



County of Roanoke

FINANCE DEPARTMENT PURCHASING DIVISION

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February 26, 2018

RFQ #2018- 035 Generator Installation

ADDENDUM NO. 3

Questions

Due Date & Time:
March 5, 2018 12:00PM
(Local Prevailing Time)

RFQ #2018- 035
Generator Installation

1. Weight on the generator?

Answer: See attachment

2. Fuel capacity of the generator, assuming the contractor is responsible for the initial fueling.

Answer: See attachment

3. It appears the ATS is included with the equipment procured by the County. Can data consisting of dimensions, weights, conduit entry, etc. be provided?

Answer: See attachment

4. Also, if the fuel polisher is being furnished with the generator, can data be provided for it as well?

Answer: See attachment

5. Since this is a County project, will permit fees be waived?

Answer: Fees are not waived

6. It seems to me the concrete pad for the generator is not of sufficient thickness to safely set the generator and 2600 gallons of fuel. However, I am not a structural engineer. Can this be verified as structurally sound?

Answer: Yes, the concrete pad thickness is sufficient

7. Specification page calls for all outdoor conduit to be rigid steel. Can PVC conduit be used underground, especially in the duct bank?

Answer: Yes

8. Obviously this project will require power outages. What is the longest time and what restrictions will be placed on outages? Is the center a twenty-four hour facility?

Answer: See question No. 11

9. Can you verify the equipment being supplied by the owner? And its estimated delivery?

Answer: See attachment. Estimated delivery is the first week of May 2018

10. Can you publish a sign-in sheet of those attending the walk-thru?

Answer: This was a non-mandatory meeting. No Sign-In sheet available.

11. Adjustments to Liquidated Damages and Dates to be aware of.

Answer:

- a. Green Ridge wishes to have generator installed and connected before May 18th when Splash Valley Water Park starts operation.
- b. Generator site work will interfere with customer usage of the fenced in exercise area next to the generator installation site. Green Ridge would prefer that no heavy equipment work or testing of the generator take place while customers are using the exercise area. Light duty work that does not pose a risk to customers such as wiring, minor adjustments etc. are acceptable as long as contractor takes necessary precautions to ensure customer safety and minimize noise.
- c. The fenced in exercise area called the "TRX" is scheduled to be used from 3 pm - 5 pm on the following dates in March: 14th, 16th, 19th, 21st, 23rd. Starting the first Tuesday in April and continuing thru the summer, the TRX is scheduled to be used from 5 pm - 8 pm on Tues and Thur and 8 am -11 am Sat.
- d. If contractor gives a 14 day lead time, the TRX schedule can be interrupted if needed. Green Ridge would prefer a 30 day lead time to inform customers of changes in schedule but considering potential changes due to weather, supplies etc., and 14 calendar days is acceptable
- e. As of today, the generator is not scheduled to arrive until week of April 30 - May 4th. Green Ridge understands that this date may change.
- f. Contractor is responsible for coordinating with generator supplier to develop firm delivery date.
- g. Preference is that generator be installed on the new pad the same day it is delivered to the site avoiding need to store on site.
- h. With that said, the contractor will have three (3) potential weeks to shut down facility power for one (1) day to make installation. Those are: The week of April 30th - May 4th, the week of May 7th- May 11th or week of May 14th-May 17th.
- i. To avoid incurring liquidated damages, the Contractor will need to inform Green Ridge of selected date of facility shutdown and generator installation at a

minimum of 14 calendar days before installation date to allow Green Ridge time to inform customers of change. Again, 30 day lead time would be preferred and appreciated.



Submittal Data For:

Caterpillar Model C27, 750 KW Enclosed Diesel
Generator Set with (2600) Gallon
Sub-base Fuel Tank and (2000AMP) Service Entrance
Rated Transfer Switch

Greenridge Recreation Center – Roanoke, VA

Customer: County of Roanoke Virginia

Project Number: 17-232MO

Date: January 12, 2018

Power Systems Sales Representative:
Terry Kelley

Power Systems Project Manager:
Michael Olszewski

971 Russell Dr.
Salem, VA 24153

Office: (540) 682-2007
Toll Free: (800) 228-7971

Carter**LET'S GET
TO WORK.**

Carter Machinery Company, Inc.
10990 Air Park Road Ashland, VA 23005

Phone (804) 823-1179 Fax (804) 752-2812

Project: Green Ridge Rec Center NJPA Contract Number #080613-CAT Member # 50460

GENERATOR SUBMITTAL BILL OF MATERIALS

One (1) Caterpillar Diesel Packaged Generator Set Model C 27, EPA Tier 2 Emissions Certified with Brushless Generator, UL 2200 Listed, 750KW Standby Rated, 277/480 Volt, 3 Phase, 60 Hertz at 1800 RPM complete with the following attachments and accessories:

LEVEL 2 SOUND ATTENUATED WEATHERPROOF ENCLOSURE

Sound Attenuated, Insulated 75dbA @ 23'
Critical Grade Internal Silencer
UL142 Base Fuel Tank 2,600 Gallons (48 hour at full load run time)
100A Load Center w/Branch Breaker, Accessories wired to panel 150
GPH Installed Fuel polishing System internal to enclosure

GENERATOR

Oversize Alternator, 125degree C Temperature Rise
Drip proof generator air intake (NEMA 2, IP23)
Permanent Magnet Excitation, Anti Condensation Strip Heater
Electrical design in accordance with BS5000 Part 99, EN61000-6, IEC60034-1,
NEMA MG-1.33

GENERATOR SET

Complete system designed and built at ISO 9001 certified facilities
Factory tested to design specifications at full load conditions Spring
Vibration Isolators

ENGINE

Governor, Charging Alternator Electrical
system, 24 VDC, HD Starter Heavy Duty
Air Cleaner
Cartridge type filters
HD Battery, Racks and cables
Coolant and lube drains piped to edge of base

COOLING SYSTEM

Radiator and cooling fan complete with protective guards
Jacket Water Coolant Heater

CIRCUIT BREAKER

One (1) 1,200amp LSIG
One (1) 400amp secondary breaker w/ adjustable trip for Fire Pump
UL/CSA listed , 3-pole with solid neutral
NEMA 1 steel enclosure, vibration isolated Electrical
stub-up area directly below circuit breaker

DIGITAL VOLTAGE REGULATOR

Voltage within $\pm 0.5\%$ at steady state from no load to full load

Provides fast recovery from transient load changes

LEAD ACID BATTERY. BATTERY CHARGER

Heavy Duty Set

Float Equalize, 10 amp, Mounted

EMCP 4.2B Digital Generator Control Panel

Panel construction and finish: Components installed in a heavy duty sheet steel enclosure

Phosphate chemical pre-coating of steel provides corrosion resistant surface

Polyester composite powder topcoat forms high gloss and extremely durable finish

Mounting: Mounted to generating set baseframe on robust steel stand Vibration isolated from generating set

Instrumentation: LCD Display with adjustable contrast and backlight with auto power off

AC metering: Volts 3-phase (L-L & L-N); Amps (per phase & average); Frequency; kW (total & per phase);

kVA (total & per phase); kVAr (total & per phase); Power Factor (overall & per phase); kW hours; kVAr hours

DC metering: Battery Volts; Engine Hours run; Engine Jacket Water Temperature (in $^{\circ}\text{C}$ or $^{\circ}\text{F}$);

Lube Oil Pressure (in psi, kPa or bar); Engine Speed (rpm); Crank attempt counter;

Start counter

Protection: Fail to start shutdown

Low oil pressure shutdown

High engine temperature

Approaching high coolant temperature alarm

Approaching low oil pressure alarm

Not in auto mode alarm

Under-speed / Over-speed

Loss of Engine Speed Detection

Low / High battery voltage Battery

charger failure (if fitted) Under

volts, Over volts

Under frequency, Over frequency

Overcurrent

4 spare fault channels

20 Event fault log (name of event, engine hours at first occurrence of event, time stamp at first occurrence, engine hours at latest occurrence of event, time stamp at latest occurrence, number of occurrences of event)

Volts adjust potentiometer Panel

Mounted Audible alarm

Controls: 2 LED status indicators (1 red shutdown, 1 amber warning)

Run key and LED indicator

Auto key and LED indicator

Stop key and LED indicator

Lamp test key

Alarm acknowledge key

Menu navigation keys

Engine and AC metering shortcut keys

All control module keys have tactile feedback

Lock down emergency stop push button

Languages: English

Other features: Real time clock

Service interval counter

CAN 2 accessory data link – for additional modules: remote annunciator, discrete input/output module
Ethernet Telemetry

AUTOMATIC TRANSFER SWITCH

One (1) ASCO

480V, 3 Pole, NEMA 2000 AMP, Open Transition, SE Rated, NEMA 3R

ANNUNCIATOR

Local Annunciator per NFPA 110

One (1) Remote Annunciator per NFPA 110 shipped loose **supports the generator and ATS in a single annunciator as specified**

WARRANTY

Four (4) Year Warranty Caterpillar Parts and Service per NJPA Contract

TESTING

Factory: Standard Tests with Rated Load w/Certified Test Report including 0.8pf

On-Site: Site Load Startup Service Procedures Performed During Our Normal Business

Hours (No Fuel Included) including load bank testing 4 hours

Owner Personnel Training, Operations and Maintenance manuals

IMPORTANT – Generator Control Wiring

To be executed by Contractor and/or end user prior to on-site generator commissioning.

Control Wiring Recommendations as Follows for: Greenridge 750 KW

Generator Model/Control Panel:	C27/EMCP4.2B
Generator Annunciator	EMCP4 RS-485
ATS Model:	ASCO SE Rated
Generator control panel to ATS:	(4) #12 stranded wires.
Generator Control Panel to Generator Annunciator:	(4) #12 stranded plus (1) shielded Belden data cable (see below)
Required Belden Data Cable:	Belden # 9365

Power Requirements: Supply voltage shall be 100 AMP, 120/240V pulled to the Square D panel inside the customer generator enclosure.

THE ABOVE WIRING REQUIREMENTS HAVE BEEN MET FOR THIS PROJECT.

CONTRACTOR: _____

BY: _____ DATE: _____



Image shown may not reflect actual configuration

Bore – mm (in)	137.2 (5.4)
Stroke – mm (in)	152.4 (6.0)
Displacement – L (in ³)	27.03 (1649.47)
Compression Ratio	16.5:1
Aspiration	TA
Fuel System	MEUI
Governor Type	ADEM™ A4

Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Emissions Performance
750 (937)	680 (850)	800 (1000)	725 (906)	U.S. EPA Emergency Stationary Use Only (Tier 2)

Standard Features

Cat® Diesel Engine

- Meets U.S. EPA Emergency Stationary Use Only (Tier 2) emission standards
- Reliable performance proven in thousands of applications worldwide

Generator Set Package

- Accepts 100% block load in one step and meets other NFPA 110 loading requirements
- Conforms to ISO 8528-5 G3 load acceptance requirements
- Reliability verified through torsional vibration, fuel consumption, oil consumption, transient performance, and endurance testing

Alternators

- Superior motor starting capability minimizes need for oversizing generator
- Designed to match performance and output characteristics of Cat diesel engines

Cooling System

- Cooling systems available to operate in ambient temperatures up to 50°C (122°F)
- Tested to ensure proper generator set cooling

EMCP 4 Control Panels

- User-friendly interface and navigation
- Scalable system to meet a wide range of installation requirements
- Expansion modules and site specific programming for specific customer requirements

Warranty

- 24 months/1000-hour warranty for standby and mission critical ratings
- 12 months/unlimited hour warranty for prime and continuous ratings
- Extended service protection is available to provide extended coverage options

Worldwide Product Support

- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- Your local Cat dealer provides extensive post-sale support, including maintenance and repair agreements

Financing

- Caterpillar offers an array of financial products to help you succeed through financial service excellence
- Options include loans, finance lease, operating lease, working capital, and revolving line of credit
- Contact your local Cat dealer for availability in your region

Optional Equipment

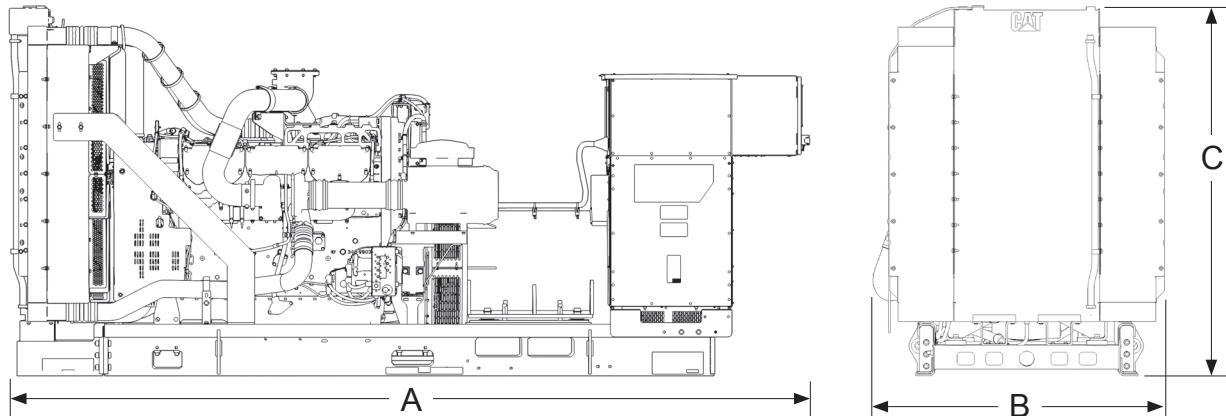
Engine	Power Termination	Charging
Air Cleaner		
<input type="checkbox"/> Single element		
<input checked="" type="checkbox"/> Dual element		
<input type="checkbox"/> Heavy duty		
Starting		
<input type="checkbox"/> Standard batteries		
<input checked="" type="checkbox"/> Oversized batteries		
<input checked="" type="checkbox"/> Standard electric starter(s)		
<input checked="" type="checkbox"/> Jacket water		
Alternator		
Output voltage		
<input type="checkbox"/> 208V		
<input type="checkbox"/> 240V		
<input checked="" type="checkbox"/> 480V		
<input type="checkbox"/> 600V		
Temperature Rise (over 40°C ambient)		
<input type="checkbox"/> 150°C		
<input checked="" type="checkbox"/> 125°C		
<input type="checkbox"/> 105°C		
<input type="checkbox"/> 80°C		
Winding type		
<input type="checkbox"/> Random wound		
Excitation		
<input type="checkbox"/> Internal excitation (IE)		
Attachments		
<input type="checkbox"/> Anti-condensation heater		
<input type="checkbox"/> Stator and bearing temperature monitoring and protection		
	Type	
	<input type="checkbox"/> Bus bar	
	<input checked="" type="checkbox"/> Circuit breaker	
	<input checked="" type="checkbox"/> 400A	<input type="checkbox"/> 800A
	<input checked="" type="checkbox"/> 1200A	<input type="checkbox"/> 1600A
	<input type="checkbox"/> 2000A	<input type="checkbox"/> 2500A
	<input type="checkbox"/> 3000A	
	<input checked="" type="checkbox"/> UL	<input type="checkbox"/> IEC
	<input type="checkbox"/> 3-pole	<input type="checkbox"/> 4-pole
	<input checked="" type="checkbox"/> Manually operated	
	<input type="checkbox"/> Electrically operated	
	Trip Unit	
	<input checked="" type="checkbox"/> LSI	<input checked="" type="checkbox"/> LSI-G
	<input type="checkbox"/> LSIG-P	
	Factory Enclosure	
	<input type="checkbox"/> Sound attenuated	
	Attachments	
	<input type="checkbox"/> Cold weather bundle	
	<input type="checkbox"/> DC lighting package	
	<input type="checkbox"/> Motorized louvers	
	Fuel Tank	
	<input type="checkbox"/> 1000 gal (3785 L)	
	<input type="checkbox"/> 2000 gal (7571 L)	
	<input type="checkbox"/> 3600 gal (13627 L)	
	Control System	
	Controller	
	<input checked="" type="checkbox"/> EMCP 4.2B	
	<input type="checkbox"/> EMCP 4.3	
	<input type="checkbox"/> EMCP 4.4	
	Attachments	
	<input checked="" type="checkbox"/> Local annunciator module	
	<input type="checkbox"/> Remote annunciator module	
	<input type="checkbox"/> Expansion I/O module	
	<input type="checkbox"/> Remote monitoring software	
		Charging
		<input checked="" type="checkbox"/> Battery charger – 10A
		<input type="checkbox"/> Battery charger – 20A
		<input type="checkbox"/> Battery charger – 30A
		Vibration Isolators
		<input type="checkbox"/> Rubber
		<input checked="" type="checkbox"/> Spring
		<input checked="" type="checkbox"/> Seismic rated
		Cat Connect
		Connectivity
		<input type="checkbox"/> Ethernet
		<input type="checkbox"/> Cellular
		<input type="checkbox"/> Satellite
		Extended Service Options
		Terms
		<input type="checkbox"/> 2 year (prime)
		<input type="checkbox"/> 3 year
		<input type="checkbox"/> 5 year
		<input type="checkbox"/> 10 year
		Coverage
		<input type="checkbox"/> Silver
		<input type="checkbox"/> Gold
		<input checked="" type="checkbox"/> Platinum
		<input type="checkbox"/> Platinum Plus
		Ancillary Equipment
		<input checked="" type="checkbox"/> Automatic transfer switch (ATS)
		<input type="checkbox"/> Uninterruptible power supply (UPS)
		<input type="checkbox"/> Paralleling switchgear
		<input type="checkbox"/> Paralleling controls
		Certifications
		<input checked="" type="checkbox"/> UL2200
		<input type="checkbox"/> IBC seismic certification
		<input type="checkbox"/> OSHPD pre-approval
		<input type="checkbox"/> EU Certification of Conformance (CE)
		<input type="checkbox"/> EEC Declaration of Conformity

Note: Some options may not be available on all models. Certifications may not be available with all model configurations. Consult factory for availability.

Package Performance

Performance	Standby	Prime	Standby	Prime
Frequency	60 Hz	60 Hz	60 Hz	60 Hz
Gen set power rating with fan	750 ekW	680 ekW	800 ekW	725 ekW
Gen set power rating with fan @ 0.8 power factor	937 kVA	850 kVA	1000 kVA	906 kVA
Emissions	EPA ESE (Tier 2)			
Performance number	DM9071-03	DM9073-02	DM7696-02	DM9069-02
Fuel Consumption	Standby	Prime	Standby	Prime
100% load with fan – L/hr (gal/hr)	202.9 (53.6)	187.4 (49.5)	216.9 (57.3)	199.6 (52.7)
75% load with fan – L/hr (gal/hr)	162.4 (42.9)	149.6 (39.5)	171.7 (45.4)	157.8 (41.7)
50% load with fan – L/hr (gal/hr)	116.2 (30.7)	107.0 (28.3)	122.3 (32.3)	112.5 (29.7)
25% load with fan – L/hr (gal/hr)	70.6 (18.7)	66.0 (17.4)	73.9 (19.5)	69.0 (18.2)
Cooling System	Standby	Prime	Standby	Prime
Radiator air flow restriction (system) – kPa (in. water)	0.12 (0.48)	0.12 (0.48)	0.12 (0.48)	0.12 (0.48)
Radiator air flow – m ³ /min (cfm)	1200 (42377)	1200 (42377)	1200 (42377)	1200 (42377)
Engine coolant capacity – L (gal)	55.0 (14.5)	55.0 (14.5)	55.0 (14.5)	55.0 (14.5)
Radiator coolant capacity – L (gal)	41.0 (10.0)	41.0 (10.0)	41.0 (10.0)	41.0 (10.0)
Total coolant capacity – L (gal)	96 (24.5)	96 (24.5)	96 (24.5)	96 (24.5)
Inlet Air	Standby	Prime	Standby	Prime
Combustion air inlet flow rate – m ³ /min (cfm)	58.7 (2073.6)	56.0 (1977.7)	62.8 (2216.4)	60.3 (2129.4)
Exhaust System	Standby	Prime	Standby	Prime
Exhaust stack gas temperature – °C (°F)	509.3 (948.7)	502.5 (936.5)	511.4 (952.5)	500.6 (933.0)
Exhaust gas flow rate – m ³ /min (cfm)	158.9 (5610.2)	149.7 (5285.5)	170.3 (6011.7)	160.7 (5674.4)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7 (27.0)	6.7 (27.0)	6.7 (27.0)	6.7 (27.0)
Heat Rejection	Standby	Prime	Standby	Prime
Heat rejection to jacket water – kW (Btu/min)	324 (18441)	307 (17433)	330 (18785)	320 (18191)
Heat rejection to exhaust (total) – kW (Btu/min)	738 (41994)	693 (39387)	796 (45257)	741 (42135)
Heat rejection to aftercooler – kW (Btu/min)	139 (7898)	123 (6970)	162 (9235)	146 (8320)
Heat rejection to atmosphere from engine – kW (Btu/min)	110 (6249)	92 (5238)	110 (6240)	89 (5074)
Heat rejection from alternator – kW (Btu/min)	53 (3014)	47 (2644)	40 (2292)	37 (2081)
Emissions (Nominal)	Standby	Prime	Standby	Prime
NOx mg/Nm ³ (g/hp-h)	2637.1 (5.25)	2330.9 (4.68)	2580.0 (5.18)	2283.7 (4.61)
CO mg/Nm ³ (g/hp-h)	123.9 (0.25)	147.4 (0.29)	115.1 (0.23)	135.6 (0.27)
HC mg/Nm ³ (g/hp-h)	11.2 (0.03)	10.9 (0.02)	12.5 (0.03)	12.2 (0.03)
PM mg/Nm ³ (g/hp-h)	8.8 (0.02)	8.8 (0.02)	9.7 (0.02)	9.0 (0.02)

Weights and Dimensions



Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
4674 (184.0)	1723 (67.8)	2162 (85.1)	6622 (14,600)

Note: For reference only. Do not use for installation design. Contact your local Cat dealer for precise weights and dimensions.

Ratings Definitions

Standby

Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Prime

Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated kW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

Applicable Codes and Standards

AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2014/35/EU, 2006/42/EC, 2014/30/EU.

Note: Codes may not be available in all model configurations. Please consult your local Cat dealer for availability.

Data Center Applications

Tier III/Tier IV compliant per Uptime Institute requirements. ANSI/TIA-942 compliant for Rated-1 through Rated-4 data centers.

Fuel Rates

Fuel rates are based on fuel oil of 35° API [16°C (60°F)] gravity having an LHV of 42,780 kJ/kg (18,390 Btu/lb) when used at 29°C (85°F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.)

GENERATOR DATA**JANUARY 12, 2018**For Help Desk Phone Numbers [Click here](#)**Selected Model**

Engine: C27	Generator Frame: 1296	Genset Rating (kW): 750.0	Line Voltage: 480
Fuel: Diesel	Generator Arrangement: 3850654	Genset Rating (kVA): 937.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 1127.0
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 41205 /41383 /41513 /10134

Spec Information

Generator Specification		Generator Efficiency		
Frame: 1296	Type: SR5	No. of Bearings: 1	Per Unit Load	kW
Winding Type: RANDOM WOUND		Flywheel: 18.0	0.25	187.5
Connection: PARALLEL STAR		Housing: 0	0.5	375.0
Phases: 3		No. of Leads: 12	0.75	562.5
Poles: 4		Wires per Lead: 2	1.0	750.0
Sync Speed: 1800		Generator Pitch: 0.6667		93.4

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X_d''	0.1265	0.0311
SUBTRANSIENT - QUADRATURE AXIS X_q''	0.1416	0.0348
TRANSIENT - SATURATED X_d'	0.1579	0.0388
SYNCHRONOUS - DIRECT AXIS X_d	3.2275	0.7932
SYNCHRONOUS - QUADRATURE AXIS X_q	1.9364	0.4759
NEGATIVE SEQUENCE X_2	0.1343	0.0330
ZERO SEQUENCE X_0	0.0098	0.0024

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T_{d0}'	2.0450
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T_d'	0.1000
OPEN CIRCUIT SUBTRANSIENT - DIRECT AXIS T_{d0}''	0.0130
SHORT CIRCUIT SUBTRANSIENT - DIRECT AXIS T_d''	0.0100
OPEN CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T_{q0}''	0.1370
SHORT CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T_q''	0.0100
EXCITER TIME CONSTANT T_e	0.0300
ARMATURE SHORT CIRCUIT T_a	0.0150

Short Circuit Ratio: 0.41	Stator Resistance = 0.0072 Ohms	Field Resistance = 0.386 Ohms
---------------------------	---------------------------------	-------------------------------

Voltage Regulation		Generator Excitation			
Voltage level adjustment: +/-	5.0%	No Load	Full Load, (rated) pf		
Voltage regulation, steady state: +/-	0.5%	Series	Parallel		
Voltage regulation with 3% speed change: +/-	0.5%	Excitation voltage:	11.61 Volts	49.69 Volts	Volts
Waveform deviation line - line, no load: less than	2.0%	Excitation current:	0.97 Amps	3.41 Amps	Amps
Telephone influence factor: less than	50				

Selected Model

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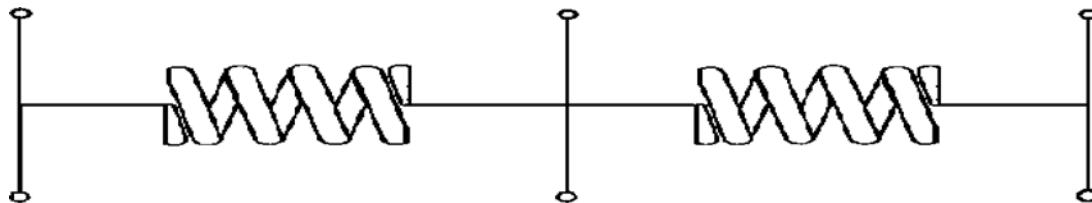
Generator Mechanical Information**Center of Gravity**

Dimension X	-670.0 mm	-26.4 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 1665 kg * Rotor WT = 620 kg * Stator WT = 1045 kg
 3,671 LB 1,367 LB 2,304 LB

Rotor Balance = 0.0508 mm deflection PTP
 Overspeed Capacity = 125% of synchronous speed

Generator Torsional Data

**J1 = Coupling
and Fan**

J2 = Rotor
TOTAL J = J1 + J2 + J3

**J3 = Exciter
End**

**K1 = Shaft Stiffness between
J1 + J2 (Diameter 1)**

**K2 = Shaft Stiffness between
J2 + J3 (Diameter 2)**

J1	K1	Min Shaft Dia 1	J2	K2	Min Shaft Dia 2	J3
9.9 LB IN. s ²	72.3 MLB IN./rad	5.7 IN.	78.9 LB IN. s ²	71.2 MLB IN./rad	5.5 IN.	3.3 LB IN. s ²
1.12 N m s ²	8.17 MN m/rad	145.0 mm	8.92 N m s ²	8.05 MN m/rad	140.0 mm	0.37 N m s ²

Total J

92.1 LB IN. s²

10.41 N m s²

Selected Model

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Fuel: Diesel	Generator Arrangement: 3850654	Genset Rating (kVA): 937.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 1127.0
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 41205 /41383 /41513 /10134

Generator Cooling Requirements - Temperature - Insulation Data					
Cooling Requirements:	Temperature Data: (Ambient 40 $^{\circ}\text{C}$)				
Heat Dissipated: 53.0 kW	Stator Rise:	125.0 $^{\circ}\text{C}$			
Air Flow: 66.0 m^3/min	Rotor Rise:	125.0 $^{\circ}\text{C}$			
Insulation Class: H					
Insulation Reg. as shipped: 100.0 $\text{M}\Omega$ minimum at 40 $^{\circ}\text{C}$					
Thermal Limits of Generator					
Frequency: 60 Hz					
Line to Line Voltage: 480 Volts					
B BR 80/40	808.0 kVA				
F BR -105/40	894.0 kVA				
H BR - 125/40	970.0 kVA				
F PR - 130/40	970.0 kVA				
H PR - 150/40	1017.0 kVA				
H PR27 - 163/27	1050.5 kVA				

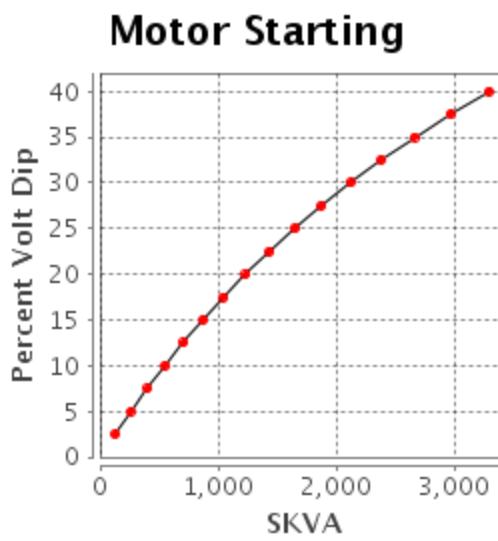
Selected Model

Engine: C27 **Generator Frame:** 1296 **Genset Rating (kW):** 750.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 3850654 **Genset Rating (kVA):** 937.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.8 **Rated Current:** 1127.0
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 41205 /41383 /41513 /10134

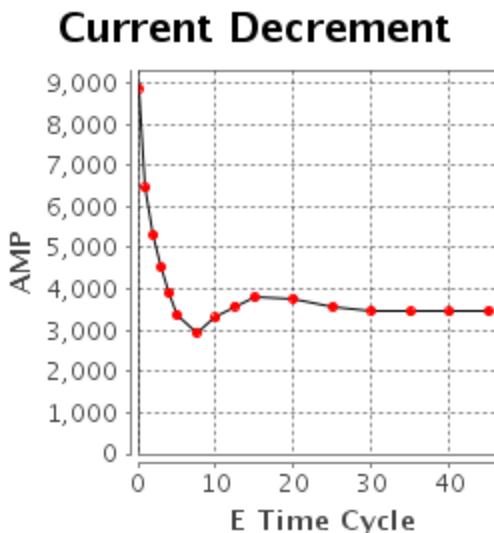
Starting Capability & Current Decrement
Motor Starting Capability (0.4 pf)

