



Sales and
Service

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Section I

Bill of Material

Feature Code	Description	Qty
C1500D6E	C1500D6E, Diesel Genset, 60Hz, 1500kW	2
Install-US-Stat	U.S. EPA, Stationary Emergency Application	
C1500D6E	C1500D6E, Diesel Genset, 60Hz, 1500kW	
L170-2	Emission Certification, EPA, Tier 2, NSPS CI Stationary Emergency	
L090-2	Listing - UL 2200	
L224-2	IBC Seismic Certification	
A331-2	Duty Rating - Standby Power (ESP)	
R184-2	Low Voltage (220/380V - 347/600V)	
R002-2	Voltage - 277/480, 3 Phase, Wye, 4 Wire	
E170-2	Ambient Temperature (40C/104F)	
E169-2	240VAC	
KR78-2	Output Terminals - 2 - Hole Lug, NEMA	
BE09-2	80C Temperature Rise	
B601-2	Alternator - 60Hz, 3Phase, 480 Volt, 80C - Standby	
B244-2	Bearing Temperature Sensor RTDs	
J047-2	Generator Louvers	
A293-2	Alternator Heater, 240 Volt AC	
H679-2	Control Mounting - Front Facing	
KX21-2	Generator Set Control - PowerCommand 3.3, Paralleling with MLD	
H536-2	Control Display Language - English	
H606-2	Analog Meters - AC Output	
H720-2	AmpSentry™ UL Listed Protective Relay	
KA08-2	Alarm - Audible, Engine Shutdown	
H678-2	LCD Control Display	
K020-2	Display, Running Time	
KS53-2	Signals - Auxiliary, 8 Inputs/8 Outputs	
KX24-2	Relays - User Configured	
M683-2	Circuit Breaker or Entrance Box - Single	
M702-2	Motorized Circuit Breaker - Right	
0431	CB dual breaker type None	
KB72-2	Right Side Breaker - Bottom Entry, Right Side	
KP82-2	Circuit Breaker - 2500A, 3P, 600 / 690V, UL / IEC, Right	
0440	Circuit Breaker or Entrance Box - None - Left	
M694-2	Circuit Breaker Access Heater - Right Side	
A333-2	Battery Charging Alternator	
C325-2	Fuel Filters - Engine, Single	
H756-2	Water in Fuel (WIF) sensor	
H545-2	Low fuel pressure sensor	
H389-2	Shutdown - Low Coolant Level	
H527-2	Warning - Low Coolant Level	
E166-2	Temperature independent coolant heater (208/240)	
D041-2	Engine Air Cleaner - Normal Duty	
DC02-2	Air cleaner restriction indicator (Mechanical)	
H479-2	Engine Oil Heater - 208/240 Volts AC, Single Phase	
H607-2	Engine Oil Filters, Full Flow with Bypass	
H734-2	Oil Sampling Valve	
A334-2	Engine Starter - 24 Volt DC Motor	
C333-2	Fuel Hoses	
L050-2	Literature - English	
L186-2	Standby 5 Year 2500 Hour Parts+Labor	
A358-2	Packing - None	

NOTES:

Proposal is for equipment only, offloading, rigging, and installation by others.
 Fuel and permits, unless listed above, is not included.
 Cummins Standard Start-up and testing is included. Additional tests, such as NETA testing, if required, is by others
 Coordination Study not provided.

Section II

QTY. 2

Specification sheet



Diesel Generator set QSK38 engine series

1250 kW-1500 kW 60 Hz
EPA emissions



Description

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

Features

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

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

G3 Capable – Consult factory for related performance rating as per ISO8528-5

HVO Fuel Compatible – Approved for use with paraffinic fuels (EN15940), including Hydrotreated vegetable oil which has a very low life cycle carbon emission

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 and auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard and enhanced integral set-mounted radiator systems, 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 standard three-year warranty and worldwide distributor network.

Model	Standby rating	Prime rating	Data Center Continuous rating	Emissions compliance
	60 Hz kW (kVA)	60 Hz kW (kVA)	60 Hz kW (kVA)	EPA
C1250D6E	1250 (1563)	1136 (1420)	1136 (1420)	EPA Tier 2
C1500D6E	1500 (1875)	1364 (1705)	1364 (1705)	EPA Tier 2

Generator set specifications

Performance Class	ISO 8528-5 G3 Capable - refer to the factory for site and configuration specific transient performance classification
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 1%
Frequency regulation	Isochronous
Random frequency variation	± 0.25
Electromagnetic Compatibility Performance	Emissions to EN 61000-6-2:2005 Immunity to EN 61000-6-4:2007+A1:2011 FCC PART 15 subpart B; ICES-002

Engine specifications

Bore	159 mm (6.26 in.)
Stroke	159 mm (6.26 in.)
Displacement	37.8 litres (2307 in ³)
Configuration	Cast iron, V 12 cylinder
Battery capacity	1800 amps minimum at ambient temperature of -18 °C (0 °F)
Battery charging alternator	100A
Starting voltage	24 volts, negative ground
Fuel system	Cummins YZ modular common rail system
Fuel filter	Two stage spin-on fuel filter and water separator system. Stage 1 has a two element 5 micron filter and stage 2 has a two element 4 micron filter.
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	Single bearing, flexible disc
Insulation system	Class H
Standard temperature rise	125 °C 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

Available voltages

60 Hz Line-Neutral/Line-Line

- 220/380 • 225/440 • 2400/4160 • 3810/6600 • 6350/11000
- 277/480 • 347/600 • 3637/6300 • 3983/6900

Note: Consult factory for other voltages.

Generator set options and accessories

Engine

- 240V thermo-statically controlled coolant heater
- ✓ 120/240V 500W lube oil heaters
- Heavy duty air cleaner
- Remote Duplex Fuel Filter
- Engine Oil Filters - Full Flow with Bypass
- Automatic Oil Make Up System and Monitoring
- Engine toolkit

Alternator

- ✓ 80°C/105°C/125°C/150°C rise
- Stator winding temp sensor 2 RTDs/phase
- ✓ Bearing temp sensor RTDs
- 1-hole or 2-hole lug output terminal
- Cable entrance box set mounted top or bottom entry
- ✓ 120/240V 225W anti-condensation heater
- ✓ Generator Louvres

Control panel

- ✓ Masterless Load Demand
- Multiple language support
- 120/240V 100W control anti-condensation heater
- Exhaust pyrometer
- Ground fault indication
- Paralleling relay package
- Shutdown alarm relay package
- Mechanical hour meter
- 6x user-configurable relays
- ✓ 8 additional I/O relays

Generator set options and accessories (continued)

Exhaust system

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

Cooling system

- Enhanced high ambient temperature (50 °C)
- ✓ Low coolant level warning
- ✓ Coolant heater

Generator set

- ✓ Oil Sampling Valve
- 10A battery charger
- ✓ Set mounted circuit breakers up to 3200 Amps
- Circuit breaker Aux and Trip contacts
- Anti-vibration mounts
- Battery temperature sensor
- ✓ IBC Certification
- HCAI Certification

Miscellaneous

- Multilingual manuals
- 3-year extended warranty
- ✓ 5-year extended warranty
- 10-year extended warranty
- Witness testing
- Virtual witness test
- Tier 4 compliant aftertreatment kits shipped loose

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

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.

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
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Full authority electronic engine protection

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)

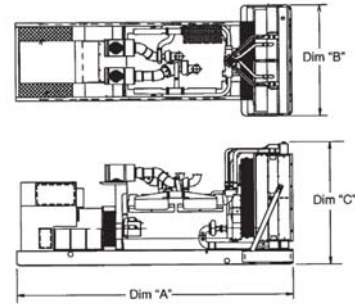
Ratings definitions

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, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550

Prime Power (PRP):

Applicable for supplying power to varying electrical loads for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550



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

Do not use for installation design





Refer to drawings for specific weights & dimensions

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
C1250D6E	5085 (200)	2184(86)	2406(94.7)	9197 (20276)	9687 (21357)
C1500D6E	5085 (200)	2184(86)	2406(94.7)	9231 (20351)	9721 (21431)

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

Codes and standards

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

	This product was manufactured in a plant whose quality management system is registered as being in conformity with ISO 9001		UL Listing to UL 2200, "Stationary Engine Generator Assemblies" is available for this genset model
	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.		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 genset models are available as CSA certified to CSA C22.2 No. 100		The generator set package is available certified for seismic application in accordance with International Building Code

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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PowerCommand® 3.3 Generator Set Digital Integrated Control System



Bargraph Optional

Introduction

The PowerCommand® 3.3 control system is a microprocessor-based generator set monitoring, metering, and control system, which is comprised of PowerCommand® Control 3300 and the Human Machine Interface 320. PCC3300 supports multiple operation modes including:

- Standalone,
- Synchronization only,
- Isolated bus paralleling,
- Utility single generator set paralleling,
- Utility multiple generator set paralleling,
- Utility single generator set paralleling with power transfer control (automatic mains failure),
- Isolated bus paralleling with Masterless Load Demand

PowerCommand® Control 3300 is designed to meet the exacting demands of the harsh and diverse environments of today's typical power generation applications for Full Authority Electronic or Hydromechanical engine power generator sets.

Offering enhanced reliability and performance over more conventional generator set controls via the integration of all generator control functions into a single system, PCC3300 is your Power of One generator set control solution.

Benefits and Features

- 320 x 240 pixels graphical LED backlit LCD
- Multiple languages supported
- AmpSentry™ protection provides industry-leading generator overcurrent protection
- Digital Power Transfer Control (Automatic Mains Failure) 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 Sharing
- 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 automatic voltage regulation is provided using three phase sensing and full wave FET type regulator, which is compatible with either shunt or PMG excited systems with a standard AUX103 AVR or an option for a more powerful high-current field drive capability AUX106 AVR
- Digital engine speed governing is provided on applicable platforms
- Generator set monitoring (including metering) and protection with PCC3300 measuring voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Utility / AC Bus metering and protection with PCC3300 voltage, current, kW and kVAr offering a measurement accuracy of 1%
- 12 V (DC) and 24 V (DC) battery operation
- RS-485 Modbus® interface for interconnecting to customer equipment
- Warranty and service – Cummins Power Generation offers a comprehensive warranty and worldwide distributor service network
- Global regulatory certification and compliance: PCC3300 is suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA, and CE standards

PowerCommand® Generator Set Digital Control System PCC 3300



Introduction

PCC3300 is an industry-leading digital generator set control suitable for usage on a wide range of diesel and lean burn natural gas generator sets in both standalone as well as paralleling applications.

