2.50	2.14
Transient	0.29	0.27	0.22	0.21	0.28	0.23	0.20
Subtransient	0.21	0.19	0.16	0.15	0.20	0.16	0.14
Negative Sequence	0.25	0.23	0.19	0.18	0.21	0.18	0.15
Zero Sequence	0.03	0.03	0.02	0.02	0.03	0.02	0.02

MOTOR STARTING

	Broad Range	600	Broad Range
Maximum kVA (90% Sustained Voltage)	3313	3313	2250

TIME CONSTANTS (Sec)

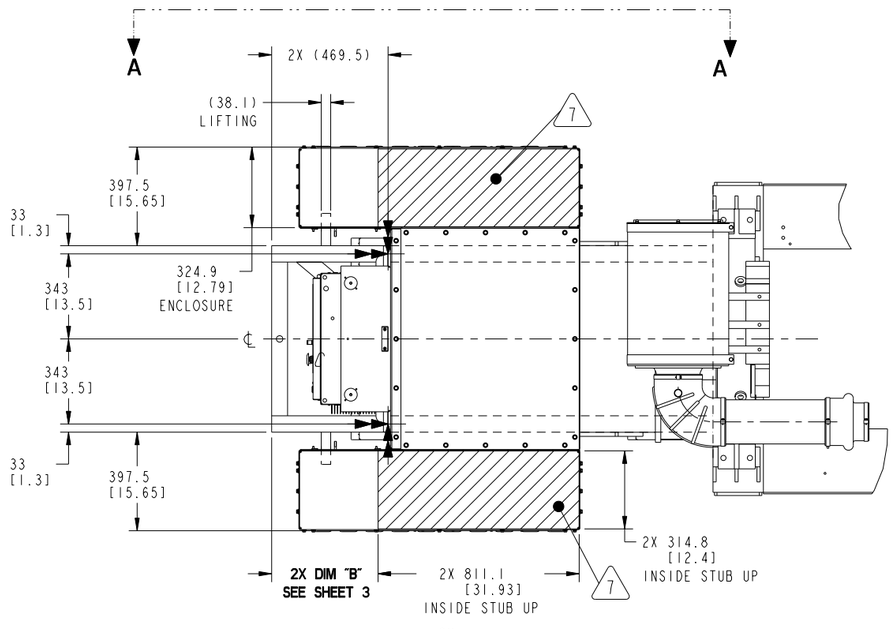
	Broad Range	600	Broad Range
Transient	0.185	0.185	0.185
Subtransient	0.025	0.025	0.025
Open circuit	2.440	2.440	2.440
DC	0.040	0.040	0.040

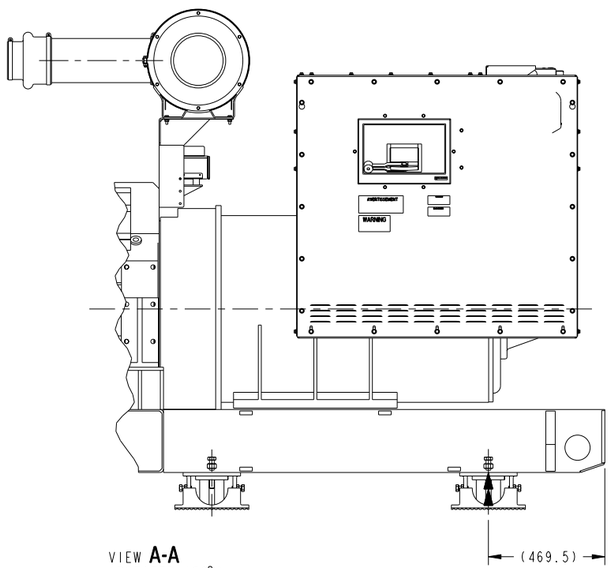
WINDINGS (@ 20ºC)

	Broad Range	600	Broad Range
Stator Resistance (Ohms per phase)	0.0060	0.0072	0.0060
Rotor Resistance (Ohms)	1.4700	1.4700	1.4700
Number of Leads	6 (12 Optional)	6	6 (12 optional)

* 12 lead reconnectible option is required to obtain low (parallel wye) voltages.

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08





VIEW **A-A**
(ROTATED 180°)

