
MID FLORIDA
DIESEL INC.

BID FORM

FY 20234-24 DESIGN CONSTRUCTION AND INSTALLATION
OF EMERGENCY GENORATORS

RETURN DATE: Wednesday, March 26, 2024 by 4:00 P.M.

RETURN TO: Office of the Town Clerk
Attn: RFP #24-06
Town of Dundee
P.O. Box 1000
202 East Main Street
Dundee, Florida 33838

ITEM	ESTIMATED QTY	UNIT BID	EXTENDED AMOUNT
1. 4337-381-R	1 Each	$91,995.00	$91,995.00
2. 4337-481-R	1 Each	$65,00.00	$65,000.00
3.			
4.			
5.			
		TOTAL	$156,995.00

ALL BID FORMS SHOULD INCLUDE THE FOLLOWING INFORMATION:

Company Submitting Bid: Mid Florida Diesel, Inc.

Company Address: 2215 Hwy 60 East

Company City: Bartow

State: FL Zip: 33830

Fax Number: N/A

Company Phone Number: 863-519-0107

~~Authorized Representative:~~

Signature:

Date: March 25, 2024

Print Name: Al McCoy

Title: President

Phone Number: 863-698-1267

AFFIDAVIT CERTIFICATION
IMMIGRATION LAWS

THE TOWN OF DUNDEE, FLORIDA, WILL NOT INTENTIONALLY AWARD TOWN CONTRACTS TO ANY CONTRACTOR WHO KNOWINGLY EMPLOYS UNAUTHORIZED ALIEN WORKERS, CONSTITUTING A VIOLATION OF THE EMPLOYMENT PROVISIONS CONTAINED IN 8 U.S.C. SECTION 1324 a(e) AND/OR SECTION 274A(e) OF THE IMMIGRATION AND NATIONALITY ACT ("INA").

THE TOWN OF DUNDEE, FLORIDA, MAY CONSIDER THE EMPLOYMENT BY ANY CONTRACTOR OF UNAUTHORIZED ALIENS A VIOLATION OF SECTION 274A(e) OF THE INA. **SUCH VIOLATION BY THE RECIPIENT OF THE EMPLOYMENT PROVISIONS CONTAINED IN SECTION 274A(e) OF THE INA SHALL BE GROUNDS FOR UNILATERAL CANCELLATION OF THE CONTRACT BY THE TOWN OF DUNDEE.**

BIDDER ATTESTS THAT THEY ARE FULLY COMPLIANT WITH ALL APPLICABLE IMMIGRATION LAWS (SPECIFICALLY TO THE 1986 IMMIGRATION ACT AND SUBSEQUENT AMENDMENTS).

Company Name Mid Florida Diesel, Inc.

Signature _____ Date: 3/25/2024

Printed Name Al McCoy

Title President

PRIVATE PROVIDER FIRM N/A

THIS SECTION TO BE COMPLETED BY A NOTARY PUBLIC:

STATE OF Florida COUNTY OF Polk

SWORN TO AND SUBSCRIBED BEFORE ME THIS 25 DAY OF March, 20 24

NOTARY PUBLIC: CHECK ONE PERSONALLY KNOWN TO ME X Produced I.D. _____

TYPE OF ID PRODUCED _____

SIGN: Kristina Frasher

PRINT: Kristina Frasher

KRISTINA FRASHER
MY COMMISSION # HH 034563
EXPIRES: August 29, 2024
Bonded Thru Notary Public Underwriters

A1

NONCOLLUSION AFFIDAVIT OF BIDDER

State of Florida

County of Polk

I Al McCoy ("Affiant"), **being first duly sworn, deposes and says that:**

(1) Affiant is President (insert job title) of Mid Florida Diesel, Inc (insert name of company) the bidder that submitted the attached bid;

(2) Affiant is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;

(3) Such bid is genuine and is not a collusive or sham bid:

(4) Neither the said Affiant nor any of his/her/its officers, partners, owners, agents, representatives, employees or parties in interest, including Affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached bid has been submitted or has refrained from bidding in connection with such Contract; nor in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the attached bid or of any other bidder; nor has fixed any overhead, profit or cost element of the bid price, or the bid price of any other bidder; nor has secured through any collusion, conspiracy, connivance or unlawful agreement, any advantage against the Town of Dundee or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Affiant or any of its agents, representatives, owners, employees, or parties in interest.

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STATE OF Florida COUNTY OF Polk

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KRISTINA FRASHER
MY COMMISSION # HH 024563
EXPIRES: August 29, 2024
Bonded Thru Notary Public Underwriters

CERTIFICATION OF DRUG-FREE WORKPLACE

I Al McCoy ("Undersigned"), certify that:

(1) Undersigned is President (insert job title) and duly authorized to act on behalf of the Contractor Mid Florida Diesel, Inc that submitted the attached bid.

(2) Undersigned acknowledges that Preference shall be given to businesses with drug-free workplace programs.

(3) Undersigned acknowledges that whenever two (2) or more bids which are equal with respect to price, quality, and service are received by the Town for the Purchasing of commodities or contractual services, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process.

(4) In order to have a drug-free workplace program, a business shall:

(a) Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in-the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

(b) Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

(c) Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (a).

(d) In the statement specified in subsection (a), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 of the Florida Statutes or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

(e) Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

(f) Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

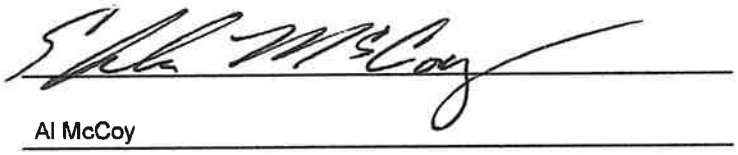
The Undersigned, as the person authorized to sign this CERTIFICATION OF DRUG FREE WORKPLACE, does hereby certify that the Contractor, Mid Florida Diesel, Inc _____, acknowledges, understands, and complies fully with the above requirements.

DATE: March 25, 2024 NAME OF ENTITY: Mid Florida Diesel, Inc

PHONE/FAX: 863-519-0107

ADDRESS: 2215 Hwy 60 E.

Bartow, FL 33830

SIGNATURE: 

PRINT NAME: Al McCoy

SALES TAX SAVINGS FORM

CONTRACT NUMBER: _____

NAME OF PROJECT: _____

MATERIALS	(1) Amount in Contract	(2) Sales Tax	(3) Net Amount

(1) This is the amount to be deducted from contract by change order.

(2) The amount of the sales tax included in the material purchase line item supplied by the Contractor.

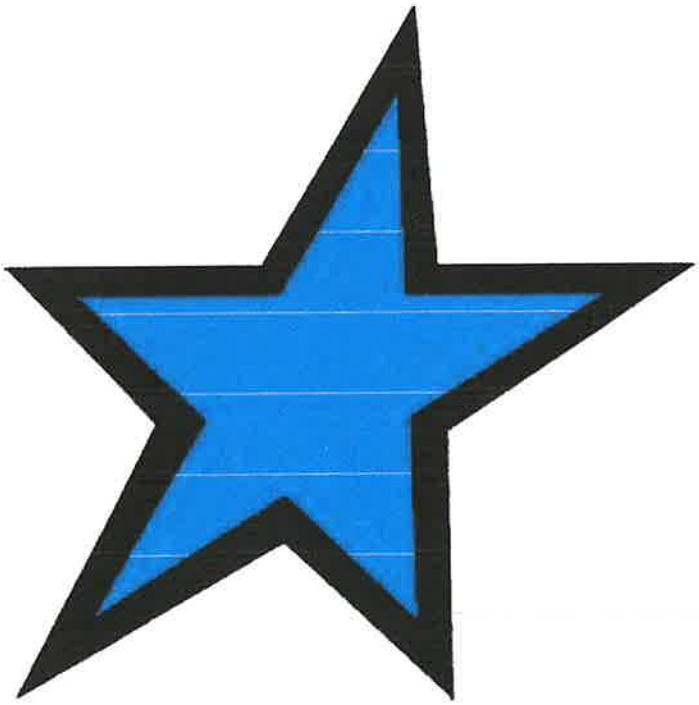
(3) The amount to be used by the Town to make the material purchase per the Contractor's stated quantities

BLUE STAR
Power Systems Inc.

Submittal

3/21/2024

Project Title	Dundee Community Center 100KW Generator
Quote Number:	0107619-2
Model:	JD100-01



Mid Florida Diesel
Joe Antonini
2215 Hwy 60 East
Bartow FL 33830
Office: 863-519-0107
Cell: 863-944-0400
Email: joe@midfloridadiesel.com

BLUE STAR
Power Systems Inc.

Table of Contents

BLUE STAR Power Systems Inc.

Sales Quote

Quote Date:	**3/21/2024 11:32:30 AM**
Quote Number:	**0107619-2**
Project Title:	**Dundee Community Center 100KW Generator**
Prepared for	**Mid Florida Diesel**

Distributed by:

Unit Model	**JD100-01**	**Standby / Prime**	**Emergency Stationary Standby**
kWe Rating	**100 kWe**	**UL 2200 Listed**	**Yes**
Fuel	**Diesel**	**CSA Approved**	**Yes**
EPA	**Tier 3**	**Paint Color**	**White**

Engine Model:	John Deere 4045HF285 100kW Standby Power Rating at 1800 RPM Governor - Electronic Isochronous
Voltage:	208/120V 3 Phase 60 Hz 0.8 PF
Gen Model:	Stamford UCI274E 12 Lead Wired 208V 3 Phase Low Wye 105°C Rise Over 40°C Ambient
Voltage Regulator:	Stamford MX321 Automatic Voltage Regulator with PMG Excitation
Control Panel:	Blue Star DGC-2020 Microprocessor Based Gen-Set Controller Mounted Facing Left from Generator End (Unless Specified Otherwise) Standard Features: Low Oil Pressure, High Coolant Temp, Overspeed, Overcrank Shutdowns Emergency Stop Pushbutton, Audible Alarm Buzzer with Silencing Switch Optional Features Include: Generator Protection (Undervoltage, Overvoltage, Underfrequency, Overfrequency, Overcurrent),15 Contact Outputs, RS-485 Communications
Control Panel Options:	Low Water Level Sensor with Shutdown
Unit Color:	White
Enclosure:	Level 3 (Sound Attenuated Enclosure) Powder Coated .090 Aluminum Rugged and Durable 200 MPH Wind Rated Enclosure with Exhaust Hood Pitched Roof for Increased Structural Integrity and Improved Watershed Punched Intake with Baffle and Punched Exhaust Openings Keyed Alike Lockable Doors with Draw Down Latches and Stainless Steel Component Hinges Additional 1.5" Thick Polydamp Type D Acoustical Foam (PAF) Formed Steel Base with Mounting and Lifting Holes Includes Vibration Mounts to Isolate Unit from Base Rail
Sound Attenuation Foam:	Sound Attenuation Installed in Enclosure and Exhaust Hood
Cooling:	Unit Mounted Radiator (50°C Ambient)
Oil Drain Extension:	Plumbed to Bulkhead Fitting in Base
Mainline Breaker:	350 Amp 3 Pole 240 Volt Breaker Mounted & Wired in a NEMA 1 Enclosure 12VDC Shunt Trip Wired to Engine ShutdownsBreaker- Adjustable Trip to 300amp
Jacket Water Heater:	Engine Block Heater 1500W 120VAC Rated for -20°F Heater Installed with Isolation Valves and Wired to Terminal
Air Cleaner:	Dry Single Stage
Silencer:	Critical Grade Compact (CPJ Series) Silencer Mounted to Engine
Battery:	12 Volt System with Rack and Cables
Battery Charger:	12 Volt 6 Amp Mounted and Wired to Terminal

Fuel Tank:	24 Hour / 250 Gallon UL 142 Listed Sub-Base Fuel Tank with Stub-up Area Double Wall Construction with Secondary Containment Standard Includes: Supply & Return Connections, Fuel Level Gauge, Fuel Leak Switch and Fill & Vent Plumbing
Factory Test:	Standard Commercial Testing Includes: Verification of Alarm Shutdowns, Voltage Settings, Block Loading to Rated kWe and PF
Owner's Manual:	Print Copy (Qty 1) **Standard**
Warranty:	2 Year / 2000 Hour Limited
Notes:	Coat 250 gallon tank with Extreme Liner $2,500.00 2 steps required. one for controller and one for breaker $800.00
Additional Options (Not Included in Price):	

ATS 1

Series	**300**	**Volts**	**208/120V 3 PH**
Service Entrance Rated	**No**	**Poles**	**3**
Amps	**400**	**Enclosure**	**Nema 3R**

Warranty:	Two (2) Year Basic ATS Limited Warranty Standard
Optional Accessories:	11BE Feature Bundle Includes Engine Exerciser/Event Log/RS-485 Enabled/Common Al
ATS Notes:	
Payment Terms:	Due Upon on Receipt
Lead Time:	20 + Weeks

Payment Terms:	Due Upon Receipt
Delivery Schedule:	32-34 Weeks (Contingent on component availability)

Terms & Conditions

- This quote is valid for a period of 30 days.
- This proposal is our interpretation of your requirement. It includes only the items listed on this quotation. Should there be other requirements or specifications, we will re-quote accordingly.
- Units are shipped wet to include lube oil and 50/50 water and antifreeze mix unless otherwise noted in this quotation.
- All extended piping, wiring, or other than listed above is performed by "others".
- Seller is not quoting, offloading, job site startup, personnel instructions, field testing, or unit installation.
- Quoted prices include normal testing, packaging, and instructional literature.
- It is the distributor/purchaser and end user's responsibility to ensure that this equipment is operated in accordance with all applicable local, state, and federal laws and regulations governing the use and operation of this equipment.

Distributor Terms & Conditions

BLUE STAR
Power Systems Inc.

Diesel Product Line

208-600 Volt

JD100-01

60 Hz / 1800 RPM

100 kWe

Standby

Ratings

	240V	208V	240V	480V	600V
Phase	1	3	3	3	3
PF	1.0	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60
Generator Model	UCI274F	UCI274D	UCI274D	UCI274C	UCI274D
Connection	12 LEAD DD	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	4 LEAD WYE
kWe	100	100	100	100	100
AMPS	417	347	301	151	120
Temp Rise	125°C / 40°C	125°C / 40°C	125°C / 40°C	125°C / 40°C	125°C / 40°C

Standard Equipment

Engine
- Radiator Cooled Unit Mounted (50°C)
- Radiator Duct Flange (OPU Only)
- Blower Fan & Fan Drive
- Starter & Alternator
- Oil Pump & Filter
- Oil Drain Extension w/Valve
- Governor - Electronic Isochronous
- 12V Battery System & Cables
- Air Cleaner (Dry Single Stage)
- Critical Grade Silencer Mounted
- Flexible Fuel Connector
- EPA Certified Tier 3

Generator
- Brushless Single Bearing
- Automatic Voltage Regulator
- ± 1% Voltage Regulation
- 4 Pole, Rotating Field
- 125°C Standby Temperature Rise
- 100% of Rated Load - One Step
- 5% Maximum Harmonic Content
- NEMA MG 1, IEEE and ANSI Standards Compliance for Temperature Rise

Additional
- Single Source Supplier
- UL 2200 & cUL Listed
- CSA Certified
- Seismic Certified to IBC 2021
- NFPA 110 / CSA C282 Compliant
- Microprocessor Based Digital Control Panel Mounted in NEMA 12 Enclosure
- Base - Formed Steel
- Main Line Circuit Breaker Mounted & Wired
- Battery Charger 12V 6 Amp
- Jacket Water Heater -20°F 1500W 120V w/Isolation Valves
- Vibration Isolation Mounts
- 2 Year / 2000 Hour Standby Warranty
- Standard Colors - White / Gray

Diesel Product Line

100 kWe

BLUE STAR Power Systems Inc.

Application Data

Engine

Manufacturer:	John Deere	Displacement - Cu. In. (lit):	275 (4.50)
Model:	4045HF285	Bore - in. (cm) x Stroke - in. (cm):	4.19 (10.6) x 5.00 (12.7)
Type:	4-Cycle	Compression Ratio:	19.0:1
Aspiration:	Turbo Charged	Rated RPM:	1800
Cylinder Arrangement:	4 Cylinder Inline	Max HP Stby (kWm):	158 (118)

	Standby
Exhaust System	
Gas Temp. (Stack): °F (°C)	1,076 (580)
Gas Volume at Stack Temp: CFM (m³/min)	805 (22.8)
Maximum Allowable Exhaust Restriction: in. H_2O (kPa)	30.0 (7.50)
Cooling System	
Ambient Capacity of Radiator: °F (°C)	122 (50.0)
Maximum Allowable Static Pressure on Rad. Exhaust: in. H_2O (kPa)	0.50 (0.12)
Water Pump Flow Rate: GPM (lit/min)	48.0 (182)
Heat Rejection to Coolant: BTUM (kW)	3,544 (62.0)
Heat Rejection to CAC: BTUM (kW)	1,127 (19.8)
Heat Radiated to Ambient: BTUM (kW)	2,016 (35.3)
Air Requirements	
Aspirating: CFM (m³/min)	288 (8.15)
Air Flow Required for Rad. Cooled Unit: CFM (m³/min)	6,638 (188)
Air Flow Required for Heat Exchanger/Rem. Rad. CFM (m³/min)	Consult Factory For Remote Cooled Applications
Fuel Consumption	
At 100% of Power Rating: gal/hr (lit/hr)	7.76 (29.4)
At 75% of Power Rating: gal/hr (lit/hr)	6.25 (23.7)
At 50% of Power Rating: gal/hr (lit/hr)	4.55 (17.2)
Fluids Capacity	
Total Oil System: gal (lit)	3.43 (13.0)
Engine Jacket Water Capacity: gal (lit)	2.24 (8.50)
System Coolant Capacity: gal (lit)	5.40 (20.4)

Deration Factors: Rated Power is available up to 10,000 ft (3,048 m) at ambient temperatures to 122°F (50°C).
Consult factory for site conditions above these parameters.

Diesel Product Line

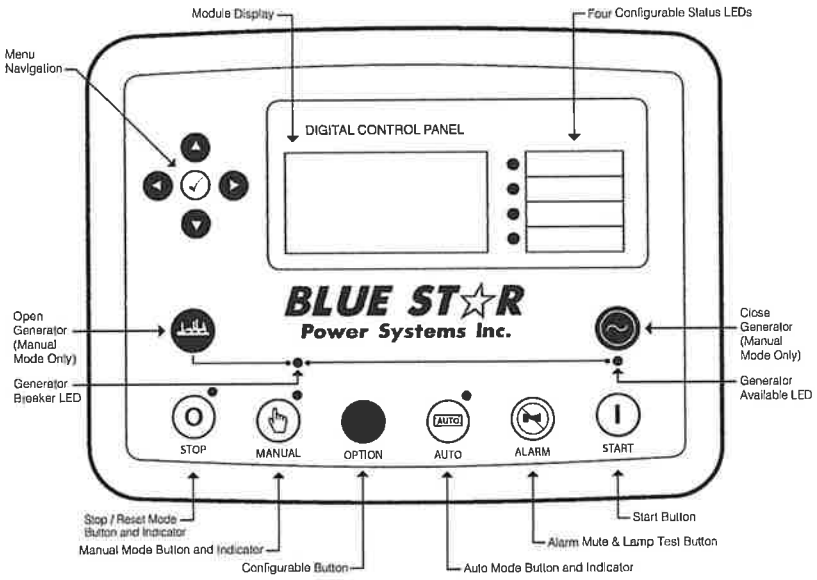
100 kWe

BLUE STAR Power Systems Inc.

DCP7310 Control Panel

Standard Features

- Digital Metering
- Engine Parameters
- Generator Protection Functions
- Engine Protection
- CAN Bus (J1939) ECU Communications
- Windows-Based Software
- Multilingual Capability
- Remote Communications to DSE2548 Remote Annunciator
- 8 Programmable Contact Inputs
- 10 Contact Outputs
- RS485 Communicator Interface
- cULus Listed, CE Approved
- Event Recording
- IP 65 rating (with supplied gasket) offers increased resistance to water ingress
- NFPA 110 Level 1 Compatible

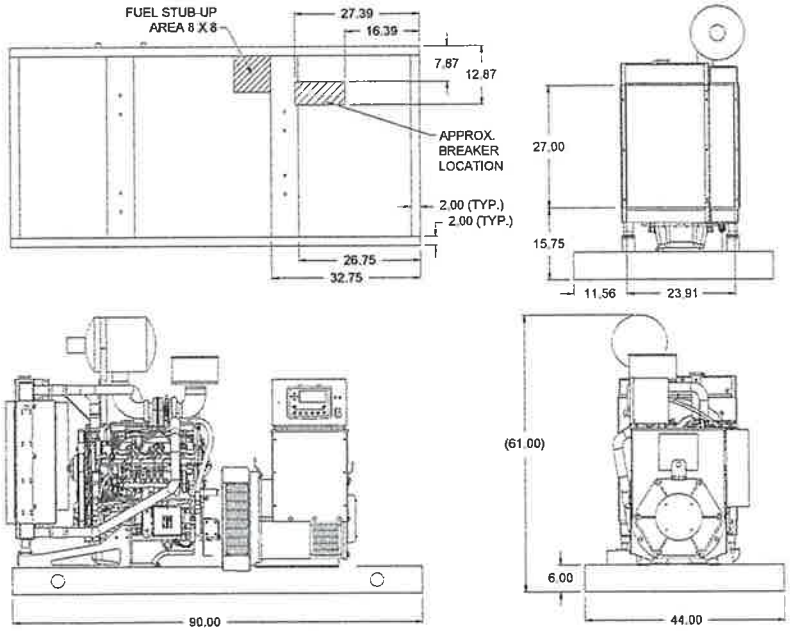


Weights / Dimensions / Sound Data

	L x W x H	Weight lbs
OPU	90 x 44 x 61 in	2,750
Level 1	102 x 44 x 66 in	3,350
Level 2	102 x 44 x 66 in	3,400
Level 3	132 x 44 x 66 in	3,575

Please allow 6-12 inches for height of exhaust stack.

	No Load	Full Load
OPU	78 dBA	82 dBA
Level 1	75 dBA	78 dBA
Level 2	72 dBA	74 dBA
Level 3	66 dBA	68 dBA

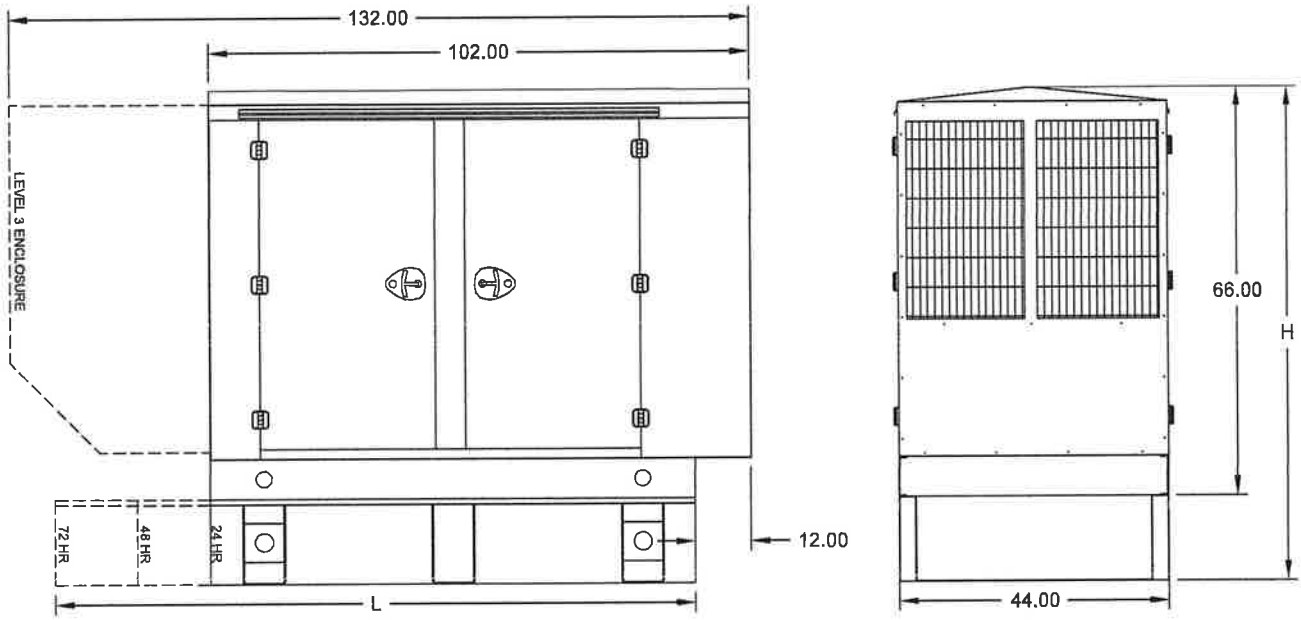


Diesel Product Line

100 kWe

BLUE STAR Power Systems Inc.

