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Power Generation

Bill of Materials

Item	Description	Qty
1500DQGAB	GENSET-DIESEL,60HZ,1500KW	1
A292-2	ALTERNATOR HEATER – 120V	
A331-2	DUTY RATING-STANDBY POWER	
A333-2	BATTERY CHARGING ALTERNATOR – NORMAL OUTPUT	
A334-2	ENGINE STARTER – 24VDC MOTOR	
B600-2	ALT-60HZ,3PH,480V,105/80C-SP	
C127-2	SEPARATOR – FUEL/WATER	
C278-2	FUEL FILTERS-ENGINE, DUPLEX	
D041-2	ENGINE AIR CLEANER-NORMAL DUTY	
E125-2	ENGINE COOLING-HIGH AMBIENT AIR TEMPERATURE	
H389-2	SHUTDOWN-LOW COOLANT LVL	
H536-2	DISPLAY LANGUAGE-ENGLISH	
H557-2	COOLHTR-208TO480V,SUB40F	
H605-2	DISPLAY-CONTROL,GRAPHICAL	
H606-2	METERS-AC OUTPUT,ANALOG	
H607-2	FILTERS-ENGINE OIL, FULL FLOW AND BYPASS	
H611-2	POWERCOMMAND CONTROL – PCC 3201	
H613-2	PARALLELING-ISOLATEDBUS,AUTOMATIC	
H616-2	POWERTRANSFER-OPENTRANSITIONONLY	
H679-2	CONTROL MOUNTING-FRONT FACING	
K911-2	SHUTDOWN ALARM RELAY-3 PDT	
K974-2	RUN RELAYS-THREE 3PDT	
K993-2	TRANSFORMERS-DIFFCURR,3PH	
KA08-2	ALARM-AUDIBLE,ENGSHUTDOWN	
KP60-2	INTERFACE-COMMUNICATIONSNTWK,FTT-10	
KP7X-2	CKT BRKR - 2500A WITH LSI 5.0 TRIP	
L050-2	LITERATURE-ENGLISH	
L090-2	LISTING-UL 2200	
L170-2	EPA, TIER 2, NSPS CI STATIONARY EMERGENCY	
L189-2	ST 5YR 2500HR PARTS + LABOR + TRAVEL	
L224-2	IBC SEISMIC CERTIFICATION	
R002-2	VOLTAGE – 277/480, 3 PHASE, WYE, LIMITED	
SPEC-C	PRODUCT REVISION-C	

Diesel Generator Set QSK50 Series Engine

1100 kW – 1500 kW 60 Hz

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications. Codes or standards compliance may not be available with all model configurations – consult factory for availability.

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, fault clearing short-circuits capability.

Permanent Magnet Generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit.

Control System - Standard PowerCommand® electronic control provides total 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.

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
DQGAA	1250 (1563)		1100 (1375)				D-3333	
DQGAB	1500 (1875)		1350 (1688)				D-3334	

Generator Set Specifications

Governor regulation class	ISO8528 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	158.8 mm (6.25 in.)
Stroke	158.8 mm (6.25 in.)
Displacement	50.3 Liters (3067 in^3)
Configuration	Cast iron, V 16 cylinder
Battery capacity	1800 amps minimum at ambient temperature of 0 C (32 F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Cummins' Modular Common Rail System
Fuel filter	Dual Element 10 micron filtration spin-on fuel filter with 15 micron water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Four spin-on, combination full flow filter 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 disc
Insulation system	Class H
Standard temperature rise	150 °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 (THDV)	< 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
220/380 255/440	277/480 347/600	2400/4160	

*Note: Consult factory for other voltages.

Generator Set Options

Engine

208/240/480 V thermostatically controlled coolant heater for ambient above 4.5 °C (40 °F)
208/240/480 V thermostatically controlled coolant heater for ambient below 4.5 °C (40 °F)
Dual 120 V 300 W lube oil heaters
Dual 208/240 V 300 W lube oil heaters
Dual 480 V 300 W lube oil heaters

Control Panel

120/240 V 100 W control anti-condensation heater
Paralleling configuration
Remote fault signal package
Run relay package
Exhaust pyrometer
Fuel pressure indication
Ground fault indication

Alternator

80 °C rise
105 °C rise
125 °C rise
120/240 V 300 W anti-condensation heater

Exhaust System

Industrial grade exhaust silencer
Residential grade exhaust silencer
Critical grade exhaust silencer
Exhaust packages

Cooling System

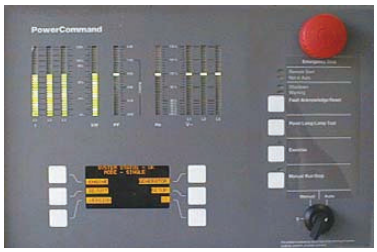
Remote indicator

Generator Set

AC entrance box
Battery
Battery charger
Circuit breaker – set mounted
Disconnect switch - set mounted
PowerCommand Network
Remote annunciator panel
Spring isolations
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.

Control System PCC 3201



The 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.
- Control suitable for operation in ambient temperatures from -40 ℃ to +70 ℃ (-40 ℉ to +158 ℉) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.
- Optional Echelon® LONWORKS® network interface.

Operator/Display Panel

- Off/manual/auto mode switch
- Manual run/stop switch
- Panel lamp test switch
- Emergency stop switch
- Exercise switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments
- LED lamps indicating not in auto, common warning, common shutdown, remote start
- 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
- 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
- Engine speed
- Engine ECM data

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

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
- Bus voltage and frequency (with paralleling options)

Other Data

- Genset model data
- Start attempts, starts, running hours
- kW hours (total and since reset)
- Fault history
- Load profile (accessible with InPower)

Governing

- Digital electronic isochronous governor
- Temperature dynamic governing
- Smart idle speed mode

Voltage Regulation

- Digital PWM electronic voltage regulation
- Three phase Line-to-Neutral sensing
- 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 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

- 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)
- Paralleling
- Power transfer control

For further detail see document S-1444.

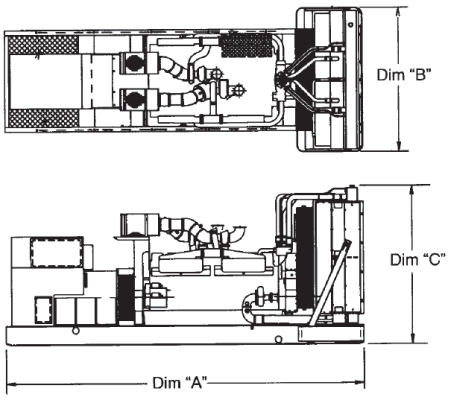
Ratings Definitions

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

Model	Dim 'A' (mm) (in.)	Dim 'B' (mm) (in.)	Dim 'C' (mm) (in.)	Set Weight dry* kg (lbs)	Set Weight* wet kg (lbs)
DQGAA	5969 (235)	2007 (79)	2840 (112)	10989 (24220)	11493 (25330)
DQGAB	5969 (235)	2007 79)	2840 (112)	10989 (24220)	11493 (25330)

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

Codes and Standards

	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 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 set is available certified for seismic application in accordance with the following International Building Code: IBC2000, IBC2003, IBC2006 and IBC2009.