LEFT SIDE ENTRY 11

RIGHT SIDE ENTRY

NOTE:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. COMMON REFERENCE POINT ON GENSET SKID (⟶). POINTS TO ANCHORING HOLE ON SKID. SEE GENSET_OUTLINE (FOUNDATION) FOR DETAILS.
3. LISTED TORQUE VALUES ARE FOR MAXIMUM CONDUCTOR SIZES ACCOMMODATED. CONSULT UL 486 TABLE 7-4, 7-5 AND 7-6 FOR SMALLER CONDUCTOR SIZES.
4. ALL ITEMS SHOWN IN ILLUSTRATION ARE FOR REFERENCE ONLY.
5. ELECTRICAL CONDUITS MUST:
   - PROVIDE FLEXIBLE CONNECTION (USING FLEXIBLE CONDUIT AND CABLES). -LFMC
   - INSTALLED IN A WAY THAT IT WILL ABSORB OR REDUCE VIBRATION CONDITIONS, FOR EXAMPLE: ADD OFF-SET BENDS, BETWEEN THE MOUNTING SURFACE OF THE CIRCUIT BREAKER ENCLOSURE AND THE STUB AREA ORIGINATING IN CONCRETE OR THE TYPE OF BASE FLOORING.
6. FLEXIBLE CONDUITS MUST ALLOW FOR GENERATOR SET MOVEMENT AS MUCH AS ±50 [2] IN THE VERTICAL DIRECTION.
7. AREA SHOWN INDICATES APPROXIMATE OFFSET PLACEMENT OF THE ELECTRICAL FLEXIBLE CONDUIT STUB-UP AREA ORIGINATING IN CONCRETE OR OTHER TYPE OF BASE FLOORING RELATIVE TO CIRCUIT BREAKER LOCATION WITHIN ENCLOSURE TO PROVIDE VIBRATION PROTECTION.
8. WIRE-CONDUIT COMBINATIONS MEET NEC AND CEC. TO USE OTHER COMBINATIONS, REFER TO APPLICABLE CODES TO ENSURE THAT WIRE AMPACITY, BEND SPACE AND GUTTER SPACE MEET THE REQUIREMENTS.
9. SHUNT TRIP UNITS CAN BE OPERATED AT 75% OF NOMINAL VOLTAGE AND WILL ACCEPT MOMENTARY OR CONTINUOUS APPLIED VOLTAGE.
10. SHUNT TRIP UNITS CAN BE OPERATED AT 70% TO 100% OF NOMINAL VOLTAGE AND WILL ACCEPT MOMENTARY OR CONTINUOUS APPLIED VOLTAGE.
11. ALL DIMENSIONS SHOWN FOR RIGHT SIDE ENTRY ALSO APPLY TO LEFT SIDE ENTRY IN MIRROR ORIENTATION.
12. ALTERNATOR MODEL HC634G & R-FRAME CIRCUIT BREAKER ARE BEING SHOWN FOR DRAWING SIMPLICITY.
13. "NS" SHUNT TRIP HAS NO INTERNAL CONTACTS, IT MUST BE USED IN CONJUNCTION WITH AUXILIARY CONTACTS TO ACCEPT CONTINUOUS APPLIED VOLTAGE. IT CAN OPERATE AT 75% OF NOMINAL VOLTAGE.
14. 800 AMP BREAKER: A LUG ACCEPTING (2) 3/0-600 kcmil CONDUCTORS IS AVAILABLE THRU ACCESSORIES. PGA PART NUMBER 0332-4278.
15. 1200 AMP BREAKER: A LUG ACCEPTING (3) 3/0-600 kcmil CONDUCTORS IS AVAILABLE THRU ACCESSORIES. PGA PART NUMBER 0332-4279.

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 3/32

SIM to .

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

FIRST USED ON DOCA,CB,CC

DRN I_LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 07-27-06

SITE CODE PGF

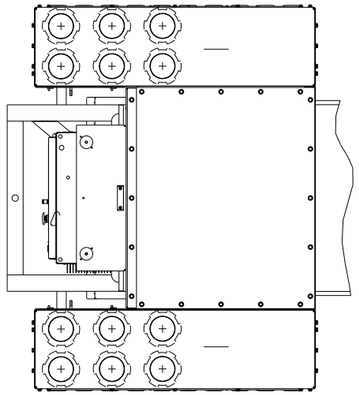
CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
(23 LITER)

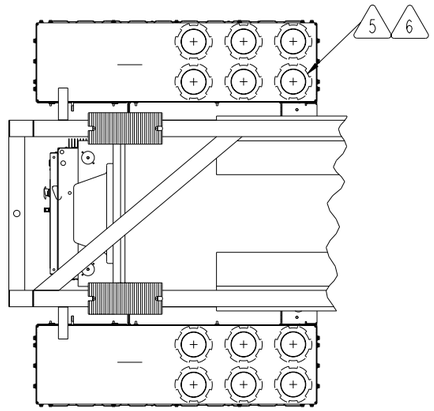
DWG SIZE D | 0500_4540 | SHEET 1 of 3 | DWG REV B

Pro/ENGINEER

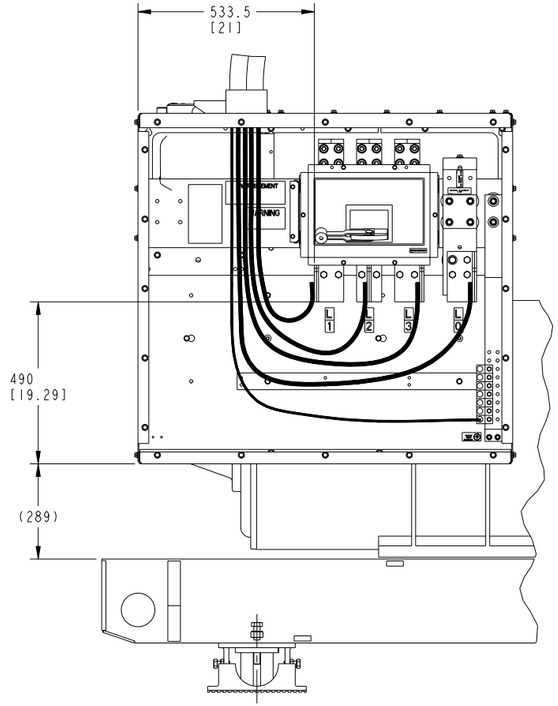
REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08



