CSDG

CUMMINS / DQKAN 2500

Cummins Sales and Service

CSDG

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CSDG

Bill of Materials

Item	Description	Qty
	Diesel Genset: 60Hz-2500kW	
	U.S. EPA, Stationary Emergency Application	1
2500DQKAN	Genset-Diesel,60Hz-2500kW	1
A331-2	Duty Rating-Standby Power	1
L090-2	Listing-UL 2200	1
L170-2	Emissions Certification, EPA, Tier 2, NSPS CI Stationary Emergency	1
R002-2	Voltage-277/480,3 Phase,Wye,4 Wire	1
B601-2	Alt-60Hz,3Ph,277/480V,80C, C-S	1
H704-2	Generator Set Control-PowerCommand 3.3, Paralleling	1
H536-2	Display Language-English	1
H606-2	Meters-AC Output,Analog	1
H678-2	Display-Control, LCD	1
H720-2	AmpSentryTM Protective Relay	1
KA08-2	Audible Alarm	1
KX24-2	RELAYS-USER CONFIGURED	1
B225-2	Temperature Sensor-Stator, 2 RTD/Phase	1
A416-2	Heater-Alternator, 110/220 (120/240) Volt AC	1
H609-2	Control Mounting-Left Facing	1
C127-2	Separator-Fuel/Water	1
A334-2	Engine Starter-24 VDC Motor	1
A333-2	Battery Charging Alternator-Normal Output	1
E125-2	Engine Cooling-High Ambient Air Temperature	1
H389-2	Shutdown-Low Coolant Level	1
H557-2	Coolant Heater-208/240/480V, Below 40F Ambient Temp	1
D041-2	Engine Air Cleaner-Normal Duty	1
H110-2	Oil Pan-High Capacity	1
H607-2	Filters-Engine Oil, Full Flow and Bypass	1
L028-2	Genset Warranty- Base	1

Specification sheet

Diesel generator set QSK60 series engine

2500 kW 60 Hz
Emergency Standby
EPA emissions

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability, and versatility for stationary Standby applications.

Features

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

Alternator - Offers 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® digital 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™ protective relay, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

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

NFPA - The generator set 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	Emissions compliance	Data sheets
Model	60 Hz kW (kVA)	EPA	60 Hz
DQKAN	2500 (3125)	EPA Tier 2	NAD-5919

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	158.8 mm (6.25 in)
Stroke	190 mm (7.48 in)
Displacement	60.2 liters (3673 in^3)
Configuration	Cast iron, V 16 cylinder
Battery capacity	2200 amps minimum at ambient temperature of 0 °C (32 °F)
Battery charging alternator	55 amps
Starting voltage	24 volt, negative ground
Fuel system	Cummins' modular common rail system
Fuel filter	Two-stage spin-on fuel filters and water separator system. Stage 1 has a three element, 5-micron filter and Stage 2 has a three element, 3-micron filter (EleMax™ NanoNet™).
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 cooling system

Alternator specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Two bearing, flexible disc
Insulation system	Class H on low and medium voltage, Class F on high voltage
Standard temperature rise	80 ºC Standby
Exciter type	Permanent Magnet Generator (PMG)
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

- 220/380
- 277/480
- 240/416
- 255/440
- 347/600
- 2400/4160
- 7200/12470
- 7620/13200
- 7970/13800

Note: Consult factory for other voltages.

Generator set options and accessories

Engine

- 120/240 V 300 W anti-condensation heater
- 208/240/480 V thermo-statically controlled coolant heater for ambient above and below 4.5 °C (40 °F)
- Dual 120/208/240/480 V 300 W lube oil heaters
- Duplex fuel filter

Alternator

- 80 °C rise
- 105 °C rise
- 125 °C rise
- 150 °C rise
- 163 °C rise

Control panel

- PowerCommand 3.3
- Multiple language support
- 120/240 V 100 W control anti-condensation heater
- Exhaust pyrometer
- Ground fault indication
- Remote annunciator panel
- Paralleling relay package
- Shutdown alarm relay package
- Audible engine shutdown alarm
- AC output analog meters (bargraph)
- Display running time

Generator set options and accessories (continued)

Exhaust system

- Industrial grade exhaust silencer
- Residential grade exhaust silencer
- Critical grade exhaust silencer

Cooling system

- Standard high ambient temperature (43 °C)

Generator set

- PowerCommand 550 remote monitoring system
- Batteries
- Battery charger
- Bottom entry chute
- IBC seismic certification
- OSHPD seismic approval
- LV and MV/HV entrance box
- Manual language – English, Spanish and French
- Spring isolators
- 2 year warranty
- 5 year warranty
- 10 year major components warranty

PowerCommand 3.3 – control system

An integrated microprocessor based generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry – Includes integral AmpSentry protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power management – Control function provides battery monitoring and testing features and smart starting control system.

Advanced control methodology – Three phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications interface – Control comes standard with PCCNet and Modbus interface.

Regulation compliant – Prototype tested: UL, CSA and CE compliant.

Service - InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily upgradeable – PowerCommand controls are designed with common control interfaces.

Reliable design – The control system is designed for reliable operation in harsh environment.

Multi-language support

Operator panel features

Operator/display functions

- Displays paralleling breaker status
- Provides direct control of the paralleling breaker
- 320 x 240 pixels graphic LED backlight LCD
- Auto, manual, start, stop, fault reset and lamp test/panel lamp switches
- Alpha-numeric display with pushbuttons
- LED lamps indicating genset running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop

Paralleling control functions

- First Start Sensor™ system selects first genset to close to bus
- Phase lock loop synchronizer with voltage matching
- Sync check relay
- Isochronous kW and kVar load sharing
- Load govern control for utility paralleling
- Extended paralleling (Base Load/Peak Shave) mode
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions.

Alternator data

- Line-to-Neutral and Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kW, kVar, power factor kVA (three phase and total)

Engine data

- DC voltage
- Engine speed
- Lube oil pressure and temperature
- Coolant temperature
- Comprehensive FAE data (where applicable)

Other data

- Genset model data
- Start attempts, starts, running hours, kW hours
- Load profile (operating hours at % load in 5% increments)
- Fault history
- Data logging and fault simulation (requires InPower)

Standard control functions

Digital governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase, 4-wire Line-to-Line sensing
- Configurable torque matching

AmpSentry AC protection

- AmpSentry protective relay
- Over current and short circuit shutdown
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse Var shutdown
- Field overload shutdown

Standard control functions (continued)

Engine protection

- Battery voltage monitoring, protection and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown
- Full authority electronic engine protection

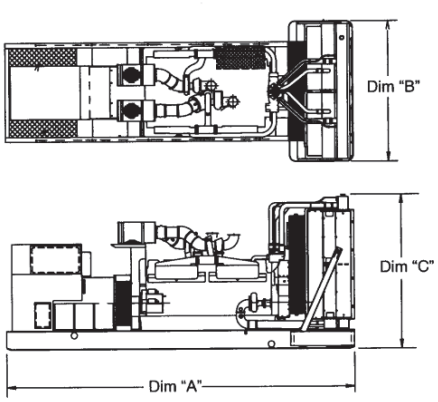
Emergency Standby Power (ESP):
Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Control functions

- Time delay start and cool down
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop
- Data logging
- Cycle cranking
- Load shed
- Configurable inputs and outputs (4)
- Remote emergency stop

Options

- Auxiliary output relays (2)



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)
DQKAN	7101 (280)	2635 (104)	3186 (125)	22887 (50457)	23299 (51366)

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

see below drawings for overall shipping weight and dimensions

Codes and standards

Codes 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.
	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 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.

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

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NAS-5918-EN 0619 (06/19)

Generator set data sheet

Model:	**DQKAN**
Frequency:	**60 Hz**
Fuel type:	**Diesel**
kW rating:	**2500 Standby**
Emissions level:	**EPA NSPS Stationary emergency Tier 2**

Exhaust emission data sheet:	**EDS-1153**
Exhaust emission compliance sheet:	**EPA-1223**
Sound performance data sheet:	**MSP-1189**
Cooling performance data sheet:	**MCP-269**
Prototype test summary data sheet:	**PTS-315**
Standard set-mounted radiator cooling outline:	**A054H274**

Fuel consumption

	kW (kVA)			
Ratings	2500 (3125)			
Load	**1/4**	**1/2**	**3/4**	**Full**
US gph	50.6	91.1	133.6	173.1
L/hr	191.5	344.9	505.7	655.3

Engine

Engine manufacturer	Cummins Inc.
Engine model	QSK60-G19 NR2
Configuration	Cast iron, V 16 cylinder
Aspiration	Turbocharged and low temperature after-cooled
Gross engine power output, kWm (bhp)	2715 (3640)
BMEP at set rated load, kPa (psi)	3007 (436)
Bore, mm (in.)	159 (6.25)
Stroke, mm (in.)	190 (7.48)
Rated speed, rpm	1800
Piston speed, m/s (ft/min)	11.4 (2243)
Compression ratio	14.5:1
Lube oil capacity, L (qt)	378 (400)
Overspeed limit, rpm	2070
Regenerative power, kW	207

Fuel flow

Maximum fuel flow, L/hr (US gph)	1105 (292)
Maximum fuel inlet restriction, clean/dirty, kPa (in Hg)	16.9 (5) / 30 (9)
Maximum fuel inlet temperature, °C (°F)	71 (160)

Air

Combustion air, m^3/min (scfm)	193 (6829)
Maximum air cleaner restriction, clean/dirty, kPa (in H_2O)	1.3 (7) / 5.3 (20.6)
Alternator cooling air, m^3/min (cfm)	222 (7840)

Exhaust

Exhaust flow at set rated load, m^3/min (cfm)	517 (18269)
Exhaust temperature, °C (°F)	551 (1022)
Maximum back pressure, kPa (in H_2O)	7.4 (30)

Standard set-mounted radiator cooling

Ambient design, °C (°F)	43.3 (110)
Fan load, kW_m (HP)	54 (72)
Coolant capacity (with radiator), L (US gal)	681.4 (180)
Cooling system air flow, m^3/min (scfm)	2649 (93550)
Total heat rejection, MJ/min (Btu/min)	88.4 (83894)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)

Weights[1]

Unit dry weight kgs (lbs)	22887 (50457)
Unit wet weight kgs (lbs)	23299 (51366)

see below drawings for overall shipping weight and dimensions

[1] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Full rated power available up to 300 m (1000 ft.) at ambient temperature up to 43 °C (110 °F). Above these elevations, derate at 5% per 300 m (1000 ft.) and 12% per 10 °C (18 °F).

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.

Alternator data

Voltage	Connection[1]	Temp rise degree C[2]	Duty	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature code
380	Wye, 3-phase	105	S	13024	13	ADS-531	B408-2
416	Wye, 3-phase	80	S	28176	12	ADS-532	B734-2
416	Wye, 3-phase	80	P	13283	12	ADS-531	B715-2
416	Wye, 3-phase	105	S	13283	12	ADS-531	B715-2
440	Wye, 3-phase	80	S	14781	12	ADS-532	B688-2
440	Wye, 3-phase	80	P	13204	12	ADS-531	B664-2
440	Wye, 3-phase	105	S	13204	12	ADS-531	B664-2
480	Wye, 3-phase	80	S	13204	12	ADS-531	B601-2
480	Wye, 3-phase	80	S/P	14781	12	ADS-532	B903-2
600	Wye, 3-phase	80	S	12426	7	ADS-531	B604-2
600	Wye, 3-phase	80	S/P	14781	7	ADS-532	B904-2
4160	Wye, 3-phase	80	S	11185	51	ADS-545	B605-2
4160	Wye, 3-phase	80	S/P	15662	51	ADS-587	B905-2
12470	Wye, 3-phase	80	S	13438	91	ADS-534	B607-2
12470	Wye, 3-phase	105	S	11213	91	ADS-533	B568-2
13200	Wye, 3-phase	80	S	13438	91	ADS-534	B807-2
13200	Wye, 3-phase	105	S	11213	91	ADS-533	B501-2
13800	Wye, 3-phase	80	S	11213	91	ADS-533	B610-2
13800	Wye, 3-phase	80	S/P	13438	91	ADS-534	B909-2

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multiply the three phase kW rating by the Single Phase Factor[2]. All single phase ratings are at unity power factor.