For more information contact your local Cummins distributor or visit power.cummins.com

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Generator set data sheet

Model:	DQGAB
Frequency:	60 Hz
Fuel type:	Diesel
KW rating:	1500 standby 1350 prime
Emissions level:	EPA NSPS Stationary Emergency Tier 2

Exhaust emission data sheet:	EDS-1059
Exhaust emission compliance sheet:	EPA-1093
Sound performance data sheet:	MSP-1034
Cooling performance data sheet:	MCP-152
Prototype test summary data sheet:	PTS-265
Standard set-mounted radiator cooling outline:	0500-4357
Optional remote radiator cooling outline:	0500-4309

Fuel consumption

	Standby				Prime			
	kW (kVA)				kW (kVA)			
Ratings	1500 (1875)				1350 (1688)			
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
US gph	35.4	58.2	81	103.8	33.1	53.6	74.2	94.7
L/hr	133.9	220.3	306.6	393	125.3	203	208.7	358.4

Engine

	Standby rating	Prime rating
Engine manufacturer	Cummins Inc.	
Engine model	QSK50-G4 NR2	
Configuration	Cast iron, V 16 cylinder	
Aspiration	Turbocharged and low temperature aftercooled	
Gross engine power output, kWm (bhp)	1656 (2220)	1470 (1971)
BMEP at set rated load, kPa (psi)	2192 (318)	1957 (284)
Bore, mm (in)	159 (6.25)	
Stroke, mm (in)	159 (6.25)	
Rated speed, rpm	1800	
Piston speed, m/s (ft/min)	9.5 (1875)	
Compression ratio	15:1	
Lube oil capacity, L (qt)	235 (248)	
Overspeed limit, rpm	2100 ±50	
Regenerative power, kW	168	

Maximum fuel flow, L/hr (US gph)	912 (241)
Maximum fuel inlet restriction, kPa (in Hg)	16.9 (5)
Maximum fuel inlet temperature, °C (°F)	71 (160)

Air

	Standby rating	Prime rating
Combustion air, m^3/min (scfm)	139 (4895)	133 (4700)
Maximum air cleaner restriction, kPa (in H_2O)	3.7 (15)	
Alternator cooling air, m^3/min (cfm)	207 (7300)	

Exhaust

Exhaust flow at set rated load, m^3/min (cfm)	342 (12065)	312 (11000)
Exhaust temperature, °C (°F)	491 (915)	446 (835)
Maximum back pressure, kPa (in H_2O)	6.78 (27)	

Standard set-mounted radiator cooling

Ambient design, °C (°F)	40 (104)	
Fan load, kW_m (HP)	45 (60)	
Coolant capacity (with radiator), L (US gal)	541 (143)	
Cooling system air flow, m^3/min (scfm)	1705 (60150)	
Total heat rejection, MJ/min (Btu/min)	72.3 (68580)	64.8 (61510)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)	
Maximum fuel return line restriction kPa (in Hg)	34 (10)	

Optional remote radiator cooling[1]

Set coolant capacity, L (US gal)		
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	1893 (500)	
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	537 (142)	
Heat rejected, jacket water circuit, MJ/min (Btu/min)	35.44 (33610)	32.11 (30455)
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	26.93 (25545)	23.96 (22725)
Heat rejected, fuel circuit, MJ/min (Btu/min)		
Total heat radiated to room, MJ/min (Btu/min)	13.1 (12420)	11.9 (11275)
Maximum friction head, jacket water circuit, kPa (psi)	67 (10)	
Maximum friction head, aftercooler circuit, kPa (psi)	48 (7)	
Maximum static head, jacket water circuit, m (ft)	18.3 (60)	
Maximum static head, aftercooler circuit, m (ft)	18.3 (60)	
Maximum jacket water outlet temp, °C (°F)	104 (220)	100 (212)
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	49 (120)	
Maximum aftercooler inlet temp, °C (°F)	71 (160)	66 (150)
Maximum fuel flow, L/hr (US gph)	469 (124)	
Maximum fuel return line restriction, kPa (in Hg)	34 (10)	

Weights[2]

Unit dry weight kgs (lbs)	12700 (28000)
Unit wet weight kgs (lbs)	13270 (29260)

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	Full rated power available up to 1134.0m (3719.6 ft) elevation at ambient temperatures up to 40 °C (104 °F). Full rated power available up to 702.5m (2304.2 ft) elevation at ambient temperatures up to 50 °C (120 °F). Above these conditions derate by 6.6% per 305m (1000 ft) and derate by an additional 10.3% per 10 °C (18 °F).
Prime	Full rated power available up to 1334.9m (4378.6 ft) elevation at ambient temperatures up to 40 °C (104 °F). Above these conditions derate by 5.8% per 305m (1000 ft) and derate by an additional 14.0% per 10 °C (18 °F).

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	Wye, 3-phase	125	P		5743		ADS-332	B596-2
380	Wye, 3-phase	150/105	S/P		6716		ADS-333	B595-2
380	Wye, 3-phase	80	P		6716		ADS-333	B687-2
380	Wye, 3-phase	105/80	S/P		7361		ADS-334	B599-2
380	Wye, 3-phase	80	S		7695		ADS-335	B660-2
440	Wye, 3-phase	125	P		4602		ADS-330	B692-2
440	Wye, 3-phase	150/125	S/P		5521		ADS-331	B691-2
440	Wye, 3-phase	125/105	S/P		5743		ADS-332	B663-2
440	Wye, 3-phase	80	S		6716		ADS-333	B688-2
440	Wye, 3-phase	80	P		7695		ADS-331	B689-2
480	Wye, 3-phase	105	P		4602		ADS-330	B693-2
480	Wye, 3-phase	125/105	S/P		5521		ADS-331	B276-2
480	Wye, 3-phase	80	P		5521		ADS-331	B694-2
480	Wye, 3-phase	105/80	S/P		5743		ADS-332	B600-2
480	Wye, 3-phase	80	S		6716		ADS-333	B601-2
600	Wye, 3-phase	105	P		4602		ADS-330	B581-2
600	Wye, 3-phase	125/105	S/P		5521		ADS-331	B602-2
600	Wye, 3-phase	80	P		5521		ADS-331	B695-2
600	Wye, 3-phase	105/80	S/P		5743		ADS-332	B603-2
600	Wye, 3-phase	80	S		6716		ADS-333	B604-2
4160	Wye, 3-phase	105	P		6204		ADS-322	B312-2
4160	Wye, 3-phase	105/80	S/P		7005		ADS-323	B313-2

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	Single phase output
$\frac{kW \times 1000}{Voltage \times 1.73 \times 0.8}$	$\frac{kW \times SinglePhaseFactor \times 1000}{Voltage}$

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-3334k (6/15)

power.cummins.com

Alternator data sheet

Frame size: P734D

Characteristics

Weights:	Stator assembly:	3569 lb	1619 kg
	Rotor assembly:	3034 lb	1376 kg
	Complete assembly:	7315 lb	3318 kg
Maximum speed:		2250 rpm	
Excitation current:	Full load:	3.6 Amps	
	No load:	0.5 Amps	
Insulation system:	Class H throughout		

3 Ø Ratings (0.8 power factor)		**60 Hz Voltage** (winding no)					
(Based on specific temperature rise at 40° C ambient temperature)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
163° C rise ratings	kW			1368	1552	1656	1728	1728
	kVA			1710	1940	2070	2160	2160
150° C rise ratings	kW			1328	1512	1612	1680	1680
	kVA			1660	1890	2015	2100	2100
125° C rise ratings	kW			1276	1452	1548	1612	1612
	kVA			1595	1815	1935	2015	2015
105° C rise ratings	kW			1188	1352	1440	1500	1500
	kVA			1485	1690	1800	1875	1875
80° C rise ratings	kW			1100	1252	1332	1388	1388
	kVA			1375	1565	1665	1735	1735

Reactances (per unit ± 10%)	220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
(Based on full load at 125° C rise rating)							
Synchronous			3.95	3.75	3.57	3.12	3.56
Transient			0.25	0.23	0.22	0.19	0.17
Subtransient			0.18	0.17	0.16	0.14	0.14
Negative sequence			0.25	0.24	0.23	0.20	0.19
Zero sequence			0.03	0.03	0.03	0.02	0.02

Motor starting	220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Maximum kVA (90% sustained voltage)			5743	5743	5743	5743	5743

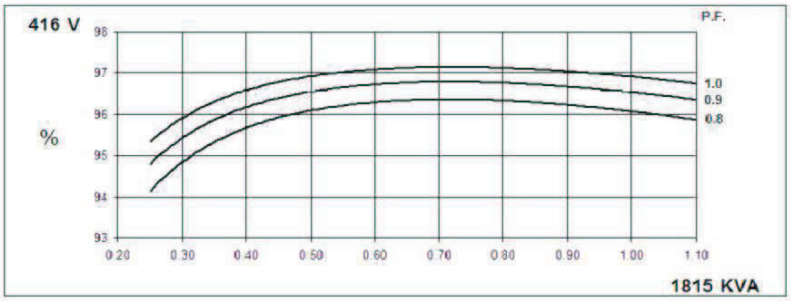
Time constants (sec)	220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Transient			0.137	0.137	0.137	0.137	0.137
Subtransient			0.010	0.010	0.010	0.010	0.010
Open circuit			2.250	2.250	2.250	2.250	2.250
DC			0.020	0.020	0.020	0.020	0.020