PowerCommand® is compatible with either shunt or PMG excitation, and is suitable for usage with reconnectable or non-reconnectable generators. Configuration for any frequency, voltage and power connection from 120 V (AC) to 600 V (AC) line-to-line or 601 V (AC) to 45k V (AC) with an external PT is supported. The PCC3300 derives its own power from the generator set starting batteries and functions over a voltage range of 8 V (DC) to 30 V (DC).

Features

- PCC3300 supports configurable control features via software download using InPower PC-compatible software
- 12 V (DC) and 24 V (DC) battery operation
- Digital automatic voltage regulation is provided using three phase sensing and full wave FET type regulator, which is compatible with either shunt or PMG excited systems with a standard AUX103 AVR or an option for a more powerful high-current field drive capability AUX106 AVR
- Digital engine speed governing on applicable platform is provided, which is capable of providing isochronous frequency regulation
- Full authority J1939 CANBus® prime mover communications and control is provided for platforms with an Engine Control Module (ECM)
- AmpSentry™ protection provides industry-leading alternator overcurrent protection:
 - Time-based generator protection applicable to both line-to-line and line-to-neutral, that can detect an unbalanced fault condition and swiftly react appropriately. Balanced faults can also be detected by AmpSentry and appropriate acted upon.
 - Reduces the risk of Arc Flash due to thermal overload or electrical faults by inverse time protection

- Generator set monitoring offers status information for all critical prime mover and generator functions
- AC and DC digital generator set metering is provided. AC measurements are configurable for single or three phase sensing with PCC3300 measuring voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Battery monitoring system continually monitors the battery output and warns of the potential occurrence of a weak battery condition
- Relay drivers for prime mover starter, fuel shutoff (FSO), glow plug/spark ignition power and switched B+ applications are provided
- Integrated generator set protection is offered to protect the prime mover and generator
- 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 (Automatic Mains Failure) 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 Sharing
- Droop kW and kVAr Control
- The synchronization check function provides adjustments for phase angle window, voltage window, frequency window and time delay
- Utility / AC Bus metering and protection with PCC3300 voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Advanced serviceability is offered via InPower™, a PC-based software service tool
- PCC3300 is designed for reliable operation in harsh environments with the unit itself being a fully encapsulated module
- RS-485 ModBus interface for interconnecting to customer equipment
- Native on PCC3300: Four discrete inputs, two dry contact relay outputs and two low-side driver outputs are provided and are all configurable.
 - Optional extra PCC3300 input and output capability available via AUX101
- Warranty and service – Cummins Power Generation offers a comprehensive warranty and worldwide distributor service network
- Global regulatory certification and compliance: PCC3300 is suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA and CE standards

Base Control Functions

HMI capability

Options: Local and remote HMI320 options are available

Operator adjustments: The HMI320 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 HMI320 or InPower.

Data logs: Information concerning all of the following parameters is periodically logged and available for viewing; 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) as well as alternator drive end and non-drive end bearing

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

AmpSentry: 3x current regulation for downstream tripping/motor inrush management. Thermal damage curve (3-phase short) or fixed timer (2 sec for 1-Phase Short or 5 sec for 2-Phase short).

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)

Lean Burn Natural Gas (LBNG) application parameters include:

- 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 and 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 as well as coolant temperature 1 and 2 for both HT/LT respectively
- Exhaust port temperature (up to 18 cylinders)
- Pre-filter oil pressure
- Exhaust back pressure
- Parent ECM internal temperature and isolated battery voltage
- Speed bias
- Child ECM internal temperature and isolated battery voltage
- Knock level, spark advance, and knock count (for up to 18 cylinders)
- Auxiliary supply disconnect 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 HMI320 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

Prime Mover 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 V (DC) or 24 V (DC) nominal battery voltage is supported by PCC3300 for normal operation.

Temperature dependant prime mover governing dynamics: This function is supported enabling the engine to be responsive when warm and more stable when operating at lower temperature via providing control and modification over electronic governing parameters as a function of engine temperature.

Isochronous governing is provided in order to control prime mover speed within $\pm 0.25\%$ of nominal rated speed for any steady state load from no load to full load. During operation frequency drift should not exceed $\pm 0.5\%$ of nominal frequency given a 33°C (or 60°F) change in ambient temperature within an eight-hour period.

Droop electronic speed is governing capability is natively offered by PCC3300 to permit droop from 0% to 10% between no load to full load.

Remote start capability is built into the PCC3300 as the unit accepts a ground signal from remote devices to automatically command the starting of the generator set as well as the reaching of rated speed, voltage and frequency or otherwise run at idle speed until prime mover temperature is adequate. The presence of a remote start signal shall cause the PCC3300 to leave sleep mode and return to normal power mode. PCC3300 supports an option for delayed start or stop.

Remote Start Integrity: In compliance with NEC2017 Start Signal Integrity standard – NFPA70 Article 700.10(D)(3), the remote start circuit from ATS to PCC3300 is continuously monitored for signal disturbance due to broken, disconnected or shorted wires via a configurable input. Loss of signal integrity results in activation of a remote start signal.

Remote and local emergency stopping capability: PCC3300 accepts ground signal from a locally or remotely mounted emergency stop switch to cause the generator set to immediately shutdown. The generator set is prevented from either running or cranking with the emergency stop switch engaged. If PCC3300 is in sleep mode, then the activation of any emergency stop switch shall return PCC3300 to normal powered state along with the activation of the corresponding shutdown and run-prevention states.

Sleep mode: PowerCommand 3.3 supports a configurable low current draw state, which is designed with consideration to the needs of prime applications or other applications without a battery charger (in order to minimize battery current drain).

Automatic prime mover starting: Any generator set controlled by PCC3300 is capable of automatic starting achieved via either magnetic pickup or main alternator output frequency. PCC3300 additionally supports

configurable glow plug control where applicable.

Prime mover cycle cranking: PCC3300 supports configurable starting cycles and rest periods. Built-in starter protection is incorporated to prevent the operator from specifying a starting sequence that may be damaging.

Configurable time delay functionality: PCC3300 supports time delayed generator set starting and stopping (for cooldown). Permissible time delays are as follows (noting a default setting is 0 seconds):

1. Start delay: 0 seconds to 300 seconds prior to starting after receiving a remote start signal.
2. Stop delay: 0 seconds to 600 seconds prior to shut down after receiving a signal to stop in normal operation modes.

Lean Burn Natural Gas application specific parameters

PCC3300 supports prime mover inhibiting in order to permit application-specific processes (i.e. Auxiliaries) to be started first.

Generator Control

PCC3300 performs both Genset voltage sensing and Genset voltage regulation as follows:

- Voltage sensing is integrated into PCC3300 via three phase line-to-line sensing that is compatible with shunt or PMG excitation systems
- Automatic voltage regulation is accomplished by using a three phase fully rectified input and has a FET output for good motor starting capability.

Major features of generator control include:

Digital output voltage regulation - Capable of regulating output voltage to within $\pm 1.0\%$ for any loads between no load and full load. Voltage drift will not exceed $\pm 1.5\%$ for a 40 °C (104 °F) 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.

Cylinder Cut-off System (CCS): PCC 3300 supports Cylinder Cut-off System which is used to operate the engines on half bank at no load and light load conditions. CCS has the following benefits on engine

performance- improved emission standards, improved fuel efficiency, reduced hydrocarbons, reduced white smoke, reduced wet stacking and higher exhaust temperature at light loads to improve turbocharger operations and catalyst performance.

Step Timing Control (STC): PCC 3300 supports STC functionality which is used to advance the engine timing of a hydro-mechanical engine during start up and light load conditions. During ADVANCED injection timing, it:

- Improves cold weather idling characteristics
- Reduces cold weather white smoke
- Improves light load fuel economy
- Reduces injector carboning

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 hertz. 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 - 300sec, stop delay from 0 - 800sec, transfer delay from 0-120sec, retransfer delay from 0-1800sec, programmed transition delay from 0-60sec, and maximum parallel time from 0-1800sec.

Negative Sequence Current Protection: PCC3300 supports this protection natively in order to determine if the generator is at any point was running subject to negative phase sequencing.

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.

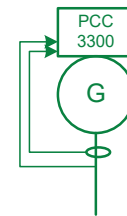
Exerciser clock –The exerciser clock (when enabled) allows the system to be operated at preset times in either test without load, test with load, or extended parallel mode. A Real Time Clock is built in. Up to 12 different programs can be set for day of week, time of day, duration, repeat interval, and 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.

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

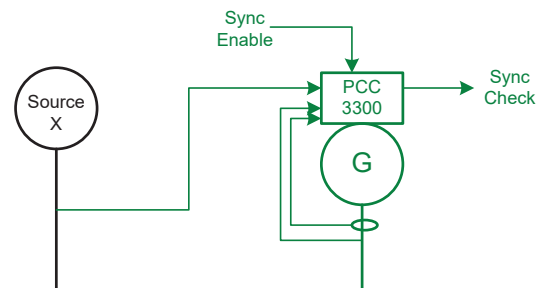
penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

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:

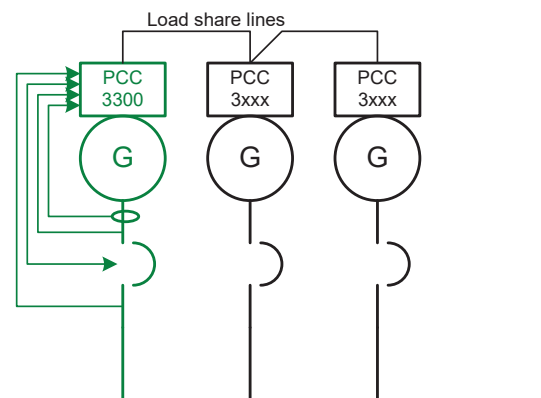
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



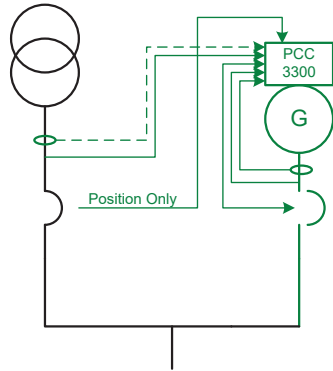
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



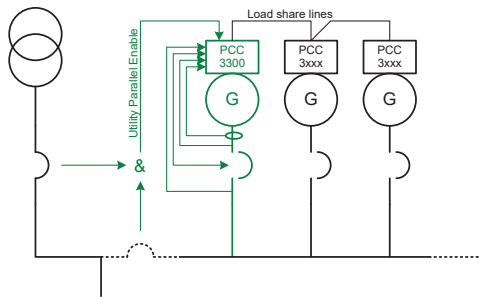
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



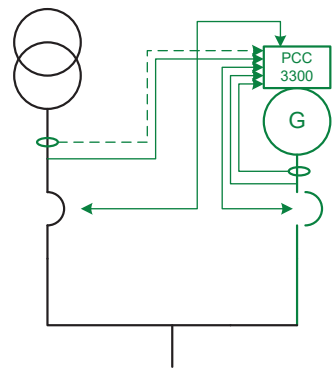
Utility Single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



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.