[2] Also capable of 105/125/150 °C temp rise.

[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

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

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Specification sheet

PowerCommand® 3.3 control system

Control system description

The PowerCommand control system is a microprocessor-based genset monitoring, metering and control system designed to meet the demands of today's engine driven gensets. The integration of all control functions into a single control system provides enhanced reliability and performance, compared to conventional genset control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied.

Features

- 320 x 240 pixels graphic LED backlight LCD.
- Multiple language support.
- AmpSentry™ protection - for true alternator overcurrent protection.
- Digital power transfer control (AMF) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes.
- Extended paralleling (peak shave/base load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility Bus monitoring point.
- Digital frequency synchronization and voltage matching.
- Isochronous load share
- Droop kW and kVAr control
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop initiate a test with or without load, or a base load or peak shave session.
- Digital voltage regulation. Three phase full wave FET type regulator compatible with either shunt or PMG systems.
- Digital engine speed governing (where applicable)
- Generator set monitoring and protection.
- Utility/AC Bus metering and protection
- 12 and 24 V DC battery operation.
- ModBus® interface for interconnecting to customer equipment.
- Warranty and service. Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.

PowerCommand digital genset control PCC 3300

Description

The PowerCommand genset control is suitable for use on a wide range of diesel and lean burn natural gas gensets in paralleling applications. The PowerCommand control is compatible with shunt or PMG excitation style. It is suitable for use with reconnectable or non-reconnectable generators, and it can be configured for any frequency, voltage and power connection from 120-600 VAC line-toline, 601-45,000 VAC with external PT.

Power for this control system is derived from the genset starting batteries. The control functions over a voltage range from 8 VDC to 30 VDC.

Features

- 12 and 24 VDC battery operation.
- Digital voltage regulation - Three phase full wave FET type regulator compatible with either shunt or PMG systems. Sensing is three phase.
- Digital engine speed governing (where applicable) - Provides isochronous frequency regulation.
- Full authority engine communications (where applicable) - Provides communication and control with the Engine Control Module (ECM).
- AmpSentry protection - for true alternator overcurrent protection.
- Genset monitoring - Monitors status of all critical engine and alternator functions.
- Digital genset metering (AC and DC).
- Genset battery monitoring system to sense and warn against a weak battery condition.
- Configurable for single or three phase AC metering.
- Engine starting - Includes relay drivers for starter, Fuel Shut Off (FSO), glow plug/spark ignition power and switch B+ applications.
- Genset protection – Protects engine and alternator.
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop initiate a test with or without load, or a base load or peak shave session.
- Digital power transfer control (AMF) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes.
- Extended paralleling (peak shave/base load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point.
- Digital frequency synchronization and voltage matching.
- Isochronous load share
- Droop kW and KVAr control
- Sync cCheck – The sync check function has adjustments for phase angle window, voltage window, frequency window and time delay.
- Utility/AC Bus metering and protection
- Advanced serviceability – using InPower™, a PC-based software service tool.
- Environmental protection – The control system is designed for reliable operation in harsh environments.
- The main control board is a fully encapsulated module that is protected from the elements.
- ModBus interface for interconnecting to customer equipment.
- Configurable inputs and outputs – Four discrete inputs and four dry contact relay outputs.
- Warranty and service – Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications – Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.

Base control functions

HMI capability

Options – Local and remote HMI options.

Operator adjustments – The HMI includes provisions for many set up and adjustment functions.

Genset hardware data – Access to the control and software part number, genset rating in kVA and genset model number is provided from the HMI or InPower.

Data logs – Includes engine run time, controller on time, number of start attempts, total kilowatt hours, and load profile. (Control logs data indicating the operating hours at percent of rated kW load, in 5% increments. The data is presented on the operation panel based on total operating hours on the generator).

Fault history – Provides a record of the most recent fault conditions with control date and time stamp. Up to 32 events are stored in the control non-volatile memory.

Alternator data

- Voltage (single or three phase line-to-line and line-to-neutral)
- Current (single or three phase)
- kW, kVAr, power factor, kVA (three phase and total)
- Frequency

For Lean burn natural gas engine applications:

- Alternator heater status
- Alternator winding temperature (per phase)
- Alternator drive end bearing temperature
- Alternator non-drive end bearing temperature

Utility/AC Bus data

- Voltage (three phase line-to-line and line-to-neutral)
- Current (three phase and total)
- kW, kVAr, power factor, kVA (three phase and total)
- Frequency

Engine data

- Starting battery voltage
- Engine speed
- Engine temperature
- Engine oil pressure
- Engine oil temperature
- Intake manifold temperature
- Coolant temperature
- Comprehensive Full Authority Engine (FAE) data (where applicable)

For lean burn natural gas engine applications:

- Safety shutoff valve status
- Valve proving status
- Downstream gas pressure
- Gas inlet pressure
- Gas mass flow rate
- Control valve position
- Gas outlet pressure
- Manifold pressure
- Manifold temperature
- Throttle position
- Compressor outlet pressure
- Turbo speed
- Compressor bypass position
- Cylinder configuration (e.g., drive end and non-drive end configurations
- Coolant pressure 1 and 2 (e.g., HT and LT)
- Coolant temperature 1 and 2 (e.g., HT and LT)
- Exhaust port temperature (up to 18 cylinders)
- Pre-filter oil pressure
- Exhaust back pressure
- CM700 internal temperature
- CM700 isolated battery voltage
- Speed bias
- CM558 internal temperature
- CM558 isolated battery voltage
- Knock level (up to 18 cylinders)
- Spark advance (up to 18 cylinders)
- Knock count (up to 18 cylinders)
- Auxiliary supply disconnector status
- Engine heater status
- Coolant circulating pump status
- Lube oil priming pump status
- Lube oil status
- Oil heater status
- Derate authorization status
- Start system status
- Ventilator fan status
- Ventilation louvre status
- Radiator fan status
- DC PSU status
- Start inhibit/enable status and setup

Service adjustments – The HMI includes provisions for adjustment and calibration of genset control functions. Adjustments are protected by a password. Functions include:

- Engine speed governor adjustments
- Voltage regulation adjustments
- Cycle cranking
- Configurable fault set up
- Configurable input and output set up
- Meter calibration
- Paralleling setup
- Display language and units of measurement

Engine control

SAE-J1939 CAN interface to full authority ECMs (where applicable). Provides data transfer between genset and engine controller for control, metering and diagnostics. 12 VDC/24 VDC battery operations - PowerCommand will operate either on 12 VDC or 24 VDC batteries.

Temperature dependent governing dynamics (with electronic governing) - modifies the engine governing control parameters as a function of engine temperature. This allows the engine to be more responsive when warm and more stable when operating at lower temperature levels.

Isochronous governing - (where applicable) Capable of controlling 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 electronic speed governing - Control can be adjusted to droop from 0 to 10% from no load to full load.

Remote start mode - It accepts a ground signal from remote devices to automatically start the genset and immediately accelerates to rated speed and voltage or run at idle until engine temperature is adequate. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Remote and local emergency stop - The control accepts a ground signal from a local (genset mounted) or remote (facility mounted) emergency stop switch to cause the genset to immediately shut down. The genset is prevented from running or cranking with the switch engaged. If in sleep mode, activation of either emergency stop switch will wake up the control.

Sleep mode - The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating. The control can also be configured to go into a low current state while in auto for prime applications or applications without a battery charger.

Engine starting - The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of two methods: magnetic pickup or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking - Is configurable for the 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.

Time delay start and stop (cooldown) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for time delay of 0-600 seconds prior to shut down after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

For lean burn natural gas engine applications:

Engine start inhibit/enable – The function will allow application-specific processes to be started prior to the genset/engine start (e.g., pumps, boosters, etc.).

Alternator control

The control includes an integrated three phase line-to-line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is a three phase full wave rectified and has an FET output for good motor starting capability. Major system features include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-1.0% for any loads between no load and full load. Voltage drift will not exceed +/-1.5% for a 40 ºC
(104 ºF) change in temperature in an eight hour period. On engine starting or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

The automatic voltage regulator feature can be disabled to allow the use of an external voltage regulator.

Droop voltage regulation - Control can be adjusted to droop from 0-10% from no load to full load.

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.

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

Paralleling functions

First Start Sensor™ system – PowerCommand provides a unique control function that positively prevents multiple gensets from simultaneously closing to an isolated bus under black start conditions. The First Start Sensor system is a communication system between the gensets that allows the gensets to work together to determine which genset is 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.

Synchronizing – Control incorporates a digital synchronizing function to force the genset to match the frequency, phase and voltage of another source such as a utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer can match other sources over a range of 60-110% of nominal voltage and -24 to +6 Hz. The synchronizer function is configurable for slip frequency synchronizing for applications requiring a known direction of power flow at instant of breaker closure or for applications where phase synchronization performance is otherwise inadequate.

Load sharing control – The genset control includes an integrated load sharing control system for both real (kW) and reactive (kVar) loads when the genset(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 genset 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 control – When PowerCommand receives a signal indicating that the genset is paralleled with an infinite source such as a utility (mains) service, the genset will operate in load govern mode. In this mode the genset 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 (lagging). Default setting is 80% of Standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control. In addition, the control can be configured for operation in kW or kVAr load govern droop.

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

Sync check – The sync check function decides when permissive conditions have been met to allow breaker closure. Adjustable criteria are: phase difference from 0.1-20 deg, frequency difference from 0.001-1.0 Hz, voltage difference from 0.5-10%, and a dwell time from 0.5-5.0 sec. Internally the sync check is used to perform closed transition operations. An external sync check output is also available.

Genset and utility/AC Bus source AC metering – The control provides comprehensive three phase AC metering functions for both monitored sources, including:

3-phase voltage (L-L and L-N) and current, frequency, phase rotation, individual phase and totalized values of kW, kVAr, kVA and Power Factor; totalized positive and negative kW-hours, kVAr-hours, and kVA-hours. Three wire or four wire voltage connection with direct sensing of voltages to 600V, and up to 45kV with external transformers. Current sensing is accomplished with either 5 amp or 1 CT secondaries and with up to 10,000 amp primary. Maximum power readings are 32,000kW/kVAR/kVA.

Power transfer control – provides integrated automatic power transfer functions including source availability sensing, genset start/stop and transfer pair monitoring and control. The transfer/retransfer is configurable for open transition, fast closed transition (less than 100msec interconnect time), or soft closed transition (load ramping) sequences of operation. Utility source failure will automatically start genset and transfer load, retransferring when utility source returns. Test will start gensets and transfer load if test with load is enabled. Sensors and timers include:

Under voltage sensor: 3-phase L-N or L-L under voltage sensing adjustable for pickup from 85-100% of nominal. Dropout adjustable from 75-98% of pickup. Dropout delay adjustable from 0.1-30 sec.

Over voltage sensor: 3-phase L-N or L-L over voltage sensing adjustable for pickup from 95-99% of dropout. Dropout adjustable from 105-135% of nominal. Dropout delay adjustable from 0.5-120 sec. Standard configuration is disabled, and is configurable to enabled in the field using the HMI or InPower service tools.

Over/Under frequency sensor: Center frequency adjustable from 45-65 Hz. Dropout bandwidth adjustable from 0.3-5% of center frequency beyond pickup bandwidth. Pickup bandwidth adjustable from 0.3-20% of center frequency. Field configurable to enable.

Loss of phase sensor: Detects out of range voltage phase angle relationship. Field configurable to enable.

Phase rotation sensor: Checks for valid phase rotation of source. Field configurable to enable.

Breaker tripped: If the breaker tripped input is active, the associated source will be considered as unavailable.

Timers: Control provides adjustable start delay from 0- 300 sec, stop delay from 0-800 sec, transfer delay from
0- 120 sec, retransfer delay from 0-1800 sec, programmed transition delay from 0-60sec, and maximum parallel time from 0-1800 sec.