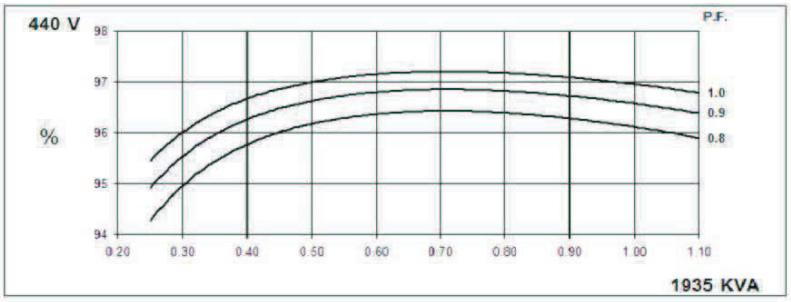
Windings (@ 20° C)		220/380 (13)	240/416 (13)	220/380 (312)	240/416 (312)	254/440 (312)	277/480 (312)	347/600 (07)
Stator resistance	(Line to Line, Ohms)			0.00114	0.00114	0.00114	0.00114	0.00390
Rotor resistance	(Ohms)			1.98	1.98	1.98	1.98	1.98
Number of leads				6	6	6	6	6

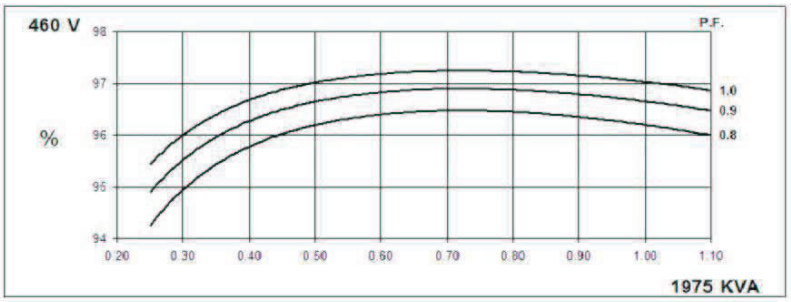
60 Hz

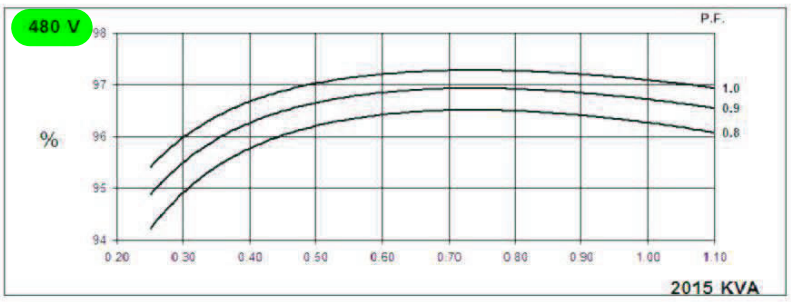
Winding 312

THREE PHASE EFFICIENCY CURVES



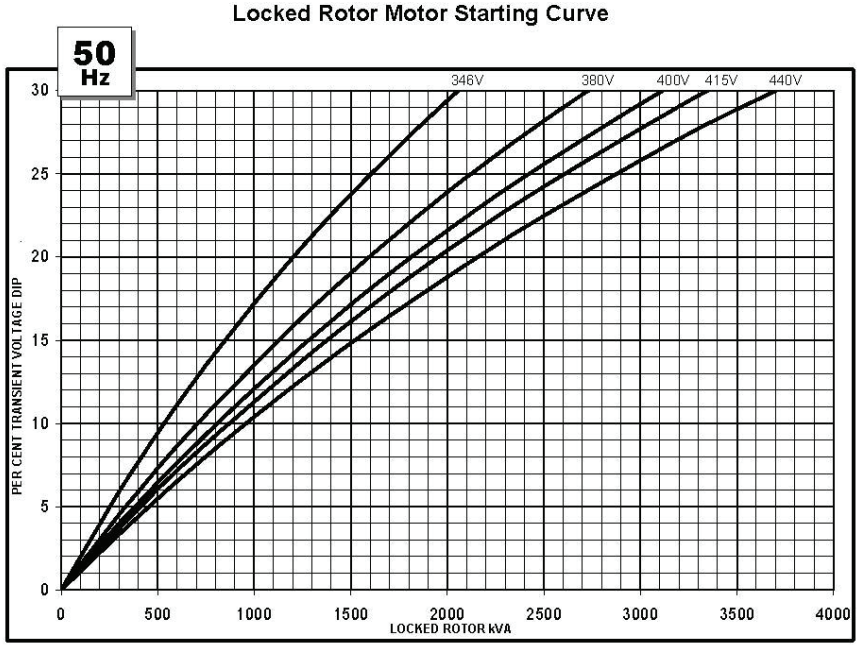


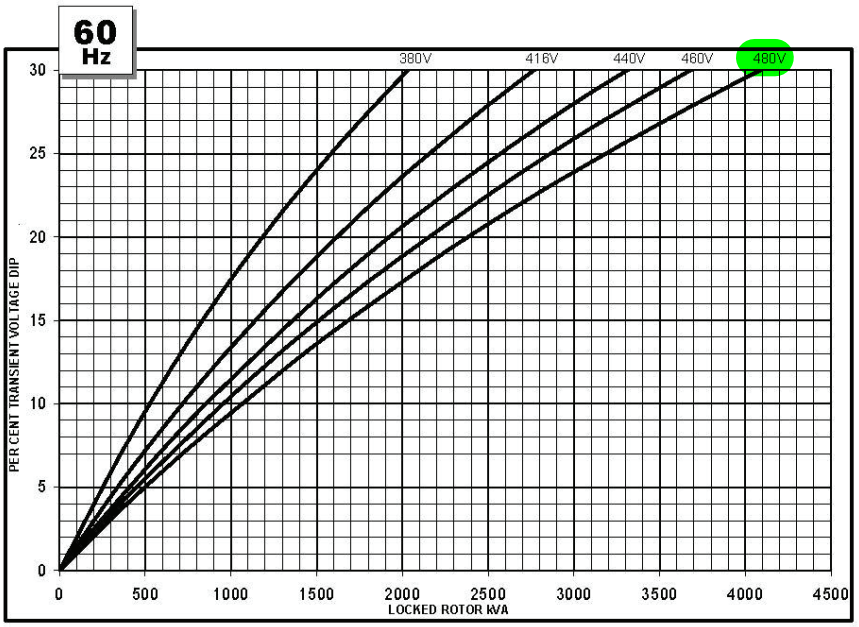




Winding 312

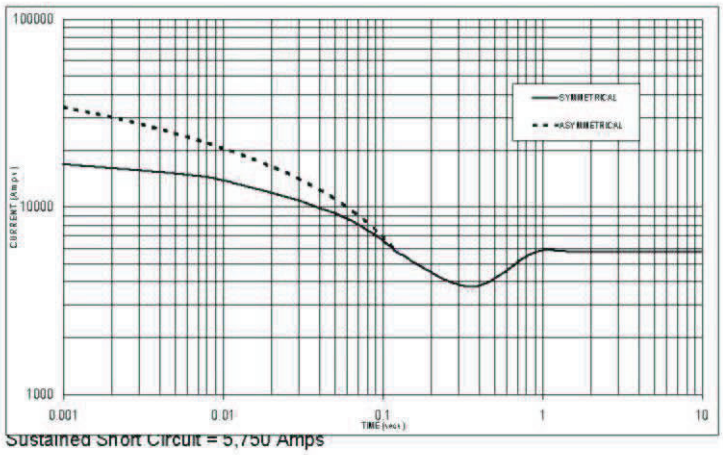
Locked Rotor Motor Starting Curve





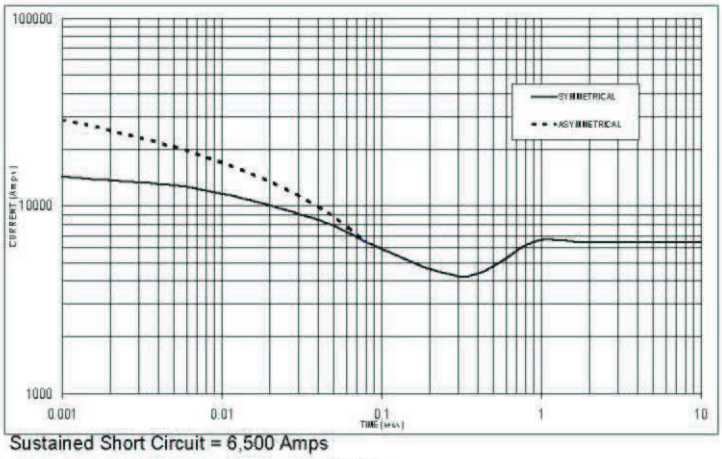
Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 5,750 Amps

60 Hz



Sustained Short Circuit = 6,500 Amps

Note 1
The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	x 1.00	416v	x 1.00
400v	x 1.05	440v	x 1.06
415v	x 1.09	460v	x 1.10
440v	x 1.16	480v	x 1.15

The sustained current value is constant irrespective of voltage level

Note 2
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

Note 3
Curves are drawn for Star (Wye) connected machines.

PROTOTYPE TEST SUPPORT (PTS)