SKVA	Percent Volt Dip
127	2.5
260	5.0
401	7.5
549	10.0
706	12.5
872	15.0
1,048	17.5
1,235	20.0
1,434	22.5
1,647	25.0
1,874	27.5
2,117	30.0
2,379	32.5
2,660	35.0
2,964	37.5
3,294	40.0



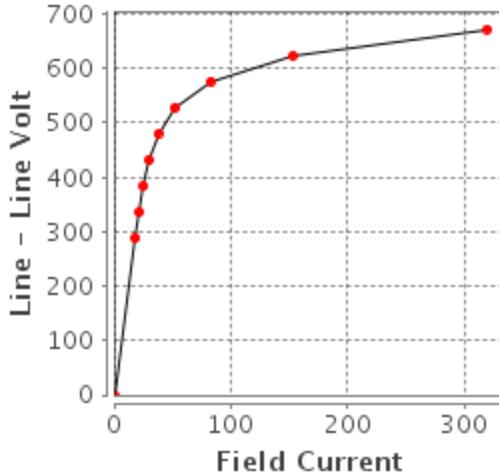
Current Decrement Data

E Time Cycle	AMP
0.0	8,876
1.0	6,458
2.0	5,318
3.0	4,532
4.0	3,900
5.0	3,372
7.5	2,950
10.0	3,303
12.5	3,591
15.0	3,807
20.0	3,771
25.0	3,573
30.0	3,476
35.0	3,450
40.0	3,453
45.0	3,465

**Instantaneous 3 Phase Fault Current:** 8876 Amps**Instantaneous Line - Line Fault Current:** 7461 Amps**Instantaneous Line - Neutral Fault Current:** 12456 Amps**Selected Model**

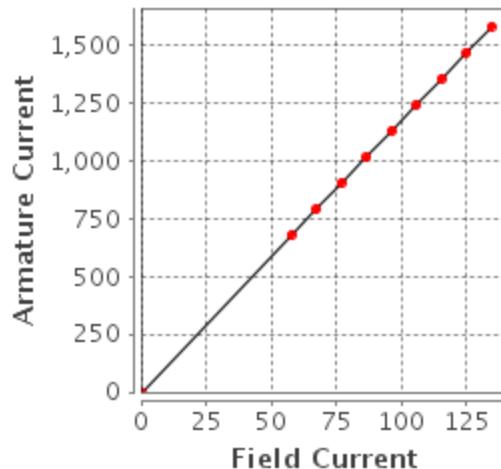
Engine: C27	Generator Frame: 1296	Genset Rating (kW): 750.0	Line Voltage: 480
Fuel: Diesel	Generator Arrangement: 3850654	Genset Rating (kVA): 937.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 1127.0
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 41205 /41383 /41513 /10134

Generator Output Characteristic Curves
Open Circuit Curve**Open Circuit**

Short Circuit Curve**Short Circuit**

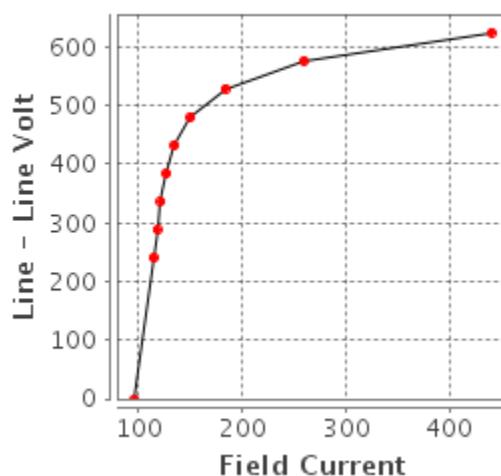
Field Current	Armature Current
0.0	0
57.6	677
67.2	789
76.8	902
86.4	1,015
96.1	1,128
105.7	1,240
115.3	1,353
124.9	1,466
134.5	1,579

**Selected Model****Engine:** C27**Generator Frame:** 1296**Genset Rating (kW):** 750.0 **Line Voltage:** 480**Fuel:** Diesel**Generator Arrangement:** 3850654**Genset Rating (kVA):** 937.0 **Phase Voltage:** 277**Frequency:** 60**Excitation Type:** Permanent Magnet**Pwr. Factor:** 0.8**Rated Current:** 1127.0**Duty:** STANDBY**Connection:** PARALLEL STAR**Application:** EPG**Status:** Current

Version: 41205 /41383 /41513 /10134

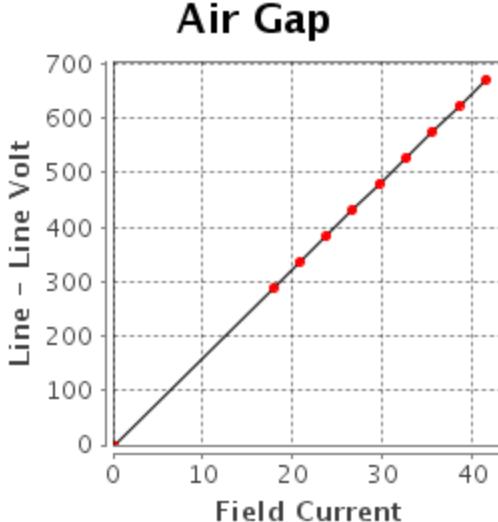
Generator Output Characteristic Curves
Zero Power Factor Curve**Zero Power**

Field Current	Line - Line Volt
96.1	0
114.1	240
117.5	288
121.3	336
126.4	384
134.5	432
150.0	480
183.2	528
259.4	576
439.9	624



Air Gap Curve

Field Current	Line - Line Volt
0.0	0
17.8	288
20.7	336
23.7	384
26.6	432
29.6	480
32.6	528
35.5	576
38.5	624
41.5	672

**Selected Model**

Engine: C27	Generator Frame: 1296	Genset Rating (kW): 750.0	Line Voltage: 480
Fuel: Diesel	Generator Arrangement: 3850654	Genset Rating (kVA): 937.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 1127.0
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 41205 /41383 /41513 /10134

Reactive Capability Curve[Click to view Chart](#)**Selected Model**

Engine: C27	Generator Frame: 1296	Genset Rating (kW): 750.0	Line Voltage: 480
Fuel: Diesel	Generator Arrangement: 3850654	Genset Rating (kVA): 937.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 1127.0
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 41205 /41383 /41513 /10134

General Information

DM7825 Caterpillar SR5 Generators (50 Hz, 60 Hz)
 Data for 1400, 1600, 1700, 1800 and 1900 frames Caterpillar SR5
 generators built by Leroy Somer - USA and Leroy Somer → France.

Refer to DM7821 for explanation of all generator data in Technical
 Marketing Information (TMI) except generator efficiency for which the
 explanation is given below.

GENERATOR EFFICIENCY

Generator efficiency is the percentage of engine flywheel (or other
 prime mover) power that is converted into electrical output. The
 generator efficiency shown is calculated by the summation of all
 losses method, and is determined in accordance with the IEC Standard
 60034. The efficiency considers only the generator. There is no
 consideration of engine or parasitic losses here.

Refer to DM7829 for low and medium voltage protective setting values a
 nd limits.

PERFORMANCE DATA[DM9071]

January 12, 2018

Performance Number: DM9071

Change Level: 03

SALES MODEL:	C27	COMBUSTION:	DI
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
ENGINE POWER (BHP):	1,141	HERTZ:	60
GEN POWER WITH FAN (EKW):	750.0	FAN POWER (HP):	37.5
COMPRESSION RATIO:	16.5	ADDITIONAL PARASITICS (HP):	52.7
RATING LEVEL:	STANDBY	ASPIRATION:	TA
PUMP QUANTITY:	1	AFTERCOOLER TYPE:	ATAAC
FUEL TYPE:	DIESEL	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
MANIFOLD TYPE:	DRY	INLET MANIFOLD AIR TEMP (F):	120
GOVERNOR TYPE:	ADEM4	JACKET WATER TEMP (F):	210.2
ELECTRONICS TYPE:	ADEM4	TURBO CONFIGURATION:	PARALLEL
IGNITION TYPE:	CI	TURBO QUANTITY:	2
INJECTOR TYPE:	EUI	TURBOCHARGER MODEL:	GTA5008BS-56T-1.60
REF EXH STACK DIAMETER (IN):	10	CERTIFICATION YEAR:	2006
MAX OPERATING ALTITUDE (FT):	10,000	PISTON SPD @ RATED ENG SPD (FT/MIN):	1,800.0

INDUSTRY	SUBINDUSTRY	APPLICATION
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (VFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
750.0	100	1,141	305	0.329	53.6	52.6	120.7	1,210.7	36.7	948.7
675.0	90	1,036	276	0.333	49.3	48.2	117.3	1,184.5	33.3	935.9
600.0	80	931	248	0.339	45.0	43.6	114.3	1,157.5	30.1	920.5
562.5	75	878	234	0.342	42.9	41.2	112.8	1,143.4	28.5	911.5
525.0	70	826	220	0.344	40.6	38.3	110.7	1,127.0	26.5	902.0
450.0	60	722	193	0.346	35.7	31.9	105.8	1,084.0	22.3	877.6
375.0	50	618	165	0.348	30.7	25.3	100.8	1,028.5	18.0	845.1
300.0	40	516	138	0.350	25.8	19.1	97.6	957.6	14.1	798.9
225.0	30	413	110	0.356	21.0	13.6	95.6	866.3	10.9	731.9
187.5	25	361	96	0.361	18.7	11.0	94.8	813.1	9.5	691.2
150.0	20	309	82	0.368	16.3	8.6	94.0	754.4	8.2	645.3
75.0	10	201	54	0.403	11.6	4.9	92.4	617.0	6.1	532.3

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
750.0	100	1,141	55	340.2	2,073.6	5,610.2	8,929.7	9,304.9	1,958.6	1,773.7
675.0	90	1,036	51	321.4	1,972.9	5,269.2	8,478.1	8,823.2	1,856.4	1,685.5
600.0	80	931	46	304.2	1,874.4	4,932.9	8,053.0	8,368.4	1,757.3	1,600.2
562.5	75	878	43	295.1	1,825.8	4,766.3	7,827.5	8,127.9	1,709.1	1,558.8
525.0	70	826	40	282.3	1,763.3	4,540.6	7,544.0	7,828.2	1,639.5	1,497.3
450.0	60	722	34	253.9	1,610.3	4,039.0	6,871.8	7,121.9	1,485.0	1,359.5
375.0	50	618	27	225.6	1,444.6	3,541.1	6,147.8	6,362.8	1,334.4	1,225.1
300.0	40	516	21	197.9	1,288.0	3,054.4	5,467.1	5,647.9	1,193.2	1,099.5
225.0	30	413	15	170.0	1,143.5	2,567.6	4,844.7	4,992.1	1,059.4	981.2
187.5	25	361	12	155.9	1,073.8	2,322.4	4,546.8	4,677.5	992.1	921.8
150.0	20	309	10	141.7	1,005.3	2,074.6	4,256.4	4,370.3	923.1	860.8
75.0	10	201	6	120.2	905.7	1,659.5	3,831.9	3,913.1	822.6	775.2

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN

PERFORMANCE DATA[DM9071]

January 12, 2018

750.0	100	1,141	18,441	6,249	41,994	23,831	6,126	7,898	48,396	115,016	122,520
675.0	90	1,036	17,256	5,747	39,140	22,066	5,635	6,971	43,919	105,788	112,691
600.0	80	931	15,826	5,250	36,542	20,327	5,147	6,151	39,470	96,630	102,935
562.5	75	878	15,112	5,002	35,207	19,404	4,904	5,747	37,253	92,071	98,078
525.0	70	826	14,395	4,735	33,573	18,346	4,642	5,270	35,034	87,162	92,850
450.0	60	722	12,964	4,166	29,877	15,903	4,084	4,206	30,613	76,677	81,680
375.0	50	618	11,533	3,579	25,870	13,283	3,509	3,134	26,205	65,876	70,174
300.0	40	516	10,625	3,010	21,327	10,638	2,951	2,202	21,876	55,406	59,021
225.0	30	413	10,020	2,453	16,594	7,940	2,405	1,439	17,528	45,159	48,105
187.5	25	361	9,569	2,175	14,401	6,617	2,133	1,109	15,330	40,038	42,650
150.0	20	309	8,939	1,895	12,407	5,323	1,858	813	13,103	34,888	37,164
75.0	10	201	6,694	1,353	9,559	2,900	1,326	406	8,541	24,900	26,525

Emissions Data

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN	EKW	750.0	562.5	375.0	187.5	75.0
PERCENT LOAD	%	100	75	50	25	10
ENGINE POWER	BHP	1,141	878	618	361	201
TOTAL NOX (AS NO2)	G/HR	7,181	4,159	2,639	1,824	1,310
TOTAL CO	G/HR	520	683	655	540	554
TOTAL HC	G/HR	55	82	96	88	101
PART MATTER	G/HR	47.2	59.4	150.5	116.9	78.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,190.9	2,326.7	2,078.5	2,424.5
TOTAL CO	(CORR 5% O2)	MG/NM3	231.7	383.5	519.6	772.5
TOTAL HC	(CORR 5% O2)	MG/NM3	21.1	40.7	65.9	111.3
PART MATTER	(CORR 5% O2)	MG/NM3	17.2	27.7	103.8	128.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,554	1,133	1,012	1,181
TOTAL CO	(CORR 5% O2)	PPM	185	307	416	618
TOTAL HC	(CORR 5% O2)	PPM	39	76	123	208
TOTAL NOX (AS NO2)	G/HP-HR	6.35	4.76	4.29	5.06	6.52
TOTAL CO	G/HP-HR	0.46	0.78	1.07	1.50	2.76
TOTAL HC	G/HP-HR	0.05	0.09	0.16	0.24	0.50
PART MATTER	G/HP-HR	0.04	0.07	0.24	0.32	0.39
TOTAL NOX (AS NO2)	LB/HR	15.83	9.17	5.82	4.02	2.89
TOTAL CO	LB/HR	1.15	1.51	1.45	1.19	1.22
TOTAL HC	LB/HR	0.12	0.18	0.21	0.19	0.22
PART MATTER	LB/HR	0.10	0.13	0.33	0.26	0.17

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN	EKW	750.0	562.5	375.0	187.5	75.0
PERCENT LOAD	%	100	75	50	25	10
ENGINE POWER	BHP	1,141	878	618	361	201
TOTAL NOX (AS NO2)	G/HR	5,935	3,437	2,181	1,507	1,082
TOTAL CO	G/HR	278	365	351	289	296
TOTAL HC	G/HR	29	43	51	47	53
TOTAL CO2	KG/HR	525	419	298	180	112
PART MATTER	G/HR	24.2	30.5	77.2	59.9	40.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,637.1	1,922.9	1,717.8	2,003.7
TOTAL CO	(CORR 5% O2)	MG/NM3	123.9	205.1	277.9	413.1
TOTAL HC	(CORR 5% O2)	MG/NM3	11.2	21.5	34.9	58.9
PART MATTER	(CORR 5% O2)	MG/NM3	8.8	14.2	53.2	65.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,285	937	837	976
TOTAL CO	(CORR 5% O2)	PPM	99	164	222	330
TOTAL HC	(CORR 5% O2)	PPM	21	40	65	110
TOTAL NOX (AS NO2)	G/HP-HR	5.25	3.94	3.54	4.18	5.39
TOTAL CO	G/HP-HR	0.25	0.42	0.57	0.80	1.48
TOTAL HC	G/HP-HR	0.03	0.05	0.08	0.13	0.27
PART MATTER	G/HP-HR	0.02	0.03	0.13	0.17	0.20
TOTAL NOX (AS NO2)	LB/HR	13.08	7.58	4.81	3.32	2.39
TOTAL CO	LB/HR	0.61	0.81	0.77	0.64	0.65
TOTAL HC	LB/HR	0.06	0.10	0.11	0.10	0.12
TOTAL CO2	LB/HR	1,157	924	658	397	246
PART MATTER	LB/HR	0.05	0.07	0.17	0.13	0.09
OXYGEN IN EXH	%	8.9	10.1	11.2	13.2	15.4
DRY SMOKE OPACITY	%	0.4	1.4	2.9	4.4	3.8
BOSCH SMOKE NUMBER		0.18	0.48	1.07	1.51	1.40

Regulatory Information

2006 - 2010				
Locality U.S. (INCL CALIF)	Agency EPA	Regulation NON-ROAD	Tier/Stage TIER 2	Max Limits - G/BKW - HR CO: 3.5 NOx + HC: 6.4 PM: 0.20
2011 - -----				
Locality U.S. (INCL CALIF)	Agency EPA	Regulation STATIONARY	Tier/Stage EMERGENCY STATIONARY	Max Limits - G/BKW - HR CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)	0	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
0	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
1,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
2,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
3,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
4,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
5,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
6,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
7,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
8,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,127	1,108	1,141
9,000	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,140	1,120	1,101	1,082	1,064	1,141
10,000	1,141	1,141	1,141	1,141	1,141	1,135	1,114	1,094	1,075	1,056	1,038	1,021	1,141
11,000	1,141	1,141	1,141	1,131	1,109	1,089	1,069	1,050	1,031	1,014	996	980	1,141
12,000	1,141	1,128	1,106	1,084	1,064	1,044	1,025	1,007	989	972	956	940	1,137
13,000	1,103	1,081	1,060	1,039	1,020	1,001	983	965	948	932	916	901	1,098
14,000	1,057	1,036	1,016	996	977	959	942	925	909	893	878	863	1,060
15,000	1,012	992	973	954	936	919	902	886	870	855	841	827	1,023

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K7492	PP5659	2671232	GS327	-	MJE00001	
3704840	GG0522	3495619	GS603	LS	MJE00001	
0K4032	GG0384	3541450	GS582	-	PEN00001	
3704840	GG0522	3884919			MJE00001	

Performance Parameter Reference

Parameters Reference:DM9600-10

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION:

Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:

PERFORMANCE DATA[DM9071]

Power +/- 3%
 Torque +/- 3%
 Exhaust stack temperature +/- 8%
 Inlet airflow +/- 5%
 Intake manifold pressure-gage +/- 10%
 Exhaust flow +/- 6%
 Specific fuel consumption +/- 3%
 Fuel rate +/- 5%
 Specific DEF consumption +/- 3%
 DEF rate +/- 5%
 Heat rejection +/- 5%
 Heat rejection exhaust only +/- 10%
 Heat rejection CEM only +/- 10%
 Heat Rejection values based on using treated water.
 Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
 On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
 These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:

Heat rejection +/- 10%
 Heat rejection to Atmosphere +/- 50%
 Heat rejection to Lube Oil +/- 20%
 Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque +/- 0.5%
 Speed +/- 0.2%
 Fuel flow +/- 1.0%
 Temperature +/- 2.0 C degrees
 Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 deg C (84.2 deg F), where the density is 838.9 G/Liter (7.001 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

PERFORMANCE DATA[DM9071]

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSIONS DEFINITIONS:

Emissions : DM1176

HEAT REJECTION DEFINITIONS:

Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS:

3500: EM1500

RATING DEFINITIONS:

Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS:

Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 7/7/15



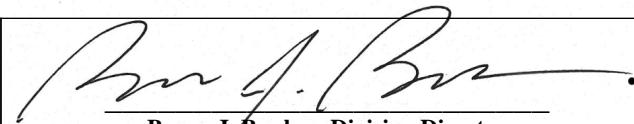
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2017 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Caterpillar Inc.
(U.S. Manufacturer or Importer)

Certificate Number: HCPXL27.0HXF-011

Effective Date:
07/29/2016
Expiration Date:
12/31/2017



Byron J. Bunker, Division Director
Compliance Division

Issue Date:
07/29/2016
Revision Date:
N/A

Model Year: 2017
Manufacturer Type: Original Engine Manufacturer
Engine Family: HCPXL27.0HXF

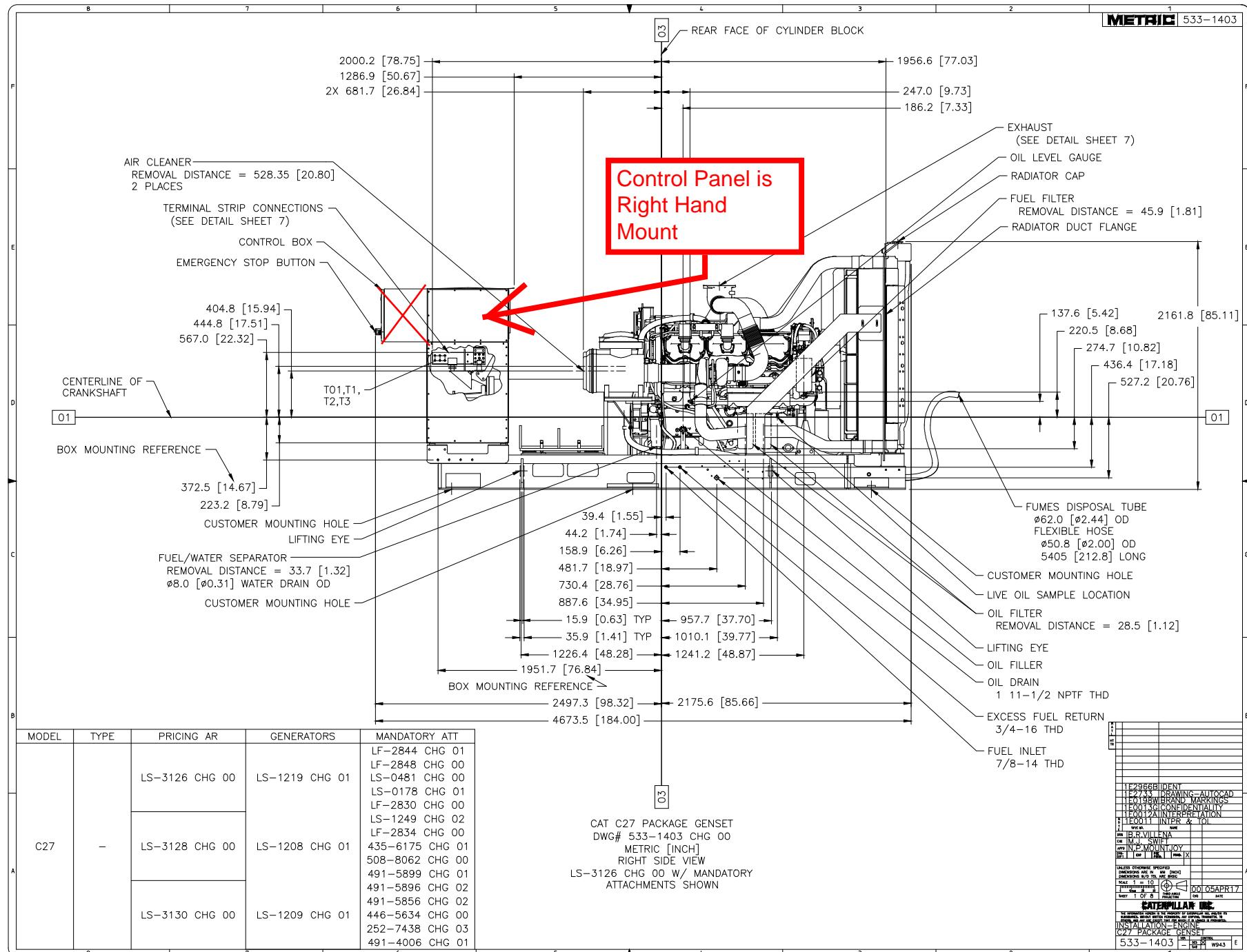
Mobile/Stationary Indicator: Both
Emissions Power Category: 560< kW <=900
Fuel Type: Diesel
After Treatment Devices: Diesel Oxidation Catalyst
Non-after Treatment Devices: Electronic Control, Electronic/Electric EGR - Cooled

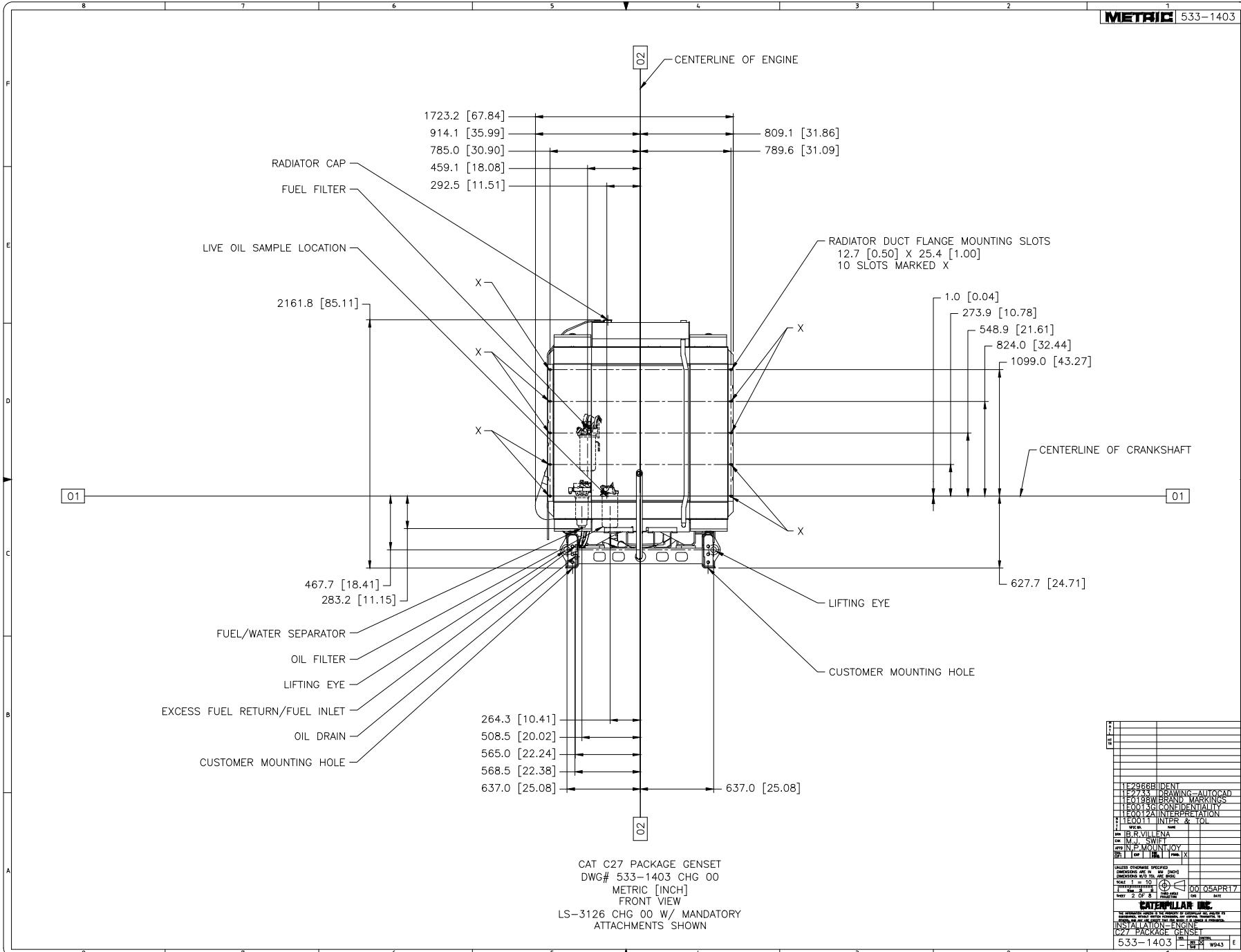
Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Parts 60 and 1039, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Parts 60 and 1039 and produced in the stated model year.

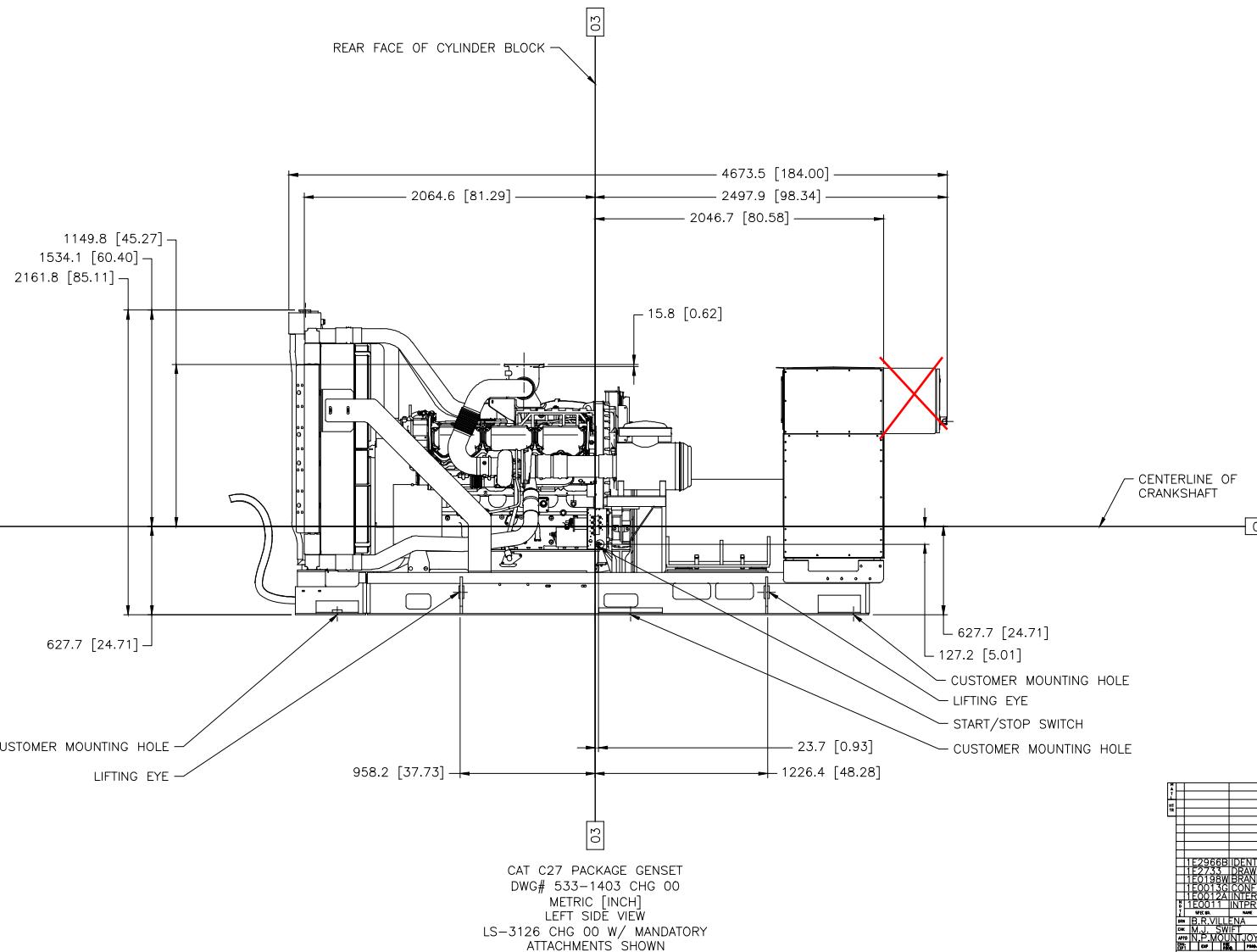
This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Parts 60 and 1039 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Parts 60 and 1039.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Parts 60 and 1039. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Parts 60 and 1039.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.