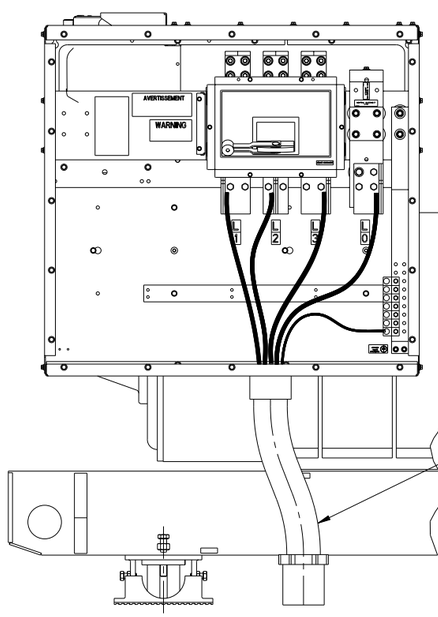
VIEW B-B
TOP ENTRANCE
SCALE 3/32



VIEW C-C
BOTTOM ENTRANCE
SCALE 3/32



RIGHT SIDE
TOP ENTRY ROUTING EXAMPLE
SCALE 1/8



RIGHT SIDE
BOTTOM ENTRY ROUTING EXAMPLE
SCALE 1/8

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 3/32

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DWN I_LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 07-27-06

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

FIRST USED ON DOCA,CB,CC

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
(23 LITER)

DWG SIZE D | 0500_4540 | SHEET 2 of 3 | DWG REV B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08

TABLE 1

UL/IEC LUGS					ACCESSORY SPECIFICATIONS			
LUG	FRAME	MAX AMPS	WIRE RANGE COPPER	DIM D ±25 [1.0]	ACCESSORY DESCRIPTION	CONTACT RATING	INRUSH	CONNECTION TYPE
	SQUARE D NSJ	400A 3 OR 4 POLE	#2-600 KCMIL	554 [21.8]	24 VDC SHUNT TRIP	----------	10A (10)	COMPRESSION TERMINALS #20-16 AWG OR SMALLER TORQUE: 10 LB-IN
	SQUARE D NSJ W/STR23SP TRIP UNIT	600A 3-POLE	2/0-350 KCMIL	554 [21.8]	24 VDC SHUNT TRIP	----------	10A (10)	COMPRESSION TERMINALS #20-16 AWG OR SMALLER TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	
(14)	SQUARE D P 800 W/MICROLOGIC 3.0 TRIP UNIT	800A 3-POLE	3/0-500 KCMIL	599 [23.5]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
(15)	SQUARE D P 1200 W/MICROLOGIC 3.0 TRIP UNIT	1200A 3-POLE	3/0-500 KCMIL	556 [21.8]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
	SQUARE D R 2500/2000/1600 3-POLE 1600-2500 AMP BUS BARS STANDARD W/MICROLOGIC 3.0 TRIP UNIT	NEMA HOLE PATTERN		490 [19]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 4 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
	(3) R 2500/2000/1600 W/OPTIONAL LUG 1600-2500 AMP BREAKERS TORQUE 375 IN LBS [42 Nm]	#2-600 KCMIL		490 [19]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 4 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN

TABLE 2

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AT 75C TEMPERATURE RATED CONDUCTOR AT 30C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFMC)

(8)

MAX BRKR AMPS	WIRE (COPPER)		CABLE AMPACITY	TOTAL NUMBER OF CONDUITS	
	QTY	SIZE		QTY	SIZE (IN INCHES)
2500	6	600 KCMIL	420	6	4
2000	5	600 KCMIL	420	5	4
1600	5	600 KCMIL	420	5	4
1200	3	500 KCMIL	385	3	3
1000	3	400 KCMIL	335	3	3
800	2	300 KCMIL	285	2	3
630	2	350 KCMIL	310	2	3
600	2	350 KCMIL	310	2	3
400	1	600 KCMIL	420	1	4
250	1	250 KCMIL	255	1	2 1/2
100	1	2 KCMIL	115	1	2

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AND TABLE 310-16 AT 75C TEMPERATURE RATED CONDUCTOR AT 40C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFMC)

(8)

MAX BRKR AMPS	WIRE (COPPER)		CABLE AMPACITY	TOTAL NUMBER OF CONDUITS	
	QTY	SIZE		QTY	SIZE (IN INCHES)
2500	6	750 KCMIL	418	6	4
2000	5	700 KCMIL	405	5	4
1600	4	700 KCMIL	405	4	4
1000	3	500 KCMIL	334	3	3 1/2
800	3	350 KCMIL	273	3	3