Enclosures & Fuel Tanks



- All enclosure models are 200 MPH wind rating certified in accordance with IBC2021 and ASCE/SEI 7-16 standards.
- Level 2 & 3 enclosures include sound attenuation foam
- Level 3 enclosure includes frontal sound & exhaust hood.
- Enclosure height does not include exhaust stack.

	24 Hour 250 Gallon	48 Hour 500 Gallon	72 Hour 750 Gallon
L	90.00	120.00	174.00
H	94.00	102.00	102.00

American Owned

American Made

Notes

- All specification sheet dimensions are represented in inches.
- All drawings based on standard 480 volt standby generator. Lengths may vary with other voltages. All drawings and dimensions subject to change without notice.
- All enclosures and fuel tanks are based on the standard unit configuration. Any requested deviation can change dimensions.
- Sound data is measured at 23 feet (7 meters) in accordance with ISO 8528-10.
- All materials and specifications subject to change without notice.

Blue Star Power Systems, Inc.
2250 Carlson Drive
North Mankato, Minnesota 56003
Phone + 1 507 345 1776
bluestarps.com
quote.bluestarps.com
sales@bluestarps.com

JOHN DEERE

ENGINE PERFORMANCE CURVE

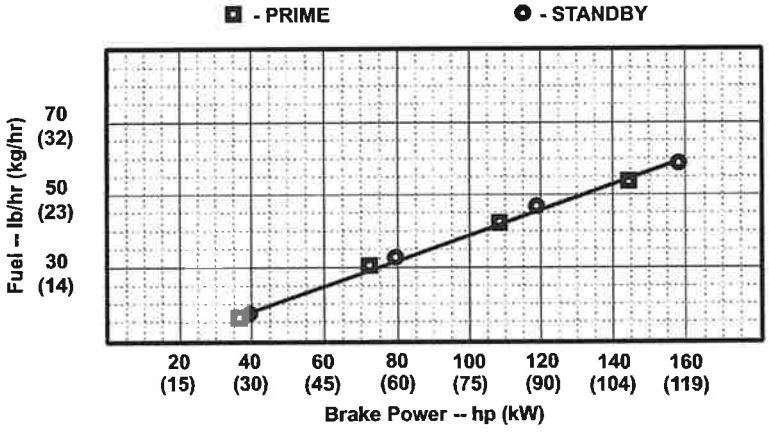
PowerTech E™ 4.5L Engine
Model: 4045HF285

Rating: Gross Power — **144 hp (107 kW) Prime**
Application: Generator (60 Hz) — **158 hp (118 kW) Standby**
Target: 100 kWe Standby Market — [See Option Code Tables]

Nominal Engine Power @ 1800 RPM			
Prime		Standby	
HP	kW	HP	kW
144	107	158	118

Generator Efficiency %	Fan Power (6% of Standby)		Power Factor	Prime Rating [2]		Standby Rating [1,2]		ISO 8528 G2 Block Load Capability
	hp	kW		kWe	kVA	kWe	kVA	
88-92	8.7	6.5	0.8	89-93	111-116	98-103	123-129	100%

Note 1: Based on nominal engine power.
Note 2: kWe / kVA rating assumes 90% efficiency. "Generator Efficiency %" will vary.



STANDARD CONDITIONS

Air Intake Restriction ..... 12 in.H_2O (3 kPa)
Exhaust Back Pressure ..... 30 in.H_2O (7.5 kPa)

Gross power guaranteed within + or - 5% at SAE J1995 and ISO 3046 conditions:
- 77 °F (25 °C) air inlet temperature
- 29.31 in.Hg (99 kPa) barometer
- 104 °F (40 °C) fuel inlet temperature
- 0.853 fuel specific gravity @ 60 °F (15.5 °C)

Conversion factors:
- Power: kW = hp x 0.746
- Fuel: 1 gal = 7.1 lb, 1 L = 0.85 kg
- Torque: N•m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.

Notes:
All OEM Gen Set Engine Applications must be pre-screened for torsional vibration compatibility with the respective alternator end hardware.

OEM Engine Application Engineering will perform this computer-based analysis work upon request.

Tier-3 Emission Certifications:	Certified by:
CARB; EPA Ref: Engine Emission Label	22 June '07

* Revised Data
Curve 4045HF2851800158 ..... Sheet 1 of 2
June 2007

Engine Installation Criteria

General Data

Model	4045HF285
Number of Cylinders	4
Bore and Stroke--in. (mm)	4.19 x 5.00 (106 x 127)
Displacement--in.^{3} (L)	275 (4.5)
Compression Ratio	19.0:1
Valves per Cylinder--Intake/Exhaust	1 / 1
Firing Order	1-3-4-2
Combustion System	Unit Injection
Engine Type	In-line, 4-Cycle
Aspiration	Turbocharged
Charge Air Cooling System	Air-to-Air
Engine Crankcase Vent System	Open

Physical Data

Length--in. (mm)	33.9 (860)
Width--in. (mm)	24.1 (612)
Height--in. (mm)	40.9 (1039)
Weight, with oil--lb (kg)	1083 (491)
(Includes flywheel hsg., flywheel & electrics)	
Center of Gravity Location	
From Rear Face of Block (X-axis)--in. (mm)	9.8 (249)*
Right of Crankshaft (Y-axis)--in. (mm)	2.17 (55)*
Above Crankshaft (Z-axis)--in. (mm)	5.7 (145)*
Max. Allow. Static Bending Moment at Rear Face of Flywhl Hsg w/ 5-G Load--lb-ft (N•m)	600 (814)

Thrust Bearing Load Limit--lb (N)	Forward	Rearward
Intermittent	899 (4000)	450 (2000)
Continuous	495 (2200)	225 (1000)

Max. Front of Crank. Torsional Vibration--DDA	0.25

Electrical System	12 Volt	24 Volt
Min. Battery Capacity (CCA)--amp	800	570
Max. Allow. Start. Circ't Resist.--Ohm	0.0012	0.002
Starter Rolling Current:		
At 32 °F (0 °C)--amp	920	600
At -22 °F (-30 °C)--amp	1300	700
Min. Volts at ECU while Cranking--volts	6	10
Max. ECU Temperature--°F (°C)	221 (105)	
Max. Harness Temperature--°F (°C)	248 (120)	
Maximum Voltage From Engine Crankshaft/ Generator Shaft to Ground--VAC	0.15	0.15

Air System	Prime	Standby
Max. Allowable Temp Rise--Ambient Air to Engine Inlet--°F (°C)	15 (8)	
Maximum Air Intake Restriction		
Dirty Air Cleaner--in.H_2O (kPa)	25 (6.25)	
Clean Air Cleaner--in.H_2O (kPa)	15 (3.75)	
Engine Air Flow--ft^3/min (m^3/min)	273 (7.73)	288 (8.16)
Air Cleaner Efficiency--%	99.9	

Charge Air Cooling System	Prime	Standby
Air/Air Exchanger Heat Rejection--BTU/min (kW)	1002 (17.6)	1127 (19.8)
Compress. Dischrg. Temp.(Rated) @ 77 °F (25°C) Amb. Air--°F (°C)	349 (176.2)	373 (189.6)
Compress. Dischrg. Temp.(Max.) @ 47°C amb. and 80 kPa bar.--°F (°C)	NA (NA)	NA (NA)
Press. Drop, thru CAC--in.H_2O (kPa)		
Max.	52 (13)	
Min.	None*	
Intake Manifold Pressure--psi (kPa)	22 (149)	24 (165)
CAC Out Temp @ 77°F (25°C) Amb.--°F (°C)		
Max.	140 (60)	
Min.	118 (48)	
CAC Out Temp @ any Ambient--°F (°C)		
Max.	190 (88)	

Cooling System	Prime	Standby
Engine Heat Reject.--BTU/min (kW)	NA (NA)	3544 (62)
Coolant Flow--gal/min (L/min)	48 (180)	48 (180)
Thermostat Start to Open--°F (°C)	180 (82)	
Thermostat Fully Open--°F (°C)	203 (95)	
Engine Coolant Capacity--qt (L)	9 (8.5)*	
Min. Pressure Cap--psi (kPa)	14.5 (100)	
Max. Top Tank Temp--°F (°C)	230 (110)	
Min. Coolant Fill Rate--gal/min (L/min)	3 (11)	
Min. Air-to-Boil Temperature--°F (°C)	117 (47)	
Min. Pump Inlet Pressure--psi (kPa)	4.4 (30)	

Exhaust System	Prime	Standby
Exhaust Flow--ft^3/min (m^3/min)	750 (21.2)	805 (22.8)
Exhaust Temperature--°F (°C)	1040 (560)	1076 (580)
Max. Exhaust Restriction---in. H_2O (kPa)	30 (7.5)	
Min. Exhaust Restriction----in. H_2O (kPa)	None	
Max. Bend. Moment, Turbo Out.--lb-ft (N•m)	5.2 (7.0)	
Max. Shear on Turbo Outlet--lb (kg)	24 (11)	

Fuel System	Prime	Standby
ECU Description	L16 Controller	
Fuel Injection Pump	Denso HP3	
Governor Type	Electronic	
Total Fuel Flow--lb/hr (kg/hr)	122 (55.3)	140 (63.5)
Fuel Consumption--lb/hr (kg/hr)	51 (23.0)	58 (26.5)
Max. Fuel Inlet Temp.--°F (°C)	176 (80)	
Fuel Temp. Rise, Inlt to Retrn--°F (°C)	82.6 (46)	87.3 (49)
Max. Fuel Inlet Restriction--in. H_2O (kPa)	80 (20)	
Max. Fuel Inlet Pressure--in. H_2O (kPa)	NA (NA)	
Max. Fuel Return Pressure--in. H_2O (kPa)	80 (20)	

Lubrication System	Prime	Standby
Oil Press. at Rated Speed--psi (kPa)	46 (320)	46 (320)
Min. Oil Pressure--psi (kPa)	15 (105)	
Max. Oil Carryover in Blow-by--lb/hr (g/hr)	0.002 (1.0)	
Max. Airflow in Blow-by--gal/min (l/min)	26 (100)	
Max. Crankcase Pressure--in. H_2O (kPa)	2 (0.5)	

Performance Data	Prime	Standby
Rated Power--hp (kW)	144 (107)	158 (118)
Rated Speed--rpm	1800	1800
Low Idle Speed--rpm	1150	1150
Rated Torque--lb-ft (N•m)	772 (569)	849 (626)
BMEP--psi (kPa)	230 (1589)	254 (1748)
Friction Power @ Rated Speed--hp (kW)	17 (13)	17 (13)
Altitude Capability--ft (m)	10,000 (3050)	7500 (2286)
Ratio--Air : Fuel	22 : 1	21 : 1
Smoke @ Rated Speed--Bosch No.	0.67	1.3
Noise--dB(A) @ 1 m	86.7*	87*

Fuel Consumption -- lb/hr (kg/h)	Prime	Standby
25 % Power	16.3 (7.4)	17.8 (8.1)
50 % Power	30.6 (13.9)	33.3 (15.1)
75 % Power	42.8 (19.4)	46.6 (21.1)
100 % Power	53.6 (24.3)	58.3 (26.5)

All values at rated speed and power with standard options unless otherwise noted.

* Revised Data

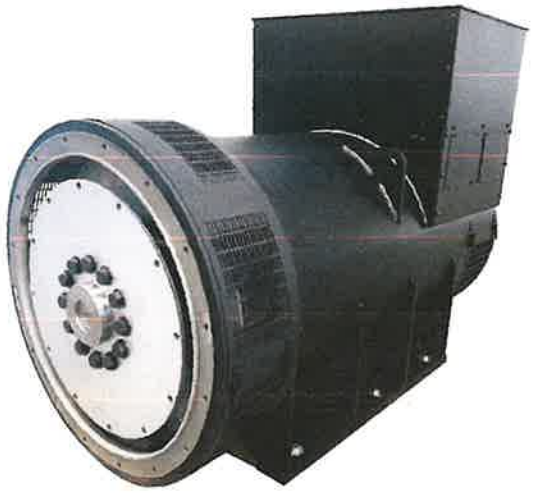
Curve 4045HF2851800158 ..... Sheet 2 of 2

June 2007

Industrial Alternators

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. utilizes the highest quality alternators available. Our industrial alternators provide consistent performance, quality design, and great durability required for long life and versatility. Alternators used by Blue Star Power Systems, Inc. are UL and CSA Listed, which guarantees that each one meets the rigorous demands of industrial power generation and will provide safe and effective service for the life of the alternator. Blue Star Power Systems, Inc. alternators range from 20 kWe through 2000 kWe.



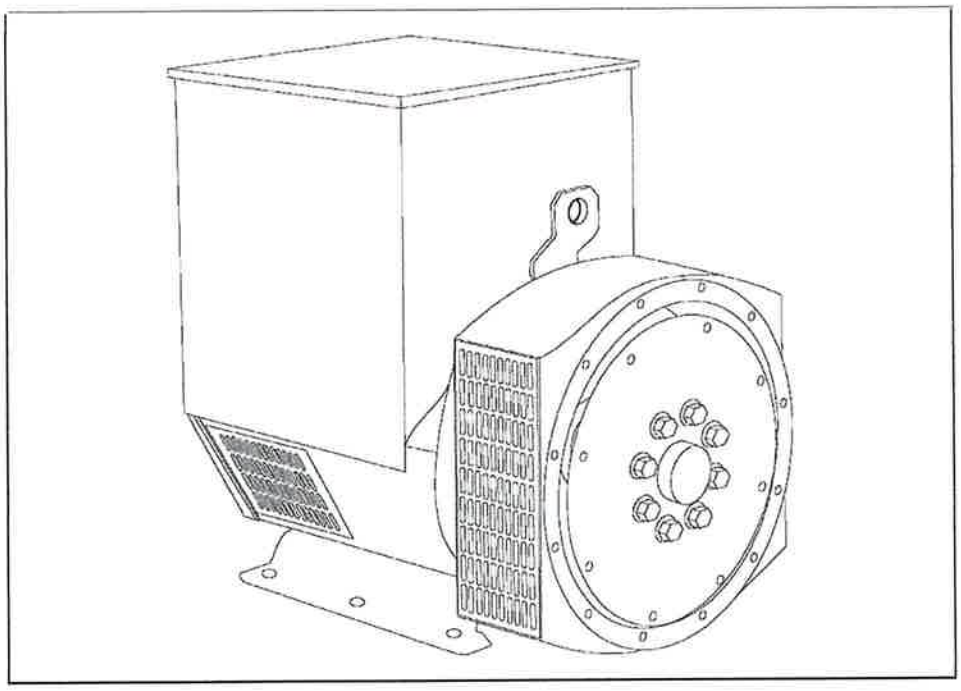
Standard Features

- **Enhanced Ventilation**
  Created by a high-efficiency fan that optimizes internal airflow patterns, maximizes heat transfer, and minimizes hot spot differentials for extended winding life.
- **Fully Guarded**
  For operator safety and alternator protection. No rotating or electrically energized parts are exposed. All openings are covered by louvers or screens.
- **Large Conduit Box**
  Provides ample space for easy connections and allows load line access from all sides, top, or bottom.
- **Design Specs and Agency Approvals**
  All Blue Star Power Systems, Inc. alternators are UL and CSA Listed (unless specified otherwise) and meet NEMA MG1-32, BS5000, CSA C22.2, IEC 34 and VDE 0530 requirements.
- **Class H Insulation System**
  Utilizes an unsaturated polyester varnish for optimal insulation life and superior moisture protection.
- **Optimized Windings**
  Provide low reactances and exceptional motor starting capability. The stator windings utilize a 2/3 pitch to minimize harmonic distortion and facilitate parallel operation.
- **Permanent Magnet Generator (optional)**
  Ensures 300% short circuit current during fault conditions and provides the regulator with input power isolated from load distortion.
- **Heavy-Duty Bearing**
  Resists contamination and gives a life expectancy up to 40,000 hours.
- **Automatic Voltage Regulator**
  Provides accurate 1% regulation, under-speed protection, stability adjustment to optimize transient performance, and EMI filtering to commercial standards. Fully encapsulated for rugged durability in virtually any environment.

STAMFORD®

UCI274E - Winding 311

Technical Data Sheet



SPECIFICATIONS & OPTIONS

STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.
Other standards and certifications can be considered on request.

VOLTAGE REGULATORS

SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th ...) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

DE RATES

All values tabulated on page 8 are subject to the following reductions

5% when air inlet filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5°C by which the operational ambient temperature exceeds 40°C.
Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.

Front cover drawing typical of product range.

UCI274E

STAMFORD

WINDING 311

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)		

CONTROL SYSTEM	SELF EXCITED		
A.V.R.	SX460	AS440	
VOLTAGE REGULATION	± 1.0 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT		

INSULATION SYSTEM	CLASS H							
PROTECTION	IP23							
RATED POWER FACTOR	0.8							
STATOR WINDING	DOUBLE LAYER CONCENTRIC							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	12							
STATOR WDG. RESISTANCE	0.0317 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED							
ROTOR WDG. RESISTANCE	1.34 Ohms at 22°C							
EXCITER STATOR RESISTANCE	20 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.091 Ohms PER PHASE AT 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING DRIVE END	BALL. 6315-2RS (ISO)							
BEARING NON-DRIVE END	BALL. 6310-2RS (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	492 kg				511 kg			
WEIGHT WOUND STATOR	180 kg				180 kg			
WEIGHT WOUND ROTOR	167.51 kg				156.55 kg			
WR² INERTIA	1.3271 kgm²				1.2765 kgm²			
SHIPPING WEIGHTS in a crate	525 kg				539 kg			
PACKING CRATE SIZE	123 x 67 x 103(cm)				123 x 67 x 103(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.514 m³/sec 1090 cfm				0.617 m³/sec 1308 cfm			
VOLTAGE SERIES STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA BASE RATING FOR REACTANCE VALUES	140	140	140	N/A	160	167.5	167.5	178.8
Xd DIR. AXIS SYNCHRONOUS	2.34	2.11	1.96	-	2.68	2.51	2.29	2.25
X'd DIR. AXIS TRANSIENT	0.21	0.19	0.18	-	0.25	0.23	0.21	0.21
X"d DIR. AXIS SUBTRANSIENT	0.14	0.13	0.12	-	0.17	0.16	0.15	0.14
Xq QUAD. AXIS REACTANCE	1.53	1.38	1.28	-	1.74	1.63	1.49	1.46
X"q QUAD. AXIS SUBTRANSIENT	0.18	0.16	0.15	-	0.22	0.21	0.19	0.18
X_L LEAKAGE REACTANCE	0.08	0.08	0.07	-	0.09	0.08	0.08	0.08
X_2 NEGATIVE SEQUENCE	0.16	0.14	0.13	-	0.19	0.18	0.16	0.16
X_0 ZERO SEQUENCE	0.10	0.09	0.08	-	0.11	0.10	0.09	0.09
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.032 s							
T"d SUB-TRANSTIME CONST.	0.01 s							
T'do O.C. FIELD TIME CONST.	0.85 s							
Ta ARMATURE TIME CONST.	0.007 s							
SHORT CIRCUIT RATIO	1/Xd							