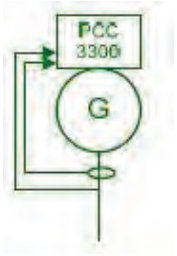
Breaker control – Utility and genset breaker interfaces include separate relays for opening and closing breaker, as well as inputs for both 'a' and 'b' breaker position contacts and tripped status. Breaker diagnostics include contact failure, fail to close, fail to open, fail to disconnect, and tripped. Upon breaker failure, appropriate control action is taken to maintain system integrity.

Extended paralleling – In extended paralleling mode (when enabled) the controller will start the genset and parallel to a utility source and then govern the real and reactive power output of the genset based on the desired control point. The control point for the real power (kW) can be configured for either the genset metering point ("base load") or the utility metering point ("peak shave"). The control point for the reactive power (kVAr or Power Factor) can also be independently configured for either the genset metering point or the utility metering point. This flexibility would allow base kW load from the genset while maintaining the utility power factor at a reasonable value to avoid penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

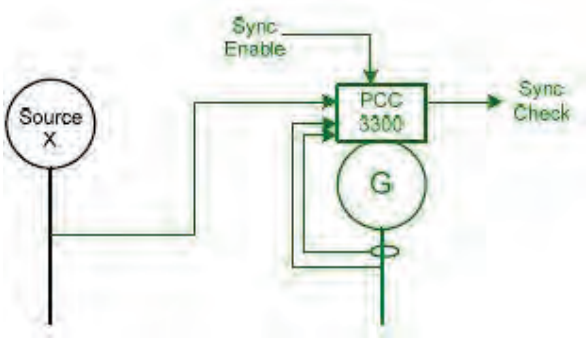
Exerciser clock –The exerciser clock (when enabled) allows the system to be operated at preset times in either test without load, test with load, or extended parallel mode. A real time clock is built in. Up to 12 different programs can be set for day of week, time of day, duration, repeat interval, and mode. For example, a test with load for 1 hour every Tuesday at 2AM can be programmed. Up to 6 different exceptions can also be set up to block a program from running during a specific date and time period.

Application types – Controller is configured to operating in one of six possible application types. These topologies are often used in combinations in larger systems, with coordination of the controllers in the system either by external device or by interlocks provided in the control. Topologies that may be selected in the control include:

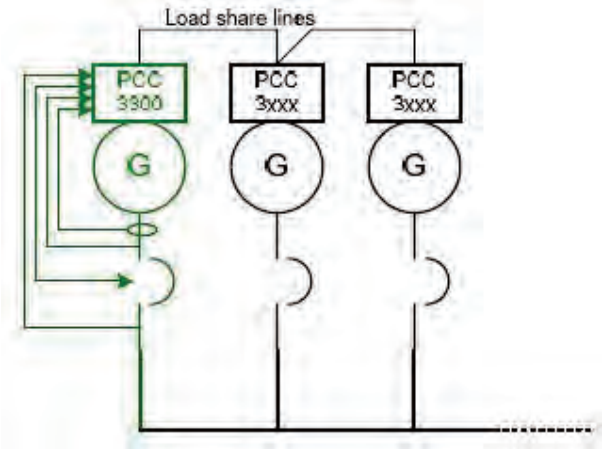
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



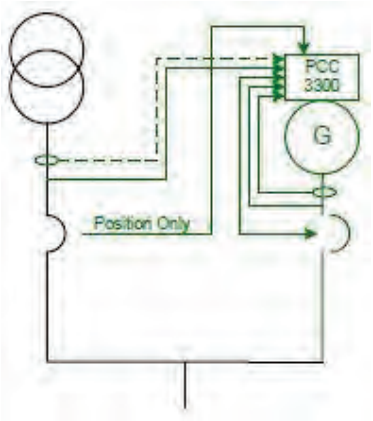
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



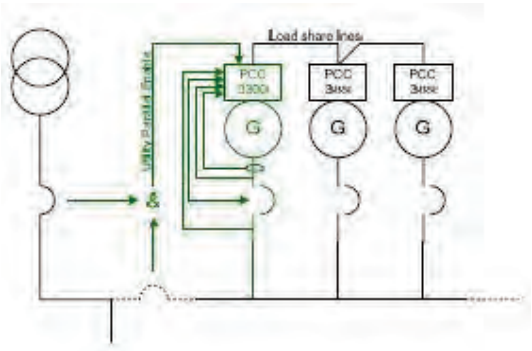
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



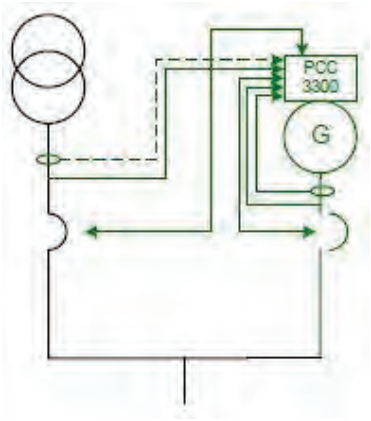
Utility single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



Utility multiple: Supports all functionality of Isolated Bus and provides extended paralleling to the utility. Extended paralleling load set points follow a constant setting; dynamically follow an analog input, ModBus register or HMI.



Power transfer control: control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



Protective functions

On operation of a protective function the control will indicate a fault by illuminating the appropriate status LED on the HMI, as well as display the fault code and fault description on the LCD. 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.

Protective functions include:

Battle short mode

When enabled and the battle short switch is active, the control will allow some shutdown faults to be bypassed. If a bypassed shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a fail to shutdown fault. Emergency stop shutdowns and others that are critical for proper operation (or are handled by the engine ECM) are not bypassed. Please refer to the control application guide or manual for list of these faults.

Derate

The derate function reduces output power of the genset in response to a fault condition. If a derate command occurs while operating on an isolated bus, the control will issue commands to reduce the load on the genset via contact closures or ModBus. If a derate command occurs while in utility parallel mode, the control will actively reduce power by lowering the base load kW to the derated target kW.

Configurable alarm and status inputs

The control accepts up to four alarm or status inputs (configurable contact closed to ground or open) to indicate a configurable (customer-specified) condition. The control is programmable for warning, derate, shutdown, shutdown with cooldown or status indication and for labeling the input.

Emergency stop

Annunciated whenever either emergency stop signal is received from external switch.

General engine protection

Low and high battery voltage warning - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.

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

Fail to start (overcrank) shutdown - The control system will indicate a fault if the genset fails to start by the completion of the engine crack sequence.

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

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

Fault simulation –The control in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of the control and its interface 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 provided by the controller.

For lean burn natural gas engine applications:

Off load running (protection) – This feature protects the engine in the event the genset is being called to go off load for too long.

Hydro mechanical fuel system engine protection

Overspeed shutdown – Default setting is 115% of nominal Low lube oil pressure warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High lube oil temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High engine temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

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

Low coolant temperature warning – Can be set up to be a warning or shutdown.

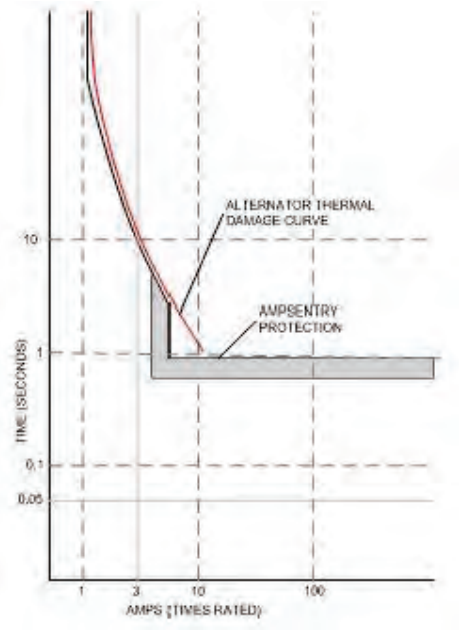
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Full authority electronic engine protection

Engine fault detection is handled inside the engine ECM. Fault information is communicated via the SAE-J1939 data link for annunciation in the HMI.

Alternator protection

AmpSentry protective relay - A 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 genset 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 for a full size time over current curve. The control does not included protection required for interconnection to a utility (mains) service.



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 0.1-10 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 2-20 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 V/Hz roll-off or synchronizing.

Under frequency shutdown (81 u) - Genset output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below reference governor set point, for a 5- 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.

Over frequency shutdown/warning (81o) - Genset is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for a 1-20 second time delay. Default: 6 Hz, 20 seconds, disabled.

Overcurrent warning/shutdown (51) - Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.

Loss of sensing voltage shutdown - Shutdown of genset will occur on loss of voltage sensing inputs to the control.

Field overload shutdown - Monitors field voltage to shutdown genset when a field overload condition occurs.

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 application 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. Default: 10%, 3 seconds.

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

Short circuit protection - Output current on any phase is more than 175% of rating and approaching the thermal damage point of the alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time.

Negative sequence overcurrent warning (46) – Control protects the generator from damage due to excessive imbalances in the three phase load currents and/or power factors.

Custom overcurrent warning/shutdown (51) – Control provides the ability to have a custom time overcurrent protection curve in addition to the AmpSentry protective relay function.

Ground fault overcurrent (51G) – Control detects a ground fault either by an external ground fault relay via a contact input or the control can measure the ground current from an external current transformer. Associated time delays and thresholds are adjustable via InPower or HMI.

Paralleling protection

Breaker fail to close warning: When the control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has closed. If the control does not sense a breaker closure within an adjustable time period after the close signal, the fail to close warning will be initiated.

Breaker fail to open warning: The control system monitors the operation of breakers that have been signalled to open. If the breaker does not open within and adjustable time delay, a Breaker Fail to Open warning is initiated.

Breaker position contact warning: The controller will monitor both ‘a’ and ‘b’ position contacts from the breaker. If the contacts disagree as to the breaker position, the breaker position contact warning will be initiated.

Breaker tripped warning: The control accepts inputs to monitor breaker trip / bell alarm contact and will initiate a breaker tripped warning if it should activate.

Fail to disconnect warning: In the controller is unable to open either breaker, a fail to disconnect warning is initiated. Typically this would be mapped to a configurable output, allowing an external device to trip a breaker.

Fail to synchronize warning: Indicates that the genset could not be brought to synchronization with the bus. Configurable for adjustable time delay of 10 -900 seconds, 120 default.

Phase sequence sensing warning: Verifies that the genset phase sequence matches the bus prior to allowing the paralleling breaker to close.

Maximum parallel time warning (power transfer control mode only): During closed transition load transfers, control independently monitors paralleled time. If time is exceeded, warning is initiated and genset is disconnected.

Bus or genset PT input calibration warning: The control system monitors the sensed voltage from the bus and genset output voltage potential transformers. When the paralleling breaker is closed, it will indicate a warning condition if the read values are different.

Field control interface

Input signals to the PowerCommand control include:

- Coolant level (where applicable)
- Fuel level (where applicable)
- Remote emergency stop
- Remote fault reset
- Remote start
- Rupture basin
- Start type signal
- Battle short
- Load demand stop
- Synchronize enable
- Genset circuit breaker inhibit
- Utility circuit breaker inhibit
- Single mode verify
- Transfer inhibit – prevent transfer to utility (in power transfer control mode)
- Retransfer inhibit – prevent retransfer to genset (in power transfer control mode)
- kW and kVAr load setpoints
- Configurable inputs - Control includes (4) input signals from customer discrete devices that are configurable for warning, shutdown or status indication, as well as message displayed

For lean burn natural gas engine applications:

- Gearbox oil pressure/temperature protection
- Fire fault
- Earth fault
- Differential fault
- DC power supply fault
- Genset Interface Box (GIB) isolator open fault
- Start inhibit/enable (x3)
- Radiator fan trip

- Ventilator fan trip
- Ventilation louvers closed
- Start system trip
- Alternator heater trip
- Alternator heater status
- Alternator winding temperature (PT100 RTDx3)
- Alternator drive end bearing temperature (PT100 RTD)
- Alternator non-drive end bearing temperature (PT100 RTD)

Output signals from the PowerCommand control include:

- Load dump signal: Operates when the genset is in an overload condition.
- Delayed off signal: Time delay based output which will continue to remain active after the control has removed the run command. Adjustment range: 0 - 120 seconds.
  Default: 0 seconds.
- Configurable relay outputs: Control includes (4) relay output contacts (3 A, 30 VDC). These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning and common shutdown.
- Ready to load (genset running) signal: Operates when the genset has reached 90% of rated speed and voltage and latches until genset is switched to off or idle mode.
- Paralleling circuit breaker relays outputs: Control includes (4) relay output contacts (3.5 A, 30 VDC) for opening and closing of the genset and utility breakers.