TABLE 3

GENSET MODEL	ALTERNATOR MODEL	DIM "A"	DIM "B"
❑ DQCA ❑ DQCB ❑ DQCC	❑ HC634G	109.7 [4.32]	431.9 [17.0]
	❑ HC634H	109.7 [4.32]	431.9 [17.0]
	❑ HC634J	109.7 [4.32]	431.9 [17.0]
	❑ HC634K	8.7 [.34]	330.9 [13.03]

QTY | ITEM | PART NO | DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±1; .X ±0.8; .XX± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° | SCALE: 3/32

SIM TO . | DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN I_LANDRUS | CKD L_NAVARRETE | APVD L_NAVARRETE | DATE 07-27-06

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994 | FIRST USED ON DQCA,CB,CC

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

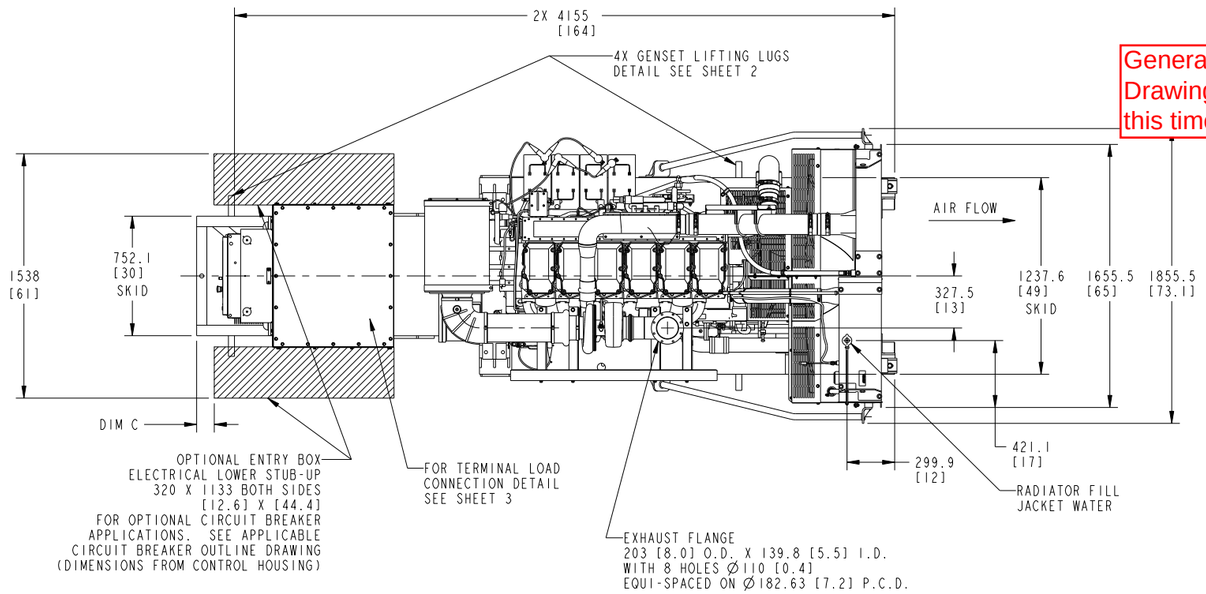
CIRCUIT BRKR OUTLINE
(23 LITER)

SITE CODE PGF | DWG SIZE D | 0500_4540 | SHEET 3 of 3 | DWG REV B

Pro/ENGINEER

Creo Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-133597	A	1	PRODUCTION_RELEASE	MLL	SV	S.VENKATESAN	29MAR13



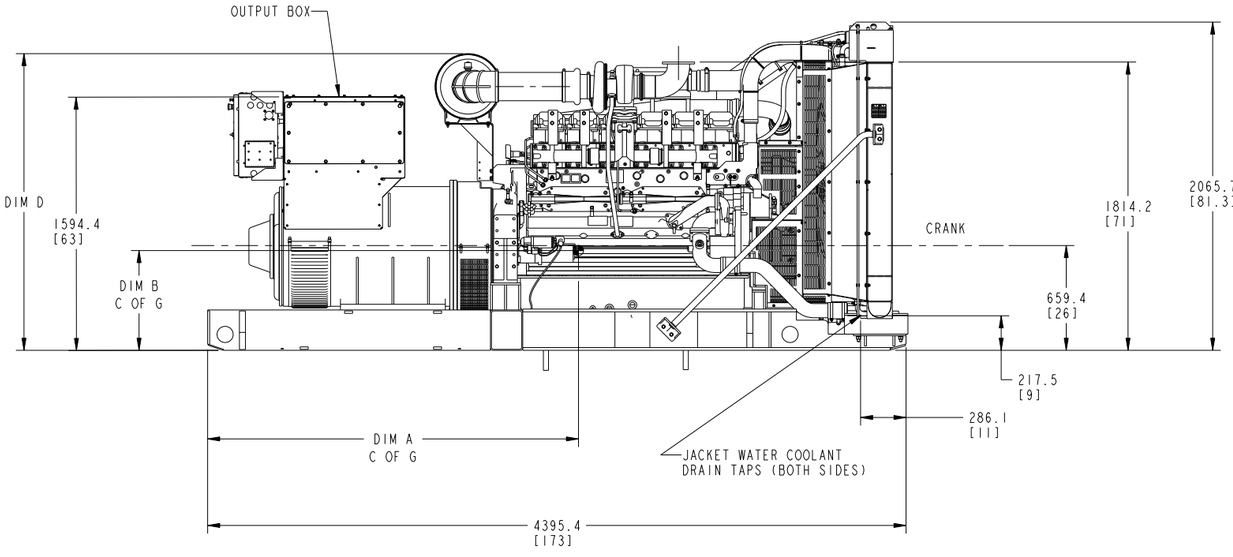
Generator will be enclosed
Drawing Not available at
this time.