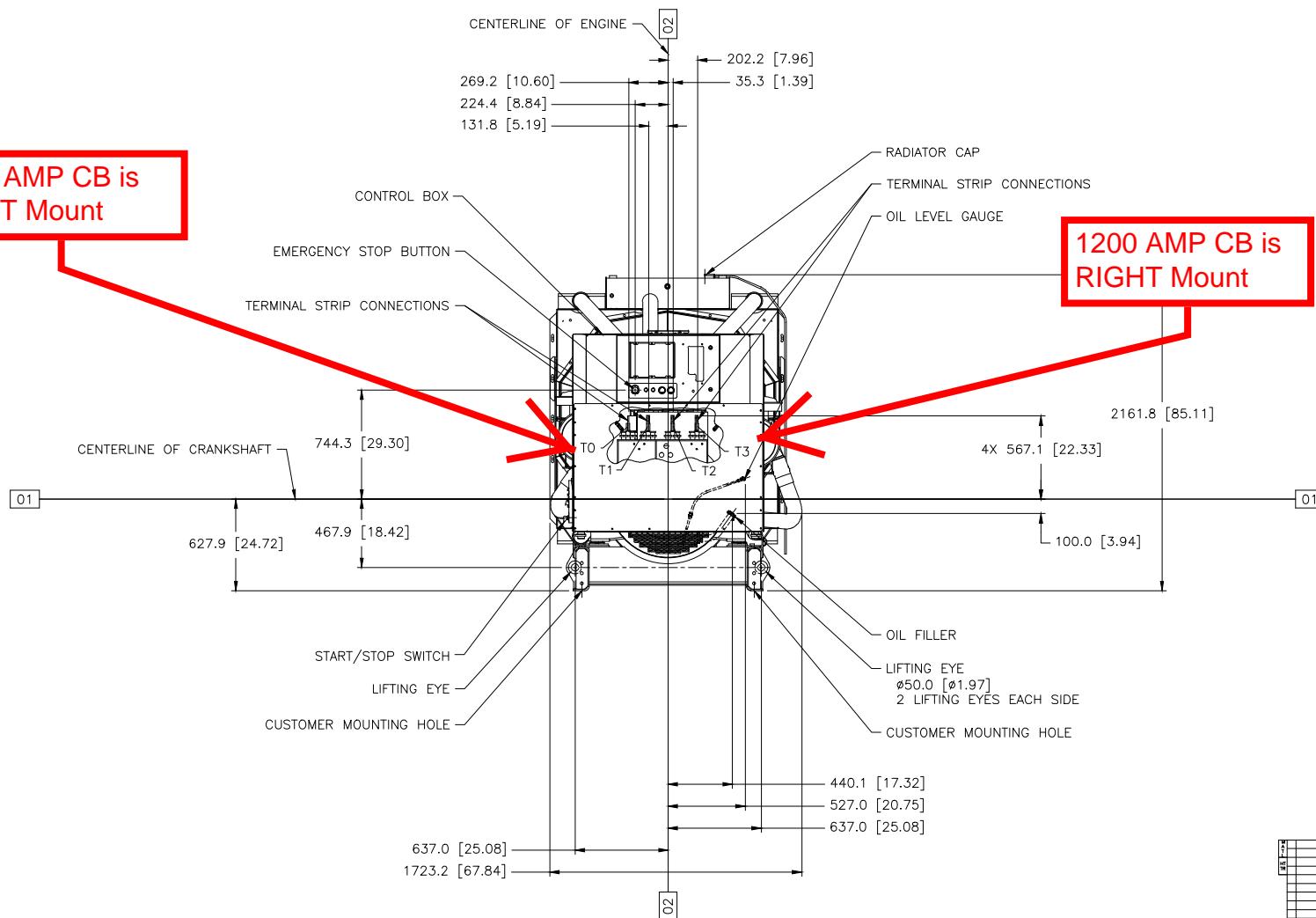




CAT C27 PACKAGE GENSET
DWG# 533-1403 CHG 00
METRIC [INCH]
LEFT SIDE VIEW
LS-3126 CHG 00 W/ MANDATORY
ATTACHMENTS SHOWN

400 AMP CB is
LEFT Mount

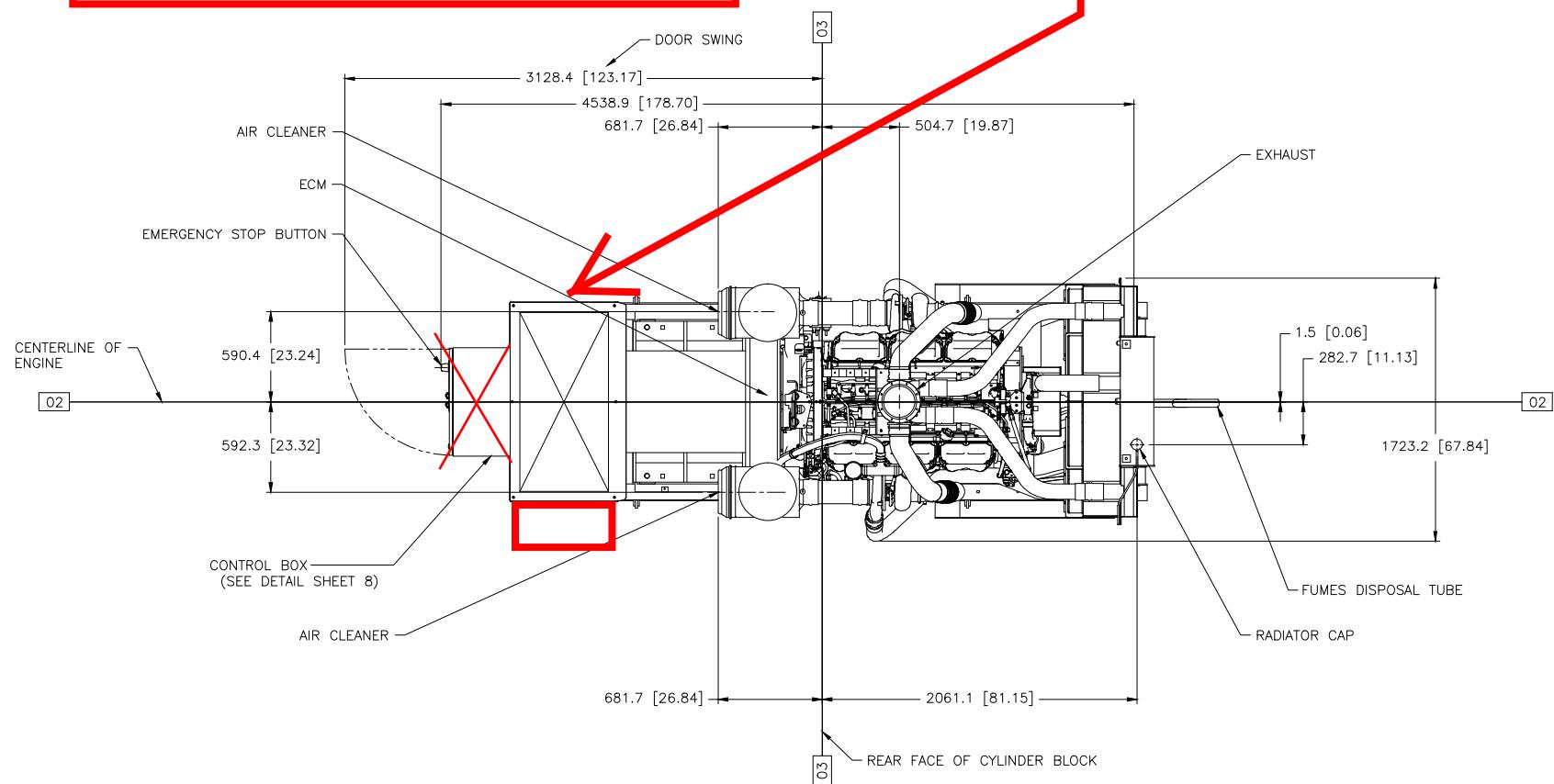
1200 AMP CB is
RIGHT Mount



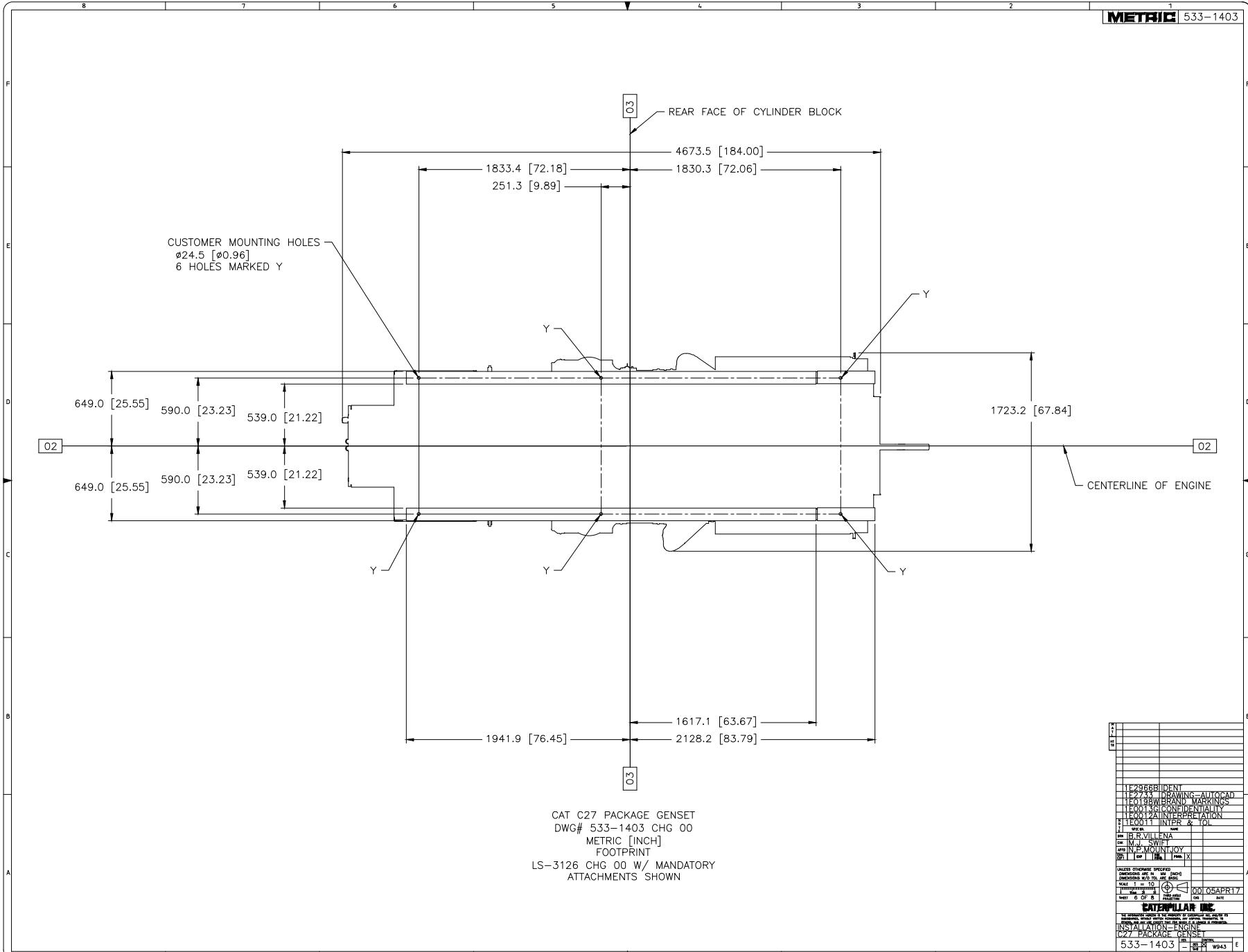
CAT C27 PACKAGE GENSET
DWG# 533-1403 CHG 00
METRIC [INCH]
REAR VIEW
LS-3126 CHG 00 W/ MANDATORY
ATTACHMENTS SHOWN

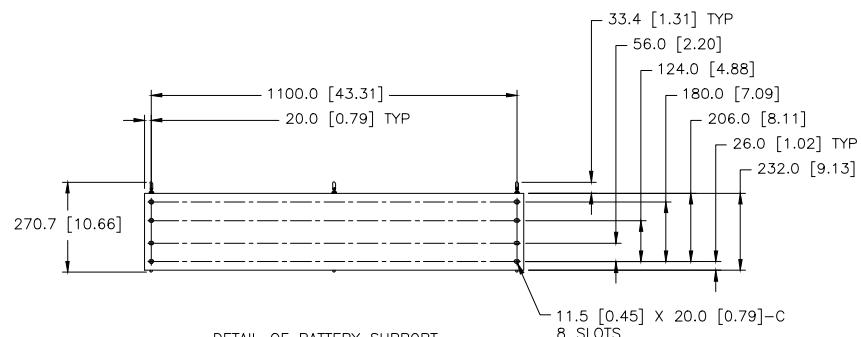
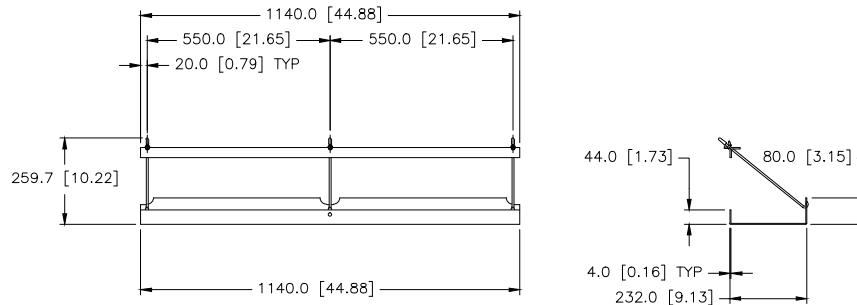
Control Panel is Right Hand Mount above 1200 AMP Breaker. 400 AMP Breaker is LEFT mount.

400A Breaker

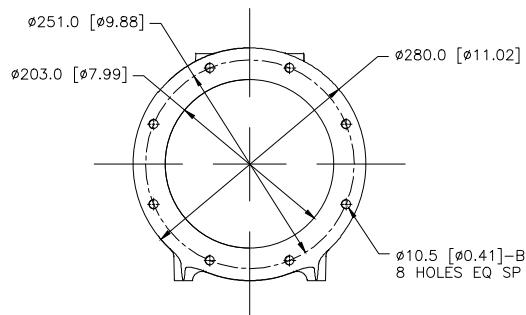


CAT C27 PACKAGE GENSET
DWG# 533-1403 CHG 00
METRIC [INCH]
TOP VIEW
LS-3126 CHG 00 W/ MANDATORY
ATTACHMENTS SHOWN

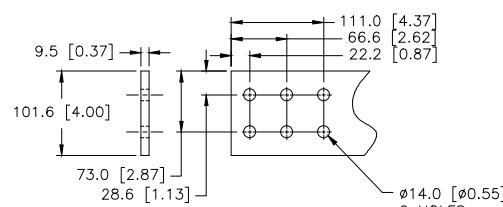




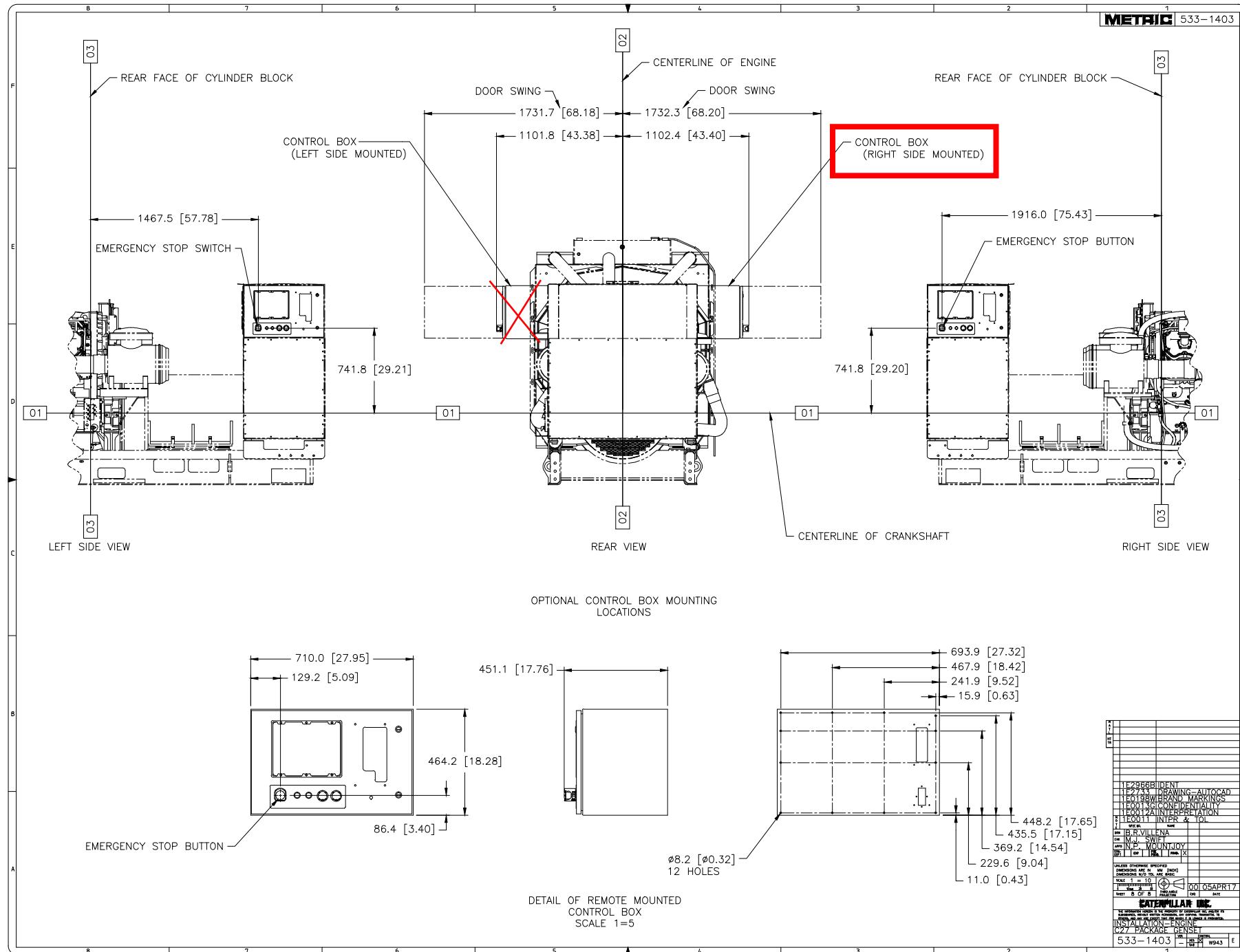
DETAIL OF BATTERY SUPPORT
342-5296 CHG 01
(SHIPPED LOOSE)
SCALE 1=5



DETAIL OF EXHAUST
SCALE 1=2

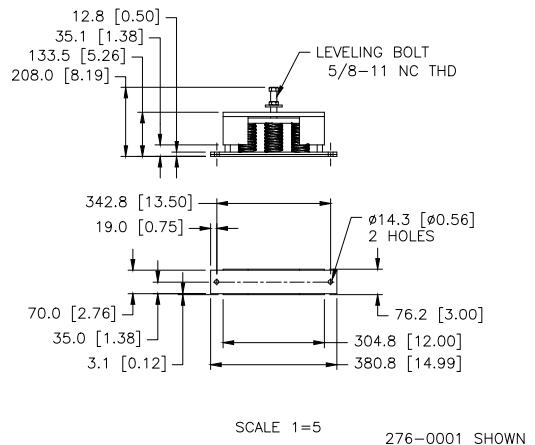


DETAIL OF TERMINAL STRIP CONNECTIONS
SCALE 1=2



GP1545 Isolator

MODEL	TYPE	PRICING AR
C27	6	GP-1545 CHG 00
C32		LS-0395 CHG 00
		500-0476 CHG 01



MODEL	TYPE	PRICING	AR
C27	6	GP-1548	CHG 00
C32	-	509-9437	CHG 01
	1	363-2738	CHG 01
		363-2761	CHG 00
3512	KB	472-4754	CHG 00
		472-4755	CHG 00
		472-4756	CHG 00
		472-4757	CHG 00
	KB	472-4758	CHG 00
3516		472-4759	CHG 00
		472-4760	CHG 00
		472-4761	CHG 01
	BY1	350-2449	CHG 01
	B1	353-9013	CHG 01
	1	353-9017	CHG 04
	Y	493-7433	CHG 00
		493-7434	CHG 00
		538-1116	CHG 00
C175-16	3	471-6562	CHG 01
		471-6563	CHG 01
	4	259-9232	CHG 04
		259-9233	CHG 04
C175-20		348-5769	CHG 03

SHIPPED LOOSE
REFERENCE FOOTPRINT OF ENGINE PACKAGE FOR DETAILED MOUNTING
SHEET LOCATIONS
FOR RADIATOR MOUNTING:
SHIPPING AR 304-3140 INCLUDES 2 ISOLATORS FROM SHEET 2
SHIPPING AR 493-7431 INCLUDES 4 ISOLATORS FROM SHEET 2

MODEL	TYPE	PRICING AR
C27		LS-1249 CHG 02
C32	6	256-3170 CHG 01 328-7171 CHG 00
3512	1	LF-1344 CHG 00
	KB	256-3166 CHG 01 LF-1343 CHG 00 LF-1894 CHG 00
3516		256-3168 CHG 02 LF-3412 CHG 00
	B1	256-3169 CHG 00
C175-16	4	
	3	247-6981 CHG 00 247-6982 CHG 00
	4	
		256-3178 CHG 02
3516	B	510-9144 CHG 01 510-9145 CHG 01
C175-20	4	303-0288 CHG 01
	3	479-9998 CHG 00

SHIPPED LOOSE
REFERENCE FOOTPRINT OF ENGINE PACKAGE FOR DETAILED
MOUNTING HOLE LOCATIONS

LF-1343 SHOW

1	2	3	4
5	6	7	8
9	10	11	12
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17	18	19	20
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25	26	27	28
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961	962	963	964
965	966	967	968
969	970	971	972
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985	986	987	988
989	990	991	992
993	994	995	996
997	998	999	1000



Picture shown may not reflect actual configuration

GENERAL DESCRIPTION

The Cat® EMCP 4.2B offers fully featured power metering, protective relaying and engine and generator control and monitoring. Engine and generator controls, diagnostics, and operating information are accessible via the control panel keypads; diagnostics from the EMCP 4 optional modules can be viewed and reset through the EMCP 4.2B.

FEATURES

Full range of attachments

- Wide range of system expansion attachments, designed specifically to work with the EMCP 4
- Flexible packaging options for easy and cost effective installation

World wide product support

- Cat dealers provide extensive pre and post sale support
- Cat dealers have over 1,600 dealer branch stores operating in 200 countries

Features

- A 33 x 132 pixel, 3.8 inch, white backlit graphical display denotes text alarm/event descriptions, set points, engine and generator monitoring, and is visible in all lighting conditions.
- Textual display with support for 26 languages, including character languages such as Arabic, Chinese, and Japanese
- Advanced engine monitoring is available on systems with an ADEM™ controller.
- Integration with the CDVR and IVR provides enhanced system performance

EMCP 4.2B GENERATOR SET CONTROLLER

Caterpillar is leading the power generation market place with power solutions engineered to deliver unmatched performance, reliability, durability and cost-effectiveness.

- Fully featured power metering, protective relaying, engine and generator parameter viewing, and expanded AC metering are all integrated into this controller.
- Real-time clock allows for date and time stamping of diagnostics and events in the control's logs as well as service maintenance reminders based on engine operating hours or calendar days. Up to 40 diagnostic events are stored in the non-volatile memory
- Ability to view and reset diagnostics on EMCP 4 optional modules via the control panel removes the need for a separate service tool for troubleshooting
- Set points and software stored in non-volatile memory, preventing loss during a power outage
- Five levels of security allow for configurable operator privileges
- Programmable security levels for groups of setpoints.
- Programmable kW Relays (3)

FEATURES (Continued)

- Programmable weekly exerciser timer
- Dealer configurable resistive maps
- Default overview screen
- Real (kW) Load histogram
- Auto mains failure
- Programmable logic functionality
- Selectable units
 - Temperature: °C or °F
 - Pressure: psi, kPa, bar
 - Fuel Consumption: Liter/hr or Gal/hr (U.S. or U.K.)

STANDARD FEATURES

- Voltage (L-L, L-N)
- Current (Phase)
- Average Volt, Amp, Frequency
- kW, kVAr, kVA (Average, Phase, %)
- Power Factor (Average, Phase)
- kW-hr, kVAr-hr (total)
- Excitation voltage and current (with CDVR)
- Desired Voltage, Excitation Command, Operating Mode (with IVR)
- Generator stator and bearing temp (with optional module)
- kW load histogram

Generator Protection

- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under frequency (81 O/U)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)
- Thermal Damage Curve

Engine Monitoring

- Coolant temperature
- Oil pressure
- Engine speed (RPM)
- Battery voltage
- Run hours
- Crank attempt and successful start counter
- Enhanced engine monitoring (with electronic engines)

Engine Protection

- Control switch not in auto (alarm)
- High coolant temp (alarm and shutdown)
- Low coolant temp (alarm)
- Low coolant level (alarm)
- High engine oil temp (alarm and shutdown)
- Low, high, and weak battery voltage
- Overspeed
- Overcrank
- Low Oil Pressure

Control

- Run / Auto / Stop control
- Speed and voltage adjust
- Local and remote emergency stop
- Remote start/stop
- Cycle crank

Inputs & Outputs

- Two dedicated digital inputs
- Three analog inputs
- Six programmable digital inputs
- Eight relay out
- Two programmable digital outputs

Communications

- Primary and accessory CAN data links
- RS-485 annunciator data link
- Modbus RTU (RS-485 Half duplex)

Language Support

Arabic, Bulgarian, Czech, Chinese, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Italian, Icelandic, Japanese, Latvian, Lithuanian, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish

Environmental

- Control module operating temperature: -40°C to 70°C
- Display operating temperature: -20°C to 70°C
- Humidity: 100% condensing 30°C to 60°C
- Storage temperature: -40°C to 85°C
- Vibration: Random profile, 24-1000 Hz, 4.3G rms

Required wiring from EMCP4.2 Panel:
 (4) #12 stranded wires
 (1) Belden 9365



Picture shown may not reflect actual configuration.
 Shown with Optional Equipment.

Features

- The EMCP 4 annunciator provides sixteen (16) individual points of annunciation, with two (2) LED's included for each point.
- An additional pair of LED's provides status indication of the RS-485 communication network.
- Includes alarm horn with lamp test and alarm acknowledge pushbuttons.
- Configurable to NFPA 99/110 requirements for local and remote annunciation on emergency standby generator systems.
- Provides custom label kit including software for customer's specific alarms and arrangement
- Designed and tested to meet stringent impulse shock and operating vibration requirements
- Uses high quality shielded twisted-triad cable for robust remote communications
- Graphic symbols are provided next to each pair to indicate various alarms and events
- The annunciator can be mounted remotely up to 1200 m (4,000 ft).
- Provides superior visibility of the LED's in direct sunlight.

EMCP 4 RS-485 Annunciator

The EMCP 4 RS-485 annunciator serves to display generator set system alarm conditions and status indications. The annunciator has been designed for use on the EMCP 4 RS-485 annunciator data link for remote applications, providing customers with enhanced site flexibility.

The EMCP 4 annunciator is configurable to the standards of NFPA 99/110 for emergency standby generator systems.

Specifications

Technical Data

Electrical

Battery Voltage Functional Range: 9 to 32 VDC

Power Consumption

Maximum: _ 12 watt at 24 VDC

Standby: _ 5 watt at 24 VDC

Control Power: 12-24 VDC

Communication: RS-485

Single, 8-pin Connector

Alarm

Sound Level 80 db

Physical

Weight 2.5 lb or _ 1.13 kg

Environmental

Operating Temperature -40° C to 70° C

-40° F to 158° F

Storage Temperature -50° C to 70° C

-58° F to 158° F

Relative Humidity 90%

Certifications

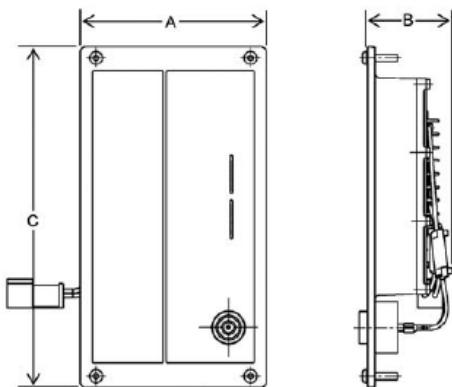
UL Recognized

LED Color Scheme

Each pair of LED's on the annunciator consists of two of three colors: green, yellow and red, which allows for custom configuration of status, warning and shutdown conditions.

