



Cummins Bill of Materials

1	C3000D6E	C3000D6E, Diesel Genset, 3000kW-Standby Rating, OPEN
1	A331-2	Duty Rating-standby Power
1	A334-2	Engine Starter-24 Vdc Motor
1	A362-2	Heater-cntl Cabinet,120v
1	A416-2	Heater-alt, 110/220 (120/240) Volt
1	B225-2	Temp Sens-stator,2 Rtd/ph
1	B244-2	Temp Sens-altr Bearng Rtd
1	B801-2	Alt-60hz,3ph,480v,125/105/80c-spc
1	C286-2	Fuel Filters-stage 1 Redundant
1	D041-2	Engine Air Cleaner-normal Duty
1	E128-2	Engine Cooling-high Ambient Air Temperature, Ships Loose
1	H244-2	Gauge-exhaust Gas Temp
1	H268-2	Extension-oil Drain
1	H389-2	Shutdown-low Coolant Lvl
1	H536-2	Display Language-english
1	H607-2	Filters-eng Oil,full Flow/bypass
1	H609-2	Control Mtg-left Facing
1	H663-2	Priming-engine Lube Oil, Starting Only
1	H678-2	Display-control, Lcd
1	H704-2	Genset Control-powercommand 3.3
1	H731-2	Display-exhaust Port Temp
1	H732-2	Breather-coalescor
1	H737-2	Coolant Heater-400/480v, 40F Minimum Ambient Temp
1	K028-2	Circuit Breaker-none
1	KA08-2	Alarm-audible,engshutdown
1	KX24-2	Relays-user Configured
1	L010-2	Test Record-strip Chart
1	L023-2	Test Record-safety Shutdowns
1	L024-2	Test Record-exhaust Temp
1	L025-2	Test Record-amb Temp/pres
1	L026-2	Test Record-certified
1	L028-2	Genset Warranty- Base
1	L050-2	Literature-english
1	L090-2	Listing-ul 2200
1	L170-2	Emissions Certification, Epa, Tier 2, Nsps Ci Stationary Emergency
1	L193-2	Nfpa 110 Type 10 Level 1 Capable
1	L228-2	Certification-seismic, Ibc2000, Ibc2003, Ibc2006, Ibc2009, Ibc2012
1	L239-2	Auxiliary Supply Voltage-120v,1ph,2w
1	R002-2	Voltage-277/480,3 Phase,wy,4 Wire



Diesel Generator Set QSK95 Series Engine



2500 kW-3500 kW 60 Hz
EPA Tier 2 Emissions Regulated

Description

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

Features

Cummins Heavy-Duty Engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance windings, low waveform distortion with non-linear loads 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.

Cooling System - Standard and enhanced integral set-mounted radiator systems, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat. Also optional remote cooled configuration for non-factory supplied cooling systems.

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

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

ISO8528-5 - refer to factory for site and configuration specific transient performance classification

Model	Standby Rating	Prime Rating	Continuous Rating	Emissions Compliance	Data Sheets
	60 Hz kW (kVA)	60 Hz kW (kVA)	60 Hz kW (kVA)	EPA	60 Hz
C3000 D6e	3000 (3750)	2750 (3438)	2500 (3125)	EPA Tier 2	NAD-5942-EN
C3250 D6e	3250 (4063)	3000 (3750)	2500 (3125)	EPA Tier 2	NAD-3527-EN
C3500 D6e	3500 (4375)	3000 (3750)	2750 (3438)	EPA Tier 2	NAD-5917-EN

Note: All ratings include radiator fan losses.

Generator Set Specifications

Performance Class	Genset models have been tested in accordance with ISO 8528-5. Consult factory for transient performance information.
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Electromagnet Compatibility Performance	Emissions to EN 61000-6-2:2005 Immunity to EN 61000-6-4:2007+A1:2011

Engine Specifications

Bore	190 mm (7.48 in)
Stroke	210 mm (8.27 in)
Displacement	95.3 litres (5816 in ³)
Configuration	Cast iron, V 16 cylinder
Battery capacity	6 x 1400 amps minimum at ambient temperature of -18 °C (0 °F)
Battery charging alternator	145 amps
Starting voltage	24 volt, negative ground
Fuel system	Cummins modular common rail system
Fuel filter	On engine triple element, 5 micron primary filtration with water separators, 3 micron/2 micron (filter in filter design) secondary filtration.
Fuel transfer pump	Electronic variable speed priming and lift pump
Breather	Cummins impactor breather system
Air cleaner type	Unhoused dry replaceable element
Lube oil filter type(s)	Spin-on combination full flow filter and bypass filters
Standard cooling system	High ambient compact cooling system (ship loose) High ambient cooling system (ship loose)

Alternator Specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	Optimal
Rotor	Two bearing, flexible coupling
Insulation system	Class H throughout
Standard temperature rise	125 °C Standby/105 °C Prime
Exciter type	Optimal
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform Total Harmonic Distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Anti-condensation heater	1400 watt

Available Voltages

60 Hz Line – Neutral/Line – Line

• 220/380	• 7200/12470	• 2400/4160
• 240/416	• 277/480	• 7620/13200
• 230/400	• 347/600	• 7970/13800

Note: Consult factory for other voltages.

Generator Set Options and Accessories

Engine

- 480 V thermostatically controlled coolant heater for ambient above 4.5 °C (40 °F)
- Redundant fuel filter
- Air starter
- Redundant electric starting

- Eliminator oil filter system
- Lube oil make up
- Coalescing breather filter

Alternator

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

- Differential current transformers

Cooling System

- Enhanced high ambient cooling system (ship loose)
- High ambient compact cooling system (ship loose)
- **High ambient cooling system (ship loose)**
- Remote cooled configuration

Generator Set Options and Accessories (continued)

Control Panel

- Multiple language support
- Ground fault indication
- Remote annunciator panel
- Paralleling and shutdown alarm relay package
- Floor mounted pedestal installed control panel

Generator Set

- Battery
- Battery charger
- LV and MV entrance box
- Spring isolators
- Factory witness tests
- IBC, HCAI and IEEE certification

Warranty

- 3, 5, or 10 years for Standby including parts (labor and travel optional)
- 2 or 3 years for Prime including parts, labor and travel

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.

Other Control Features

- 150 watt anti-condensation heater
- DC distribution panel
- AC auxiliary distribution panel

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)
- Winding temperature
- Bearing temperature

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)
- Air cleaner restriction indication
- Exhaust temperature in each cylinder

Standard Control Functions

Digital Governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Standard Control Functions (continued)

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

Engine Protection

- Battery voltage monitoring, protection and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning

- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown
- Full authority electronic engine protection

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 (20)
- Remote emergency stop

Ratings Definitions

Emergency Standby Power (ESP):

Applicable for supplying power continuously 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 and ISO 3046-1, obtained and corrected in accordance with ISO 15550).

Limited-Time Running Power (LTP):

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

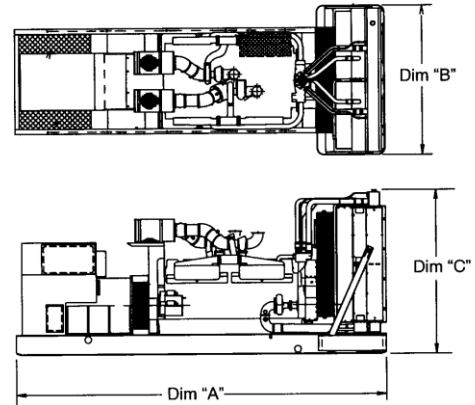
Prime Power (PRP):

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

Base Load (Continuous) Power (COP):

Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO 8528 and ISO 3046-1, obtained and corrected in accordance with ISO 15550).

This rating is not applicable to all generator set models.



This outline drawing is for reference only. See PowerSuite library for specific model outline drawing number.

Do not use for installation design

Model	Dim "A"* mm (in.)	Dim "B"* mm (in.)	Dim "C"* mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
C3000 D6e	8009 (315)	3024 (119)	3766 (148)	29370 (64750)	30100 (66359)
C3250 D6e	8009 (315)	3024 (119)	3766 (148)	29370 (64750)	30100 (66359)
C3500 D6e	8294 (327)	3172 (125)	3791 (149)	30005 (66150)	30800 (67902)

* Weights and dimensions represent a set with standard features and alternator frame S9. See outline drawing for weights and dimensions of other configurations.







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Codes and standards

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

<p>ISO 9001 ISO 14001 ISO 45001</p>	<p>This product was manufactured in a facility whose quality management system is certified to ISO 9001 and its Health Safety Environmental Management Systems certified to ISO 14001 and ISO 45001.</p>		<p>This product is listed to UL 2200, Stationary Engine Generator Assemblies for all 60 Hz low voltage models.</p>
	<p>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.</p>		<p>The generator set package is available certified for seismic application in accordance with International Building Code.</p>
	<p>All genset models are available as CSA certified to CSA C22.2 No.100</p>		<p>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.</p>
	<p>The generator meets or exceeds the limits specified in Eurocode 8, certificate available upon request.</p>	<p>ISO 8528</p>	<p>This generator set has been designed to comply with ISO 8528 standards.</p>

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

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Generator set data sheet



Model:	C3000 D6e
Frequency:	60 Hz
Fuel type:	Diesel
kW rating:	3000 Standby 2750 Prime 2500 Continuous
Emissions level:	EPA NSPS Stationary emergency Tier 2

Fuel consumption	Standby				Prime				Continuous			
	kW (kVA)				kW (kVA)				kW (kVA)			
Ratings	3000 (3750) †				2750 (3438)				2500 (3125)			
Ratings without fan ¹	3078 (3848)				2828 (3535)				2578 (3223)			
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
US gph	65	115	158	205	62	107	147	190	58	98	137	175
L/hr	246	435	598	776	235	405	556	719	220	371	519	662

¹Ratings for reference with the optional remote radiator cooling configuration. See note 1 under "Alternator data" section.

†DCC available at standby power subject to Cummins' site-specific assessment. Please contact your Cummins Distributor.

Engine	Standby rating	Prime rating	Continuous rating
Engine model	QSK95-G9		
Configuration	Cast iron, Vee, 16 cylinder		
Aspiration	Turbocharged and after-cooled		
Gross engine power output, kWm (bhp)	3215 (4309)	2956 (3963)	2698 (3616)
BMEP at set rated load, kPa (psi)	2248 (326)	2068 (300)	1889 (274)
Bore, mm (in.)	190.0 (7.48)		
Stroke, mm (in.)	210.1 (8.27)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	12.6 (2480)		
Compression ratio	15.1:1		
Lube oil capacity, L (qt)	647 (684)		
Overspeed limit, rpm	2070		
Regenerative power, kW	321		

Fuel flow	
Maximum fuel flow, L/hr (US gph)	1601.1 (423)
Maximum fuel inlet restriction with clean filter, kPa (in Hg)	30.48 (9)
Maximum fuel return line restriction, kPa (in Hg)	34 (10)
Maximum fuel inlet temperature, °C (°F)	71.1 (160)
Maximum fuel outlet temperature, °C (°F)	92.2 (198)

Air	Standby rating	Prime rating	Continuous rating
Combustion air, m ³ /min (scfm)	274 (9649)	268 (9441)	261 (9191)
Maximum air cleaner restriction with clean filter, mm H ₂ O (in H ₂ O)	508 (20)		
Alternator cooling air, m ³ /min (scfm)	255 (9005)		

Exhaust

Exhaust flow at set rated load, m ³ /min (cfm)	650 (22925)	619 (21829)	588 (20735)
Exhaust temperature at set rated load, °C (°F)	443 (828)	423 (792)	404 (759)
Maximum back pressure, kPa (in H ₂ O)	7 (28)		

Set-mounted radiator cooling

	High Ambient	High Ambient Compact
Ambient design, °C (°F)	48 (118)	45 (113)
Fan load, kWm (HP)	78 (105)	149 (200)
Coolant capacity (with radiator), L (US gal)	1120 (296)	1238 (327)
Cooling system air flow, m ³ /min (scfm)	3135 (110700)	2579 (91083)
Maximum cooling air flow static restriction, kPa (in H ₂ O)	0.12 (0.5)	0.12 (0.5)

Set-mounted radiator cooling

	Enhanced High Ambient
Ambient design, °C (°F)	50 (122)
Fan load, kWm (HP)	78 (105)
Coolant capacity (with radiator), L (US gal)	1120 (296)
Cooling system air flow, m ³ /min (scfm)	3135 (110700)
Maximum cooling air flow static restriction, kPa (in H ₂ O)	0.12 (0.5)

Optional remote radiator cooling

Engine coolant capacity, L (US gal)	379 (100)		
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	2896 (765)		
Max flow rate at max friction head, after-cooler circuit, L/min (US gal/min)	651 (172)		
Heat rejected, jacket water circuit, MJ/min (Btu/min)	91.9 (87063)	85.4 (80943)	78.6 (74485)
Heat rejected, after-cooler circuit, MJ/min (Btu/min)	21.7 (20491)	20.9 (19753)	19.5 (18423)
Heat rejected, fuel circuit, MJ/min (Btu/min)	0.53 (513)	0.53 (513)	0.53 (513)
Total heat radiated to room, MJ/min (Btu/min)	26.0 (24565)	24.0 (22696)	22.1 (20856)
Maximum friction head, jacket water circuit, kPa (psi)	83 (12)		
Maximum friction head, after-cooler circuit, kPa (psi)	83 (12)		
Maximum static head above engine crank centerline, jacket water circuit, m (ft)	18 (60)		
Maximum static head above engine crank centerline, after-cooler circuit, m (ft)	18 (60)		
Maximum jacket water outlet temp, °C (°F)	110 (230)	100 (212)	100 (212)
Maximum after-cooler inlet temp, °C (°F)	71.1 (160)	68 (155)	68 (155)
Maximum after-cooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	46.1 (115)		

Note: For non-standard remote installations contact your local Cummins representative.

Weights

Unit dry weight kg (lb)	29370 (64750)
Unit wet weight kg (lb)	30100 (66359)

Note: Weights represent a set with standard features and alternator frame S9. See outline drawing for weights of other configurations.

Derating factors

Standby	<p>High Ambient Cooling System: Full genset power available up to 2311 m (7581 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5% per 305 m (1000 ft) and 15.1% per 10 °C (18 °F).</p> <p>High Ambient Compact Cooling System: Full genset power available up to 1187 m (3894 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5% per 305 m (1000 ft) and 21.2% per 10 °C (18 °F).</p> <p>Enhanced High Ambient Cooling System: Full genset power available up to 2319 m (7609 ft) at ambient temperatures up to 40 °C (104 °F) and 2011 m (6598 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 5% per 305 m (1000 ft) and 14.8% per 10 °C (18 °F).</p>
Prime	<p>High Ambient Cooling System: Full genset power available up to 1641 m (5383 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5.4% per 305 m (1000 ft) and 14.9% per 10 °C (18 °F).</p> <p>High Ambient Compact Cooling System: Full genset power available up to 420 m (1378 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5.4% per 305 m (1000 ft) and 19.5% per 10 °C (18 °F).</p> <p>Enhanced High Ambient Cooling System: Full genset power available up to 1667 m (5471 ft) at ambient temperatures up to 40 °C (104 °F) and 1153 m (3783 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 5.4% per 305 m (1000 ft) and 14.8% per 10 °C (18 °F).</p>
Continuous	<p>High Ambient Cooling System: Full genset power available up to 1464 m (4802 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5.1% per 305 m (1000 ft) and 10.4% per 10 °C (18 °F).</p> <p>High Ambient Compact Cooling System: Full genset power available up to 888 m (2913 ft) at ambient temperatures up to 40 °C (104 °F). Above these conditions, derate at 5.5% per 305 m (1000 ft) and 22.1% per 10 °C (18 °F).</p> <p>Enhanced High Ambient Cooling System: Full genset power available up to 1494 m (4902 ft) at ambient temperatures up to 40 °C (104 °F) and 913 m (2997 ft) at ambient temperatures up to 50 °C (122 °F). Above these conditions, derate at 5.1% per 305 m (1000 ft) and 9.5% per 10 °C (18 °F).</p>

Ratings definitions

Emergency Standby Power (ESP):	Limited-Time Running Power (LTP):	Prime Power (PRP):	Base Load (Continuous) Power (COP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with 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 a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046-1, obtained and corrected in accordance with ISO 15550.	Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO 8528 and ISO 3046-1, obtained and corrected in accordance with ISO 15550). This rating is not applicable to all generator set models.

Alternator data¹

Voltage	Connection	Temp rise °C	Duty	Ambient temp C	Max surge kVA	Winding No.	Alternator	Feature code
480	Wye, 3 phase	105C	S	40	13290	312	ADS-682	B280-2
600	Wye, 3 phase	125C	S	40	13293	607	ADS-682	B465-2
600	Wye, 3 phase	105C	P	40	13293	607	ADS-682	B465-2
600	Wye, 3 phase	80C	C	40	13293	607	ADS-682	B465-2
480	Wye, 3 phase	125C	S	40	13290	312	ADS-682	B801-2
480	Wye, 3 phase	105C	P	40	13290	312	ADS-682	B801-2
480	Wye, 3 phase	80C	C	40	13290	312	ADS-682	B801-2
380	Wye, 3 phase	150C	S	40	11250	613	ADS-682	BE95-2
380	Wye, 3 phase	125C	S	40	11250	613	ADS-682	B872-2
380	Wye, 3 phase	125C	S	50	12105	312	ADS-684	B872-2
400	Wye, 3 phase	125C	S	40	11250	613	ADS-682	BC36-2
400	Wye, 3 phase	125C	S	50	12750	312	ADS-684	BC36-2
400	Wye, 3 phase	150C	S	40	11250	613	ADS-682	BE13-2
480	Wye, 3 phase	105C	S	50	14310	312	ADS-683	B280-2
480	Wye, 3 phase	125C	S	50	13290	312	ADS-682	B801-2
480	Wye, 3 phase	105C	P	50	14310	312	ADS-683	B801-2
480	Wye, 3 phase	80C	C	50	14310	312	ADS-683	B801-2
600	Wye, 3 phase	125C	S	50	13293	607	ADS-682	B465-2
600	Wye, 3 phase	105C	P	50	14343	607	ADS-683	B465-2
600	Wye, 3 phase	80C	C	50	14343	607	ADS-683	B465-2

Notes:

¹Alternator data is configured for a set with ratings including engine cooling fan losses and standard features at 40 °C ambient temperature. For non-standard configurations, including remote radiator applications, check appropriate alternator data sheets or contact your local Cummins representative.

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

³Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Alternator data¹ (Continued)

Voltage	Connection	Temp rise degrees C	Duty ²	Ambient temp C	Max surge kVA ³	Winding number	Alternator data sheet	Feature code
4160	Wye, 3-phase	80	S	40/50	17127	851	ADS-653	B935-2
4160	Wye, 3-phase	105/80	S/P	40	14835	851	ADS-652	B937-2
4160	Wye, 3-phase	105	S	50	14835	851	ADS-652	B937-2
4160	Wye, 3-phase	80	P	50	17127	851	ADS-653	B937-2
4160	Wye, 3-phase	125/105	S/P	40	12870	851	ADS-651	B467-2
4160	Wye, 3-phase	125/105	S/P	50	14835	851	ADS-652	B467-2
4160	Wye, 3-phase	80	C	40/50	14835	851	ADS-652	B467-2
12.47k	Wye, 3-phase	105	S	40	15180	991	ADS-661	B568-2
12.47k	Wye, 3-phase	125/105	S/P	40	13908	991	ADS-660	B609-2
12.47k	Wye, 3-phase	125/105	S/P	50	15180	991	ADS-661	B609-2
12.47k	Wye, 3-phase	80	C	40	15180	991	ADS-661	B609-2
12.47k	Wye, 3-phase	105	C	40/50	13908	991	ADS-660	B569-2
13.2-13.8k	Wye, 3-phase	105	C	40	12294	991	ADS-659	B657-2
13.2k	Wye, 3-phase	105	C	50	13908	991	ADS-660	B657-2
13.8k	Wye, 3-phase	105	S	40	13908	991	ADS-660	BE20-2
13.8k	Wye, 3-phase	105	S	50	15180	991	ADS-661	BE20-2
13.8k	Wye, 3-phase	105	C	50	12294	991	ADS-659	B657-2

Notes:

¹Alternator data is configured for a set with ratings including engine cooling fan losses and standard features at 40 °C ambient temperature. For non-standard configurations, including remote radiator applications, check appropriate alternator data sheets or contact your local Cummins representative.

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

³Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

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

Our energy working for you.™





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.

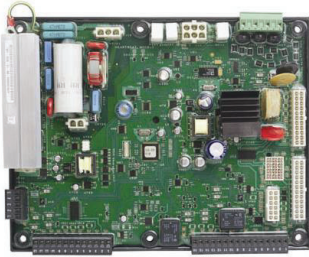
Offering enhanced reliability and performance over more conventional generator set controls via the integration of all generator control functions into a single system, PCC3300 is your Power of One generator set control solution.

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 design with consideration to the needs of prime applications or others application 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 are 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 below 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 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.