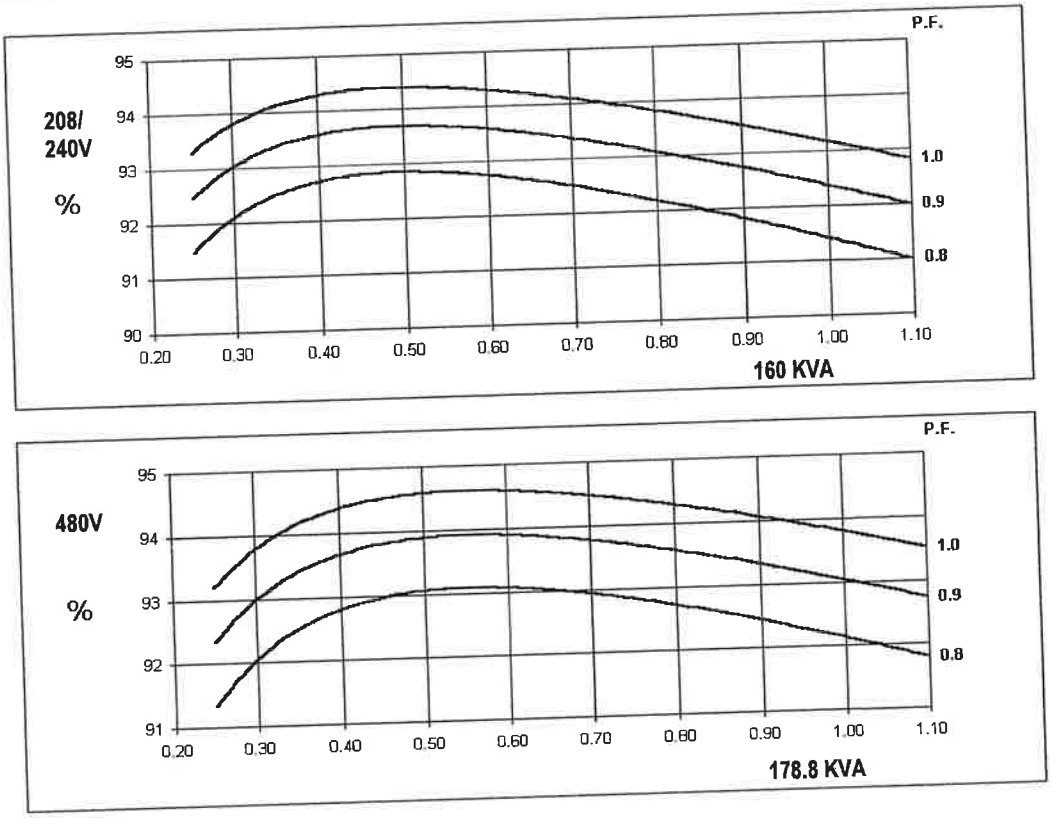
60 Hz

UCI274E

Winding 311

STAMFORD

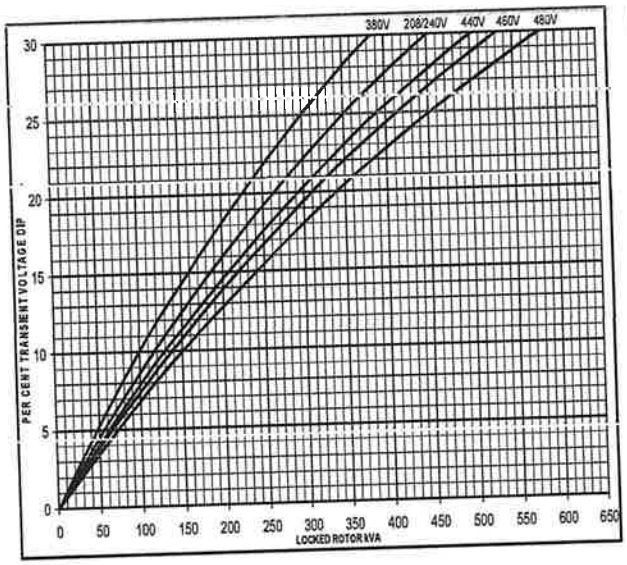
THREE PHASE EFFICIENCY CURVES



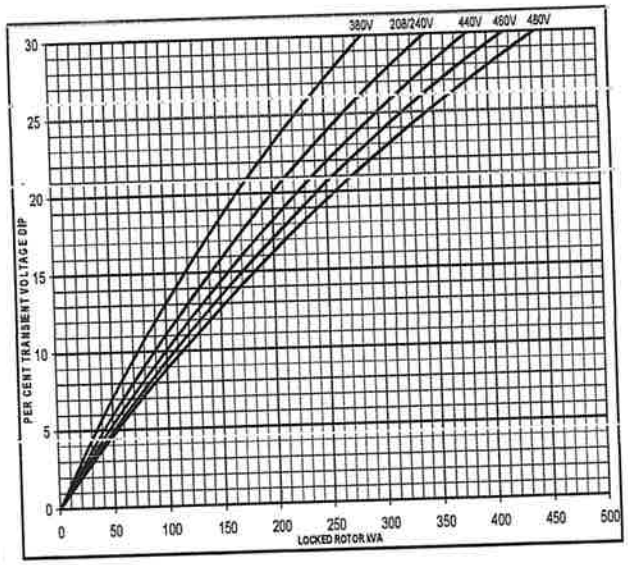
Locked Rotor Motor Starting Curve

60 Hz

MX

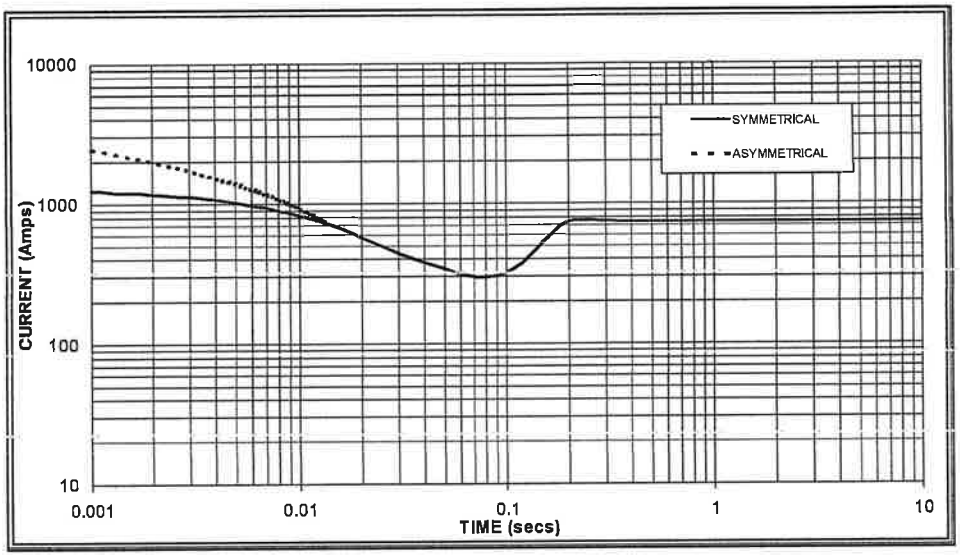


SX



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

60 Hz



Sustained Short Circuit = 740 Amps

Note 1

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

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	X 1.00	416v	X 1.00
400v	X 1.07	440v	X 1.06
415v	X 1.12	460v	X 1.12
		480v	X 1.17

The sustained current value is constant irrespective of voltage level

Note 2

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

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

All other times are unchanged

Note 3

Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

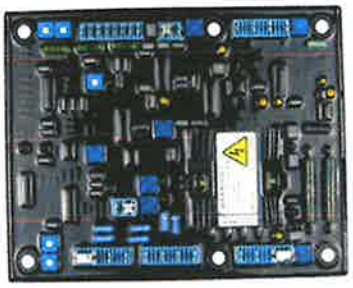
RATINGS

	Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Series Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	140.0	143.8	143.8	160.0	160.0	167.5	167.5	178.8	170.0	175.0	175.0	187.5	175.0	181.3	181.3	193.8
	kW	112.0	115.0	115.0	128.0	128.0	134.0	134.0	143.0	136.0	140.0	140.0	150.0	140.0	145.0	145.0	155.0
	Efficiency (%)	91.9	92.2	92.5	92.5	91.4	91.7	92.1	92.1	91.2	91.5	91.9	92.0	91.0	91.4	91.8	91.9
	kW Input	121.9	124.8	124.4	138.4	140.0	146.1	145.5	155.3	149.1	153.0	152.3	163.0	153.8	158.7	158.0	168.7

MX321 Voltage Regulator

BLUE STAR
Power Systems Inc.

MX321 is a three phase sensed Automatic Voltage Regulator and forms part of the excitation system for a brush-less generator. Excitation power is derived from a three-phase permanent magnet generator (PMG), to isolate the AVR control circuits from the effects of nonlinear loads and to reduce radio frequency interference on the generator terminals. Sustained generator short circuit current is another feature of the PMG system.



Voltage Adjustment
The screwdriver adjustable potentiometer adjusts the generator output voltage. Adjustment clockwise increases the generator output voltage.

When using a remote voltage adjust rheostat, remove the jumper wire across terminals 1 and 2 and install a 1k ohm 1 watt rheostat. This will give ±10% voltage variation from the nominal.

Stability Adjustment
The AVR includes a stability or damping circuit to provide good steady state and transient performance of the generator.

A jumper link selector is provided to optimize the response of the stability circuit to various size generators. The link should be positioned as shown in the diagram according to the kW rating of the generator.

The correct setting of the Stability adjustment can be found by running the generator at no load and slowly turning the stability control anti-clockwise until the generator voltage starts to become unstable.

The optimum or critically damped position is slightly clockwise from this point (i.e. where the machine volts are stable but close to the unstable region).

Under Frequency Roll Off (UFRO) Adjustment
The AVR incorporates an underspeed protection circuit which gives a volts/Hz characteristic when the generator speed falls below a presettable threshold known as the "knee" point.

The red Light Emitting Diode (LED) gives indication that the UFRO circuit is operating.

The UFRO adjustment is preset and sealed and only requires the selection of 50 or 60Hz and 4 pole or 6 pole, using the jumper link as shown in the diagram.

For optimum setting, the LED should illuminate as the frequency falls just below nominal, i.e. 47Hz on a 50Hz system or 57Hz on a 60Hz system.

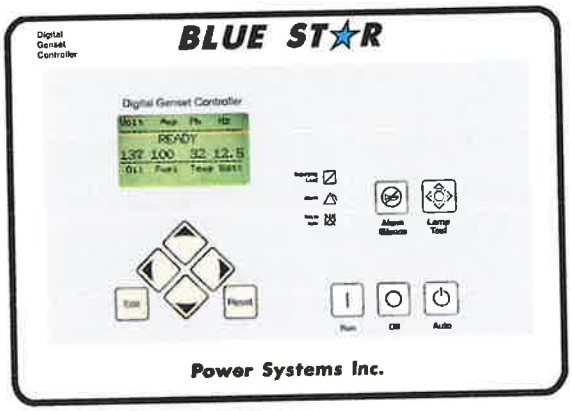
Specifications

Sensing Input	
Voltage	190 to 264VAC max, 1 or 3 phase
Frequency	50 to 60 Hz Nominal
Power Input (PMG)	
Voltage	170 to 220VAC, 3 phase
Current	3A
Frequency	100 to120 Hz Nominal
Output	
Voltage	max 120VDC
Current	Continuous 3.7A Intermittent 6A for 10 secs
Resistance	15 ohms Minimum
Regulation +/- 0.5% RMS	
Thermal Drift 0.02% per 1°C change in AVR ambient	
Soft Start Ramp Time 0.4 - 4 seconds	
Typical System Response	
AVR Response	10 ms
Field Current to 90%	80 ms
Machine Volts to 97%	300 ms
External Voltage Adjustment +/-10% with 1k ohm 1 watt trimmer	
Under Frequency Protection	
Set Point	95% Hz
Slope	100 to 300% down to 30 Hz
Max. Dwell	20% volts/S Recovery
Unit Power Dissipation 18 watts Maximum	
Analog Input	
Maximum Input	+/- 5VDC
Sensitivity	1V for 5% Generator Volts (Adjustable)
Input Resistance	1k ohm
Quadrature Droop Input 10 ohms Burden	
Max. Sensitivity	0.22A for 5% Droop 0PF
Max. Input:	0.33A
Current Limit Input 10 ohms burden	
Sensitivity Range	0.5 to 1A
Over Voltage Detection Input 10 ohms Burden	
Set Point	300V Time Delay: 1 sec (Fixed)
CB Trip Coil Volts	10 to 30VDC
CB Trip Coil Resistance	20 to 60 ohms
Time Delay	1 second (Fixed)
Over Excitation Protection	
Set Point	75VDC
Time Delay	8 to 15 seconds (Fixed)

DGC-2020 Control Panel

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. Digital Generator Set Control Panel (DGC-2020) is a highly advanced integrated generator set control system. The DGC-2020 is perfectly focused, combining rugged construction and microprocessor technology to offer a product that will hold up to almost any environment and flexible enough to meet your application's needs. This device provides generator set control, transfer switch control, metering, protection and programmable logic in a simple, easy to use, reliable, rugged, and cost effective package.



Highlights

- UL Recognized, CSA & CE approved
- Microprocessor based
- Complete system metering
- Remote communication options
- Rugged encapsulated construction

Standard Features

- Generator Metering
- Engine Metering
- Generator Set Control
- Engine Protection:
  - Oil Pressure
  - Engine Temperature
  - Overspeed
  - Overcrank
- BESTCOMS Plus:
  - Programming and Setup Software
  - Intuitive and Powerful
  - Remote Control and Monitoring
  - Programmable Logic
  - USB Communications
- SAE J1939 Engine ECU Communications (Where Applicable)
- Extremely Rugged, Fully Encapsulated Design
- 16 Programmable Inputs
- 7 Contact Outputs: (3) 30ADC and (4) Programmable 2ADC Rated Contacts
- Wide Ambient Temperature Range
- UL Recognized, CSA Certified, CE Approved
- HALT (Highly Accelerated Life Test) Tested
- IP54 Front Panel Rating with Integrated Gasket
- NFPA110 Level One Compliant
- Real Time Clock with Battery Backup and Event Log
- Emergency Stop Pushbutton
- Current Sensing: 5A CT inputs
- Generator Frequency: 50/60 Hz
- LCD Display Heater to -40°F
- Event Recording (up to 99 occurrences)

Standard Gen-Set Monitoring

- Generator parameters: voltage, current, frequency, real power (Watts), apparent power (VA), and power factor
- Engine parameters: oil pressure, coolant temperature, RPM, battery voltage, fuel level, engine runtime, and various J1939 supported parameters where applicable

Standard Engine Control Functions

Cranking Control

- Cyclic or Continuous (Fully Programmable)

Successful Start Counter

- Counts and Records Successful Engine Starts

Timers

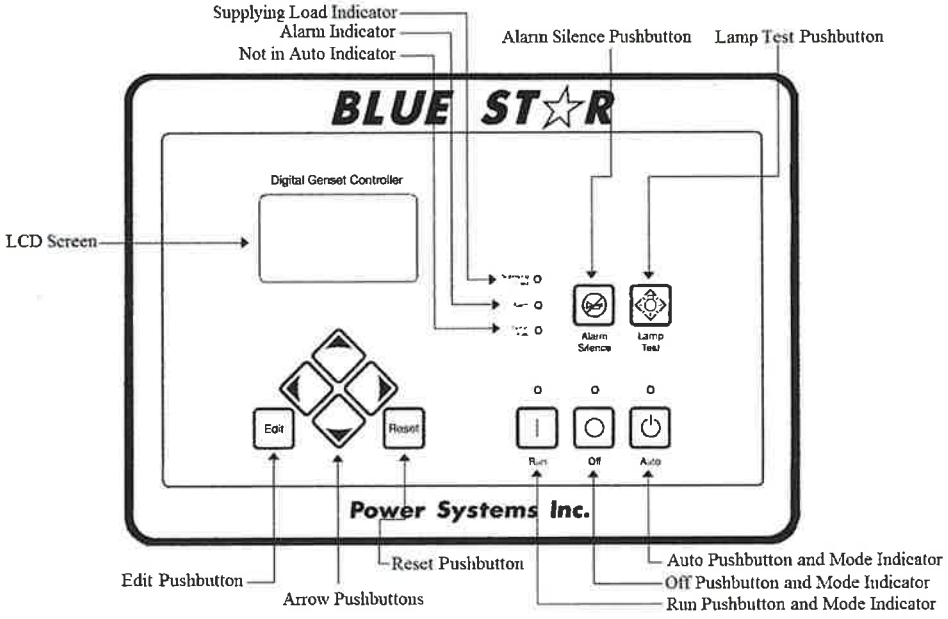
- Engine Cooldown Timer (Specify)
- Engine Maintenance Interval Timer (Specify)
- Pre-Alarm Time Delays for Weak/Low Battery Voltage
- Alarm Time Delay for Overspeed
- Alarm Time Delay for Sender Failure
- Arming Time Delays After Crank Disconnect:
  - Low Oil Pressure
  - High Coolant Temperature
  - Pre-Crank Delay
- Continuous/Cyclic Cranking Timing Sequence

DGC-2020 Control Panel

BLUE STAR Power Systems Inc.

Front Panel LED Indicators:

- Run: Green – Indicates controller is in the RUN mode
- Off: Red – Indicates controller is in the OFF mode
- Auto: Green – Indicates unit is in the AUTO mode
- Not in Auto: Red – Indicates DGC-2020 is not in AUTO mode
- Supplying Load: Green – Indicates system is supplying current to a connected load
- Alarm: Red – Indicates an alarm situation by continuous illumination
  A pre-alarm will flash



Standard Engine Protection Functions

Pre-Alarms (Warnings)

- Low Oil Pressure
- High Coolant Temperature
- Low Coolant Temperature
- Battery Overcharge (High Voltage)
- Weak Battery (Low Voltage)
- Battery Charger Failure
- Engine Sender Unit Failure
- Engine kWe Overload
- Maintenance Interval Timer
- Low Fuel Level
- Fuel Leak Detect

Alarms (Shutdowns)

- Low Oil Pressure
- High Coolant Temperature
- Overspeed
- Overcrank
- Fuel Sender Failure

– All alarms and pre-alarms can be configured via the BESTCOMSPlus PC software or the front panel.

Optional Features

- Generator Protection
  27(2), 32, 40Q, 51(2), 59(2), 81O, 81U
- Enhanced Generator Protection - 51 and 47
- Selection of Integrating Reset or Instantaneous Reset Characteristics for Overcurrent Protection
- Remote Communication to RDP-110 / NFPA-110 Compliant Remote Annunciator
- Additional (8) Programmable 2ADC Contacts
- Remote Dial-out and Dial-in Capability with Modem
- Modbus Communications with RS-485
- Expandable I/O Capability via J1939 CANBUS
- Automatic Transfer Switch Control
- Remote Emergency Stop
- Multilingual Capability
- High Fuel Level Pre-Alarm
- Critical Low Fuel Level Alarm
- Analog Meters

Generator Protection

- Undervoltage (27)
- Overvoltage (59)
- Underfrequency (81U)
- Overfrequency (81O)
- Overcurrent (51)
- Phase Imbalance (57)
- Reverse Power (32)
- Loss of Excitation (400)
- Phase Imbalance (47)
- Generator Overcurrent (51)

All generator protection features are programmable as alarms or pre-alarms.

DGC-2020 Control Panel

BLUE STAR Power Systems Inc.

Contact Outputs

For those applications where more output contacts are needed, the DGC-2020 can be adapted to include 8 additional 2ADC rated dry contact outputs. These are real contacts and not the solid-state type that require additional external circuitry to properly operate. These contacts are fully programmable via the easy-to-use BESTCOMSPlus PC software and can be assigned to numerous user-defined functions.

DC Voltage Panel Mounted Modem

The DGC-2020 can provide long distance communication by adding a modem. When a modem is used, the user can access the DGC-2020 from virtually anywhere via a dedicated telephone line. The user can monitor and control the gen-set as if standing right in front of it. The DGC-2020 can also dial out for pre-programmed circumstances to alert the user of selected situations.

RS-485 Communication

When the RS-485 option is selected, the user can send and receive information from the DGC-2020 via the RS-485 communications port and Modbus protocol. This feature allows the DGC-2020 to be fully integrated into the building management system. Please see the instruction manual for the Modbus register list.

Enhanced Generator Protection

In addition to the standard generator protection (27, 59, 81O, 81U) the DGC-2020 can be equipped with a more sophisticated generator protection system. This option provides an overcurrent element (51) with 17 selectable time current characteristic curves and a voltage phase balance protection function.

Transfer Switch Control (Mains Failure)

The DGC-2020 monitors utility (mains) and determines if it is providing power that is suitable for the loads. If the utility supply goes outside of predetermined levels, the generator is started and the utility is disconnected from the load and the generator is connected. When the utility returns to acceptable levels for a sufficient time, the generator is disconnected and the utility is reconnected to the load. It also includes appropriate adjustable timers or time delays for establishing stable utility operation.

Contact Expansion Module (CEM)

The CEM add-on module increases the contact input and contact output capability adding 10 contact inputs and 24 form C contact outputs. This module communicates to the DGC-2020 via SAE J1939 CANBUS and allows the user to program the functionality of these inputs and outputs in the BESTCOMS programmable logic program. The user can add labels for the inputs and outputs that appear on BESTCOMS front panel, and in the programmable logic. All the functionality can be assigned to these inputs and outputs as if they were an integrated part of the DGC-2020. The CEM-2020 module has all of the environmental ratings, like the DGC-2020, including a model for UL Class1 Div2 applications (consult price list for part number). The output ratings of the form C contacts are: (12 contacts) 10A @ 30VDC and (12 contacts) 2A @ 30VDC. The 2A rated contacts are gold flash contacts for low current circuits. The CEM-2020 terminals accept a maximum wire size of 12 AWG while the chassis ground requires 12 AWG wire. The CEM-2020 provides the user with the flexibility to use the same model DGC-2020 gen-set controller for simple applications or more complicated applications that require contact functionality or duplication of contacts for remote annunciation. Flexibility is one of the benefits of the DGC-2020, and this add-on module enhances that benefit even further.

ModBus TCP/RTU (NetBiter RTU-TCP Gateway)

NetBiter® RTU-TCP Gateway connects the fully enhanced DGC-2020 with Ethernet and mobile networks. The gateway acts as a transparent bridge translating DGC-2020 Modbus registers allowing control systems, such as PLCs, SCADA, etc. to communicate over Ethernet. One gateway is required per generator allowing multiple generator sets to be accessed and monitored simultaneously. Note: This option does not interface with BESTCOMSPlus software. Features include: connectivity between serial Modbus devices and the Modbus TCP; RS-232, RS-485 and RS-422 connectivity; Ethernet and mobile network connectivity; 10/100 Mbit/s Ethernet; web-based configuration; DIN rail mounting; and network and serial status indicators.

Load Share Module 2020 (LSM-2020)

The LSM is an easy to connect and use add-on module for the DGC-2020 to allow the DGC-2020 to control the kW load sharing of multiple generator sets. The LSM-2020 is remotely mounted and communicates to the DGC-2020 via J1939 CANbus communications.

Paint & Powder Coat

BLUE STAR
Power Systems Inc.

Generator Set

Blue Star Power Systems, Inc. completely paints all of its generator sets in our state-of-the-art downdraft paint booth. It begins with an extensive cleaning of the unit through sanding and a full wipe down using an alkaline-based cleaner. Once completely clean, the unit is then painted with Cardinal Industrial Semigloss paint. Electrostatic paint equipment ensures correct and even coverage. The unit then receives a complete covering of Cardinal Industrial Clear Coat in a hammer texture to provide extra protection and a durable long-lasting easy-to-clean finish.

Performance Characteristics

- 3.0+ Mils TDFT
- Xenon Arc 1100 hours - Excellent Weatherability
- 1000 Hour Salt Spray - Over Primer - Passed (3.0 Mils Total TDFT)
- Adhesion, Crosshatch - 5B
- Gloss 90+ @ 60°

Generator Set Enclosure

Blue Star Power Systems, Inc. provides Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coating as standard on all our enclosures. Long term exterior durability, high performance mechanical properties and high gloss are standard characteristics of Cardinal Powder Coating. Cardinal TGIC Polyester Coating exceeds UL 2200 & CSA requirements.

Performance Characteristics

- Cured Powder Properties 2.0+ Mils DFT
- PCI Powder Smoothness 1 Mil
- Pencil Hardness 2H+
- Flexibility 1/8 in Diameter - No Fracture
- Salt Spray ASTM-B117 1000 Hours - Pass
- Humidity ASTM-02247 1000 Hours - Pass
- Adhesion, Crosshatch - 5B
- Gloss 90+ @ 60°

Standard Colors

White | T012-WH260

Custom Colors

Custom Colors: Blue Star Power Systems, Inc. offers custom color options for your generator set enclosure. Cardinal is licensed by PANTONE® to accurately simulate both the PANTONE MATCHING SYSTEM® colors and the PANTONE® Textile Color System® with our powder and liquid coatings. Additional Charges apply.

Sub-Base Fuel Tanks

Blue Star Power Systems, Inc. provides either Diamond Vogel Nexgen Technology Paint or Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coat on all of our sub-base fuel tanks. Nexgen and Cardinal Industrial both offer excellent coverage and performance characteristics. Nexgen and Cardinal Industrial both exceed UL requirements.

Performance Characteristics

- 3.0+ Mils TDFT
- Xenon Arc 1100 Hours
- 500 Hour Salt Spray - Over Primer - Passed (3.0 Mils Total TDFT)
- Adhesion Crosshatch - 5B
- Gloss 90+ @ 60°

Standard Color

Enclosures

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. enclosures are specifically designed for optimal protection against the elements. They are designed to protect the entire system from even the most extreme environments, and to reduce sound levels to most specified requirements. Blue Star Power Systems, Inc's vast flexibility allows the design of standard enclosures to meet most specifications or requirements. All standard enclosure models are constructed of 14 gauge steel and feature a pitched roof for increased structural integrity and superior watershed. All enclosures feature a rugged UL listed hammer powder coat finish as standard for a long lasting and durable finish in standard white or gray. Custom colors are available as specified.

Enclosure Design Features

- UL 2200 & CSA Listed as standard
- All enclosure models are 200 MPH wind rating certified in accordance with IBC2018 and ASCE/SEI 7-16 standards.
- Lockable gasketed doors with draw down latches and Stainless Steel component hinges
- All Stainless Steel fasteners
- UL & CSA listed extreme-wear hammer powder coat finish
- Pitched roof for high structural integrity and superior watershed
- Above-door drip guards
- Optimal airflow means no cooling system de-rates on most models
- Internally mounted exhaust silencers standard up to 600 kWe
- Sound attenuation options
- Stainless Steel and Aluminum enclosure options

Level 1

Weather Proof Enclosure

Blue Star Power Systems, Inc. Level 1 enclosures have the rugged construction and weather proof protection required for most outdoor environments. These enclosures will effectively protect the gen-set through high wind (200 MPH), rain, snow, and other extreme weather conditions. Weather proof enclosures feature standard hinged lockable doors, a pitched roof to prevent water accumulation and improved structural integrity. The enclosure is painted with extreme-wear UL and CSA listed hammer powder coat finish.