The available colors and combinations are:

Row	LED 1	LED 2
1	Red	Yellow
2	Red	Yellow
3	Red	Yellow
4	Red	Yellow
5	Red	Yellow
6	Red	Green
7	Red	Yellow
8	Red	Yellow
9	Red	Yellow
10	Red	Yellow
11	Red	Yellow
12	Red	Yellow
13	Green	Yellow
14	Green	Yellow
15	Red	Green
16	Red	Yellow



LED Color Scheme

- Emergency stop shutdown
- Overcrank shutdown
- Low coolant temperature warning
- High coolant temperature warning/shutdown
- Low oil pressure warning/shutdown
- Overspeed warning/shutdown
- Low coolant level warning/shutdown
- Low fuel level warning/shutdown
- EPS supplying load status
- Control switch not in auto warning
- High battery voltage warning/shutdown
- Low battery voltage warning/shutdown
- BATT charger AC failure warning/shutdown
- Low cranking voltage
- Engine running
- Tier 4 SCR

Annunciator Dimensions		
A	158 mm	6.22 in
B	60 mm	2.37 in
C	288 mm	11.34 in

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ENGINE CONTROLLER



ADEM™ A4 Engine Controller

The ADEM™ A4 is the main Electronic Control Module (ECM) used on select diesel engines. The ADEM A4 provides a higher degree of control over a large number of combustion variables. The ADEM A4 is designed to control/interface Electronic Unit Injector (EUI) equipped engines. The ADEM A4 engine system is composed of the ADEM A4 ECM, control software, sensors, actuators, fuel injectors, and interface to the generator system. The prime benefit of an ADEM A4 engine system is to better control and maintain the particulate emissions, both steady state and transient, while improving engine performance



FEATURES

RELIABLE, DURABLE

All ADEM A4 controllers are designed to survive the harshest environments.

- Environmentally sealed, die-cast aluminum housing isolates and protects electronic components from moisture and dirt contamination.
- Rigorous vibration testing ensures product reliability and durability.
- Accuracy maintained from -40° C to 85° C
- Electrical noise immunity to 100 volts/meter
- Internal circuits are designed to withstand shorts to + battery and - battery.

SIMPLE SERVICING

Each ADEM A4 system works in combination with the Cat® ET service tool software to keep the engine operating at peak performance.

- Displays measured parameters
- Retrieves active and logged event code documenting abnormal system operation
- Performs calibrations and diagnostic tests
- Supports flash programming of new software into the ADEM A4 ECM

SELF DIAGNOSTICS

Each ADEM A4 ECM has a full compliment of diagnostics. The ECM can detect faults in the electrical system and report those faults to the service technician for quick repair.

- Self-diagnostic capability pinpoints operational problems in need of attention.

ADVANCED FEATURES

- Enhanced performance from fuel injection timing and limiting
- Adjustable monitoring of vital engine parameters
- Programmable speed acceleration ramp rate
- Data link interfaces

ENGINE CONTROLLER



DESCRIPTION

The ECM is housed in an environmentally sealed casting. All wiring connections to the ECM are made using two sealed connectors: a single seventy-pin connector and a single one hundred twenty-pin connector.

ENGINE SPEED GOVERNING

Desired engine speed is calculated by the ECM and held within ± 0.2 Hz for isochronous and droop mode. The ECM accounts for droop that is requested. The proper amount of fuel is sent to the injectors due to these calculations. The ECM also employs cooldown/shutdown strategies, acceleration delays on startup, acceleration ramp times and speed reference.

FUEL LIMITING

Warm and cold fuel-air ratio control limits are controlled by the ECM. Electronic monitoring system derates, torque limit, and cranking limit, programmable torque scaling, and cold cylinder cutout mode are standard features.

FUEL INJECTION TIMING

Master timing for injection is controlled by the ECM control. Temperature dependencies are accounted for in the fuel injection calculations.

ELECTRONIC MONITORING

Electronic monitoring of vital engine parameters can be programmed. Warning, derate, and shutdown event conditions may be customized by the user.

INFORMATION MANAGEMENT

The ECM stores information to assist with electronic troubleshooting. Active and logged diagnostic codes, active events, logged events, fuel consumption, engine hours, and instantaneous totals aid service technicians when diagnosing electronic faults and scheduling preventive maintenance.

CALIBRATIONS

Engine performance is optimized through injection timing. Auto/manual sensor calibrations are standard features.

ON-BOARD SYSTEM TESTS

System tests are available to assist in electronic troubleshooting. These tests include: injector activation, injector cutout, and override of control outputs.

DATA LINK INTERFACES

The ADEM A4 communicates with the EMCP via a dedicated communication network.

ELECTRONIC SENSING

The following sensing is available on the ADEM A4: oil pressure, fuel pressure, fuel temperature, atmospheric pressure, air inlet temperature, turbo outlet pressure, engine coolant temperature, engine speed, throttle, position, exhaust temperature, oil filter pressure differential, fuel filter pressure differential, air filter pressure differential and crankcase pressure.

ENGINE CONTROLLER



SPECIFICATIONS

Impervious to:

salt spray, fuel, oil and oil additives, coolant, spray cleaners, chlorinated solvents, hydrogen sulfide and methane gas, and dust

Input and output protection

all inputs and outputs are protected against short circuits to + battery and - battery

Input voltage range (24 VDC nominal)

18 to 32 VDC

Mounting

engine mounted

Reverse polarity protected

Shock, withstands 20 g

Temperature range

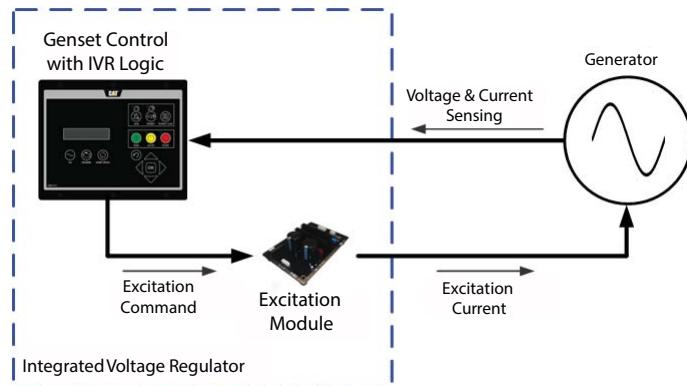
Operating: -40° C to 85° C (-40° F to 185° F)

Storage: -50° C to 120° C (-58° F to 248° F)

Vibration

withstands 8.0 g @ 24 to 2 kHz

INTEGRATED VOLTAGE REGULATOR



INTEGRATED VOLTAGE REGULATOR

The Integrated Voltage Regulator (IVR) is designed to provide robust, precise closed-loop control of the generator voltage, optimized transient performance and industry leading feature specification.

Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability and cost-effectiveness.

FEATURES

When used with an Excitation Module, EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 controllers offer:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope, Configurable Under Frequency (Volts/Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode
- Setpoint adjustment from the EMCP display or Cat® ET ServiceTool
- IVR Operating Status and Voltage Bias Overview screens to provide an enhanced level of user interface
- Integrated Voltage Regulator event monitoring

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 controllers also offer:

- Power Factor Regulation (PF)
- Reactive Droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry
- Cat dealers provide extensive post sale support including maintenance and repair agreements

COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP controls.

INTEGRATED VOLTAGE REGULATOR



INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION



SPECIFICATIONS				
No Load to Full Load Regulation	±0.5%	±0.25%	±0.25%	±0.25%
Configurable Volts / Hz Characteristic	•	•	•	•
Configurable Knee Frequency	•	•	•	•
Regulator Response Time	10 ms	10 ms	5 ms	5 ms
Single and Three Phase Sensing	•	•	•	•
Voltage Adjustment Range (Configurable up to)	± 30%	± 30%	± 30%	± 30%
CONTROL				
Dual Slope Configurable Volts / Hz Characteristic	•	•	•	•
Excitation Enable / Disable Selection	•	•	•	•
Line Loss (I ² R) Compensation	—	•	•	•
Reactive Droop Compensation	—	•	•	•
Power Factor Control Mode	—	•	•	•
PROTECTION / ALARMS				
Generator Overvoltage	•	•	•	•
Generator Undervoltage	•	•	•	•
Over Excitation	•	•	•	•
Loss of Sensing	•	•	•	•
Generator Reverse VARs	—	•	•	•
Event Log	•	•	•	•
METERING				
EMCP AC Metering	•	•	•	•
EMCP Power Metering	—	•	•	•
Excitation Command Percentage	•	•	•	•
Operating Mode Status Indication	•	•	•	•

INTEGRATED VOLTAGE REGULATOR



INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION (continued)



VOLTAGE ADJUSTMENT				
EMCP 4 Display Voltage Bias	•	•	•	•
Digital Input (Raise / Lower) Voltage Bias ¹	•	•	•	•
Potentiometer Voltage Bias ¹	•	•	•	•
Analog Voltage Bias – Voltage Range ¹	0V to 5V	0V to 5V	-10V to +10V	-10V to +10V
Analog Voltage Bias – Current Range ¹	–	–	0mA to 20mA	0mA to 20mA
Analog Voltage Bias – PWM Range ¹	–	–	0% to 100%	0% to 100%
SCADA (Modbus) Voltage Bias	–	•	•	•

¹Requires an available input on the EMCP 4.

INTEGRATED VOLTAGE REGULATOR

EXCITATION MODULE SPECIFICATION



The Integrated Voltage Regulator consists of an EMCP 4 interfacing with an Excitation Module. There are a range of Excitation Modules available to match Cat generator sets.

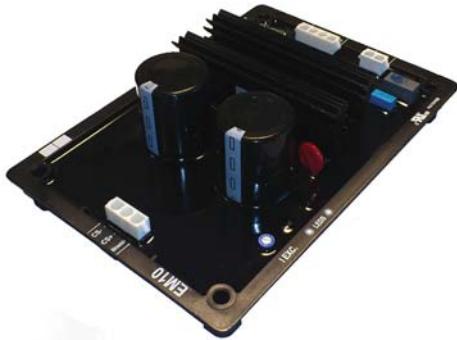


Figure 1:
EM10 Excitation Module



Figure 2:
EM15 Excitation Module

EXCITATION MODULE TECHNICAL SPECIFICATION

	EM10	EM15
Compatible Generator Excitation Types	Self Excitation (SE) Internal Excitation (IE) Permanent Magnet (PMG)	
Nominal Field Current Output	6 Amps	7 Amps
Maximum (forcing) Field Current Output	10 Amps	15 Amps
Maximum AC Voltage Input	180 Vrms	240 Vrms

For more information on the Excitation Module refer to the component spec sheet.

INTEGRATED VOLTAGE REGULATOR

EMCP 4 DISPLAY



EXAMPLE SCREENS – EMCP 4.1/4.2

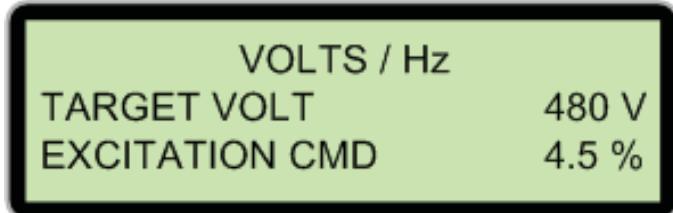


Figure 3: IVR Overview Screen



Figure 4: Voltage Bias Overview Screens

EXAMPLE SCREENS – EMCP 4.3/4.4

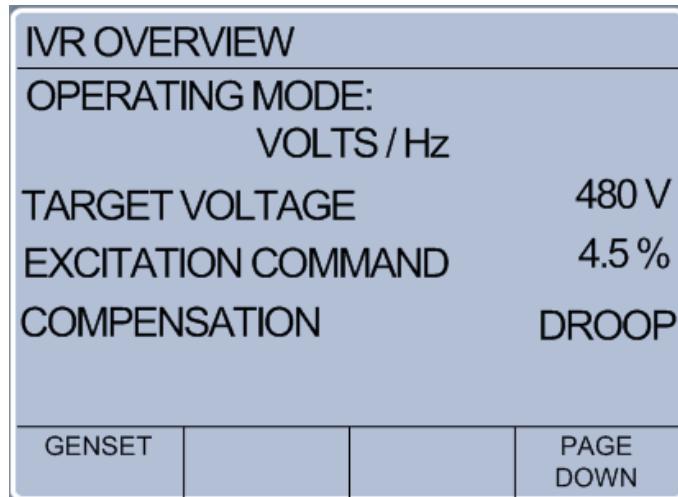


Figure 5: IVR Overview Screen

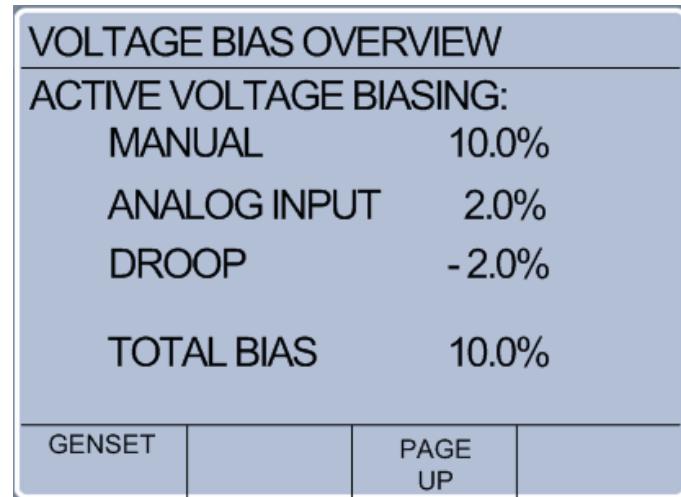


Figure 6: Voltage Bias Overview Screen

EXCITATION MODULE



EM15

The EM15 Excitation Module is a power electronics component designed to provide excitation current to the generator that is controlled by the Integrated Voltage Regulator (IVR) feature in the EMCP 4 controls.

Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability and cost-effectiveness.

FEATURES

- Over-excitation protection – limit can be adjusted via a potentiometer (IEXC.)
- Green status LED indicating unit is powered on
- Red status LED indicating excitation current limiting (flashing) or shutdown (solid)

When used with EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 controllers, the Integrated Voltage Regulator system offers:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope Under Frequency (Volts / Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 controllers also offer:

- Power Factor Regulation (PF)
- Generator paralleling with reactive droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat® dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry

COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP controls.

EXCITATION MODULE – EM15



SPECIFICATIONS

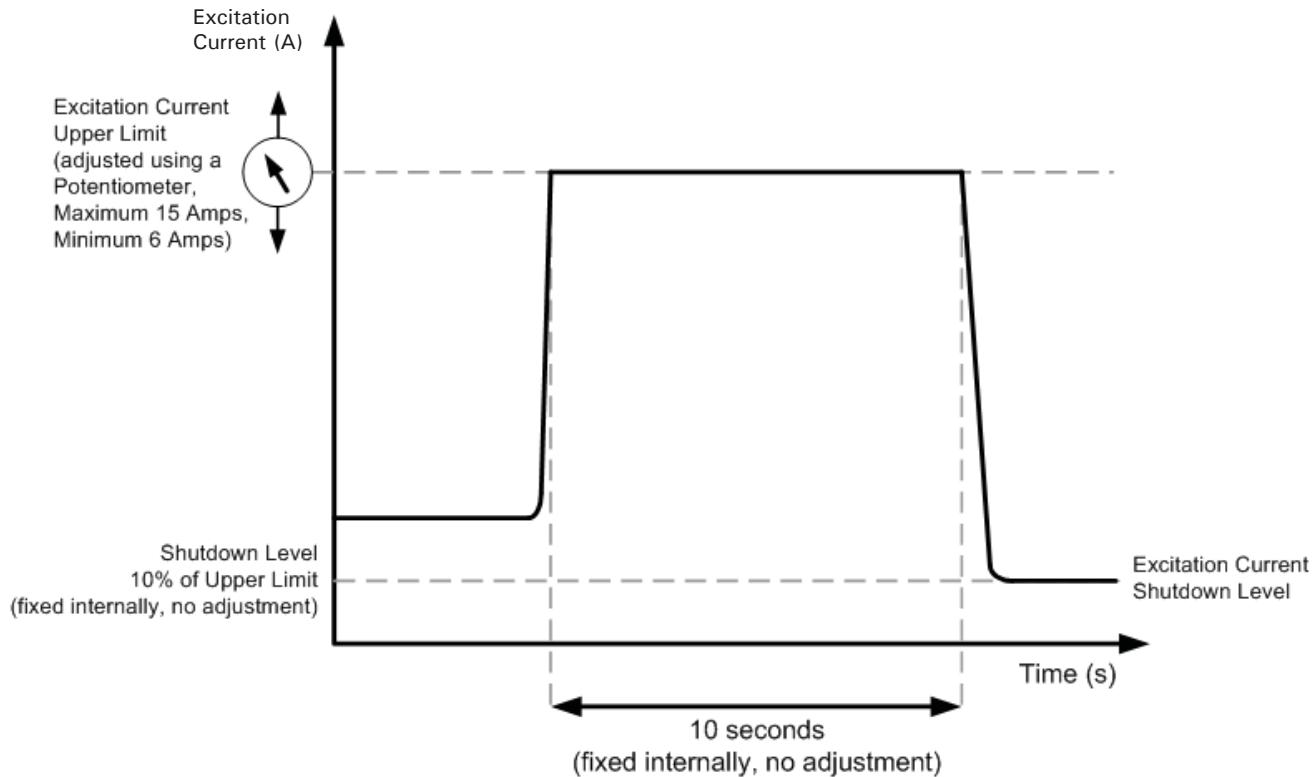
ELECTRICAL	
Generator Excitation Types	Self Excitation / Internal Excitation / Permanent Magnet (PMG)
Max. Continuous Field Current Output	7 Amps
Max. Forcing Field Current Output	15 Amps
Max. AC Voltage Input (X1:X2, Z1:Z2)	240Vrms
ENVIRONMENTAL	
Operating Temperature Range	–40 °C (–40 °F) to +70 °C (+158 °F)
Storage Temperature Range	–40 °C (–40 °F) to +85 °C (+185 °F)
Relative Humidity Tolerance	95% non-condensing humidity
Salt Spray	5% salt (NaCl) solution for 120 hrs
Vibration	4.5 G-rms, 24-2000 Hz in 3 orthogonal planes
Electromagnetic Compatibility	RF Immunity (Radiated & Conducted) RF Emissions (Radiated & Conducted) Electrical Transients
Weight	800 g ± 30 g
Power Consumption (at Max. Continuous Rating)	<600VA
CONFORMITY	
UL	UL Recognized (U.S. and Canada) File No. E334232
CE Integration Certificate	In conformity with the applicable requirements of the following Standards: EN 50178 EN 60204-1 EN 61000-6-2 EN 61000-6-4

EXCITATION MODULE – EM15



OVER-EXCITATION PROTECTION

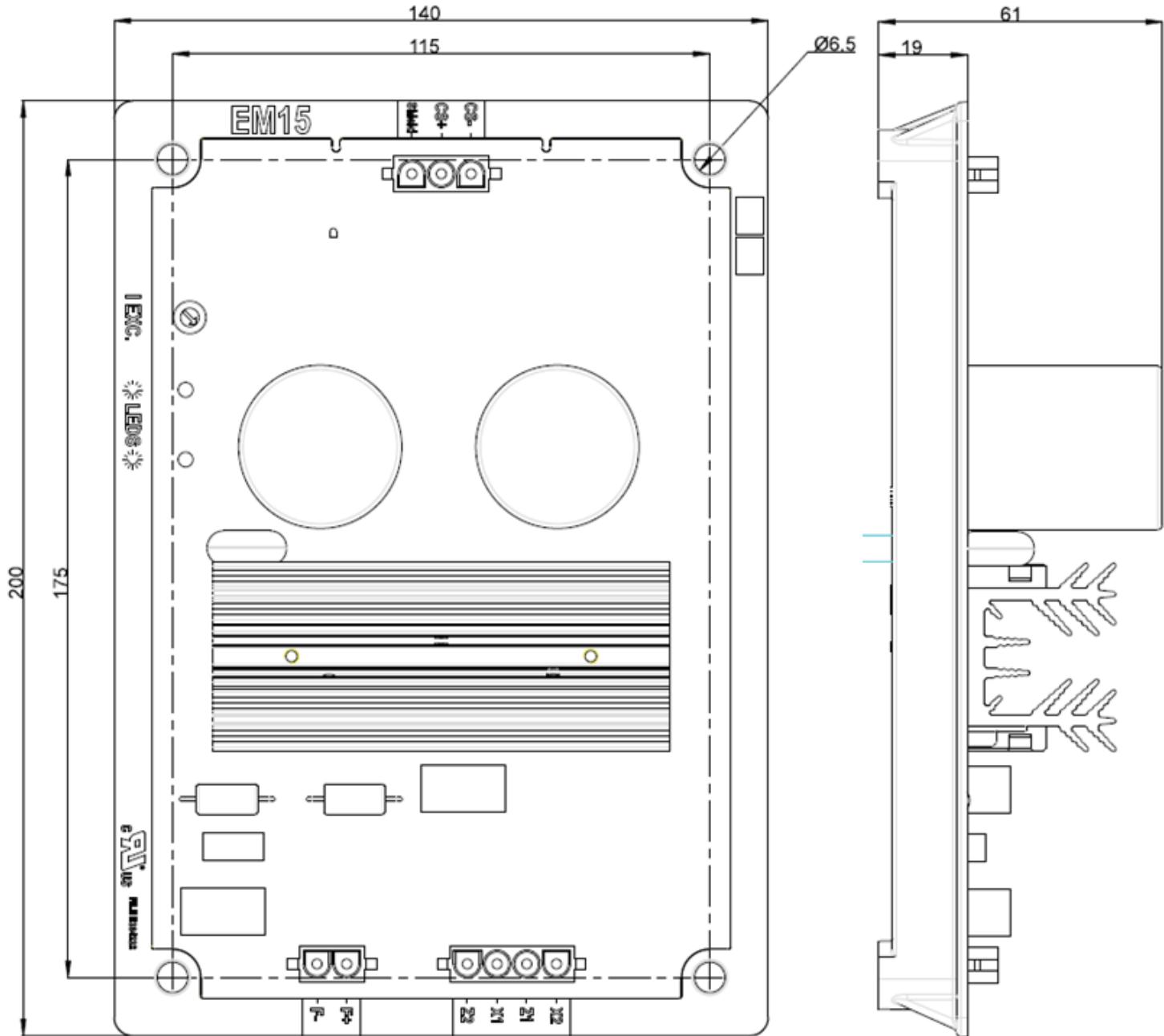
- If a short-circuit fault occurs at the generator terminals, the EM15 will allow the excitation current to rise to the upper limit value set by the adjustment potentiometer (max. 15 Amps).
- The excitation current will be clamped at the upper limit value for 10 seconds (fixed internally).
- After 10 seconds, the excitation current is reduced to a value of 10% of the potentiometer setting.



EXCITATION MODULE – EM15



OUTLINE DRAWING (Dimensions in mm)



EXCITATION MODULE – EM15



EXAMPLE CONNECTION DIAGRAM (Permanent Magnet Excitation)

EMCP 4.3 / 4.4

120-pin Connector

PWM Output #2

Shield Positive Negative
19 28 8

EMCP 4.1 / 4.2

70-pin Connector

Batt Negative Batt Negative
Splice Positive Splice
60 or 65 68 60 or 65

2-way Connector Functions:

Terminal	Label	Function
P2-1	F+	Exciter Field Positive Output
P2-2	F-	Exciter Field Negative Output

3-way Connector Functions:

Terminal	Label	Function
P3-1	Shield	Excitation Command Shield
P3-2	CS+	Excitation Command Positive Input
P3-3	CS-	Excitation Command Negative Input

4-way Connector Functions (PMG Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (PMG Phase B)
P4-2	Z1	Not Connected
P4-3	X1	Excitation Power Supply Input (PMG Phase A)
P4-4	Z2	Excitation Power Supply Input (PMG Phase C)

Notes:

- (1) External fuses required with EM15 module
- (2) Recommend 250V, 10A fast acting fuses

4-way Connector Functions (Self-Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (single-phase)
P4-2	Z1	Not Connected
P4-3	X1	Excitation Power Supply Input (single-phase)
P4-4	Z2	Not Connected

4-way Connector Functions (Internal Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (Aux Winding 1 - Positive)
P4-2	Z1	Excitation Power Supply Input (Aux Winding 2 - Positive)
P4-3	X1	Excitation Power Supply Input (Aux Winding 1 - Negative)
P4-4	Z2	Excitation Power Supply Input (Aux Winding 2 - Negative)

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The International System of Units (SI) is used in this publication.

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Picture shown may not reflect actual configuration

Features

- Moisture and fungus protection
- Clear indication of breaker status
- Reinforced insulation
- Shunt trip
- Auxiliary contacts
- Load side extension bars
- Maintenance-free operation
- Exceptional characteristics under short-circuit conditions
- Adjustable trip settings

NS-Frame

- Federal Specification W-C-375B/GEN
- NEMA AB1
- UTE, VDE, BS, CEI, UNE

Molded Case and Insulated Case Circuit Breakers:

C27-C175 North America built packages (50/60Hz)

L-Frame

400A (UL)

P-Frame

800-1200A (UL)

R-Frame

1600-3000A (UL)

NS-Frame

1600-3200A (IEC)

NW-Frame

1200-5000A (UL), 1600-5000A (IEC)

Conformity with International Standards

Circuit Breakers have been designed to comply with the international standard IEC 60947-2 as well as these other major standards:

L-Frame

UL 489

CSA 22.2 No 5

Federal Specification W-C-375B/GEN

NEMA AB1

NMX J-266

CCC

CE Marking

P-Frame & R-Frame

UL 489

IEC Standard 60947-2

CSA 22.2 No 5-02

Federal Specification W-C-375B/GEN

NEMA AB1

NMX J-266

UTE, VDE, BS, CEI, UNE

NW-Frame

UL 489

NEMA AB1

CSA 22.2 No. 5096

NMX J-266-ANCE

ANSI C37.13, C37.16, C37.17, C37.50

UL 1066 (cULus Listed)

NEMA SG3

Standard Features

Standards

- UL-CSA
 - L-Frame
 - P-Frame
 - R-Frame
 - NW-Frame
- IEC
 - NS-Frame

Shunt trip

- The shunt trip provides a means of tripping the circuit breaker electronically
- Shunt trip ratings
- Voltage: 24VDC
- Coil Burden (Holding/Inrush): 4.5/200 VA
- Power Consumption: 4.5 VA

Auxiliary contacts

The auxiliary contacts provide a means of remote circuit breaker position indication and consists of (1) Form C Contact (1 Normally open and 1 Normally closed contact) with the following current ratings:
6A @ 240-480 VAC, 50/60Hz

Trip units

All circuit breakers come equipped with True RMS Current Sensing.

The trip units for each of the circuit breaker ratings sample the current waveform to provide true RMS protection through the 15th harmonic. This true RMS sensing gives accurate values for the magnitude of a nonsinusoidal waveform. Therefore, the heating effects of harmonically distorted waveforms are accurately evaluated. The trip system comes equipped with a set of current transformers (CT's) to sense current, a trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker.

Additionally, each trip unit comes equipped with Active

Thermal Imaging which is active 20 minutes before and after tripping.

Customer cable connections

Connections include bus for installation flexibility.

Optional Features

Electrically-operated Circuit Breakers

Circuit breakers that are electrically-operated come with a two-step stored energy mechanism and come standard with a motor assembly. Motor assemblies provide on and off control from remote locations.

These assemblies contain a spring-charging motor, a shunt trip, and shunt close.

Motor Assembly Voltage Rating: 24-30VDC

Undervoltage trip

Undervoltage trip option trips the circuit breaker when the voltage drops to a value between 35% and 70% of the control voltage.

An attempt to close the circuit breaker when the UV is not energized produces no movement in the main contacts.

Closing is allowed when the supply voltage of the UV trip reaches 85% of the rated voltage.