60 HZ TEST SUMMARY

GENERATOR SET MODELS	REPRESENTATIVE PROTOTYPE
1250DQGAA	Model:1500DQGAB
1500DQGAB	Alternator: P734C
	Engine: QSK50-G4 NR2

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: 1580 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 1200 to 2000 RPM.

Cooling System: 40 °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.

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:

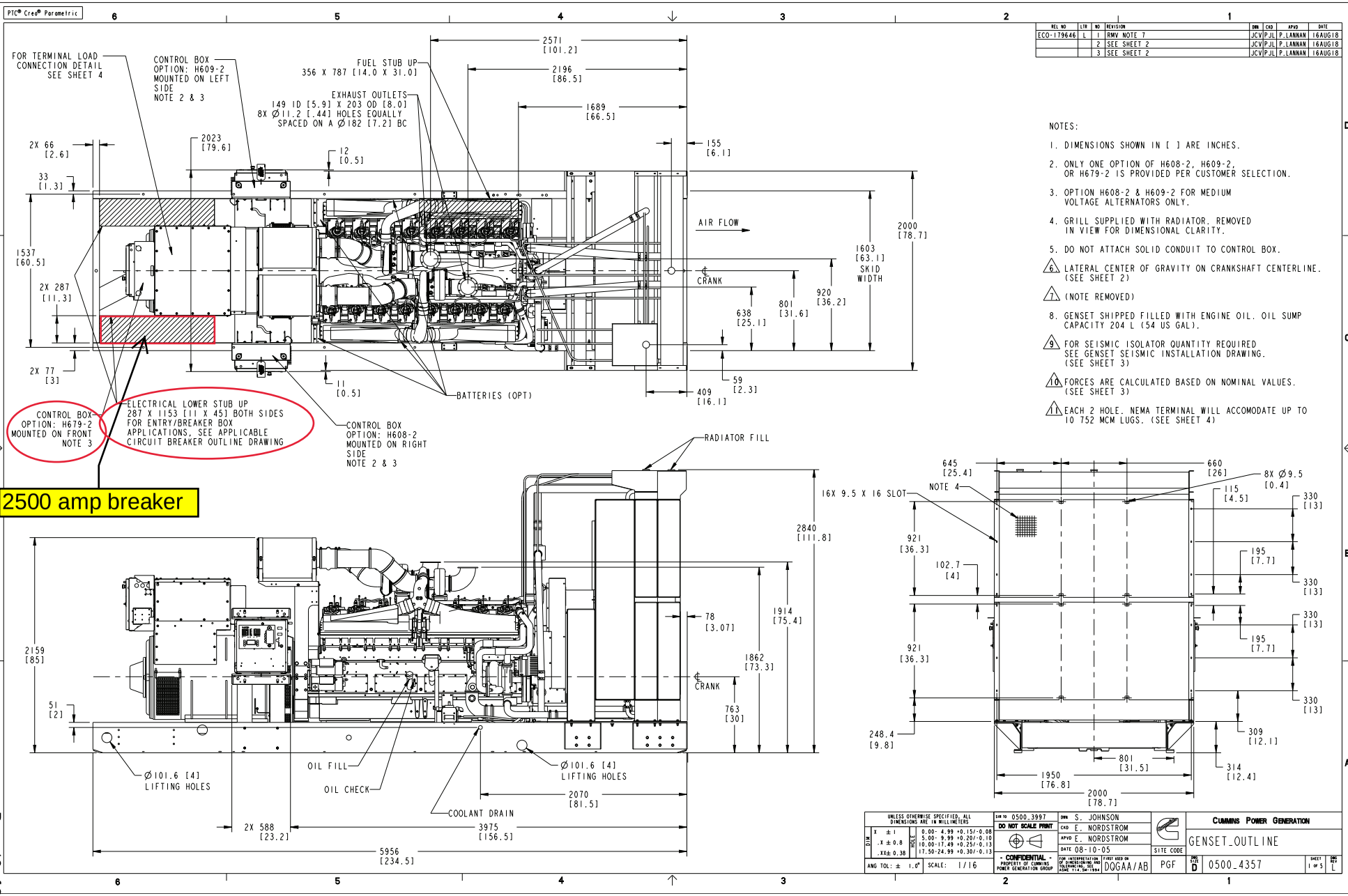
The generator set was tested with the standard alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded:

Full Load Acceptance:		
Voltage Dip:	40.4	%
Recovery Time:	4.2	Second
Frequency Dip:	7.5	%
Recovery Time:	5.6	Second
Full Load Rejection:		
Voltage Rise:	26.4	%
Recovery Time:	2.8	Second
Frequency Rise:	3.5	%
Recovery Time:	1.3	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	0.18	0.01	0.13	0.08
5	0.2	2.3	0.13	2.3
7	0.52	1.46	0.48	0.74
9	0.08	0.03	0.03	0.07
11	0.65	0.49	0.64	0.46
13	0.21	0.28	0.19	0.31
15	0.05	0.05	0.03	0.1



REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-179646	L	1	RMV NOTE 7	JCV	PJL	P.LANNAN	16AUG18
		2	SEE SHEET 2	JCV	PJL	P.LANNAN	16AUG18
		3	SEE SHEET 2	JCV	PJL	P.LANNAN	16AUG18