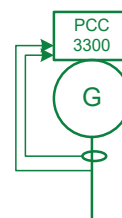
Exerciser clock –The exerciser clock (when enabled) allows the system to be operated at preset times in either test without load, test with load, or extended parallel mode. A Real Time Clock is built in. Up to 12 different programs can be set for day of week, time of day, duration, repeat interval, and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

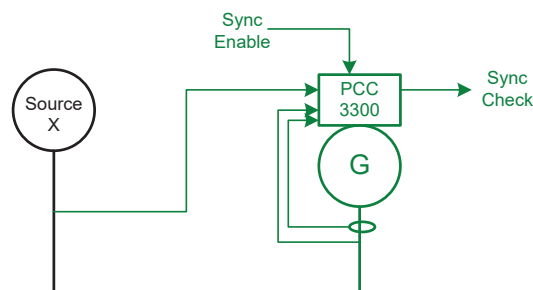
penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

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:

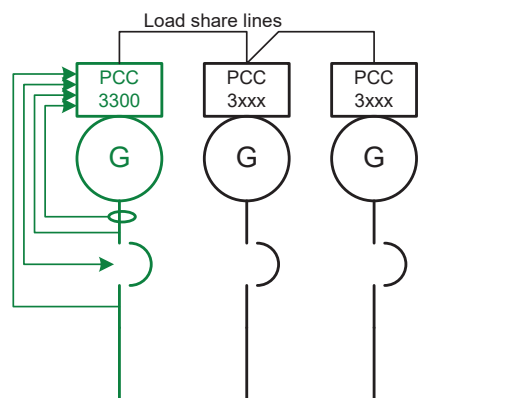
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



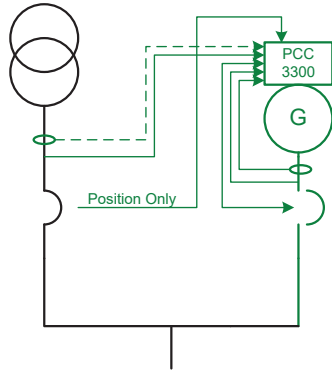
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



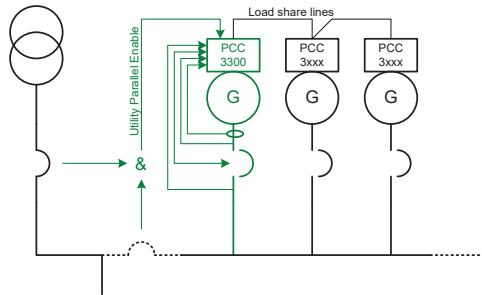
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



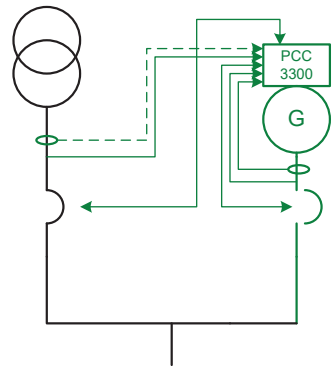
Utility Single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



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.

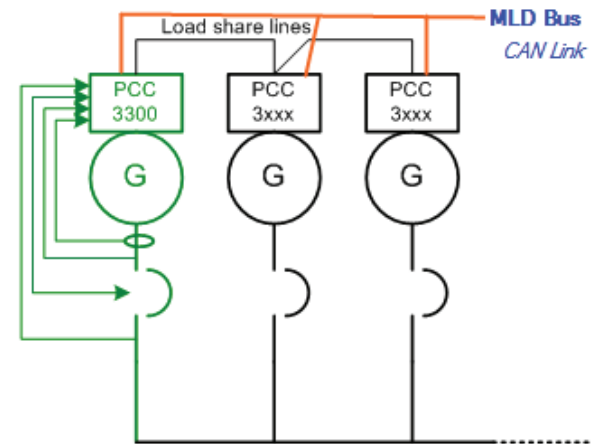
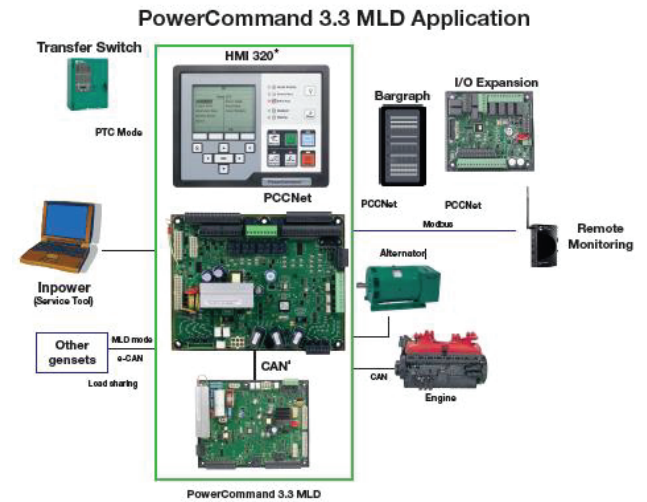


Power Transfer Control: Control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



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.

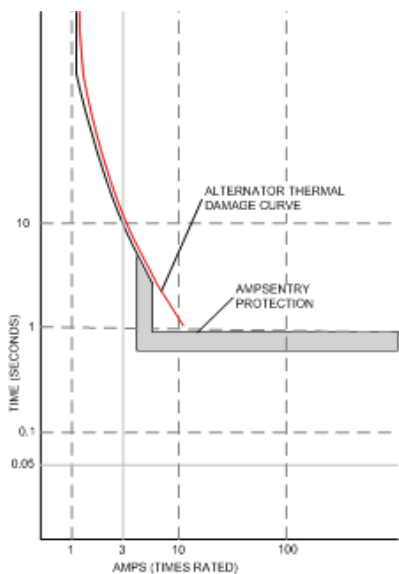
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

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

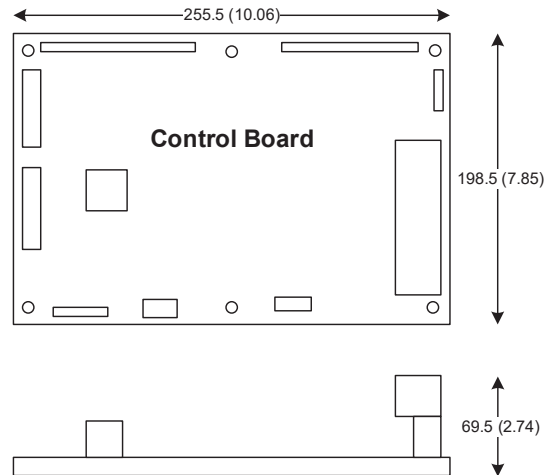
Communications connections include:

- 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:

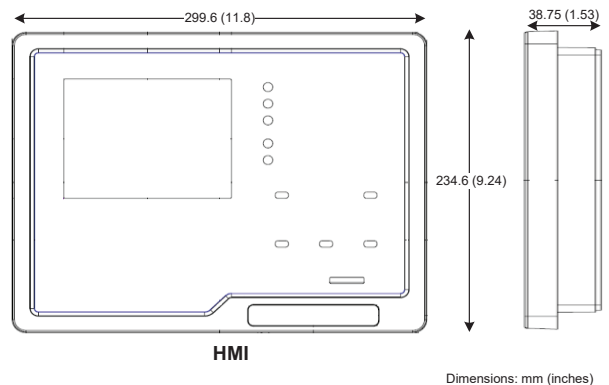
- LED indicating lamps
 - genset running
 - remote start
 - not in auto
 - shutdown
 - warning
 - auto
 - manual and stop
 - Circuit breaker open (if equipped)
 - Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. 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 61000-6-3,4 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.





2026 EPA Tier 2 Exhaust Emission Compliance Statement C3000 D6e Stationary Emergency 60 Hz Diesel Generator Set

Compliance Information:

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

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	TCEXL95.0AAA-029
Effective Date:	10/09/2025
Date Issued:	10/09/2025
EPA Engine Family (Cummins Emissions Family):	TCEXL95.0AAA

Engine Information:

Model:	QSK95-G9	Bore:	7.48 in. (190 mm)
Engine Nameplate HP:	5051	Stroke:	8.27 in. (210 mm)
Type:	4 cycle, Vee, 16 Cylinder Diesel	Displacement:	5816 cu. in. (95.3 liters)
Aspiration:	Turbocharged and Aftercooled	Compression Ratio:	15.5:1
Emission Control Device:	Turbocharged and Aftercooled	Exhaust Stack Diameter:	14 in.

Diesel Fuel Emissions Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kW _m -hr		
	<u>NO_x + NMHC</u>	<u>CO</u>	<u>PM</u>	<u>NO_x + 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: Cetane number: 40-50. Reference: ASTM D975 No. 2-D, 7-15 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.



Alternator Data Sheet Frame Size: S9L1D-E4

Characteristics			No of Bearings:		1-bearing		2-bearing			
Weights:	Stator assembly:		N/A	N/A	7782 lb	3530 kg				
	Rotor assembly:		N/A	N/A	5262 lb	2387 kg				
	Complete assembly:		N/A	N/A	15542 lb	7050 kg				
Maximum speed:			2250 rpm							
Excitation current:	Full load:		Wdg 312: 4; Wdg 607: 3.9, Wdg 613: 3.9							
	No load:		Wdg 312: 1-0.9; Wdg 607: 1.0, Wdg 613: 0.9							
Insulation system:			Class H throughout							
3 Ø Ratings (0.8 power factor)			60 Hz (winding no)							
			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
150° C rise ratings	@ 40° C	kW	3072	3248	3396	3544	3545	3200	3200	3200
		kVA	3840	4060	4245	4430	4431	4000	4000	4000
125° C rise ratings	@ 40° C	kW	2872	3040	3175	3314	3315	3000	3000	3000
		kVA	3590	3800	3969	4142	4144	3750	3750	3750
105° C rise ratings	@ 40° C	kW	2680	2840	2968	3097	3100	2760	2760	2760
		kVA	3350	3550	3710	3871	3875	3450	3450	3450
80° C rise ratings	@ 40° C	kW	2332	2468	2579	2691	2700	2425	2425	2425
		kVA	2915	3085	3224	3364	3375	3031	3031	3031
Reactances (per unit ± 10%)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
(Based on full load at 125° C rise rating)										
Synchronous			2.454	2.322	2.219	2.126	1.960	2.090	1.886	1.744
Transient			0.231	0.219	0.209	0.200	0.173	0.230	0.207	0.191
Subtransient			0.156	0.148	0.141	0.135	0.120	0.136	0.122	0.113
Negative sequence			0.218	0.207	0.198	0.189	0.170	0.173	0.156	0.144
Zero sequence			0.089	0.084	0.080	0.077	0.064	0.006	0.005	0.005
Motor starting			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
Maximum kVA (90% sustained voltage)			11520	12180	12735	13290	13293	11250	11250	11250
Time constants (sec)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
Transient			0.24	0.24	0.24	0.24	0.23	0.363	0.363	0.363
Subtransient			0.0163	0.0163	0.0163	0.0163	0.0184	0.017	0.017	0.017
Open circuit			4.16	4.16	4.16	4.16	4.25	3.477	3.477	3.477
DC			0.034	0.034	0.034	0.034	0.039	0.025	0.025	0.025
Windings (@22° C)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
Stator resistance (L-L Ohms)			0.00066	0.00066	0.00066	0.00066	0.00096	0.0004	0.0004	0.0004
Rotor resistance (Ohms)			1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
Number of leads			6	6	6	6	6	6	6	6



Alternator Data Sheet

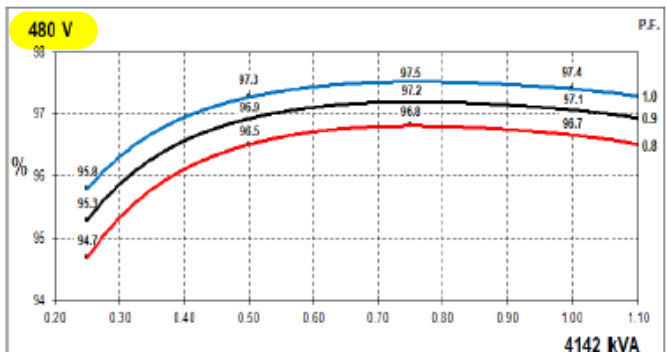
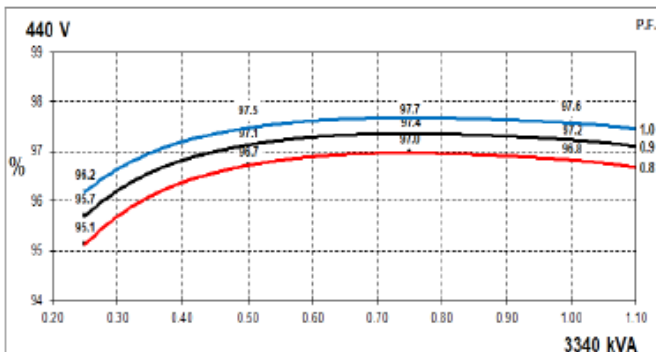
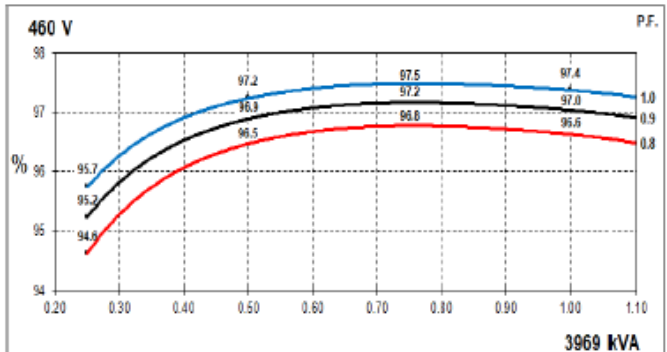
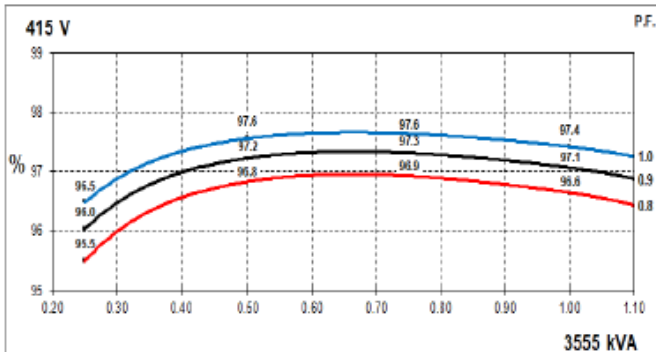
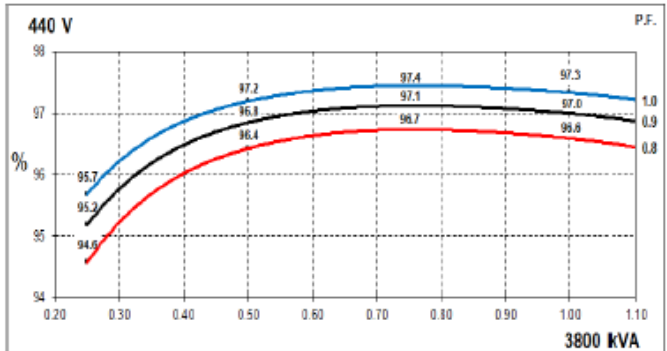
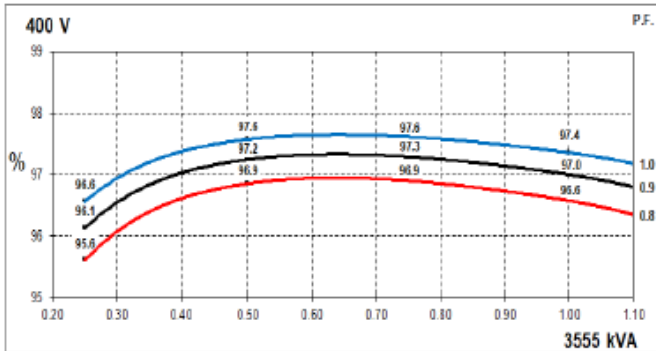
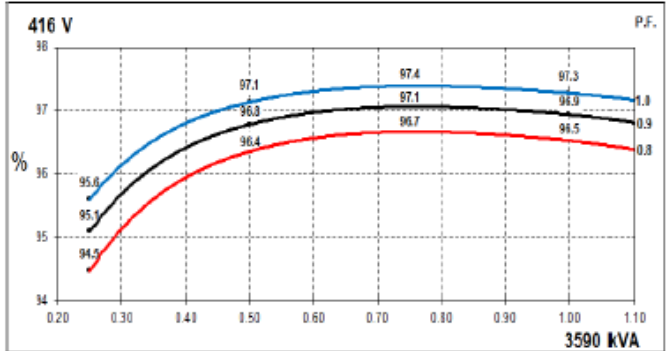
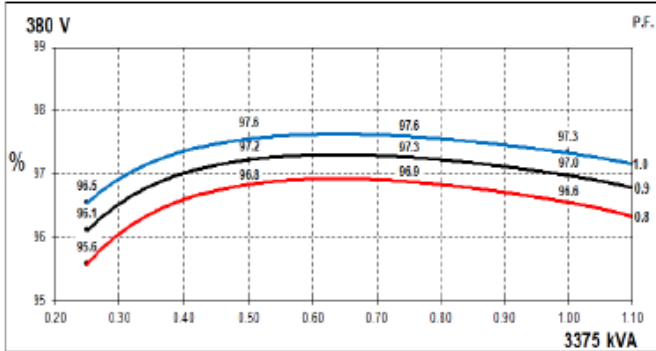
Frame Size: S9L1D-E4

S9L1D-E4 Wdg.312

THREE PHASE EFFICIENCY CURVES

50Hz

60Hz



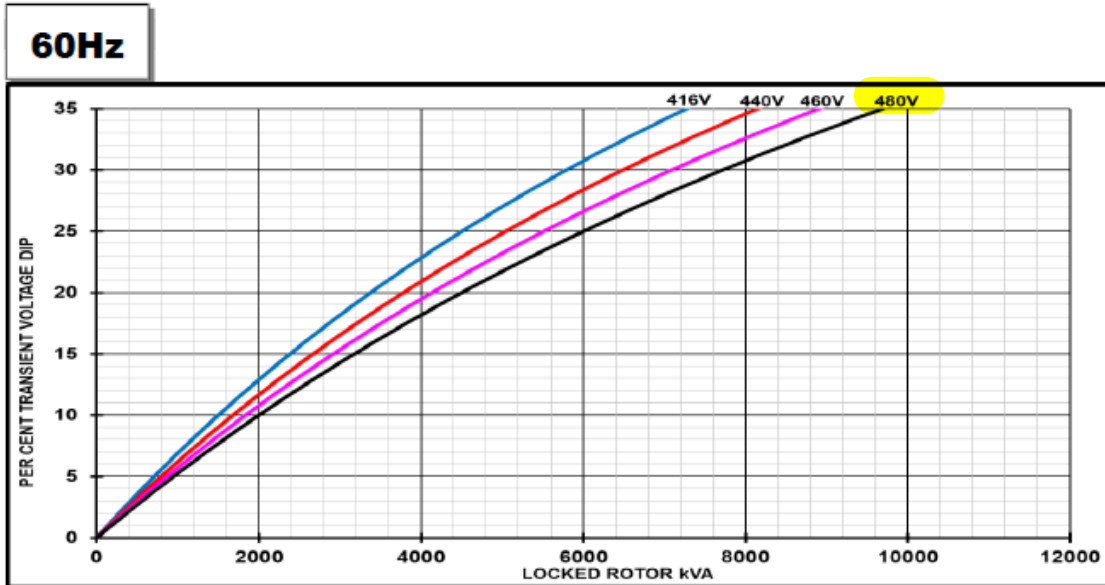
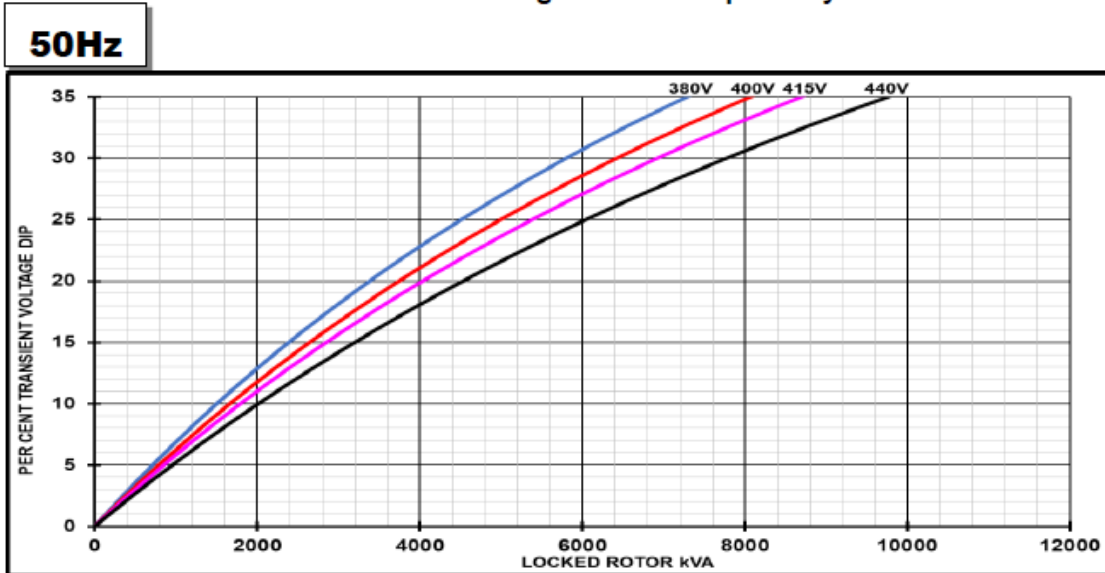


Alternator Data Sheet

Frame Size: S9L1D-E4

S9L1D-E4 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.