- Voltage Rating: 24-30VAC/VDC
- Operating Threshold:
 - Opening: 0.35 to 0.7Vn
 - Closing: 0.85 Vn
- Power Consumption: 4.5VA
- Circuit Breaker Response Time at Vn: 50ms +/- 10

Circuit Breakers Table

Cat® Part Number	Frame and Rating (Amps)	IEC/UL	No. Poles	Operation	Trip Unit	Circuit Breaker Characteristics	Options	Instantaneous Override (kA RMS) +/- 10%
2449742	1200A P-Frame MCCB	UL	3P	EO	5.0A LSI	Table 1	1 Aux Contact, Shunt Trip	24
2449744	800A NS-Frame MCCB	IEC	4P	MO	5.0A LSI	Table 2	1 Aux Contact, Shunt Trip	—
2449746	1200A P-Frame MCCB	UL	3P	EO	6.0A LSIG	Table 1	1 Aux Contact, Shunt Trip	24
2449764	1250A NS-Frame MCCB	IEC	4P	EO	5.0A LSI	Table 3	1 Aux Contact, Shunt Trip	—
2449765	1250A NS-Frame MCCB	IEC	4P	EO	6.0A LSIG	Table 3	1 Aux Contact, Shunt Trip	—
2449766	1200A P-Frame MCCB	UL	3P	EO	6.0H LSIG-H	Table 1	1 Aux Contact, Shunt Trip, Modbus	24
2449767	1250A NS-Frame MCCB	IEC	4P	EO	6.0P LSIG-P	Table 3	1 Aux Contact, Shunt Trip, Modbus	—
2449770	1200A P-Frame MCCB	UL	3P	EO	6.0P LSIG-P	Table 1	1 Aux Contact, Shunt Trip, Modbus	24
2449772	1600A NS1600 MCCB	IEC	3P	EO	5.0A LSI	Table 3	1 Aux Contact, Shunt Trip	—
2449773	1600A NS1600 MCCB	IEC	3P	EO	6.0A LSIG	Table 3	1 Aux Contact, Shunt Trip	—
2449775	1600A NS1600 MCCB	IEC	3P	EO	6.0P LSIG-P	Table 3	1 Aux Contact, Shunt Trip, Modbus	—
2449776	1600A NS1600 MCCB	IEC	3P	MO	5.0A LSI	Table 4	1 Aux Contact, Shunt Trip	—
2449777	1600A NS1600 MCCB	IEC	3P	MO	6.0A LSIG	Table 4	1 Aux Contact, Shunt Trip	—

Circuit Breakers Table (Continued)

Cat Part Number	Frame and Rating (Amps)	IEC/UL	No. Poles	Operation	Trip Unit	Circuit Breaker Characteristics	Options	Instantaneous Override (kA RMS) +/- 10%
3946030	5000A NW-Frame ICCB	IEC	6P	EO	5.0A LSI	Table 5	4 Aux Contacts, Shunt Trip, UV	170
3946031	5000A NW-Frame ICCB	IEC	6P	EO	6.0A LSIG	Table 5	4 Aux Contacts, Shunt Trip, UV	170
3946032	5000A NW-Frame ICCB	IEC	6P	EO	6.0P LSIG-P	Table 5	4 Aux Contact, Shunt Trip, Modbus	170
3946033	5000A NW-Frame ICCB	UL	6P	EO	5.0A LSI	Table 8	4 Aux Contacts, Shunt Trip, UV	170
3946034	5000A NW-Frame ICCB	UL	6P	EO	6.0A LSIG	Table 8	4 Aux Contacts, Shunt Trip, UV	170
3946035	5000A NW-Frame ICCB	UL	6P	EO	6.0P LSIG-P	Table 8	4 Aux Contact, Shunt Trip, Modbus	170
4213235	400A L-Frame MCCB	UL	3P	MO	5.0 LSI	Table 10	1 Aux Contact, Shunt Trip	—
4213237	400A L-Frame MCCB	UL	3P	MO	6.0A LSIG	Table 10	1 Aux Contact, Shunt Trip	—
4213239	400A L-Frame MCCB	UL	4P	MO	6.0A LSIG	Table 11	1 Aux Contact, Shunt Trip	—
4448345	1600A NS-Frame MCCB	IEC	3P	MO	5.0A LSI	Table 4	1 Aux Contact, Shunt Trip	—
4448346	1600A NS-Frame MCCB	IEC	3P	MO	6.0A LSIG	Table 4	1 Aux Contact, Shunt Trip	—
4448347	2000A NS-Frame MCCB	IEC	3P	MO	5.0A LSI	Table 4	1 Aux Contact, Shunt Trip	—
4448348	2000A NS-Frame MCCB	IEC	3P	MO	6.0A LSIG	Table 4	1 Aux Contact, Shunt Trip	—

Circuit Breakers Characteristics

Model		P-Frame	
Number of Poles		3	
Rated Current (Amps)		800-2500A (UL)	
Voltage Rating (VAC)		600UL/690 IEC	
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	65	
	480V	35	
	600V	18	
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	240V	50
		380/415V	35
	Ics	240V	25
		380/415V	20

Table 1

Model		NS-Frame MO	
Number of Poles		3 & 4	
Rated Current (Amps)		1600-3200A (IEC)	
Voltage Rating (VAC)		690 (IEC)	
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	240V	85
		380/415V	70
	Ics	240V	65
		380/415V	52

Table 4

Model		NW-Frame	
Number of Poles		3 & 4	
Rated Current (Amps)		2000A - 5000A (IEC)	
Voltage Rating (VAC)		690 IEC	
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	240V	65
		440V	65
	Ics	690V	65

Table 5

Model		R-Frame	
Number of Poles		3	
Rated Current (Amps)		1600-3000A (UL)	
Voltage Rating (VAC)		600UL/690 IEC	
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	240V	65
		480V	35
	Ics	600V	18
		240V	50
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	380/415V	35
		240V	25
	Ics	380/415V	20

Table 6

Model		NS-Frame EO	
Number of Poles		3 & 4	
Rated Current (Amps)		1250-1600A (IEC)	
Voltage Rating (VAC)		690 (IEC)	
IEC 60947-2 Rating (50/60Hz) - kA RMS	Icu	240V	50
		380/415V	50
	Ics	240V	37
		380/415V	37

Table 3

Circuit Breakers Characteristics (Continued)

Model	NW-Frame	
Number of Poles	3 & 4	
Rated Current (Amps)		1200-2000A (UL)
Voltage Rating (VAC)		600UL
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	65
	480V	65
	600V	50

Table 7

Model	NW-Frame	
Number of Poles	3 & 4	
Rated Current (Amps)		2500-5000A (UL)
Voltage Rating (VAC)		600UL
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	100
	480V	100
	600V	85

Table 8

Model	R-Frame	
Number of Poles	3	
Rated Current (Amps)		1600-3000A (UL)
Voltage Rating (VAC)		600UL/690 IEC
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	100
	480V	65
	600V	25
IEC 647-2 Rating (50/60Hz) - kA RMS	Icu	240V 65 380/415V 50
	Ics	240V 35 380/415V 25

Table 9

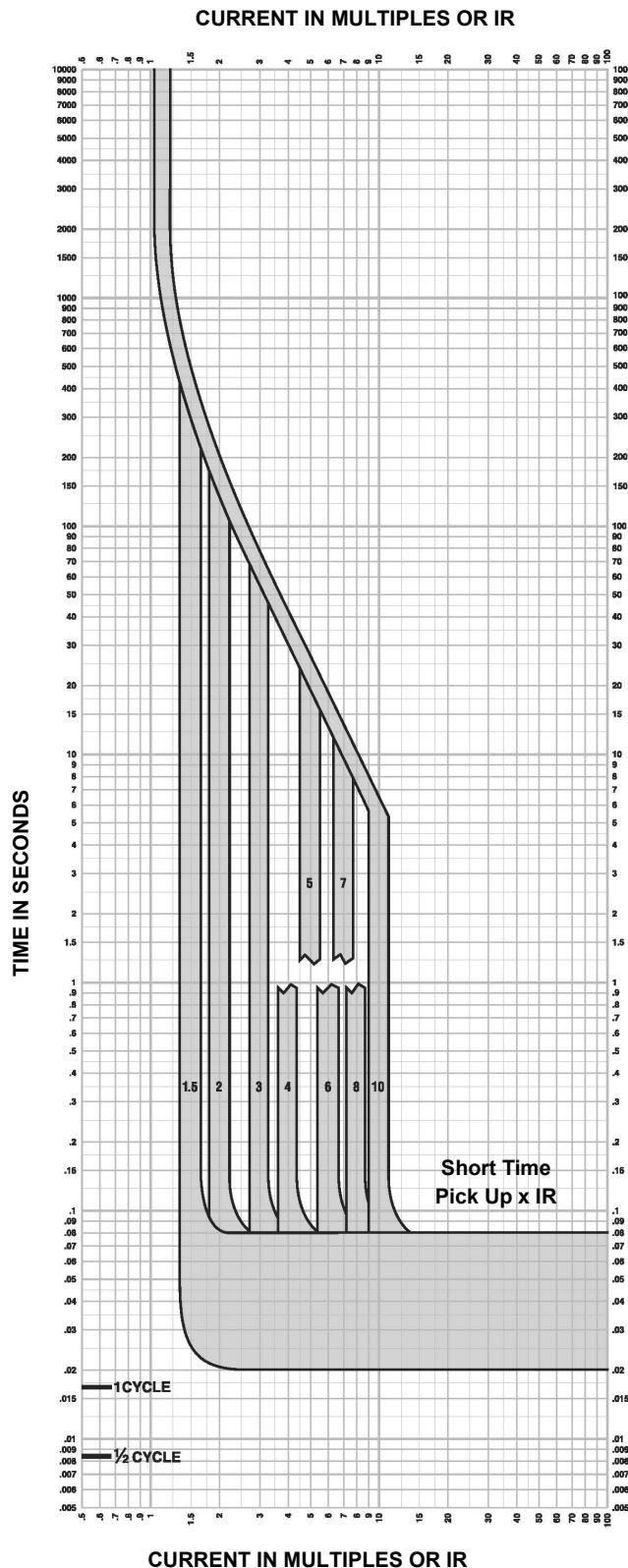
Model	L-Frame	
Number of Poles	3	
Rated Current (Amps)		400A (UL)
Voltage Rating (VAC)		600UL/525 IEC
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	65
	480V	35
	600V	18
IEC 647-2 Rating (50/60Hz) - kA RMS	Icu	240V 65 380/415V 35
	Ics	220V 65 380/415V 35

Table 10

Model	L-Frame	
Number of Poles	3	
Rated Current (Amps)		400A (UL)
Voltage Rating (VAC)		600UL/525 IEC
Interrupt Rating (UL/CSA) (60Hz) - kA RMS	240V	200
	480V	200
	600V	100
IEC 647-2 Rating kA RMS	240V	150
	480V	75
	690V	20

Table 11

L-Frame Long-Short Trip Curve



3.3S Long Time/Short Time Trip Curve 250A, 400A L-Frame

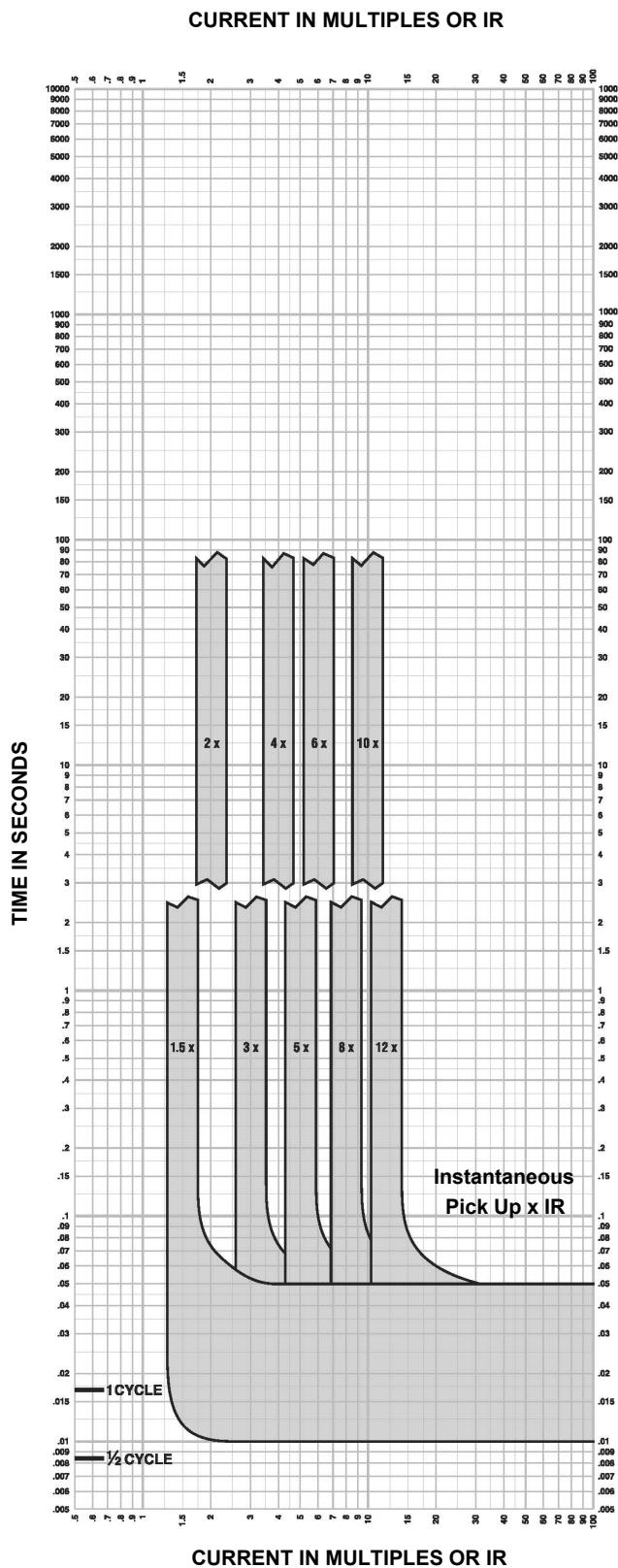
The time-current curve information is to be used for application and coordination purposes only.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

Curves apply from -35°C to +70°C (-31°F to +158°F) ambient temperature.

L-Frame Instant Trip Curve



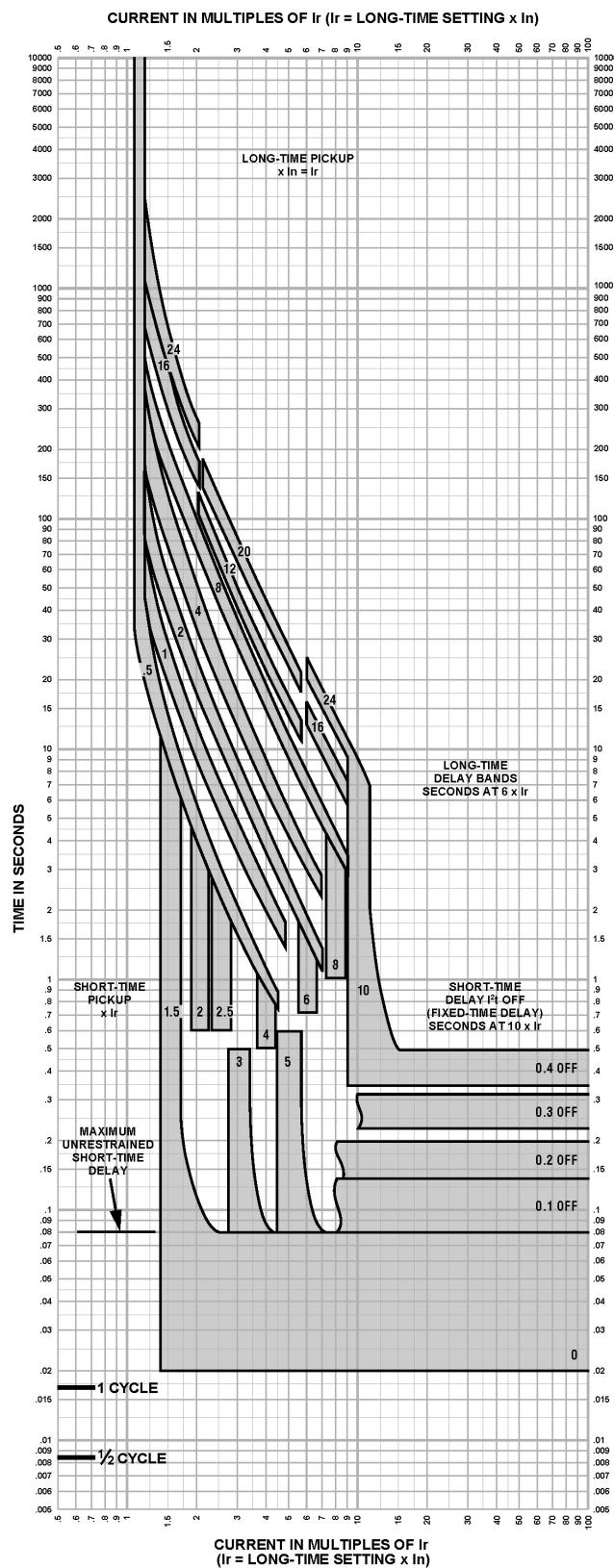
3.3/3.3S Instantaneous Trip Curve 250A L-Frame

The time-current curve information is to be used for application and coordination purposes only.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. In = Maximum dial setting of Ir. 250A L-Frame: In = 250A = Max Ir setting Curves apply from -35°C to +70°C (-31°F to +158°F) ambient temperature.

P, R, NS-Frame Long-Short Trip Curve and NW-Frame Long-Short Trip Curve



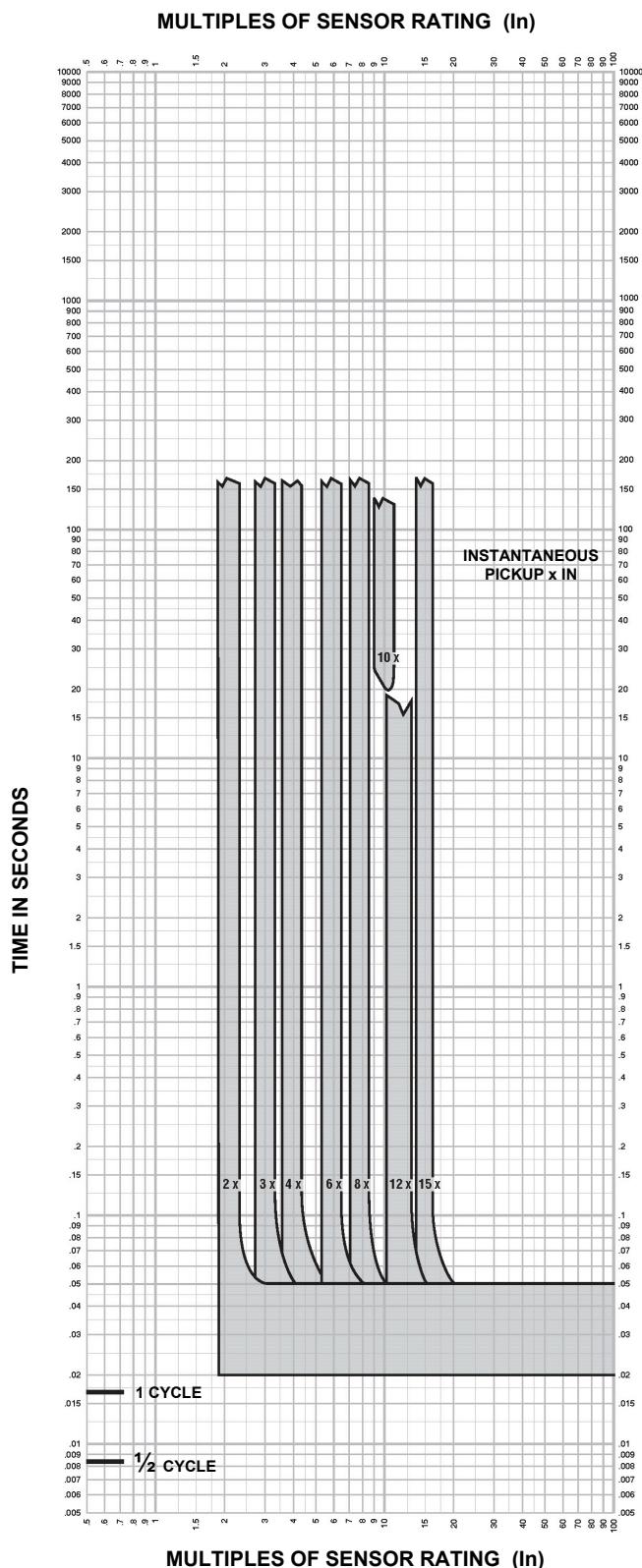
Long-time Pickup and Delay Short-time Pickup and I^2t OFF Delay

The time-current curve information is to be used for application and coordination purposes only. Curves apply from -30°C to $+60^{\circ}\text{C}$ ambient temperature.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. With zone-selective interlocking on, short-time delay utilized and no restraining signal, the maximum unrestrained short-time delay time band applies regardless of the setting.
4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
5. For a withstand circuit breaker, instantaneous can be turned OFF. See Page 22 for instantaneous trip curve. See tables on pages 03-18 for instantaneous override values..
6. Overload indicator illuminates at 100%.

P, R, NS-Frame Instant Curve and NW-Frame Instant Trip Curve



Instantaneous Pickup 2x–15x and OFF

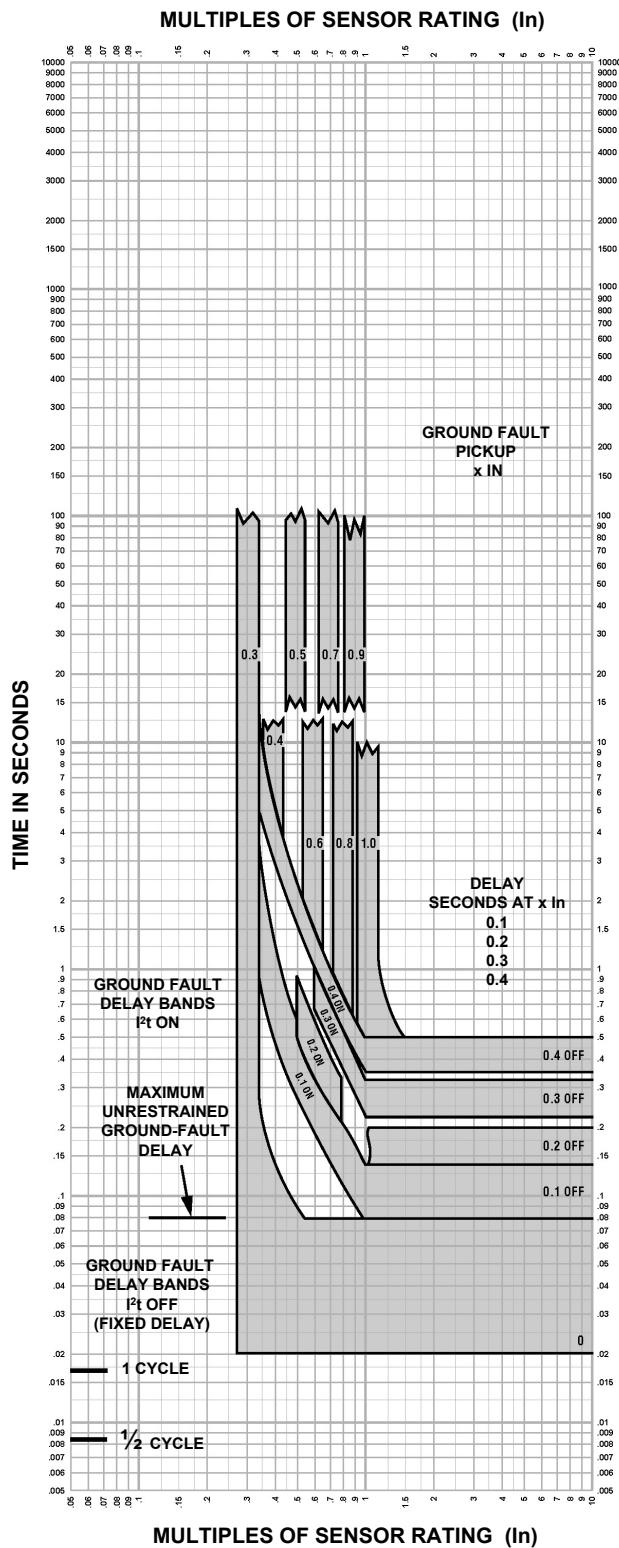
The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30° to +60°C ambient temperature.

Notes:

1. The end of the curve is determined by the interrupting rating of the circuit breaker.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. The instantaneous region of the trip curve shows maximum total clearing times. Actual clearing times in this region can vary depending on the circuit breaker mechanism design and other factors. The actual clearing time can be considerably faster than indicated. Contact your local Sales Office for additional information.
4. For a withstand circuit breaker, instantaneous can be turned OFF. See tables on pages 03-18 for instantaneous override values.
5. See page 22 for long-time pickup, long-time delay, short-time pickup, and short time delay trip curves.

P, R, NS-Frame Ground Curve and NW-Frame Ground Fault Trip Curve



Ground-fault I^2t OFF and ON In ≤ 400 A

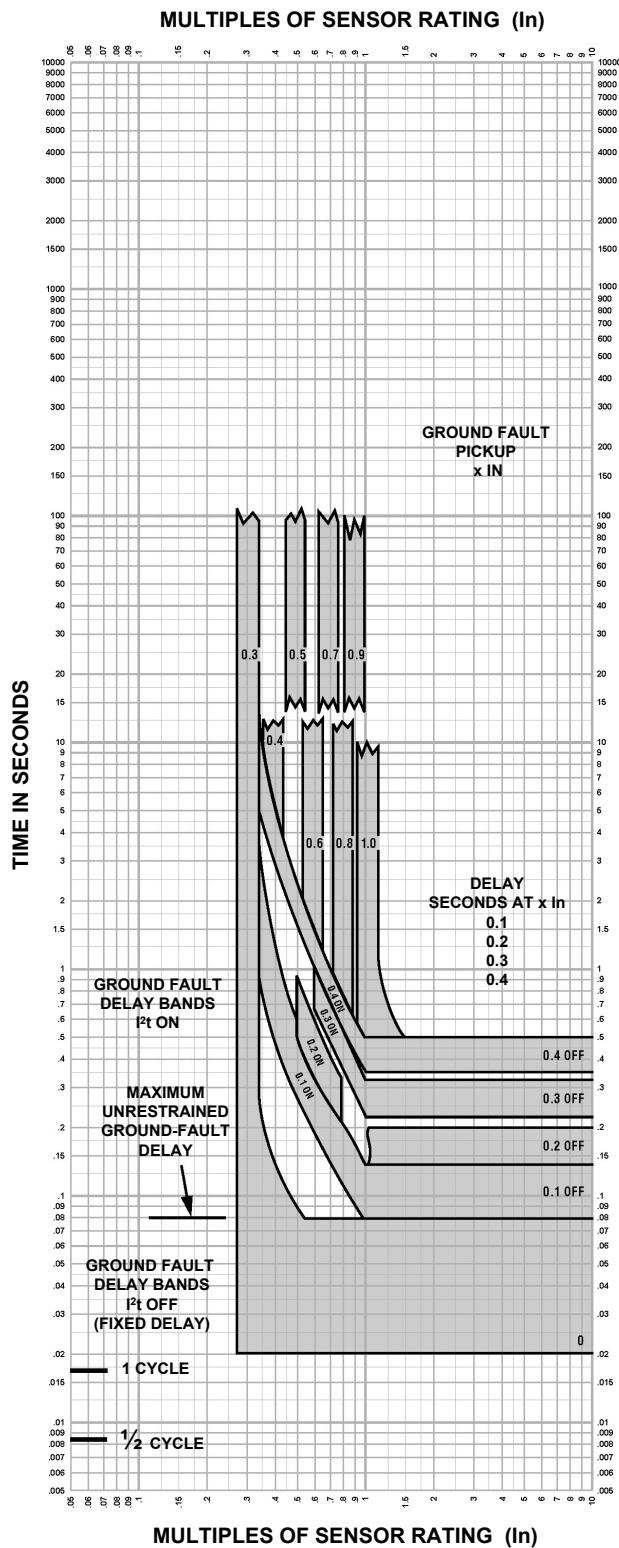
The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.

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P, R, NS-Frame Ground Curve and NW-Frame Ground Fault Trip Curve



Ground-fault I^2t OFF and ON In ≤ 400 A

The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.

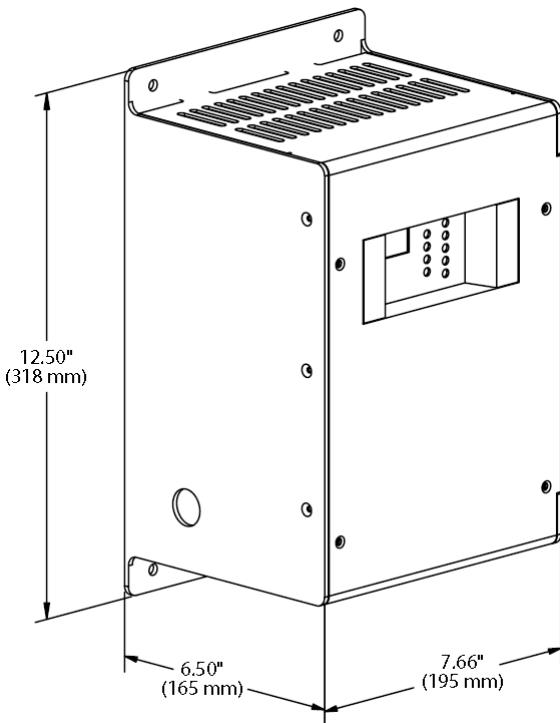


Image Shown may not Reflect Actual Package

UL 10 AMP BATTERY CHARGER

This battery charger offers accurate, automatic charging of lead-acid and nickel cadmium batteries. The output voltage automatically adjusts to changing input, load, battery and ambient conditions. This prevents battery over-charging and consequent loss of battery electrolyte.

Standard features include AC line compensation, precision voltage regulation, current limiting, automatic 2-rate charging, voltmeter and ammeter, temperature compensation and UL Listing.

The user interface is easy to understand with digital metering, NFPA 110 alarms and a battery fault alarm.

SPECIFICATION

Input Supply	110-120 V
	208-240 V
AC and DC Fuses	2 input and 2 output)
Output voltage	24V
Frequency	50/60 Hz
Operating temperature	-20°C (-4°F) to +60°C (140°F)
Housing constructed of rustproof anodized aluminum.	

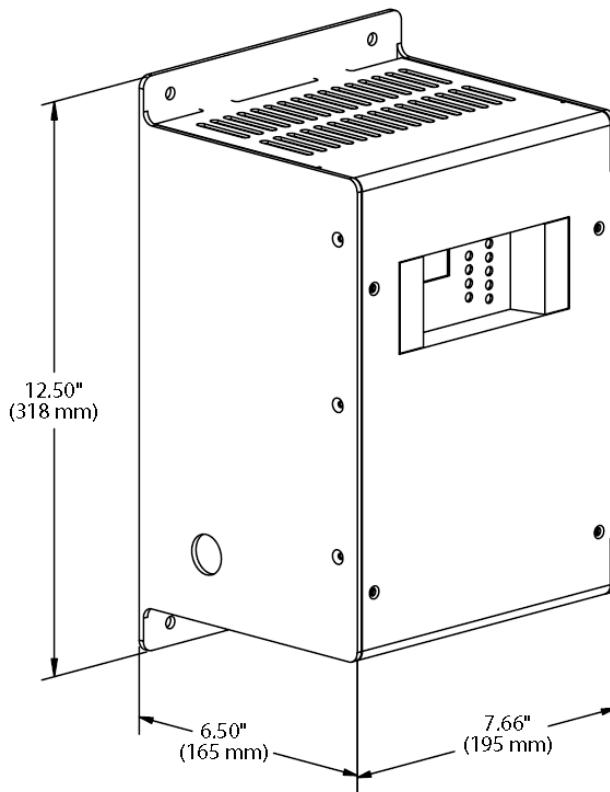
STANDARDS

- C-UL listed to UL 1236
- NFPA 70, NFPA 110
- CSA 22.2 No 107 certified
- UL 1564
- CE DOC to EN 60335
- IBC Seismic Certification

FEATURES

- Electronically current limited at 105% of rated output
- Alarm system
- Digital Display
- Lightning and voltage transient protection
- Protection of connected equipment against load dump protection
- Constant voltage, current limited, 4-rate automatic equalization
- IP 20 housing
- AC isolated from DC
- Temperature Compensation
 - On board temperature sensor with remote port
- Auto AC line compensation
- Output regulated by sensed battery voltage

BATTERY CHARGER



Output		Input	
Amps	Volts	Hz	Volts
10	24	50/60	110-120 208-240
Width	Depth	Height	Weight
195 mm (7.66")	165 mm (6.50")	318 mm (12.50")	10.4 kg (23 lb)
Feature codes			
BTC1024	BTC1028	BTC1035	
BTC1025	BTC1032		

NFPA 110 alarm package as follows:

- AC on Green led (indication)
- AC fail Red led and form C contact (2A)
- Float mode LED
- Fast charge LED
- Temp comp active LED
- Low battery volts Red led and Form C contact
- High Battery Volts Red led and Form C contact
- Charger fail Red led and Form C contact
- Battery fault Red led and Form C contact
 - Battery disconnected
 - Battery polarity reversed
 - Mismatched charger battery voltage
 - Open or high resistance charger to battery connection
 - Open battery cell or excessive internal resistance

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www.Cat-ElectricPower.com



Jacket Water Heater with Pump

C27, C32

Image shown may not reflect actual package.