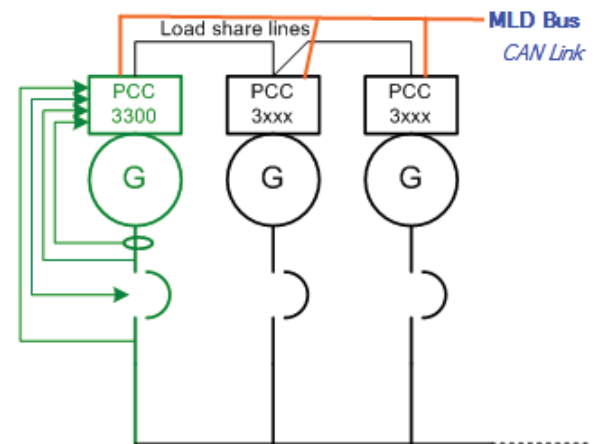
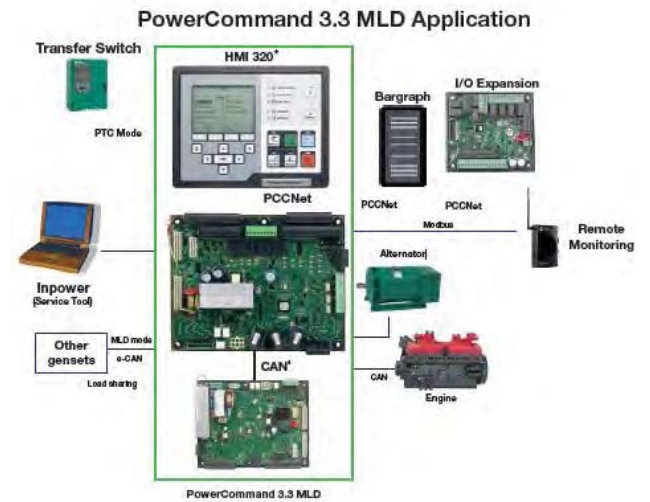


Power Transfer Control: Control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



Masterless Load Demand (Optional Feature):

PowerCommand® 3.3 with Masterless Load Demand (MLD) technology enables generator sets to start/stop automatically based on load demand. Masterless Load Demand-capable generators are equipped with an additional s-CAN network connection that allows sharing of information amongst paralleled generator sets. MLD has been designed for hassle-free installation, commissioning and operation. MLD functionality. Integrated on-board system logic provides the MLD topology control without the need for any additional system.



PCC3300 External Voltage and Frequency Biasing Inputs

PCC3300 supports externally driven voltage and frequency biasing capability in order to permit external paralleling (if intending to use this feature please contact your local distributor for further information).

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 prime mover 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.

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

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

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

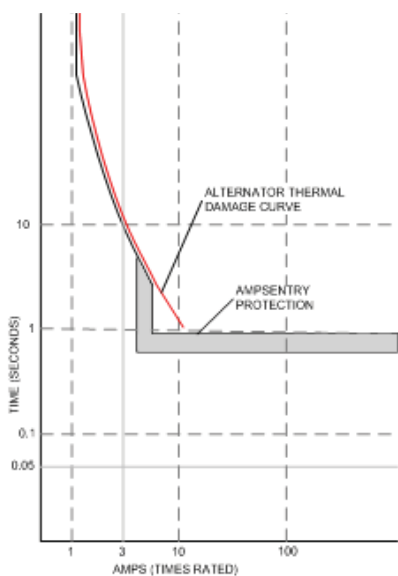
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

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 (3x Current) so that downstream protective devices have the maximum current available to quickly clear fault conditions without subjecting the alternator to potentially catastrophic failure conditions. Thermal damage curve (3 phase short) or fixed timer (2sec for 1P short, 5sec for 2P short). See document R1053 for a full-size time over current curve. The control does not include protection required for interconnection to a utility (mains) service.



AmpSentry Maintenance Mode (AMM) - Instantaneous tripping, if AmpSentry Maintenance mode is active (50mS response to turn off AVR excitation/shutdown genset) for arc flash reduction when personnel are near genset.

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 (40) - 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 signaled to open. If the breaker does not open within an 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

Input signals for Lean Burn Natural Gas Engine applications:

- Gearbox oil pressure/temperature protection
- Fire fault
- Earth fault support as a discrete input via an appropriate secondary detection device
- 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, 30VDC). 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 (3.5A, 30 VDC) for opening and closing of the genset and utility breakers.

Output Signals 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

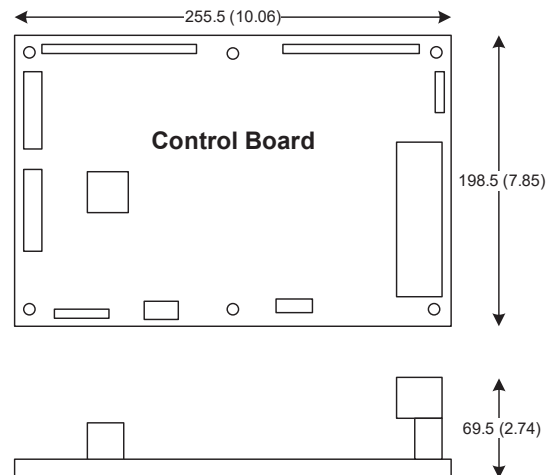
Communications connections include:

- 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 Power Generation 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:

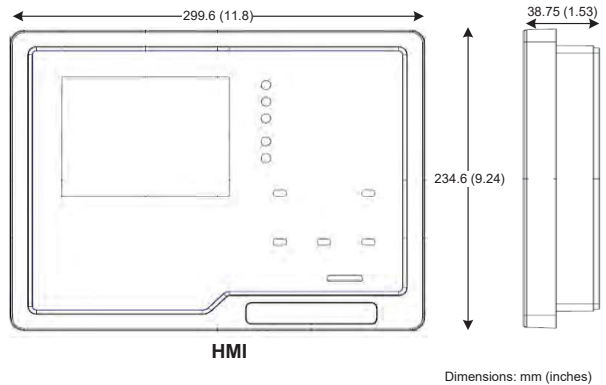
- LED indicating lamps
 - genset running
 - remote start
 - not in auto
 - shutdown
 - warning
 - auto
 - manual and stop
 - Circuit breaker open (if equipped)
 - Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. 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., UKCA and CE standards.
- Languages supported: English, Spanish, French, German, Italian, Greek, Portuguese, Finnish, Norwegian, Danish, Russian (Cyrillic), Chinese, Hungarian, Japanese, Polish, Korean, Romanian, Brazilian Portuguese, Turkish, Dutch, and Czech

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 °C (-40 °F) to +70° C (158 °F), and for storage from -55 °C (-67 °F) to +80 °C (176 °F). Control will operate with humidity up to 95%, non-condensing.

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

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 8528-4:2005 compliance, controls and switchgear (second edition)
- CE marking: The CE marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
- UKCA marking- The UKCA marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
- 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 6200 recognized, 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.
- ROHS (Restriction of Hazardous substance) complaint both for HMI 320 & PCC3300v2.

Reference Documents

Please refer to the following reference documents available in the PowerSuite library:

- PowerCommand™ 3.3. Application Guide
- T-037: PowerCommand Control Application Manual (ANSI Protective Functions)
- T-040: PowerCommand 3.3 Paralleling Application Guide

Please refer to the following reference documents available on Cummins Quickserve:

- Service Manuals for PC3.3 (non-MLD) and PC3.3 (MLD)
- Modbus Register Mapping

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.