Level 2

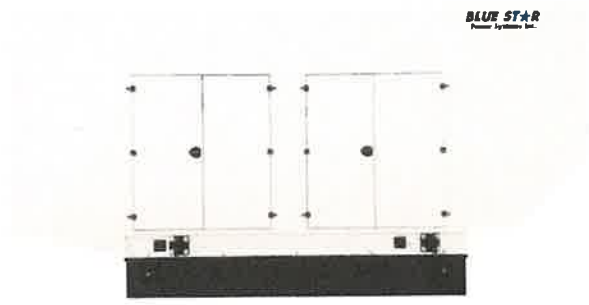
Weather Proof Enclosure with Foam

Blue Star Power Systems, Inc. Level 2 enclosures include all of the same great features of the Level 1 enclosures, and include even more. With the addition of high performance 1.5" Type D Sound Attenuating Foam, our Level 2 Enclosures offer an even lower dBA rating with the same great weather proof protection.

Level 3

Sound Attenuated Enclosure

Blue Star Power Systems, Inc. Level 3 enclosures feature the same great weather proof protection and standard features as the Level 1 & 2 enclosure models, but with a greater emphasis on reducing sound levels. Standard Level 3 features include the same high performance 1.5" type D sound attenuating foam, and also feature the addition of a separate frontal exhaust sound chamber and dual rear air intake to ensure that your system runs exceptionally quiet. These features make this enclosure among the best in the industry for noise reduction and quality.



Sound Attenuation Foam

BLUE STAR Power Systems Inc.

Polydamp® Type D Acoustical Foam, (PAF) is an acoustical grade, open cell, flexible ether based urethane foam designed to give maximum sound absorption for a given thickness. It has excellent resistance to heat, moisture and chemicals. All applications use 1.5" foam as standard.

Foam Characteristics

Sound Absorption: Nominal values of random incidence sound absorption coefficient per ASTM C384-77 for Plain/Tuffylm

Foam Thickness	125	250	500	1000	2000	4000
(1.5 in) 38.1 mm	15/20	27/49	60/96	77/93	90/82	98/67
(2.0 in) 50.8 mm	20/30	40/66	90/98	100/96	96/85	100/75

	Test Standard	U.S. Standard
Density, Nominal: (lb/ft3-kg/m3)	ASTM-D-3574-91	1.85
Tensile Strength: (PSI-KPa)	ASTM-D-3574-91	12
Elongation, %	ASTM-D-3574-91	120
Tear Resistance: (lb/in - N/M)	ASTM-D-3574-91	1.3
IFD: (PSI - KN/M2)	ASTM-D-3574-91	30
Compression Set (50%): %	ASTM-D-3574-91	10
Air Permeability (Tested at 1" thickness): (Rayles/M)	ASTM C-522	
Thermal Conductivity		
(BTU/hr. ft2, °F/in.)	ASTM C-177	0.25

Service Temperature

Continuous	-45°F (-43°C) TO 212°F (100°C)
Intermittent	250°F (121°C)

Flame Resistance

UL94	HF-1
FAR.853(B)	PASS
SAEJ-369(B)	PASS
MVSS-302	PASS
DIN	PASS

Humidity Resistance

Excellent; no significant decrease in tensile strength or elongation after 5 hrs. of steam autoclave at 250°F (121°C) per ASTM D3574-86, Test J.

Chemical Resistance

Excellent - no significant change in strength after 4 weeks immersion in common solvents, alkalies, acids, and water.

Estimated Service Life:

Min. 10 years at 80F (27°C) and 95% R.H.

Adhesive Characteristics

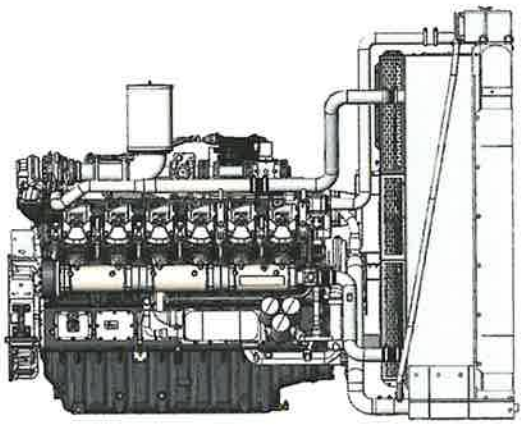
P4 is a high performance unsupported acrylic pressure sensitive adhesive exhibiting aggressive tack, high peel and shear, and good heat resistance. In addition, it has good chemical and plasticizer resistance as well as excellent long term aging and the ability to withstand environmental extremes.

Adhesive Thickness (Nominal)	0.004"
Color of Adhesive	Water Clear
Release Liner	76 lb Polycoated bleached kraft paper
Service Temperature	-40°F +200°F

Radiators

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. radiators offer a variety of styles and configurations including radiator and charged air assemblies, radiator and aftercooler assemblies with durable core construction. Our radiators are compact and efficient meeting the most stringent enclosure footprint requirements. All radiators are sized for 50°C (122°F) ambient. The single-source design ensures a perfect match with your generator set package.



Radiator Features

Standard Radiator Package

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Complete cooling package with mounting foot and plumbing kit
- All steel construction of top and bottom tanks
- Dual Core designs -
  - Jacket Water / Charged Air Circuit
  - Jacket Water / After Cooler Circuit
- Individual radiators designed to meet manufacturer's specific requirements
- Top tank has built in expansion capacity - no need for an external recover tank
- Full or partial deration system built into the top tank
- Standard cooling package includes fan shroud & fan guard
- Corrosion preventive options:
  - Hot dipped galvanizing on all steel parts or stainless steel
  - Epoxy coated cores

Fan-On Radiator Design

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Rigid built construction for fan support
- High speed bearings within pillow blocks
- Dual Core designs with variable jacket water / after cooler circuit designs
- All steel construction of top and bottom tanks
- Individual radiators designed to meet manufacturer's specific requirements

Circuit Breakers

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. MC (Molded Case) Series Circuit Breakers are the highest quality in the industry. They will protect the power system and corresponding equipment from damaging fault currents circuits and overloads.

80% Rated Circuit Breakers

80% rated breakers can only be applied continuously at 80% of the rated breaker. Tripping of the circuit breaker if the current goes above 80% will depend on the amount of current and the duration.

100% Rated Circuit Breakers

100% rated breakers can be applied at 100% of their current rating continuously.

Accessories

Shunt Trip - Provides a means of tripping the circuit breaker from a remote source by energizing a solenoid in the breaker. This can be achieved through the panel faults such as engine shutdowns, overcurrent, etc. The circuit breaker will have to be reset locally in the event of a tripped breaker.

Bell Alarm / Alarm Switch - Provides remote indication of whether the circuit breaker is in a tripped position. The bell alarm will remain unchanged during on-off operations and during operation by the Push-to-Trip button on the circuit breaker.

Auxiliary Switch/Contacts - Provides remote indication of whether the circuit breaker is in an open or closed state.

Ground Fault Indication/Alarm - Adjustable relay that indicates a ground fault condition with adjustable time delay.

Trip Unit

LI Breakers - Includes adjustable Long-Time pickup and delay and adjustable Instantaneous pickup.
LSI Breakers - Includes features of LI Breakers with addition of Short-Time pickup and delay.

Breaker Model	Amperage	Percentage Rated	Maximum Voltage Rating (AC)	UL Listed Interrupting Rating (kA)			Lug Qty. and Size (Cu & Al)
				240	480	600	
H-Frame	15-150	80% or 100%	600	25	18	14	(1) #14-3/0
Q-Frame	70-250	80%	240	10	-	-	(1) #4-300 kcmil
J-Frame	150-175	80% or 100%	600	25	18	14	(1) #4-4/0
	200-250						(1) 3/0-350 kcmil
L-Frame	125-400	80% or 100%	600	65	35	18	(2) 2/0-500 kcmil
	200-600	80%	600				
M-Frame	300-800	80%	600	65	35	18	(3) 3/0-500 kcmil

Breaker Model	Frame Size	Percentage Rated	Maximum Voltage Rating (AC)	UL Listed Interrupting Rating (kA)			Lug Qty. and Size (Cu & Al)
				240	480	600	
P-Frame	600	80% or 100%	600	65	35	18	(3) 3/0-500 kcmil
	800						
	1000						(4) 3/0-500 kcmil
	1200						
	1600						(12) 3/0-750 kcmil
R-Frame (LSI Standard)	2000	100%	600	65	35	18	(15) 3/0-750 kcmil
	2500						(18) 3/0-750 kcmil
	3000						(21) 3/0-750 kcmil

TPS Series Block Heaters

BLUE STAR Power Systems Inc.

The TPS engine block heater is designed to preheat diesel and gaseous engines. It is simple to install, lightweight, and heats engines up to 12L displacement. Thermosiphon circulation of the coolant delivers even heat throughout the entire engine block.

Features

- cULus Listed
- CE Compliant
- Various temperature settings available, including an optional adjustable thermostat 90° - 130°F (32° - 54°C)
- Can be supplied with UL marked 120 or 240V NEMA plug

Specifications

Part Number	Volts	Watts	Amps	Male Plug	Outlet Size (Inches)
13224	120	500	4.2	Yes	5/8
14209	240	500	2.1	Yes	5/8
10014	120	1000	8.4	Yes	5/8
10015	240	1000	4.2	Yes	5/8
10016	120	1500	12.5	Yes	5/8
10017	240	1500	6.3	Yes	5/8
10018	120	1800	15	Yes	5/8
10019	240	2000	8.3	Yes	5/8

Single Stage Air Cleaner

BLUE STAR
Power Systems Inc.

Single Stage Air Cleaners are tough, non-metallic, lightweight, self-supporting and completely disposable. They are also easy to install, durable, and reliable. They are designed to function well under high and severe pulsation conditions found in many applications. Vibration-resistant media is potted into molded housings of rugged ABS plastic – so they don't fall apart as other designs might. They can be mounted vertically or horizontally.

Specifications

- No serviceable parts - Air cleaner housing and filter are one unit
- Designed to withstand severe intake pulsation
- Economical replacement cost
- Self-supporting, sturdy
- Very reliable: only one critical seal
- Lightweight and compact in size
- Non-metallic, non-corrosive
- Completely disposable - acceptable for normal trash pick-up (should not be incinerated)
- Easily installed and maintained
- Minimal removal clearance needed: only 1.5"
- Three airflow styles available to fit virtually any engine intake configuration
- Various media available for specific generator set applications: high pulsation, high humidity, etc.
- Temperature tolerance: 180°F/83°C continuous 220°F/105°C intermittent

CPJ Series Critical Grade Silencers

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. "CPJ" Series is the accumulation of research and development offering a compact silencer without compromising performance. It incorporates a unique combination of resonator chambers, acoustically packed internal components and diffusers to achieve a stunning level of performance for its size. All CPJ series silencers are critical grade silencers and are packed with insulation to greatly reduce radiated noise and exterior shell temperature.

Standard Construction Features

- Available in sizes from 2 inch to 12 inch
- Multitude of inlet/outlet design styles to meet almost any requirement
- Packed with fiberglass insulation to reduce shell temperature and noise levels
- Fully welded double shell carbon steel weldment construction, corrosive resistant
- High density fiberglass acoustic blanket good to 1500°F, wrapped with 304 Stainless Steel wire mesh cloth and encased in a carbon steel perforated facing
- Black phenolic resin based finish paint

Optional Construction Features and Accessories

- Stainless Steel construction
- Aluminum construction
- Aluminized Steel construction
- Vertical mounting legs
- Round mounting bands
- Horizontal mounting saddles
- Horizontal and vertical shell lugs
- Special finish per specification
- Air leak test
- ASME code construction
- Oversized flanges
- Acoustic shell lagging
- High temperature acoustic pack material
- Contact factory for additional features to meet your requirements

Model #	Part #	Outlet Size	Flanged Connection	WT (lbs)
CPJS-02	10660	2.0" OD	No	12
CPJS-25	10661	2.5" OD	No	18
CPJS-03	10662	3.0" OD	No	20
CPJS-35	10663	3.5" OD	No	30
CPJS-04	10664	4.0" OD	No	31
CPJS-05	10665	5.0" OD	No	50
CPJS-06	10666	6.0" OD	Yes	50
CPJS-08	10667	8.0" OD	Yes	120
CPJS-10	10668	10.0" OD	Yes	180

Industrial Batteries

BLUE STAR Power Systems Inc.

Engine Starting Batteries

Blistering heat and bitter cold are ruthless battery killers. That's why Blue Star Power Systems, Inc. utilizes a pioneered climatized battery. Designed to offer you long-life and high-performance starting power that will get your gen-set running even under extreme conditions. Blue Star Power Systems, Inc. "all-climate" batteries stand up to the harshest temperatures and are available in sizes and configurations to fit almost any application.

Standard Features

- Unique Manifold Vent - Virtually eliminates corrosion by venting gases away from terminals and cables
- Exclusive TRP™ Construction – Rib reinforced TRP™ container significantly improves the vibration and impact resistance
- Armored Plate Cell Bonding - Vibration is the number one killer of commercial batteries. To solve this problem, the cells of every battery are bonded
- Polyethylene Enveloped Separator Design – Super tough polyethylene material reduces electrical resistance and provides higher cranking performance
- Center Lug Design - Suppresses the vibration inherent in traditional construction for improved performance (where applicable)
- TTP™ - Through-the-Partition inter-cell connectors create a shorter current path to deliver more power to the terminals
- Heavy Duty Cases - Reinforced polyethylene or hard rubber cases stand up to the demands of standby gen-sets
- Convenient Lifting Slots - a handle is built in the top of the battery for easy carrying and transportation
- Protective Bottom Design - Waffled bottom design provides protection against nuts, bolts, or stones that might become lodged under the battery
- Computer Designed Radical Grids - An improved state-of-the-art design which adds power and resists vibration
- Threaded Accessory Ports - Features a sealed "O" ring that does not work loose during severe service (78DT only)

Specifications

	NEMA Type			Dimensions (Inches)			
BCI Group Size	Part Number	CCA at 0°F	CCA at 32°F	Length	Width	Height	Weight (lbs.)
78DT	78DT-HD	800	960	10-11/16	7-1/16	8-1/8	54
4D	4D-HD	1000	1200	19-9/16	8-5/16	10	95
8D	8D-HD	1300	1560	20-3/4	11	10	117

BC1206A Series Battery Chargers

BLUE STAR Power Systems Inc.

The BC1206A charger is built to stand up to the punishing power generation environment. It is engineered to exacting performance specifications, including cULus listing for an extra margin of safety.

Features

- Automatic 12V 6A, 2-Stage charge rate
- UL 1236 listed
- Watertight, shock proof and corrosion proof
- LED status indicators
- Reverse polarity protected
- Short circuit protected
- EMI/RFI Shielded

Specifications

Specifications

Output Voltage:	12VDC

Input Rating

Input Voltage Range:	100 - 130VAC
Input Current Rating:	1.6A maximum

Float - Maintenance Stage

Float Voltage:	13.3VDC
Float Current:	0.1 A
LED Status:	Green LED On

Full Load - Bulk Stage

Full Load Voltage:	12.0 - 14.1VDC
Full Load Current:	0.2 - 6.0A
LED Status:	Red LED On

Reverse Polarity Protection

Available as Standard:	Yes

Short Circuit / Overload Protection

Maximum Short Circuit Current:	8A (typical)
Current Limit:	7A (+/- 10%)

Operating Temperature Range

Minimum Temperature:	-20° C
Maximum Temperature:	50° C

Agency Certification

This product is listed under UL 1236 for battery chargers.

Warranty

Warranty Period:	1 Year

Weight

3.5 Pounds

Sub-Base Fuel Tanks

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. sub-base fuel tanks are listed and manufactured under UL 142 & ULC-S601 standards for steel above ground tanks, which guarantees that every fuel tank meets the structural and mechanical integrity requirements for mounting a generator set directly on top of the tank. This provides a convenient, efficient, and safe way to store fuel for your generator set.

Sub-Base Fuel Tank Standard Features

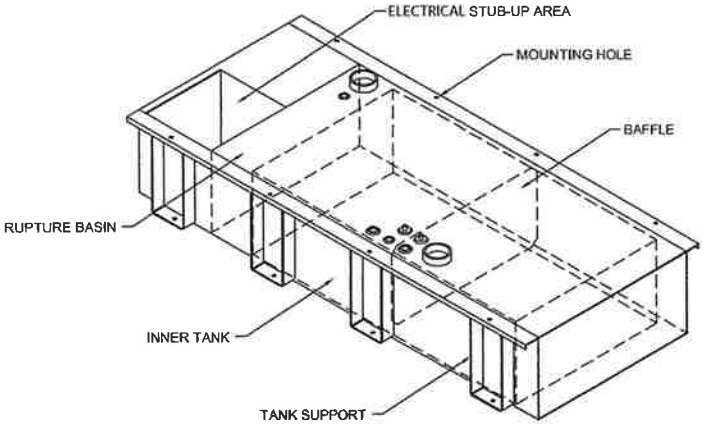
- Double walled secondary containment UL 142 & ULC-S601 Listed
- Electrical stub-up openings are standard to provide generator set wiring provisions through the base tank
- Heavy gauge steel construction
- Diamond Vogel Nexgen Technology Paint or Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coat
- Standard fittings: fuel supply with check valve (sized per unit), fuel return (sized per unit), 2" NPT for normal vent, 2" - 6" NPT for emergency vent (sized per unit), 2" NPT for manual fill, 1 1/2" NPT for fuel level gauge, and 3/8" NPT basin drain (plugged). Removable 1/2" supply dip tube standard (size may vary with gen-set model). 1 1/2" NPT for leak detection
- Interior tank baffle: Separates cold engine supply fuel from hot returning fuel
- Direct reading fuel level gauge
- Low fuel level and fuel leak alarms

Design Options

- High and critical low fuel level shutdowns or alarms
- Full pumping control systems for a true day tank system with a full array of electrical options
- Additional Tank Fittings
- Custom Fuel Tank Designs (sizes and shapes)
- Fuel Heater
- Fill / Spill Containment

Blue Star Power Systems, Inc. offers two distinctive types of double wall sub-base fuel tanks, those with an electrical stub up area (standard) and those without. Each type can be customized to any specification to meet your specific requirements.

UL 142 & ULC-S601 double wall secondary containment sub-base fuel tank with stub-up.



Factory Load Test

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. factory testing is performed with the same extreme diligence and attention to detail that is given to the prototype testing process. Every engine generator set receives a complete factory load test that certifies and ensures that the set will function in accordance to every specific application. Test metering will have an accuracy of 1.3% or better. This metering equipment is calibrated annually, and is directly traceable to the National Institution of Standards & Technology (NIST). All test procedures are conducted in accordance with MIL-STD-705C where applicable.

Factory Acceptance Testing Procedures

- Insulation Resistance Test (301.1c)*
- High Potential Test (302.1b)*
- Alternator Over Speed
- Complete Engine Inspection
- Generator Inspection
  - Winding Resistance Test (401.1b)
  - Exciter Field Stator
  - Main Field Stator
- Mounting & Coupling Inspection
- Engine Fuel System Inspection
- Engine Lube Oil System Inspection
- Engine Cooling System Inspection
- DC Charging System Inspection
- Main Output Circuit Breaker Inspection

* Performed By Alternator OEM

- Anticipatory Alarms and Shutdowns Test (505.2b, 515.1b, 515.2b)
- Optional Equipment Inspection (513.2a)
- Load Test (640.1d
  - Regulator Range Test (511.1d)
  - No Load
  - MAX Load © 1.0 P.F. (640.2d)
  - MAX Load @ 0.8 P.F.
  - Block Loads @ 0-25%, 0-50%, 0-75%, 0-100% of rated load tests (640.2d)
- 1.0 Power Factor Max Load
- 1.0 Power Factor Max Block Load Pickup
- Full Name Plate Rated Load.
- Standard Readings Taken Every 5 Minutes.

Standard Reading Recorded During Load Test Inspection

Run Time	**AC Frequency**
AC Voltage	**Exciter Field Voltage**
AC Amperage	**Exciter Field Current**
kVA	**Lube Oil Pressure**
kWe	**Engine Coolant Temp.**
Power Factor	**Ambient Temp.**

Factory Load Test Summary

All engine generator sets are visually inspected prior to testing. This includes a complete visual/mechanical inspection to ensure that all fasteners and electrical connections are secure, that all rotating components are free of obstruction/ interference and are properly guarded.

Once the unit is started, the AC voltage and frequency are set to rated values. The unit is operated at no load while all of the safety shutdowns and warnings are verified and tested. The unit is then restarted and run at 25%, 50% and 100% of rated load and power factor until the engine temperature has stabilized for at least ten minutes. During the rated and maximum load pickup portion of the test, the voltage regulator gain, stability and under frequency compensation adjustments are set for optimal performance. All test procedures are performed in accordance with MIL-STD-705C where applicable.

Throughout these test procedures the AC parameters, engine oil pressure, engine temperature, exhaust temperature, timing and air/fuel ratio (gaseous units) are monitored and recorded. The unit and all installed accessory equipment are continually examined for oil and coolant leaks, excessive vibration and foreign noises.

Once all test procedures are performed and recorded, the unit is allowed a cool down period prior to being shut down. The unit is once again inspected for leaks, loose fasteners and connections prior to leaving the test facility.

The unit receives another complete final inspection process prior to packaging and shipment.

Note: All units are tested after the painting process is complete to prevent unforeseen difficulties resulting from the painting process being performed after testing.

Witnessed Factory Load Test

Standard witnessed factory load testing must be scheduled and approved at least four weeks prior to the engine generator sets scheduled shipping date. Any requests for witnessed factory load testing after this four week period may incur additional charges.

Witnessed Extended Run Factory Load Test

Witnessed extended run factory load testing must be scheduled and approved at the time of order placement. Any requests for witnessed extended run factory load testing after this time could be denied and would if approved incur additional cost.

All units are built and tested to cUL, CSA and NFPA 110 standards.

Engine Generator Set Two (2) Year 2000 Hour Standby Limited Warranty

BLUE STAR Power Systems Inc.

Your Blue Star Power Systems, Inc. product has been designed and manufactured with care by people with many years of experience. Blue Star Power Systems, Inc. warrants to its buyer that the product is free from defects in materials and/or workmanship for the period of time outlined below. If the product should prove defective within the time period outlined below, it will be repaired, adjusted or replaced at the option of Blue Star Power Systems, Inc., provided that the product, upon inspection by Blue Star Power Systems, Inc., has been properly installed, maintained and operated in accordance with Blue Star Power Systems, Inc.'s Generator Set Installation Guide and Operating Instructions. This limited warranty is not valid or enforceable unless: (1) all supporting maintenance records are kept on file with the end user and made available upon request from factory, and (2) the generator set is routinely exercised in accordance with operating instructions. This warranty does not apply to malfunctions caused by physical damage, misuse, improper installation, repair or service by unauthorized persons, or normal wear and tear. The warranty is not assignable.

Blue Star Power Systems, Inc. product warranty period: Engine generator set: Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first). Accessories (installed on the engine generator set or shipped loose): Parts and Labor for one (1) year from the date of factory invoice or 2000 hours (whichever occurs first). Transfer Switches: If purchased with a generator set (same order number): Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first).

The start of the warranty period can be adjusted to the date of unit start-up (limited to 180 days from invoice date) provided that the following information is provided to Blue Star Power Systems, Inc. within 30 days of start-up. The warranty will not be effective unless a copy of the Blue Star Power Systems, Inc. Start-Up Instructions & Warranty Validation form is properly filled out and returned to Blue Star Power Systems, Inc. within 30 days of start-up. If the Start-Up Instructions & Warranty Validation Form is received after 365 days (1 year) from invoicing date, all unit warranties will be void. Additionally, the engine manufacturer's engine registration form must be completed and returned to the engine manufacturer as stated in the instructions with the registration form.