For lean burn natural gas engine applications:

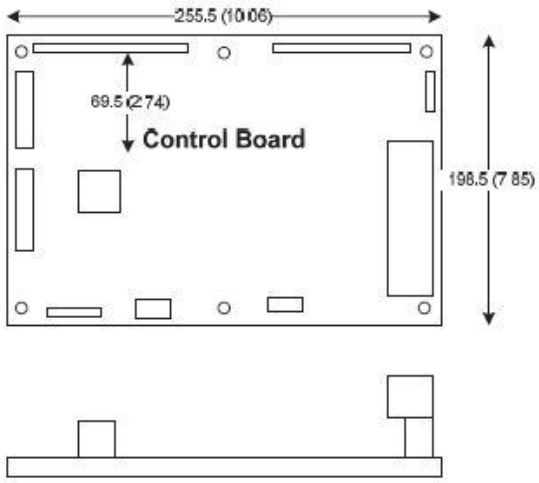
- Start inhibit/enable event
- Emergency stop event
- Ventilator fan run control
- Louvre control
- Radiator fan control
- Alternator heater control
- Engine at idle speed event

Communications connections include:

- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower software.
- ModBus RS-485 port: Allows the control to communicate with external devices such as PLCs using ModBus protocol.

  Note - An RS-232 or USB to RS-485 converter is required for communication between PC and control.
- Networking: This RS-485 communication port allows connection from the control to the other Cummins products.

Mechanical drawing



PowerCommand Human Machine Interface HMI320

Description

This control system includes an intuitive operator interface panel that allows for complete genset control as well as system metering, fault annunciation, configuration and diagnostics. The interface includes five genset status LED lamps with both internationally accepted symbols and English text to comply with customer's needs. The interface also includes an LED backlit LCD display with tactile feel soft-switches for easy operation and screen navigation. It is configurable for units of measurement and has adjustable screen contrast and brightness.

The run/off/auto switch function is integrated into the interface panel.

All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.

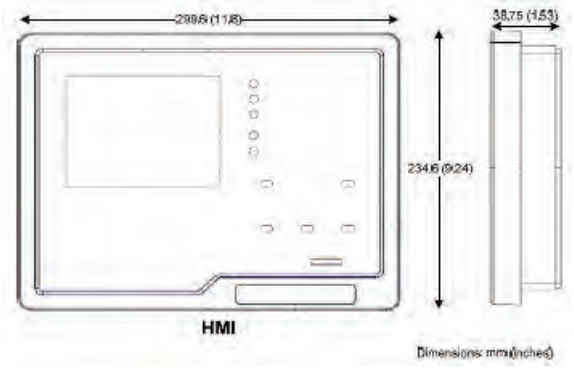
Features

- LED indicating lamps:
- Genset running
- Remote start
- Not in auto
- Shutdown
- Warning
- Auto
- Manual and stop
- Circuit breaker open (if equipped)
- Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Seven tactile feel membrane switches dedicated screen navigation buttons for up, down, left, right, ok, home and cancel.
- Six tactile feel membrane switches dedicated to control for auto, stop, manual, manual start, fault reset and lamp test/panel lamps.
- Two tactile feel membrane switches dedicated to control of circuit breaker (where applicable).
- Allows for complete genset control setup.
- Certifications: Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std. and CE standards.
- LCD languages supported: English, Spanish, French, German, Italian, Greek, Dutch, Portuguese, Finnish, Norwegian, Danish, Russian and Chinese characters.

Communications connections include:

- PC tool interface - This RS-485 communication port allows the HMI to communicate with a personal computer running InPower.
- This RS-485 communication port allows the HMI to communicate with the main control board.

Mechanical drawing



Software

InPower (beyond 6.5 version) is a PC-based software service tool that is designed to directly communicate to PowerCommand gensets and transfer switches, to facilitate service and monitoring of these products.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 ºC (-40 ºF) to +70 ºC (158 ºF), and for storage from -55 ºC (-67 ºF) to +80 ºC (176 ºF). Control will operate with humidity up to 95%, non-condensing.

The HMI is designed for proper operation in ambient temperatures from -20 ºC (-4 ºF) to +70 ºC (158 ºF), and for storage from -30 ºC (-22 ºF) to +80 ºC (176 ºF).

The control board is fully encapsulated to provide superior resistance to dust and moisture. Display panel has a single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments.

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

Certifications

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

- NFPA 110 for level 1 and 2 systems.
- ISO 8528-4: 1993 compliance, controls and switchgear.
- CE marking: The control system is suitable for use on generator sets to be CE-marked.
- EN 50081-1,2 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- Mil Std 202C, Method 101 and ASTM B117: Salt fog test.
- UL 508 recognized or Listed and suitable for use on UL 2200 Listed generator sets.
- CSA C282-M1999 compliance
- CSA 22.2 No. 14 M91 industrial controls.
- PowerCommand control systems and generator sets are designed and manufactured in ISO 9001 certified facilities.

Warranty

All components and subsystems are covered by an express limited one year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available.

PCCNet COMPATIBLE

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

Our energy working for you.™

S-1570 (08/17)

Alternator Data Sheet
Frame Size: LVSI804X

Characteristics

	No of Bearings:	1-bearing	2-bearing	
Weights:	Stator assembly:	N/A	10141 lb	4600 kg
	Rotor assembly:	N/A	6060 lb	2749 kg
	Complete assembly:	N/A	17954 lb	8144 kg
Maximum speed:		2250 rpm		
Excitation current:	Full load:	3.94 Amps		
	No load:	0.88 Amps		
Insulation system:	Class H throughout			

3 Ø Ratings (0.8 power factor)			**60 Hz** (winding no)			
			416 (12)	440 (12)	480 (12)	600 (07)
163° C rise ratings	@ 27° C	kW	3680	3592	3920	3920
		kVA	4600	4490	4900	4900
150° C rise ratings	@ 40° C	kW	3304	3496	3816	3816
		kVA	4130	4370	4770	4770
125° C rise ratings	@ 40° C	kW	3096	3272	3571	3571
		kVA	3870	4090	4464	4464
105° C rise ratings	@ 40° C	kW	2892	3056	3338	3338
		kVA	3615	3820	4172	4172
80° C rise ratings	@ 40° C	kW	2512	2640	2900	2900
		kVA	3140	3300	3625	3625

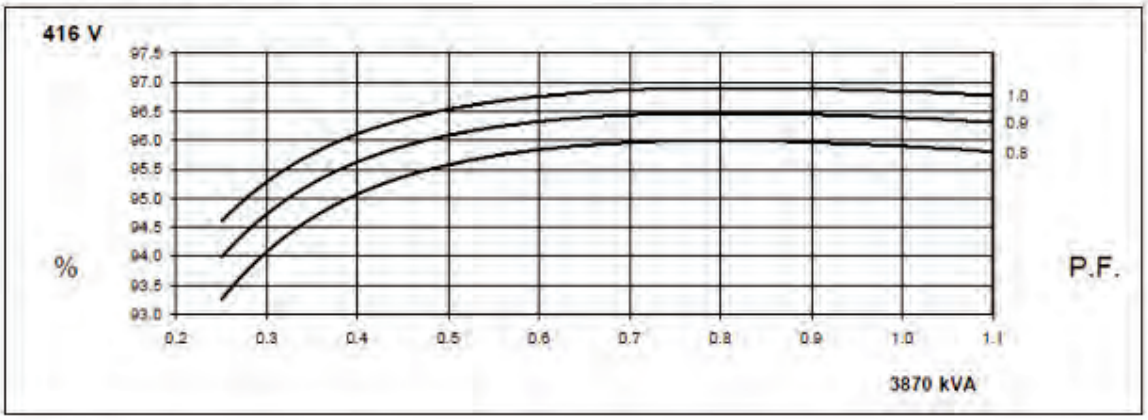
3 Ø Reactances (Based on full load at 125° C rise rating)	416 (12)	440 (12)	480 (12)	600 (07)
Synchronous	2.655	2.508	2.300	2.000
Transient	0.186	0.176	0.161	0.148
Subtransient	0.137	0.130	0.119	0.108
Negative sequence	0.197	0.186	0.171	0.156
Zero sequence	0.027	0.025	0.023	0.021

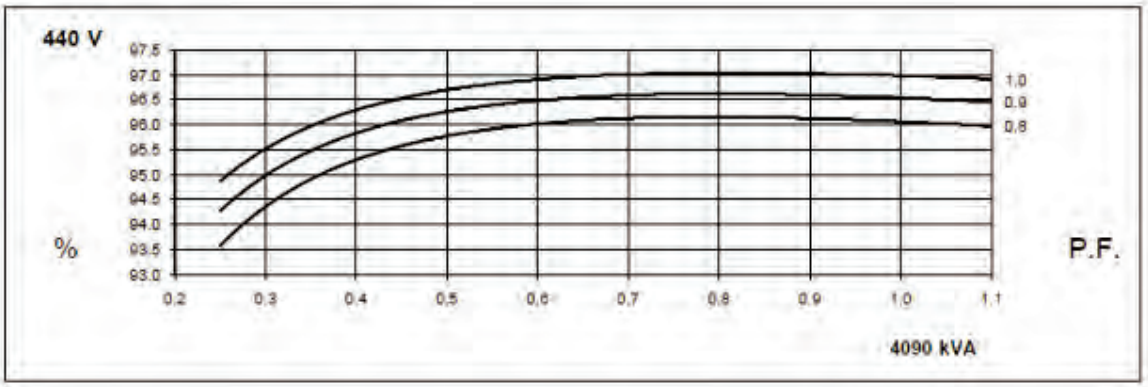
3 Ø Motor starting	416 (12)	440 (12)	480 (12)	600 (07)
Maximum kVA (90% sustained voltage)	14781	14781	14781	14781

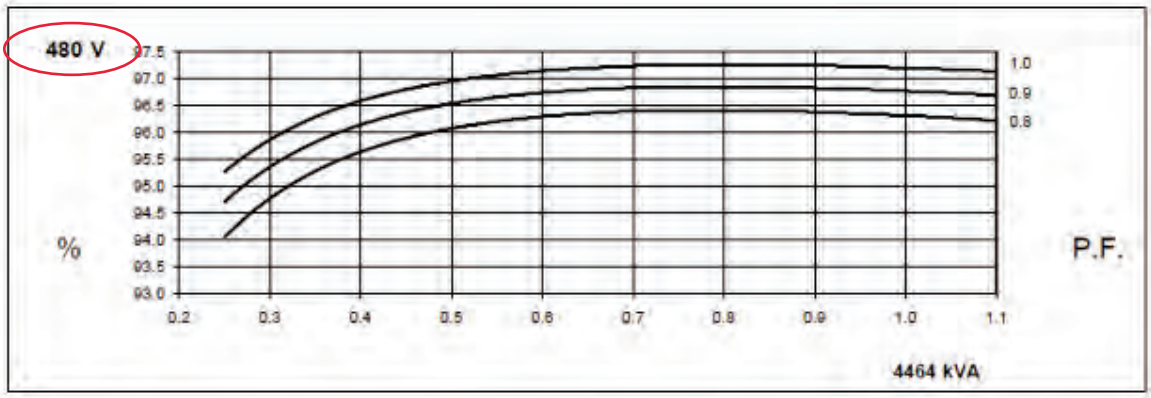
Time constants (sec)	416 (12)	440 (12)	480 (12)	600 (07)
Transient	0.213	0.213	0.213	0.212
Subtransient	0.016	0.016	0.016	0.016
Open circuit	5.100	5.100	5.100	5.180
DC	0.081	0.081	0.081	0.083

Windings (@20° C)	416 (12)	440 (12)	480 (12)	600 (07)
Stator resistance (L-L Ohms)	0.000512	0.000512	0.000512	0.000732
Rotor resistance (Ohms)	1.63	1.63	1.63	1.63
Number of leads	6	6	6	6