The Jacket Water Heater with the pump is a complete coolant preheater with thermostat, pump and all required controls.

Forced circulation of the coolant delivers uniform heating throughout the entire engine, extends element life and offers a significant reduction in electrical consumption.

The Jacket Water Heater operates automatically when provided contacts are supplied with a 24 Volt DC signal from the engine.

Features

- Factory Installed
- Complete with hoses, thermostat and pump
- Base frame mounting minimizes engine induced vibration
- Automatically disconnected when engine is running via the generator space heater relay
- Supplied with UL recognized components
- Thermostat is factory pre-set to 54°C (130°F)

Heater design description

The jacket water heater package is designed to efficiently pre-heat the engine by heating and circulating the engine's coolant.

This design results in the following benefits

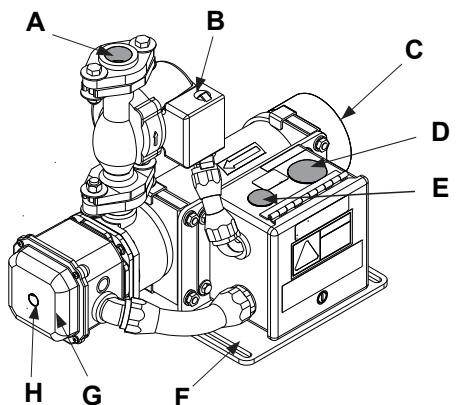
- Increase life of heater hoses, engine seals, and heating elements.
- Improve heat transfer efficiency from elements to engine coolant.
- More uniform engine temperature distribution.
- Application of a thermostat with a reduced thermal differential.
- Lower customer utility costs and increased heater reliability.
- Heater thermostat's setpoint is preset from the factory.

Heater operation/wiring

A 32 L/pm (10 gmp) pump is located at the heater outlet to pull the coolant through the heater.

A fixed thermostat probe is located inside the heater tank near the outlet of the heater and responds to the temperature of the coolant entering the tank.

The figure below shows the general heater design



A. Discharge port

E. Control wiring entrance

B. Pump/motor

F. Mounting base

C. Suction (behind unit)

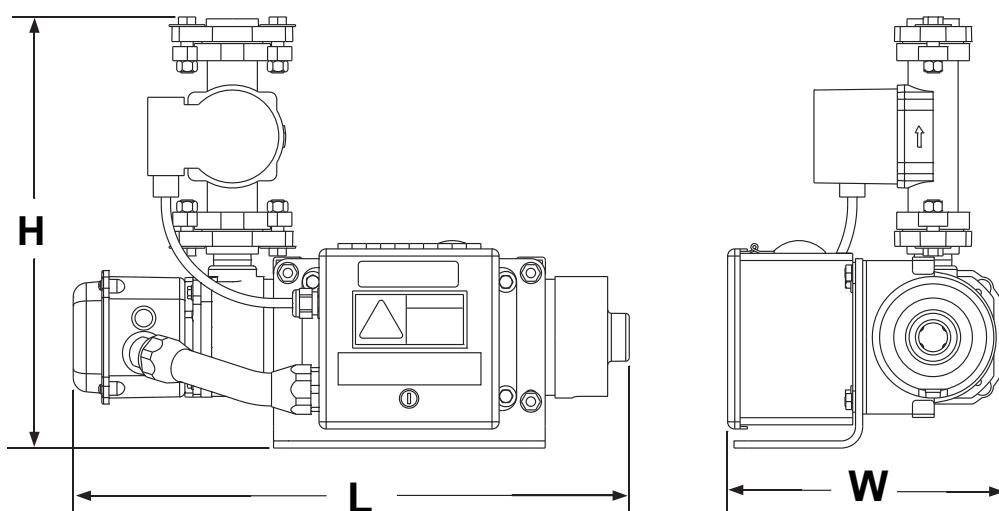
G. Element assembly

D. Power in wiring entrance

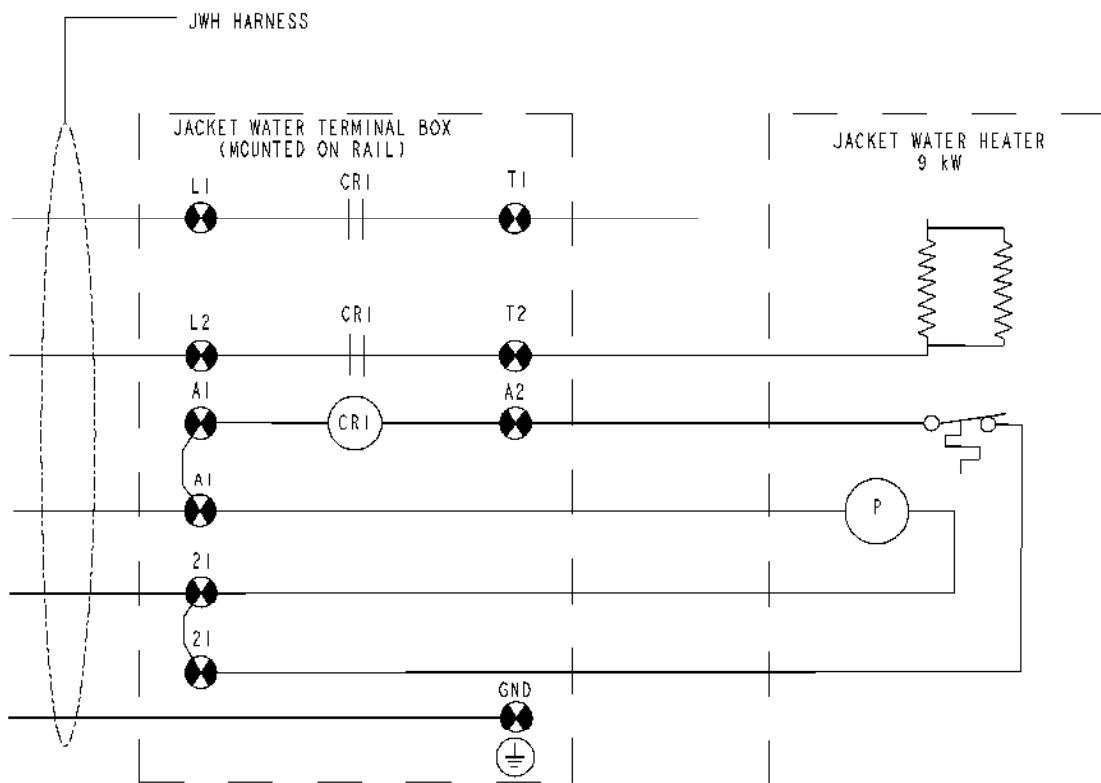
H. Thermostat

Specifications

	Voltage		
	240	208	220
Rating	9 kW	6.75 kW	9 kW
Frequency	60	60	50
Phase	Single		Single
Amps	38.1	29.6	39.8
Flow Rate	32 L/pm (10 gmp)	29 L/pm (7.7 gmp)	32 L/pm(10 gmp)
Pump Rating	240 VAC 97W	208 VAC 84W	220 VAC 90W
Adjustable Thermostat	38°C - 54°C (100°F - 130°F)		
Length	542 mm (21.3")		
Width	207 mm (8.1")		
Height	321 mm (12.6")		
Weight	20.5 kg (45.2 lbs)		



Wiring Diagram



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Picture shown may not reflect actual configuration

GENERAL DESCRIPTION

This series of isolator combines the open spring mountings within a rugged welded steel housing. The housing is designed to limit equipment motion in all directions due to seismic loads. An external adjusting bolt allows for full levelling capability of the equipment.

Features and Benefits

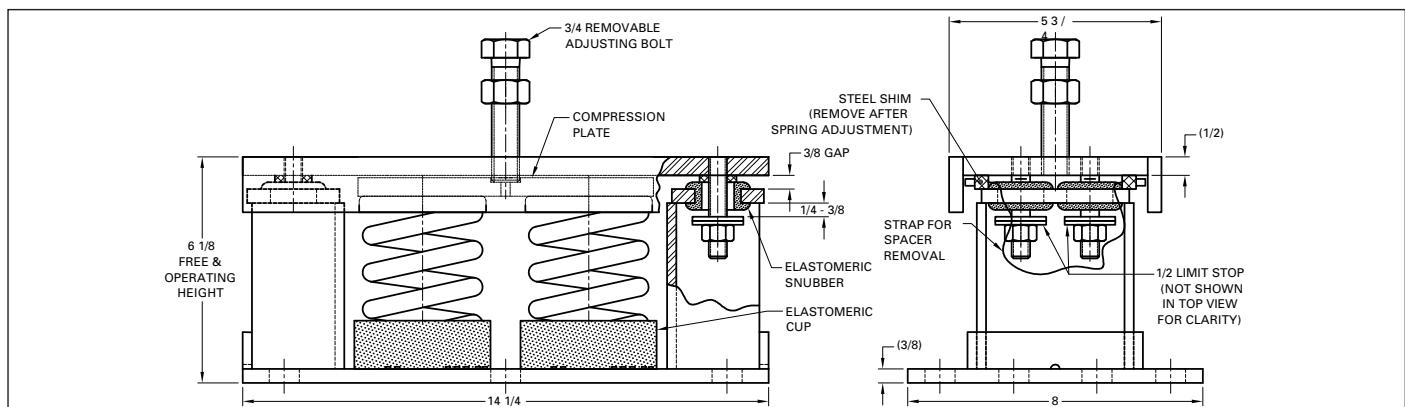
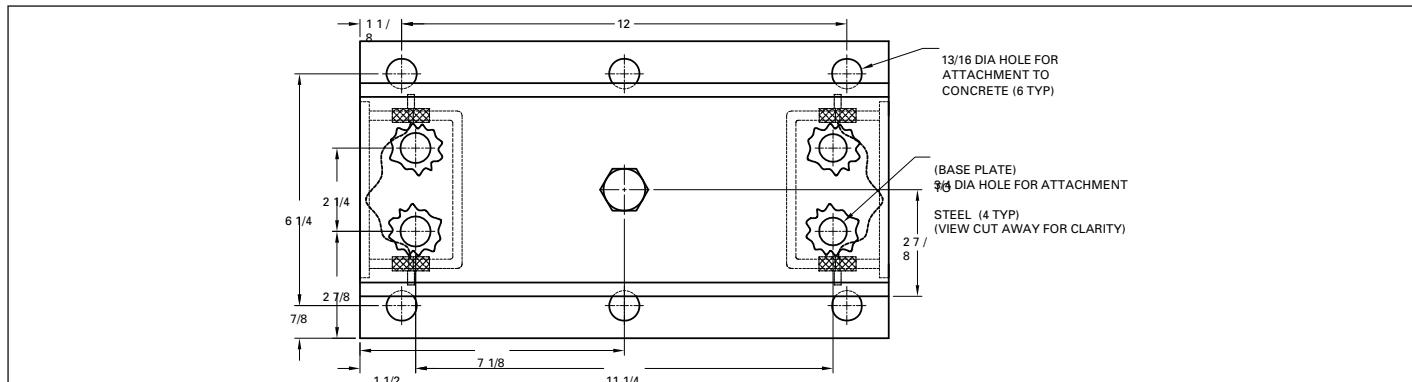
- Housings are welded steel construction
- Maximum deflection is over 1" at a static rated load of 2336 kg (5,150 lb), 2712 kg (5,980 lb), and 2948 kg (6,500 lb) per isolator.
- Isolator weight – 63kg (138.9 lb)
- Mounts are strategically placed under the factory designed base to support the generator, engine, and radiator
- Installation spacer between the upper and lower housings ensures accurate installation height
- Springs are not welded to cups or housings
- Elastomeric acoustical spring cups are used under each spring, eliminating metal-to-metal contact
- The lower housing incorporates an oversized base plate that spreads the anchor bolts over a wider area
- Mounts are designed to be anchored to a concrete or steel base
- Pre-drilled holes in the housing base are easily accessible and simplify installation
- Mounts are designed to be anchored to a concrete or steel base with 3/4" or equivalent hardware
- All zinc-electroplated hardware provides superior corrosion resistance
- Shipped loose for customer installation
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007
- Tested and analyzed in accordance with: ASCE 7-98, ASCE 7-02, ASCE 7-05, ICC-ES AC-156
- Side loading capability of isolators is matched to the package certification level. Refer to IBC Certification documents for details.
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength. IBC Certification requires that the anchoring system used is reviewed and approved by a Professional Engineer.

Isolator Data

Engine Series	Generator Frame Size	Mount placement	Mounts (Qty)	Rated Capacity kg (lb)	Rated Deflection mm (in)	Spring Rate kg/cm (lbs/in)	Solid Load kg (lbs)	Color Code (Springs)
C27	All Frames	Throughout base	6	2336 (5150)	28.2 (1.11)	325 (4626)	3508 (7734)	White/Dk.Purple
C32								

Engine Series	Generator Frame Size	Mount placement	Mounts (Qty)	Rated Capacity kg (lb)	Rated Deflection mm (in)	Spring Rate kg/cm (Lbs/in)	Solid Load kg (lbs)	Color Code (Springs)
3512	1400, 1600 and 1800	Throughout base	10	2712 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green
3512B	1400, 1600 and 1800		10	2713 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green
3512C	1400 and 1600		12	2714 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green
3512	2700	Radiator	2	2336 (5150)	28.2 (1.11)	325 (4626)	3508 (7734)	White/Dk.Purple
		Generator, Engine	8	2712 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green
3512B	2700	Radiator	2	2336 (5150)	28.2 (1.11)	325 (4626)	3508 (7734)	White/Dk.Purple
		Generator, Engine	8	2712 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green
3512C	2700	Radiator	4	2336 (5150)	28.2 (1.11)	325 (4626)	3508 (7734)	White/Dk.Purple
		Generator, Engine	8	2712 (5980)	28.2 (1.11)	377 (5364)	4068 (8968)	White/Dk.Green

Isolator Drawing



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2,600 GALLON UL142 SUB BASE TANK

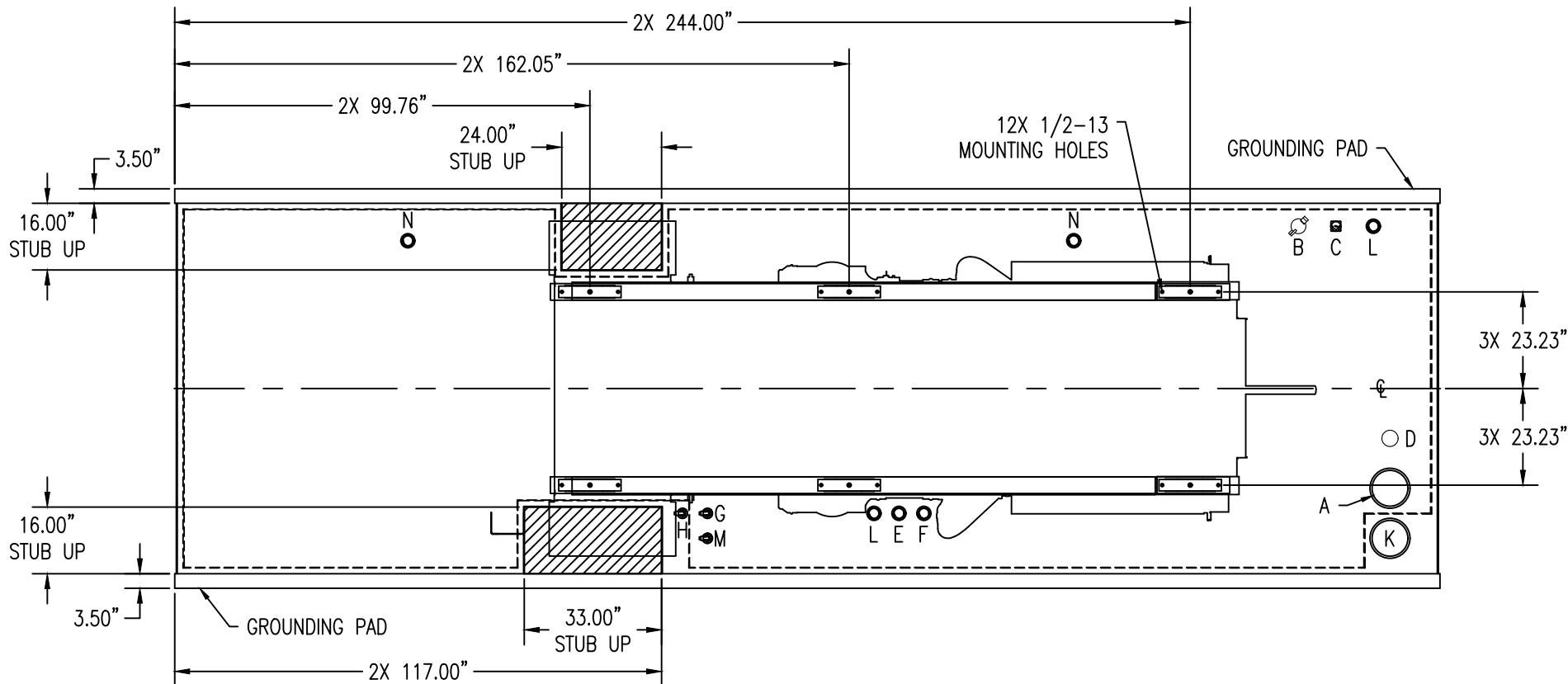
TANK PRIME & FINISH PAINT: BLACK

CUSTOMER TO VERIFY STUB UP, MOUNTING HOLES & FITTINGS

3" 14 GA GALVANNEAL WALL PANELS

Page 1 of EK Machines sub-base fuel tank plus
enclosure submittal drawings/documents.

TANK FITTINGS			
ITEM #	PART #	QTY	LABEL'S
A	8" NPT	1	EMERGENCY VENT
B	2" NPT	1	FILL PORT
C	2" NPT	1	FUEL LEVEL
D	2" NPT	1	VENT
E	2" NPT	1	FUEL RETURN
F	2" NPT	1	FUEL SUPPLY
G	2" NPT	1	LOW LEVEL ALARM
H	2" NPT	1	RUPTURE BASIN ALARM
I	1/2" NPT	1	BASIN DRAIN
K	8" NPT	1	EMERGENCY VENT
L	2" NPT	2	EXTRA FITTING
M	2" NPT	1	HIGH LEVEL ALARM
N	2" NPT	2	FUEL SUPPLY/RETURN

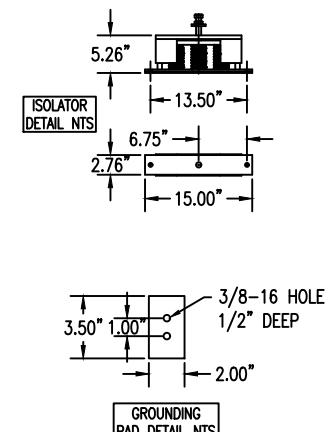
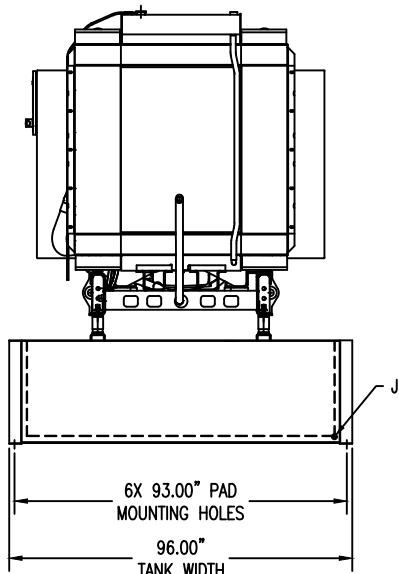
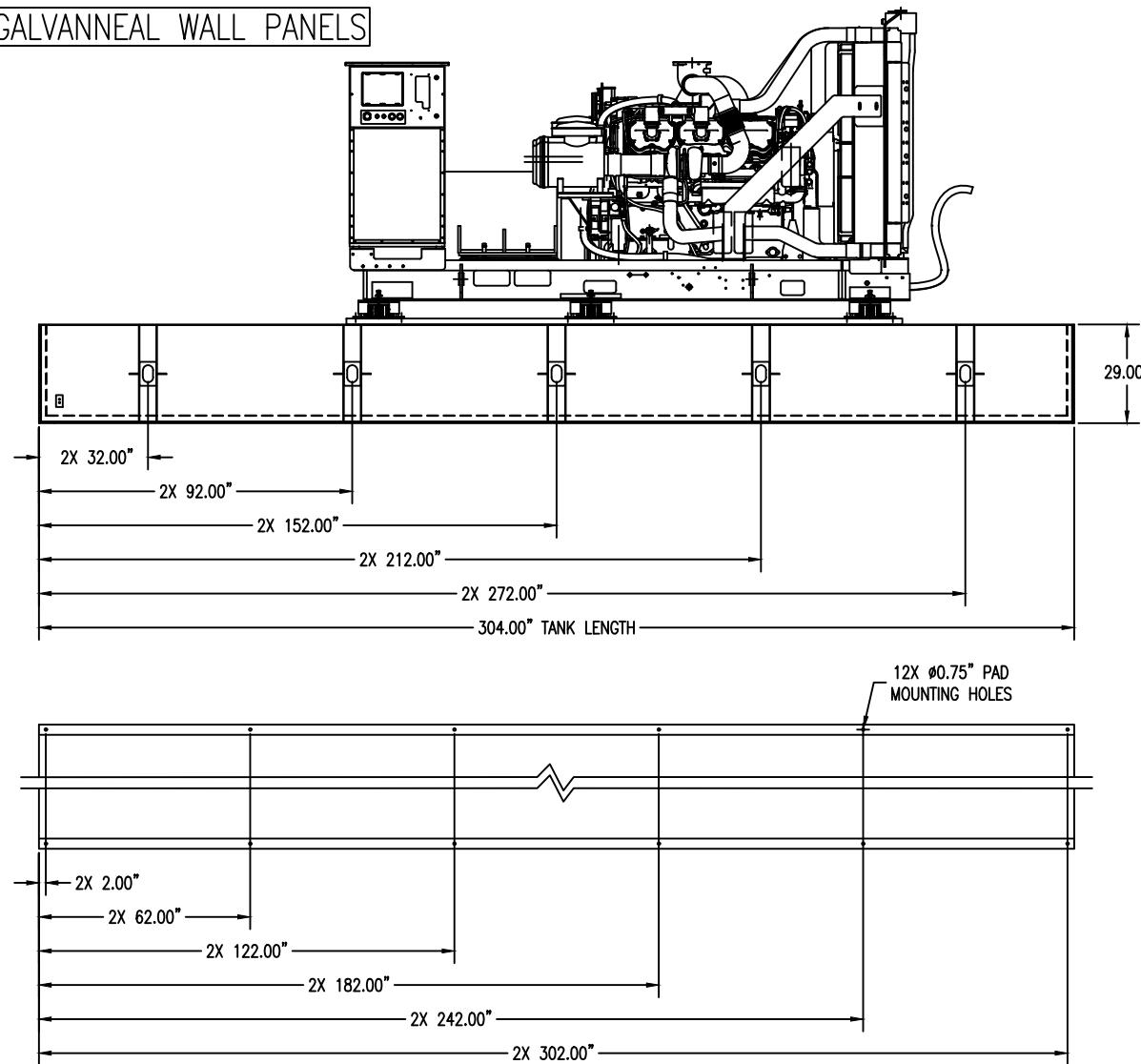


2,600 GALLON UL142 SUB BASE TANK

TANK PRIME & FINISH PAINT: BLACK

CUSTOMER TO VERIFY STUB UP, MOUNTING HOLES & FITTINGS

3" 14 GA GALVANNEAL WALL PANELS



REVISIONS:

REV. A: DRAWN ON 01-04-18 SLL.
REV. B: ADDED WEIGHTS 01-10-18 SLL.

DESCRIPTION SAE-G2-ULSB-2600 (REACH-IN)

GENERATOR C27 750KW

CUSTOMER APPROVAL:

NAME:

JOB NAME GREEN RIDGE REC CNTR JOB # 13102

CUSTOMER CARTER MACHINERY QUOTE # 12213

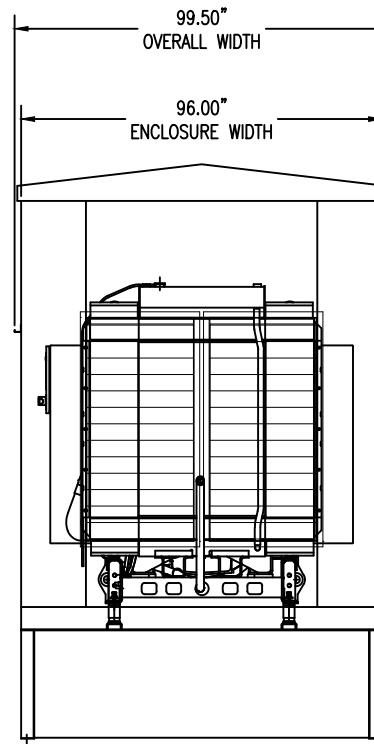
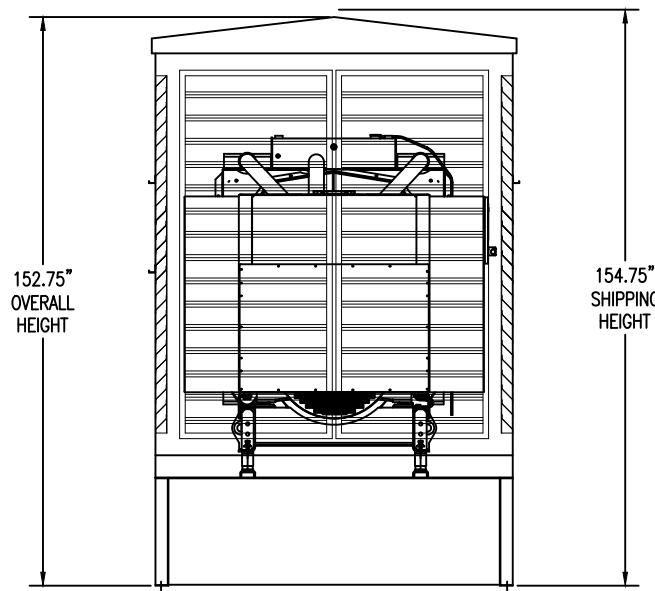
DRAWN BY SLL DATE: 01-04-18

SHEET 2 OF 8

SCALE: NTS REV B

ENCLOSURE EXTERIOR POWDER PAINT COLOR: COLONIAL RED

3" 14 GA GALVANNEAL WALL PANELS



FIXED INTAKE LOUVERS

GRAVITY DISCHARGE LOUVERS
(PLENUM REMOVED FOR CLARITY)



REVISIONS:

REV. A: DRAWN ON 01-04-18 SLL.
REV. B: ADDED WEIGHTS 01-10-18 SLL.