To obtain warranty service: Contact your nearest Blue Star Power Systems, Inc. Service Representative. For assistance in locating your nearest authorized service representative, contact Blue Star Power Systems, Inc, at warranty@bluestarps.com.

Warranty service may be performed by authorized Blue Star Power Systems, Inc. service providers only. Service work performed by unauthorized persons will void all warranties and not be paid.

Blue Star Power Systems, Inc. shall not be liable for any claim in amount greater than the purchase price of the product. In no event shall Blue Star Power Systems, Inc. be held liable for any special, indirect, consequential or liquidated damages including but not limited to: loss of profits, loss of time, increased overhead, delays, loss of business opportunity, good will, or any commercial or economic loss.

Blue Star Power Systems, Inc. shall not be liable for any claim that requires replacement of engine, part, or component of the gen-set that is no longer manufactured or available. Additionally, Blue Star Power Systems, Inc. will not be liable for any engine replacement that may require emissions tier level change.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE DESCRIBED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, OR WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

The following items and/or circumstances are excluded from this limited warranty:

- Improper installation or operation as outlined in the Generator Set Installation Guide and Operating Instructions.
- Misapplication and misuse of the equipment outside the original design parameters as stated on the nameplate of the equipment.
- Equipment purchased at the standby rating that is being used in a prime power application(s).
- Failure to properly exercise and maintain your equipment per manufacturer's specifications will void all warranty.
- Any equipment or components adding including fuel tanks and enclosures not installed at the Blue Star Power Systems, Inc. factory.
- Equipment modifications made without the written consent of Blue Star Power Systems, Inc. will void all warranty.
- Damages caused by acts of nature, such as lightning, wind, flood, or earthquake.
- Any damage due to situations beyond the control of the manufacturing and/or workmanship of the product.
- Engine starting batteries: The battery manufacturers' warranty applies. Consult your local battery supplier for warranty service.
- Fuel system and/or governing system adjustments performed during or after start-up.
- Normal maintenance items and consumable items such as belts, filters, fluids, and hoses.
- Adjustments and tune-ups performed during start-up or thereafter. Start-up, training, tuning, and adjustments for any paralleling or bi-fuel system.
- Loose connections (electrical and mechanical) before and after unit start-up. Including fittings, connectors, clamps and fasteners.
- Diesel engine "Wet Stacking" due to lightly loaded diesel engines. Regeneration issues, aftertreatment exhaust systems, including DEF related issues.
- All fluid level related items found before, during, or after unit start up.
- Use of steel enclosure within 25 miles of the coast.
- Requested rental generators used while warranty work is being performed.
- Charges, fees, and site delays due to a replacement components availability with the product manufacturer.
- Any labor charges deemed excessive by Blue Star Power Systems, Inc. factory or component manufacturer.
- Travel labor and mileage for mobile generator sets.
- Additional trips to the site due to a service vehicle was not stocked with normal service parts.
- Any special access fees, equipment, requirements or after hours scheduling to gain access to the equipment for warranty service purposes.
- Lodging expense associated with unit repair and excessive mileage charges (limit to 300 miles and 6 hours travel round trip from nearest service center).
- Shipping damage of any type. All equipment is shipped F.O.B. Blue Star Power Systems, Inc. and risk of loss transfers to the carrier once loaded for shipment. It is the responsibility of the receiving party to sign for the receipt of and note any shipping damage to the equipment. Freight damage claim filing is the responsibility of the receiving party. In the rare event that damage occurs resulting from shrink wrap during shipment, Blue Star Power Systems, Inc. will not warrant any damage to the unit.

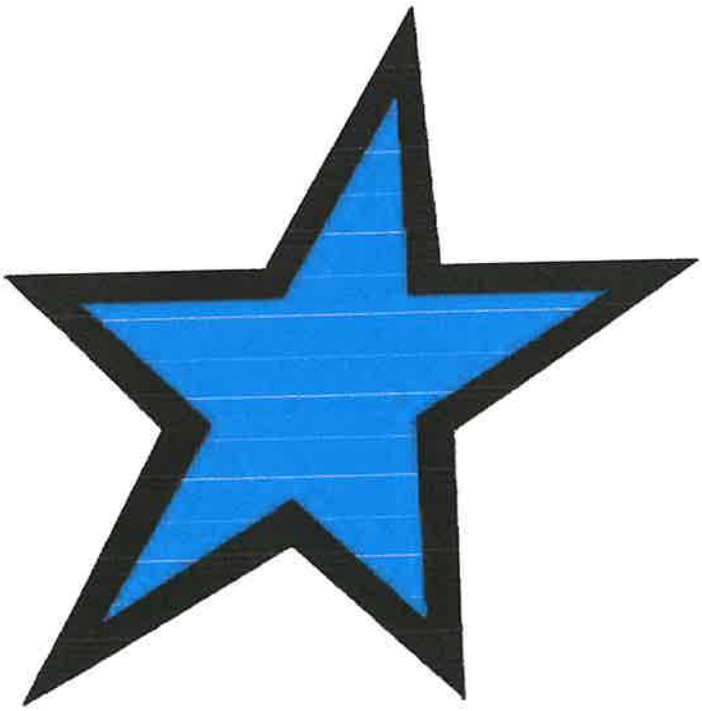
This agreement is deemed made and executed in North Mankato, Nicollet County, Minnesota and shall be construed and interpreted in accordance with the laws of the state of Minnesota without giving effect to its conflicts of laws principals. Each of the parties submits to the exclusive personal jurisdiction and venue with respect to any action or proceeding arising out of, in connection with, relating to, or by reason of this agreement before the district court of the state of Minnesota, located in Nicollet County and agrees that all claims in respect of the action or proceeding may be heard and determined in any such court.

BLUE STAR
Power Systems Inc.

Submittal

3/21/2024

Project Title	Dundee LS- 60KW Generator
Quote Number:	0107630-2
Model:	JD60-02



Mid Florida Diesel
Joe Antonini
2215 Hwy 60 East
Bartow FL 33830
Office: 863-519-0107
Cell: 863-944-0400
Email: joe@midfloridadiesel.com

BLUE STAR
Power Systems Inc.

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BLUE STAR
Power Systems Inc.

Quote Date:	**3/21/2024 11:30:01 AM**
Quote Number:	**0107630-2**
Project Title:	**Dundee LS- 60KW Generator**
Prepared for	**Mid Florida Diesel**

Distributed by:

Unit Model	**JD60-02**	**Standby / Prime**	**Emergency Stationary Standby**
kWe Rating	**60 kWe**	**UL 2200 Listed**	**Yes**
Fuel	**Diesel**	**CSA Approved**	**Yes**
EPA	**Tier 3**	**Paint Color**	**White**

Engine Model:	John Deere 4045TF280 60kW Standby Power Rating at 1800 RPM Governor - Electronic Isochronous
Voltage:	480/277V 3 Phase 60 Hz 0.8 PF
Gen Model:	Stamford UCI224G 12 Lead Wired 480V 3 Phase High Wye 80°C Rise Over 40°C Ambient
Voltage Regulator:	Stamford MX321 Automatic Voltage Regulator with PMG Excitation
Control Panel:	Blue Star DGC-2020 Microprocessor Based Gen-Set Controller Mounted Facing Left from Generator End (Unless Specified Otherwise) Standard Features: Low Oil Pressure, High Coolant Temp, Overspeed, Overcrank Shutdowns Emergency Stop Pushbutton, Audible Alarm Buzzer with Silencing Switch Optional Features Include: Generator Protection (Undervoltage, Overvoltage, Underfrequency, Overfrequency, Overcurrent),15 Contact Outputs, RS-485 Communications
Control Panel Options:	Low Water Level Sensor with Shutdown
Unit Color:	White
Enclosure:	Level 3 (Sound Attenuated Enclosure) Powder Coated .090 Aluminum Rugged and Durable 200 MPH Wind Rated Enclosure with Exhaust Hood Pitched Roof for Increased Structural Integrity and Improved Watershed Punched Intake with Baffle and Punched Exhaust Openings Keyed Alike Lockable Doors with Draw Down Latches and Stainless Steel Component Hinges Additional 1.5" Thick Polydamp Type D Acoustical Foam (PAF) Formed Steel Base with Mounting and Lifting Holes Includes Vibration Mounts to Isolate Unit from Base Rail
Sound Attenuation Foam:	Sound Attenuation Installed in Enclosure and Exhaust Hood
Cooling:	Unit Mounted Radiator (50°C Ambient)
Oil Drain Extension:	Plumbed to Bulkhead Fitting in Base
Mainline Breaker:	90 Amp 3 Pole 480 Volt Breaker Mounted & Wired in a NEMA 1 EnclosureAdjustable Trip to 70amps
Jacket Water Heater:	Engine Block Heater 1500W 120VAC Rated for -20°F Heater Installed with Isolation Valves and Wired to Terminal
Air Cleaner:	Dry Single Stage
Silencer:	Critical Grade Compact (CPJ Series) Silencer Mounted to Engine
Battery:	12 Volt System with Rack and Cables
Battery Charger:	12 Volt 6 Amp Mounted and Wired to Terminal
Fuel Tank:	24 Hour / 120 Gallon UL 142 Listed Sub-Base Fuel Tank with Stub-up Area Double Wall Construction with Secondary Containment Standard Includes: Supply & Return Connections, Fuel Level Gauge, Fuel Leak Switch and Fill & Vent Plumbing

Factory Test:	Standard Commercial Testing Includes: Verification of Alarm Shutdowns, Voltage Settings, Block Loading to Rated kWe and PF
Owner's Manual:	Print Copy (Qty 1) **Standard**
Warranty:	2 Year / 2000 Hour Limited
Notes:	Coat 120 gallon tank with Extreme Liner 2 steps required. one for controller and one for breaker
Additional Options (Not Included in Price):	

ATS 1

Series	**300**	**Volts**	**480/277V 3 PH**
Service Entrance Rated	**No**	**Poles**	**3**
Amps	**104**	**Enclosure**	**Nema 4X (316)**

Warranty:	Two (2) Year Basic ATS Limited Warranty Standard
Optional Accessories:	11BE Feature Bundle Includes Engine Exerciser/Event Log/RS-485 Enabled/Common Al
ATS Notes:	
Lead Time:	

BLUE STAR
Power Systems Inc.

Diesel Product Line

JD60-02

60 kWe

208-600 Volt

60 Hz / 1800 RPM

Standby

Ratings

	240V	208V	240V	480V	600V
Phase	1	3	3	3	3
PF	1.0	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60
Generator Model	UCI224G	UCI224F	UCI224F	UCI224E	UCI224E
Connection	12 LEAD DD	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	4 LEAD WYE
kWe	60	60	60	60	60
AMPS	250	208	181	90	72
Temp Rise	125°C / 40°C	125°C / 40°C	125°C / 40°C	125°C / 40°C	125°C / 40°C

Standard Equipment

Engine
- Radiator Cooled Unit Mounted (50°C)
- Radiator Duct Flange (OPU Only)
- Blower Fan & Fan Drive
- Starter & Alternator
- Oil Pump & Filter
- Oil Drain Extension w/Valve
- Governor - Electronic Isochronous
- 12V Battery System & Cables
- Air Cleaner (Dry Single Stage)
- Critical Grade Silencer Mounted
- Flexible Fuel Connector
- EPA Certified Tier 3

Generator
- Brushless Single Bearing
- Automatic Voltage Regulator
- ± 1% Voltage Regulation
- 4 Pole, Rotating Field
- 125°C Standby Temperature Rise
- 100% of Rated Load - One Step
- 5% Maximum Harmonic Content
- NEMA MG 1, IEEE and ANSI Standards Compliance for Temperature Rise

Additional
- Single Source Supplier
- UL 2200 & cUL Listed
- CSA Certified
- Seismic Certified to IBC 2021
- NFPA 110 / CSA C282 Compliant
- Microprocessor Based Digital Control Panel Mounted in NEMA 12 Enclosure
- Base - Formed Steel
- Main Line Circuit Breaker Mounted & Wired
- Battery Charger 12V 6 Amp
- Jacket Water Heater -20°F 1500W 120V w/Isolation Valves
- Vibration Isolation Mounts
- 2 Year / 2000 Hour Standby Warranty
- Standard Colors - White / Gray

Diesel Product Line

60 kWe

BLUE STAR Power Systems Inc.

Application Data

Engine

Manufacturer:	John Deere	Displacement - Cu. In. (lit):	275 (4.50)
Model:	4045TF280	Bore - in. (cm) x Stroke - in. (cm):	4.19 (10.6) x 5.00 (12.7)
Type:	4-Cycle	Compression Ratio:	19.0:1
Aspiration:	Turbo Charged	Rated RPM:	1800
Cylinder Arrangement:	4 Cylinder Inline	Max HP Stby (kWm):	85.0 (63.4)

	Standby
Exhaust System	
Gas Temp. (Stack): °F (°C)	1,074 (579)
Gas Volume at Stack Temp: CFM (m³/min)	679 (19.2)
Maximum Allowable Exhaust Restriction: in. H_2O (kPa)	30.0 (7.50)
Cooling System	
Ambient Capacity of Radiator: °F (°C)	122 (50.0)
Maximum Allowable Static Pressure on Rad. Exhaust: in. H_2O (kPa)	0.50 (0.12)
Water Pump Flow Rate: GPM (lit/min)	38.0 (144)
Heat Rejection to Coolant: BTUM (kW)	2,049 (35.9)
Heat Radiated to Ambient: BTUM (kW)	1,237 (21.6)
Air Requirements	
Aspirating: CFM (m³/min)	187 (5.29)
Air Flow Required for Rad. Cooled Unit: CFM (m³/min)	4,760 (135)
Air Flow Required for Heat Exchanger/Rem. Rad. CFM (m³/min)	Consult Factory For Remote Cooled Applications
Fuel Consumption	
At 100% of Power Rating: gal/hr (lit/hr)	4.95 (18.7)
At 75% of Power Rating: gal/hr (lit/hr)	3.86 (14.6)
At 50% of Power Rating: gal/hr (lit/hr)	2.72 (10.3)
Fluids Capacity	
Total Oil System: gal (lit)	3.88 (14.7)
Engine Jacket Water Capacity: gal (lit)	2.32 (8.50)
System Coolant Capacity: gal (lit)	5.40 (20.4)

Deration Factors: Rated Power is available up to 10,000 ft (3,048 m) at ambient temperatures to 122°F (50°C).
Consult factory for site conditions above these parameters.

Diesel Product Line

60 kWe

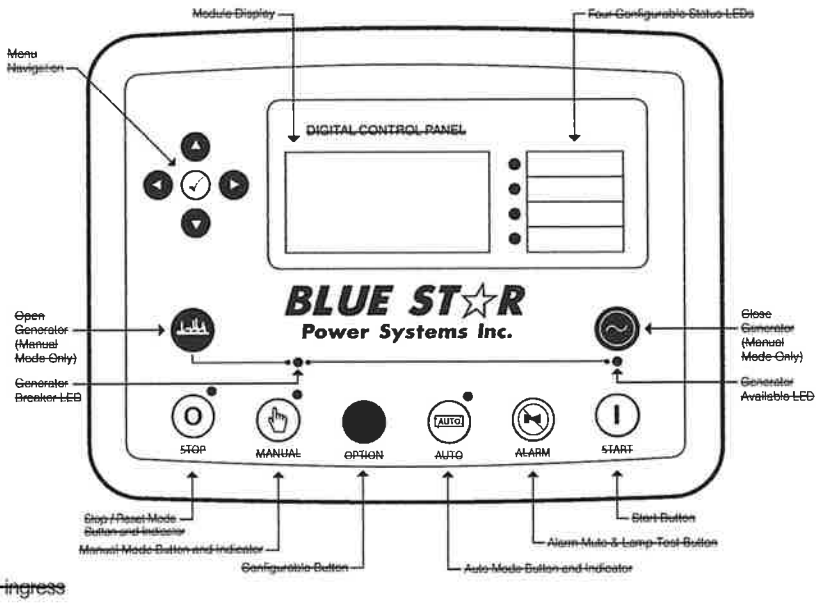
BLUE STAR Power Systems Inc.

~~DGP7310 Control Panel~~

2020 Controller on following pages

~~Standard Features~~

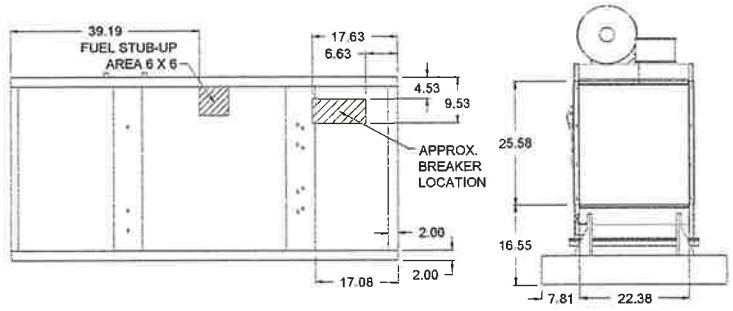
- ~~Digital Metering~~
- ~~Engine Parameters~~
- ~~Generator Protection Functions~~
- ~~Engine Protection~~
- ~~CAN Bus (J1939) ECU Communications~~
- ~~Windows-Based Software~~
- ~~Multilingual Capability~~
- ~~Remote Communications to DSE2548 Remote Annunciator~~
- ~~8 Programmable Contact Inputs~~
- ~~10 Contact Outputs~~
- ~~RS485 Communicator Interface~~
- ~~cULus Listed, CE Approved~~
- ~~Event Recording~~
- ~~IP 65 rating (with supplied gasket) offers increased resistance to water ingress~~
- ~~NFPA 110 Level 1 Compatible~~



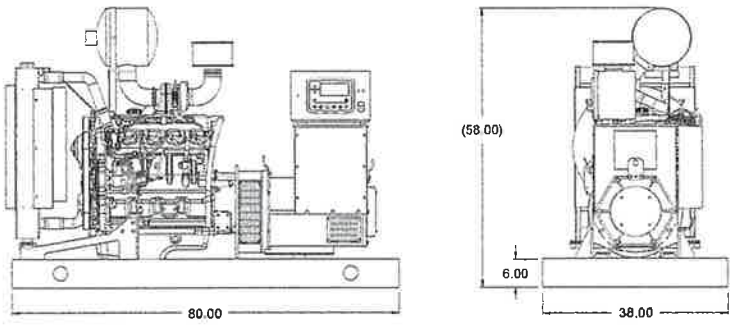
Weights / Dimensions / Sound Data

	L x W x H	Weight lbs
OPU	80 x 38 x 58 in	2,225
Level 1	90 x 38 x 60 in	2,725
Level 2	90 x 38 x 60 in	2,775
Level 3	120 x 38 x 60 in	2,925

Please allow 6-12 inches for height of exhaust stack.



	No Load	Full Load
OPU	73 dBA	77 dBA
Level 1	71 dBA	73 dBA
Level 2	68 dBA	70 dBA
Level 3	63 dBA	65 dBA

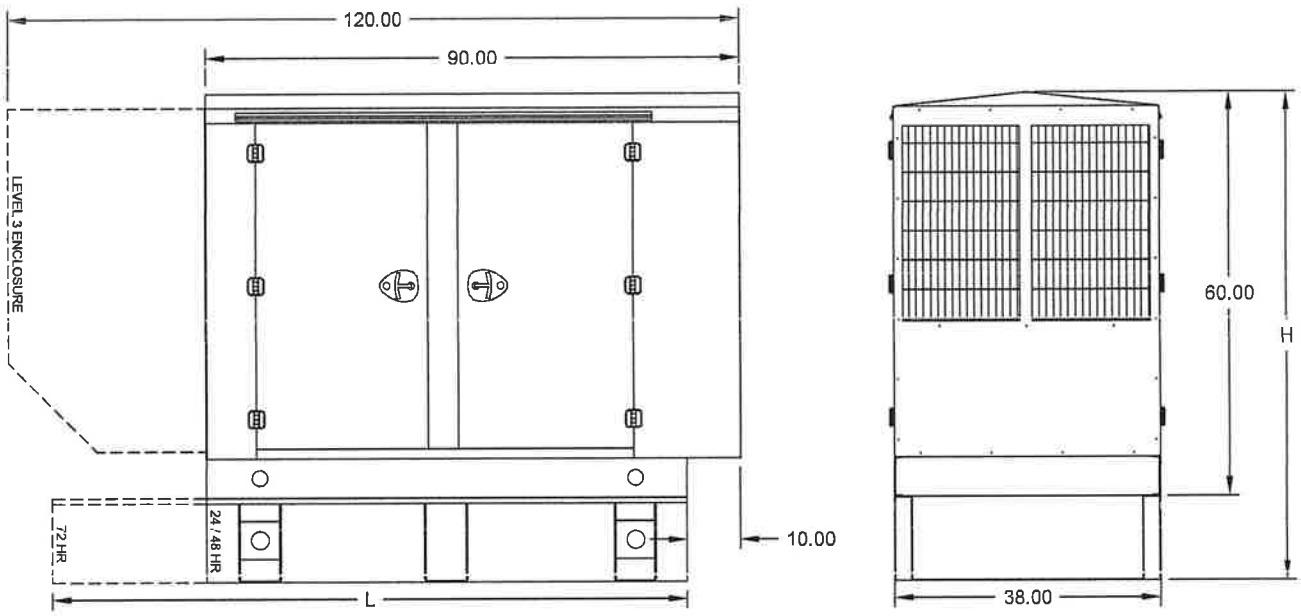


Diesel Product Line

60 kWe

BLUE STAR Power Systems Inc.

Enclosures & Fuel Tanks



- All enclosure models are 200 MPH wind rating certified in accordance with IBC2021 and ASCE/SEI 7-16 standards.
- Level 2 & 3 enclosures include sound attenuation foam
- Level 3 enclosure includes frontal sound & exhaust hood.
- Enclosure height does not include exhaust stack.

	24 Hour 120 Gallon	48 Hour 240 Gallon	72 Hour 360 Gallon
L	80.00	80.00	108.00
H	80.00	96.00	96.00

American Owned

American Made

Notes

- All specification sheet dimensions are represented in inches.
- All drawings based on standard 480 volt standby generator. Lengths may vary with other voltages. All drawings and dimensions subject to change without notice.
- All enclosures and fuel tanks are based on the standard unit configuration. Any requested deviation can change dimensions.
- Sound data is measured at 23 feet (7 meters) in accordance with ISO 8528-10.
- All materials and specifications subject to change without notice.

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JOHN DEERE

ENGINE PERFORMANCE CURVE

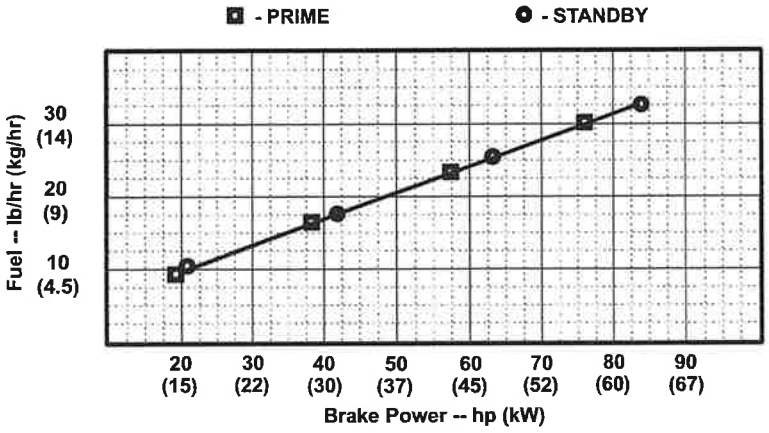
PowerTech M™ 4.5L Engine
Model: **4045TF280**

Rating: Gross Power — **76 hp (57 kW) Prime**
Application: Generator (60 Hz) — **85 hp (63 kW) Standby**
Target: 55 kWe Standby Market — [See Option Code Tables]

Nominal Engine Power @ 1800 RPM			
Prime		Standby	
HP	kW	HP	kW
76	57	85	63

Generator Efficiency %	Fan Power (3% of Standby)		Power Factor	Prime Rating [2]		Standby Rating [1,2]		ISO 8528 G2 Block Load Capability
	hp	kW		kWe	kVA	kWe	kVA	
88-92	2.5	1.9	0.8	48-51	60-64	54-56	68-70	NA

Note 1: Based on nominal engine power.
Note 2: kWe / kVA rating assumes 90% efficiency. "Generator Efficiency %" will vary.