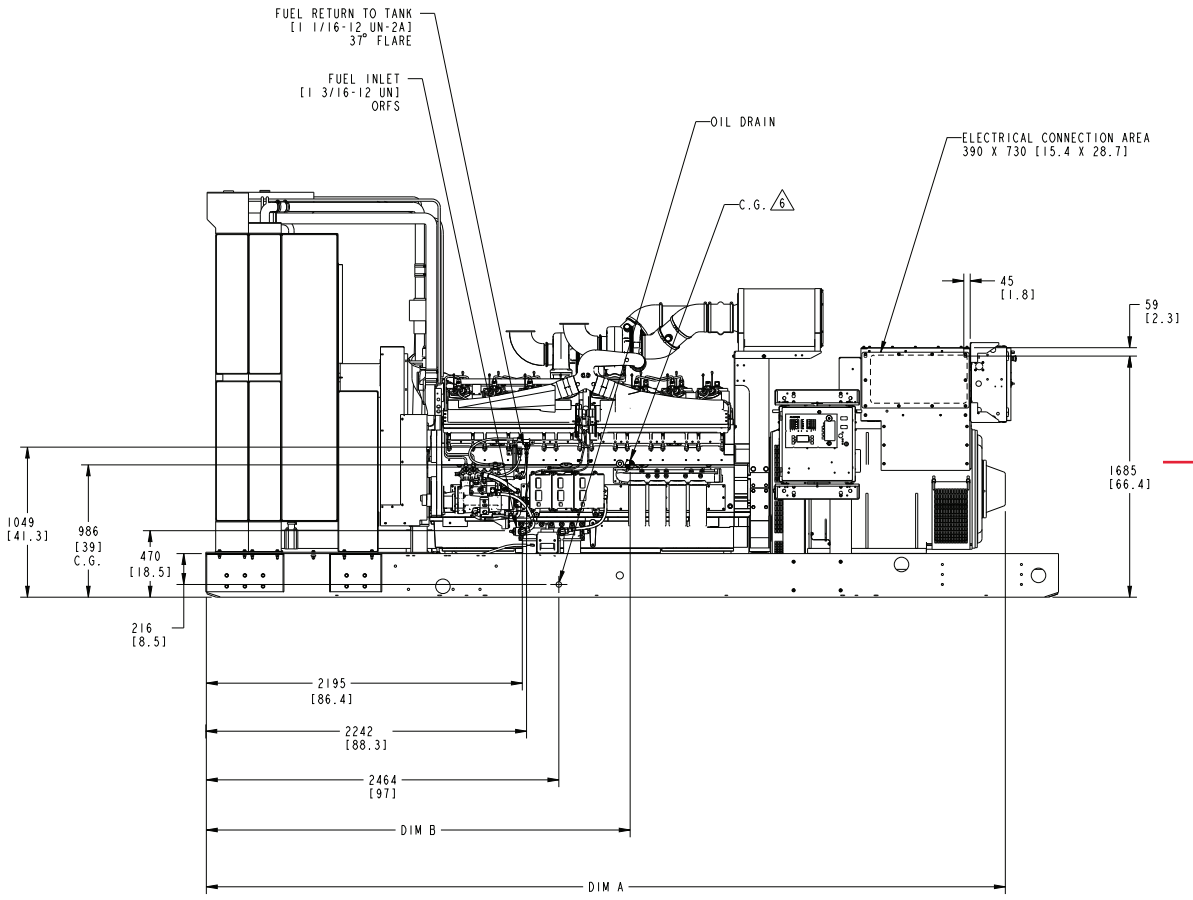
NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE INCHES.
2. ONLY ONE OPTION OF H608-2, H609-2, OR H679-2 IS PROVIDED PER CUSTOMER SELECTION.
3. OPTION H608-2 & H609-2 FOR MEDIUM VOLTAGE ALTERNATORS ONLY.
4. GRILL SUPPLIED WITH RADIATOR. REMOVED IN VIEW FOR DIMENSIONAL CLARITY.
5. DO NOT ATTACH SOLID CONDUIT TO CONTROL BOX.
6. LATERAL CENTER OF GRAVITY ON CRANKSHAFT CENTERLINE. (SEE SHEET 2)
7. (NOTE REMOVED)
8. GENSET SHIPPED FILLED WITH ENGINE OIL. OIL SUMP CAPACITY 204 L (54 US GAL).
9. FOR SEISMIC ISOLATOR QUANTITY REQUIRED SEE GENSET SEISMIC INSTALLATION DRAWING. (SEE SHEET 3)
10. FORCES ARE CALCULATED BASED ON NOMINAL VALUES. (SEE SHEET 3)
11. EACH 2 HOLE. NEMA TERMINAL WILL ACCOMODATE UP TO 10 752 MCM LUGS. (SEE SHEET 4)

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ± 1, .X ± 0.8, .XX ± 0.38
ANGLE: 0.00 - 4.99 ±0.15/-0.08; 5.00 - 9.99 ±0.20/-0.10; 10.00 - 17.49 ±0.25/-0.13; 17.50 - 24.99 ±0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/16
SIM TO 0500_3997
DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP
DRN S. JOHNSON
CKD E. NORDSTROM
APVD E. NORDSTROM
DATE 08-10-05
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994
FIRST USED ON DQGAA/AB
CUMMINS POWER GENERATION
GENSET_OUTLINE
SITE CODE PGF
SIZE D 0500_4357
SHEET 1 OF 5
REV L

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-179646	L	2	ZONE D5, "FUEL--- FLARE" WAS "FUEL---2A"	JCV	PJL	P.LANNAN	16AUG18
		3	ZONE D5, "FUEL--- ORFS" WAS "FUEL---2A"	JCV	PJL	P.LANNAN	16AUG18



TABULATION

GEN FRAME SIZE	DIM "A"	DIM "B" CENTER OF GRAVITY WITH COOLANT	GENSET WEIGHT WITHOUT COOLANT		GENSET WEIGHT WITH COOLANT	
			KGS.	LBS.	KGS.	LBS.
P7B	5642 [222.1]	2961 [116.6]	11261	24826	11833	26087
P7C	5642 [222.1]	3009 [118.5]	11519	25395	12091	26656
P7D	5792 [228.0]	3053 [120.2]	11819	26056	12391	27317
P7E	5792 [228.0]	3097 [121.9]	12057	26581	12629	27842
P7F	5877 [231.4]	3142 [123.7]	12341	27207	12913	28468
P7G	5877 [231.4]	3176 [125.0]	12701	28001	13273	29262
MV7F	5765 [227.0]	3027 [119.2]	11402	25137	11973	26396
MV7G	5915 [232.9]	3109 [122.4]	11952	26350	12523	27608
MV7H	5915 [232.9]	3156 [124.3]	12282	27077	12853	28336

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1, .X ±0.8, .XX± 0.38
ANGL: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/16
SIM TO 0500_3997
DO NOT SCALE PRINT
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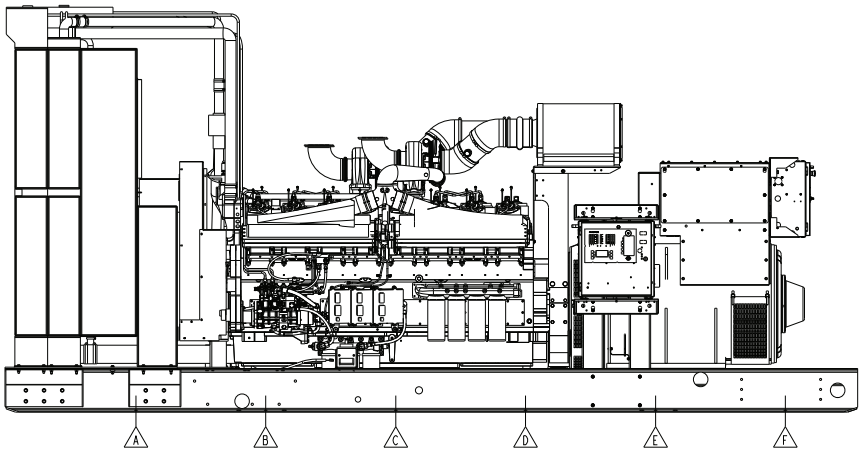
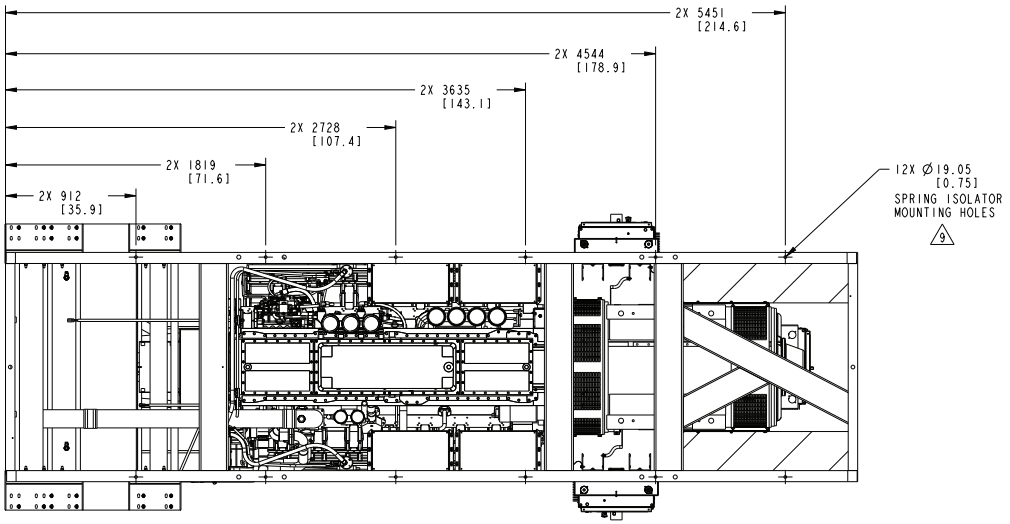
DWN S. JOHNSON
CKD E. NORDSTROM
APVD E. NORDSTROM
DATE 08-10-05
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994
FIRST USED ON D0GAA/AB
SITE CODE PGF
CUMMINS POWER GENERATION
GENSET_OUTLINE
SIZE D | 0500_4357 | SHEET 2 OF 5 | REV L