Generator set data sheet

Model:	C1500D6E
Frequency:	60 Hz
Fuel type:	Diesel
kW rating:	1500 Standby 1364 Prime 1364 Data Center Continuous
Emissions level:	EPA NSPS Stationary Emergency Tier 2

Exhaust emission data sheet:	EDS-3088
Exhaust emission compliance sheet:	EPA-2066
Sound performance data sheet:	MSP-4122
Cooling performance data sheet:	MCP-2177
Prototype test summary data sheet:	PTS-717
Standard set-mounted radiator cooling outline:	A062V279
Optional set-mounted radiator cooling outline:	A062V279

Fuel consumption	Standby				Prime				Data Center Continuous			
	kW (kVA)				kW (kVA)				kW (kVA)			
Ratings	1500 (1875)				1364 (1705)				1364 (1705)			
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
US gph	31.7	56.8	81.9	102.5	29.5	51.8	75.1	95.3	29.5	51.8	75.1	95.3
L/hr	120	215	310	388	112	196	285	361	112	196	285	361

Engine	Standby rating	Prime rating	Data Center Continuous rating
Engine manufacturer	Cummins Inc.		
Engine model	QSK38-G18		
Configuration	Cast iron, V12 cylinder		
Aspiration	Turbocharged and low temperature after-cooled		
Gross engine power output, kWm (bhp)	1659(2225)	1500 (2014)	1500 (2014)
BMEP at set rated load, kPa (psi)	5853 (849)	5240 (760)	5240 (760)
Bore, mm (in.)	159 (6.26)		
Stroke, mm (in.)	159 (6.26)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	9.54 (1878)		
Compression ratio	14.7:1		
Lube oil capacity, L (gal)	117 (30.9)		
Overspeed limit, rpm	2070		
Regenerative power, kW	124		

Fuel flow

Maximum return fuel flow, L/hr (US gph)	397 (105)
Maximum fuel inlet restriction, kPa (in Hg)	25 (7.4)
Maximum fuel inlet temperature, °C (°F)	70 (158)

Air

	Standby rating	Prime rating	Data Center Continuous rating
Combustion air, m ³ /min (cfm)	125 (4408)	122 (4300)	122 (4300)
Maximum air cleaner restriction, kPa (in H ₂ O)	3.7 (15)		
Alternator cooling air, m ³ /min (cfm)	195 (6886)		

Exhaust

Exhaust flow at set rated load, ft ³ /min (L/sec)	10631 (5017)	10235 (4830)	10235 (4830)
Exhaust temperature, °C (°F)	499 (930)	486 (908)	486 (908)
Maximum back pressure, kPa (in Hg)	10.1 (3)		

Standard set-mounted radiator cooling

Ambient design, °C (°F)	40.0 (104)		
Fan load, kW _m (HP)	66 (88.5)		
Coolant capacity (with radiator), L (US gal)	272 (72)		
Cooling system air flow, m ³ /min (cfm)	994.5 (35121)		
Total heat rejection, MJ/min (Btu/min)	64.4(61041)	59.31 (56215)	59.31 (56215)
Maximum cooling air flow static restriction, kPa (in H ₂ O)	0.12 (0.5)		
Maximum fuel return line restriction kPa (in Hg)	33.8 (10)		

Optional set-mounted radiator cooling

Ambient design, °C (°F)	50.0 (122)		
Fan load, kW _m (HP)	73.5 (98.6)		
Coolant capacity (with radiator), L (US gal)	272 (72)		
Cooling system air flow, m ³ /min (acfm)	1377 (48615)		
Total heat rejection, MJ/min (Btu/min)	64.4(61041)	59.31 (56215)	59.31 (56215)
Maximum cooling air flow static restriction, kPa (in H ₂ O)	0.12 (0.5)		
Maximum fuel return line restriction, kPa (in Hg)	33.8 (10)		

Notes:

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

Derating factors

Standby -	<p><u>Standard cooling system:</u> Full genset power available up to 1463 m (4800 ft) and ambient temperatures up to 40 °C (104 °F). Above these conditions, derate of 8% per 304.8 m (1000 ft) and 33.7% per 10 °C (50 °F).</p> <p><u>Enhanced cooling system:</u> Full genset power available up to 671 m (2200 ft) and ambient temperatures up to 50 °C (122 °F). Above these conditions, derate of 11% per 304.8 m (1000 ft) and 33.7% per 10 °C (50 °F).</p>
Prime For Standby -	<p><u>Standard cooling system:</u> Full genset power available up to 1706.9 m (5600 ft) and ambient temperatures up to 50 °C (122 °F). Above these conditions, derate of 4% per 304.8 m (1000 ft) and 34.6% per 10 °C (50 °F).</p> <p><u>Enhanced cooling system:</u> Full genset power available up to 853.4 m (2800 ft) and ambient temperatures up to 50 °C (122 °F). Above these conditions, derate of 4% per 304.8 m (1000 ft) and 34.6% per 10 °C (50 °F).</p>
Data Center Continuous -	<p><u>Standard cooling system:</u> Full genset power available up to 1706.9 m (5600 ft) and ambient temperatures up to 50 °C (122 °F). Above these conditions, derate of 4% per 304.8 m (1000 ft) and 34.6% per 10 °C (50 °F).</p> <p><u>Enhanced cooling system:</u> Full genset power available up to 853.4 m (2800 ft) and ambient temperatures up to 50 °C (122 °F). Above these conditions, derate of 4% per 304.8 m (1000 ft) and 34.6% per 10 °C (50 °F).</p>

Ratings definitions

Emergency Standby Power (ESP):	Prime Power (PRP):
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, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550	Applicable for supplying power to varying electrical loads for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550

Formulas for calculating full load currents:

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

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

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

Our energy working for you.™





Alternator Data Sheet Frame Size: S7L1D-F4

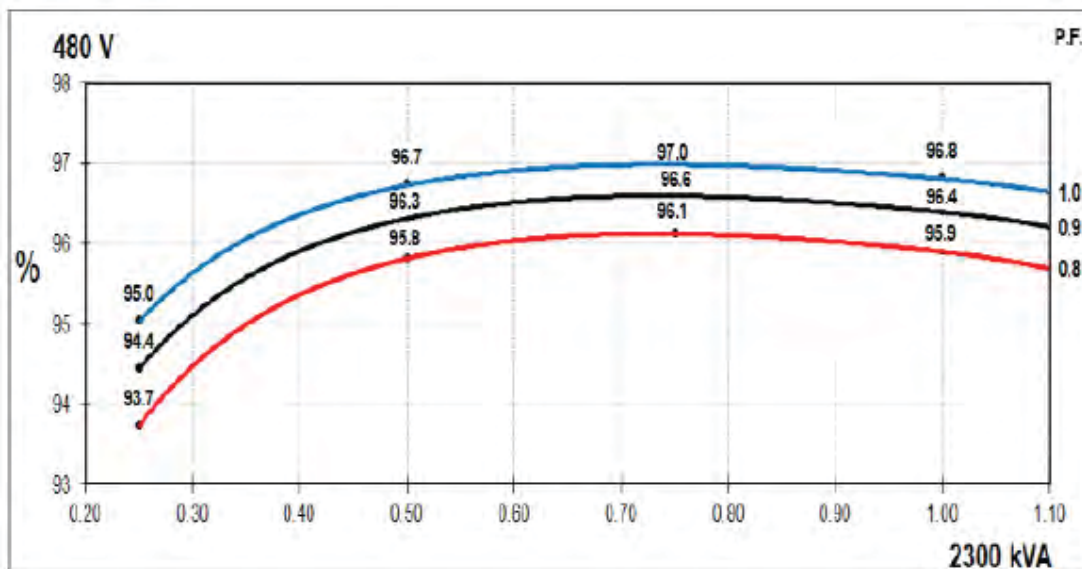
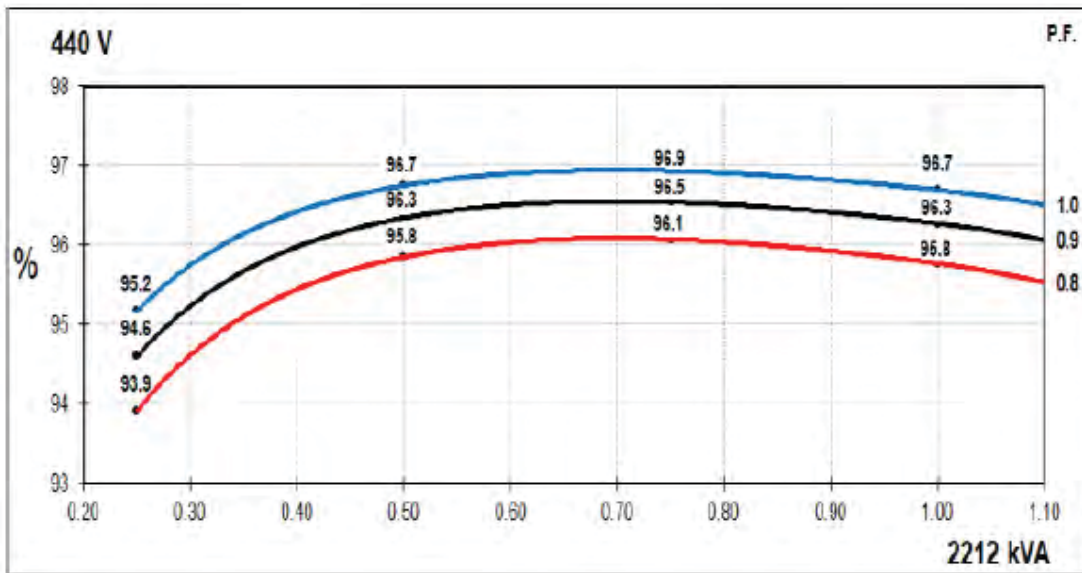
Characteristics						
		No of Bearings:	1-bearing		2-bearing	
Weights:		Stator assembly:	3347 lb	1518 kg	3347 lb	1518 kg
		Rotor assembly:	2983 lb	1353 kg	2866 lb	1300 kg
		Complete assembly:	7385 lb	3350 kg	7196 lb	3264 kg
Maximum speed:			2250 rpm			
Excitation current:		Full load:	Wdg 07: 2.8, Wdg 13: 2.5, Wdg 312: 2.8			
		No load:	Wdg 07: 0.83, Wdg 13: 0.8, Wdg 312: 0.68-0.64			
Insulation system:		Class H throughout				
3 ∅ Ratings		(0.8 power factor)	60 Hz (winding no)			
			<u>600</u>	<u>380</u>	440	<u>480</u>
			(07)	(13)	(312)	<u>(312)</u>
163° C rise ratings	@ 27° C	kW	1975	1870	1895	1975
		kVA	2469	2338	2369	2469
150° C rise ratings	@ 40° C	kW	1920	1815	1840	1920
		kVA	2400	2269	2300	2400
125° C rise ratings	@ 40° C	kW	1840	1750	1770	1840
		kVA	2300	2187	2212	2300
105° C rise ratings	@ 40° C	kW	1715	1625	1645	1715
		kVA	2144	2031	2056	2144
80° C rise ratings	@ 40° C	kW	1585	1505	1520	1600
		kVA	1981	1881	1900	2000
3 ∅ Reactances			<u>600</u>	<u>380</u>	440	480
			(07)	(13)	(312)	(312)
		(Based on full load at 125° C rise rating)				
		Synchronous	2.6	3.21	2.96	2.58
		Transient	0.2	0.23	0.22	0.19
		Subtransient	0.14	0.14	0.16	0.14
		Negative sequence	0.17	0.19	0.19	0.16
		Zero sequence	0.03	0.04	0.03	0.03
3 ∅ Motor starting			<u>600</u>	<u>380</u>	440	480
			(07)	(13)	(312)	(312)
		Maximum kVA (90% sustained voltage)	7407	7014	7407	7407
Time constants		(sec)	<u>600</u>	<u>380</u>	440	480
			(07)	(13)	(312)	(312)
		Transient	0.141	0.147	0.15	0.15
		Subtransient	0.016	0.016	0.017	0.017
		Open circuit	4.42	4.41	4.29	4.29
		DC	0.04	0.027	0.028	0.028
Windings		(@22° C)	<u>600</u>	<u>380</u>	440	480
			(07)	(13)	(312)	(312)
		Stator resistance (L-L Ohms)	0.0026	0.0013	0.0017	0.0017
		Rotor resistance (Ohms)	1.950	1.950	1.950	1.950
		Number of leads	6	6	6	6