Prototype Test Support (PTS) 60 Hz test summary



<u>Generator set models</u>		<u>Representative prototype</u>	
C3500 D6e	C3500 D6	Model:	C3500 D6
C3250 D6e	C3250 D6	Engine:	QSK95-G9
C3000 D6e	C3000 D6	Alternator:	S9H1D-H4

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

Maximum surge power: N/A kW
The generator set was evaluated to determine the stated maximum surge power.

Maximum motor starting: N/A
The generator set was tested to simulate motor starting by applying the specified kVA load at low lagging power factor (0.4 or lower). With this load applied, the generator set recovered to a minimum of 90% rated voltage

Torsional analysis and testing:
The generator set on S9H1D-H4 was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1350 to 1950 RPM.

Cooling system: 50°C ambient
0.5 in H2O restriction

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

Durability:
The generator set was subjected to 130 hour of endurance testing replicating field duty cycles operating at variable load up to the standby rating based on MIL-STD-705 to verify structural soundness and durability of the design

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

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

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

Transient performance:
The generator set was tested with the listed alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded at 0.8 power factor:

Full load acceptance:

Voltage dip:	27.9%
Recovery time:	3.8 seconds
Frequency dip:	9.9%
Recovery time:	4.6 seconds

Full load rejection:

Voltage rise:	19.5%
Recovery time:	3.7 seconds
Frequency rise:	8.0%
Recovery time:	4.5 seconds

All data based on 0.8 power factor:

Harmonic analysis:

(per MIL-STD-705B, Method 601.4)

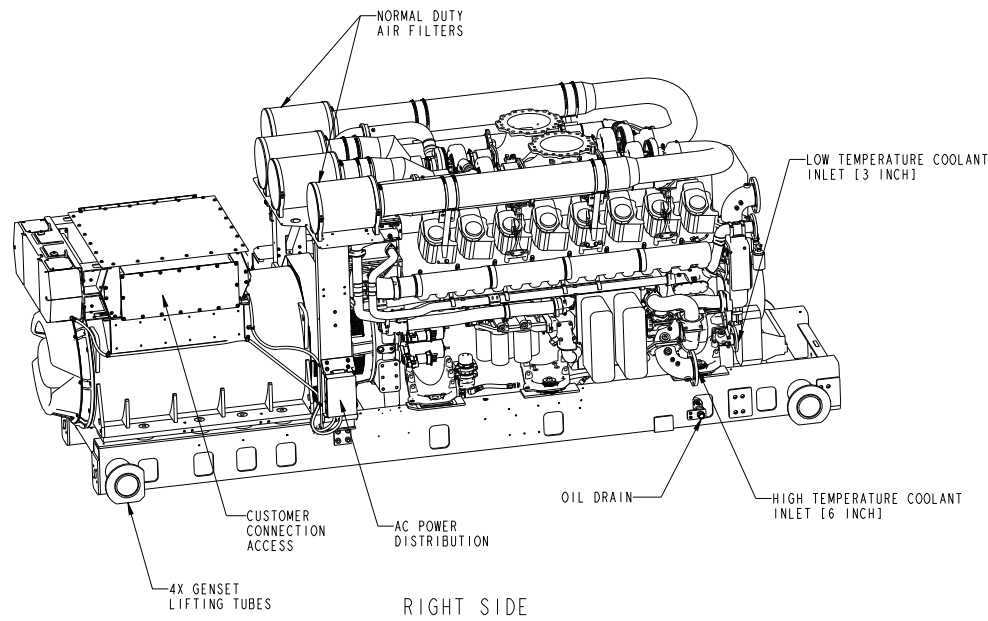
<u>Harmonic</u>	<u>Line to Line</u>		<u>Line to Neutral</u>	
	<u>No load</u>	<u>Full load</u>	<u>No load</u>	<u>Full load</u>
3	0.007	0.18	0.016	0.18
5	1.098	0.30	1.083	0.30
7	1.002	0.42	0.982	0.42
9	0.017	0.54	0.010	0.54
11	0.050	0.66	0.051	0.66
13	0.176	0.78	0.183	0.78
15	0.006	0.90	0.003	0.90

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

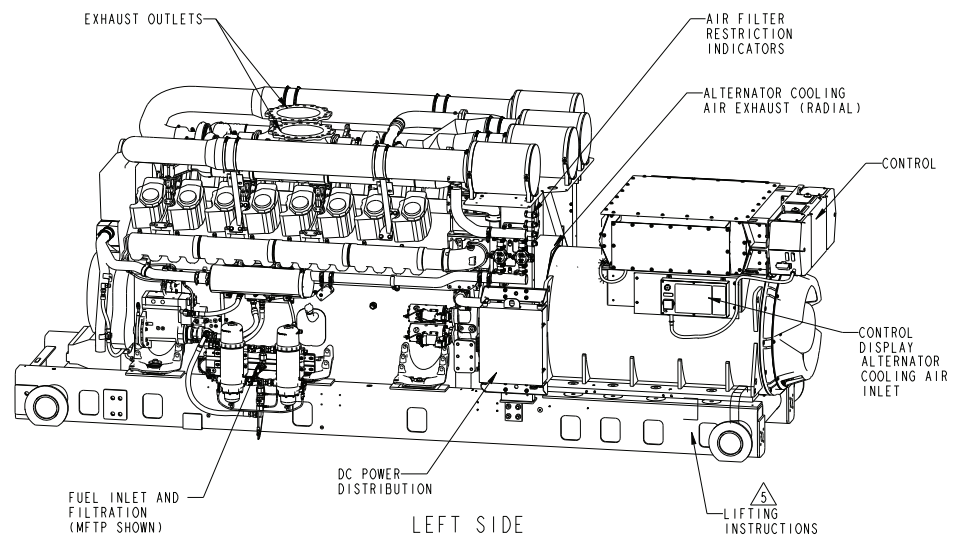
- NOTES:
- ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[]".
 - IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.
 - ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED..
 - WEIGHT: REFER TO TABLE FOR STANDARD GENSET.
 - *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 KG/1168 LBS)
 - **3.2 DOES NOT INCLUDE NON-SUPPLIED 378.5 LITERS [100 GALLONS] OF ENGINE COOLANT CAPACITY.
 - LARGEST REMOTE COOLED GENSET DIMENSIONS:
 - LENGTH: 6415 [252.6]
 - WIDTH: 2594 [102.1]
 - HEIGHT: 3009 [118.5]
 - DOES NOT INCLUDE THE HEIGHT OF VIBRATION ISOLATOR
 - LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL.

NOTE: GENSET SHALL NOT BE LIFTED USING THE LIFTING TUBES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.
 - ALLOW 1 METER OF SPACE AROUND THE GENSET FOR SERVICE.

⚠ ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENSET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.
 - SEE NOTES ON SHEET 7, 8, 11, 13, 14, 17 AND 20.



RIGHT SIDE



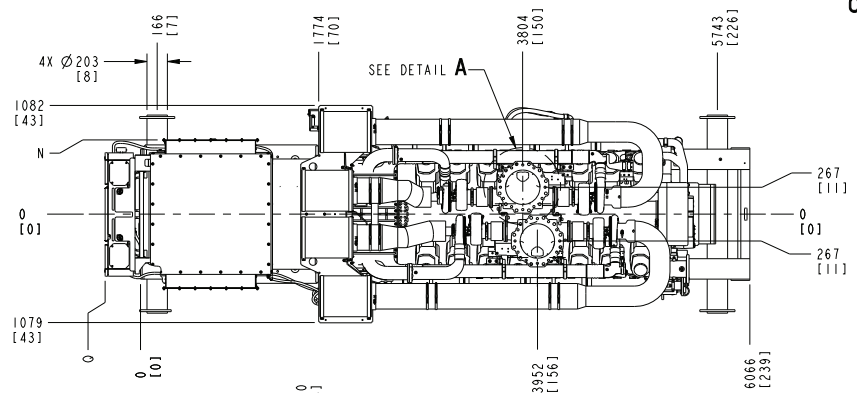
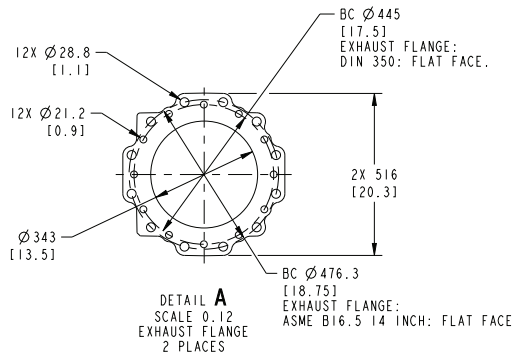
LEFT SIDE

STANDARD GENSET WITH S9HD-H42 ALTERNATOR AND NORMAL DUTY AIR INDUCTION CONFIGURATION SHOWN

PART NUMBER: A078A144		PART REVISION: B	
PART NAME: OUTLINE.GENSET			
DRAWING CATEGORY: OUTLINE			
STATE: RELEASED		SHEET: 1 OF 23	
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL			
THIS DOCUMENT AND THE INFORMATION SHOWN THEREIN IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.			
LAST DATUM LETTER USED: .		LAST REFERENCE LETTER USED: W	
MODEL/PLATFORM: C325006		THIS PART IS SIMILAR TO: A049P698	
Cummins Inc.			
DIMENSIONS ARE IN: MILLIMETERS		SIZE: A1	
[] ARE IN: INCHES		SCALE: 13/320	
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		THIRD ANGLE PROJECTION	
		CAD SYSTEM: PTC® Creo® Parametric	

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

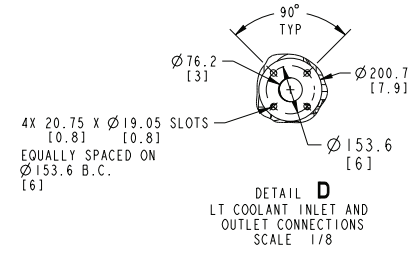
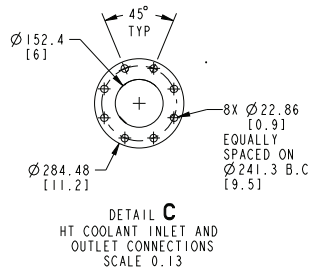
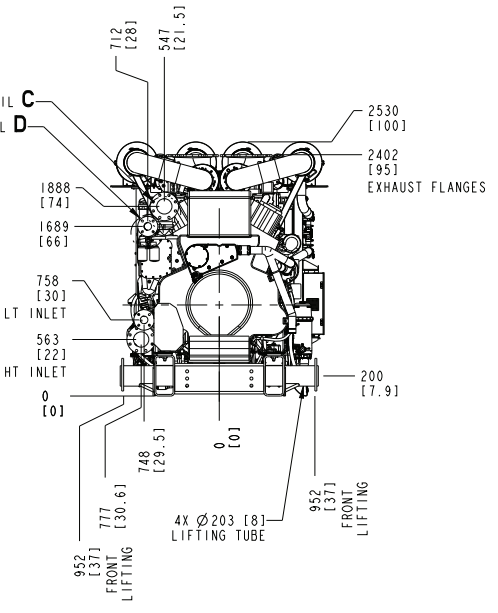
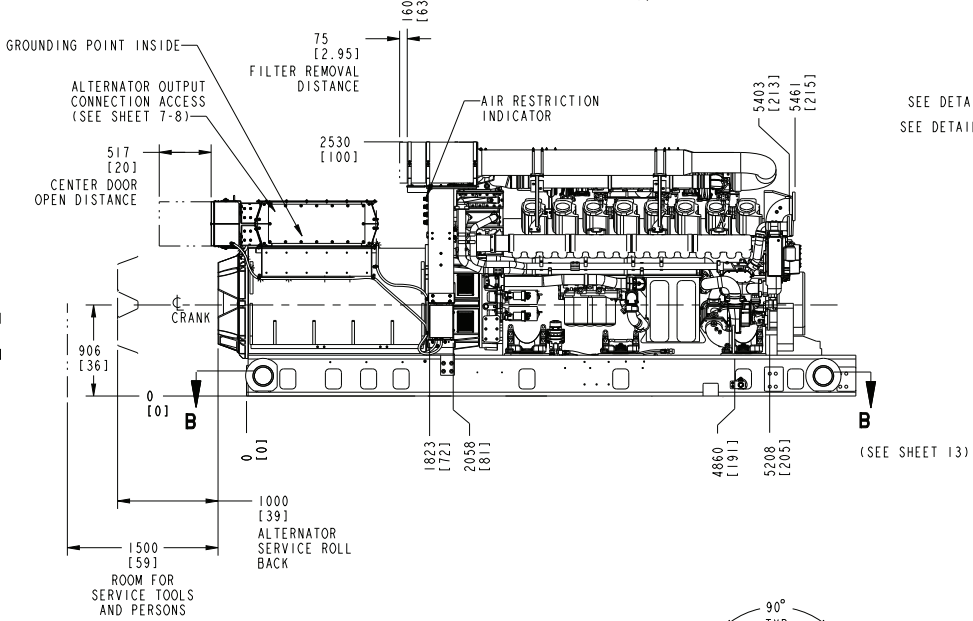
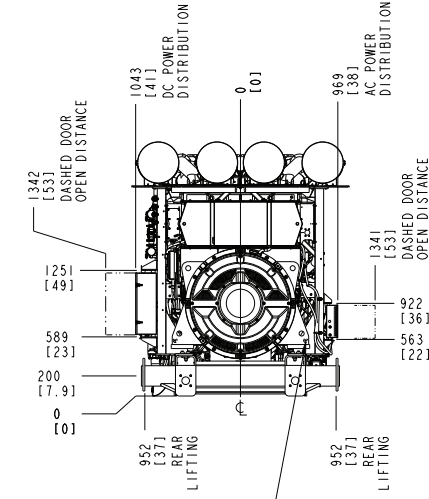
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



GENSET DIMENSIONAL AND LIFTING DETAILS INCLUDE C OF G, COOLING SYSTEM DETAILS, EXHAUST FLANGE CONNECTIONS.

DIMENSION	MV AND HV CORE			
	E	F	G	H
N	739	739	739	739
Q	166	166	352	352

DIMENSION	LV CORE		
	E	F	G
N	611	611	611
Q	161	231	351

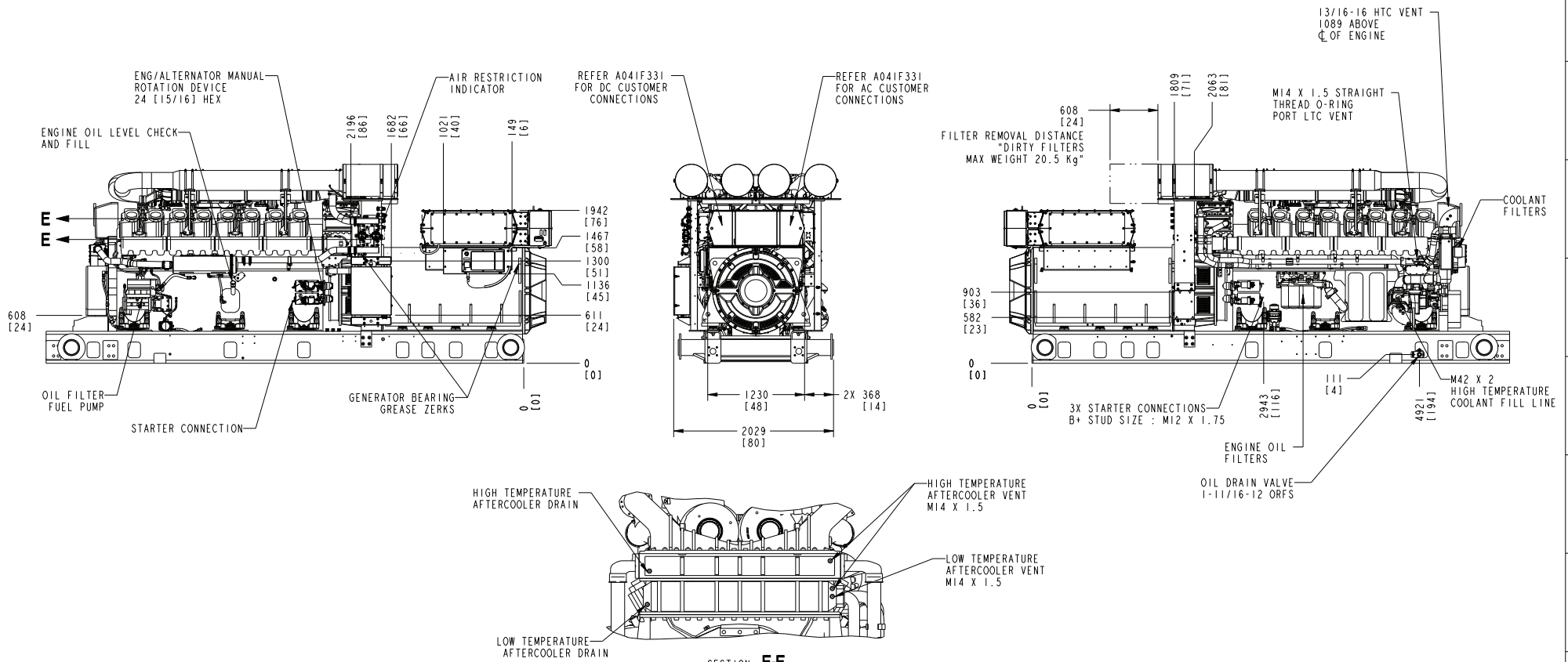


STANDARD GENSET WITH NORMAL DUTY AIR INDUCTION CONFIGURATION SHOWN

PART NUMBER: A678A144	PART REVISION: B		DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: INCHES	SIZE: A1 SCALE: 13/320
PART NAME: OUTLINE GENSET	DRAWING CATEGORY: OUTLINE			
STATE: RELEASED	SHEET: 2 OF 23		DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	CAD SYSTEM: PTC® Creo® Parametric
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.				