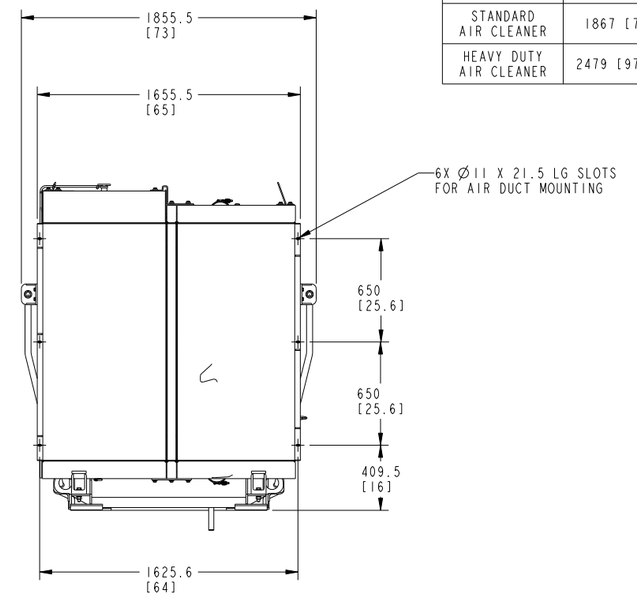
NOTES:

1. DIMENSIONS SHOWN IN [ ] BRACKETS ARE INCHES.
2. FUEL INLET HOSE-1650 [65] LONG
   WITH 1"-11.5 NPT EXTERNAL FITTING.
3. FUEL RETURN HOSE-2000 [79] LONG
   WITH 1"-11.5 NPT EXTERNAL FITTING.
4. GENSET SHIPPED FILLED WITH ENGINE OIL.

TABULATION							
GEN FRAME SIZE	DIM A C OF G	DIM B C OF G	DIM C	GENSET WT W/O COOLANT		GENSET WT W/COOLANT	
				KGS	LBS	KGS	LBS
HC6G	2031 [80]	764 [30.1]	109	6075	13395	6337	13973
HC6H	2064 [81.2]	761 [30]	109	6225	13726	6487	14304
HC6J	2038 [80.2]	764 [30.1]	109	6380	14068	6642	14645
HC6K	2112 [83.2]	758 [29.9]	109	6653	14670	6915	15247

TABULATION	
AIR CLEANER OPTION	DIM D HEIGHT
STANDARD AIR CLEANER	1867 [74]
HEAVY DUTY AIR CLEANER	2479 [97.6]





RADIATOR END VIEW

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
	X ± 1		0.00- 4.99 +0.15/-0.08
	.X ± 0.8		5.00- 9.99 +0.20/-0.10
	.XX± 0.38		10.00-17.49 +0.25/-0.13
			17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/16

SIM TO A030Y552
DO NOT SCALE PRINT
- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

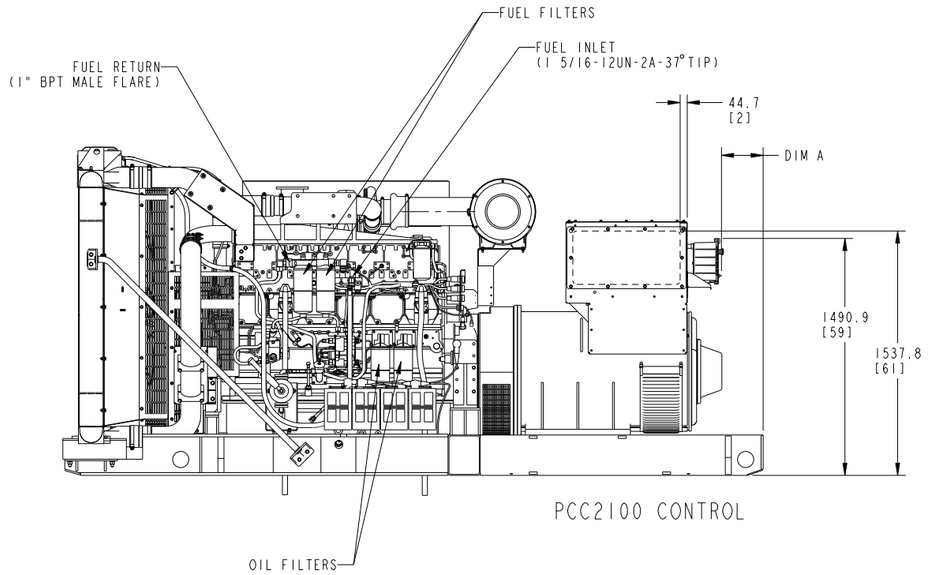
DRN M.LEHR
CKD S_VENKATESAN
APVD S_VENKATESAN
DATE 29MAR13
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DQCA,CB,CC