S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

THREE PHASE EFFICIENCY CURVES

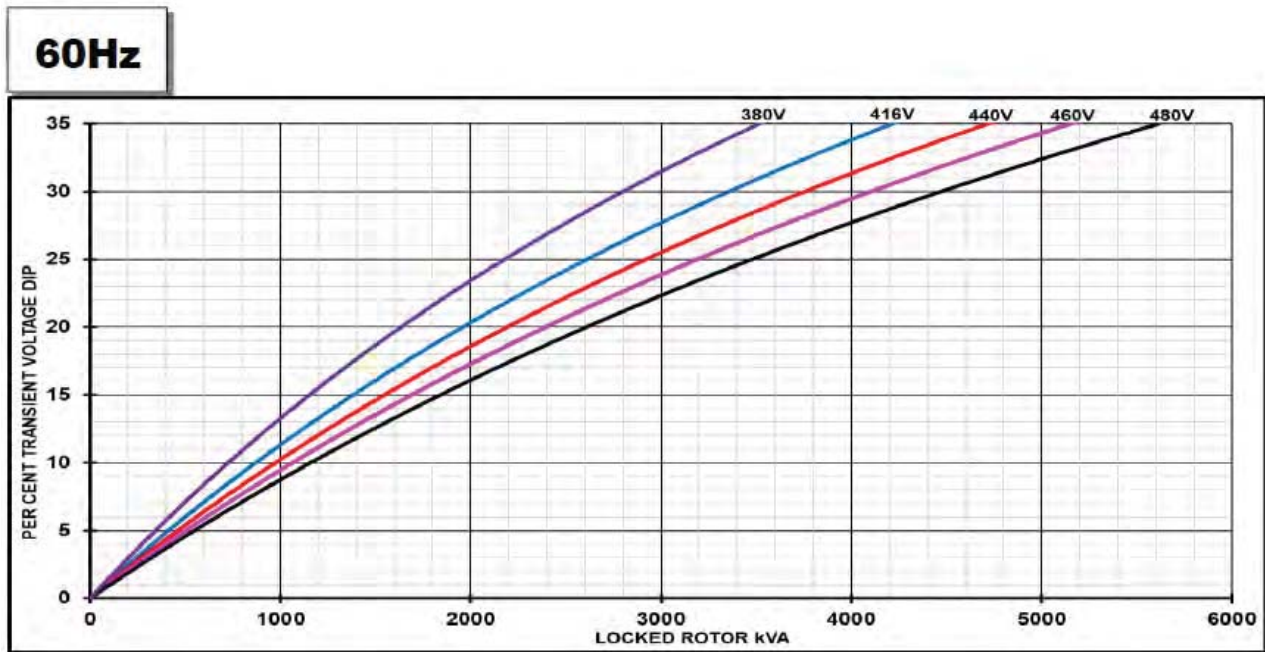
60Hz





S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

Locked Rotor Motor Starting Curves - Separately Excited



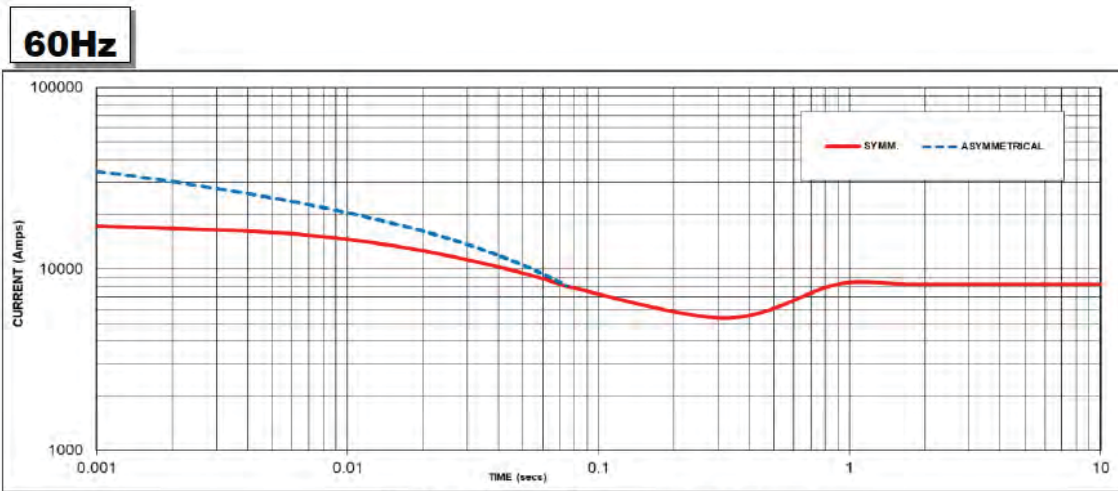
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.



S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

Three-phase Short Circuit Decrement Curve - Separately Excited



Sustained Short Circuit = 8246 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

If MX322 or digital AVR is used, the sustained short-circuit current value is to be multiplied by a factor of 1.2.

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.

Note 3

All other times are unchanged
Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732



Sound Data

C1500D6E

QSK38-G18 60Hz Diesel

A-weighted Sound Pressure Level @ 7 meters, dB(A)

See notes 2, 5 and 7-11 listed below

Configuration	Exhaust	Applied Load	Position (Note 2)								8 Position Average
			1	2	3	4	5	6	7	8	
Standard – Unhoused with 50°C Cooling Package	Infinite Exhaust	0% Prime	88.8	93.6	92.7	94.5	94.5	97.0	95.0	92.7	94.1
		75% Prime	89.5	94.4	93.9	95.1	93.6	96.6	95.3	93.4	94.4
		100% Prime	89.8	95.2	95.3	96.1	93.5	96.7	95.4	93.7	94.9
		100% Standby	90.2	95.5	95.2	96.3	93.8	96.8	95.8	94.0	95.1

Average A-weighted Sound Pressure Level @ 1 meter, dB(A)

See notes 1, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused with 50°C Cooling Package	Infinite Exhaust	0% Prime	N/A	55.5	65.2	91.8	91.5	96.6	96.3	94.3	91.6	84.0	75.3	102.1
		75% Prime	N/A	56.4	67.0	91.3	92.0	96.8	96.1	94.6	92.5	89.1	76.3	102.4
		100% Prime	N/A	55.8	67.1	91.2	92.6	96.9	96.2	94.8	92.1	90.7	77.4	102.7
		100% Standby	N/A	55.9	67.2	91.3	93.0	97.0	96.4	95.0	93.5	91.2	77.9	102.9

A-weighted Sound Pressure Level @ Operator Location, dB(A)

See notes 1, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused with 50°C Cooling Package	Infinite Exhaust	100% Prime	N/A	61.5	71.0	87.5	89.9	92.3	92.3	88.9	86.4	81.5	67.4	98.0
		100% Standby	N/A	61.6	70.6	87.7	90.7	92.6	92.8	89.4	87.1	82.4	68.3	98.5

A-weighted Sound Power Level, dB(A)

See notes 1, 3 and 6-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused with 50°C Cooling Package	Infinite Exhaust	0% Prime	N/A	75.8	85.5	112.1	111.8	117.0	116.6	114.7	111.9	104.3	93.6	122.4
		75% Prime	N/A	76.7	87.3	111.6	112.4	117.1	116.4	114.9	112.8	109.5	96.6	122.7
		100% Prime	N/A	76.2	87.4	111.5	113.0	117.2	116.5	115.1	113.4	111.0	97.7	123.0
		100% Standby	N/A	76.2	87.5	111.7	113.3	117.3	116.7	115.3	113.8	111.5	98.2	123.2



Sound Data

C1500D6E

QSK38-G18 60Hz Diesel

Exhaust Sound Power Level, dB(A)

See notes 4 and 6-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Open Exhaust (Unhoused with 50°C Cooling Package)	With Tail Pipe	0% Prime	N/A	48.9	98.1	107.2	108.9	108.4	106.4	109.3	100.4	93.8	82.7	115.4
		75% Prime	N/A	61.6	110.3	126.1	131.3	130.4	126.0	123.5	119.7	112.9	100.6	135.5
		100% Prime	N/A	60.4	112.6	127.7	132.7	131.6	128.6	125.8	122.6	116.6	103.7	137.2
		100% Standby	N/A	62.4	113.1	127.6	132.5	132.1	129.1	126.2	123.4	117.8	104.9	137.4

Global Notes:

1. Sound pressure levels at 1 meter are measured per the requirements of ISO 3744, ISO 8528-10, and European Communities Directive 2000/14/EC as applicable. The microphone measurement locations are 1 meter from a reference parallelepiped just enclosing the generator set (enclosed or unenclosed).
2. Seven-meter measurement location 1 is 7 meters (23 feet) from the generator (alternator) end of the generator set, and the locations proceed counter-clockwise around the generator set at 45° angles at a height of 1.2 meters (48 inches) above the ground surface.
3. Sound Power Levels are calculated according to ISO 3744, ISO 8528-10, and or CE (European Union) requirements..
4. Exhaust Sound Levels are measured and calculated per ISO 6798, Annex A.
5. Reference Sound Pressure Level is 20 µPa.
6. Reference Sound Power Level is 1 pW (10⁻¹² Watt).
7. Sound data for remote-cooled generator sets are based on rated loads without cooling fan noise.
8. Sound data for the generator set with infinite exhaust do not include the exhaust noise contribution.
9. Published sound levels are measured at CE certified test site and are subject to instrumentation, measurement, installation and manufacturing variability.
10. Unhoused/Open configuration generator sets refers to generator sets with no sound enclosures of any kind.
11. Housed/Enclosed/Closed/Canopy configuration generator sets refer to generator sets that have noise reduction sound enclosures installed over the generator set and usually integrally attached to the skid base/base frame/fuel container base of the generator set.
12. Published sound levels meet the requirements India's Central Pollution Control Board (Ministry of Environment & Forests), vide GSR 371 (E), which states the A-weighted sound level at 1 meter from any diesel generator set up to a power output rating of 1000kVA shall not exceed 75dB(A)
13. For updated noise pollution information for India see website: <http://www.envfor.nic.in/legis/legis.html>
14. Sound levels must meet India's Ambient Air Noise Quality Standards detailed for Daytime/Night-time operation in Noise Pollution (Regulation and Control) Rules, 2000
15. Operator Location is near genset control panel and is at 1 meter distance from genset control panel and at 1.6 meter height.