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

GENSET SERVICE DETAILS

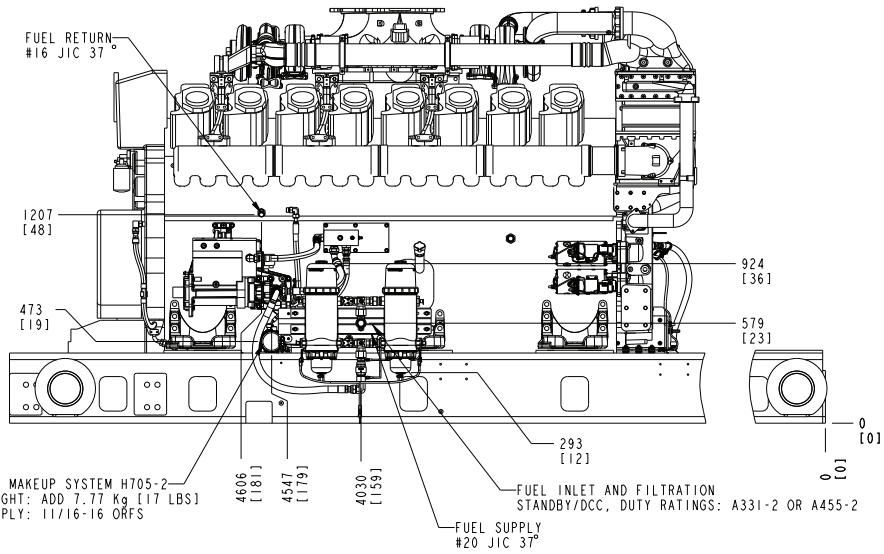


SECTION E-E
ON ENGINE COOLANT DRAIN AND VENT PORTS
SCALE 29/320

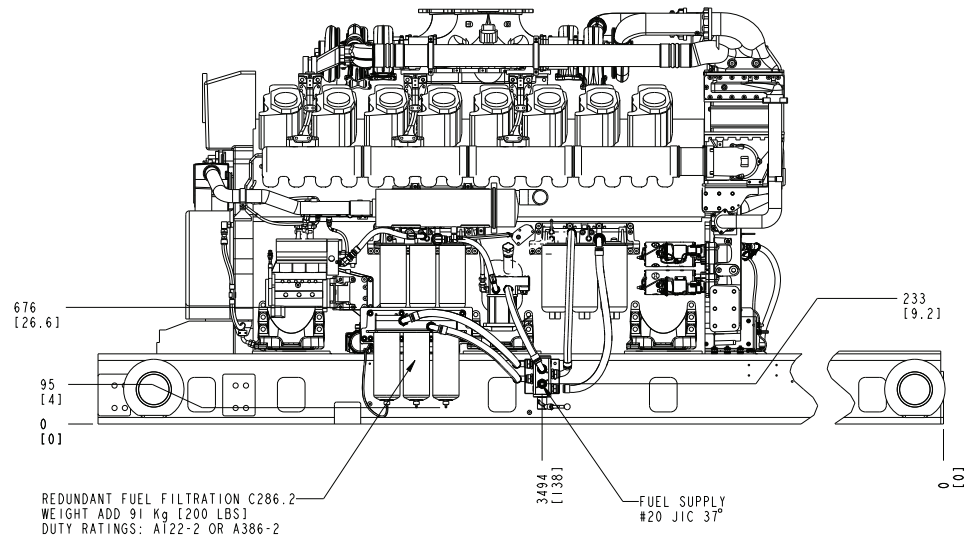
STANDARD GENSET WITH NORMAL DUTY AIR INDUCTION CONFIGURATION SHOWN

PART NUMBER: A078A144	PART REVISION: B	Cummins Inc.		
PART NAME: OUTLINE GENSET				
DRAWING CATEGORY: OUTLINE		DIMENSIONS ARE IN: MILLIMETERS	SIZE: A1	SCALE: 13/320
STATE: RELEASED	SHEET: 3 OF 23	ARE IN: INCHES	 THIRD ANGLE PROJECTION	
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL		DIMENSIONING AND TOLERANCING PER:		
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS INC.		ASME Y14.5-2009	 CAD SYSTEM PTC® Creo® Parametric	

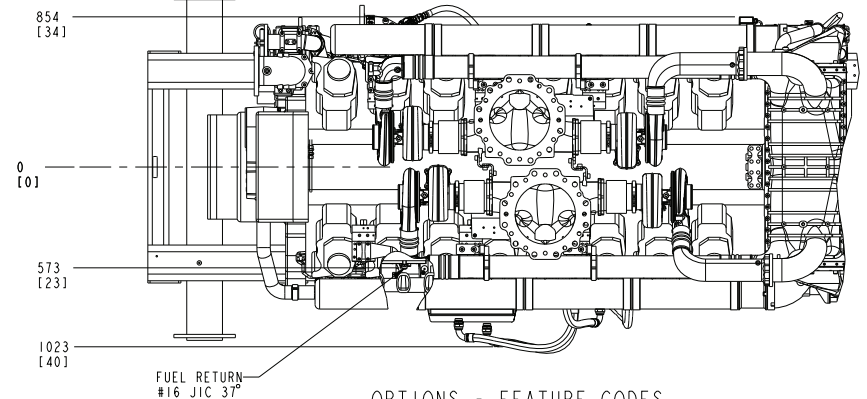
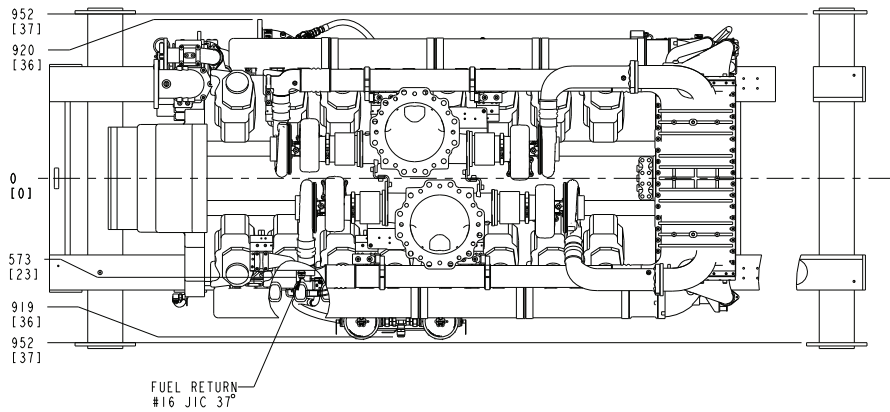
STANDARD MECHANICAL FUEL TRANSFER PUMP (MFTP) AND
OPTIONAL REDUNDANT ELECTRONIC FUEL TRANSFER PUMP (EFTP) DETAILS



SCALE 11/160
MFTP (MECHANICAL FUEL TRANSFER PUMP) STANDARD FUEL SYSTEM



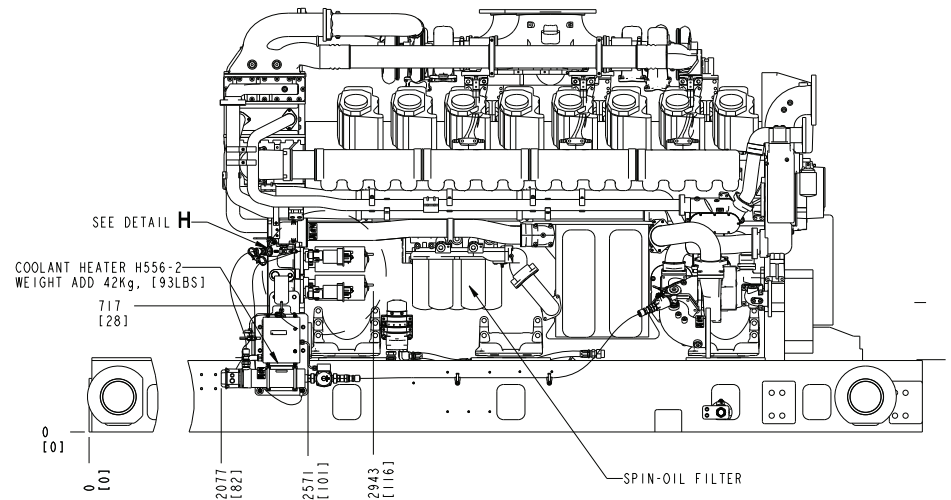
SCALE 0.07
EFTP (ELECTRONIC FUEL TRANSFER PUMP) REDUNDANT FUEL SYSTEM



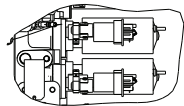
OPTIONS - FEATURE CODES
WEIGHTS ARE ADJUSTMENTS TO NOTE 3

PART NUMBER: A678A144	PART REVISION: B	Cummins Inc.	
PART NAME: OUTLINE.GENSET			
DRAWING CATEGORY: OUTLINE		DIMENSIONS ARE IN: MILLIMETERS	SIZE: A1 SCALE: 13/320
STATE: RELEASED	SHEET: 4 OF 23	DIMENSIONS ARE IN: INCHES	
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL		DIMENSIONING AND TOLERANCING PER:	THIRD ANGLE PROJECTION
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.		ASME Y14.5-2009	PTC® Creo® Parametric CAD SYSTEM

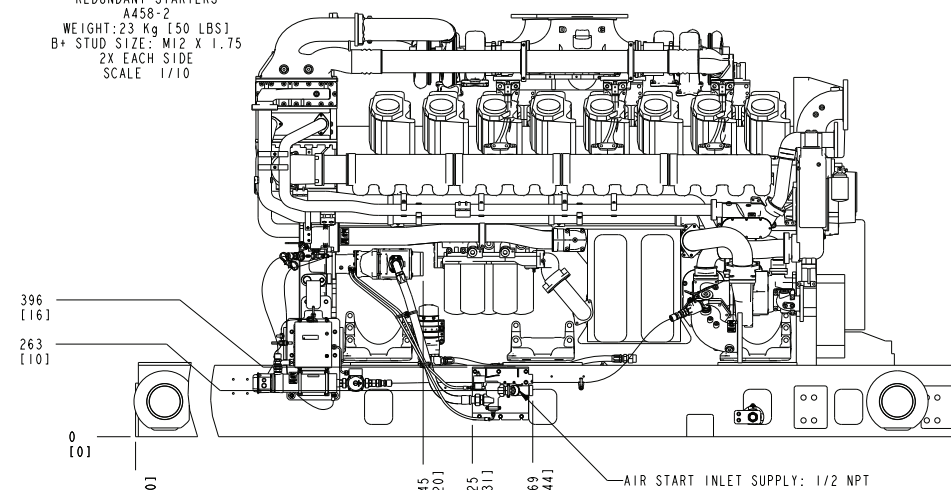
**GENSET OPTION DETAILS: COOLANT HEATER, CCV,
AIR START AND COALESCER BREATHER**



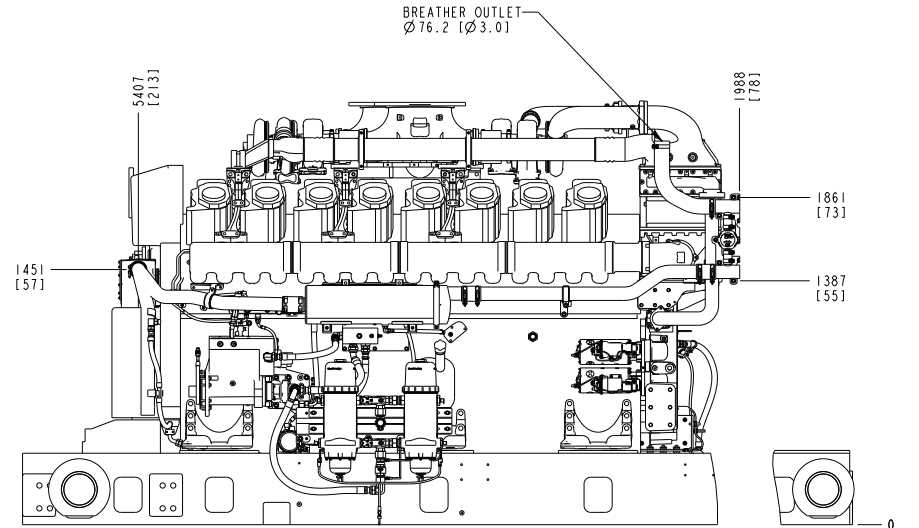
SCALE 11/160



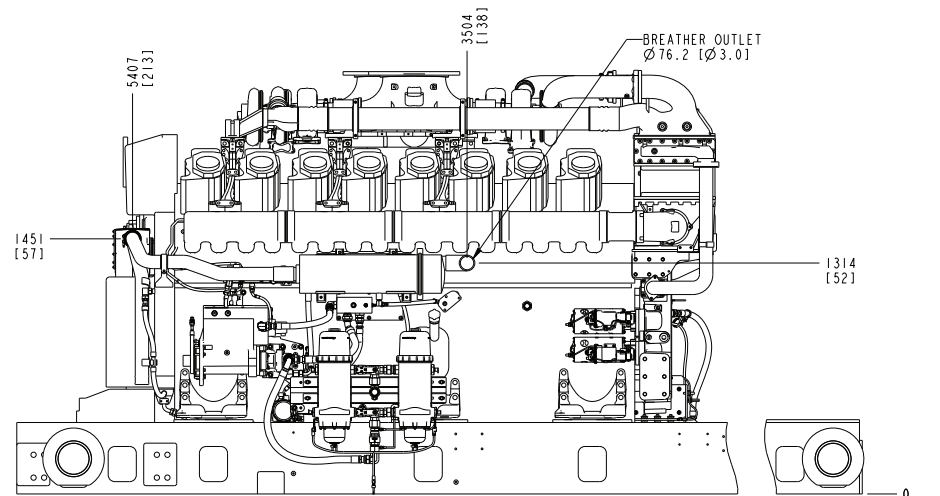
DETAIL H
REDUNDANT STARTERS
A458-2
WEIGHT: 23 Kg [50 LBS]
B+ STUD SIZE: M12 X 1.75
2X EACH SIDE
SCALE 1/10



AIR STARTER
A300-2
WEIGHT: 38 Kg [83.7 LBS]
SCALE 11/160



CLOSED CRANKCASE VENTILATION
H735-2
WEIGHT: 74 Kg [163.1 LBS]
SCALE 11/160

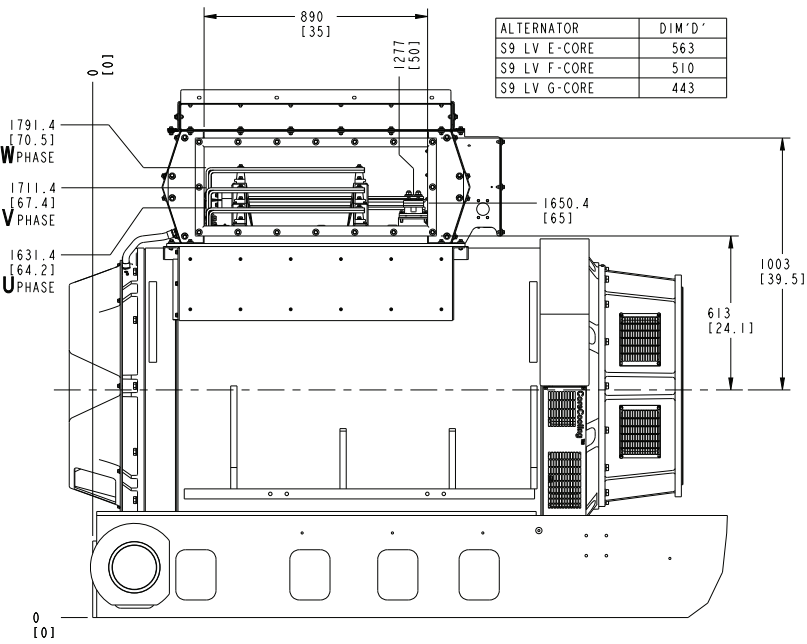
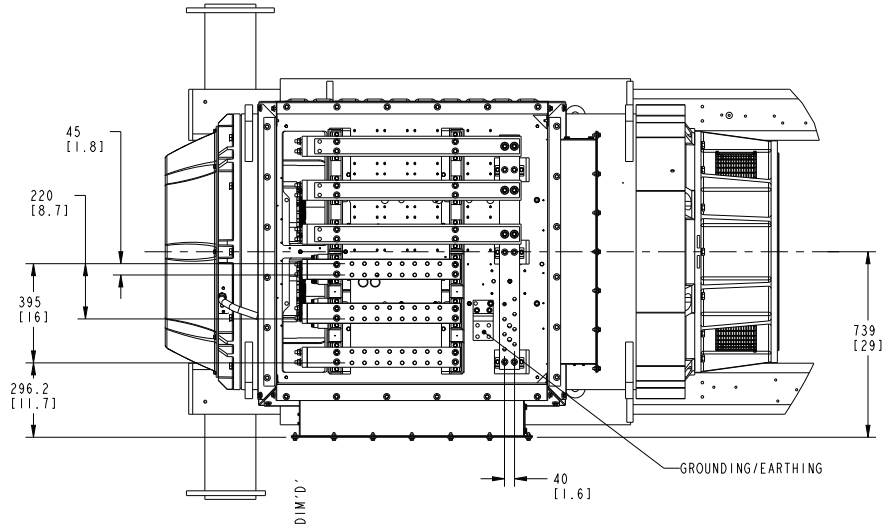


COALESCER BREATHER
H732-2
WEIGHT: 56.8 Kg [125.2 LBS]
SCALE 11/160

OPTIONS - FEATURE CODES WEIGHTS ARE ADJUSTMENTS TO NOTE 3

PART NUMBER: A678A144		PART REVISION: B	
PART NAME: OUTLINE GENSET			
DRAWING CATEGORY: OUTLINE			
STATE: RELEASED		SHEET: 5 OF 23	
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL			
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DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: INCHES		SIZE: A1	SCALE: 13/320
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		THIRD ANGLE PROJECTION	
CAD SYSTEM PTC® Creo® Parametric		CUMMINS INC.	

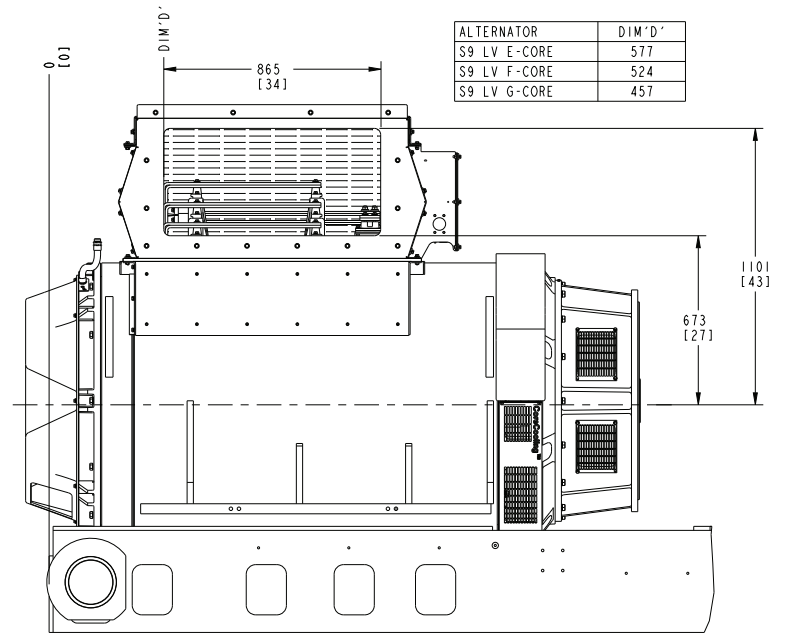
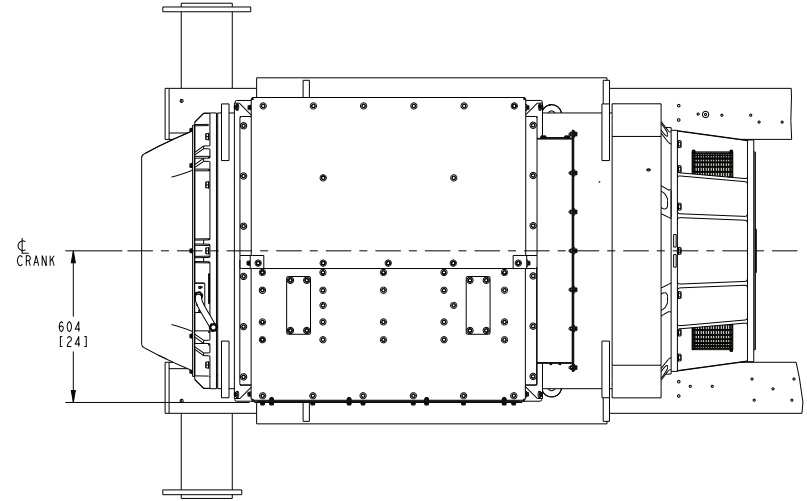
S9 LV TERMINAL BOX INTERNAL



ALTERNATOR	DIM'D'
S9 LV E-CORE	563
S9 LV F-CORE	510
S9 LV G-CORE	443

SCALE 1/10

S9 LV FLAT SIDE PANEL OPTION

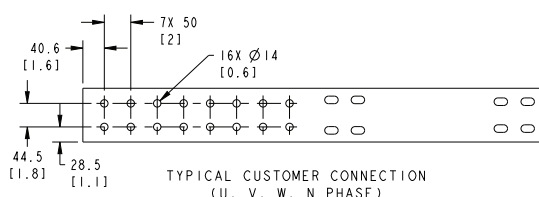
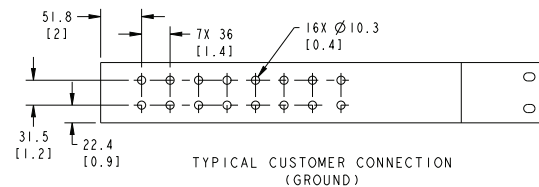
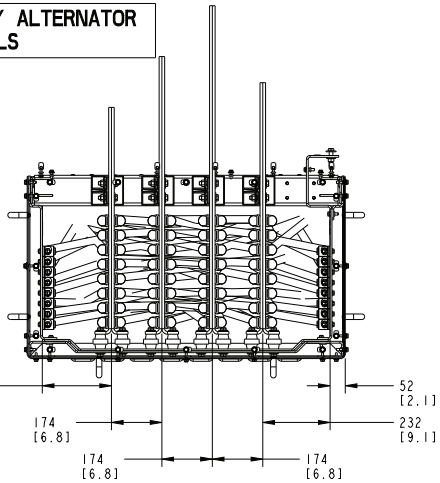