CUMMINS POWER GENERATION
OUTLINE,GENSET
SITE CODE
PGF
DWG SIZE D
A045X135
SHEET 1 OF 3
DWG REV A

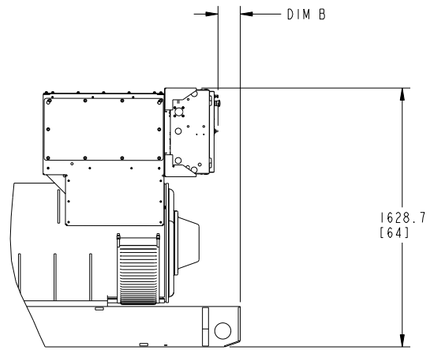
Drawing Name: A045X136 Revision: A
Part Name: A045X135 Revision: A
Sheet 1 of 4

Creo Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-133597	A	1	PRODUCTION_RELEASE	MLL	SV	S.VENKATESAN	29MAR13

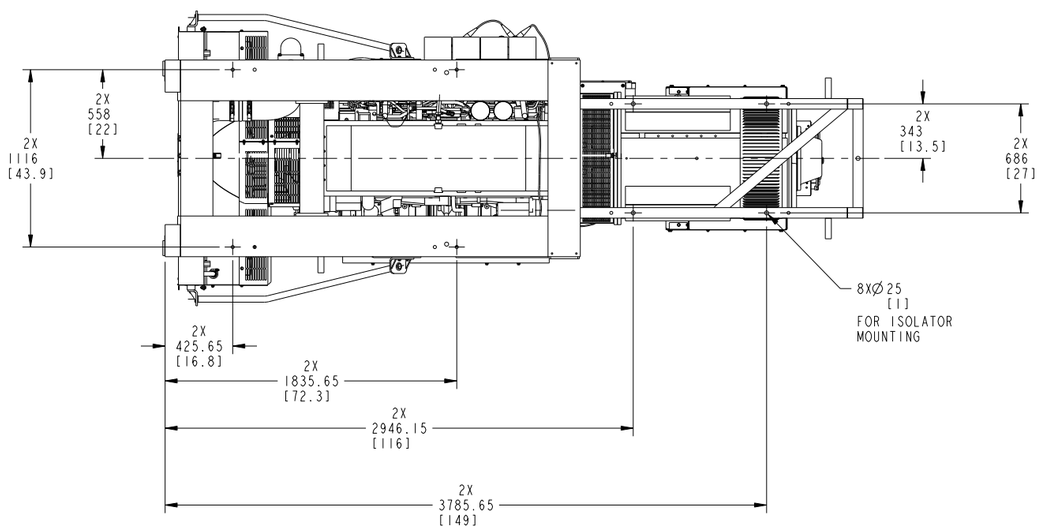


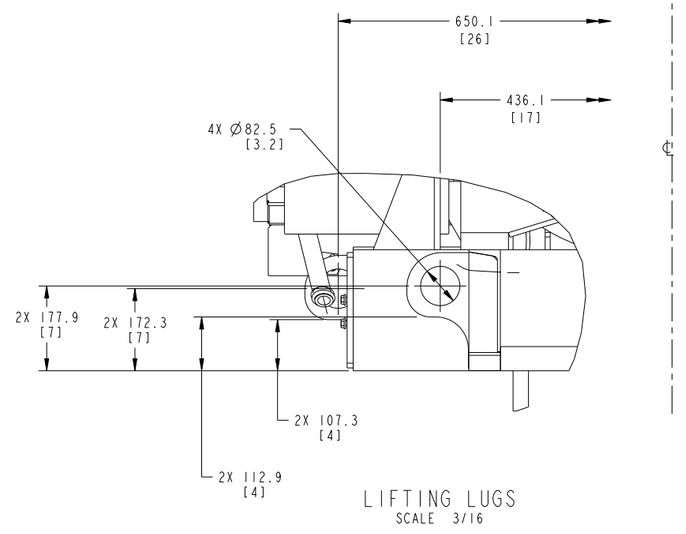
PCC2100 CONTROL



PCC3201 CONTROL

TABULATION		
GEN FRAME SIZE	DIM A 2100 CONTROL	DIM B 3201 CONTROL
HC6G,H,J	264 [10.4]	142 [5.6]
HC6K	163 [6.4]	41 [1.6]





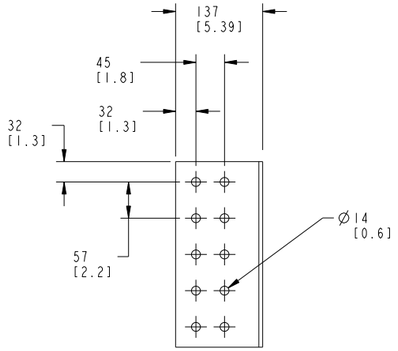
LIFTING LUGS
SCALE 3/16

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO A030Y552	DRN M_LEHR		CUMMINS POWER GENERATION	
DIM: X ±1, .X ±0.8, .XX±0.38 — HOLE: 0.00-4.99 +0.15/-0.08; 5.00-9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD S_VENKATESAN		OUTLINE,GENSET	
	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	APVD S_VENKATESAN	SITE CODE		
		DATE 29MAR13			
ANG TOL: ± 1.0° — SCALE: 1/16		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994 — FIRST USED ON DQCA,CB,CC	PGF	DWG SIZE D — A045X135 — SHEET 2 of 3 — DWG REV A	