Circuit Breakers



Description

This data sheet provides circuit breaker manufacturer part numbers and specifications. The circuit breaker box description is the rating of that breaker box installation on a Cummins® generator. Please refer to the website of the circuit breaker manufacturer for breaker specific ratings and technical information.

Applicable Models

Engine	Models			
QSK23-G7	DQCA	DQCB	DQCC	
QST30-G5	DQFAA	DQFAB	DQFAC	DQFAD
QST30-G17	DQFAH			
QSK38-G17	C1250D6E			
QSK38-G18	C1250D6E	C1500D6E		
QSK50-G5	DQGAE	DQGAF		
QSK50-G4	DQGAA	DQGAB		
QSK50-G8	DQGAS			
QSK60-G6	DQKAA	DQKAB	DQKAD	DQKAE
QSK60-G14	DQKAF			
QSK60-G17	DQKAM			

Instructions

1. Locate the circuit breaker feature code or part number and use the charts below to find the corresponding manufacturer circuit breaker catalog number.
2. Use the first letter of the circuit breaker catalog number to determine the "frame" of the breaker. If the first letter is an "N", use the second letter. Then follow the corresponding website link from the table below to find the breaker catalog number description.

Please refer to the catalog numbering systems page, which is given in the chart, to understand the nomenclature of the catalog number.

Frame	Catalog Name*	Catalog Number description pages
P and R	0612CT0101 https://www.se.com/us/en/download/document/0612CT0101/	16-17
L	0611CT1001 https://www.se.com/us/en/download/document/0611CT1001/	8-9
MasterPact NT/NW	https://www.se.com/us/en/faqs/FA231180/	Please refer to PLS007 Rev 25

*The following link may also be used to search specifically by the breaker part number or for the catalog name listed above.

<https://www.se.com/us/en/work/support/contacts.jsp>

3. Search the catalog by using the first 3 letters of the breaker catalog number and the first 5 numbers to find information such as trip curves, accessories, and dimensional details regarding the circuit breaker.

*If the catalog number starts with "N", skip the N and begin your search with the second letter.

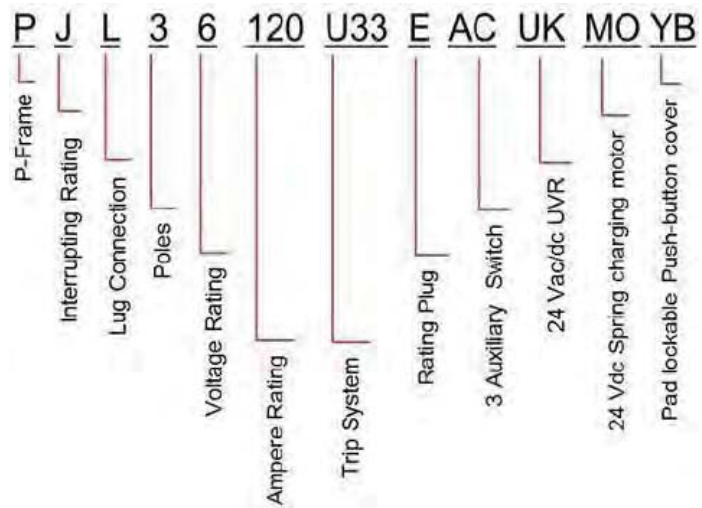
*If the first 3 letters are "PJP," the search will not work. You will need to start with just "PJ" and use the description pages to obtain the information you are looking for on the "PJP."

Example

After finding your circuit breaker catalog number to be "PJL36120U33EACUKMOYB," navigate to the P-frame catalog by using the link provided.

Look at pages 16-17 of the pdf catalog to find the nomenclature of the breaker.

Search the P-frame spec sheet using the search "PJL36120."



For decoding the ABB breakers, see the decoder sheet, titled "T8 Catalog number explanation"

Mechanically operated breakers							
Feature Code	Breaker box description	Cummins part #	Engine	Manufacturer	Breaker catalog number	Trip unit	Plug type
KP82-2	CB-2500, Right, 3P, UL600, IEC 415, UL Serv Ent, 100%	0320-2164-01	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	RLF36250U31F	MicroLogic 3.0 LI	F
		A054K364	QSK19-G8, QSK23-G7, QSK38-G17, QSK38-G18		RLF36250U33F	MicroLogic 5.0 LSI	
KP83-2	CB-2500A, Left, 3P, 600, IEC 415, UL Serv Ent, 100%	0320-2164-01	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	RLF36250U31F	MicroLogic 3.0 LI	F
		A054K364	QSK19-G8, QSK23-G7, QSK38-G17, QSK38-G18		RLF36250U33F	MicroLogic 5.0 LSI	
KP84-2	CB-2000, Right, 3P, UL 600, IEC 415, UL Serv Ent 100%	0320-2164-02	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	RLF36200U31F	MicroLogic 3.0 LI	F
		A054K366	QSK19-G8, QSK23-G7, QSK38-G17, QSK38-G18		RLF36200U33F	MicroLogic 5.0 LSI	
KP85-2	CB-2000, Left, 3P, UL 600, IEC 415, UL Serv Ent, 100%	0320-2164-02	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	RLF36200U31F	MicroLogic 3.0 LI	F
		A054K366	QSK19-G8, QSK23-G7, QSK38-G17, QSK38-G18		RLF36200U33F	MicroLogic 5.0 LSI	
KP86-2	CB-1600A, Right, 3P, UL 600, IEC 415, UL Serv Ent 100%	A065A939	QSK38-G17, QSK38-G18	Schneider Electric	RJF36160U33A	MicroLogic 5.0 LSI	F
		0320-2164-03	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, 50L, 60L, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18		RLF36160U31F	MicroLogic 3.0 LI	
		A054K368	QSK19-G8, QSK23-G7		RLF36160U33F	MicroLogic 5.0 LSI	
KP87-2	CB-1600, Left, 3P, UL 600, IEC 415, UL Serv Ent 100%	A065A939	QSK38-G17, QSK38-G18	Schneider Electric	RJF36160U33A	MicroLogic 5.0 LSI	F
		0320-2164-03	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18		RLF36160U31F	MicroLogic 3.0 LI	
		A054K368	QSK19-G8, QSK23-G7		RLF36160U33F	MicroLogic 5.0 LSI	
KP88-2	CB-1200, Right, 3P, UL 600, IEC 415, UL Serv Ent, 100%	A065A772	QSK38-G17, QSK38-G18	Schneider Electric	PJF36120U33A	MicroLogic 5.0 LSI	E
		0320-2183	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18		PJP36120U31E	MicroLogic 3.0 LI	
		A054K408	QSK19-G8, QSK23-G7		PJP36120U33F	MicroLogic 5.0 LSI	
KP89-2	CB-1200, Left, 3P, UL 600, IEC 415, UL Serv Ent, 100%	A065A772	QSK38-G17, QSK38-G18	Schneider Electric	PJF36120U33A	MicroLogic 5.0 LSI	E
		0320-2183	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18		PJP36120U31E	MicroLogic 3.0 LI	
		A054K408	QSK19-G8, QSK23-G7		PJP36120U33F	MicroLogic 5.0 LSI	
KP90-2	CB-800A, Right, 3P, UL 600, IEC 415, UL Serv Ent 100%	A065A767	QSK38-G17, QSK38-G18	Schneider Electric	PJF36080U33A	MicroLogic 5.0 LSI	F
		0320-2182	QST30-G5, 30L, QSK50-G4, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18		PJP36080U31F	MicroLogic 3.0 LI	
		A054K405	QSK19-G8, QSK23-G7		PJP36080U33F	MicroLogic 5.0 LSI	
KP91-2	CB-800A, Left, 3P, UL 600, IEC 415, UL Serv Ent, 100%	A065A767	QSK38-G17, QSK38-G18	Schneider Electric	PJF36080U33A	MicroLogic 5.0 LSI	F



2023 EPA Tier 2 Exhaust Emission Compliance Statement C1500D6E Stationary Emergency 60 Hz Diesel generator set

Compliance Information:

The engine used in this generator set complies with the Tier 2 emissions limits of U.S EPA New source performance standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart IIII.

Engine Manufacturer: Cummins Inc.
 EPA Certificate Number: PCEXL050.AAD-033
 Effective Date: 06/15/2022
 Date Issued: 06/15/2022
 EPA Diesel Engine Family: PCEXL050.AAD

Engine Information:

Model:	QSK38-G18	Bore:	6.26 in. (159 mm)
Engine Nameplate HP:	1225	Stroke:	6.26 in. (159 mm)
Type:	4 Cycle, Vee, 12-cylinder diesel	Displacement:	2307 cu. in. (38 liters)
Aspiration:	Turbocharged and Charge Air-Cooled	Compression ratio:	14.7:1
Emission Control Device:	Turbocharged and Charge Air-Cooled		

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kWm-hr		
	<u>NOx</u> <u>NMHC</u>	<u>CO</u>	<u>PM</u>	<u>NOx</u> <u>NMHC</u>	<u>CO</u>	<u>PM</u>
EPA Emissions Limit	4.8	2.6	0.15	6.4	3.5	0.20

Test methods: EPA emissions recorded per 40 CFR Part 60, 89, 1039, 1065 and weighted at load points prescribed in the regulations for constant speed engines.