ALTERNATOR	DIM'D'
S9 LV E-CORE	577
S9 LV F-CORE	524
S9 LV G-CORE	457

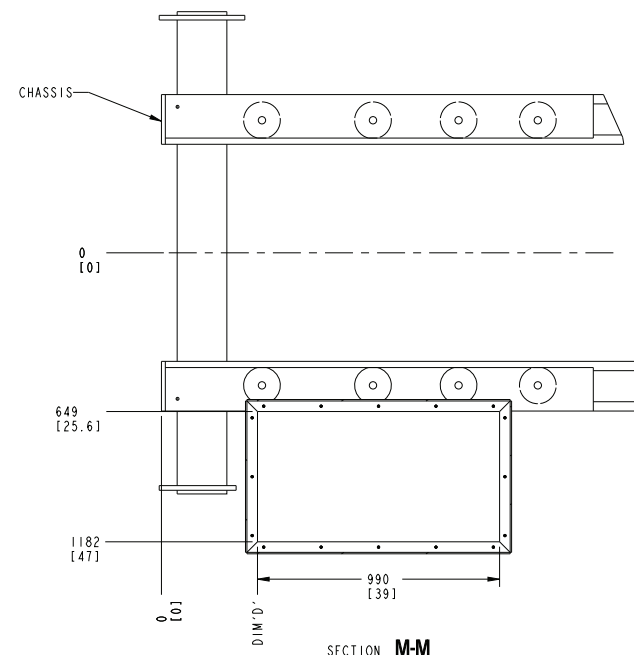
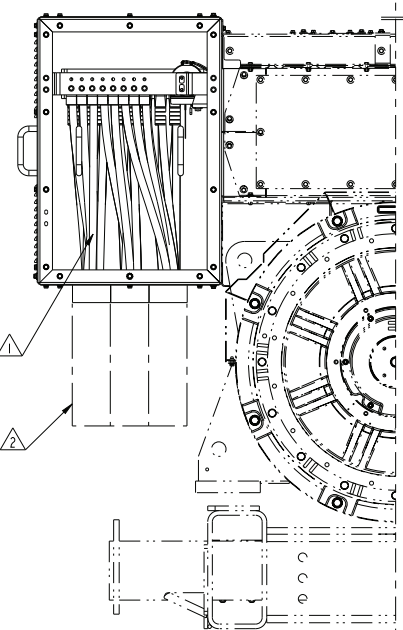
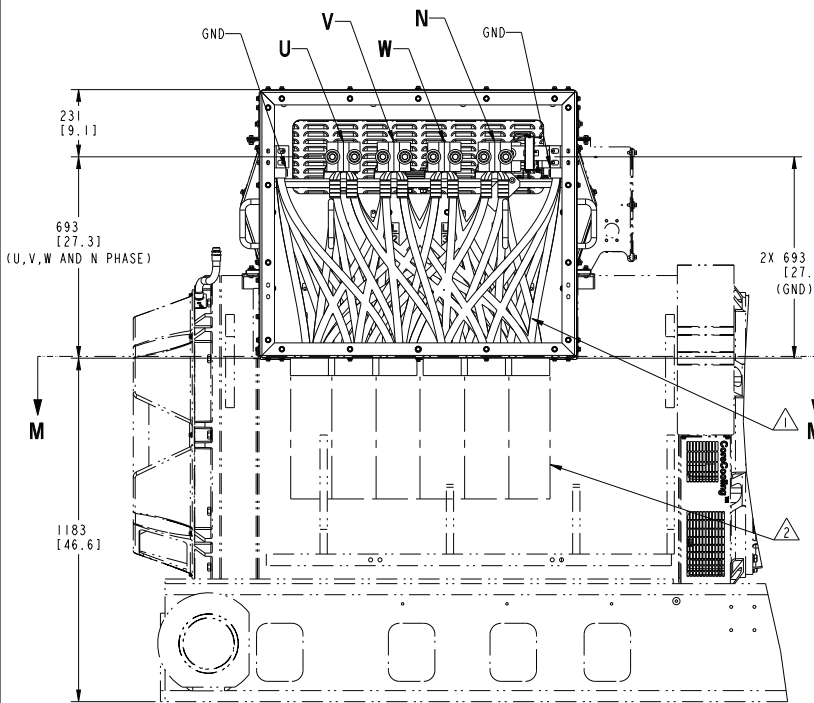
PART NUMBER: A678A144 PART REVISION: B
 PART NAME: OUTLINE.GENSET
 DRAWING CATEGORY: OUTLINE
 STATE: RELEASED SHEET: 6 OF 23
 CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL
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Cummins Inc.		
DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: INCHES	SIZE: A1 SCALE: 1/10	
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		CAD SYSTEM PTC® Creo® Parametric

S9 LV BOTTOM ENTRY ALTERNATOR ENTRANCE BOX DETAILS



- NOTES:
1. ELECTRICAL CONDUITS MUST BE:
 - FLEXIBLE, FOR EXAMPLE, LIQUIDTIGHT METAL CONDUIT - LFMC.
 - INSTALLED IN A WAY THAT WILL ABSORB OR REDUCE VIBRATION EFFECTS, FOR EXAMPLE, ADD OFFSET BENDS BETWEEN THE MOUNTING SURFACE OF THE ENTRANCE BOX ENCLOSURE AND THE STUB UP ENTRANCE AREA. (FLEX-CONDUIT ENTRY AREA).
 2. OPTIONAL INSTALLATION OF ELECTRIC CONDUIT AND POWER LEADS FOR MULTIPLE POWER LEADS RUNNING IN PARALLEL. LOCATION SHOWN IS FOR REFERENCE ONLY.
 3. FLEXIBLE CONDUITS MUST ALLOW FOR GENERATOR SET MOVEMENT AS MUCH AS ±2 INCHES IN THE VERTICAL DIRECTION.
 4. AREA SHOWN INDICATES APPROXIMATE PLACEMENT OF THE ELECTRICAL FLEXIBLE CONDUIT AREA (STUP-UP AREA), ORIGINATING IN CONCRETE OR OTHER TYPE OF BASE FLOORING REVATIVE TO OUTPUT BOX LOCATION AND BOTTOM ENTRY SHEET METAL ENCLOSURE. ELECTRICAL CONDUITS MUST BE TERMINATED AND POWER CABLES ROUTED INTO THE OUTPUT BOX AS ILLUSTRATED TYPICAL POWER LEAD CONNECTIONS.
 5. USE COPPER CABLE ONLY.

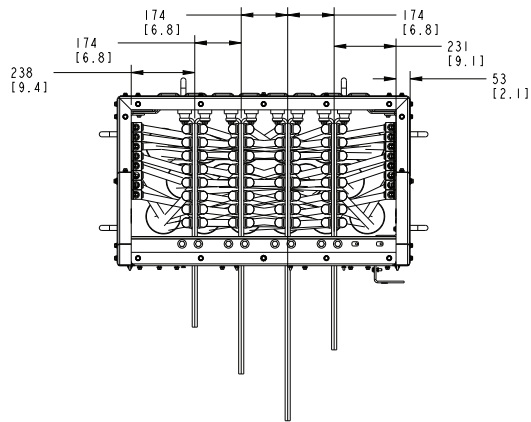
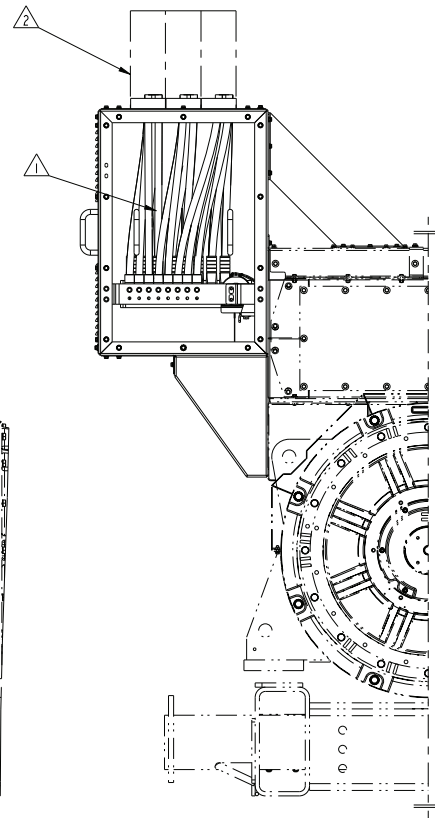
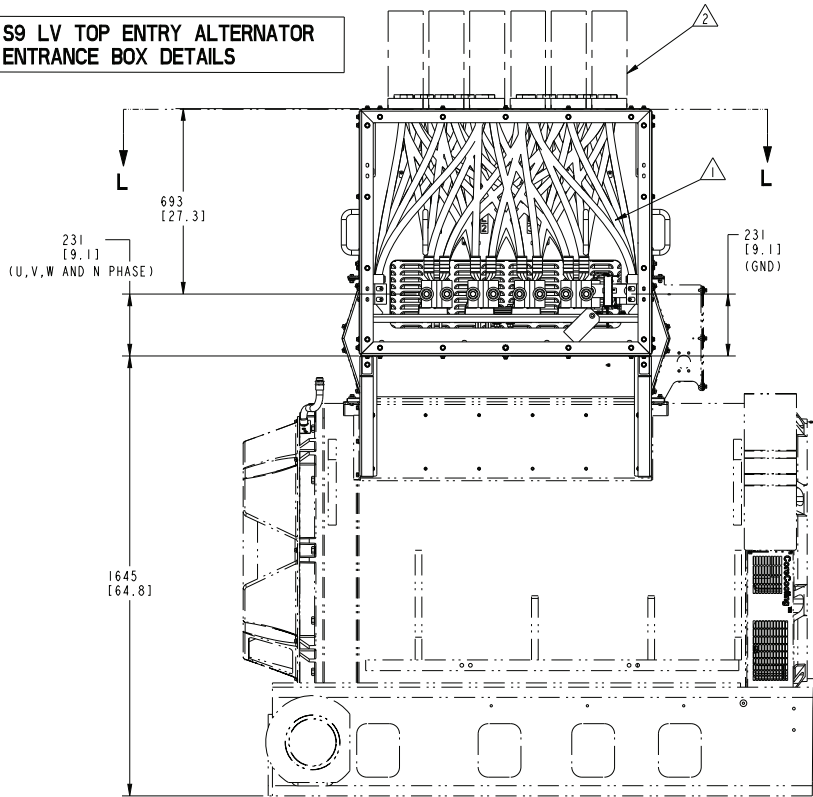


ALTERNATOR	DIM "D"
S9 LV E-CORE	393
S9 LV F-CORE	326
S9 LV G-CORE	206

BOTTOM ENTRY LV ENTRANCE BOX

PART NUMBER: A078A144	PART REVISION: B	Cummins Inc.	DIMENSIONS ARE IN: MILLIMETERS 1 ARE IN.	SIZE: D SCALE: 19/160	
PART NAME: OUTLINE.GENSET					
DRAWING CATEGORY: OUTLINE					
STATE: RELEASED	SHEET: 7 OF 23				
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL					
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			DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION	CAD SYSTEM PTC® Creo® Parametric

S9 LV TOP ENTRY ALTERNATOR ENTRANCE BOX DETAILS

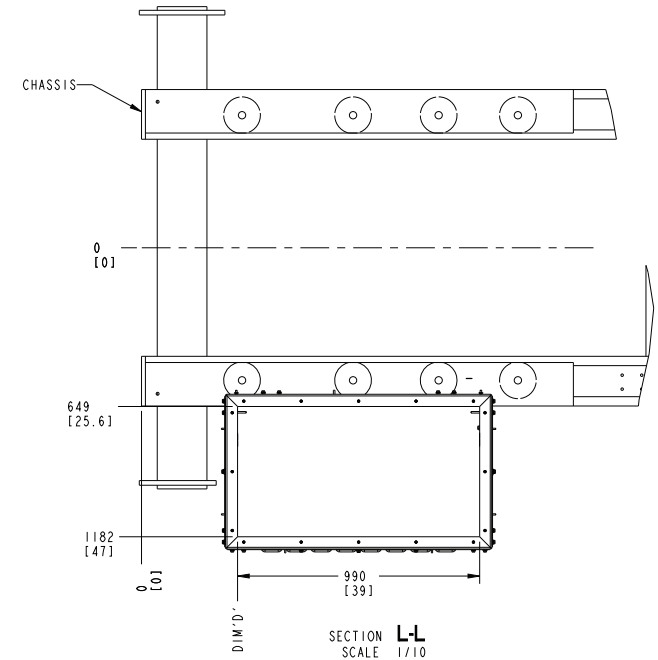


TOP ENTRY LV ENTRANCE BOX

ALTERNATOR	DIM "D"
S9 LV E-CORE	393
S9 LV F-CORE	326
S9 LV G-CORE	206

NOTES:

- 1 ELECTRICAL CONDUITS MUST BE:
 - FLEXIBLE, FOR EXAMPLE, LIQUIDTIGHT METAL CONDUIT - LFMC.
 - INSTALLED IN A WAY THAT WILL ABSORB OR REDUCE VIBRATION EFFECTS. FOR EXAMPLE, ADD OFFSET BENDS BETWEEN THE MOUNTING SURFACE OF THE ENTRANCE BOX ENCLOSURE AND THE STUB UP ENTRANCE AREA. (FLEX-CONDUIT ENTRY AREA).
- 2 OPTIONAL INSTALLATION OF ELECTRIC CONDUIT AND POWER LEADS FOR MULTIPLE POWER LEADS RUNNING IN PARALLEL. LOCATION SHOWN IS FOR REFERENCE ONLY.
- 3 FLEXIBLE CONDUITS MUST ALLOW FOR GENERATOR SET MOVEMENT AS MUCH AS ±2 INCHES IN THE VERTICAL DIRECTION.
- 4 AREA SHOWN INDICATES APPROXIMATE PLACEMENT OF THE ELECTRICAL FLEXIBLE CONDUIT AREA (STUP-UP AREA), ORIGINATING IN CONCRETE OR OTHER TYPE OF BASE FLOORING REVATIVE TO OUTPUT BOX LOCATION AND BOTTOM ENTRY SHEET METAL ENCLOSURE. ELECTRICAL CONDUITS MUST BE TERMINATED AND POWER CABLES ROUTED INTO THE OUTPUT BOX AS ILLUSTRATED TYPICAL POWER LEAD CONNECTIONS.
- 5 USE COPPER CABLE ONLY.

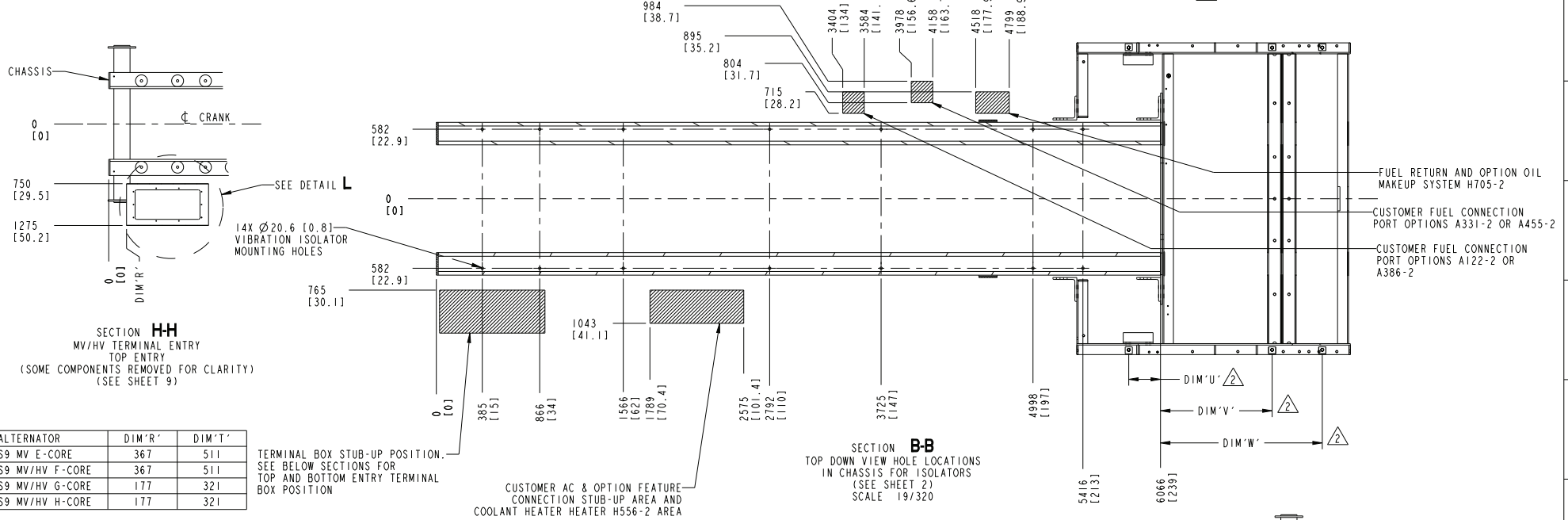


PART NUMBER: A078A144	PART REVISION: B
PART NAME: OUTLINE.GENSET	
DRAWING CATEGORY: OUTLINE	
STATE: RELEASED	SHEET: 8 OF 23
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	
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Cummins Inc.		
DIMENSIONS ARE IN: MILLIMETERS 1 ARE IN: INCHES		
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		SIZE: D SCALE: 0.04
THIRD ANGLE PROJECTION		CAD SYSTEM PTC® Creo® Parametric

**GENSET ISOLATOR (AVM) DETAILS AND LOCATIONS.
APPROXIMATE SPACE CLAIM FOR GENSET OPTIONS AND CUSTOMER AC LOAD CABLES**

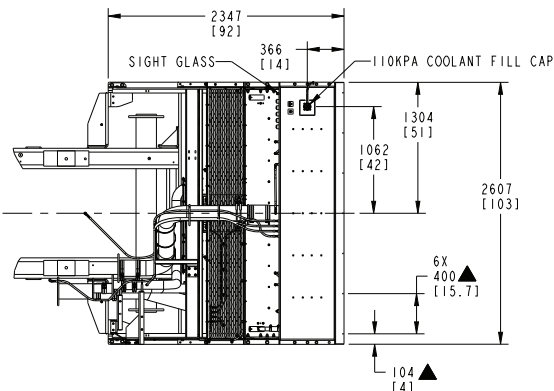
NOTE:
1. THE TERMINAL BOX STUB UP IS DESIGNED FOR LOAD POWER CONDUCTORS ONLY, NO OTHER WIRES/CABLES ALLOWED.
2. SEE SHEETS 16, 18 & 20 FOR RADIATOR AVM POSITIONS.



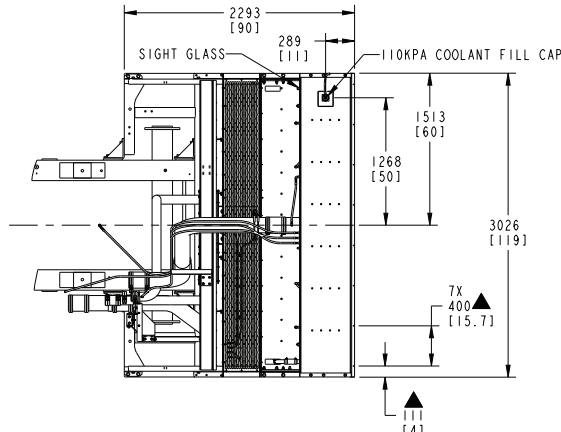
PART NUMBER: A678A144	PART REVISION: B	Cummins Inc.	
PART NAME: OUTLINE.GENSET			
DRAWING CATEGORY: OUTLINE		DIMENSIONS ARE IN: MILLIMETERS	SIZE: A1
STATE: RELEASED	SHEET: 13 OF 23	ARE IN: INCHES	SCALE: 13/320
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL		DIMENSIONING AND TOLERANCING PER:	THIRD ANGLE PROJECTION
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.		ASME Y14.5-2009	CAD SYSTEM PTC® Creo® Parametric