STANDARD CONDITIONS

Air Intake Restriction ..... 12 in.H_2O (3 kPa)
Exhaust Back Pressure ..... 30 in.H_2O (7.5 kPa)

Gross power guaranteed within + or - 5% at SAE J1995 and ISO 3046 conditions:
- 77 °F (25 °C) air inlet temperature
- 29.31 in.Hg (99 kPa) barometer
- 104 °F (40 °C) fuel inlet temperature
- 0.853 fuel specific gravity @ 60 °F (15.5 °C)

Conversion factors:
- Power: kW = hp x 0.746
- Fuel: 1 gal = 7.1 lb, 1 L = 0.85 kg
- Torque: N•m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.

Notes:
All OEM Gen Set Engine Applications must be pre-screened for torsional vibration compatibility with the respective alternator end hardware.

OEM Engine Application Engineering will perform this computer-based analysis work upon request.

Tier-3 Emission Certifications:	Certified by:
CARB; EPA Ref: Engine Emission Label	Vincenzo Pinto 08-24-07

* Revised Data
Curve 4045TF280180085 ..... Sheet 1 of 2
August 2007

Engine Installation Criteria

General Data

Model	4045TF280
Number of Cylinders	4
Bore and Stroke--in. (mm)	4.19 x 5.00 (106 x 127)
Displacement--in.^{3} (L)	275 (4.5)
Compression Ratio	19.0 : 1
Valves per Cylinder--Intake/Exhaust	1 / 1
Firing Order	1-3-4-2
Combustion System	Direct Injection
Engine Type	In-line, 4-Cycle
Aspiration	Turbocharged
Engine Crankcase Vent System	Open

Physical Data

Length--in. (mm)	33.9 (860)
Width--in. (mm)	24.1 (612)
Height--in. (mm)	39.1 (994)
Weight, with oil--lb (kg)	872 (396)
(Includes flywheel hsg., flywheel & electrics)	
Center of Gravity Location (Estimated based on Tier 2)	
From Rear Face of Block (X-axis)--in. (mm)	10.6 (269)
Right of Crankshaft (Y-axis)--in. (mm)	-0.3 (-8)
Above Crankshaft (Z-axis)--in. (mm)	5.9 (151)
Max. Allow. Static Bending Moment at Rear Face of Flywhl Hsg w/ 5-G Load--lb-ft (N•m)	600 (814)

Thrust Bearing Load Limit --lb (N)	Forward	Rearward
Intermittent	900 (4003)	450 (2000)
Continuous	500 (2224)	225 (1000)

Max. Front of Crank. Torsional Vibration--DDA	0.25

Air System

	Prime	Standby
Max. Allowable Temp Rise--Ambient Air to Engine Inlet--°F (°C)	15 (8)	
Maximum Air Intake Restriction		
Dirty Air Cleaner--in.H_2O (kPa)	25 (6.25)	
Clean Air Cleaner--in.H_2O (kPa)	12 (3)	
Engine Air Flow--ft^3/min (m^3/min)	180 (5.1)	187 (5.3)
Intake Manifold Pressure--psi (kPa)	9 (63)	10 (72)
Air Cleaner Efficiency--%	99.9	

Cooling System

	Prime	Standby
Engine Heat Reject.--BTU/min (kW)	1878(33)	2049(36)
Coolant Flow--gal/min (L/min)	38 (144)	
Thermostat Start to Open--°F (°C)	180 (82)	
Thermostat Fully Open--°F (°C)	202 (94)	
Engine Coolant Capacity--qt (L)	9 (8.5)*	
Min. Pressure Cap--psi (kPa)	14.5 (100)	
Max. Top Tank Temp--°F (°C)	230 (110)	
Min. Coolant Fill Rate--gal/min (L/min)	3 (11)	
Min. Air-to-Boil Temperature--°F (°C)	117 (47)	
Min. Pump Inlet Pressure--psi (kPa)	4.4 (30)	

Electrical System

	12 Volt	24 Volt
Min. Battery Capacity (CCA)--amp	640	570
Max. Allow. Start. Circ't Resist.--Ohm	0.0012	0.002
Starter Rolling Current:		
At 32 °F (0 °C)--amp	780	600
At -22 °F (-30 °C)--amp	1000	700
Maximum Voltage From Engine Crankshaft/ Generator Shaft to Ground--VAC*	0.15	0.15

Exhaust System

	Prime	Standby
Exhaust Flow--ft^3/min (m^3/min)	645 (18.3)	679(19.2)
Exhaust Temperature--°F (°C)	1024(551)	1074 (579)
Max. Exhaust Restriction--in. H_2O (kPa)	30 (7.5)	
Min. Exhaust Restriction--in. H_2O (kPa)	None	
Max. Bend. Moment, Turbo Out.--lb-ft (N•m)	5.2 (7.0)	
Max. Shear on Turbo Outlet--lb (kg)	24 (11)	

Fuel System

	Prime	Standby
Fuel Injection Pump	Stanadyne DB4	
Governor Type	Mechanical	
Total Fuel Flow--lb/hr (kg/hr)	106(48.0)	117(53.0)
Fuel Consumption--lb/hr (kg/hr)	45(20)	49 (22)
Max. Fuel Inlet Temp.--°F (°C)	176 (80)	
Max. Fuel Inlet Restriction--In. H_2O (kPa)	80 (20)	
Max. Fuel Return Pressure--in. H_2O (kPa)	80 (20)	

Lubrication System

	Prime	Standby
Oil Press. at Rated Speed--psi (kPa)	46(320)	46(320)
Min. Oil Pressure--psi (kPa)	15 (105)	
Max. Oil Carryover in Blow-by--lb/hr (g/hr)	0.002 (1.0)	
Max. Airflow in Blow-by--gal/min (l/min)	26 (100)	
Max. Crankcase Pressure--in. H_2O (kPa)	2 (0.5)	

Performance Data

	Prime	Standby
Rated Power--hp (kW)	76 (57)	85 (63)
Rated Speed--rpm	1800	1800
Low Idle Speed--rpm	1150	1150
Rated Torque--lb-ft (N•m)	409 (302)	453 (334)
BMEP--psi (kPa)	230 (1589)	254 (1748)
Friction Power @ Rated Speed--hp (kW)	17 (13)	17 (13)
Altitude Capability--ft (m)	10,000(3050)	10,000(3050)
Ratio--Air : Fuel	25.2 : 1	24 : 1
Smoke @ Rated Speed--Bosch No.	1.7	1.9
Noise--dB(A) @ 1 m	86.3*	86.6*

Fuel Consumption -- lb/hr (kg/h)

	Prime	Standby
25 % Power	9.2 (4.2)	10.3 (4.7)
50 % Power	16.7 (7.6)	17.6 (8.0)
75 % Power	23.3 (10.6)	25.3 (11.5)
100 % Power	29.9 (13.6)	32.6 (14.8)

All values at rated speed and power with standard options unless otherwise noted.

* Revised Data

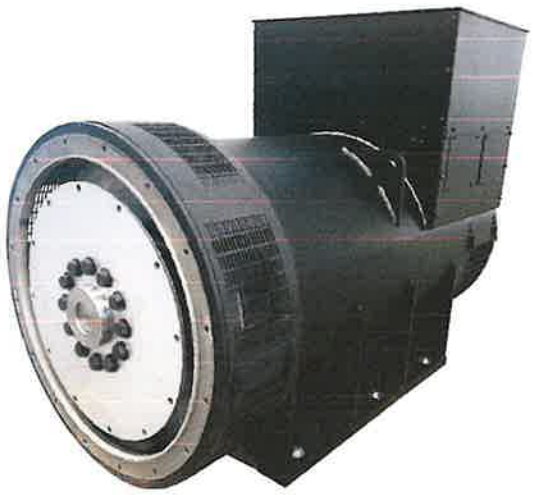
Curve 4045TF280180085 ..... Sheet 2 of 2

August 2007

Industrial Alternators

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. utilizes the highest quality alternators available. Our industrial alternators provide consistent performance, quality design, and great durability required for long life and versatility. Alternators used by Blue Star Power Systems, Inc. are UL and CSA Listed, which guarantees that each one meets the rigorous demands of industrial power generation and will provide safe and effective service for the life of the alternator. Blue Star Power Systems, Inc. alternators range from 20 kWe through 2000 kWe.



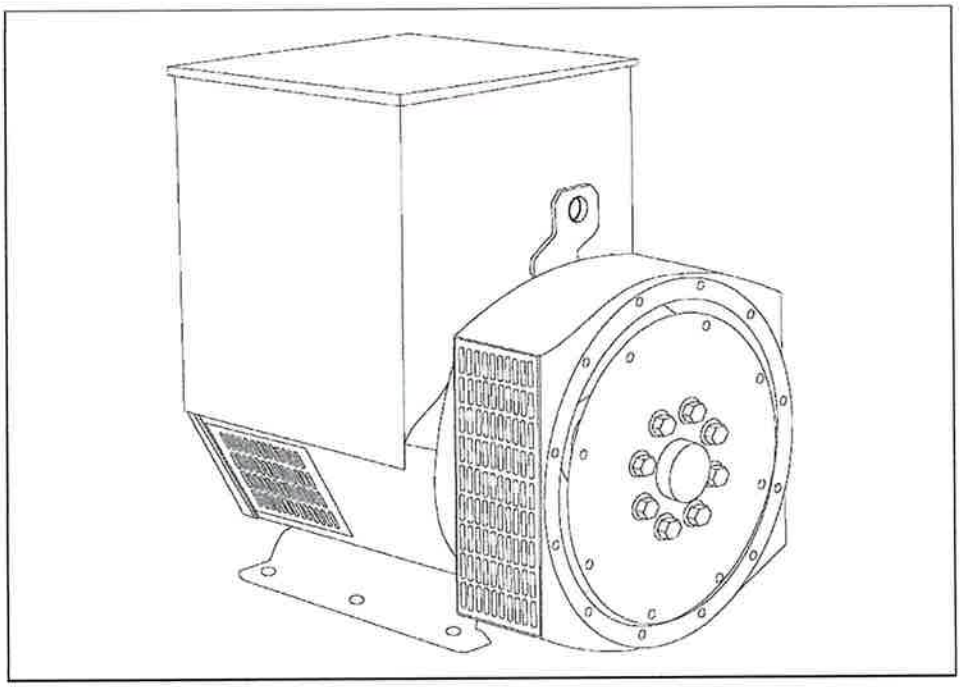
Standard Features

- **Enhanced Ventilation**
  Created by a high-efficiency fan that optimizes internal airflow patterns, maximizes heat transfer, and minimizes hot spot differentials for extended winding life.
- **Fully Guarded**
  For operator safety and alternator protection. No rotating or electrically energized parts are exposed. All openings are covered by louvers or screens.
- **Large Conduit Box**
  Provides ample space for easy connections and allows load line access from all sides, top, or bottom.
- **Design Specs and Agency Approvals**
  All Blue Star Power Systems, Inc. alternators are UL and CSA Listed (unless specified otherwise) and meet NEMA MG1-32, BS5000, CSA C22.2, IEC 34 and VDE 0530 requirements.
- **Class H Insulation System**
  Utilizes an unsaturated polyester varnish for optimal insulation life and superior moisture protection.
- **Optimized Windings**
  Provide low reactances and exceptional motor starting capability. The stator windings utilize a 2/3 pitch to minimize harmonic distortion and facilitate parallel operation.
- **Permanent Magnet Generator (optional)**
  Ensures 300% short circuit current during fault conditions and provides the regulator with input power isolated from load distortion.
- **Heavy-Duty Bearing**
  Resists contamination and gives a life expectancy up to 40,000 hours.
- **Automatic Voltage Regulator**
  Provides accurate 1% regulation, under-speed protection, stability adjustment to optimize transient performance, and EMI filtering to commercial standards. Fully encapsulated for rugged durability in virtually any environment.

STAMFORD

UCI224G - Winding 311

Technical Data Sheet



SPECIFICATIONS & OPTIONS

STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.
Other standards and certifications can be considered on request.

VOLTAGE REGULATORS

SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th ...) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

DE RATES

All values tabulated on page 8 are subject to the following reductions

5% when air inlet filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5°C by which the operational ambient temperature exceeds 40°C.
Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.

Front cover drawing typical of product range.

WINDING 311

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)		

CONTROL SYSTEM	SELF EXCITED		
A.V.R.	SX460	AS440	
VOLTAGE REGULATION	± 1.0 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT		

INSULATION SYSTEM	CLASS H							
PROTECTION	IP23							
RATED POWER FACTOR	0.8							
STATOR WINDING	DOUBLE LAYER CONCENTRIC							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	12							
STATOR WDG. RESISTANCE	0.055 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED							
ROTOR WDG. RESISTANCE	0.94 Ohms at 22°C							
EXCITER STATOR RESISTANCE	20 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.078 Ohms PER PHASE AT 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING DRIVE END	BALL. 6312-2RS (ISO)							
BEARING NON-DRIVE END	BALL. 6309-2RS (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	383 kg				400 kg			
WEIGHT WOUND STATOR	139 kg				139 kg			
WEIGHT WOUND ROTOR	126.75 kg				118.38 kg			
WR² INERTIA	0.7136 kgm²				0.6818 kgm²			
SHIPPING WEIGHTS in a crate	404 kg				420 kg			
PACKING CRATE SIZE	105 x 57 x 96(cm)				105 x 57 x 96(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.216 m³/sec 458 cfm				0.281 m³/sec 595 cfm			
VOLTAGE SERIES STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA BASE RATING FOR REACTANCE VALUES	85	85	85	75	93.8	97.5	100	103.8
Xd DIR. AXIS SYNCHRONOUS	2.43	2.20	2.04	1.60	2.66	2.47	2.32	2.21
X'd DIR. AXIS TRANSIENT	0.19	0.17	0.16	0.13	0.20	0.19	0.17	0.17
X"d DIR. AXIS SUBTRANSIENT	0.13	0.12	0.11	0.09	0.14	0.13	0.12	0.12
Xq QUAD. AXIS REACTANCE	1.12	1.01	0.94	0.74	1.22	1.13	1.06	1.01
X"q QUAD. AXIS SUBTRANSIENT	0.17	0.15	0.14	0.11	0.15	0.14	0.13	0.12
X_L LEAKAGE REACTANCE	0.07	0.06	0.06	0.05	0.08	0.07	0.07	0.07
X_2 NEGATIVE SEQUENCE	0.16	0.14	0.13	0.10	0.15	0.14	0.13	0.12
X_0 ZERO SEQUENCE	0.11	0.10	0.09	0.07	0.11	0.10	0.10	0.09
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.03 s							
T"d SUB-TRANSTIME CONST.	0.008 s							
T'do O.C. FIELD TIME CONST.	0.75 s							
Ta ARMATURE TIME CONST.	0.007 s							
SHORT CIRCUIT RATIO	1/Xd							

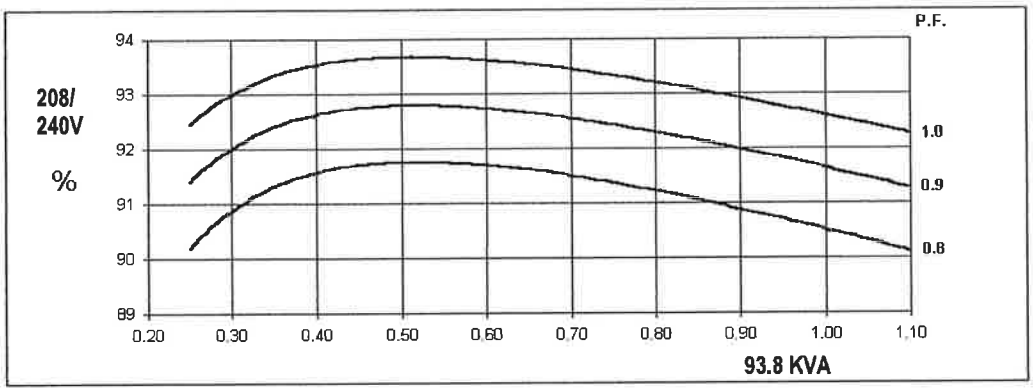
60 Hz

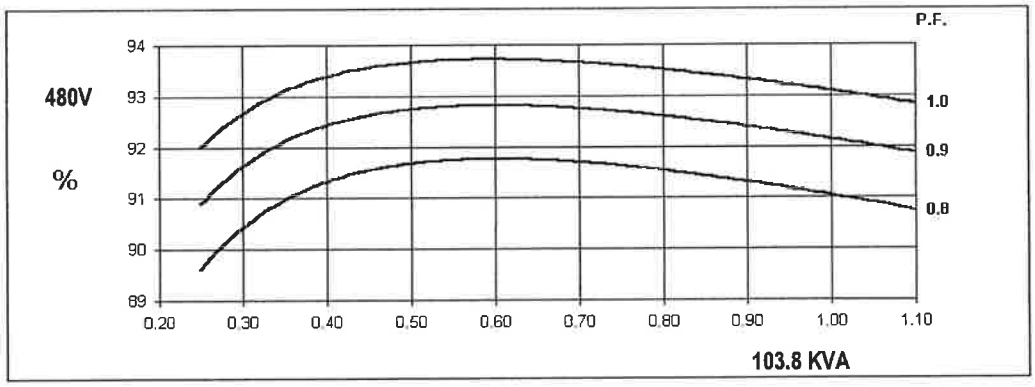
UCI224G

Winding 311

STAMFORD

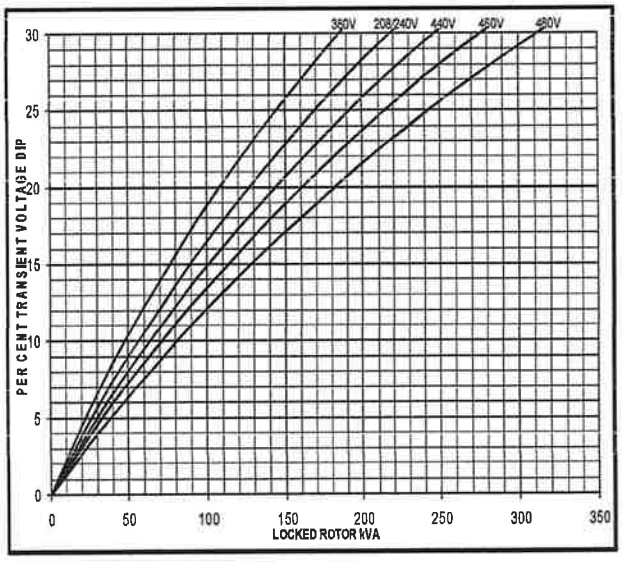
THREE PHASE EFFICIENCY CURVES



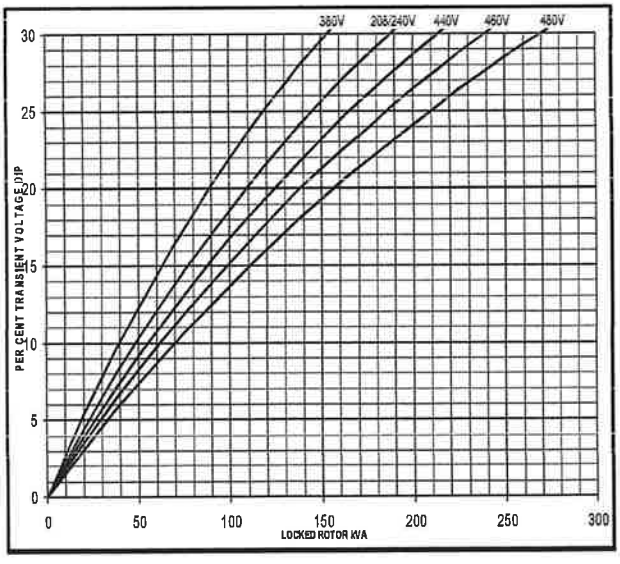


60 Hz

MX

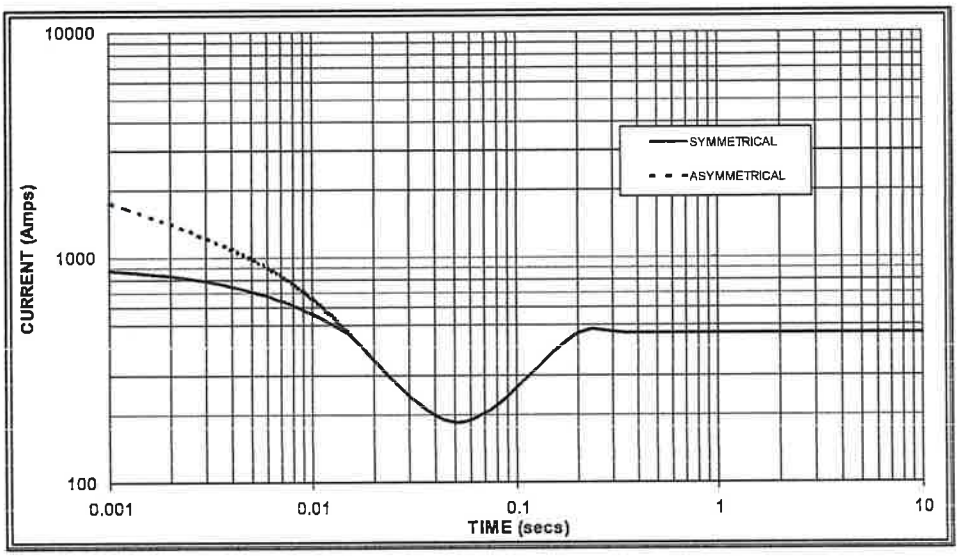


SX



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

60 Hz



Sustained Short Circuit = 460 Amps

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

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	X 1.00	416v	X 1.00
400v	X 1.07	440v	X 1.06
415v	X 1.12	460v	X 1.12
440v	X 1.18	480v	X 1.17

The sustained current value is constant irrespective of voltage level

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

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

All other times are unchanged

Note 3
Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

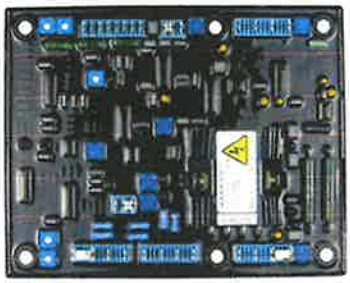
RATINGS

	Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	87.5	90.0	93.8	95.0	93.8	97.5	100.0	103.8	98.1	102.5	102.5	110.0	101.3	106.3	106.3	113.8
	kW	70.0	72.0	75.0	76.0	75.0	78.0	80.0	83.0	78.5	82.0	82.0	88.0	81.0	85.0	85.0	91.0
	Efficiency (%)	90.8	91.0	91.1	91.3	90.5	90.8	90.9	91.0	90.3	90.6	90.9	90.9	90.2	90.4	90.7	90.8
	kW Input	77.1	79.1	82.4	83.2	82.9	85.9	88.0	91.3	86.9	90.5	90.2	96.8	89.8	94.1	93.8	100.3

MX321 Voltage Regulator

BLUE STAR
Power Systems Inc.