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-179646	L	-	---	JCV	PJL	P.LANNAN	16AUG18





STATIC ISOLATOR FORCES

GEN FRAME SIZE	FORCE (N) BASED ON ISOLATOR A046D208 - 630.5 N/mm GROUND AND ROOF INSTALLATION 10					
	A	B	C	D	E	F
P7B	11686.9	10882.3	10075.8	9271.1	8464.7	7660.0
P7C	11493.9	10850.7	10206.0	9562.8	8918.1	8274.9
P7D	11358.4	10867.3	10375.2	9884.1	9392.0	8900.9
P7E	11147.7	10818.6	10488.8	10159.7	9829.8	9500.7
P7F	10950.0	10792.7	10635.0	10477.7	10320.1	10162.8
P7G	10907.0	10884.5	10861.9	10839.4	10816.9	10794.3
MV7F	11215.4	10644.9	10073.2	9502.7	8930.9	8360.4
MV7G	10938.2	10658.2	10377.6	10097.6	9816.9	9536.9
MV7H	10760.2	10659.2	10557.9	10456.8	10355.5	10254.4

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ± 1, .X ± 0.8, .XX± 0.38
ANGL: 0.00- 4.99 +0.15/-0.08, 5.00- 9.99 +0.20/-0.10, 10.00-17.49 +0.25/-0.13, 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/16

SIM TO 0500_3997
DO NOT SCALE PRINT
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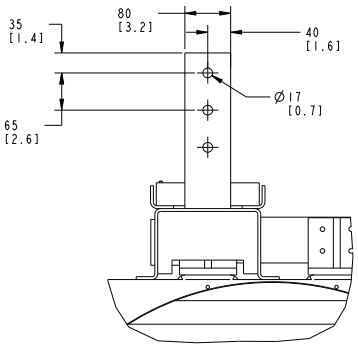
DWN S. JOHNSON
CKD E. NORDSTROM
APVD E. NORDSTROM
DATE 08-10-05
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994
FIRST USED ON DQGAA/AB

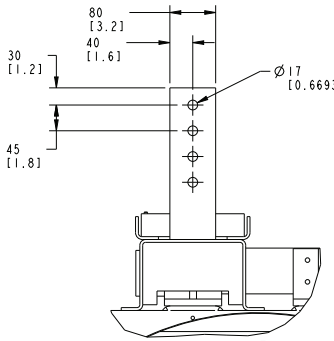
CUMMINS POWER GENERATION
GENSET_OUTLINE
SITE CODE PGF
SIZE D 0500_4357
SHEET 3 OF 5
REV L

PTC® Creo® Parametric

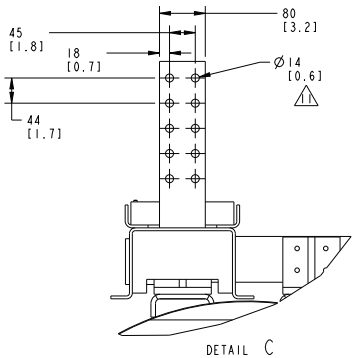
REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-179646	L	-	---	JCV	PJL	P.LANNAN	16AUG18



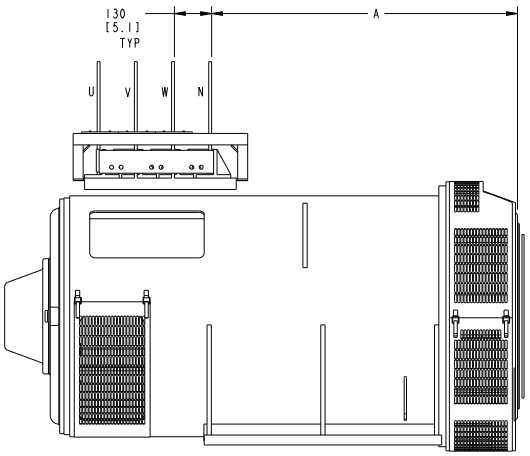
DETAIL A
SCALE 1/4

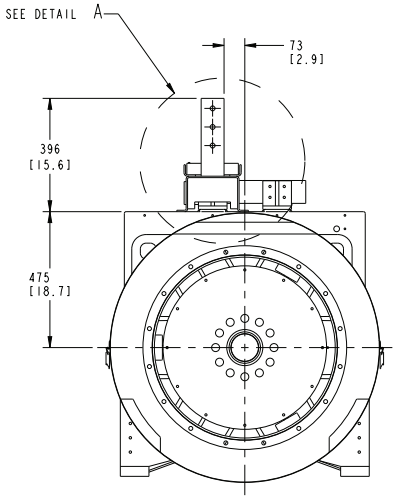


DETAIL B
SCALE 1/4

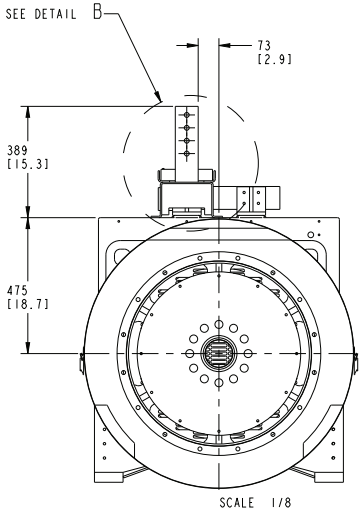


DETAIL C
SCALE 1/4



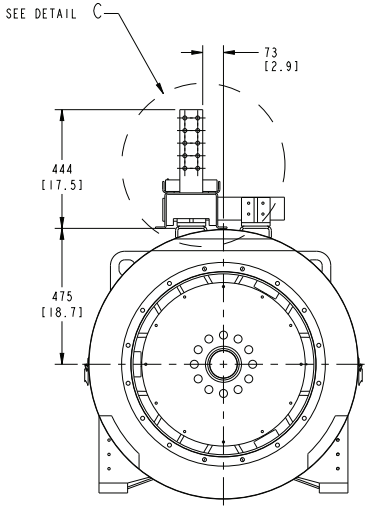


1 HOLE LUG
NEWAGE
CORES B THRU F
(KR79)



SCALE 1/8

1 HOLE LUG
NEWAGE
CORE G
(KR79)



2 HOLE LUG, NEMA
CORES B THRU G
(KR78)
UL APPROVED

TABULATION	
CORE	DIM A
B	919
C	919
D	1069
E	1069
F	1154
G	1154

P7 ALTERNATOR

ELECTRICAL CONNECTION DETAIL
(OUTPUT BOX NOT SHOWN)

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1, .X ±0.8, .XX± 0.38
ANGL: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/16