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

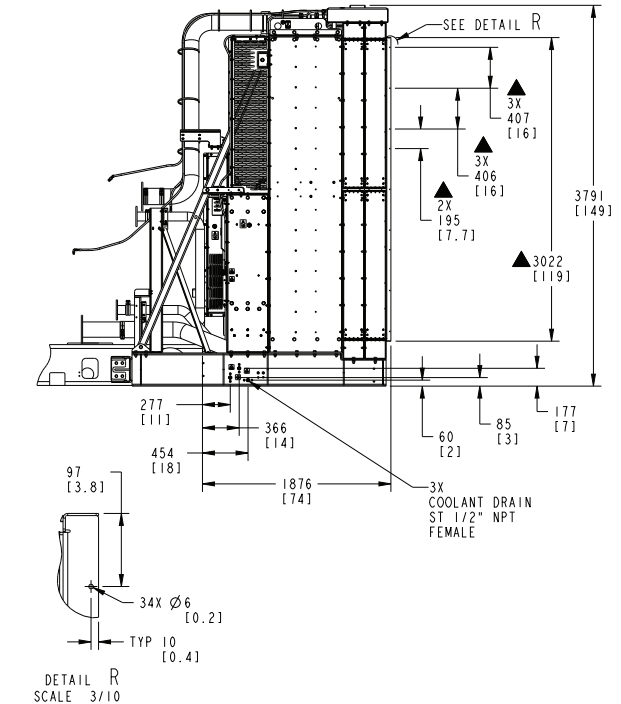
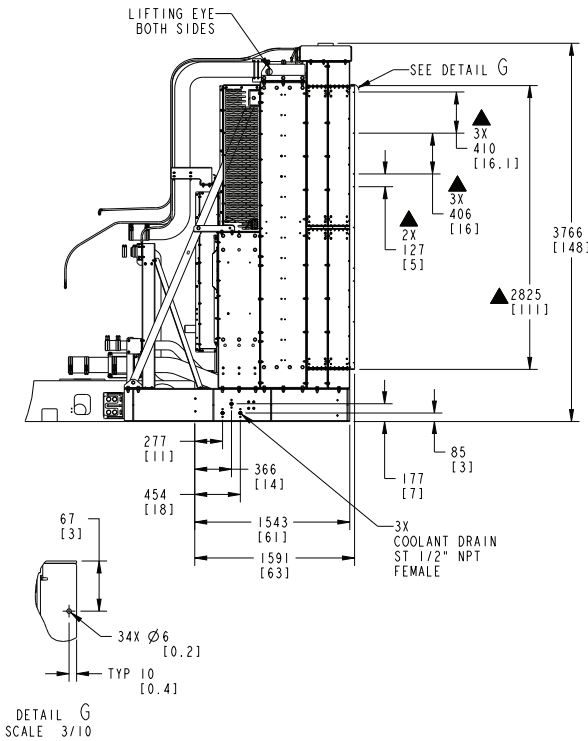
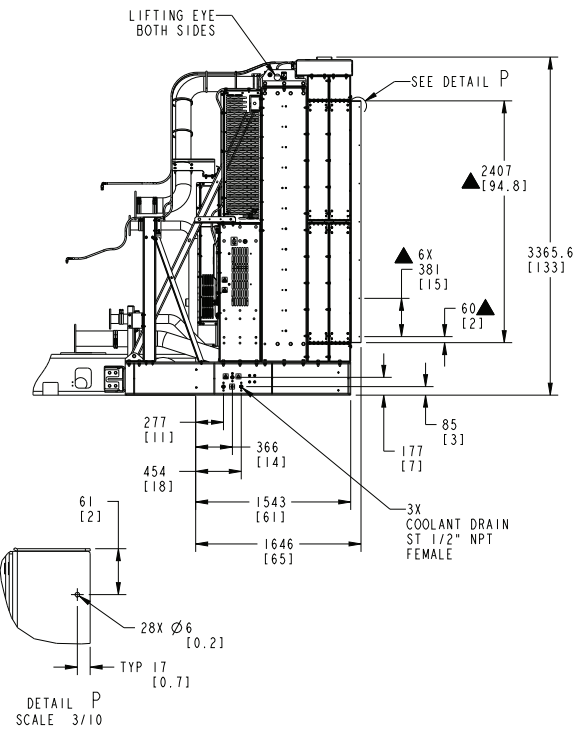
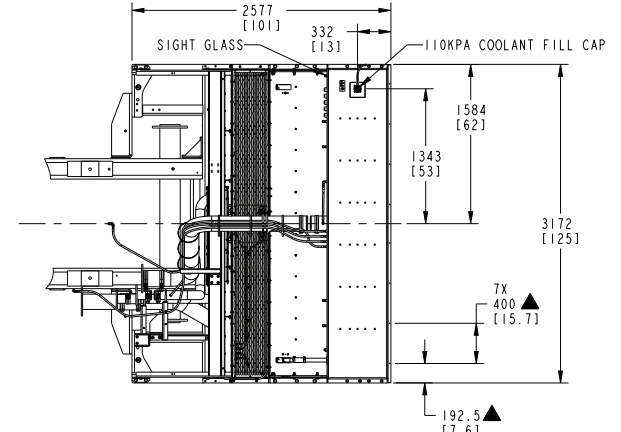
PACKAGE A 60Hz E165-2 61 SQFT



PACKAGE A 60Hz E127-2/128-2 84 SQFT



PACKAGE A 60Hz E127-2 94 SQFT



NOTES:
1. DIMENSIONS MARKED BY ▲ ARE USED FOR RADIATOR DUCT CONNECTION FLANGE

PART NUMBER: A078A144	PART REVISION: B
PART NAME: OUTLINE.GENSET	
DRAWING CATEGORY: OUTLINE	
STATE: RELEASED	SHEET: 17 OF 23
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	
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Cummins Inc.		
DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: INCHES	SIZE: A1 SCALE: 13/320	
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		CAD SYSTEM: PTC® Creo® Parametric
THIRD ANGLE PROJECTION		

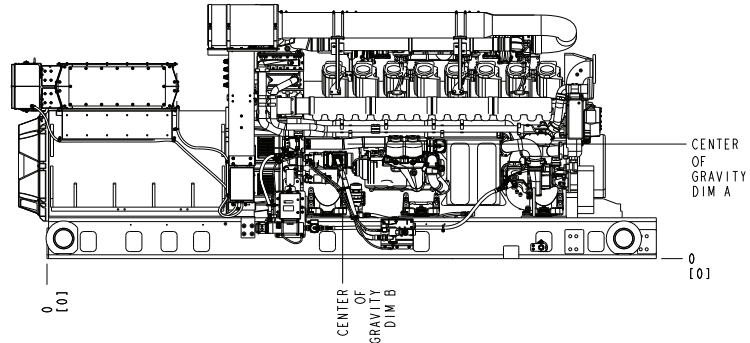
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

ALTERNATOR		PACKAGE A 60Hz E165-2 61 SQFT		
ALTERNATOR	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [lbs]	C OF G WITH RADIATOR DIM A (SHOWN)* mm [Inch]	C OF G WITH RADIATOR DIM B (SHOWN)* mm [Inch]
S9LID-E42	7400 [16400]	28200 [62000]	1098 [43]	3510 [138]
S9LID-F42	7900 [17300]	28600 [63000]	1095 [43]	3465 [136]
S9LID-G42	8700 [19200]	29400 [64900]	1090 [43]	3376 [133]
S9MID-E42	6600 [14400]	27300 [60100]	1100 [43]	3582 [141]
S9MID-F42	7000 [15400]	27700 [61100]	1097 [43]	3535 [139]
S9MID-G42	7800 [17100]	28500 [62700]	1091 [43]	3449 [136]
S9MID-H42	8200 [18100]	28900 [63700]	1088 [43]	3403 [134]
S9HID-E42	6600 [14400]	27300 [60100]	1100 [43]	3582 [141]
S9HID-F42	7000 [15400]	27700 [61100]	1097 [43]	3535 [139]
S9HID-G42	7800 [17100]	28500 [62700]	1091 [43]	3449 [136]
S9HID-H42	8200 [18100]	28900 [63700]	1088 [43]	3403 [134]

ALTERNATOR		PACKAGE A 60Hz E127-2/128-2 84 SQFT		
ALTERNATOR	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [lbs]	C OF G WITH RADIATOR DIM A (SHOWN)* mm [Inch]	C OF G WITH RADIATOR DIM B (SHOWN)* mm [Inch]
S9LID-E42	7400 [16400]	28900 [63600]	1132 [45]	3591 [141]
S9LID-F42	7900 [17300]	29300 [64500]	1129 [44]	3546 [140]
S9LID-G42	8700 [19200]	30100 [66400]	1123 [44]	3456 [136]
S9MID-E42	6600 [14400]	28000 [61600]	1135 [45]	3663 [144]
S9MID-F42	7000 [15400]	28400 [62600]	1132 [45]	3615 [142]
S9MID-G42	7800 [17100]	29200 [64200]	1126 [44]	3530 [139]
S9MID-H42	8200 [18100]	29600 [65200]	1122 [44]	3484 [137]
S9HID-E42	6600 [14400]	28000 [61600]	1135 [45]	3663 [144]
S9HID-F42	7000 [15400]	28400 [62600]	1132 [45]	3615 [142]
S9HID-G42	7800 [17100]	29200 [64200]	1126 [44]	3530 [139]
S9HID-H42	8200 [18100]	29600 [65200]	1122 [44]	3484 [137]

ALTERNATOR		PACKAGE A 60Hz E127-2 94 SQFT		
ALTERNATOR	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [lbs]	C OF G WITH RADIATOR DIM A (SHOWN)* mm [Inch]	C OF G WITH RADIATOR DIM B (SHOWN)* mm [Inch]
S9LID-E42	7400 [16400]	29500 [65000]	1151 [45]	3699 [146]
S9LID-F42	7900 [17300]	30000 [66000]	1148 [45]	3654 [144]
S9LID-G42	8700 [19200]	30800 [67800]	1141 [45]	3563 [140]
S9MID-E42	6600 [14400]	28600 [63100]	1155 [45]	3773 [149]
S9MID-F42	7000 [15400]	29100 [64100]	1151 [45]	3725 [147]
S9MID-G42	7800 [17100]	29800 [65700]	1144 [45]	3639 [143]
S9MID-H42	8200 [18100]	30300 [66700]	1141 [45]	3592 [141]
S9HID-E42	6600 [14400]	28600 [63100]	1155 [45]	3773 [149]
S9HID-F42	7000 [15400]	29100 [64100]	1151 [45]	3725 [147]
S9HID-G42	7800 [17100]	29800 [65700]	1144 [45]	3639 [143]
S9HID-H42	8200 [18100]	30300 [66700]	1141 [45]	3592 [141]

ALTERNATOR		REMOTE COOLED		
ALTERNATOR	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [lbs]	C OF G WITHOUT RADIATOR DIM A (SHOWN)* mm [Inch]	C OF G WITHOUT RADIATOR DIM B (SHOWN)* mm [Inch]
S9LID-E42	7400 [16400]	23900 [52700]	1027 [40]	2916 [115]
S9LID-F42	7900 [17300]	24300 [53600]	1025 [40]	2874 [113]
S9LID-G42	8700 [19200]	25200 [55500]	1022 [40]	2790 [110]
S9MID-E42	6600 [14400]	23000 [50700]	1027 [40]	2978 [117]
S9MID-F42	7000 [15400]	23500 [51700]	1025 [40]	2934 [115]
S9MID-G42	7800 [17100]	24200 [53400]	1021 [40]	2852 [112]
S9MID-H42	8200 [18100]	24700 [54300]	1019 [40]	2809 [111]
S9HID-E42	6600 [14400]	23000 [50700]	1027 [40]	2978 [117]
S9HID-F42	7000 [15400]	23500 [51700]	1025 [40]	2934 [115]
S9HID-G42	7800 [17100]	24200 [53400]	1021 [40]	2852 [112]
S9HID-H42	8200 [18100]	24700 [54300]	1019 [40]	2809 [111]

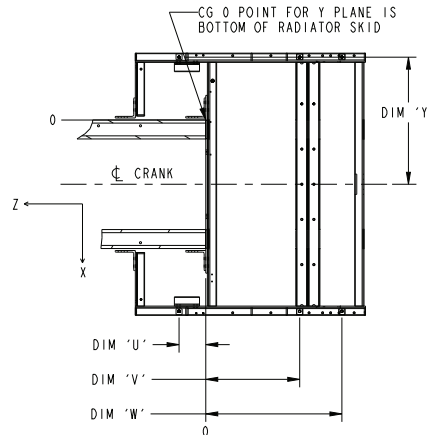


PART NUMBER: A078A144	PART REVISION: B		DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: INCHES	SIZE: A1 SCALE: 1/32"
PART NAME: OUTLINE GENSET	DRAWING CATEGORY: OUTLINE			
STATE: RELEASED	SHEET: 18 OF 23		DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	CAD SYSTEM PTC® Creo® Parametric
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.				

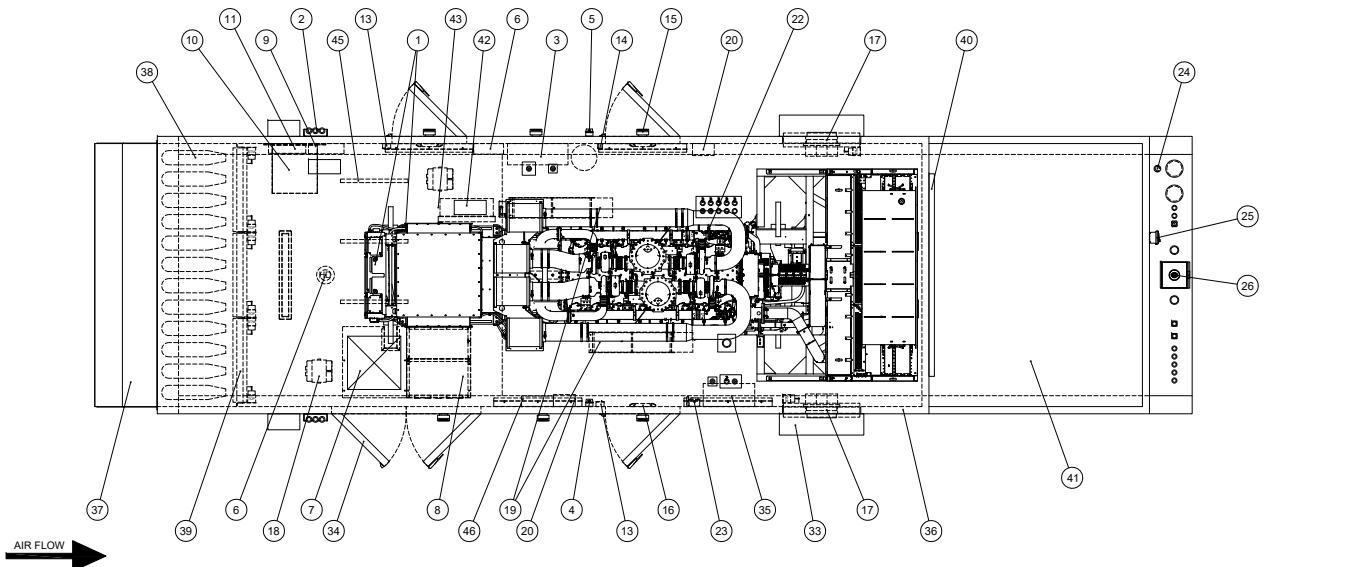
RADIATOR VARIATION	CORE SIZE	FREQUENCY	COOLANT VOLUME L [GAL]	DRY WEIGHT KG [LBS]	WET WEIGHT KG [LBS]	RAD X-AXIS CG [INCHES]	RAD Y-AXIS CG [INCHES]	RAD Z-AXIS CG [INCHES]	ALTERNATOR	GENSET O/A LENGTH [INCHES]	GENSET O/A WIDTH [INCHES]	GENSET O/A HEIGHT [INCHES]
PACKAGE A 60Hz E165-2	61 SOFT	60	585 [155]	3677 [8106]	4253 [9376]	703 [28]	1417 [56]	-740 [-29]	S9 MV/HV E & F CORE	7879 [310]	2610 [103]	3366 [133]
									S9 MV/HV G & H CORE	8065 [318]	2610 [103]	3366 [133]
									S9 LV E CORE	7874 [310]	2610 [103]	3366 [133]
									S9 LV F CORE	7944 [313]	2610 [103]	3366 [133]
									S9 LV G CORE	8064 [318]	2610 [103]	3366 [133]
PACKAGE A 60Hz E127-2/128-2	84 SOFT	60	696 [184]	4276 [9427]	4938 [10887]	699 [28]	1557 [61]	-747 [-29]	S9 MV/HV E & F CORE	7824 [308]	3024 [119]	3766 [148]
									S9 MV/HV G & H CORE	8010 [315]	3024 [119]	3766 [148]
									S9 LV E CORE	7819 [308]	3024 [119]	3766 [148]
									S9 LV F CORE	7889 [311]	3024 [119]	3766 [148]
									S9 LV G CORE	8009 [315]	3024 [119]	3766 [148]
PACKAGE A 60Hz E127-2	94 SOFT	60	758 [201]	4849 [10690]	5608 [12364]	694 [27]	1595 [63]	-910 [-36]	S9 MV/HV E & F CORE	8109 [319]	3171 [125]	3791 [149]
									S9 MV/HV G & H CORE	8295 [327]	3171 [125]	3791 [149]
									S9 LV E CORE	8104 [319]	3171 [125]	3791 [149]
									S9 LV F CORE	8174 [322]	3171 [125]	3791 [149]
									S9 LV G CORE	8294 [327]	3171 [125]	3791 [149]

RADIATOR AVM POSITION

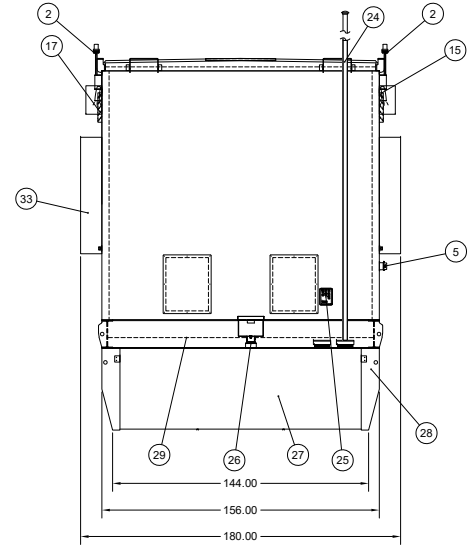
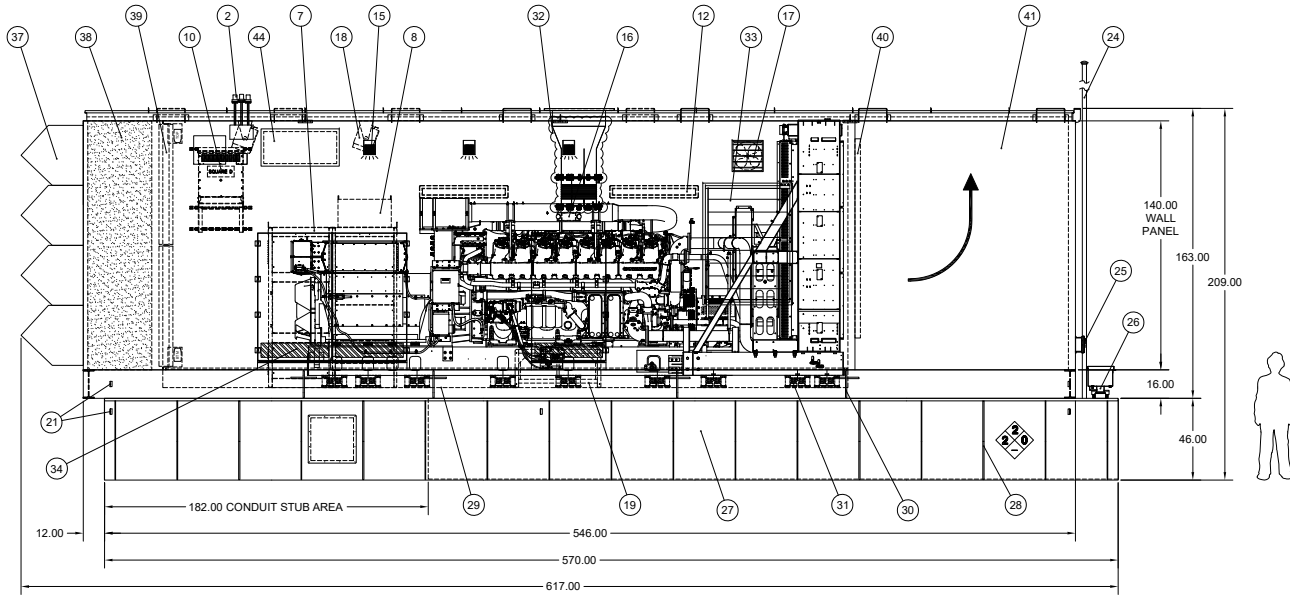
RADIATOR VARIATION	DIM 'U'	DIM 'V'	DIM 'W'	DIM 'Y'
PACKAGE A 60Hz E165-2	266	935	1356	1265
PACKAGE A 60Hz E127-2/128-2	266	935	1355	1464
PACKAGE A 60Hz E127-2	266	1220	1640	1535

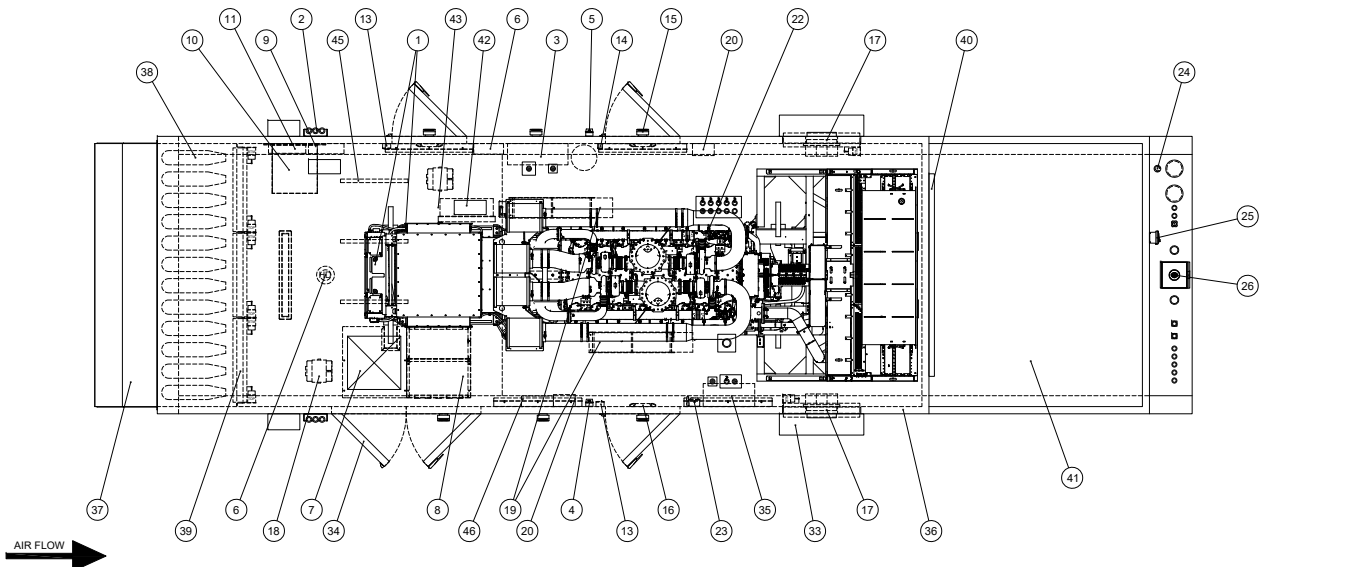


PART NUMBER: A678A144	PART REVISION: B	Cummins Inc.	
PART NAME: OUTLINE.GENSET			
DRAWING CATEGORY: OUTLINE		DIMENSIONS ARE IN: MILLIMETERS	SIZE: A1
STATE: RELEASED	SHEET: 19 OF 23	[] ARE IN: INCHES	SCALE: 13/320
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL		DIMENSIONING AND TOLERANCING PER:	THIRD ANGLE PROJECTION
THIS DOCUMENT AND THE INFORMATION SHOWN THEREIN IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.		ASME Y14.5-2009	CAD SYSTEM PTC® Creo® Parametric