Diesel fuel specifications: 40-50 Cetane number, ASTM D975 No. 2-D, 300-500 ppm Sulfur

Reference conditions: Air inlet temperature: 25 °C (77 °F), Fuel inlet temperature: 40 °C (104 °F).
 Barometric pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H₂O/lb) of dry air; required for NO_x correction,
 Restrictions: Intake restriction set to a maximum allowable limit for clean filter; Exhaust back pressure set to a maximum allowable limit.

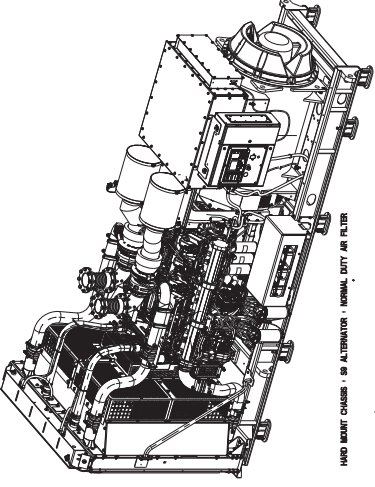
Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.



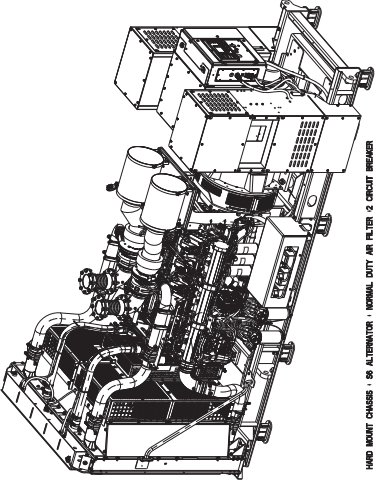
Section III

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24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8
22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7
21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6
20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5
19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4
18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3
17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
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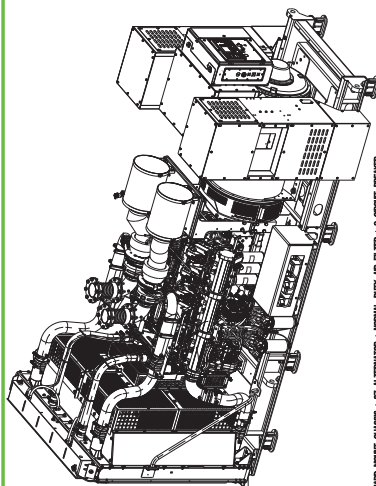
OPEN GENERATOR EXTERNAL ISOLATORS UNIT VIBRATION MOUNTS UNDER CHASSIS



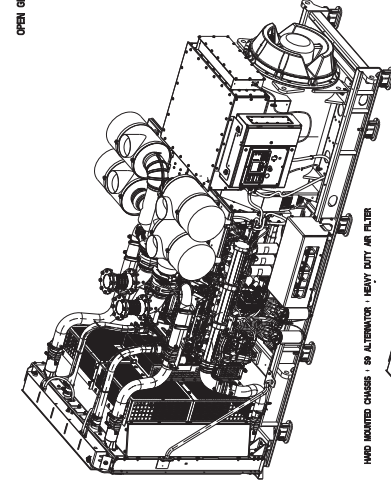
HWD MOUNT CHASSIS - S9 ALTERNATOR - NORMAL DUTY AIR FILTER



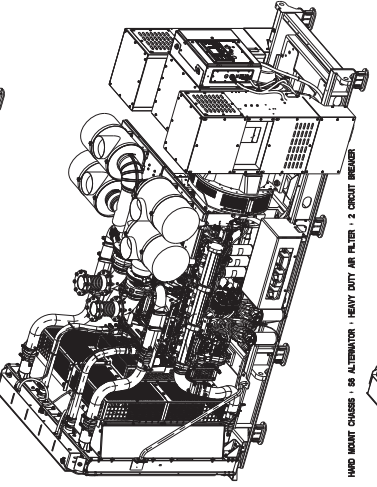
HWD MOUNT CHASSIS - S9 ALTERNATOR - NORMAL DUTY AIR FILTER - 2 CIRCUIT BREAKER



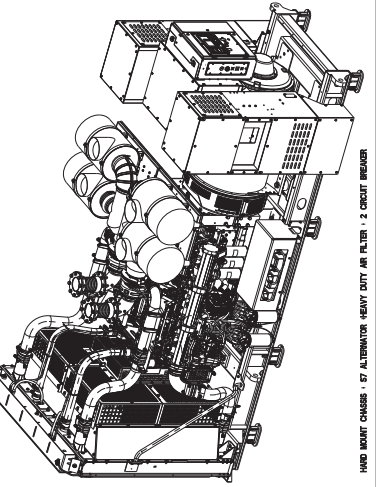
HWD MOUNT CHASSIS - S7 ALTERNATOR - NORMAL DUTY AIR FILTER - 2 CIRCUIT BREAKER



HWD MOUNT CHASSIS - S9 ALTERNATOR - HEAVY DUTY AIR FILTER



HWD MOUNT CHASSIS - S9 ALTERNATOR - HEAVY DUTY AIR FILTER - 2 CIRCUIT BREAKER



HWD MOUNT CHASSIS - S7 ALTERNATOR HEAVY DUTY AIR FILTER - 2 CIRCUIT BREAKER

NOTES:
 1. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.
 2. TOTAL COOLANT CAPACITY - 104.24 L
 3. SEE NOTES ON SHEET 5.
 4. SEE NOTES ON SHEET 9.
 5. SEE NOTES ON SHEET 12.

GENSET MODEL	ALTERNATOR	AIR CLEANER	OR
C13000E	56-F	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	56-G	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	56-H	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
C15000E	57-C	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	57-D	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	57-E	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
C15000E	57-F	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	57-G	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)
	57-H	NORMAL DUTY	ENTRANCE BOU ONLY (NO CE3)

VIEW INDEX	DESCRIPTION
1	COOLANT HEATER
2	OIL DRAIN VALVE
3	ALTERNATOR HEATER
4	BATTERY HEATER
5	OIL SERVICE POINT
6	FUEL IN AND DRAIN HOSES
7	EXHAUST BELLOWS
8	REDUNDANT STARTER/BATTERY SYSTEM
9	AIR RESTRICTION INDICATORS
10	SEISMIC VIBRATION ISOLATORS
11	BATTERY CHARGE

SHEET NO.	DESCRIPTION
1	GENERAL DIMENSIONS FOR SYSTEMS FOR ALL CONFIGURATIONS
2	GENERIC DIMENSIONS FOR SYSTEMS FOR ALL CONFIGURATIONS
3	FUEL, OIL AND DRAIN, LIFTING, LUBRICATION SYSTEM AND NON-SEISMIC
4	LIFTING ARRANGEMENT - WITH S9 ALTERNATOR - PARALLEL AND SINGLE POINT LIFT
5	LIFTING ARRANGEMENT - WITH S7 ALTERNATOR - PARALLEL AND SINGLE POINT LIFT
6	AIR CLEANER OPTION DETAILS, BARGE DETAILS AND CONTROL PANEL DETAILS
7	ALTERNATOR DETAILS - S6, S7
8	SEISMIC VIBRATION ISOLATION BELLOWS
9	SEISMIC VIBRATION ISOLATION BELLOWS
10	SEISMIC VIBRATION ISOLATION BELLOWS
11	SEISMIC VIBRATION ISOLATION BELLOWS
12	SEISMIC VIBRATION ISOLATION BELLOWS
13	SEISMIC VIBRATION ISOLATION BELLOWS
14	SEISMIC VIBRATION ISOLATION BELLOWS
15	SEISMIC VIBRATION ISOLATION BELLOWS

USE THIS REFERENCE LITERATURE:
 1. CUMMINS INSTALLATION MANUAL
 2. CUMMINS MAINTENANCE MANUAL
 3. CUMMINS OPERATOR'S MANUAL
 4. CUMMINS SERVICE MANUAL
 5. CUMMINS REPAIR MANUAL
 6. CUMMINS WIRING DIAGRAMS
 7. CUMMINS PARTS CATALOGS
 8. CUMMINS IDENTIFICATION MANUAL
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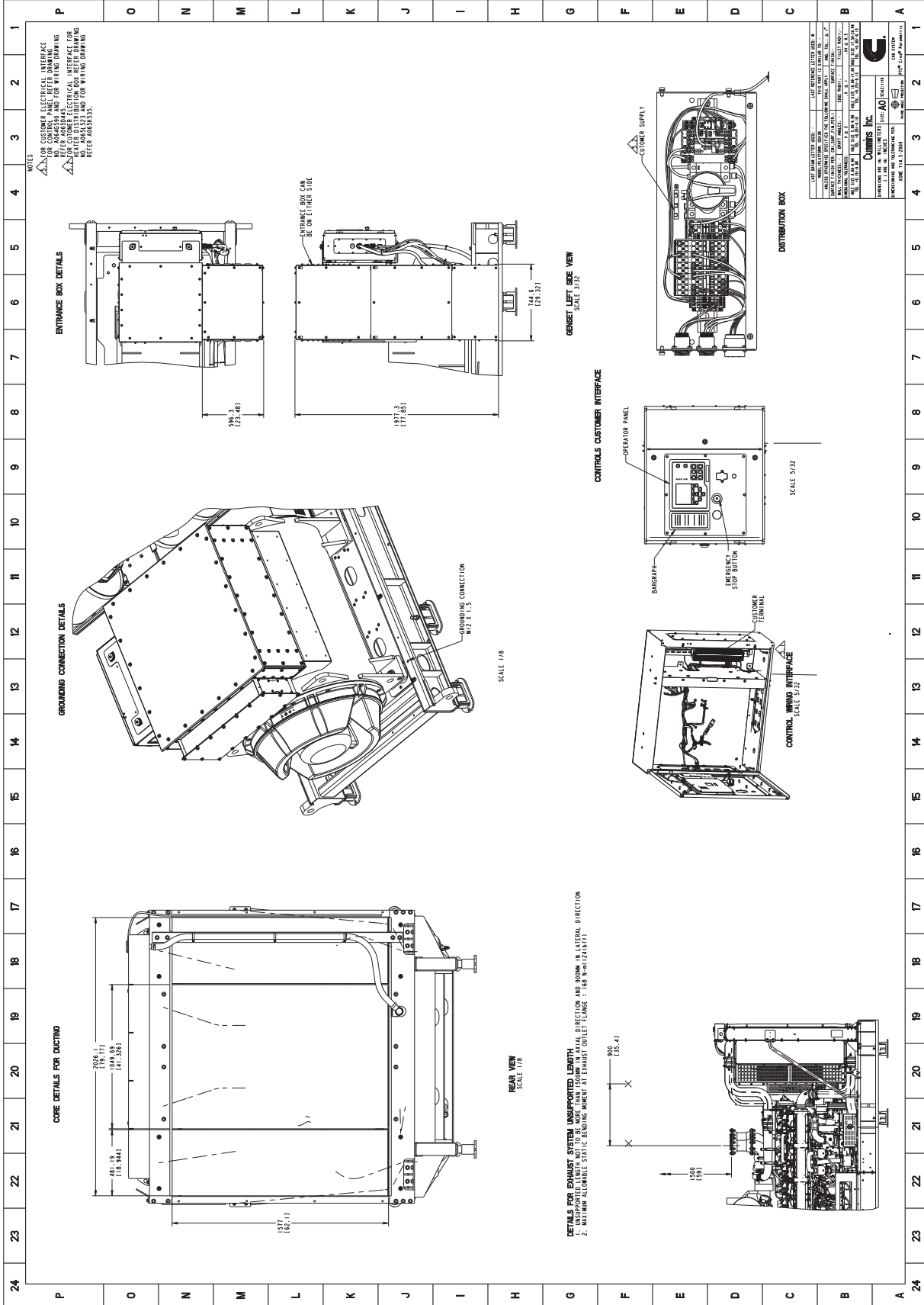
OVERALL DIMENSIONS AND COFG DATA FOR ALL CONFIGURATIONS