DESCRIPTION

SAE-G2-ULSB-2600 (REACH-IN)

JOB NAME

GREEN RIDGE REC CNTR

JOB #

13102

GENERATOR

C27 750KW

CUSTOMER

CARTER MACHINERY

QUOTE #

12213

CUSTOMER APPROVAL:

DRAWN BY

SLL

DATE:

01-04-18

NAME:

DATE:

SHEET 3 OF 8

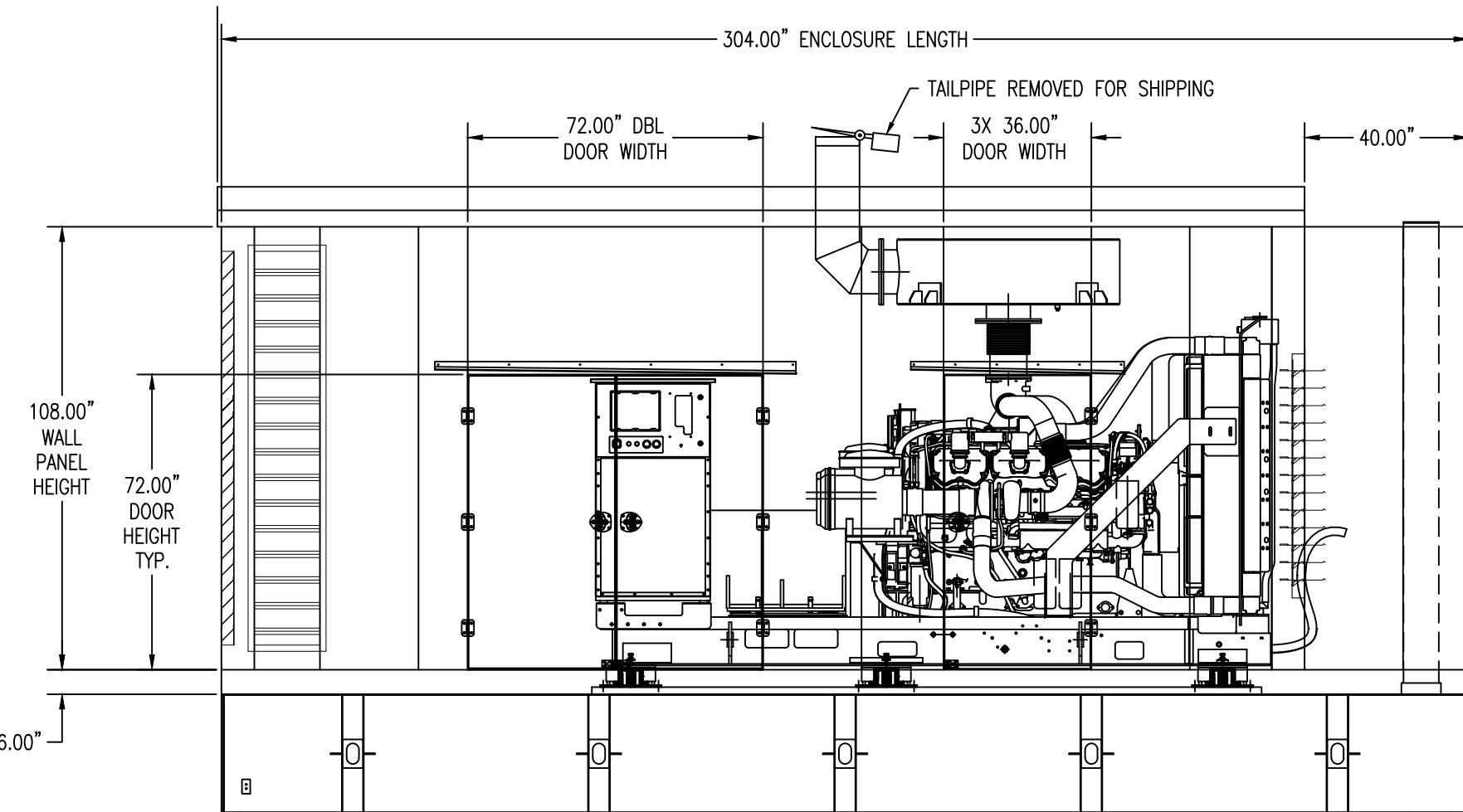
SCALE:

NTS

REV B

ENCLOSURE EXTERIOR POWDER PAINT COLOR: COLONIAL RED

3" 14 GA GALVANNEAL WALL PANELS



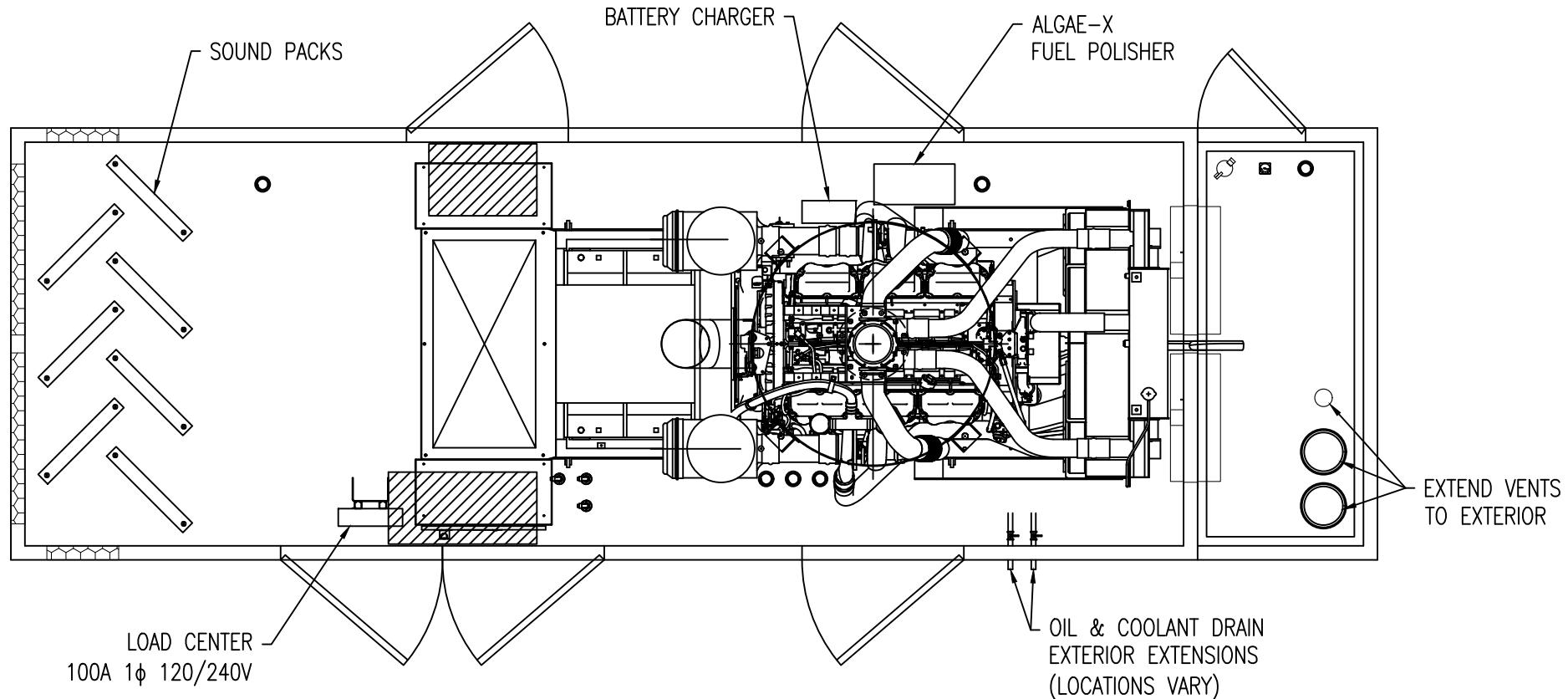
REVISIONS:

REV. A: DRAWN ON 01-04-18 SLL.
REV. B: ADDED WEIGHTS 01-10-18 SLL.

DESCRIPTION	SAE-G2-ULSB-2600 (REACH-IN)	JOB NAME	GREEN RIDGE REC CNTR	JOB #	13102
GENERATOR	C27 750KW	CUSTOMER	CARTER MACHINERY	QUOTE #	12213
CUSTOMER APPROVAL:		DRAWN BY	SLL	DATE:	01-04-18
NAME:	DATE:	SHEET	4 OF 8	SCALE:	NTS REV B

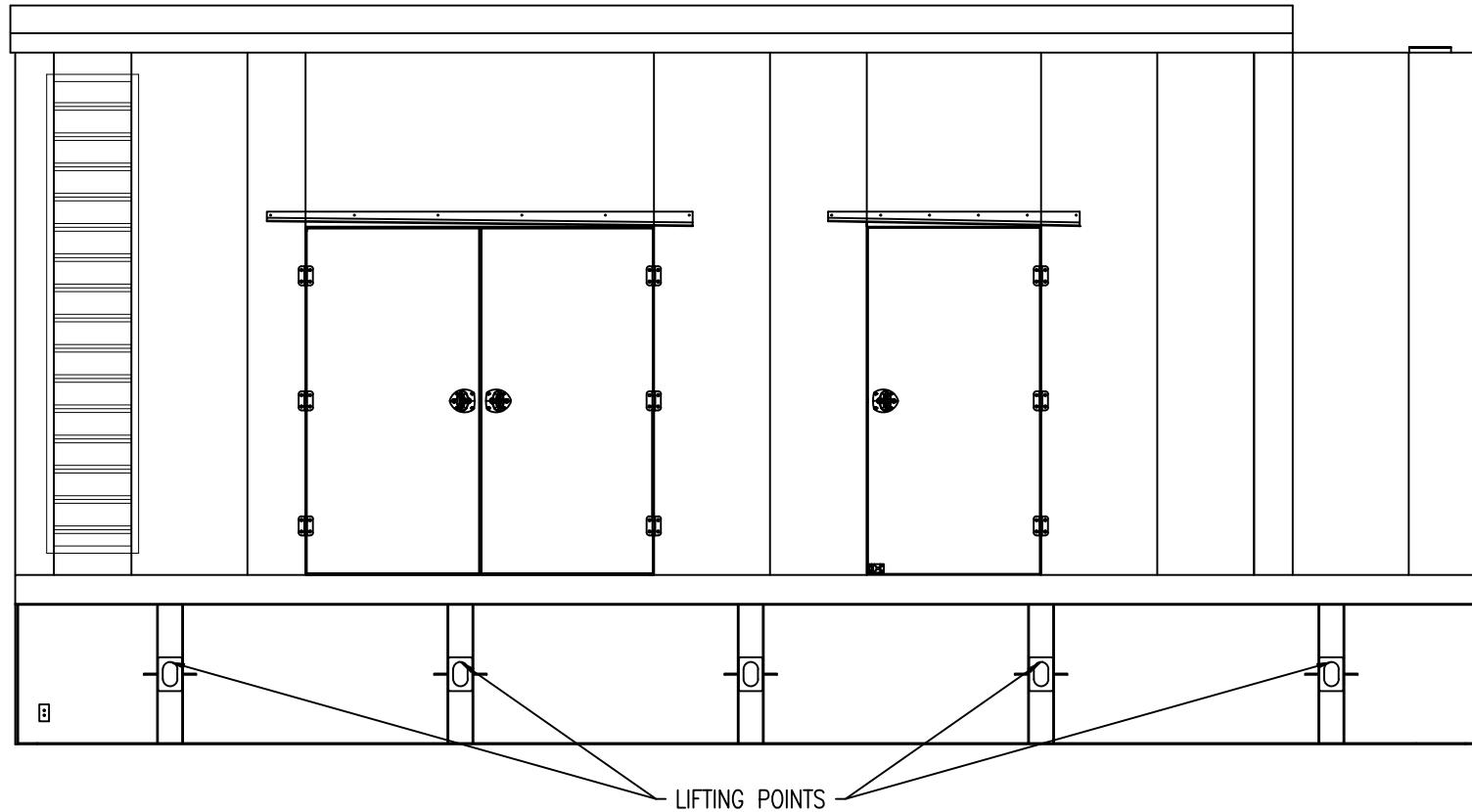
ENCLOSURE EXTERIOR POWDER PAINT COLOR: COLONIAL RED

3" 14 GA GALVANNEAL WALL PANELS



ENCLOSURE EXTERIOR POWDER PAINT COLOR: COLONIAL RED

3" 14 GA GALVANNEAL WALL PANELS

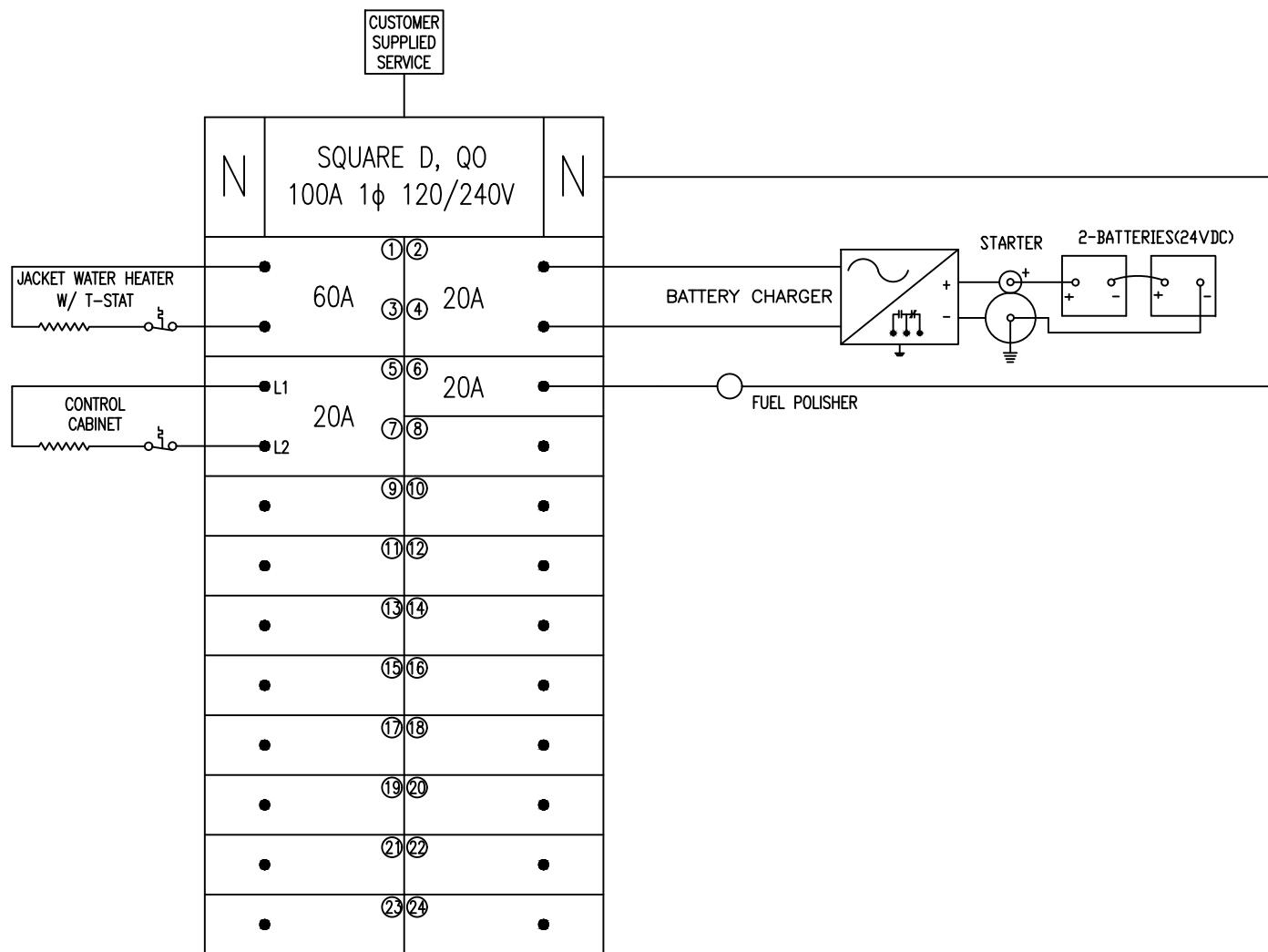


GENSET: 15,000 LBS.
ENCLOSURE: 10,900 LBS
TANK (DRY): 9,100 LBS

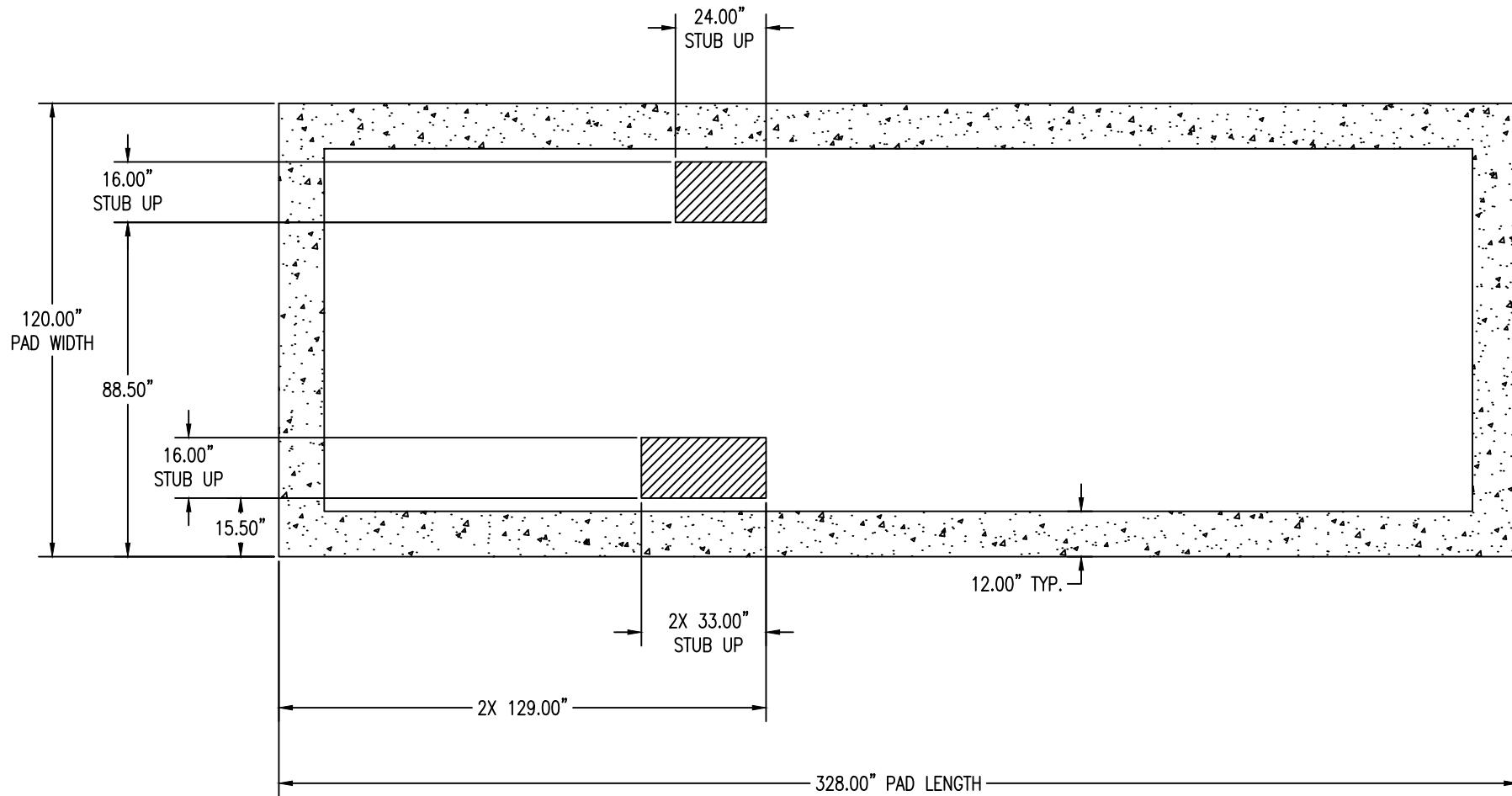


REVISIONS:
REV. A: DRAWN ON 01-04-18 SLL.
REV. B: ADDED WEIGHTS 01-10-18 SLL.

DESCRIPTION	SAE-G2-ULSB-2600 (REACH-IN)	JOB NAME	GREEN RIDGE REC CNTR	JOB #	13102
GENERATOR	C27 750KW	CUSTOMER	CARTER MACHINERY	QUOTE #	12213
CUSTOMER APPROVAL:		DRAWN BY	SLL	DATE:	01-04-18
NAME:	DATE:	SHEET	6 OF 8	SCALE:	NTS



 <p>REV. A: DRAWN ON 01-04-18 SLL. REV. B: ADDED WEIGHTS 01-10-18 SLL.</p>	DESCRIPTION	SAE-G2-ULSB-2600 (REACH-IN)	JOB NAME	GREEN RIDGE REC CNTR	JOB #	13102
	GENERATOR	C27 750KW	CUSTOMER	CARTER MACHINERY	QUOTE #	12213
	CUSTOMER APPROVAL:		DRAWN BY	SLL	DATE:	01-04-18
	NAME:	DATE:	SHEET	7 OF 8	SCALE:	NTS



SUGGESTED PAD LAYOUT



REVISIONS: REV. A: DRAWN ON 01-04-18 SLL. REV. B: ADDED WEIGHTS 01-10-18 SLL.	DESCRIPTION SAE-G2-ULSB-2600 (REACH-IN) GENERATOR C27 750KW CUSTOMER APPROVAL: NAME: _____ DATE: _____	JOB NAME GREEN RIDGE REC CNTR CUSTOMER CARTER MACHINERY DRAWN BY SLL DATE: 01-04-18 SHEET 8 OF 8	JOB # 13102 QUOTE # 12213 SCALE: NTS REV B
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Enclosure & Tank Cut Sheet Packet

Green Ridge Rec. Center EK Project 13102

Carter Cat Power Systems 750KW C27



Critical grade disk silencers are best suitable for applications where a substantial level of sound attenuation is required. Disk silencers are excellent choices for housed applications where available space is limited and exhaust system heat rejection must be minimized. Typical sound attenuation for this grade is in the range of 25 to 32 dB(A) on diesel and gaseous fueled reciprocating industrial engines. Custom disk silencers are readily available with a multitude of options to meet your specific needs.

Standard Features

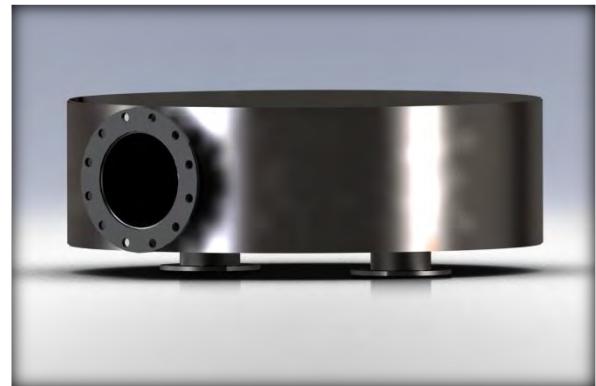
- Continuously welded heavy duty steel construction
- Internally insulated with 2" insulation on shell surfaces
- ANSI 125/150# flanges
- Four standard mounting lugs
- High temperature black finish – rated to 1000F

Optional Features

- Dual Inlets – special orientation to optimize installation fit-up
- Spark Arresting chamber
- ISO container top mount design
- Special flanges and port connections
- Support structures and brackets

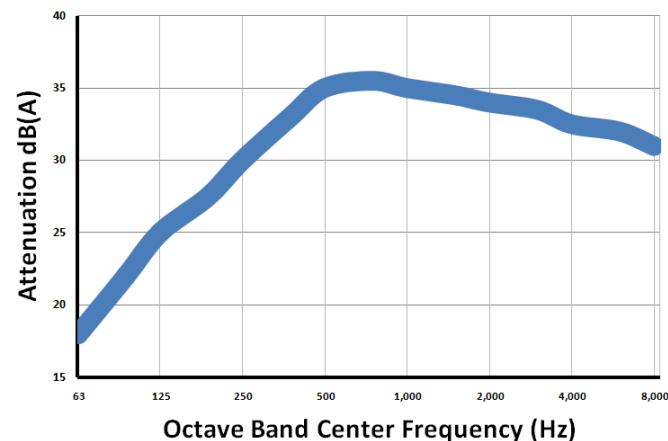
Material & Finishing options available

- Metallized Aluminum Spray Coat Finish with 100% protected outer surfaces
- High Performance paint options
- External Insulation - High-Temp Silicone Impregnated Canvas
- Stainless Steel – 304, 316, 321



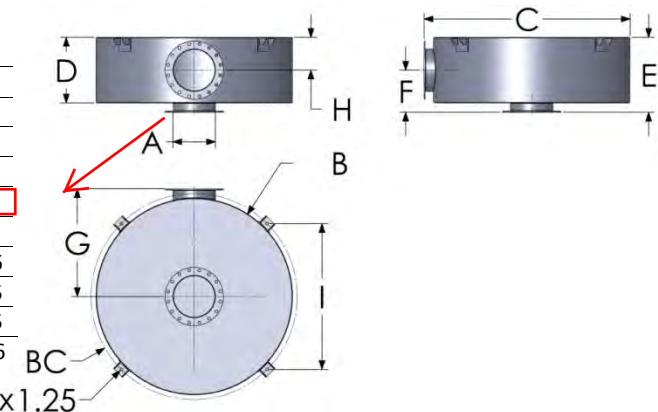
DSC-16 in 304 stainless

Typical Sound Attenuation - DSC



DIMENSIONS (Inches)

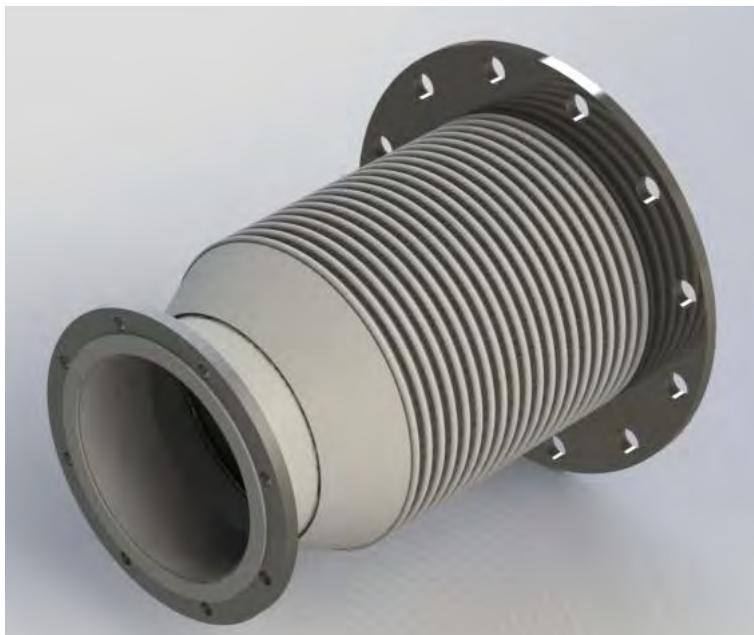
Model	A	B	C	D	E	F	G	H	I	BC	Lbs.
DSC-04	4.00	28	32	8	12	8	18	4	22.6	32	125
DSC-05	5.00	29	33	10	14	9	18.5	5	23.3	33	160
DSC-06	6.00	33	37	12	16	10	20.5	6	26.2	37	215
DSC-08	8.00	45	49	14	18	11	26.5	7	34.6	49	380
DSC-10	10.00	54	58	16	20	12	31	8	41.0	58	630
DSC-12	12.00	62	66	18	22	13	35	9	46.6	66	798
DSC-14	14.00	66	70	24	28	16	37	12	49.5	70	1056
DSC-16	16.00	72	76	26	30	17	40	13	53.8	76	1185
DSC-18	18.00	84	88	28	32	18	46	14	62.3	88	1655
DSC-20	20.00	96	100	30	34	19	52	15	70.8	100	2236



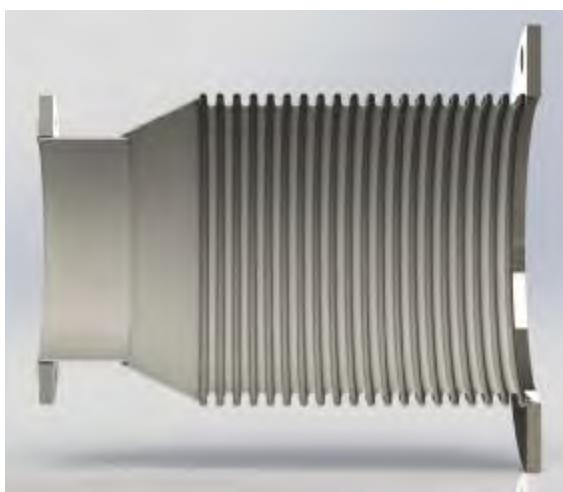


FLEX ASSEMBLIES

Bergari Solutions designs and manufactures custom engine exhaust flex assemblies for a variety of applications. Nominal flex assembly sizes from 2" up to 12" can be fitted with commonly used connections such as flanges, slip-fit joints, V-Band or pipe thread. The base flex element material is convoluted flex hose constructed of 321 stainless steel ranging in wall thicknesses from 0.010 up to .020 inches. Diameter transition cones, flanges and rings are commonly constructed of carbon steel then painted with a high-temp black paint.



Custom flex assembly shown with 8" floating engine specific inlet flange, 10" ANSI flange, transition cone from 8" to 10" nominal.



Typical construction – section view

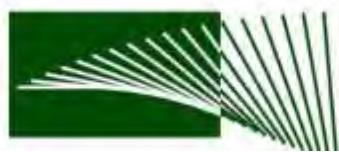
FLEX DESIGN OPTIONS

Connections

- CAT, Cummins, MTU, Mitsubishi
- ANSI, DIN flanges
- V-Band, 20° flare
- NPT, NPTF pipe

Other Options

- Floating Flange Rings
- Stainless Steel 304 & 316 flanges, etc.



FLEX ASSEMBLIES - TECHNICAL DATA

WORKING PRESSURE RATINGS

NOMINAL FLEX SIZE	WORKING PRESSURE AT 70°F, PSI
2"	15
3"	10
4"	8
5"	6
6"	5
8"	6
10"	5
12"	3



WORKING PRESSURE DERATE TABLE

The working pressure values listed above are based on a 70°F temperature. As temperature increases, the working pressure is reduced by the derate factor listed below.

TEMPERATURE, °F	DERATE FACTOR
70	1.0
250	.92
500	.78
700	.76
900	.62
1000	.60
1200	.53
1500	.46

MADE IN THE USA



BERGARI
SOLUTIONS

member of mandersgroup

INNOVATION WITH INTEGRITY

HEAVY DUTY RAINCAPS



Bergari Solutions offers heavy duty carbon steel raincaps for industrial exhaust systems. These raincaps are all welded, counterweighted designs with an integral replaceable metal bushing at the pivot point. Painted with a high temperature black finish.

- Standard models are sized to fit nominal tubing sizes.
- Optional pipe sizes are available.
- Similar models are also available in 304 and 316 grade stainless steel.
- An aluminum thermal spray coat finish is also available as an option.

STANDARD HEAVY DUTY CARBON STEEL RAINCAPS – FOR TUBE SIZES

Part No.	For OD Tube Size
500-000556	3.00
500-000557	3.50
500-000558	4.00
500-000559	4.50
500-000560	5.00
500-000562	6.00
500-000564	8.00
500-000566	10.00
500-000568	12.00
500-000570	14.00
500-000571	16.00
500-000572	18.00
500-000573	20.00



Programmable Smart FPS Systems remove water and sediment, decontaminating, stabilizing and drying diesel and bio-fuels. They prevent microbial contamination, clogged filters and injection system failures. FPS systems optimize and maintain fuel quality **for peak engine performance and reliability**



- Fully Automated & Programmable
- Modular “Plug & Play” System
- Four Unique Safety And Alarm Features
- Remote Monitoring Ready
- Powder-coated, Corrosion-Resistant, Aluminum Back Plate & Spill Tray
- Stainless Steel Plumbing
- Industrial Gear Pump

NEMA rated 4X,12

The Smart FPS has three and four-stage water removal and particulate filtration down to 3 micron. Algae-X's patented Fuel Conditioner reverses fuel deterioration and polymerization to sub micron levels.

For safe operation the Smart FPS is equipped with an automatic pump shut-down and indicators when filter elements require service. Also included are a **high pump vacuum, pressure exits, and leak detector**.