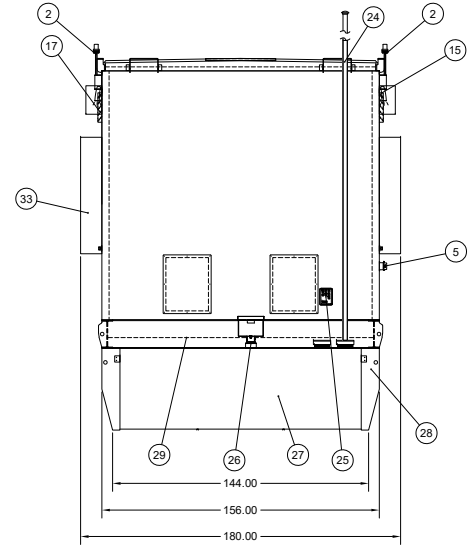
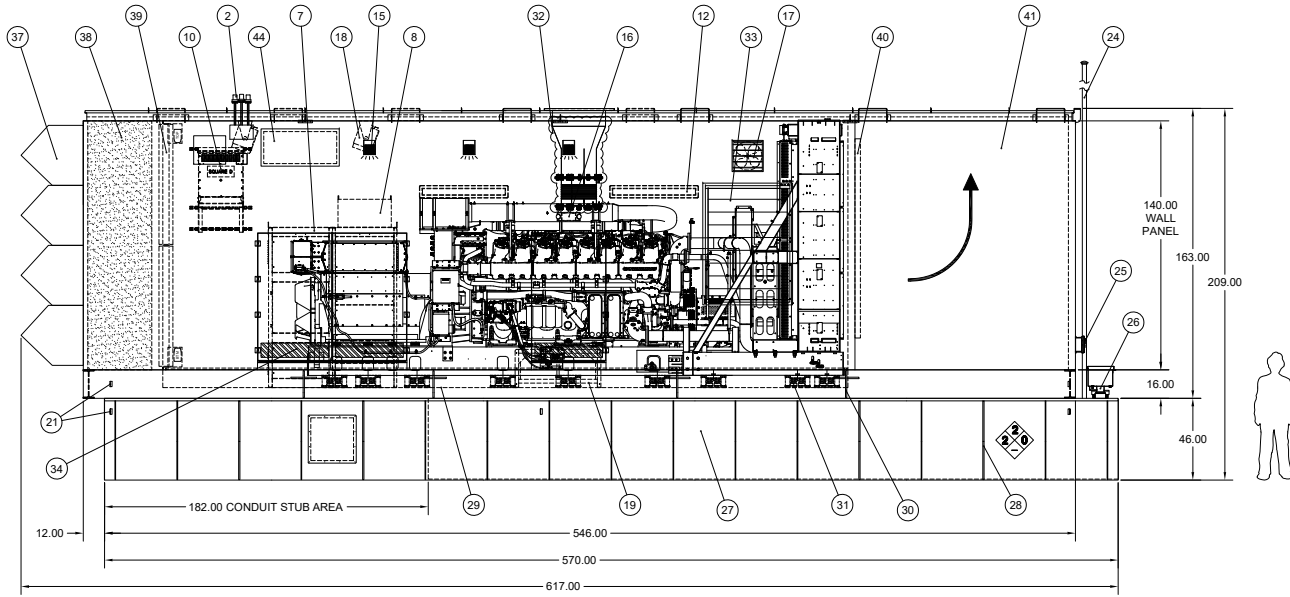


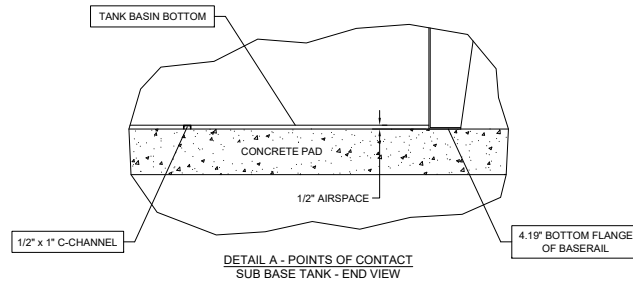
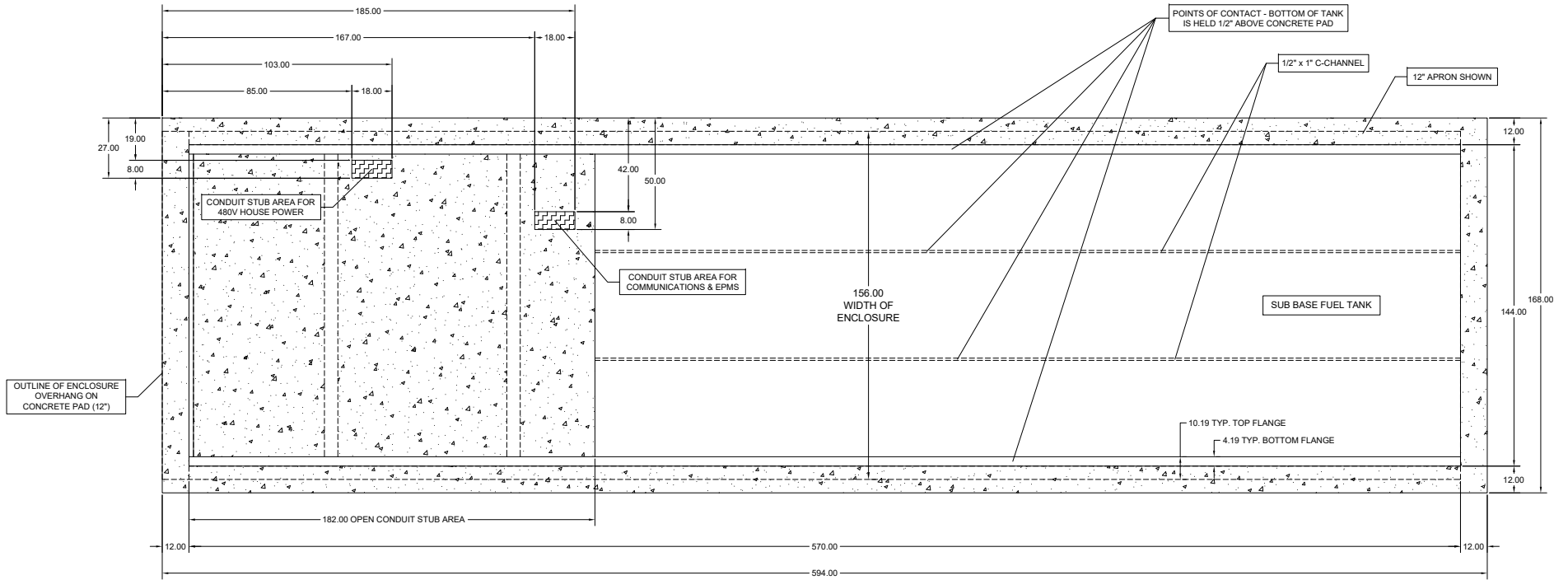
ITEM	QTY	DESCRIPTION
1	1	PowerCommand 3.3 CONTROL SYSTEM
2	3	STACK LIGHT ASSEMBLY (LEFT & RIGHT SIDE MOUNTING PROVISIONS PROVIDED)
3	1	AXI FPS LX-F FUEL POLISHING SYSTEM WITH TSC70 CONTROLLER, MANUAL ADDITIVE INJECTION SYSTEM & AWD
4	1	INTERIOR MOUNTED EMERGENCY STOP SWITCH WITH CLEAR PROTECTIVE COVER
5	1	EXTERIOR MOUNTED EMERGENCY STOP SWITCH WITH CLEAR PROTECTIVE COVER
6	1	ALARM RELAY BOX FOR HEAT DETECTOR, HORN STROBE & PULL STATION (SYMBOL FOR HEAT DETECTOR: HD)
7	1	TECHNIBUS SWITCHGEAR CABINET (GALLIUM)
8	1	HRG RESISTORS ENCLOSURE
9	1	NF MB 88V 32 35KA PANELBOARD INCLUDING 150A JGL36150 M.C.B. WITH 30A/3P & 70A/3P EGB BREAKERS
10	1	WALL MOUNTED 30 45KVA DOE 2015 COMPLIANT TRANSFORMER
11	1	30 120/208 225A RATED NQ PANEL WITH 150A MAIN CIRCUIT BREAKER
12	5	4FT LED FIXTURES
13	2	COMBINATION 3-WAY LIGHT SWITCH / GFCI PROTECTED DUPLEX OUTLET BOXES
14	1	4-WAY LIGHT SWITCH BOXES
15	6	EXTERIOR LED WALL PACK LIGHTS WITH PHOTOCELLS
16	3	BATTERY BACK-UP DUAL HEAD LED EMERGENCY LIGHTS
17	2	EXHAUST FANS WITH WALL SHUTTERS
18	2	50W FAN FORCED UNIT HEATERS
19	2	SINGLE (RIGHT) & DOUBLE TIER (LEFT) BATTERY RACKS WITH BRACKETS FOR BATTERY DISCONNECT SWITCHES
20	3	WALL MOUNTED SENS BATTERY CHARGERS
21	8	GROUND TAB ON MAJOR COMPONENTS & CORNERS OF TANK BASE & SUBFRAME
22	1	DISTRIBUTOR SUPPLIED FUEL FILTER ASSEMBLY
23	1	480V 30A NON-FUSIBLE DISCONNECT SWITCH FOR POWER TO COOLANT HEATER
24	1	NORMAL TANK VENT EXTENDED 24" ABOVE AIR DISCHARGE BRACED TO ENCLOSURE FOR STABILITY
25	2	4LAP-4MSFT TANK STATUS ALARM PANELS WITH RELAYS FOR GENERATOR CONTROLLER & CUSTOMER USE
26	1	MECHANICAL OVERFILL PREVENTION VALVE SET @ 95% WITH 3" FILL CONNECTION & S.S. 7 GALLON SPILL CONTAINER
27	1	9,100 GALLON CAPACITY UL142 LISTED SUB BASE FUEL SUPPLY TANK WITH TYPE A (STRAIGHT) CONDUIT STUB AREA
28	8	LIFT LUGS FOR SUB BASE FUEL TANK - SEE DETAIL 3A
29	1	16" W-BEAM SUBFRAME WITH 6" SUPPORT TUBES, FULL NON-SLIP FLOOR & SPILL CONTAINMENT
30	8	LIFT LUGS FOR ENCLOSURE PACKAGE - SEE DETAIL 4A
31	18	HEAVY DUTY SPRING ISOLATORS
32	1	CARBON STEEL WYE FLEX ASSEMBLY WITH STAINLESS STEEL BELLOWS & INSULATION BLANKET
33	2	SIDE MOUNTED INTAKE RELIEF OPENINGS WITH FIXED VANE SOUND LOUVERS & MOTORIZED DAMPERS
34	4	PERSONNEL DOORS WITH HYDRAULIC CLOSERS, HOLDBACKS, S.S. KICK PLATES, 316 S.S. HINGES & BRUSH SWEEPS
35	1	FCI-5000 FUEL CIRCULATION HEATER SYSTEM
36	N/A	4" THICK MINERAL WOOL INSULATION WITH PERFORATED LINER
37	4	WEATHER PROTECTIVE HOODS OVER AIR INLET
38	12	MINERAL WOOL INSULATED 36" DEEP INTAKE SOUND BAFFLES
39	6	MOTORIZED INTAKE DAMPER SECTIONS
40	1	GRAVITY EXHAUST DAMPER SECTIONS
41	1	INSULATED SOUND DIRECTIONAL EXHAUST PLENUM TERMINATED AT 17'-5" A.F.F.
42	1	CUMMINS SUPPLIED EPMS CABINET (GALLIUM)
43	1	SIDE MOUNT LEVEL SWITCH
44	2	CABLE ENTRY CLAMP PLATE (BOTH SIDES) *DIMENSIONS FOR SITE COORDINATION ON SHEET S385204-3 ES*
45	3	UNISTRUT MOUNTING PROVISIONS FOR ON-SITE E.C. INSTALLED CABLE TRAY
46	1	CUMMINS SUPPLIED BATTERY MONITORING SYSTEM





ITEM	QTY	DESCRIPTION
1	1	PowerCommand 3.3 CONTROL SYSTEM
2	3	STACK LIGHT ASSEMBLY (LEFT & RIGHT SIDE MOUNTING PROVISIONS PROVIDED)
3	1	AXI FPS LX-F FUEL POLISHING SYSTEM WITH TSC70 CONTROLLER, MANUAL ADDITIVE INJECTION SYSTEM & AWD
4	1	INTERIOR MOUNTED EMERGENCY STOP SWITCH WITH CLEAR PROTECTIVE COVER
5	1	EXTERIOR MOUNTED EMERGENCY STOP SWITCH WITH CLEAR PROTECTIVE COVER
6	1	ALARM RELAY BOX FOR HEAT DETECTOR, HORN STROBE & PULL STATION (SYMBOL FOR HEAT DETECTOR: HD)
7	1	TECHNIBUS SWITCHGEAR CABINET (GALLIUM)
8	1	HRG RESISTORS ENCLOSURE
9	1	NF MB 88V 32 35KA PANELBOARD INCLUDING 150A JGL36150 M.C.B. WITH 30A/3P & 70A/3P EGB BREAKERS
10	1	WALL MOUNTED 30 45KVA DOE 2015 COMPLIANT TRANSFORMER
11	1	30 120/208 225A RATED NQ PANEL WITH 150A MAIN CIRCUIT BREAKER
12	5	4FT LED FIXTURES
13	2	COMBINATION 3-WAY LIGHT SWITCH / GFCI PROTECTED DUPLEX OUTLET BOXES
14	1	4-WAY LIGHT SWITCH BOXES
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16	3	BATTERY BACK-UP DUAL HEAD LED EMERGENCY LIGHTS
17	2	EXHAUST FANS WITH WALL SHUTTERS
18	2	50W FAN FORCED UNIT HEATERS
19	2	SINGLE (RIGHT) & DOUBLE TIER (LEFT) BATTERY RACKS WITH BRACKETS FOR BATTERY DISCONNECT SWITCHES
20	3	WALL MOUNTED SENS BATTERY CHARGERS
21	8	GROUND TAB ON MAJOR COMPONENTS & CORNERS OF TANK BASE & SUBFRAME
22	1	DISTRIBUTOR SUPPLIED FUEL FILTER ASSEMBLY
23	1	480V 30A NON-FUSIBLE DISCONNECT SWITCH FOR POWER TO COOLANT HEATER
24	1	NORMAL TANK VENT EXTENDED 24" ABOVE AIR DISCHARGE BRACED TO ENCLOSURE FOR STABILITY
25	2	4LAP-MSFT TANK STATUS ALARM PANELS WITH RELAYS FOR GENERATOR CONTROLLER & CUSTOMER USE
26	1	MECHANICAL OVERFILL PREVENTION VALVE SET @ 95% WITH 3" FILL CONNECTION & S.S. 7 GALLON SPILL CONTAINER
27	1	9,100 GALLON CAPACITY UL142 LISTED SUB BASE FUEL SUPPLY TANK WITH TYPE A (STRAIGHT) CONDUIT STUB AREA
28	8	LIFT LUGS FOR SUB BASE FUEL TANK - SEE DETAIL 3A
29	1	16" W-BEAM SUBFRAME WITH 6" SUPPORT TUBES, FULL NON-SLIP FLOOR & SPILL CONTAINMENT
30	8	LIFT LUGS FOR ENCLOSURE PACKAGE - SEE DETAIL 4A
31	18	HEAVY DUTY SPRING ISOLATORS
32	1	CARBON STEEL WYE FLEX ASSEMBLY WITH STAINLESS STEEL BELLOWS & INSULATION BLANKET
33	2	SIDE MOUNTED INTAKE RELIEF OPENINGS WITH FIXED VANE SOUND LOUVERS & MOTORIZED DAMPERS
34	4	PERSONNEL DOORS WITH HYDRAULIC CLOSERS, HOLDBACKS, S.S. KICK PLATES, 316 S.S. HINGES & BRUSH SWEEPS
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36	N/A	4" THICK MINERAL WOOL INSULATION WITH PERFORATED LINER
37	4	WEATHER PROTECTIVE HOODS OVER AIR INLET
38	12	MINERAL WOOL INSULATED 36" DEEP INTAKE SOUND BAFFLES
39	6	MOTORIZED INTAKE DAMPER SECTIONS
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45	3	UNISTRUT MOUNTING PROVISIONS FOR ON-SITE E.C. INSTALLED CABLE TRAY
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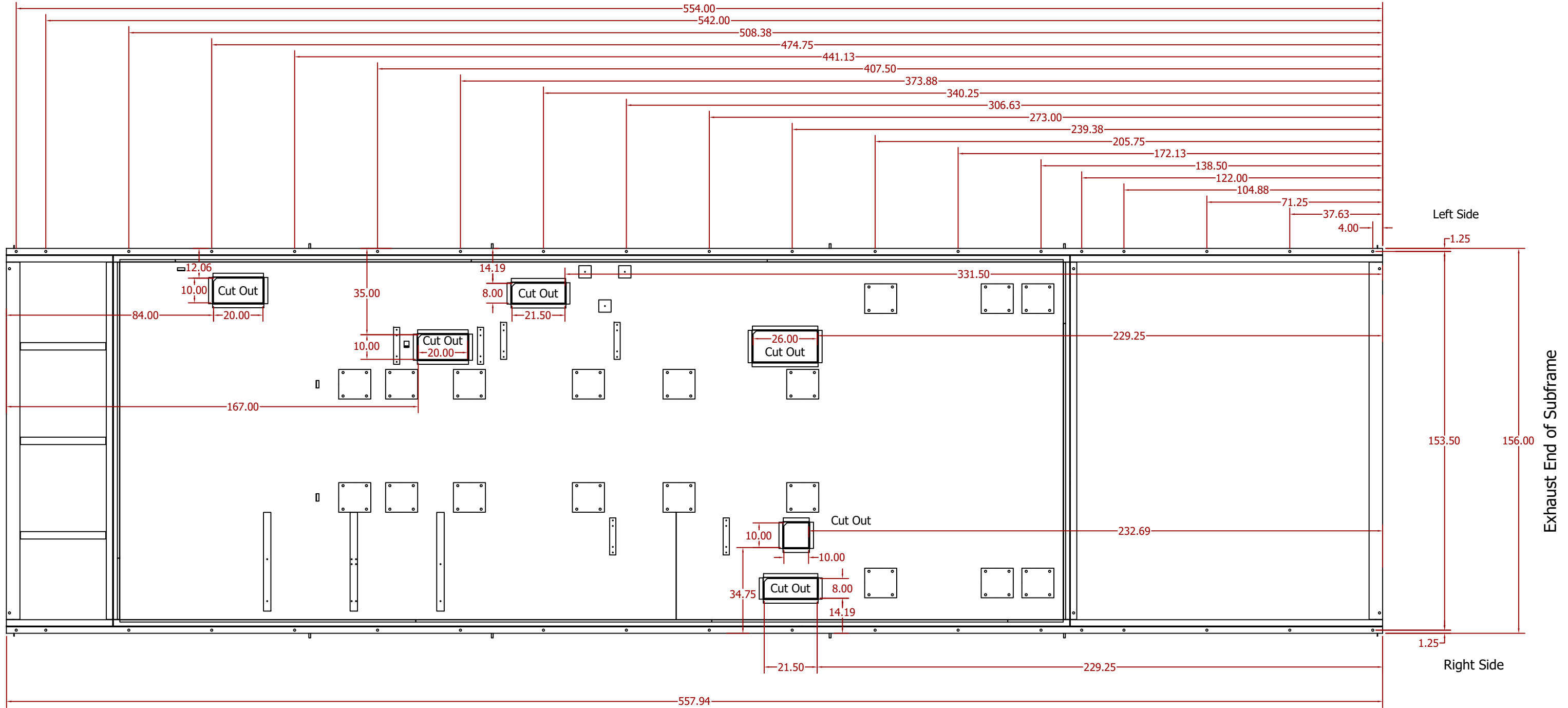