SIM TO 0500_3997
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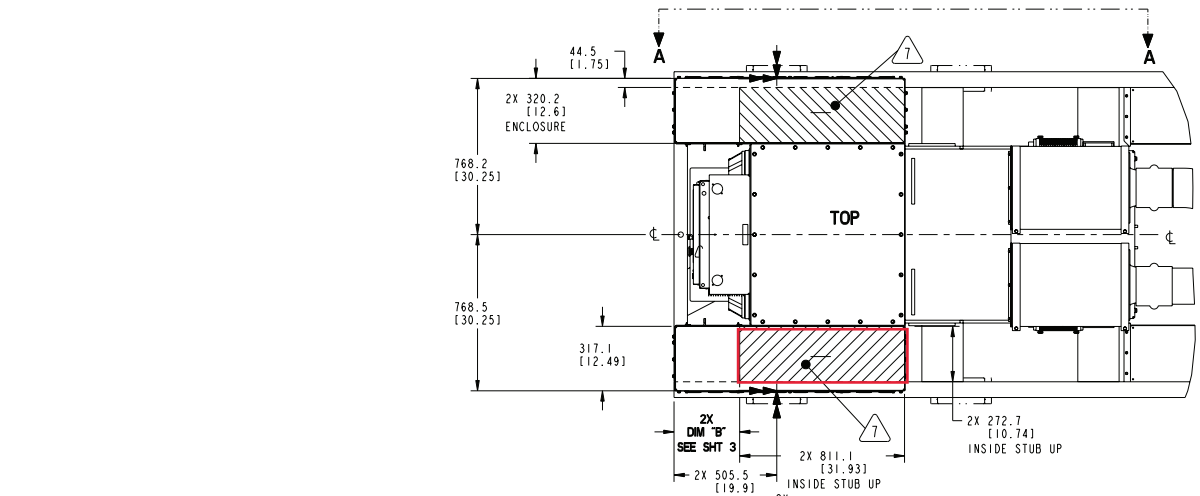
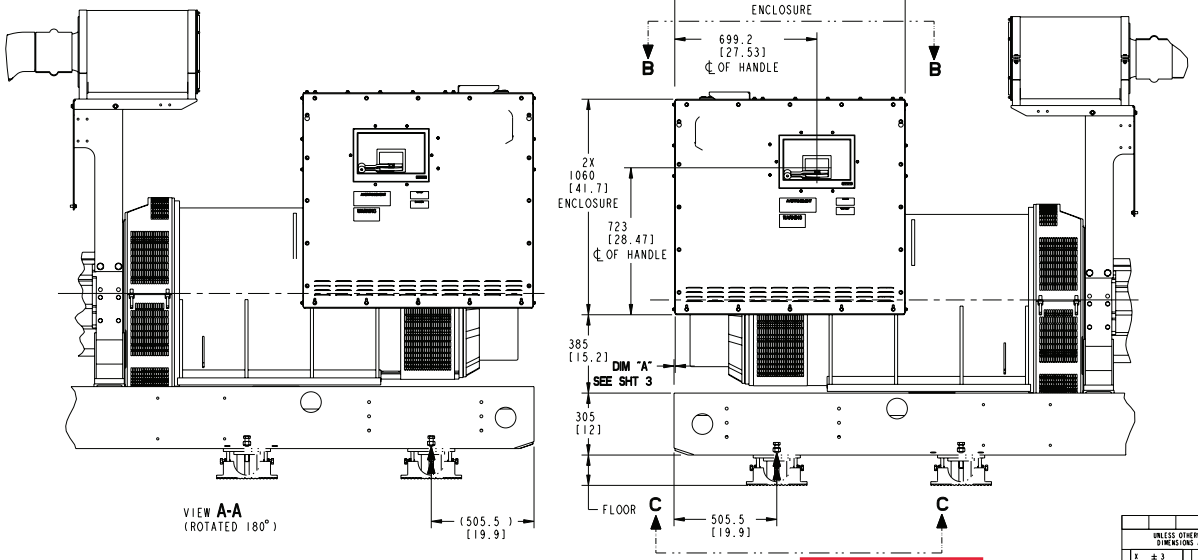
DWN S. JOHNSON
CKD E. NORDSTROM
APVD E. NORDSTROM
DATE 08-10-05
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994
FIRST USED ON D0GAA/AB

CUMMINS POWER GENERATION
GENSET_OUTLINE
SITE CODE PGF
SIZE D 0500_4357
SHEET 4 OF 5
REV L

Drawing Name: 0500-4357 Revision: L
Part Name: 0500-4357 Revision: L
ECO-179646 Sheet 4 of 6





LEFT SIDE ENTRY 11

RIGHT SIDE ENTRY

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

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 P734G & 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: X ±3, .X ±0.8, .XX± 0.38

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

ANG TOL: ± 1.0°

SCALE: 3/32

DO NOT SCALE PRINT

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FOR INTERPRETATION OF DIMENSIONS, TOLERANCES AND SURFACE FINISH SYMBOLS ASME Y14.5M-1994

FIRST USED ON: DFLB,C,E

DRN LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 12-15-06

SITE CODE: PGF

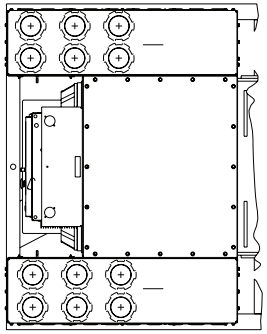
CUMMINS POWER GENERATION
1400 73RD AVENUE NE., MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
(50 LITER)

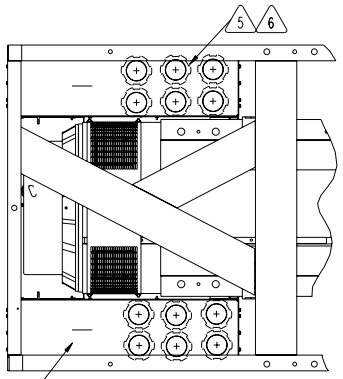
SIZE D | 0500_4537 | SHEET 1 of 3 | REV B

Pro/ENGINEER

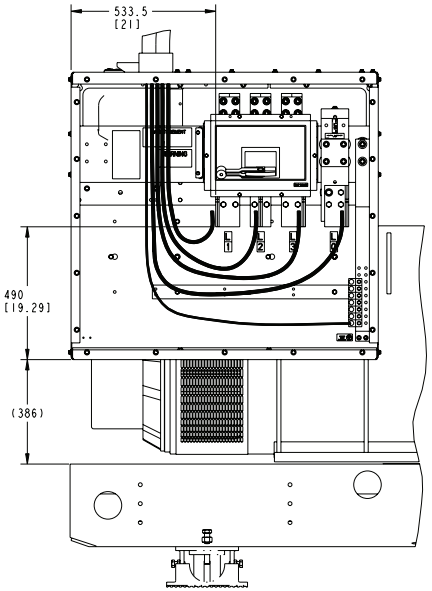
REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08



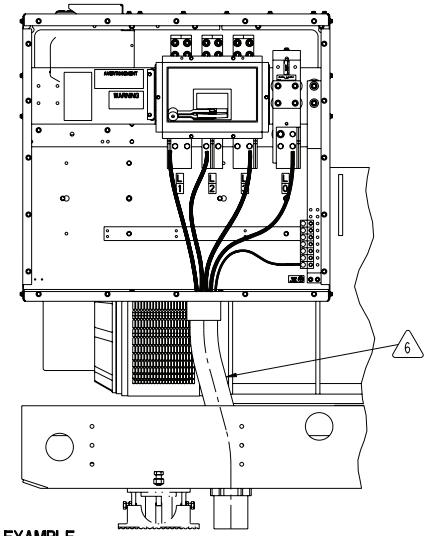
VIEW **B-B**
TOP ENTRANCE
SCALE 3/32



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	TOL
X ± 3	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
ANG TOL: ± 1.0°	17.50-24.99 +0.30/-0.13

SCALE: 3/64

DO NOT SCALE PRINT

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FIRST USED ON: DFLB,C,E

DRN	LANDRUS
CKD	L_NAVARRETE
APVD	L_NAVARRETE
DATE	12-15-06

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

CIRCUIT BRKR OUTLINE
(50 LITER)

SITE CODE: PGF

SIZE: D | 0500_4537 | SHEET: 2 of 3 | REV: B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DRN	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 with Micrologic 5.0 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"
☐ DFLB ☐ DFLC ☐ DFLE ☐ DQGAA ☐ DQGAB	☐ P734B	247.6 [9.75]	569.8 [22.43]
	☐ P734C	247.6 [9.75]	569.8 [22.43]
	☐ P734D	98.6 [3.89]	420.8 [16.57]
	☐ P734E	98.6 [3.89]	420.8 [16.57]
	☐ P734F	3.6 [.14]	325.8 [12.83]
	☐ P734G	3.6 [.14]	325.8 [12.83]