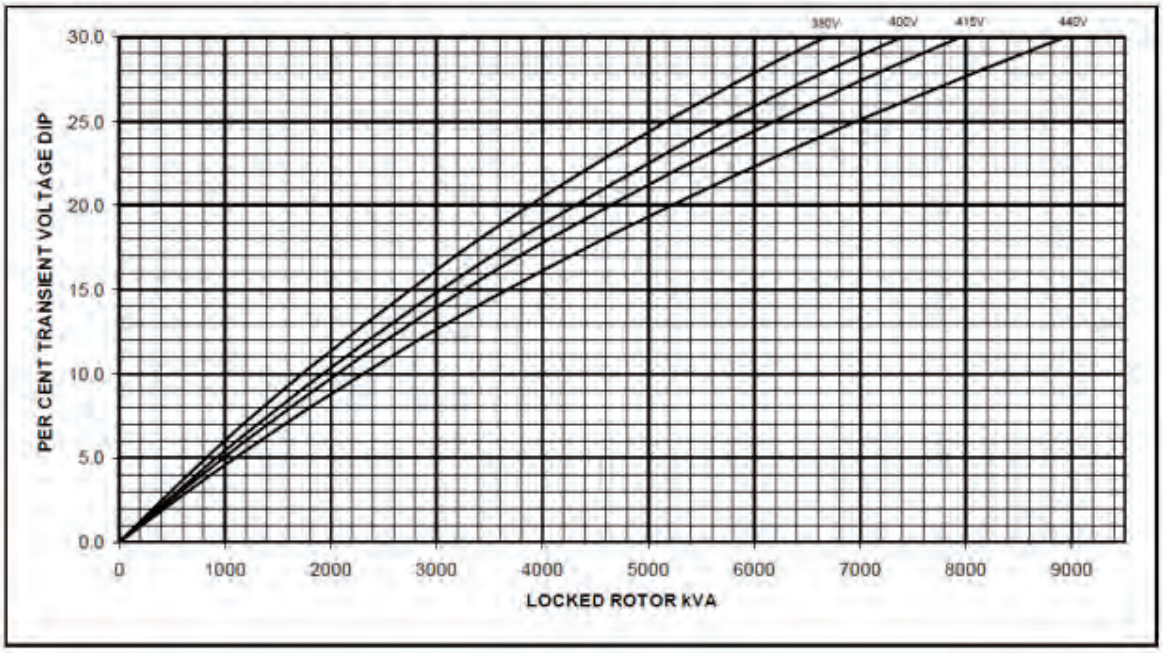
Three Phase Efficiency Curves WDG 12 60 HZ



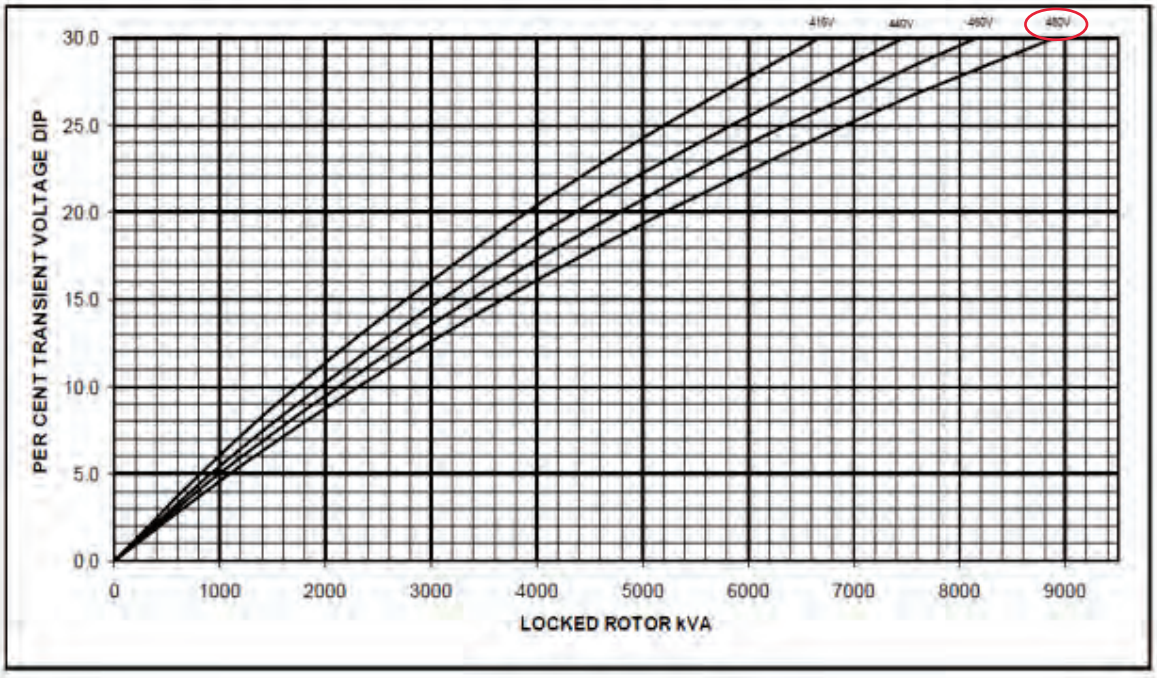




Locked Rotor Motor Starting Curve WDG 12 50 HZ



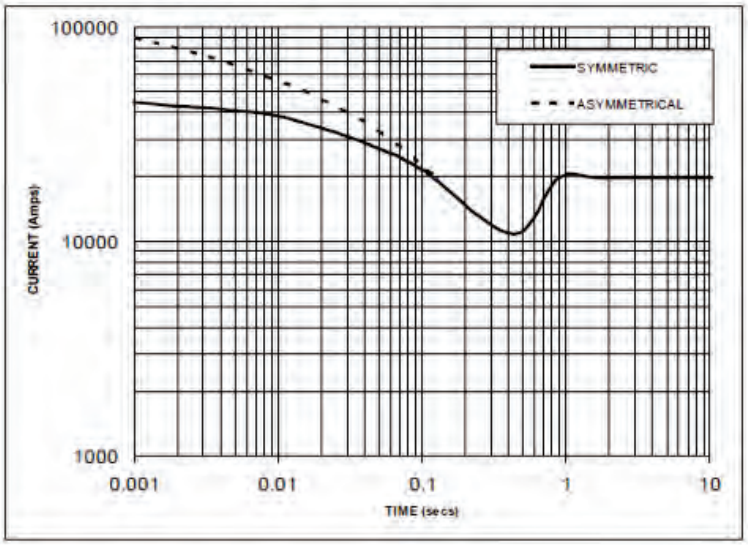
Locked Rotor Motor Starting Curve WDG 12 60 HZ



Three Phase Short Circuit Decrement Curve — WDG 12 — 50 HZ

No-Load Excitation at Rated Speed

Based on series star (wye) connection



NOTE 1
THE FOLLOWING MULTIPLICATION FACTORS SHOULD BE USED TO ADJUST THE VALUES FROM CURVES BETWEEN THE 0.001 SECONDS AND THE MINIMUM CURRENT POINT IN RESPECT OF NOMINAL OPERATING VOLTAGE

VOLTAGE	FACTOR
380V	X 0.95
400V	X 1.00
415V	X 1.04
440V	X1.10

THE SUSTAINED CURRENT VALUE IS CONSTANT IRRESPECTIVE OF VOLTAGE LEVEL

NOTE 2
THE FOLLOWING MULTIPLICATION FACTORS 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 1.0	X 0.87	X 1.30
MINIMUM	X 1.0	X 1.80	X 3.20
SUSTAINED	X 1.0	X 1.50	X 2.50
MAX SUSTAINED DURATION	10 SEC	5 SEC	2 SEC

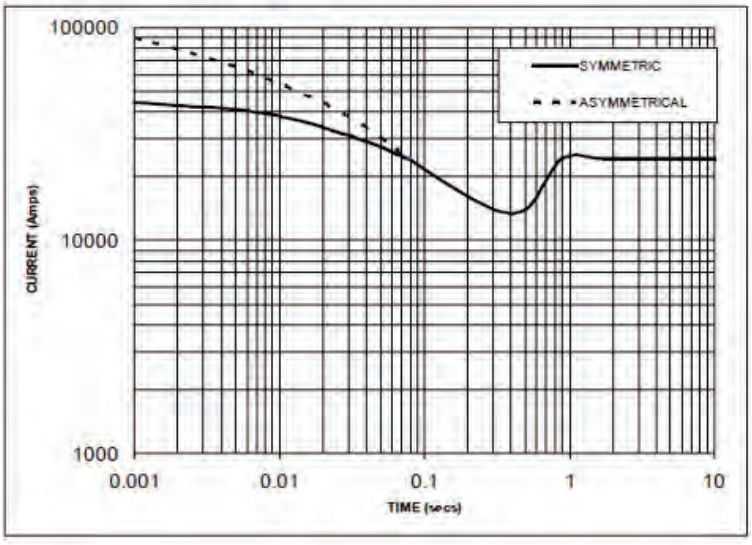
ALL OTHER TIMES ARE UNCHANGED

SUSTAINED SHORT CIRCUIT = 19758 Amps

Three Phase Short Circuit Decrement Curve — WDG 12 — 60 HZ

No-Load Excitation at Rated Speed

Based on series star (wye) connection



NOTE 1
THE FOLLOWING MULTIPLICATION FACTORS SHOULD BE USED TO ADJUST THE VALUES FROM CURVES BETWEEN THE 0.001 SECONDS AND THE MINIMUM CURRENT POINT IN RESPECT OF NOMINAL OPERATING VOLTAGE

VOLTAGE	FACTOR
416V	X 0.87
440V	X 0.92
460V	X0.96
480V	X1.00

THE SUSTAINED CURRENT VALUE IS CONSTANT IRRESPECTIVE OF VOLTAGE LEVEL

NOTE 2
THE FOLLOWING MULTIPLICATION FACTORS 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 1.0	X 0.87	X 1.30
MINIMUM	X 1.0	X 1.80	X 3.20
SUSTAINED	X 1.0	X 1.50	X 2.50
MAX SUSTAINED DURATION	10 SEC	5 SEC	2 SEC

ALL OTHER TIMES ARE UNCHANGED

SUSTAINED SHORT CIRCUIT = 24162 Amps

Prototype Test Supported Emergency/Standby Generator Sets Certification

Cummins Power Generation certifies that its commercial generator sets bearing the Prototype Test Supported (PTS) seal have been subjected to a design and development process that includes extensive prototype testing and evaluation. A PTS production model is engineered and manufactured according to documentation developed through comprehensive research, design and design verification.

Design verification is based on tests of preproduction prototype models manufactured specifically for prototype test purposes and not sold as new equipment. To be certified as a PTS model, the generator set must satisfy these prerequisites:

DESIGN - The PTS certified generator set must be designed specifically for emergency/standby applications that require high reliability and rapid response.

PROTOYPE TESTING - Design suitability of the PTS certified generator set must be proven by tests on preproduction prototype models. The prototype test program is intended to:

1. Confirm the engine and generator have reserve capacity beyond rating to minimize the potential of damage or shutdown during steady state or transient loading conditions, including momentary overloads.

2. Demonstrate generator set, controls and accessories capability to perform reliably and compatibly in service during disturbances common in actual load circuits.

3. Verify the integrity of the generator and excitation system insulation systems and electrical components to withstand heating under rated load and transient overcurrent conditions.

4. Evaluate generator set mechanical and electrical strength to perform without damage during abnormal operating conditions, such as short circuits or out-of-phase paralleling. While operating at rated load, the generator set must be subjected to several 3-phase short circuits of 20 second duration. After the tests, the generator set is inspected to verify that no electrical or mechanical damage was incurred by any components.

5. Determine by endurance testing that no resonance conditions exist in the generator set or accessories that will cause premature failure of components on production units.

6. Investigate and identify failure modes to minimize the risk of any single component failure or human error that could lead to lack of essential electrical supply.

7. Provide a margin of safety, by actual trials, between the generator set component design and protection systems so that the components are not damaged before the protective devices activate a shutdown.