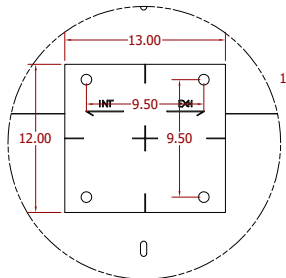
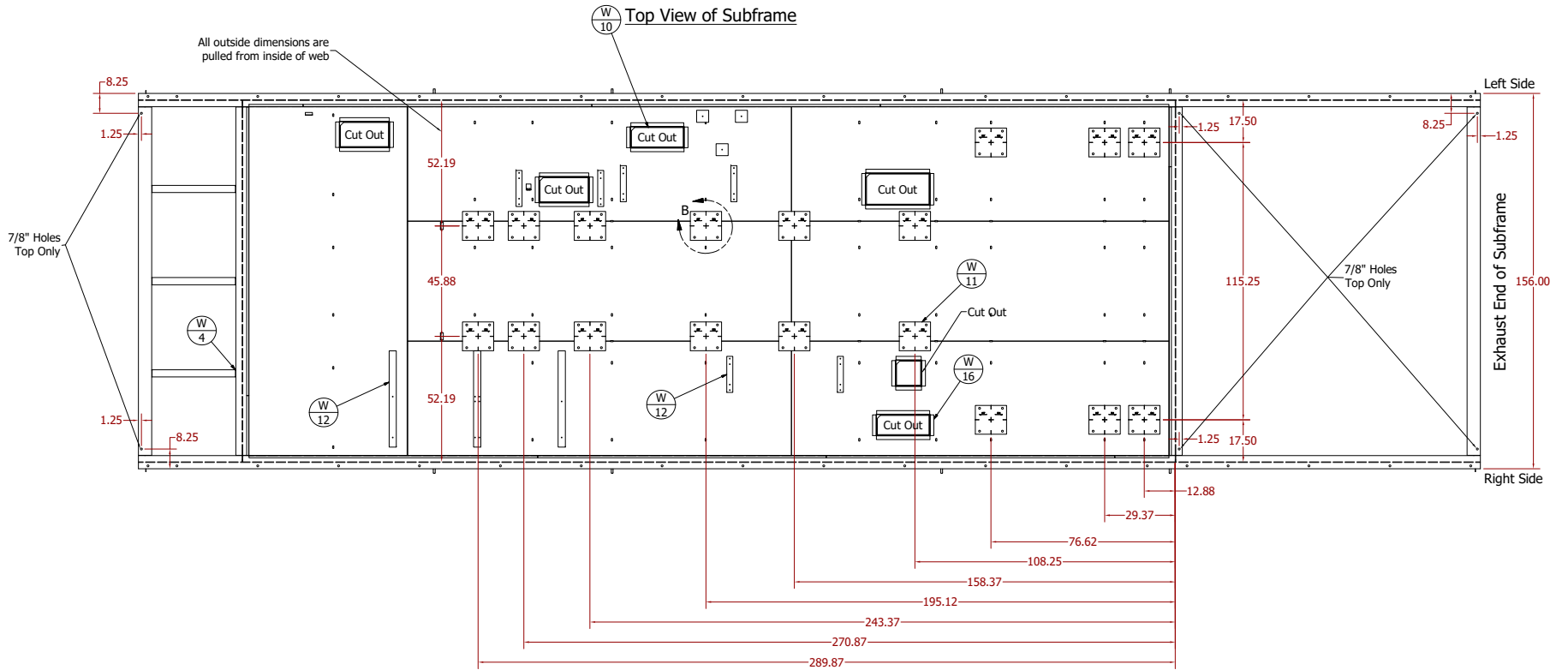
- GENERAL NOTES:
1. A MINIMUM OF (4) 7/8" MOUNT HOLES WILL BE PROVIDED IN THE BOTTOM FLANGE FOR MOUNTING PURPOSES
 2. ANCHOR BOLTS ARE NOT PROVIDED BY TANK MANUFACTURER
 3. DRILL PAD FOR ANCHORS AFTER INSTALLATION OF TANK & ACCESSORIES
 4. THE PAD SHALL BE POURED FLAT AND LEVEL WHERE AT LEAST 70% OF THE LENGTH OF EACH BASERAIL (LONG SIDES) IS SUPPORTED AND THE ENTIRE MOUNTING SURFACE IS LEVEL WITHIN 1/4" OVER EVERY 10 FEET

PAD DIMENSIONS ARE PROVIDED ONLY AS A SUGGESTION. CONSULT AN ENGINEER FOR DESIGN ASSISTANCE

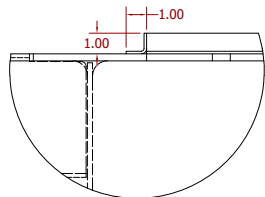
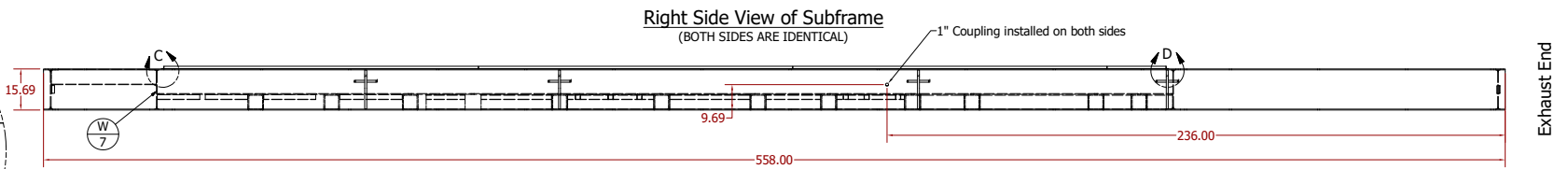
TOTAL SYSTEM WET WEIGHT: 225,438 (lbs)

Top View of Subframe

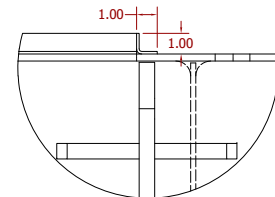




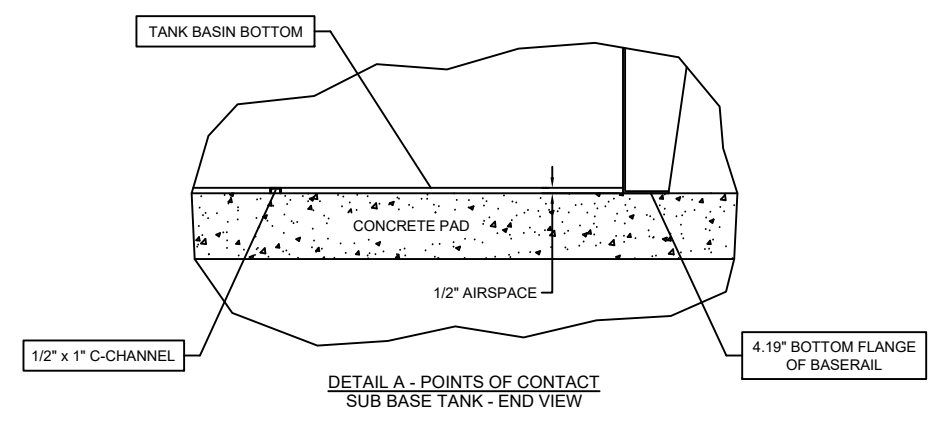
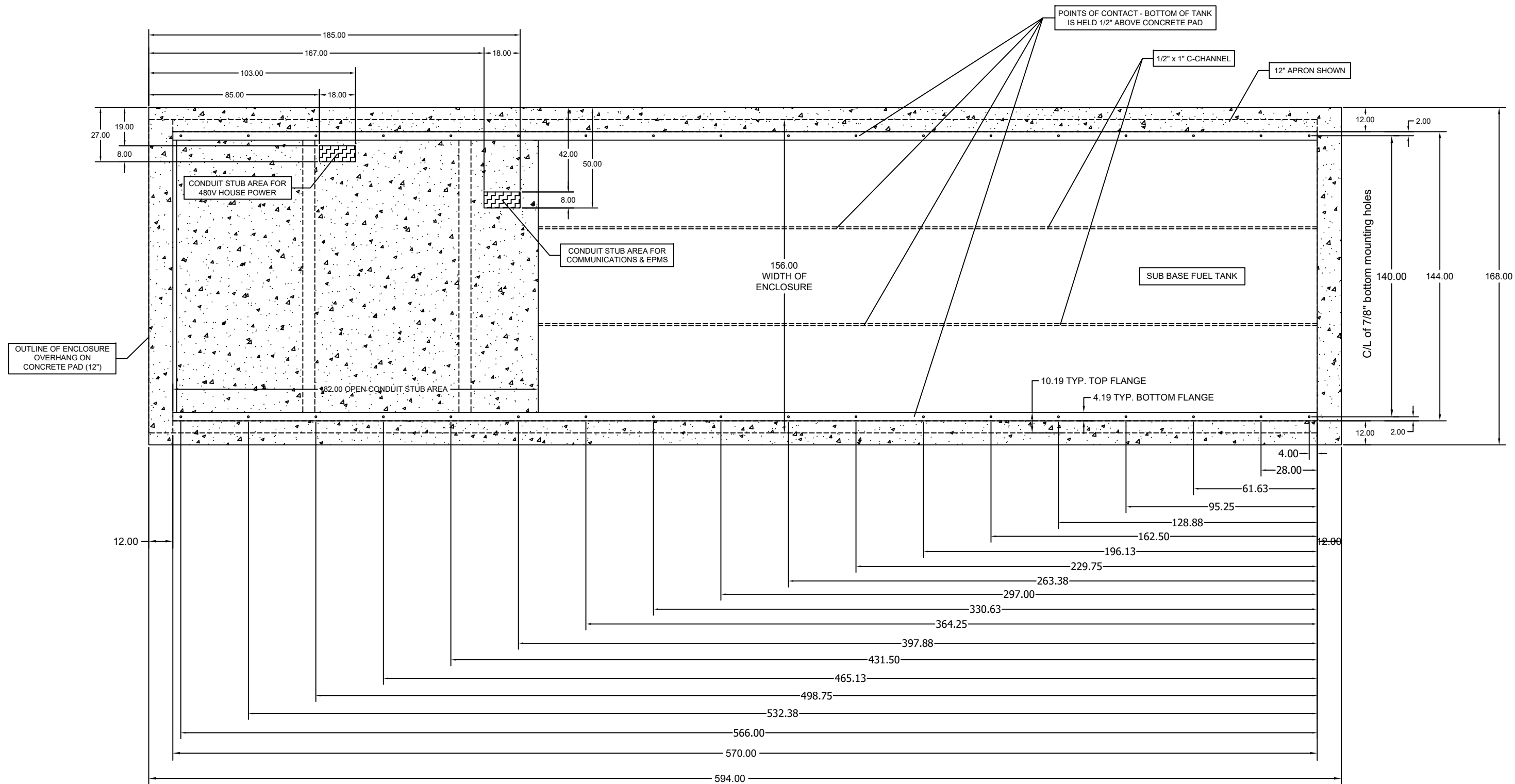
DETAIL B
 BUYOUT 3/4" MOUNTING PAD
 Drilled + Tapped for 3/4" Bolts
 (ISOLATOR M2SSHX-1E-5150N)
 (Measurements are ± 1/16")



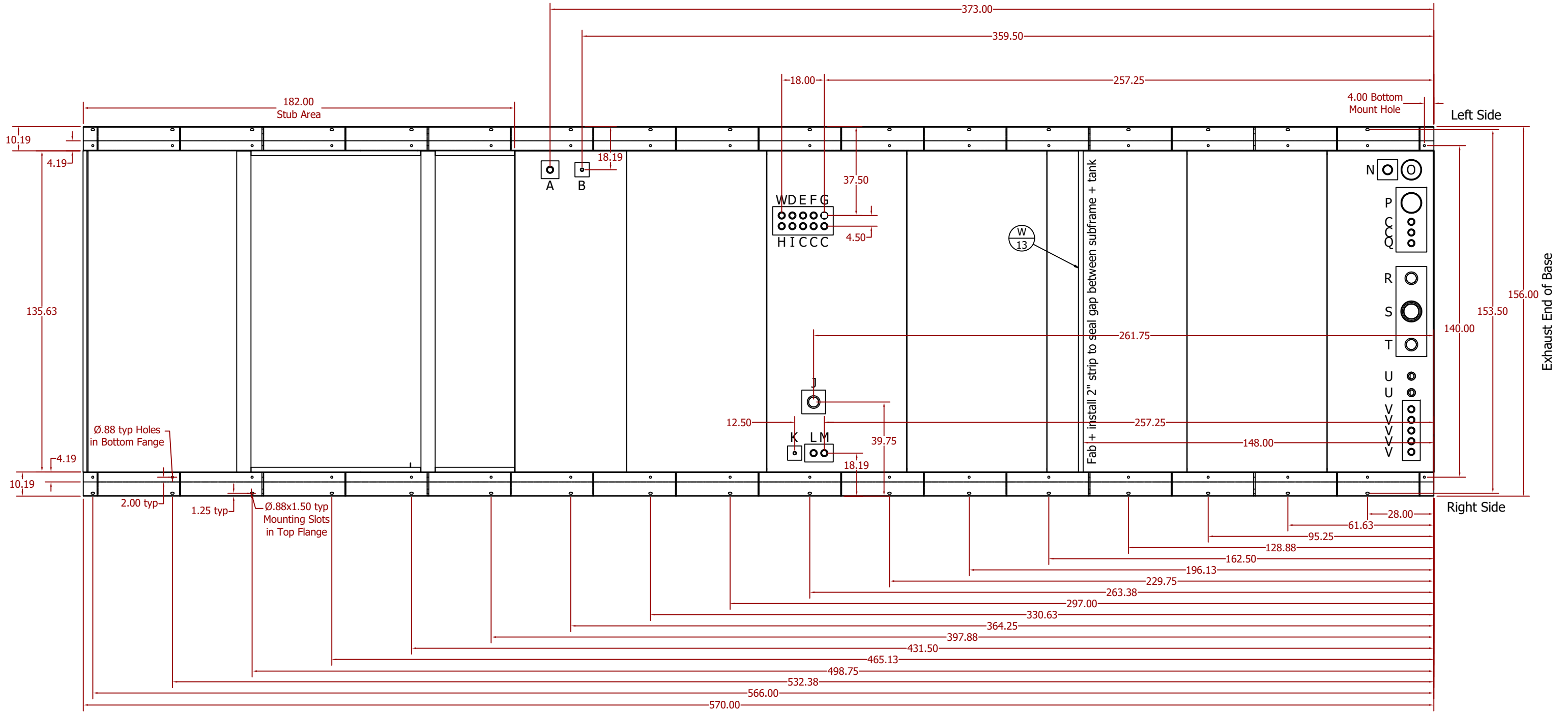
DETAIL C



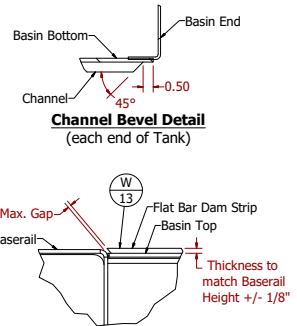
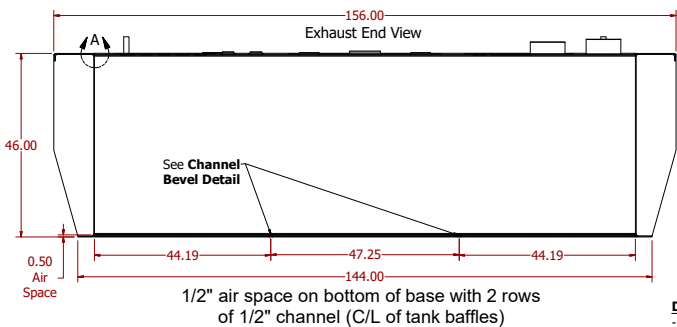
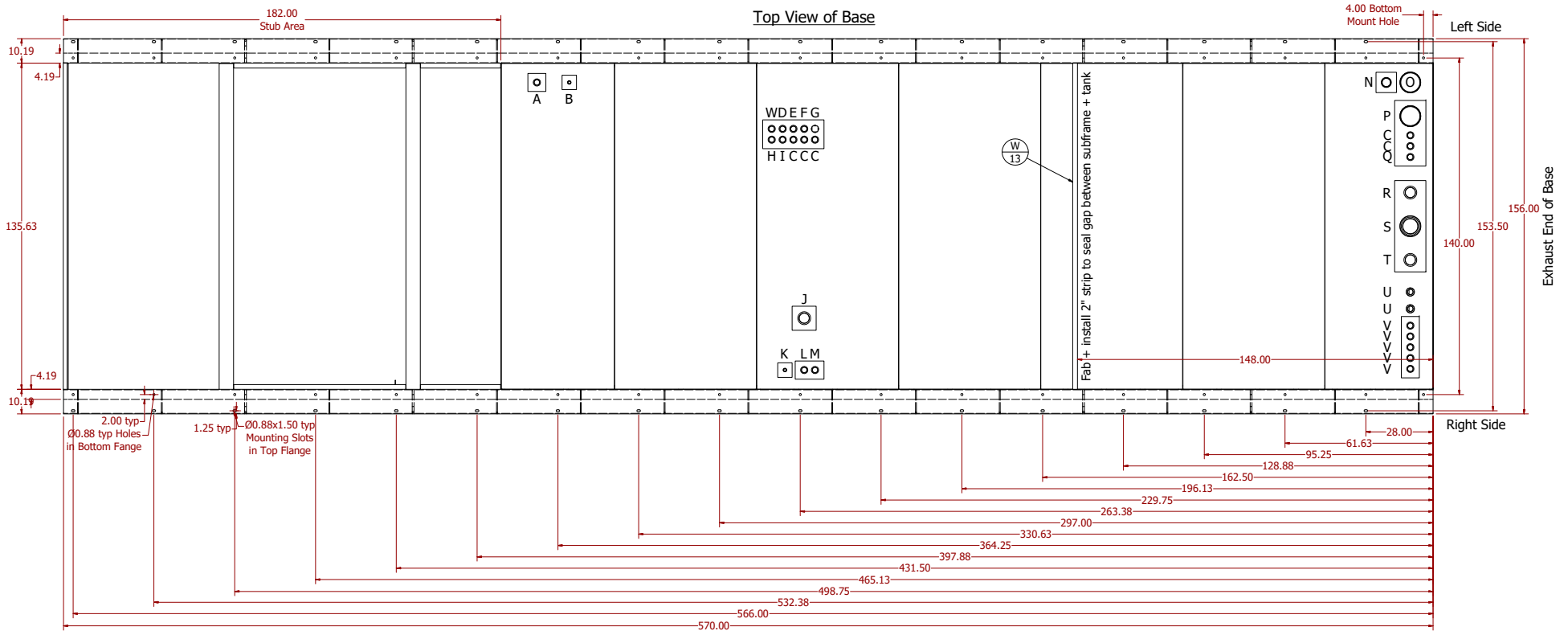
DETAIL D



Top View of Base



Top View of Base



Detail "A" - Flat Bar Dam Strip
 - Bevel Bar to 45° on each end to clear weld on Baseraills.
 - Ensure no more than an 1/8" gap between Bar and Baseraills to allow caulk to fill it in.

- A = 2" Port for [Fuel Polisher Supply] (Flange) w/ 1" removable dip tube
- B = 1" Port for [Fuel Polisher Return] w/ 1" dip tube piped 100" toward Exhaust end of Tank
- C = 2" Port for [Tank Spare] (Flange + 2 x 8npl, cpl + plug)
- D = 2" Port for [90% High Fuel] Level Float Switch (Flange)
- E = 2" Port for [33% Low Fuel] Level Float Switch (Flange)
- F = 2" Port for [25% Low Fuel] Critical Low Level Float Switch (Flange)
- G = 2" Port for [Leak Detector] (Flange) Plumb Through Tank w/ 3sq. Tube x 43"L
- H = 2" Port for Engine [Fuel Supply] (Flange) w/ 1-1/4" Removable dip Tube
- I = 2" Port for Engine [Fuel Return] (Flange) w/ 1" Removable dip Tube
- J = 4" Port for [Tank Spare] (Flange + 4 x 8npl, cpl + plug)
- K = 1" Port for Fuel [Heater Return] (w/ 1" dip tube piped 100" toward Intake end of Tank)
- L = 2" Port for [RTD Temperature Sensor] (Flange)
- M = 2" Port for Fuel [Heater Supply] (Flange) w/ 3/4" removable dip tube
- N = 3" Port for [Normal Tank Vent] (Flange) Piped 24" Above Plenum Extension Enclosure (See Final Detail)
- O = 8" Port for [Emergency Base Vent] (Nipple)
- P = 8" Port for [Emergency Tank Vent] (Nipple)
- Q = 2" Port for [Fuel Gauge] (Flange)
- R = 4" Port for [OPV Manual Check & Inspection] (Flange)
- S = 6" [Fill] Port (Flange) w/ 3" OPV Set and 95% and S.S. 7gal. Spill Containment
- T = 4" Port for [Tank Spare] (Flange + Plug)
- U = 2" Port for [Basin Spare] (Flange + Plug) Plumb Through Tank w/ 3sq. Tube x 43"L
- V = 2" Port for [Tank Spare] (Flange + Plug)
- W = 2" Port for [Continuous Level Sensor] (Flange)