Drawing Name: A045X136 Revision: A
Part Name: A045X135 Revision: A
Sheet 2 of 4

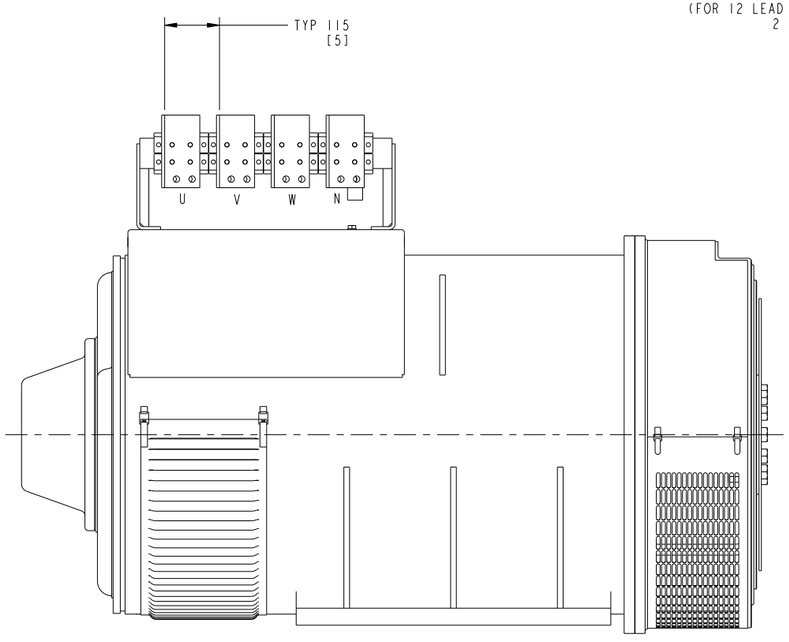
Creo Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-133597	A	1	PRODUCTION_RELEASE	MLL	SV	S.VENKATESAN	29MAR13



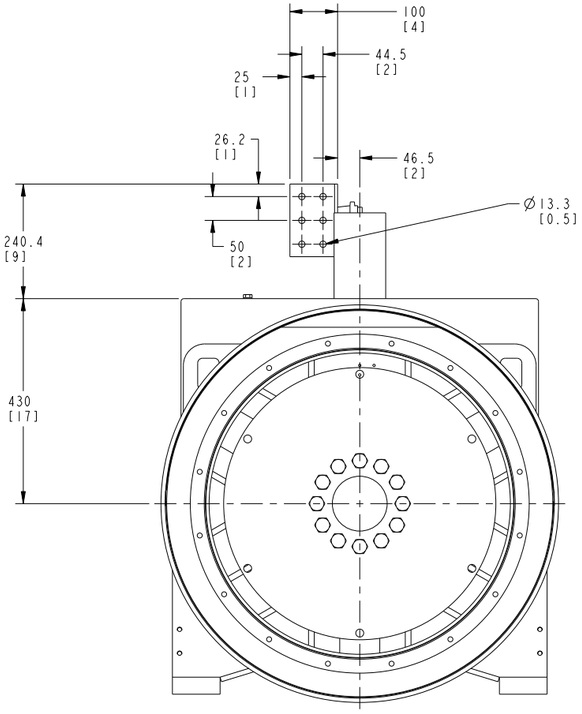
GENERATOR OUTPUT TERMINALS
(FOR 12 LEAD ALTERNATORS/WINDING 311)
2 HOLE LUG, NEMA

SCALE 1/4



HC6 ALTERNATOR
ELECTRICAL CONNECTION DETAIL
(OUTPUT BOX NOT SHOWN)