DOCUMENTATION AND SOFTWARE - The PTS certified generator set must be documented in a single drawing package with all components identified with Cummins Power Generation part numbers. A PTS test certificate must be created for each PTS generator set certifying the PTS testing performed.

QUALITY ASSURANCE - Engineering drawings, specifications and test requirements for a PTS certified generator set must be classified by components and assembly quality characteristics. A component and process inspection and test plan must be developed and maintained to measure product conformance to documentation requirements.

PRODUCTION MODEL TESTING - PTS certified generator sets must be subjected to complete production tests that demonstrate conformance to specifications at all rated conditions, including start-up, full load pickup and a performance run at full rated load and power factor.

Prototype Test Support (PTS)
60 Hz test summary

Generator set models

2500DQKAN

Representative prototype

Model: 2500DQKAN
Alternator: LVSI804X
Engine: QSK60-G19

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: 2568 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 in excess of 2500 psi. A spectrum analysis of the transducer output was conducted over the speed range of 1350 to 1860 RPM.

Cooling system: Enhanced high ambient 0.50 in H2O restriction

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

Durability:

The generator set was subjected to endurance test replicating field duty cycles 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. It was within the specified maximum limits.

Voltage regulation:	± 0.5%
Random voltage variation:	± 0.5%
Frequency regulation:	Isochronous
Random frequency variation:	± 0.25%

Transient performance:

The generator set was tested with the listed 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 at 0.8 power factor:

Full load acceptance:

Voltage dip:	41.9%
Recovery time:	6.1 seconds
Frequency dip:	12.0%
Recovery time:	6.8 seconds

Full load rejection:

Voltage rise:	16.0%
Recovery time:	3.6 seconds
Frequency rise:	4.8%
Recovery time:	2.4 seconds

All data based on 0.8 power factor:

Harmonic analysis:

(per alternator LVSI804X, MIL-STD-705B, method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No load	Full load	No load	Full load
3	0.06	0.18	0.06	0.08
5	0.86	1.20	0.87	1.24
7	0.72	1.96	0.76	1.96
9	0	0	0	0
11	0.39	0.65	0.40	0.64
13	0.13	0.48	0.14	0.46
15	0	0	0	0

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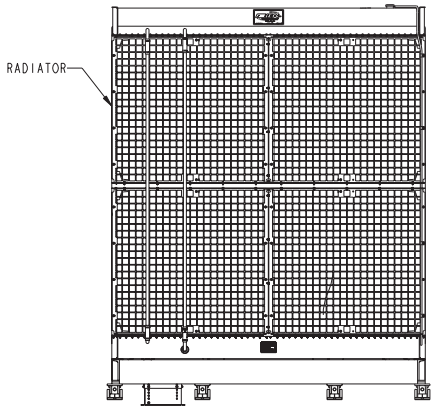
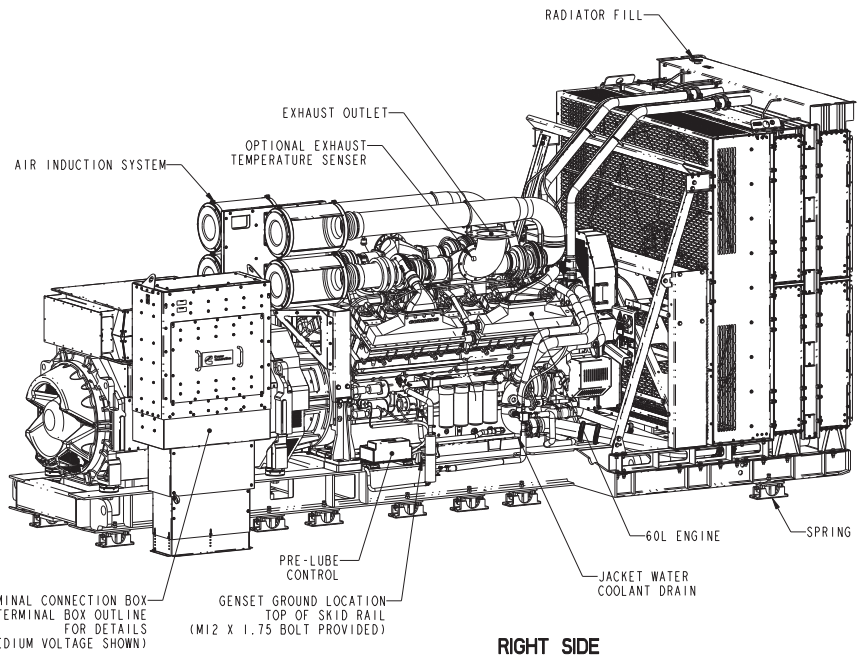
REL NO	REV	NO	REVISION	DRN	CKD	APVD	DATE
ECO-156405	A	1	PRODUCTION RELEASE	SLO	DEM	D. MALONE	10DEC15



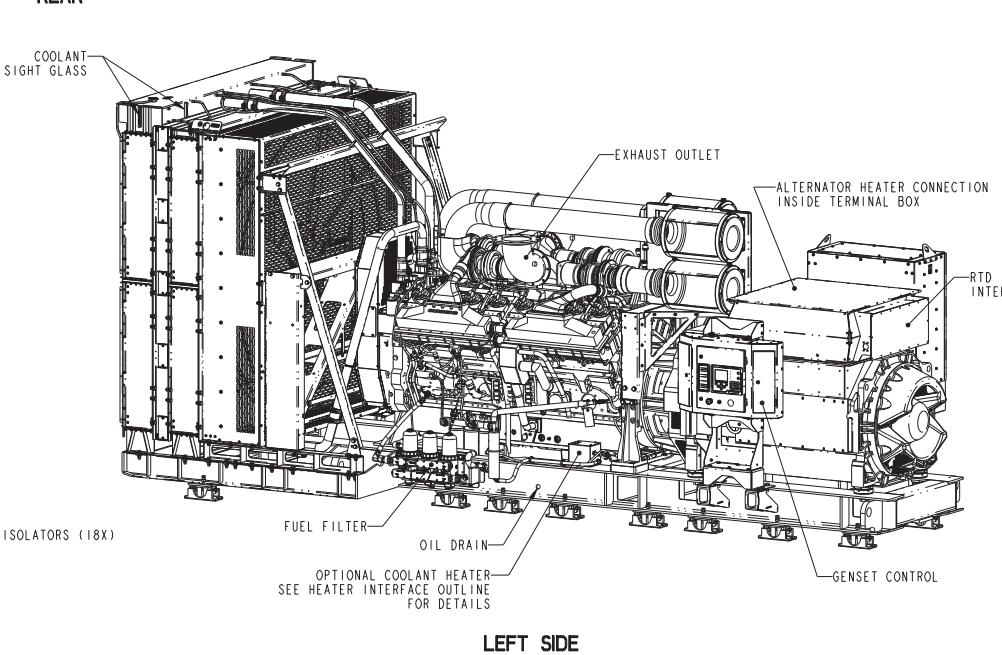
REAR

NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. ALL DIMENSIONS ARE REFERENCE BASED ON CAD DATA.
3. PROVIDE FLEXIBLE CONDUIT TO CONTROL BOX.
4. GENSET SHIPPED FILLED WITH OIL.
5. SUPPLIED FUEL HOSE:
   - 5.1. FUEL INLET HOSE 25 [1] X 1270 [50] LONG WITH 1-11 1/2 NPT EXTERNAL FITTING.
   - 5.2. FUEL OUTLET HOSE 16 [.6] X 1270 [50] LONG WITH 3/4-14 NPT EXTERNAL FITTING.
6. COMMON REFERENCE POINT ON GENSET SKID (——►) POINTS TO ANCHORING HOLE ON SKID. (SHEET 3)
7. FOR C OF G VALUE SEE SHEET 2.



RIGHT SIDE



LEFT SIDE

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO	DRN S. OSVOLD	CUMMINS POWER GENERATION		
DIM X ±- .X ±- .XX± - / 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 D. MALONE	OUTLINE, GENSET		
		APVD D. MALONE			
		DATE 03DEC15	SITE CODE		
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Drawing Name: A054H275 Revision: A
Part Name: A054H274 Revision: A
Sheet 1 of 6

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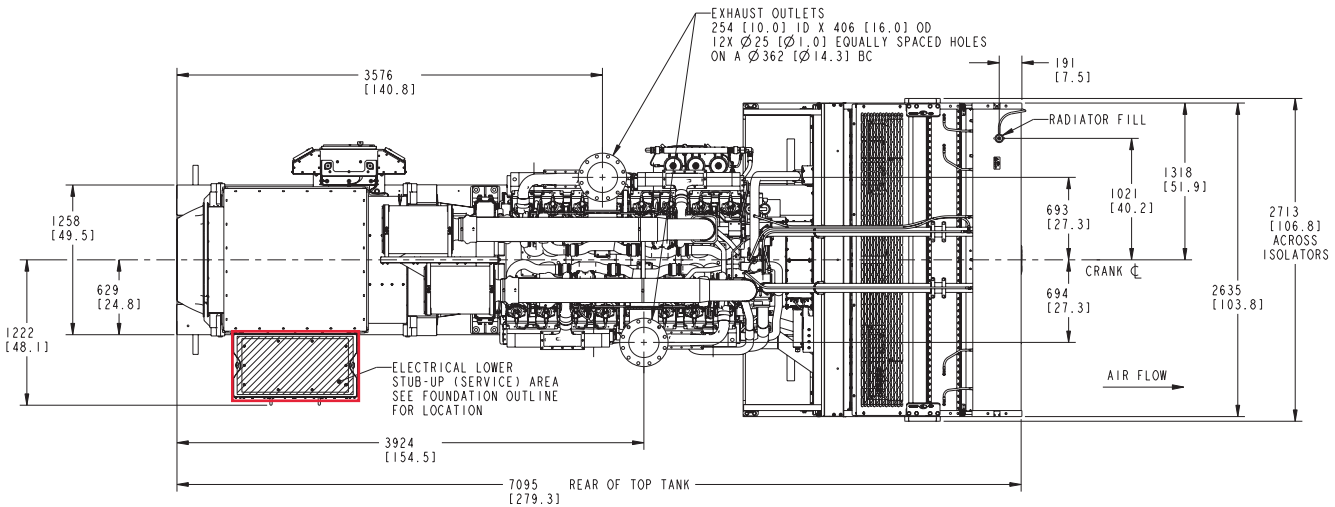
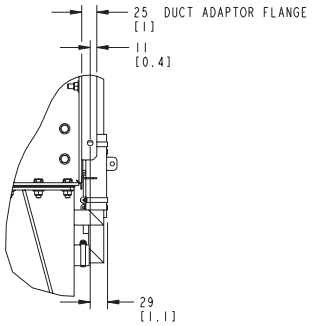
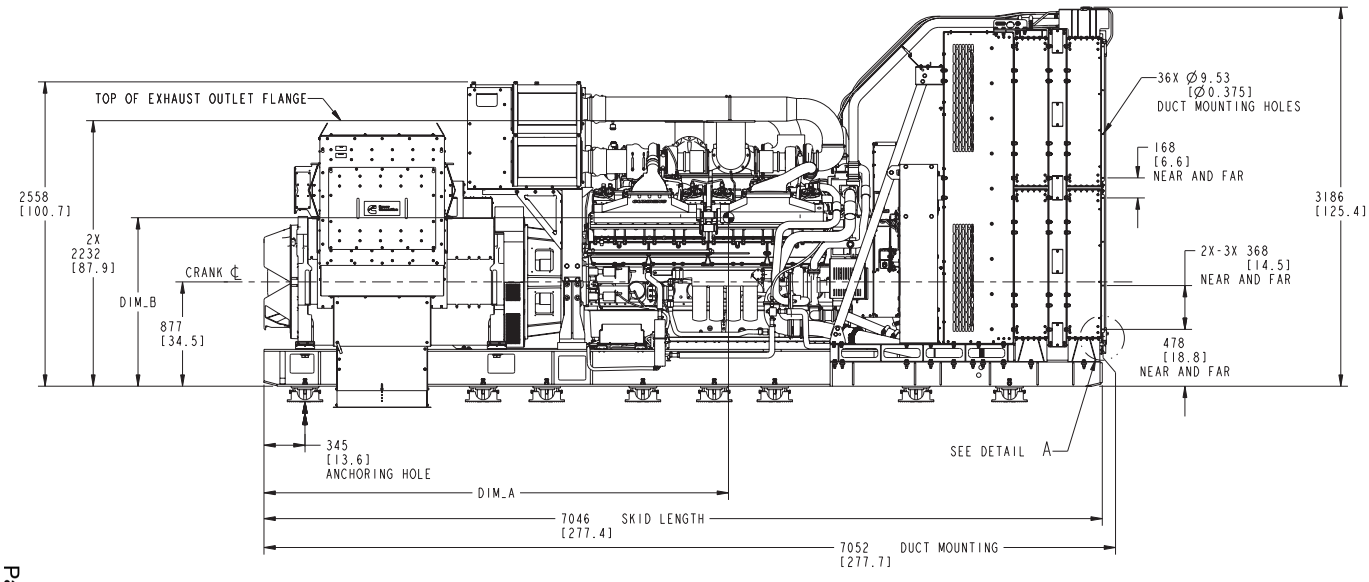
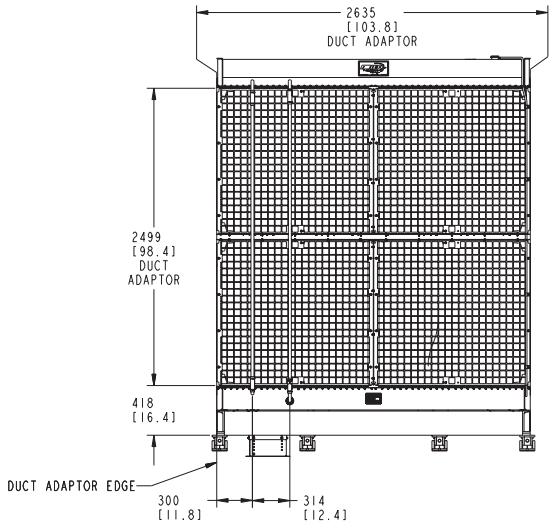
REL NO	REV	NO	REVISION	DRN	CKD	APVD	DATE
ECO-156405	A	1	PRODUCTION RELEASE	SLO	DEM	D. MALONE	10DEC15