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±3, .X ±0.8, .XX± 0.38

DECIMAL: 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: 3/64

DO NOT SCALE PRINT

FOR INTERPRETATION OF DIMENSIONS, TOLERANCES AND SYMBOLS REFER TO ASME Y14.5M-1994

FINISH USED ON: DFLB,C,E

DRN LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 12-15-06

SITE CODE: PGF

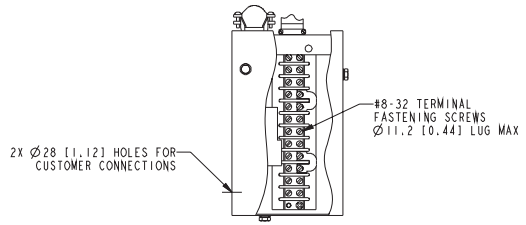
CUMMINS POWER GENERATION
1400 73RD AVENUE NE., MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE (50 LITER)

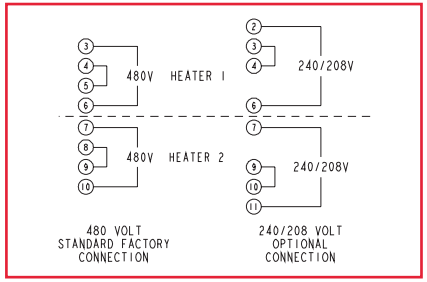
SIZE D | DWG NO 0500_4537 | SHEET 3 of 3 | REV B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DR	CHAR	APPROVED	DATE
FRD16606	A	1	PRODUCTION_RELEASE	-	WP	WF	EK	05-06-03
FRD33816	B	1	CHG HEATER AMPERAGE TABLE, SEE ECO	-	GJT	BG	NAVARRETE	09-24-07



DETAIL OF HETER
TERMINAL BOX

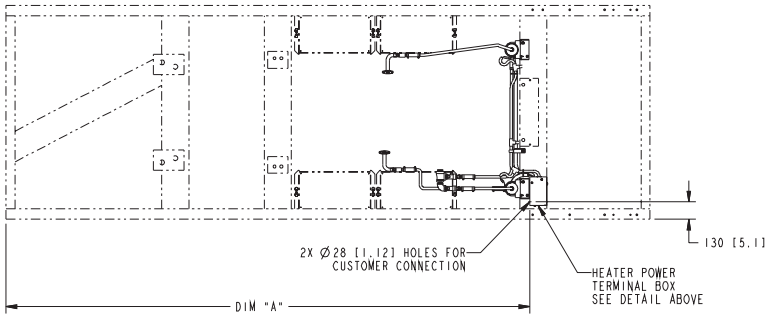


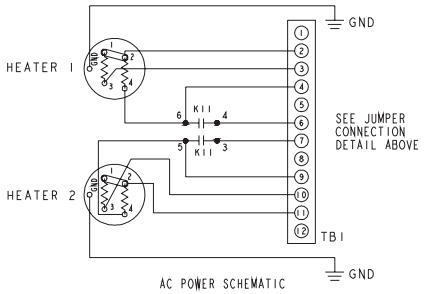
JUMPER CONNECTION DETAIL

NOTES:

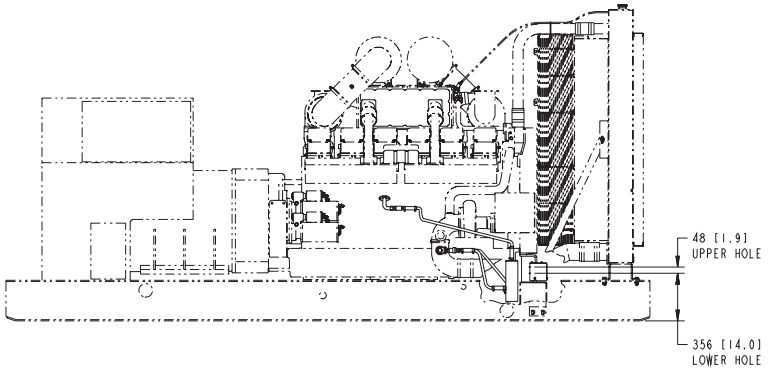
1. DIMENSIONS IN [ ] ARE INCHES.
2. THE HEATER CONTROL RELAY DRAWS 83mA OF CURRENT WHEN THE HEATERS ARE UNPOWERED. HEATERS ARE NOT POWERED WHEN:
   1) THE ENGINE HAS REACHED DESIGN TEMPERATURE OR
   2) THE ENGINE IS RUNNING.

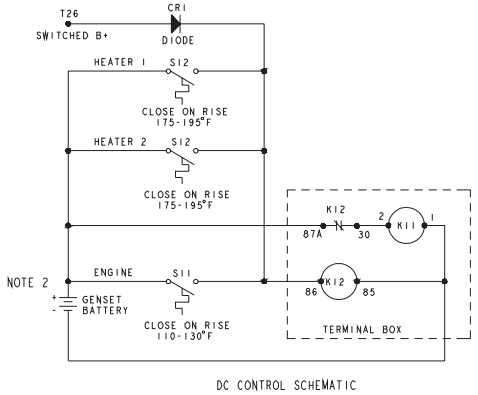
⚠ A BATTERY CHARGER IS REQUIRED TO PREVENT BATTERY DISCHARGE.





AC POWER SCHEMATIC





DC CONTROL SCHEMATIC

HEATER AMPERAGE TABLE

SINGLE PHASE HEATER VOLTAGE	FEATURE CODE H556 TWO HEATERS			FEATURE CODE H557 TWO HEATERS		
	HEATER AMPS	TOTAL AMPS	TOTAL WATTS	HEATER AMPS	TOTAL AMPS	TOTAL WATTS
208	18.0	36.0	7485	23.1	46.3	9630
240	20.8	41.6	9980	26.8	53.5	12840
480	10.4	20.8	9980	13.4	26.8	12840

TABULATION

GENSET ENGINE/MODEL	DIM "A"
KTA 38 DFJA,JB,JC,JD	3927 [154.6]
KTA 50 DFLM,LC,LD,MB	4475 [176.2]

DO NOT SCALE PRINT

TOLERANCE UNLESS OTHERWISE SPECIFIED

	W.PELTIER	05-06-03
CHKR & MFG	W.PELTIER	05-06-03
APPROVED	E.KRONNFELDT	05-06-03

CUMMINS POWER GENERATION

TITLE: INTERFACE_OUTLINE (HEATER)

SITE CODE: PGA

DRG NO: 0500_3821

SHEET: 1 of 1

SIZE: D

Limited Standby 5 Year or 2,500 Hour Parts + Labor + Travel Extended Warranty – L189

Commercial Generating Set

When purchased, this limited extended warranty applies to all Cummins Power Generation® branded commercial generating sets and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. The coverage duration is 5 years from warranty start date or 2,500 hours, whichever occurs first.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the extended warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited extended warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Failures due to normal wear, corrosion, varnished fuel system parts, lack of reasonable and necessary maintenance, unauthorized modifications and/or repair, and use of add-on or modified parts.
- Improper and/or unauthorized installation.
- Owner's or operator's negligence, accidents or misuse.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.
- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Use of Battle Short Mode

Limitations Continued:

- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited extended warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Damage to customer property.
- Repair of cosmetic damage to enclosures.

Items not covered by this limited extended warranty:

- Batteries
- Enclosures
- Coolant heaters
- Exhaust systems and aftertreatment components
- Maintenance items

www.power.cummins.com

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS POWER GENERATION ® IN REGARD TO THE PRODUCT. CUMMINS POWER GENERATION® MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited extended warranty shall be enforced to the maximum extent permitted by applicable law. This limited extended warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

Product Model Number:_____

Product Serial Number:_____

Date in Service:_____