SCALE 3/16



GENERATOR OUTPUT TERMINALS
(FOR 6 LEAD ALTERNATORS/WINDINGS 312 & 07)
2 HOLE LUG, NEMA

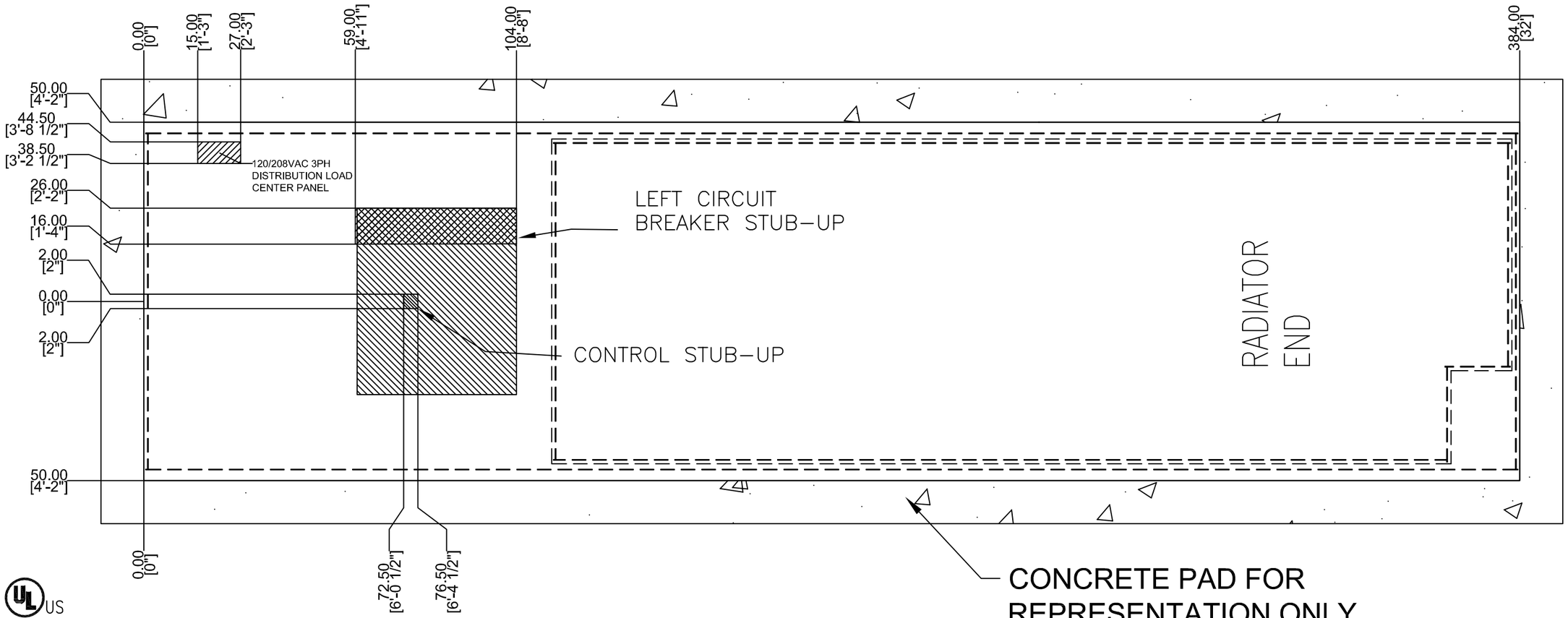
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS			SIM TO A030Y552	DRN M_LEHR		CUMMINS POWER GENERATION	
DIM: X ±1, .X ±0.8, .XX± 0.38	HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13		DO NOT SCALE PRINT	CKD S_VENKATESAN		OUTLINE,GENSET	
				APVD S_VENKATESAN			
			- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	DATE 29MAR13		SITE CODE	
ANG TOL: ± 1.0°	SCALE: 1/16		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON DQCA,CB,CC		PGF	DWG SIZE D A045X135 SHEET 3 OF 3 DWG REV A

Drawing Name: A045X136 Revision: A
Part Name: A045X135 Revision: A
Sheet 3 of 4

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. CONCRETE MAINTENANCE PAD IS SHOWN FOR REPRESENTATION ONLY. NOT FOR CONSTRUCTION. FINAL SIZE & DESIGN BY OTHERS.
3. CONCRETE PAD TO BE INSTALLED UNDER ENTIRE PACKAGE. THE PAD MUST BE FLAT AND LEVEL IN ALL DIRECTIONS.
4. 0,0 DIMENSION STARTS AT REAR OF TANK.
5. 120" MINIMUM CLEARANCE IS REQUIRED ON THE REAR OF THE ENCLOSURE TO AVOID AIRFLOW RESTRICTION ON THE AIR INLET. GENERATOR SET IS DESIGNED TO BE INSTALLED IN A FREE AIR AREA. CONTACT CUMMINS ROCKY MOUNTAIN IF THIS IS NOT THE CASE.
6. A MINIMUM OF 60" REQUIRED BETWEEN THE FUEL TANK AND ANY BUILDING OR PROPERTY LINE, UNLESS APPROVED BY THE LOCAL A.H.J.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED, ALL DIMS ARE IN INCHES

TOLERANCES:
FRACTIONAL: 1/16
.X: .06
.XX: .03
.XXX: .01
ANGLES: .5°

FINISH: N/A

REFERENCES:	PREP. BY:	AFD	08/13/2019	ENGINE FAMILY:
4085026-L3	CHKD BY:			QSK50
	MODIFIED BY:			DQGAA

UL US LISTED
FILE MH E336241
CUMMINS ROCKY MOUNTAIN, LLC

SALES & SERVICE
8211 E 96th AVE
HENDERSON, COLORADO 80640
PH: 303-287-0201
FAX: 303-287-4837

SITE NAME: SACWSD PELLET SOFTENING IMPROVEMENTS	CONTACT NAME:	CUSTOMER PROJECT NO:	TITLE: STUB-UP AREA
CONTRACTOR NAME:	CONTACT NO:	CRM PROJECT NO: 65411	SIZE B DWG NO: P2019-0084A REV: A
			SCALE: NTS DO NOT SCALE SHEET: 4 OF 9

TB-B-07 REV-D