TABULATION						
ALTERNATOR FRAME SIZE	DIM_A C.G.	DIM_B C.G.	GENSET WEIGHT			
			DRY KGS	DRY LBS	WET KGS	WET LBS
P80X	3239	937.25	22887	50457	23299	51366

see below drawings for overall shipping weight and dimensions

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DO NOT SCALE PRINT
DIM: X ± - / .X ± - / .XX± -
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
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SCALE 1:20
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DRN S. OSVOLD
CKD D. MALONE
APVD D. MALONE
DATE 03DEC15
FOR INTERPRETATION OF DIMENSIONS, TOLERANCING, AND TERMINOLOGY USE ASME Y14.5-2009
FIRST USED ON DQKAN
CUMMINS POWER GENERATION
OUTLINE, GENSET
SITE CODE PGF
SIZE D
A054H274
CAD SHEET 2 OF 5

Drawing Name: A054H275 Revision: A
Part Name: A054H274 Revision: A
Sheet 2 of 6

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REL NO	REV	NO	REVISION	DRN	CKD	APVD	DATE
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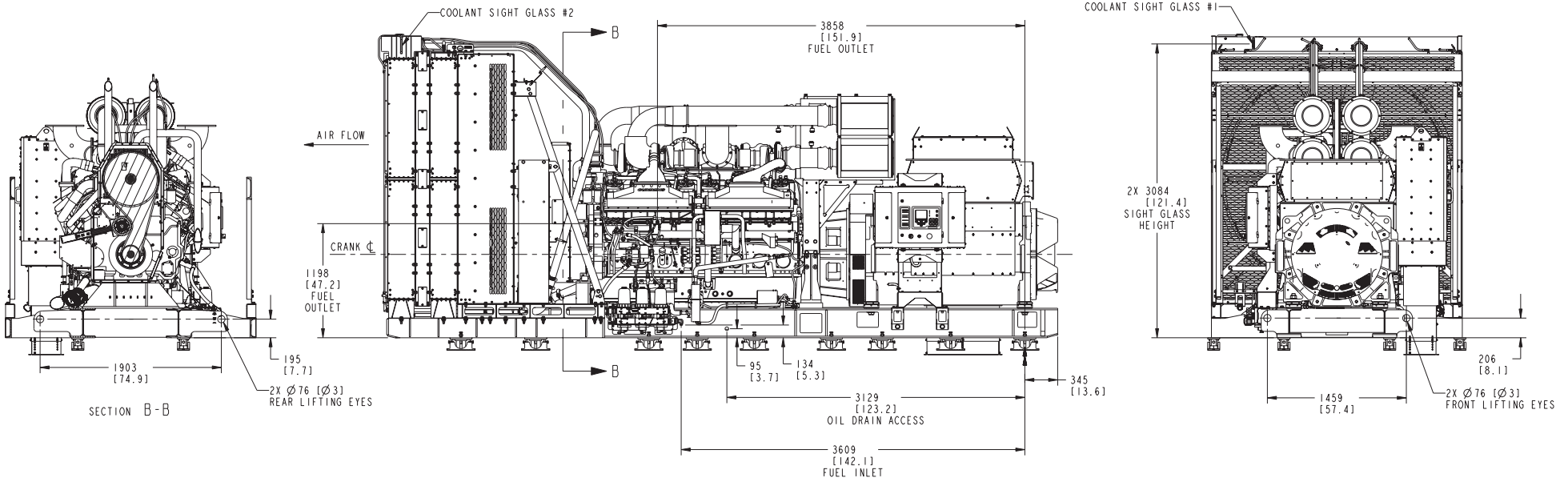
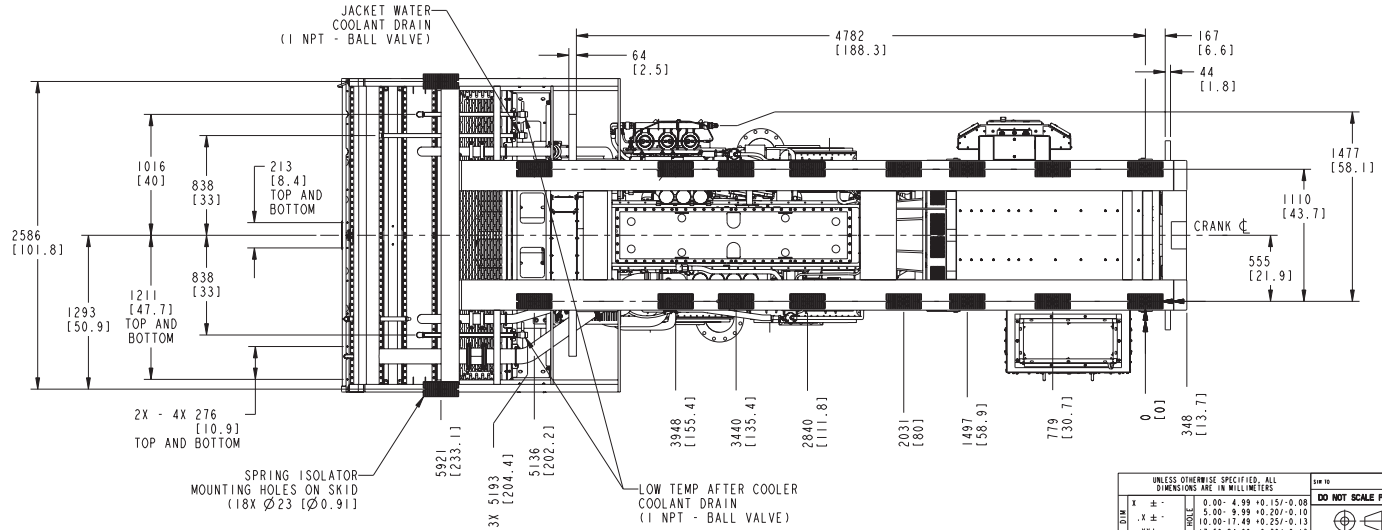


SECTION B-B



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DIM X ± - .X ± - .XX± -	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 D. MALONE; APVD D. MALONE; DATE 03DEC15	OUTLINE, GENSET
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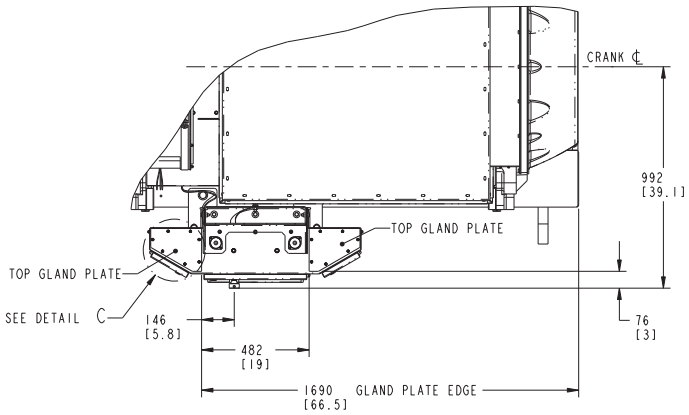
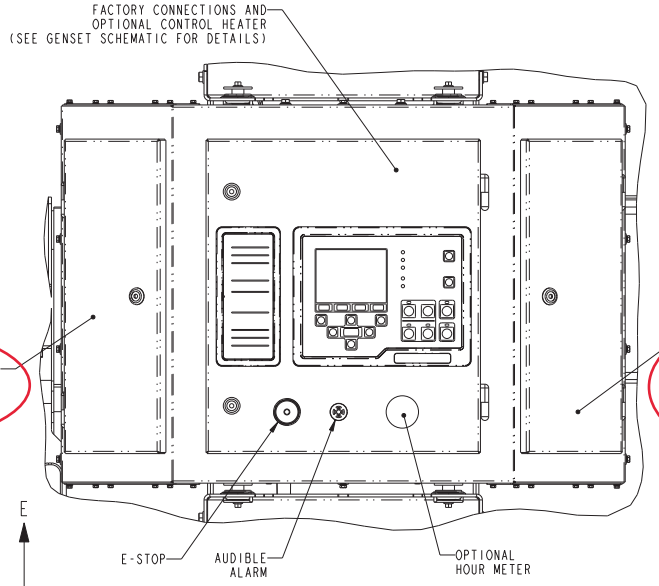
Drawing Name: A054H275 Revision: A
Part Name: A054H274 Revision: A
Sheet 3 of 6