MX321 is a three phase sensed Automatic Voltage Regulator and forms part of the excitation system for a brush-less generator. Excitation power is derived from a three-phase permanent magnet generator (PMG), to isolate the AVR control circuits from the effects of nonlinear loads and to reduce radio frequency interference on the generator terminals. Sustained generator short circuit current is another feature of the PMG system.



Voltage Adjustment

The screwdriver adjustable potentiometer adjusts the generator output voltage. Adjustment clockwise increases the generator output voltage.

When using a remote voltage adjust rheostat, remove the jumper wire across terminals 1 and 2 and install a 1k ohm 1 watt rheostat. This will give ±10% voltage variation from the nominal.

Stability Adjustment

The AVR includes a stability or damping circuit to provide good steady state and transient performance of the generator.

A jumper link selector is provided to optimize the response of the stability circuit to various size generators. The link should be positioned as shown in the diagram according to the kW rating of the generator.

The correct setting of the Stability adjustment can be found by running the generator at no load and slowly turning the stability control anti-clockwise until the generator voltage starts to become unstable.

The optimum or critically damped position is slightly clockwise from this point (i.e. where the machine volts are stable but close to the unstable region).

Under Frequency Roll Off (UFRO) Adjustment

The AVR incorporates an underspeed protection circuit which gives a volts/Hz characteristic when the generator speed falls below a presettable threshold known as the "knee" point.

The red Light Emitting Diode (LED) gives indication that the UFRO circuit is operating.

The UFRO adjustment is preset and sealed and only requires the selection of 50 or 60Hz and 4 pole or 6 pole, using the jumper link as shown in the diagram.

For optimum setting, the LED should illuminate as the frequency falls just below nominal, i.e. 47Hz on a 50Hz system or 57Hz on a 60Hz system.

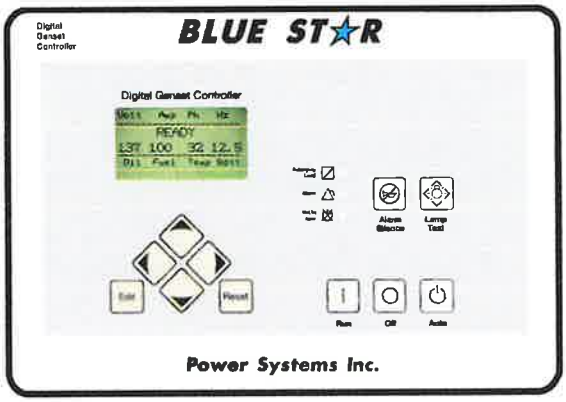
Specifications

Sensing Input	
Voltage	190 to 264VAC max, 1 or 3 phase
Frequency	50 to 60 Hz Nominal
Power Input (PMG)	
Voltage	170 to 220VAC, 3 phase
Current	3A
Frequency	100 to120 Hz Nominal
Output	
Voltage	max 120VDC
Current	Continuous 3.7A Intermittent 6A for 10 secs
Resistance	15 ohms Minimum
Regulation +/- 0.5% RMS	
Thermal Drift 0.02% per 1ºC change in AVR ambient	
Soft Start Ramp Time 0.4 - 4 seconds	
Typical System Response	
AVR Response	10 ms
Field Current to 90%	80 ms
Machine Volts to 97%	300 ms
External Voltage Adjustment +/-10% with 1k ohm 1 watt trimmer	
Under Frequency Protection	
Set Point	95% Hz
Slope	100 to 300% down to 30 Hz
Max. Dwell	20% volts/S Recovery
Unit Power Dissipation 18 watts Maximum	
Analog Input	
Maximum Input	+/- 5VDC
Sensitivity	1V for 5% Generator Volts (Adjustable)
Input Resistance	1k ohm
Quadrature Droop Input 10 ohms Burden	
Max. Sensitivity	0.22A for 5% Droop 0PF
Max. Input:	0.33A
Current Limit Input 10 ohms burden	
Sensitivity Range	0.5 to 1A
Over Voltage Detection Input 10 ohms Burden	
Set Point	300V Time Delay: 1 sec (Fixed)
CB Trip Coil Volts	10 to 30VDC
CB Trip Coil Resistance	20 to 60 ohms
Time Delay	1 second (Fixed)
Over Excitation Protection	
Set Point	75VDC
Time Delay	8 to 15 seconds (Fixed)

DGC-2020 Control Panel

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. Digital Generator Set Control Panel (DGC-2020) is a highly advanced integrated generator set control system. The DGC-2020 is perfectly focused, combining rugged construction and microprocessor technology to offer a product that will hold up to almost any environment and flexible enough to meet your application's needs. This device provides generator set control, transfer switch control, metering, protection and programmable logic in a simple, easy to use, reliable, rugged, and cost effective package.



Highlights

- UL Recognized, CSA & CE approved
- Microprocessor based
- Complete system metering
- Remote communication options
- Rugged encapsulated construction

Standard Features

- Generator Metering
- Engine Metering
- Generator Set Control
- Engine Protection:
  - Oil Pressure
  - Engine Temperature
  - Overspeed
  - Overcrank
- BESTCOMS Plus:
  - Programming and Setup Software
  - Intuitive and Powerful
  - Remote Control and Monitoring
  - Programmable Logic
  - USB Communications
- SAE J1939 Engine ECU Communications (Where Applicable)
- Extremely Rugged, Fully Encapsulated Design
- 16 Programmable Inputs
- 7 Contact Outputs: (3) 30ADC and (4) Programmable 2ADC Rated Contacts
- Wide Ambient Temperature Range
- UL Recognized, CSA Certified, CE Approved
- HALT (Highly Accelerated Life Test) Tested
- IP54 Front Panel Rating with Integrated Gasket
- NFPA110 Level One Compliant
- Real Time Clock with Battery Backup and Event Log
- Emergency Stop Pushbutton
- Current Sensing: 5A CT inputs
- Generator Frequency: 50/60 Hz
- LCD Display Heater to -40°F
- Event Recording (up to 99 occurrences)

Standard Gen-Set Monitoring

- Generator parameters: voltage, current, frequency, real power (Watts), apparent power (VA), and power factor
- Engine parameters: oil pressure, coolant temperature, RPM, battery voltage, fuel level, engine runtime, and various J1939 supported parameters where applicable

Standard Engine Control Functions

Cranking Control

- Cyclic or Continuous (Fully Programmable)

Successful Start Counter

- Counts and Records Successful Engine Starts

Timers

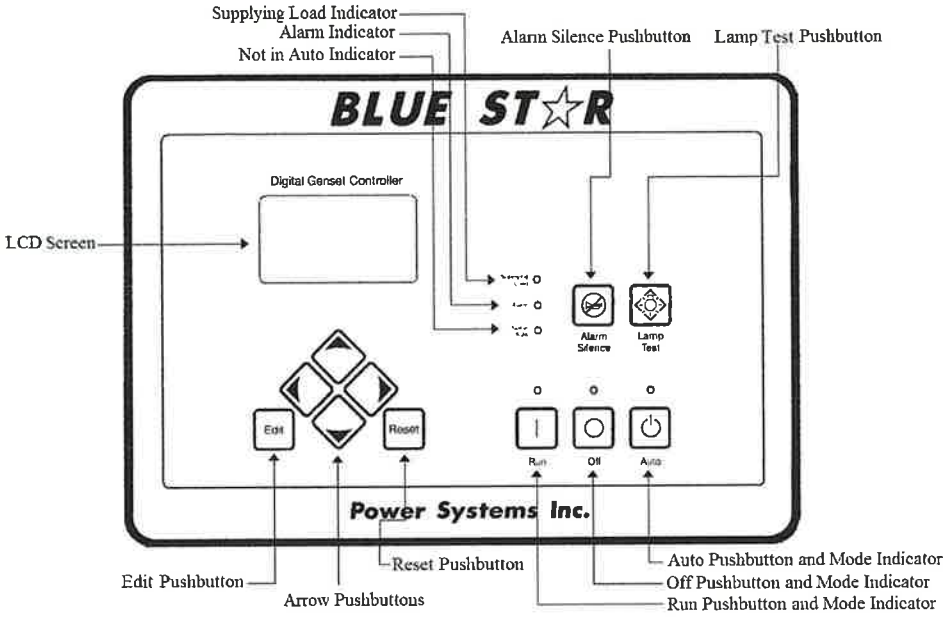
- Engine Cooldown Timer (Specify)
- Engine Maintenance Interval Timer (Specify)
- Pre-Alarm Time Delays for Weak/Low Battery Voltage
- Alarm Time Delay for Overspeed
- Alarm Time Delay for Sender Failure
- Arming Time Delays After Crank Disconnect:
  - Low Oil Pressure
  - High Coolant Temperature
  - Pre-Crank Delay
- Continuous/Cyclic Cranking Timing Sequence

DGC-2020 Control Panel

BLUE STAR Power Systems Inc.

Front Panel LED Indicators:

- Run: Green – Indicates controller is in the RUN mode
- Off: Red – Indicates controller is in the OFF mode
- Auto: Green – Indicates unit is in the AUTO mode
- Not in Auto: Red – Indicates DGC-2020 is not in AUTO mode
- Supplying Load: Green – Indicates system is supplying current to a connected load
- Alarm: Red – Indicates an alarm situation by continuous illumination
  A pre-alarm will flash



Standard Engine Protection Functions

Pre-Alarms (Warnings)

- Low Oil Pressure
- High Coolant Temperature
- Low Coolant Temperature
- Battery Overcharge (High Voltage)
- Weak Battery (Low Voltage)
- Battery Charger Failure
- Engine Sender Unit Failure
- Engine kWe Overload
- Maintenance Interval Timer
- Low Fuel Level
- Fuel Leak Detect

Alarms (Shutdowns)

- Low Oil Pressure
- High Coolant Temperature
- Overspeed
- Overcrank
- Fuel Sender Failure

– All alarms and pre-alarms can be configured via the BESTCOMSPlus PC software or the front panel.

Optional Features

- Generator Protection
  27(2), 32, 40Q, 51(2), 59(2), 81O, 81U
- Enhanced Generator Protection - 51 and 47
- Selection of Integrating Reset or Instantaneous Reset Characteristics for Overcurrent Protection
- Remote Communication to RDP-110 / NFPA-110 Compliant Remote Annunciator
- Additional (8) Programmable 2ADC Contacts
- Remote Dial-out and Dial-in Capability with Modem
- Modbus Communications with RS-485
- Expandable I/O Capability via J1939 CANBUS
- Automatic Transfer Switch Control
- Remote Emergency Stop
- Multilingual Capability
- High Fuel Level Pre-Alarm
- Critical Low Fuel Level Alarm
- Analog Meters

Generator Protection

- Undervoltage (27)
- Overvoltage (59)
- Underfrequency (81U)
- Overfrequency (81O)
- Overcurrent (51)
- Phase Imbalance (57)
- Reverse Power (32)
- Loss of Excitation (400)
- Phase Imbalance (47)
- Generator Overcurrent (51)

All generator protection features are programmable as alarms or pre-alarms.

DGC-2020 Control Panel

BLUE STAR Power Systems Inc.

Contact Outputs

For those applications where more output contacts are needed, the DGC-2020 can be adapted to include 8 additional 2ADC rated dry contact outputs. These are real contacts and not the solid-state type that require additional external circuitry to properly operate. These contacts are fully programmable via the easy-to-use BESTCOMSPlus PC software and can be assigned to numerous user-defined functions.

DC Voltage Panel Mounted Modem

The DGC-2020 can provide long distance communication by adding a modem. When a modem is used, the user can access the DGC-2020 from virtually anywhere via a dedicated telephone line. The user can monitor and control the gen-set as if standing right in front of it. The DGC-2020 can also dial out for pre-programmed circumstances to alert the user of selected situations.

RS-485 Communication

When the RS-485 option is selected, the user can send and receive information from the DGC-2020 via the RS-485 communications port and Modbus protocol. This feature allows the DGC-2020 to be fully integrated into the building management system. Please see the instruction manual for the Modbus register list.

Enhanced Generator Protection

In addition to the standard generator protection (27, 59, 81O, 81U) the DGC-2020 can be equipped with a more sophisticated generator protection system. This option provides an overcurrent element (51) with 17 selectable time current characteristic curves and a voltage phase balance protection function.

Transfer Switch Control (Mains Failure)

The DGC-2020 monitors utility (mains) and determines if it is providing power that is suitable for the loads. If the utility supply goes outside of predetermined levels, the generator is started and the utility is disconnected from the load and the generator is connected. When the utility returns to acceptable levels for a sufficient time, the generator is disconnected and the utility is reconnected to the load. It also includes appropriate adjustable timers or time delays for establishing stable utility operation.

Contact Expansion Module (CEM)

The CEM add-on module increases the contact input and contact output capability adding 10 contact inputs and 24 form C contact outputs. This module communicates to the DGC-2020 via SAE J1939 CANBUS and allows the user to program the functionality of these inputs and outputs in the BESTCOMS programmable logic program. The user can add labels for the inputs and outputs that appear on BESTCOMS front panel, and in the programmable logic. All the functionality can be assigned to these inputs and outputs as if they were an integrated part of the DGC-2020. The CEM-2020 module has all of the environmental ratings, like the DGC-2020, including a model for UL Class1 Div2 applications (consult price list for part number). The output ratings of the form C contacts are: (12 contacts) 10A @ 30VDC and (12 contacts) 2A @ 30VDC. The 2A rated contacts are gold flash contacts for low current circuits. The CEM-2020 terminals accept a maximum wire size of 12 AWG while the chassis ground requires 12 AWG wire. The CEM-2020 provides the user with the flexibility to use the same model DGC-2020 gen-set controller for simple applications or more complicated applications that require contact functionality or duplication of contacts for remote annunciation. Flexibility is one of the benefits of the DGC-2020, and this add-on module enhances that benefit even further.

ModBus TCP/RTU (NetBiter RTU-TCP Gateway)

NetBiter® RTU-TCP Gateway connects the fully enhanced DGC-2020 with Ethernet and mobile networks. The gateway acts as a transparent bridge translating DGC-2020 Modbus registers allowing control systems, such as PLCs, SCADA, etc. to communicate over Ethernet. One gateway is required per generator allowing multiple generator sets to be accessed and monitored simultaneously. Note: This option does not interface with BESTCOMSPlus software. Features include: connectivity between serial Modbus devices and the Modbus TCP; RS-232, RS-485 and RS-422 connectivity; Ethernet and mobile network connectivity; 10/100 Mbit/s Ethernet; web-based configuration; DIN rail mounting; and network and serial status indicators.

Load Share Module 2020 (LSM-2020)

The LSM is an easy to connect and use add-on module for the DGC-2020 to allow the DGC-2020 to control the kW load sharing of multiple generator sets. The LSM-2020 is remotely mounted and communicates to the DGC-2020 via J1939 CANbus communications.

Paint & Powder Coat

BLUE STAR
Power Systems Inc.

Generator Set

Blue Star Power Systems, Inc. completely paints all of its generator sets in our state-of-the-art downdraft paint booth. It begins with an extensive cleaning of the unit through sanding and a full wipe down using an alkaline-based cleaner. Once completely clean, the unit is then painted with Cardinal Industrial Semigloss paint. Electrostatic paint equipment ensures correct and even coverage. The unit then receives a complete covering of Cardinal Industrial Clear Coat in a hammer texture to provide extra protection and a durable long-lasting easy-to-clean finish.

Performance Characteristics

- 3.0+ Mils TDFT
- Xenon Arc 1100 hours - Excellent Weatherability
- 1000 Hour Salt Spray - Over Primer - Passed (3.0 Mils Total TDFT)
- Adhesion, Crosshatch - 5B
- Gloss 90+ @ 60˚

Generator Set Enclosure

Blue Star Power Systems, Inc. provides Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coating as standard on all our enclosures. Long term exterior durability, high performance mechanical properties and high gloss are standard characteristics of Cardinal Powder Coating. Cardinal TGIC Polyester Coating exceeds UL 2200 & CSA requirements.

Performance Characteristics

- Cured Powder Properties 2.0+ Mils DFT
- PCI Powder Smoothness 1 Mil
- Pencil Hardness 2H+
- Flexibility 1/8 in Diameter - No Fracture
- Salt Spray ASTM-B117 1000 Hours - Pass
- Humidity ASTM-02247 1000 Hours - Pass
- Adhesion, Crosshatch - 5B
- Gloss 90+ @ 60˚

Standard Colors

White | T012-WH260

Custom Colors

Custom Colors: Blue Star Power Systems, Inc. offers custom color options for your generator set enclosure. Cardinal is licensed by PANTONE® to accurately simulate both the PANTONE MATCHING SYSTEM® colors and the PANTONE® Textile Color System® with our powder and liquid coatings. Additional Charges apply.

Sub-Base Fuel Tanks

Blue Star Power Systems, Inc. provides either Diamond Vogel Nexgen Technology Paint or Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coat on all of our sub-base fuel tanks. Nexgen and Cardinal Industrial both offer excellent coverage and performance characteristics. Nexgen and Cardinal Industrial both exceed UL requirements.

Performance Characteristics

- 3.0+ Mils TDFT
- Xenon Arc 1100 Hours
- 500 Hour Salt Spray - Over Primer - Passed (3.0 Mils Total TDFT)
- Adhesion Crosshatch - 5B
- Gloss 90+ @ 60˚

Standard Color

Enclosures

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. enclosures are specifically designed for optimal protection against the elements. They are designed to protect the entire system from even the most extreme environments, and to reduce sound levels to most specified requirements. Blue Star Power Systems, Inc's vast flexibility allows the design of standard enclosures to meet most specifications or requirements. All standard enclosure models are constructed of 14 gauge steel and feature a pitched roof for increased structural integrity and superior watershed. All enclosures feature a rugged UL listed hammer powder coat finish as standard for a long lasting and durable finish in standard white or gray. Custom colors are available as specified.

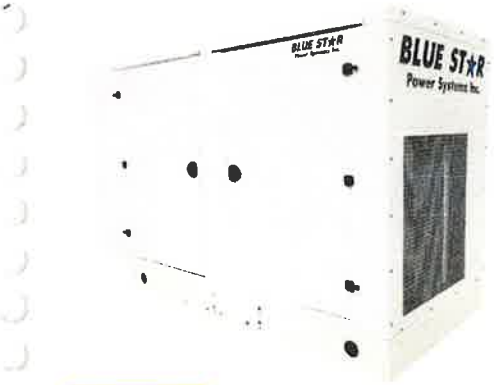
Enclosure Design Features

- UL 2200 & CSA Listed as standard
- All enclosure models are 200 MPH wind rating certified in accordance with IBC2018 and ASCE/SEI 7-16 standards.
- Lockable gasketed doors with draw down latches and Stainless Steel component hinges
- All Stainless Steel fasteners
- UL & CSA listed extreme-wear hammer powder coat finish
- Pitched roof for high structural integrity and superior watershed
- Above-door drip guards
- Optimal airflow means no cooling system de-rates on most models
- Internally mounted exhaust silencers standard up to 600 kWe
- Sound attenuation options
- Stainless Steel and Aluminum enclosure options

Level 1

Weather Proof Enclosure

Blue Star Power Systems, Inc. Level 1 enclosures have the rugged construction and weather proof protection required for most outdoor environments. These enclosures will effectively protect the gen-set through high wind (200 MPH), rain, snow, and other extreme weather conditions. Weather proof enclosures feature standard hinged lockable doors, a pitched roof to prevent water accumulation and improved structural integrity. The enclosure is painted with extreme-wear UL and CSA listed hammer powder coat finish.



Level 2

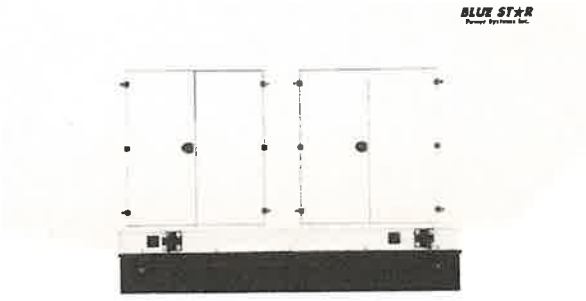
Weather Proof Enclosure with Foam

Blue Star Power Systems, Inc. Level 2 enclosures include all of the same great features of the Level 1 enclosures, and include even more. With the addition of high performance 1.5" Type D Sound Attenuating Foam, our Level 2 Enclosures offer an even lower dBA rating with the same great weather proof protection.

Level 3

Sound Attenuated Enclosure

Blue Star Power Systems, Inc. Level 3 enclosures feature the same great weather proof protection and standard features as the Level 1 & 2 enclosure models, but with a greater emphasis on reducing sound levels. Standard Level 3 features include the same high performance 1.5" type D sound attenuating foam, and also feature the addition of a separate frontal exhaust sound chamber and dual rear air intake to ensure that your system runs exceptionally quiet. These features make this enclosure among the best in the industry for noise reduction and quality.



Sound Attenuation Foam

BLUE STAR Power Systems Inc.

Polydamp® Type D Acoustical Foam, (PAF) is an acoustical grade, open cell, flexible ether based urethane foam designed to give maximum sound absorption for a given thickness. It has excellent resistance to heat, moisture and chemicals. All applications use 1.5" foam as standard.

Foam Characteristics

Sound Absorption: Nominal values of random incidence sound absorption coefficient per ASTM C384-77 for Plain/Tuffylm

Foam Thickness	125	250	500	1000	2000	4000
(1.5 in) 38.1 mm	15/20	27/49	60/96	77/93	90/82	98/67
(2.0 in) 50.8 mm	20/30	40/66	90/98	100/96	96/85	100/75

	Test Standard	U.S. Standard
Density, Nominal: (lb/ft3-kg/m3)	ASTM-D-3574-91	1.85
Tensile Strength: (PSI-KPa)	ASTM-D-3574-91	12
Elongation, %	ASTM-D-3574-91	120
Tear Resistance: (lb/in - N/M)	ASTM-D-3574-91	1.3
IFD: (PSI - KN/M2)	ASTM-D-3574-91	30
Compression Set (50%): %	ASTM-D-3574-91	10
Air Permeability (Tested at 1" thickness): (Rayles/M)	ASTM C-522	
Thermal Conductivity		
(BTU/hr. ft2, °F/in.)	ASTM C-177	0.25

Service Temperature

Continuous	-45°F (-43°C) TO 212°F (100°C)
Intermittent	250°F (121°C)

Flame Resistance

UL94	HF-1
FAR.853(B)	PASS
SAEJ-369(B)	PASS
MVSS-302	PASS
DIN	PASS

Humidity Resistance

Excellent; no significant decrease in tensile strength or elongation after 5 hrs. of steam autoclave at 250°F (121°C) per ASTM D3574-86, Test J.

Chemical Resistance

Excellent - no significant change in strength after 4 weeks immersion in common solvents, alkalies, acids, and water.

Estimated Service Life:

Min. 10 years at 80F (27°C) and 95% R.H.

Adhesive Characteristics

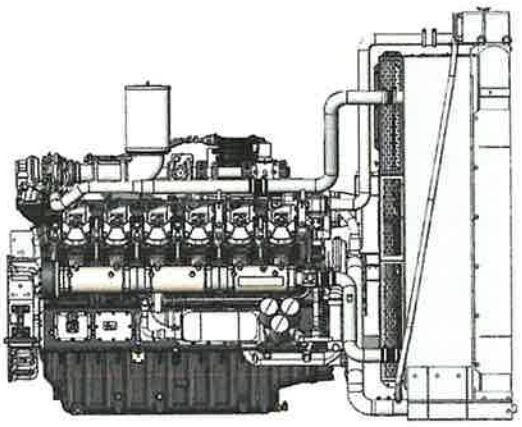
P4 is a high performance unsupported acrylic pressure sensitive adhesive exhibiting aggressive tack, high peel and shear, and good heat resistance. In addition, it has good chemical and plasticizer resistance as well as excellent long term aging and the ability to withstand environmental extremes.