ENGINE	ALTERNATOR	AIR CLEANER	CO OPTION	REFER SHEET 2 FOR DRAWING VIEW AND SHEET 6 FOR COFG				OVERALL DIMENSIONS				COFG			
				GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	LENGTH	WIDTH	HEIGHT WITHOUT INSULATION	HEIGHT WITH INSULATION	X	Y	Z	Z
05A3.8	S18-B	NORMAL DUFF HEAVY DUFF	NO CO	11711 11853	25817 26051	11221 11363	24733 25001	5085	2184	2406	2406	172.13	837.45	2643.22	2643.22

ENGINE	ALTERNATOR	AIR CLEANER	CO OPTION	REFER SHEET 3 FOR DRAWING VIEW AND SHEET 7 FOR COFG				OVERALL DIMENSIONS				COFG			
				GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	LENGTH	WIDTH	HEIGHT WITHOUT INSULATION	HEIGHT WITH INSULATION	X	Y	Z	Z
05A3.8	S18-H	NORMAL DUFF HEAVY DUFF	NO CO	10243 9945	22582 21859	8753 8415	21593 20989	5085	2184	2406	2406	172.16	853.11	2656.89	2656.89

ENGINE	ALTERNATOR	AIR CLEANER	CO OPTION	REFER SHEET 4 FOR DRAWING VIEW AND SHEET 7 FOR COFG				OVERALL DIMENSIONS				COFG			
				GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	GENSET WET WEIGHT/RESISTOR	GENSET DRY WEIGHT/RESISTOR	LENGTH	WIDTH	HEIGHT WITHOUT INSULATION	HEIGHT WITH INSULATION	X	Y	Z	Z
06A3.8	S1-E	NORMAL DUFF	1-CE	10524	23852	8844	21745	5085	2184	2406	2406	174.18	837.41	2658.37	2658.37
			2-CE	10524	23852	8844	21745	5085	2184	2406	2406	174.18	837.41	2658.37	2658.37
			NO CO	10524	23852	8844	21745	5085	2184	2406	2406	174.18	837.41	2658.37	2658.37
06A3.8	S1-E	HEAVY DUFF	1-CE	10443	23844	8933	21735	5085	2184	2406	2406	174.21	846.50	2718.52	2718.52
			2-CE	10443	23844	8933	21735	5085	2184	2406	2406	174.21	846.50	2718.52	2718.52
			NO CO	10443	23844	8933	21735	5085	2184	2406	2406	174.21	846.50	2718.52	2718.52
06A3.8	S1-F	NORMAL DUFF	1-CE	10114	22921	8624	21216	5085	2184	2406	2406	174.11	834.80	2632.72	2632.72
			2-CE	10114	22921	8624	21216	5085	2184	2406	2406	174.11	834.80	2632.72	2632.72
			NO CO	10114	22921	8624	21216	5085	2184	2406	2406	174.11	834.80	2632.72	2632.72
06A3.8	S1-G	HEAVY DUFF	1-CE	11123	24923	10634	23443	5085	2184	2406	2406	174.23	842.42	2788.90	2788.90
			2-CE	11123	24923	10634	23443	5085	2184	2406	2406	174.23	842.42	2788.90	2788.90
			NO CO	11123	24923	10634	23443	5085	2184	2406	2406	174.23	842.42	2788.90	2788.90

LAST REVISION LISTED BELOW:
 REVISION NO. DATE BY DESCRIPTION
 1 04/11/2022 JH/AD Initial
 2 04/11/2022 JH/AD Initial
 3 04/11/2022 JH/AD Initial
 4 04/11/2022 JH/AD Initial
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 6 04/11/2022 JH/AD Initial
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 24 04/11/2022 JH/AD Initial



Part Number: **A062V279** Part Revision: **C**
 Part Name: **OUTLINE, GENSET**
 Drawing Category: **Outline State: Released** Sheet 12 of 13

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Cummins Confidential

Section IV



Warranty Statement

CENTUM™ Series Generator Set
C1250D6E, C1500D6E

Limited Warranty

CENTUM™ Series Generator Set

This limited warranty applies to all Cummins Inc. branded CENTUM™ Series generator sets including C1250D6E and C1500D6E 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 3 years or 1,000 hours, whichever occurs first. 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	36	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 Inc. Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Inc. 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 Inc., its distributors or dealers within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Inc.'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 Inc. 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 Inc.
- 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 Inc. Distributor for clarification concerning these limitations.

CUMMINS INC. RIGHT TO FAILED COMPONENTS:

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

Extended Warranty:

Cummins Inc. offers several levels of Extended Warranty Coverage. Please contact your local Cummins Inc. Distributor for details.

power.cummins.com

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

IN NO EVENT IS CUMMINS INC. LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. In the United States, some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state or jurisdiction to jurisdiction.

Product Model Number: _____
 Product Serial Number: _____
 Date in Service: _____



REQUIREMENTS FOR GENERATOR STARTUP

IMPORTANT MESSAGE: (This document must be completed, signed and returned prior to the scheduled startup)

The following must be completed by the individual responsible for the installation of the Generator at the JobSite. All Systems must be installed in accordance with Cummins Power Generation published installation recommendations and Project Specific Drawings

Diesel Generators

- There is sufficient fuel (winterized fuel if applicable) in the sub-base tank for start-up and testing.
Note: The Owner/Contractor is responsible for supplying fuel: "#2 Diesel, low-sulfur/ultra-low sulfur" is required

LPG or Natural Gas Generators

- Gas pressure meets Cummins specifications – please refer to the submittal documents for proper fuel pressure & volume
- The Gas Company has turned on the gas and there is fuel to the generator.
- If required by local authority**, a signed Natural Gas/Propane/LPG Fuel System Certificate indicating compliance to all applicable authorities rules and regulations pertaining to the location of the equipment.

General Requirements (check all that apply)

Are the following correctly installed, mounted, wired, connected, wrapped, insulated, and operating (as applicable)?

- | | |
|--|--|
| <input type="checkbox"/> Exhaust system | <input type="checkbox"/> Engine Heater AC but not energized |
| <input type="checkbox"/> Room lighting | <input type="checkbox"/> Fuel solenoid valve, strainer and PRV |
| <input type="checkbox"/> Louver motors and cooling fans | <input type="checkbox"/> Exercise Clock ready to be programmed |
| <input type="checkbox"/> Transfer Switch(es) | <input type="checkbox"/> All Alarms |
| <input type="checkbox"/> Battery Charger connected to building AC power | <input type="checkbox"/> Carburetor Heater & Outlet |
| <input type="checkbox"/> DC control wiring & AC feeds in separate conduit between Genset & ATS | |
| <input type="checkbox"/> Radiator Exhaust Ducting: Air In/Out Openings meet specs & are clear of debris | |
| <input type="checkbox"/> All required inspections have been completed (EG: Local Authorities, Natural Gas, Plumbing, Electrical, etc.) | |
| <input type="checkbox"/> All interconnect wiring between generator, transfer switch and remote annunciator | |

Note: Service Technician will not pull wires or run conduit for the annunciator (if applicable)

Miscellaneous

- 1) How close can our Technician get a vehicle and trailer to the generator for Load Bank testing? _____ Ft/Yds
- 2) Does the Genset have a remote radiator? Yes No (if Yes, please attach details of location)
- 3) Is the Genset: on roof inside outside in the grounds of the property
- 4) Is the Room/Site swept and free of all debris? Yes
- 5) Will Contractor/Owner personnel be available for instruction? Yes
- 6) Accessibility to elevators, if required? Yes
- 7) **Is equipment connected to normal utility power?** Yes
- 8) **Can transfer switch be tested at time of generator startup? (Note: There will be a power interruption)** Yes

- Please note (1):** Always refer to manuals shipped with the equipment for proper installation information.
- Please note (2):** The Cummins Sales and Service Technician will supply lube, oil, anti-freeze and starting battery.
- Please note (3):** Adjustments after the initial Start-Up are not included in the Start-Up and are not covered by Warranty.

Please note (4): The Contractor/Owner understands that the above items must be completed prior to start up. Should additional trips be needed resulting from Contractor/Owner not completing the above requirements, or if our Service Technician assists in completing any of the tie-ins, the Contractor/Owner will be responsible for the additional labor and mileage incurred. Load Bank Tests will not be conducted during inclement weather. Additional trips will be at contractor/owners' expense.