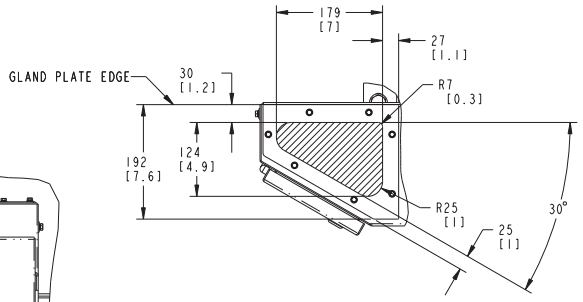
PTC® Creo® Parametric

REL NO	REV	NO	REVISION	DRN	CKD	APVD	DATE
ECO-156405	A	1	PRODUCTION RELEASE	SLO	DEM	D. MALONE	10DEC15

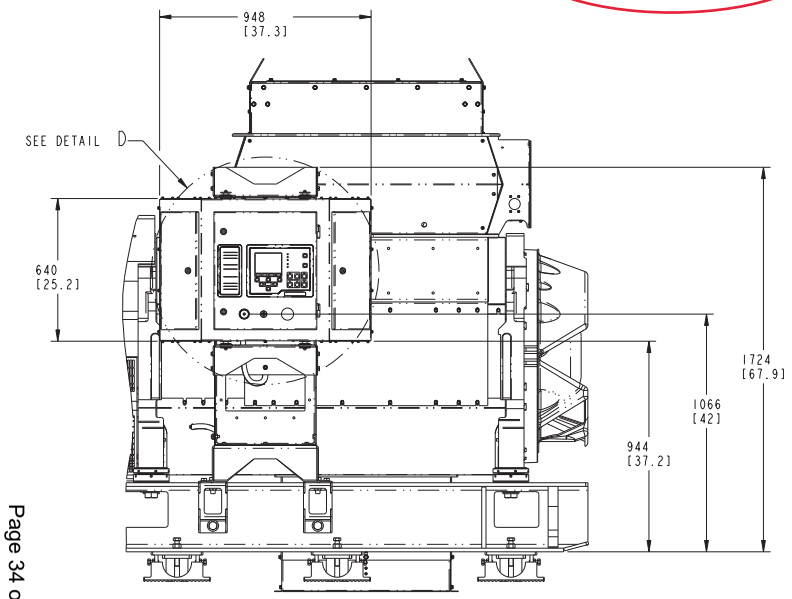


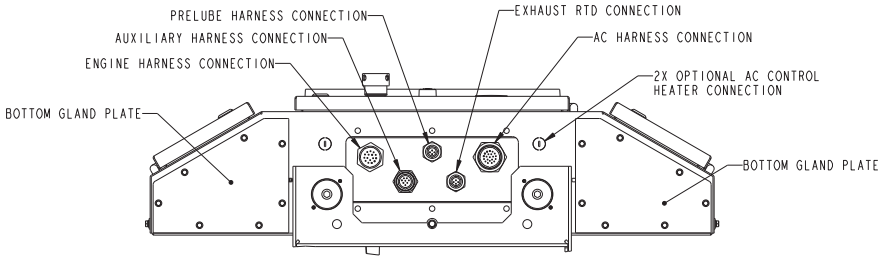


DETAIL D
SCALE 1:4



DETAIL C
TYPICAL GLAND PLATE KNOCKOUT AREA
SCALE 1:4





VIEW E-E

CONTROL BOX

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DIM: X ± - / .X ± - / .XX± -	DO NOT SCALE PRINT	CKD D. MALONE			
BOLT: 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		APVD D. MALONE	OUTLINE, GENSET		
		DATE 03DEC15	SITE CODE		
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Drawing Name: A054H275 Revision: A
Part Name: A054H274 Revision: A
Sheet 4 of 6

PTC® Creo® Parametric

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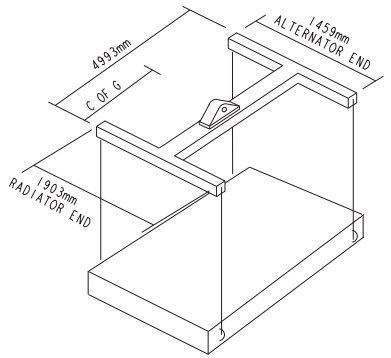
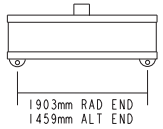
ECO-156405	A	1	PRODUCTION RELEASE	SLO	DEM	D.MALONE	10DEC15

LIFTING ARRANGEMENT FOR GENSET

FOR C OF G VALUE REFER TO SHEET 2

1. IDEAL
LIFTING FRAME AND STROPS



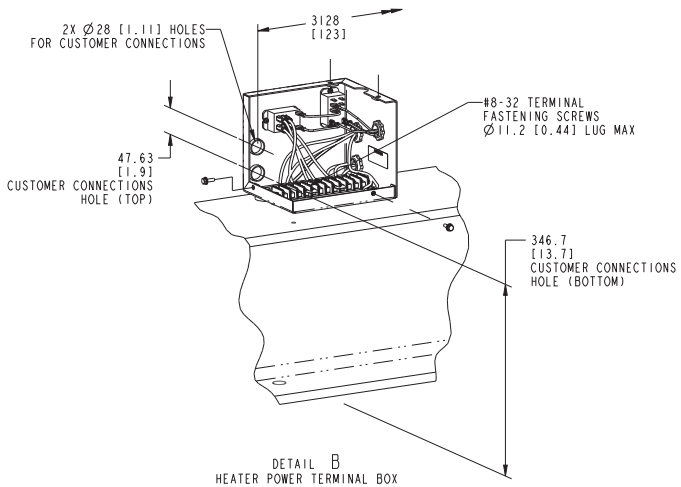


UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO	DRN S. OSVOLD	CUMMINS POWER GENERATION		
DIM: X ± - / .X ± - / .XX± -	DO NOT SCALE PRINT	CKD D. MALONE			
RANGE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13		APVD D. MALONE	OUTLINE,GENSET		
		DATE 03DEC15	SITE CODE		
ANG TOL ± -	SCALE 1:20	FIRST USED ON DQKAN	PGF	SIZE D	A054H274
					CAD SHEET 5 OF 5

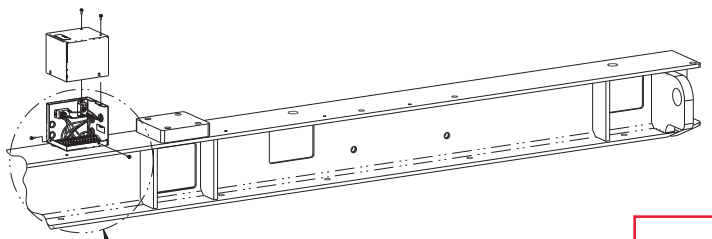
FOR INTERPRETATION OF GEOMETRIC TOLERANCING, USE ASME Y14.5-2009

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-166203	C	1	ZONES A5,A6,B5,B6;UPDATE VIEW PICTORIALLY	TDV	DPA	H.KHOR	20JAN17



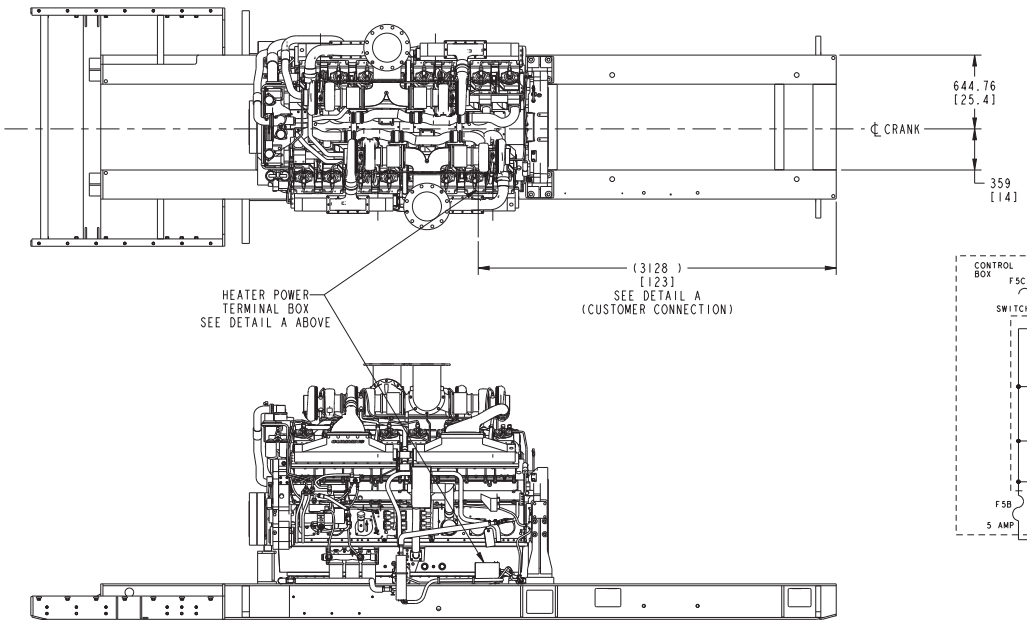
DETAIL B
HEATER POWER TERMINAL BOX
SCALE 1:4

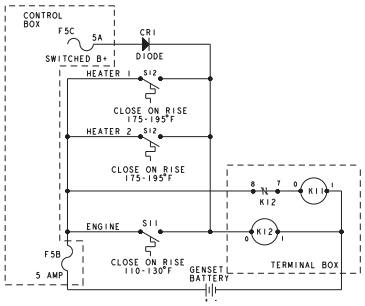


ISOMETRIC VIEW
COMPONENTS REMOVED FOR CLARITY
SCALE 1:10

NOTES:

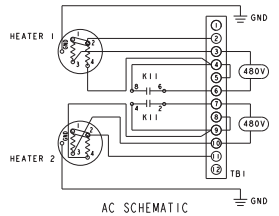
1. DIMENSIONS IN [ ] ARE INCHES.
2. ALL DIMENSIONS ARE REFERENCE BASED ON CAD DATA.
3. THE HEATER CONTROL RELAY DRAWS 83mA OF CURRENT WHEN THE HEATERS ARE UNPOWERED.
   3.1 HEATERS ARE NOT POWERED WHEN THE ENGINE HAS REACHED DESIGN TEMPERATURE OR
   3.2 THE ENGINE IS RUNNING.
4. JUMPERS ARE FACTORY INSTALLED IN THE 480 VOLT CONFIGURATION FOR 240 - 208 VOLT MOVE JUMPERS AS SHOWN
5. A BATTERY CHARGER IS REQUIRED TO PREVENT BATTERY DISCHARGE.





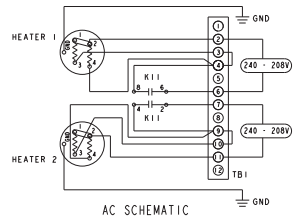
DC SCHEMATIC

4 480 VOLT CONNECTION



AC SCHEMATIC

4 240 - 208 VOLT CONNECTION



AC 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

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH
DO NOT SCALE PRINT
CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN	D. CARPENTER
CKD	J. CRAWFORD
APVD	R. GERASCH
DATE	02MAY13
FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES SEE ASME Y14.5M-1994	FIRST USED ON DOKAN

CUMMINS POWER GENERATION

OUTLINE, HEATER INTERFACE

SITE CODE	SIZE	DRAWING NO	SHEET	REV
PGF	D	A046E742	1 of 1	C

Drawing Name: A046E743 Revision: C
Part Name: A046E742 Revision: C
ECO-166203 Sheet 1 of 2

Our energy working for you.™

Power Generation

Limited Warranty

Commercial Generating Set

This limited 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. See table for details.

Continuous Power (COP) is defined as being the maximum power which the generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year. No overload capability is available for this rating.

Prime Power (PRP) is defined as being the maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the PRP. For applications requiring permissible average output higher than stated, a COP rating should be used.

Limited-Time Running Power (LTP) is defined as the maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year.

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 or under test conditions for up to 500 hours of operation per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Environmental Protection Agency – Stationary Emergency (EPA-SE) is defined as being the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generator set is capable of delivering in the event of a utility power outage or under test conditions and used in strict accordance with the EPA NSPS for stationary engines, 40 CFR part 60, subparts IIII and JJJJ, where a reliable utility must be present. The permissible average power output over 24 hours of operation shall not exceed 70% of the EPA-SE.

Data Center Continuous (DCC) is defined as the maximum power which the generator is capable of delivering continuously to a constant or varying electrical load for unlimited hours in a data center application.

Base Warranty Coverage Duration (Whichever occurs first)

Rating	Months	Max. Hours
COP	12	Unlimited
PRP	12	Unlimited
LTP	12	500 hrs
ESP	24	1000 hrs
EPA-SE	24	Unlimited
DCC	24	Unlimited

† Warranty start date for designated rental and oil and gas model Products is determined to be date of receipt of Product by the end customer.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the 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.
- 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 warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Inappropriate use of an EPA-SE application generator set relative to EPA's standards.
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- 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.
- 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 warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Damage to customer property.

A "Data center" is defined as a dedicated facility that house computers and associated equipment for data storage and data handling.

Reliable utility is defined as utility power without routine or regularly scheduled black-outs.

Please contact your local Cummins Power Generation® Distributor for clarification concerning these limitations.

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.

Extended Warranty:

Cummins Power Generation® offers several levels of Extended Warranty Coverage. Please contact your local Cummins Power Generation ® Distributor for details.
www.power.cummins.com

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 warranty shall be enforced to the maximum extent permitted by applicable law. This limited 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:_____