Adhesive Thickness (Nominal)	0.004"
Color of Adhesive	Water Clear
Release Liner	76 lb Polycoated bleached kraft paper
Service Temperature	-40°F +200°F

Radiators

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. radiators offer a variety of styles and configurations including radiator and charged air assemblies, radiator and aftercooler assemblies with durable core construction. Our radiators are compact and efficient meeting the most stringent enclosure footprint requirements. All radiators are sized for 50°C (122°F) ambient. The single-source design ensures a perfect match with your generator set package.



Radiator Features

Standard Radiator Package

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Complete cooling package with mounting foot and plumbing kit
- All steel construction of top and bottom tanks
- Dual Core designs -
    - Jacket Water / Charged Air Circuit
    - Jacket Water / After Cooler Circuit
- Individual radiators designed to meet manufacturer's specific requirements
- Top tank has built in expansion capacity - no need for an external recover tank
- Full or partial deration system built into the top tank
- Standard cooling package includes fan shroud & fan guard
- Corrosion preventive options:
    - Hot dipped galvanizing on all steel parts or stainless steel
    - Epoxy coated cores

Fan-On Radiator Design

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Rigid built construction for fan support
- High speed bearings within pillow blocks
- Dual Core designs with variable jacket water / after cooler circuit designs
- All steel construction of top and bottom tanks
- Individual radiators designed to meet manufacturer's specific requirements

Circuit Breakers

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. MC (Molded Case) Series Circuit Breakers are the highest quality in the industry. They will protect the power system and corresponding equipment from damaging fault currents circuits and overloads.

80% Rated Circuit Breakers

80% rated breakers can only be applied continuously at 80% of the rated breaker. Tripping of the circuit breaker if the current goes above 80% will depend on the amount of current and the duration.

100% Rated Circuit Breakers

100% rated breakers can be applied at 100% of their current rating continuously.

Accessories

Shunt Trip - Provides a means of tripping the circuit breaker from a remote source by energizing a solenoid in the breaker. This can be achieved through the panel faults such as engine shutdowns, overcurrent, etc. The circuit breaker will have to be reset locally in the event of a tripped breaker.

Bell Alarm / Alarm Switch - Provides remote indication of whether the circuit breaker is in a tripped position. The bell alarm will remain unchanged during on-off operations and during operation by the Push-to-Trip button on the circuit breaker.

Auxiliary Switch/Contacts - Provides remote indication of whether the circuit breaker is in an open or closed state.

Ground Fault Indication/Alarm - Adjustable relay that indicates a ground fault condition with adjustable time delay.

Trip Unit

LI Breakers - Includes adjustable Long-Time pickup and delay and adjustable Instantaneous pickup.
LSI Breakers - Includes features of LI Breakers with addition of Short-Time pickup and delay.

Breaker Model	Amperage	Percentage Rated	Maximum Voltage Rating (AC)	UL Listed Interrupting Rating (kA)			Lug Qty. and Size (Cu & Al)
				240	480	600	
H-Frame	15-150	80% or 100%	600	25	18	14	(1) #14-3/0
Q-Frame	70-250	80%	240	10	-	-	(1) #4-300 kcmil
J-Frame	150-175	80% or 100%	600	25	18	14	(1) #4-4/0
	200-250						(1) 3/0-350 kcmil
L-Frame	125-400	80% or 100%	600	65	35	18	(2) 2/0-500 kcmil
	200-600	80%	600				
M-Frame	300-800	80%	600	65	35	18	(3) 3/0-500 kcmil

Breaker Model	Frame Size	Percentage Rated	Maximum Voltage Rating (AC)	UL Listed Interrupting Rating (kA)			Lug Qty. and Size (Cu & Al)
				240	480	600	
P-Frame	600	80% or 100%	600	65	35	18	(3) 3/0-500 kcmil
	800						
	1000						(4) 3/0-500 kcmil
	1200						
R-Frame (LSI Standard)	1600	100%	600	65	35	18	(12) 3/0-750 kcmil
	2000						(15) 3/0-750 kcmil
	2500						(18) 3/0-750 kcmil
	3000						(21) 3/0-750 kcmil

TPS Series Block Heaters

BLUE STAR
Power Systems Inc.

The TPS engine block heater is designed to preheat diesel and gaseous engines. It is simple to install, lightweight, and heats engines up to 12L displacement. Thermosiphon circulation of the coolant delivers even heat throughout the entire engine block.

Features

- cULus Listed
- CE Compliant
- Various temperature settings available, including an optional adjustable thermostat 90° - 130°F (32° - 54°C)
- Can be supplied with UL marked 120 or 240V NEMA plug

Specifications

Part Number	Volts	Watts	Amps	Male Plug	Outlet Size (Inches)
13224	120	500	4.2	Yes	5/8
14209	240	500	2.1	Yes	5/8
10014	120	1000	8.4	Yes	5/8
10015	240	1000	4.2	Yes	5/8
10016	120	1500	12.5	Yes	5/8
10017	240	1500	6.3	Yes	5/8
10018	120	1800	15	Yes	5/8
10019	240	2000	8.3	Yes	5/8

Single Stage Air Cleaner

BLUE STAR
Power Systems Inc.

Single Stage Air Cleaners are tough, non-metallic, lightweight, self-supporting and completely disposable. They are also easy to install, durable, and reliable. They are designed to function well under high and severe pulsation conditions found in many applications. Vibration-resistant media is potted into molded housings of rugged ABS plastic – so they don't fall apart as other designs might. They can be mounted vertically or horizontally.

Specifications

- No serviceable parts - Air cleaner housing and filter are one unit
- Designed to withstand severe intake pulsation
- Economical replacement cost
- Self-supporting, sturdy
- Very reliable: only one critical seal
- Lightweight and compact in size
- Non-metallic, non-corrosive
- Completely disposable - acceptable for normal trash pick-up (should not be incinerated)
- Easily installed and maintained
- Minimal removal clearance needed: only 1.5"
- Three airflow styles available to fit virtually any engine intake configuration
- Various media available for specific generator set applications: high pulsation, high humidity, etc.
- Temperature tolerance: 180°F/83°C continuous 220°F/105°C intermittent

CPJ Series Critical Grade Silencers

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. "CPJ" Series is the accumulation of research and development offering a compact silencer without compromising performance. It incorporates a unique combination of resonator chambers, acoustically packed internal components and diffusers to achieve a stunning level of performance for its size. All CPJ series silencers are critical grade silencers and are packed with insulation to greatly reduce radiated noise and exterior shell temperature.

Standard Construction Features

- Available in sizes from 2 inch to 12 inch
- Multitude of inlet/outlet design styles to meet almost any requirement
- Packed with fiberglass insulation to reduce shell temperature and noise levels
- Fully welded double shell carbon steel weldment construction, corrosive resistant
- High density fiberglass acoustic blanket good to 1500°F, wrapped with 304 Stainless Steel wire mesh cloth and encased in a carbon steel perforated facing
- Black phenolic resin based finish paint

Optional Construction Features and Accessories

- Stainless Steel construction
- Aluminum construction
- Aluminized Steel construction
- Vertical mounting legs
- Round mounting bands
- Horizontal mounting saddles
- Horizontal and vertical shell lugs
- Special finish per specification
- Air leak test
- ASME code construction
- Oversized flanges
- Acoustic shell lagging
- High temperature acoustic pack material
- Contact factory for additional features to meet your requirements

Model #	Part #	Outlet Size	Flanged Connection	WT (lbs)
CPJS-02	10660	2.0" OD	No	12
CPJS-25	10661	2.5" OD	No	18
CPJS-03	10662	3.0" OD	No	20
CPJS-35	10663	3.5" OD	No	30
CPJS-04	10664	4.0" OD	No	31
CPJS-05	10665	5.0" OD	No	50
CPJS-06	10666	6.0" OD	Yes	50
CPJS-08	10667	8.0" OD	Yes	120
CPJS-10	10668	10.0" OD	Yes	180

Industrial Batteries

BLUE STAR
Power Systems Inc.

Engine Starting Batteries

Blistering heat and bitter cold are ruthless battery killers. That's why Blue Star Power Systems, Inc. utilizes a pioneered climatized battery. Designed to offer you long-life and high-performance starting power that will get your gen-set running even under extreme conditions. Blue Star Power Systems, Inc. "all-climate" batteries stand up to the harshest temperatures and are available in sizes and configurations to fit almost any application.

Standard Features

- Unique Manifold Vent - Virtually eliminates corrosion by venting gases away from terminals and cables
- Exclusive TRP™ Construction – Rib reinforced TRP™ container significantly improves the vibration and impact resistance
- Armored Plate Cell Bonding - Vibration is the number one killer of commercial batteries. To solve this problem, the cells of every battery are bonded
- Polyethylene Enveloped Separator Design – Super tough polyethylene material reduces electrical resistance and provides higher cranking performance
- Center Lug Design - Suppresses the vibration inherent in traditional construction for improved performance (where applicable)
- TTP™ - Through-the-Partition inter-cell connectors create a shorter current path to deliver more power to the terminals
- Heavy Duty Cases - Reinforced polyethylene or hard rubber cases stand up to the demands of standby gen-sets
- Convenient Lifting Slots - a handle is built in the top of the battery for easy carrying and transportation
- Protective Bottom Design - Waffled bottom design provides protection against nuts, bolts, or stones that might become lodged under the battery
- Computer Designed Radical Grids - An improved state-of-the-art design which adds power and resists vibration
- Threaded Accessory Ports - Features a sealed "O" ring that does not work loose during severe service (78DT only)

Specifications

	NEMA Type			Dimensions (Inches)			
BCI Group Size	Part Number	CCA at 0°F	CCA at 32°F	Length	Width	Height	Weight (lbs.)
78DT	78DT-HD	800	960	10-11/16	7-1/16	8-1/8	54
4D	4D-HD	1000	1200	19-9/16	8-5/16	10	95
8D	8D-HD	1300	1560	20-3/4	11	10	117

BC1206A Series Battery Chargers

BLUE STAR Power Systems Inc.

The BC1206A charger is built to stand up to the punishing power generation environment. It is engineered to exacting performance specifications, including cULus listing for an extra margin of safety.

Features

- Automatic 12V 6A, 2-Stage charge rate
- UL 1236 listed
- Watertight, shock proof and corrosion proof
- LED status indicators
- Reverse polarity protected
- Short circuit protected
- EMI/RFI Shielded

Specifications

Specifications

Output Voltage:	12VDC

Input Rating

Input Voltage Range:	100 - 130VAC
Input Current Rating:	1.6A maximum

Float - Maintenance Stage

Float Voltage:	13.3VDC
Float Current:	0.1 A
LED Status:	Green LED On

Full Load - Bulk Stage

Full Load Voltage:	12.0 - 14.1VDC
Full Load Current:	0.2 - 6.0A
LED Status:	Red LED On

Reverse Polarity Protection

Available as Standard:	Yes

Short Circuit / Overload Protection

Maximum Short Circuit Current:	8A (typical)
Current Limit:	7A (+/- 10%)

Operating Temperature Range

Minimum Temperature:	-20° C
Maximum Temperature:	50° C

Agency Certification

This product is listed under UL 1236 for battery chargers.

Warranty

Warranty Period:	1 Year

Weight

3.5 Pounds

Sub-Base Fuel Tanks

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. sub-base fuel tanks are listed and manufactured under UL 142 & ULC-S601 standards for steel above ground tanks, which guarantees that every fuel tank meets the structural and mechanical integrity requirements for mounting a generator set directly on top of the tank. This provides a convenient, efficient, and safe way to store fuel for your generator set.

Sub-Base Fuel Tank Standard Features

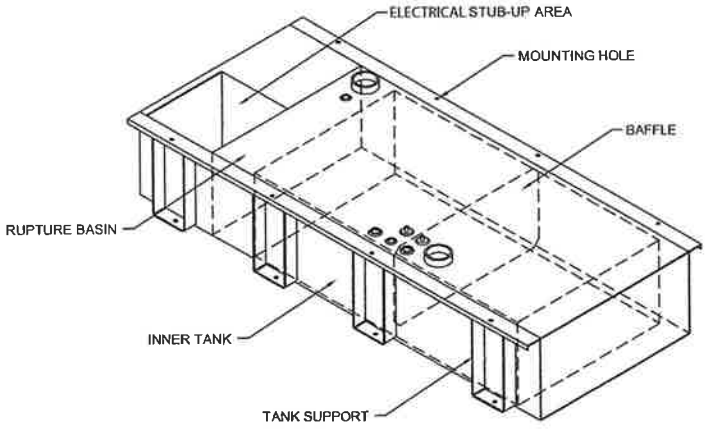
- Double walled secondary containment UL 142 & ULC-S601 Listed
- Electrical stub-up openings are standard to provide generator set wiring provisions through the base tank
- Heavy gauge steel construction
- Diamond Vogel Nexgen Technology Paint or Cardinal Industrial Hammer Textured Semi-Gloss Polyester Powder Coat
- Standard fittings: fuel supply with check valve (sized per unit), fuel return (sized per unit), 2" NPT for normal vent, 2" - 6" NPT for emergency vent (sized per unit), 2" NPT for manual fill, 1 1/2" NPT for fuel level gauge, and 3/8" NPT basin drain (plugged). Removable 1/2" supply dip tube standard (size may vary with gen-set model). 1 1/2" NPT for leak detection
- Interior tank baffle: Separates cold engine supply fuel from hot returning fuel
- Direct reading fuel level gauge
- Low fuel level and fuel leak alarms

Design Options

- High and critical low fuel level shutdowns or alarms
- Full pumping control systems for a true day tank system with a full array of electrical options
- Additional Tank Fittings
- Custom Fuel Tank Designs (sizes and shapes)
- Fuel Heater
- Fill / Spill Containment

Blue Star Power Systems, Inc. offers two distinctive types of double wall sub-base fuel tanks, those with an electrical stub up area (standard) and those without. Each type can be customized to any specification to meet your specific requirements.

UL 142 & ULC-S601 double wall secondary containment sub-base fuel tank with stub-up.



Factory Load Test

BLUE STAR
Power Systems Inc.

Blue Star Power Systems, Inc. factory testing is performed with the same extreme diligence and attention to detail that is given to the prototype testing process. Every engine generator set receives a complete factory load test that certifies and ensures that the set will function in accordance to every specific application. Test metering will have an accuracy of 1.3% or better. This metering equipment is calibrated annually, and is directly traceable to the National Institution of Standards & Technology (NIST). All test procedures are conducted in accordance with MIL-STD-705C where applicable.

Factory Acceptance Testing Procedures

- Insulation Resistance Test (301.1c)*
- High Potential Test (302.1b)*
- Alternator Over Speed
- Complete Engine Inspection
- Generator Inspection
  - Winding Resistance Test (401.1b)
  - Exciter Field Stator
  - Main Field Stator
- Mounting & Coupling Inspection
- Engine Fuel System Inspection
- Engine Lube Oil System Inspection
- Engine Cooling System Inspection
- DC Charging System Inspection
- Main Output Circuit Breaker Inspection

* Performed By Alternator OEM

- Anticipatory Alarms and Shutdowns Test (505.2b, 515.1b, 515.2b)
- Optional Equipment Inspection (513.2a)
- Load Test (640.1d
  - Regulator Range Test (511.1d)
  - No Load
  - MAX Load © 1.0 P.F. (640.2d)
  - MAX Load @ 0.8 P.F.
  - Block Loads @ 0-25%, 0-50%, 0-75%, 0-100% of rated load tests (640.2d)
- 1.0 Power Factor Max Load
- 1.0 Power Factor Max Block Load Pickup
- Full Name Plate Rated Load.
- Standard Readings Taken Every 5 Minutes.

Standard Reading Recorded During Load Test Inspection

Run Time	**AC Frequency**
AC Voltage	**Exciter Field Voltage**
AC Amperage	**Exciter Field Current**
kVA	**Lube Oil Pressure**
kWe	**Engine Coolant Temp.**
Power Factor	**Ambient Temp.**

Factory Load Test Summary

All engine generator sets are visually inspected prior to testing. This includes a complete visual/mechanical inspection to ensure that all fasteners and electrical connections are secure, that all rotating components are free of obstruction/ interference and are properly guarded.

Once the unit is started, the AC voltage and frequency are set to rated values. The unit is operated at no load while all of the safety shutdowns and warnings are verified and tested. The unit is then restarted and run at 25%, 50% and 100% of rated load and power factor until the engine temperature has stabilized for at least ten minutes. During the rated and maximum load pickup portion of the test, the voltage regulator gain, stability and under frequency compensation adjustments are set for optimal performance. All test procedures are performed in accordance with MIL-STD-705C where applicable.

Throughout these test procedures the AC parameters, engine oil pressure, engine temperature, exhaust temperature, timing and air/fuel ratio (gaseous units) are monitored and recorded. The unit and all installed accessory equipment are continually examined for oil and coolant leaks, excessive vibration and foreign noises.

Once all test procedures are performed and recorded, the unit is allowed a cool down period prior to being shut down. The unit is once again inspected for leaks, loose fasteners and connections prior to leaving the test facility.

The unit receives another complete final inspection process prior to packaging and shipment.

Note: All units are tested after the painting process is complete to prevent unforeseen difficulties resulting from the painting process being performed after testing.

Witnessed Factory Load Test

Standard witnessed factory load testing must be scheduled and approved at least four weeks prior to the engine generator sets scheduled shipping date. Any requests for witnessed factory load testing after this four week period may incur additional charges.

Witnessed Extended Run Factory Load Test

Witnessed extended run factory load testing must be scheduled and approved at the time of order placement. Any requests for witnessed extended run factory load testing after this time could be denied and would if approved incur additional cost.

All units are built and tested to cUL, CSA and NFPA 110 standards.

Engine Generator Set Two (2) Year 2000 Hour Standby Limited Warranty

BLUE STAR
Power Systems Inc.

Your Blue Star Power Systems, Inc. product has been designed and manufactured with care by people with many years of experience. Blue Star Power Systems, Inc. warrants to its buyer that the product is free from defects in materials and/or workmanship for the period of time outlined below. If the product should prove defective within the time period outlined below, it will be repaired, adjusted or replaced at the option of Blue Star Power Systems, Inc., provided that the product, upon inspection by Blue Star Power Systems, Inc., has been properly installed, maintained and operated in accordance with Blue Star Power Systems, Inc.'s Generator Set Installation Guide and Operating Instructions. This limited warranty is not valid or enforceable unless: (1) all supporting maintenance records are kept on file with the end user and made available upon request from factory, and (2) the generator set is routinely exercised in accordance with operating instructions. This warranty does not apply to malfunctions caused by physical damage, misuse, improper installation, repair or service by unauthorized persons, or normal wear and tear. The warranty is not assignable.

Blue Star Power Systems, Inc. product warranty period: Engine generator set: Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first). Accessories (installed on the engine generator set or shipped loose): Parts and Labor for one (1) year from the date of factory invoice or 2000 hours (whichever occurs first). Transfer Switches: If purchased with a generator set (same order number): Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first).

The start of the warranty period can be adjusted to the date of unit start-up (limited to 180 days from invoice date) provided that the following information is provided to Blue Star Power Systems, Inc. within 30 days of start-up. The warranty will not be effective unless a copy of the Blue Star Power Systems, Inc. Start-Up Instructions & Warranty Validation form is properly filled out and returned to Blue Star Power Systems, Inc. within 30 days of start-up. If the Start-Up Instructions & Warranty Validation Form is received after 365 days (1 year) from invoicing date, all unit warranties will be void. Additionally, the engine manufacturer's engine registration form must be completed and returned to the engine manufacturer as stated in the instructions with the registration form.

To obtain warranty service: Contact your nearest Blue Star Power Systems, Inc. Service Representative. For assistance in locating your nearest authorized service representative, contact Blue Star Power Systems, Inc, at warranty@bluestarps.com.

Warranty service may be performed by authorized Blue Star Power Systems, Inc. service providers only. Service work performed by unauthorized persons will void all warranties and not be paid.

Blue Star Power Systems, Inc. shall not be liable for any claim in amount greater than the purchase price of the product. In no event shall Blue Star Power Systems, Inc. be held liable for any special, indirect, consequential or liquidated damages including but not limited to: loss of profits, loss of time, increased overhead, delays, loss of business opportunity, good will, or any commercial or economic loss.

Blue Star Power Systems, Inc. shall not be liable for any claim that requires replacement of engine, part, or component of the gen-set that is no longer manufactured or available. Additionally, Blue Star Power Systems, Inc. will not be liable for any engine replacement that may require emissions tier level change.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE DESCRIBED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, OR WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

The following items and/or circumstances are excluded from this limited warranty:

- Improper installation or operation as outlined in the Generator Set Installation Guide and Operating Instructions.
- Misapplication and misuse of the equipment outside the original design parameters as stated on the nameplate of the equipment.
- Equipment purchased at the standby rating that is being used in a prime power application(s).
- Failure to properly exercise and maintain your equipment per manufacturer's specifications will void all warranty.
- Any equipment or components adding including fuel tanks and enclosures not installed at the Blue Star Power Systems, Inc. factory.
- Equipment modifications made without the written consent of Blue Star Power Systems, Inc. will void all warranty.
- Damages caused by acts of nature, such as lightning, wind, flood, or earthquake.
- Any damage due to situations beyond the control of the manufacturing and/or workmanship of the product.
- Engine starting batteries: The battery manufacturers' warranty applies. Consult your local battery supplier for warranty service.
- Fuel system and/or governing system adjustments performed during or after start-up.
- Normal maintenance items and consumable items such as belts, filters, fluids, and hoses.
- Adjustments and tune–ups performed during start-up or thereafter. Start-up, training, tuning, and adjustments for any paralleling or bi-fuel system.
- Loose connections (electrical and mechanical) before and after unit start-up. Including fittings, connectors, clamps and fasteners.
- Diesel engine "Wet Stacking" due to lightly loaded diesel engines. Regeneration issues, aftertreatment exhaust systems, including DEF related issues.
- All fluid level related items found before, during, or after unit start up.
- Use of steel enclosure within 25 miles of the coast.
- Requested rental generators used while warranty work is being performed.
- Charges, fees, and site delays due to a replacement components availability with the product manufacturer.
- Any labor charges deemed excessive by Blue Star Power Systems, Inc. factory or component manufacturer.
- Travel labor and mileage for mobile generator sets.
- Additional trips to the site due to a service vehicle was not stocked with normal service parts.
- Any special access fees, equipment, requirements or after hours scheduling to gain access to the equipment for warranty service purposes.
- Lodging expense associated with unit repair and excessive mileage charges (limit to 300 miles and 6 hours travel round trip from nearest service center).
- Shipping damage of any type. All equipment is shipped F.O.B. Blue Star Power Systems, Inc. and risk of loss transfers to the carrier once loaded for shipment. It is the responsibility of the receiving party to sign for the receipt of and note any shipping damage to the equipment. Freight damage claim filing is the responsibility of the receiving party. In the rare event that damage occurs resulting from shrink wrap during shipment, Blue Star Power Systems, Inc. will not warrant any damage to the unit.

This agreement is deemed made and executed in North Mankato, Nicollet County, Minnesota and shall be construed and interpreted in accordance with the laws of the state of Minnesota without giving effect to its conflicts of laws principals. Each of the parties submits to the exclusive personal jurisdiction and venue with respect to any action or proceeding arising out of, in connection with, relating to, or by reason of this agreement before the district court of the state of Minnesota, located in Nicollet County and agrees that all claims in respect of the action or proceeding may be heard and determined in any such court.