SYSTEM	FPS SX	FPS SX-R	FPS MX	FPS MX-F
Dimensions (H x W x D)	21" x 18" x 9" (53 x 46 x 23 cm)	21" x 29.5" x 9" (53 x 75x 23 cm)	23" x 22" x 9" (58 x 56 x 23 cm)	23" x 26" x 9" (58 x 66 x 23 cm)
Weight (Approx.)	50 lbs System 10 lbs Controller 23 kg System 4.5 kg Controller	50 lbs System 10 lbs Controller 23 kg System 4.5 kg Controller	60 lbs System 10 lbs Controller 27 kg System 4.5 kg Controller	70 lbs System 10 lbs Controller 32 kg System 4.5 kg Controller
Power Requirements	110/60 Hz or 230 V/50 Hz			
AMPs	FLA 15A@110 V	FLA 15A@110 V	FLA 15A@110 V	FLA 15A@110 V
Flow Rate	150 GPH	150 GPH	250 GPH	250 GPH
Fuel Conditioner	LG-X 1500	LG-X 1500	LG-X 1500	LG-X 1500
Primary Filter/Separator	Separ 2000/10 (10/30 Micron)	Racor 1000 MA (10/30 Micron)	Separ 2000/18 (10/30 Micron)	Separ 2000/18 (10/30 Micron)
Controller	SFC-50	SFC-50	SFC-50	SFC-50
Port Size	In 3/4" 37 Degree Flare Connections Out 1/2" 37 Degree Flare Connections	In 3/4" 37 Degree Flare Connections Out 1/2" 37 Degree Flare Connections	In 3/4" 37 Degree Flare Connections Out 3/4" 37 Degree Flare Connections	In 3/4" 37 Degree Flare Connections Out 3/4" 37 Degree Flare Connections

ALGAE-X® Total Fuel Management Systems

QO® and Homeline® Load Centers and Enclosures

Catalog
1100CT0501
2007

Class 1100



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QO® and Homeline® Load Centers and Enclosures

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NOTE: For information on Replacement Parts with specific part numbers, go to www.schneider-electric.us, click on Product FAQ's, enter the device catalog number, click SEARCH, then look for the information required.

QO® and Homeline® Load Centers and Enclosures

Product Description

PRODUCT DESCRIPTION



QO® Circuit Breaker Load Center

QO® Circuit Breaker Load Centers from Square D® are Underwriters Laboratories (UL) Listed panelboards. They are designed to meet residential, commercial, and industrial requirements to protect electrical systems, equipment, and people.

Features

- Single- or three-phase construction
- 30 400 A main lug or main circuit breaker ratings
- 2 4 2 circuit indoor or outdoor versions
- Flush or surface mounting
- Aluminum bus construction on fixed mains panels
- Service entrance equipment capable panels
- Straight-in wiring to minimize service cable installation
- Convertible mains to meet changing job site requirements
- Standard 22/10 k AIR series rating on main circuit breaker panels, increasing application capability
- 65 k AIR ratings for main lugs panels for industrial applications
- 65 k AIR rating with optional main circuit breaker on three-phase panels for industrial applications
- Shielded one-piece plated copper bus construction on convertible mains panels, an industry exclusive for protection and performance
- Single captive screw interior mounting on indoor panels to ease removal
- Split branch neutral for clutter-free wiring
- Top or bottom feed by rotating convertible mains panels 180 degrees
- Top or bottom feed for three-phase convertible panels by removing main circuit breaker and rotating panel 180 degrees
- Combination slot/square drive neutral, ground, and cover screws for positive drive and improved torque
- Three grounding bar mounting locations for ease of wiring
- Automatic flush adjustment cover to speed installation
- Tangential main service knockouts that eliminate offsets
- Equipment grounding bar included with main lug load centers
- Covers sold separately
- Provisions for door lock on convertible mains panel covers
- Two branch circuit breaker twistouts that are factory removed for easier installation of circuit breakers
- Side hinge doors on outdoor convertible main panels
- Outdoor panel covers lockable with padlock
- Manual and automatic transfer switch capability

QO® and Homeline® Load Centers and Enclosures

Catalog Number Description

CATALOG NUMBER DESCRIPTION

QO® Load Centers

Number Segment	Character	Description	QO®	1	3040	L	200	G	—	—
Load Center Family	QO®	UL and NOM Listed								
	CQO	CSA® Certified								
Phase	1	Blank or 1 = Single 3 = Three								
Spaces / Circuits	3040									
	M	Main circuit breaker								
Mains Type	MX	Main circuit breaker for Automatic Transfer Switch								
	L	Main lugs								
	U	Universal mains (studs only)								
Amperes	Blank	Purchase separately								
Grounding Bar	G	Included								
	N	Neutral installed								
	T	Factory-installed								
	Blank	Purchase cover separately								
Cover	C	Combination flush / surface indoor cover								
	DF	Flush cover with door								
	DS	Surface cover with door								
	F	Flush cover								
	R	Rainproof								
	RB	Rainproof for B hub								
	S	Surface cover								
	CU	Copper bussing								
Special Construction	FT	Feed-thru lugs								
	GP	Generator panel								
	NM	Non-metallic enclosure								
	R	Generator receptacle								
	WG	Wide gutter riser panel								

QO® Circuit Breakers

Number Segment	Character	Description	QO®	1	15	—
Brand	QO	Full Size				
	QOT	Tandem				
Number of Poles						
Amperes						
Device Name	Blank	10,000 AIR				
	EPD	30 mA equipment ground fault protection				
	GFI	Ground fault circuit interruption				
	HID	For use on high intensity discharge lighting systems				
	HM	High magnetic trip circuit breakers are recommended for applications where high initial inrush current may occur				
	K	Key operated				
	PL	Remote control switching capability				
	SWN	Switch neutral common trip				
	VH	22,000 AIR				
	AFI	Arc fault circuit interruption				
	CAFI	Combination arc fault circuit interruption				

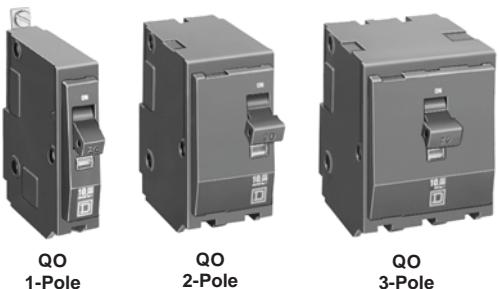
QO® and Homeline® Load Centers and Enclosures

General Information and Application Data

GENERAL INFORMATION AND APPLICATION DATA



QO® Circuit Breaker Load Center



QO
1-Pole

QO
2-Pole

QO
3-Pole

Service

120 Vac, 1 ϕ 2W	240/120 Vac delta, 3 ϕ 4W
120/240 Vac, 1 ϕ 3W	240 Vac corner grounded delta, 3 ϕ 3W
240 Vac delta, 3 ϕ 3W	48 Vdc maximum (1 ϕ convertible main
208Y/120 Vac, 3 ϕ 4W	lug 12 4 2 circuit only)

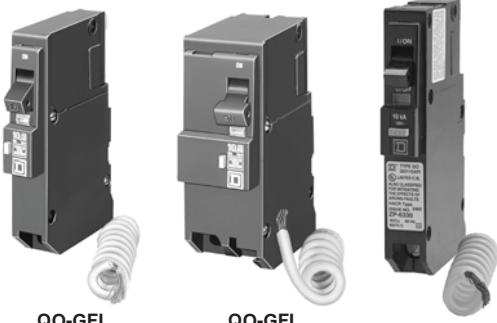
Ratings

	Main Lugs	Main Circuit Breaker
Single-Phase	30 400 A	100 4 00 A
Three-Phase	60 225 A	100 2 25 A

Branch Circuit Breakers



QO-EPD 1-Pole



QO-GFI
1-Pole

QO-GFI
2-Pole

QO-AFI 1-Pole



QO-CAFI 1-Pole



QOK, 1-Pole

QO-SWN, 1-Pole



QO-PL 2-Pole

10,000 AIR

QO	1-pole, 10 70 A
	2-pole, 10 12 5 A
	3-pole, 10 10 0 A
QOT	1-pole, 15 20 A
QO-EPD	1-pole, 15 30 A
	2-pole, 15 60 A
	1-pole, 15 30 A
QO-GFI	2-pole, 15 60 A
	1-pole, 15 20 A
	1-pole, 15 20 A
QO-AFI	1-pole, 15 20 A
	1-pole, 15 20 A
	1-pole, 15 50 A
QO-HID	2-pole, 15 50 A
	3-pole, 15 30 A
	1-pole, 10 20 A, 30 A
QO-PL QO-PLIC	2-pole, 10 60 A
	3-pole, 15 60 A
	2-wire, 10 50 A
QO-SWN	3-wire, 10 50 A
	1-pole, 10 30 A
	1-pole, 10 30 A

22,000 AIR

QO-VHGF	1-pole, 15 30 A
	1-pole, 15 30 A
	2-pole, 15 12 5 A
QO-VH	3-pole, 15 10 0 A
QOB-VH	2-pole, 150 A ¹
	3-pole, 110 150 A ¹

42,000 AIR

QOH	2-pole, 40 12 5 A
-----	-------------------

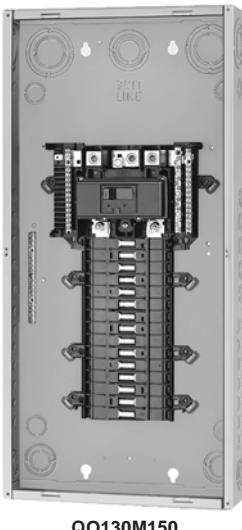
65,000 AIR

QH	1-pole, 15 30 A
	2-pole, 15 30 A
	3-pole, 15 30 A

¹ For use with 300 A and 400 A load centers only. Requires PK3CA mounting kit, ordered separately.

QO® and Homeline® Load Centers and Enclosures

General Information and Application Data



Indoor Cover



Indoor Enclosures (Type 1)

Welded sheet steel with knockouts at top, bottom, back, and sides

Finish: gray baked enamel, electrodeposited over cleaned, phosphatized steel

Most 100 225 A indoor enclosures are 14.25 in. (362 mm) wide (see Dimensions and Knockouts on page 26)

300 A and 400 A indoor enclosures are 20 in. (508 mm) wide

Top or bottom feed by rotating enclosure

Indoor Covers

Doors to cover circuit breaker handles, except on 2 4, 4 8, 6 12, and 8 16 circuit models

Shutter-type twistouts

Flush and surface covers available, sold separately

Flush covers have automatic flush adjustment

Field-installed door lock provisions available on most covers

QOFP filler plates available for all covers

QOM1FP filler plates available for 100 1 25 A convertible load center covers

QOM2FP filler plates available for 150 2 25 A convertible load center covers

Q2FP filler plates available for 3-phase load center covers

Triple lead cover screws for fast cover installation



QO140M200RB

Rainproof Enclosures (Type 3R)

Complete enclosure includes interior trim and door

Welded, galvannealed steel

Finish: gray baked enamel, electrodeposited over cleaned, phosphatized, galvannealed steel

RB devices have provisions for interchangeable bolt-on hub

Top-centered rainproof mounting boss on the back of the enclosure simplifies installation and saves time

Stainless steel door latch on the enclosure provides secure closure and maximum durability

Convertible main panels are side-hinge door devices

Allow 1.25 in. (32 mm) on the left side for the door to open

Side-hinged door provides full wiring access without door removal

Bolt-On Hubs

Hubs available from 0.75 in. (19 mm) to 4 in. (102 mm) conduit size

No gasket required with hubs from 0.75 in. (19 mm) to 2.50 in. (64 mm) when used on RB type load centers

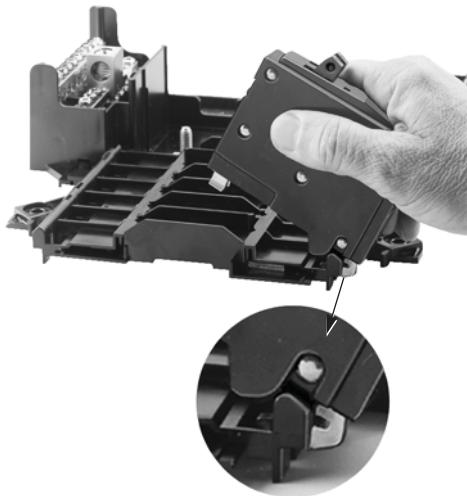


Bolt-On Hubs

QO® and Homeline® Load Centers and Enclosures

General Information and Application Data

Class CTL



Tandem circuit breaker mounts on rails.

Class CTL load centers are UL Listed

Circuit breaker mounting rails have slots to accept tandem circuit breakers, on specified load centers

Meets paragraph 408.35 of the 2005 National Electrical Code® (NEC®)

Phasing

Load centers have distributed phase bussing

Most branch circuit breakers can be mounted in any position

Line Lugs

All lugs suitable for 75 °C copper or aluminum wires (see Main Lugs and Main Circuit Breaker Ratings on page 20)

Main lugs and main circuit breaker load centers have wire binding screw torque values on the wiring diagrams and circuit breaker labels

Neutral Assemblies

All lugs suitable for copper or aluminum wire (see Main Lugs and Main Circuit Breaker Ratings on page 20)

Branch neutral terminals suitable for one #14 #4 AWG copper or one #12 #4 AWG aluminum wire

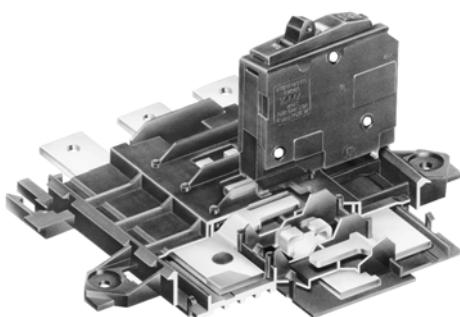
Three #14 1/0 AWG copper or #14 #6 AWG aluminum terminals provided on 12 42 circuits, 100 225 A load centers

Suitable lugs provided on the neutrals for termination of the grounding conductor

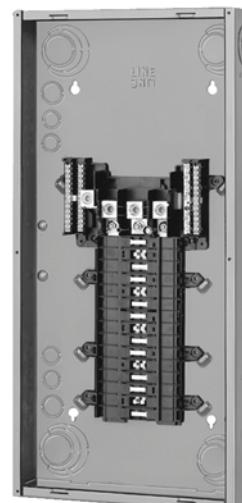
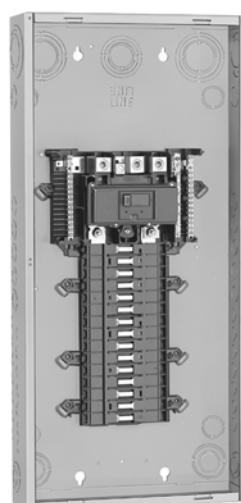
All unused neutral terminals may be used to terminate bare or green equipment grounding conductors when the load center is used as service equipment:

one or two #14 # 12 AWG copper

one or two #12 # 10 AWG aluminum



Branch Circuit Breaker



Neutral assemblies accept copper or aluminum wire.

QO® and Homeline® Load Centers and Enclosures

General Information and Application Data

Single Phase, 2–16 Circuits, 30–125 A, Fixed Mains



QO24L70S

UL Listed

File E-6294

Suitable for use as service equipment

75 °C wire rating (see Technical Information on page 20)

Federal Specification W-P-115c, Type 1, Class 2

CSA Certified

File LL-89066-21

For other CSA certified load centers, see Supplemental Digest 174.

Short Circuit Current Rating

UL short circuit current rating depends on lowest interrupting rating of circuit breaker installed (see Technical Information on page 20)

Interior

Tin plated aluminum bus

Tin plated copper bus is an available option on 6 12 and 8 16 circuit load centers

Tin plated copper bus is standard on 4 8 circuit load centers

Mains

Factory-installed main lugs

Top mains positioning only

Top or bottom feed

A backfed main circuit breaker can be field-installed in 4 8 , 6 12 and 8 16 load centers using the PK2MB retaining kit

Cover

Flush- or surface-mounted cover included with load centers

A cover with a door is an available option on 6 12 and 8 16 circuit load centers

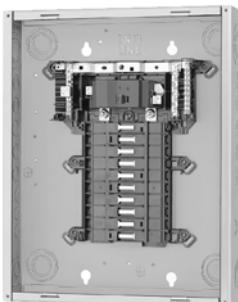


QO148L125GF

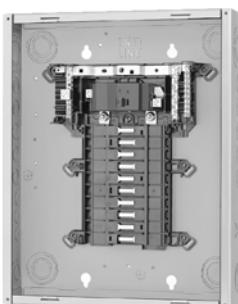
QO® and Homeline® Load Centers and Enclosures

General Information and Application Data

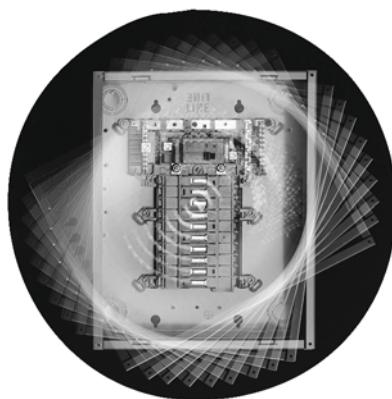
Single-Phase, 12–42 Circuits, 100–225 A, Convertible Mains



Main Circuit Breaker



Main Lug



Top or bottom mains positioning. Rotate entire load center 180 degrees.

UL Listed

File E-6294

Federal Specification W-P-115c, Type 1, Class 2

Suitable for use as service equipment

75 °C wire rating (see Technical Information on page 20)

Short Circuit Current Rating

Main lugs: up to 65,000 AIR (depends on lowest interrupting rating of branch circuit breakers installed)

Main circuit breaker: 22,000 AIR standard

22,000 AIR main circuit breaker kits (refer to page 10 and Technical Information on page 20)

Interior

Shielded, one-piece tin plated copper bus

Removable interior with single, captive mounting screw

Split branch neutral with up to 50% more terminations than required

Multiple mounting locations for equipment grounding bar kits: left, right, and bottom

Main lugs load centers have equipment grounding bar kits included (not factory-installed)

Mains

Factory-installed main lugs convertible to main circuit breaker

Load Center Amperage	Main Circuit Breaker Kit Amperage
125	50 125
150	100 15 0
200	100 20 0
225	100 22 5

Factory-installed main circuit breaker convertible to main lugs

Main Circuit Breaker Amperage	Main Lug Kit Amperage	Load Center Amperage
100	125	100
125	125	125
150	225	150
200	225	200
225	225	225

QO® and Homeline® Load Centers and Enclosures

General Information and Application Data



Cover



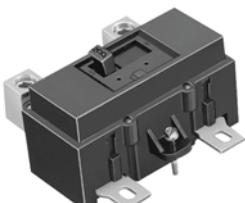
QOL125 Kit



QOL225 Kit



QOM1
Main Frame Size
50-125 A



QOM2
Main Frame Size
100-225 A

Single-Phase, 12-42 Circuits, 100-225 A, Convertible Mains, Continued

Covers

Flush and surface covers sold separately

Flush covers have spring-loaded interior trim for automatic flush adjustment

Positive action, easy-open door latch

Main Lugs Kits

Field-installable in main circuit breaker or main lugs load centers

QOL125 kit for use in 100 125 A load centers

QOL225 kit for use in 150 225 A load centers

Main Circuit Breaker Kits

Field-installable in main lugs or main circuit breaker load centers

50 2 25 A main circuit breaker kit is 22,000 AIR series rated with 10,000 AIR branch circuit breakers

Field-Installable Main Circuit Breaker (Convertible Main Load Centers Only)

Main Circuit Breaker Ampere Rating ¹	Use with Convertible Load Center Mains Rating	22,000 AIR	Lug Wire Size ² AWG/kcmil Al or Cu	Lug Torque lb-in. / N•m
		Main Circuit Breaker		

QOM1 Frame Size

50	100 125 A	QOM50VH	#12 2/0	50 lb-in. (6 N•m)
60	100 125 A	QOM60VH		
70	100 125 A	QOM70VH		
80	100 125 A	QOM80VH		
90	100 125 A	QOM90VH		
100	100 125 A	QOM100VH		
110	125 A	QOM110VH		
125	125 A	QOM125VH		

QOM2 Frame Size ^{3 4}

100	150 225 A	QOM2100VH	#4 30 0	250 lb-in. (28 N•m)
125	150 225 A	QOM2125VH		
150	150 225 A	QOM2150VH		
175	200 225 A	QOM2175VH		
200	200 225 A	QOM2200VH		
225	225 A	QOM2225VH		

¹ Do not exceed the load center mains rating.

² Wire range listed for QOM circuit breaker kits is the wire range of that circuit breaker. To find out maximum wire size permitted in a particular load center per UL, see [Main Wire Size AWG/kcmil](#) on page 20.

³ Add suffix 1021 for shunt trip.

⁴ Add suffix 8041 for control wire taps.

QO® and Homeline® Load Centers and Enclosures

General Information and Application Data

Special Purpose



QO2L30TTS

Recreational Vehicle and Manufactured Housing Load Centers

UL Listed (File E-6294) and CSA Certified (LL89066-14)

Single-phase, 2- and 3-wire

Factory-installed equipment grounding bar

Covers included with load centers

Load Centers with Covers

Combination flush/surface cover included with load centers

Equipment grounding bar included on main lug load centers

Top or bottom feed on incoming service by rotating complete load center 180 degrees

Convertible main load centers

Non-Metallic Load Center

UL Listed

Suitable for use as service equipment

Side-hinge door device

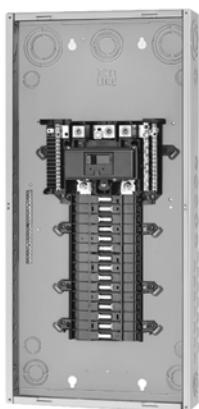
10,000 AIR rating

Single-phase, 2- and 3-wire

Factory-installed grounding bar

Cover included with load center

Knockouts in bottom endwall, side and back



QO130M150

Main Circuit Breaker with Feed-Thru Lugs

Available rainproof enclosure only

Side hinge door devices

Allow 1.25 in. (32 mm) on the left side for the door to open

125, 150, and 200 A mains rating

125, 150, and 200 A feed-thru lugs

Space for up to 8 single-pole circuit breakers



QO24L60NRNM



QO1816M200FTRB

Liquid Level Switch Details by Part Number

Detalles de Interruptor de Nivel Líquido por Número de Parte

Part Number	Materials (stem, float)	Max. Temp.	Mounting	Max. Pressure (PSIG)	Elec. Rating (Watts)	Approvals (see reverse for key)	Notes (see below for key)
Standard Full-Size Vertical							
M4182-AL	Alum, Polypro.	105°C	1/2 NPT	150	70		
M4182-SS	316 SS	200°C	1/2 NPT	300	70	2, 5, 6, 7	
M5600	316 SS	200°C	1/4 NPT	200	60	1, 4, 6	
M5400	Brass, 316 SS	200°C	1/4 NPT	200	60	1, 4, 6	
M5917	316 SS	250°C	1/4 NPT	200	60	1, 4, 6, 7	
M8800	Polypro.	105°C	1/4 NPT	100	60	1, 4, 6, 7	
M8600	316 SS, Polypro.	105°C	1/4 NPT	100	60	1, 4, 6, 7	
M8400	Brass, Polypro.	105°C	1/4 NPT	100	60	1, 4, 6	
M7800	PBT, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	
M4300	Brass, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	
M4600	316 SS, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	
M9800	Kynar	105°C	1/4 NPT	15	60	1, 6, 7	
M5600-PR	316 SS	200°C	1/4 NPT	500	100	6, 7	
M8060-PR	CPVC, Polypro.	105°C	1/4 NPT	100	100	6	
M8600-PR	Polypro.	105°C	1/4 NPT	100	100	6, 7	
M7800-PR	PBT, Buna-N	105°C	1/4 NPT	150	100	6	
MSB5600	316 SS	110°C	Bracket	85	60	8	
MSB7800	PBT, Buna-N	105°C	Bracket	150	60		
MSB8800	Polypro.	105°C	Bracket	100	60		

Standard Miniature Vertical

M5000	316 SS	200°C	1/8 NPT	300	30	1, 4, 6, 7	
M5040	Brass, 316 SS	200°C	1/8 NPT	300	30	1, 4, 6	
M8000	Polypro.	105°C	1/8 NPT	100	30	1, 4, 6, 7	
M8020	316 SS, Polypro.	105°C	1/8 NPT	100	30	1, 4, 6, 7	
M8040	Brass, Polypro.	105°C	1/8 NPT	100	30	1, 4, 6	
M7000	PBT, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	1
M4500	Brass, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M4400	316 SS, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M4008	Polypro., Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M9000	Kynar	105°C	1/8 NPT	15	30	1, 6, 7	
M3326	Polypro.	105°C	3/8-16 BH	50	15	1, 6	2
M3326-NO	Polypro.	105°C	3/8-16 BH	50	15	1, 6	2

Standard Horizontal

M3827-XX	316 SS	200°C	NPT or Bulkhead	200	30	6	
M4249	316 SS	250°C	5/8-11 BH	300	60		
M5900	316 SS	200°C	1 x 1/2 NPT	300	30	2, 4, 6, 7	
M5910	316 SS	200°C	1/2 x 1/4 NPT	300	30	2, 4, 6, 7	
M5920	316 SS	200°C	1/2 x 1/2 NPT	300	30	2, 4, 6, 7	
M5970	316 SS	200°C	1/2 BH	100	30	1, 6	
M7790	PBT	150°C	5/8-11 BH	100	30	1, 4, 6	1
M7740	PBT	150°C	3/4-16 x 7/8-14	100	30	1, 4, 6	
M7700	PBT	150°C	1/2 x 1/2 NPT	100	30	1, 4, 6	1
M7725	PBT	150°C	1/2 NPT	100	30	1, 4, 6	1
M7750	PBT	150°C	1/2 NPT	100	30	1, 4, 6	1
M8700	Polypro.	105°C	1/2 x 1/2 NPT	100	30	1, 4, 6, 7	
M8710	Polypro.	105°C	1/2 x 1/4 NPT	100	30	1, 4, 6, 7	
M8725	Polypro.	105°C	1/2 NPT	100	30	1, 4, 6, 7	
M8740	Polypro.	105°C	3/4-16 x 7/8-14	100	30	1, 4, 6, 7	
M8750	Polypro.	105°C	1/2 NPT	100	30	1, 4, 6, 7	
M8790	Polypro.	105°C	5/8-11 BH	100	30	1, 4, 6, 7	
M5010	316 SS	200°C	3/8-24 BH	300	30	1, 4, 6, 7	
M4010	Brass, Buna-N	105°C	3/8-24 BH	100	30	1, 4, 6, 7	
M9700	Kynar	105°C	1/2 x 1/2 NPT	100	30	1, 4, 6, 7	
M9750	Kynar	105°C	1/2 NPT	100	30	1, 4, 6, 7	
M9740	Kynar	105°C	3/4-16 x 7/8-14	100	30	1, 4, 6, 7	

Configured (Multi-Level)

M5602-XXXX	316 SS	200°C	X	200	60	2, 5, 6, 7	
M5402-XXXX	Brass, 316 SS	200°C	X	200	60	1, 4, 6	
M4302-XXXX	Brass, Buna-N	105°C	X	150	60	1, 4, 6	
M4602-XXXX	316 SS, Buna-N	105°C	X	150	60	1, 4, 6	
M8802-XXXX	Polypro.	105°C	X	100	60	1, 4, 6, 7	
M8602-XXXX	316 SS, Polypro.	105°C	X	100	60	1, 4, 6, 7	
M8402-XXXX	Brass, Polypro.	105°C	X	100	60	1, 4, 6	
M9802-XXXX	Kynar	105°C	X	15	60	1, 6	
M5002-XXXX	316 SS	200°C	X	300	30	1, 4, 6, 7	
M5042-XXXX	Brass, 316 SS	200°C	X	300	30	1, 4, 6	
M4502-XXXX	Brass, Buna-N	105°C	X	150	30	1, 4, 6	
M4402-XXXX	316 SS, Buna-N	105°C	X	150	30	1, 4, 6	
M8002-XXXX	316 SS, Polypro.	105°C	X	100	30	1, 4, 6, 7	
M8042-XXXX	Brass, Polypro.	105°C	X	100	30	1, 4, 6	
M8080-XXXX	Polypro.	105°C	X	100	30	1, 4, 6, 7	
M5605	316 SS	200°C	1/2 NPT	200	60		3
M8085	Polypro.	105°C	1/4 NPT	100	30		3

Notes:

- Also applies to models with slosh shields
- Also applies to Ultra Low Level (ULL) float models

1. PBT is not for use in water above 65°C (150°F).

2. The M3326 is Normally Closed. The M3326-NO is Normally Open.

Model No.	Switch Location (from bottom of fitting)	Colors	Watt Rating	Switch Type	Dry Position
M5605	1.25"	Red	60	SPST	NC
	5.75"	Black	60	SPST	NC
M8085	0.75"	Red	60	SPST	NC
	5.75"	Black	60	SPST	NC

Número de Parte	Materiales (vástago, flotador)	Temp. Máx.	Montaje	Prestón Máx. (PSIG)	Clasificación Eléct. (Watts)	Aprobaciones (ver clave en el reverso)	Notas (ver clave abajo)
Vertical Estándar Tamaño Total							
M4182-AL	Alum, Polipro.	105°C	1/2 NPT	150	70		
M4182-SS	316 SS	200°C	1/2 NPT	300	70	2, 5, 6, 7	
M5600	316 SS	200°C	1/4 NPT	200	60	1, 4, 6	
M5400	Bronce, 316 SS	200°C	1/4 NPT	200	60	1, 4, 6, 7	
M5917	316 SS	250°C	1/4 NPT	200	60	1, 4, 6, 7	
M8800	Polipro.	105°C	1/4 NPT	100	60	1, 4, 6, 7	
M8600	316 SS, Polipro.	105°C	1/4 NPT	100	60	1, 4, 6, 7	
M8400	Brass, Polipro.	105°C	1/4 NPT	100	60	1, 4, 6	
M7800	PBT, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	1
M4300	Bronce, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	
M4600	316 SS, Buna-N	105°C	1/4 NPT	150	60	1, 4, 6	
M9800	Kynar	105°C	1/4 NPT	15	60	1, 6, 7	
M5600-PR	316 SS	200°C	1/4 NPT	500	100	6, 7	
M8060-PR	CPVC, Polipro.	105°C	1/4 NPT	100	100	6	
M8800-PR	Polipro.	105°C	1/4 NPT	100	100	6, 7	
M7800-PR	PBT, Buna-N	105°C	1/4 NPT	150	100	6	1
MSB5600	316 SS	110°C	Bracket	85	60	8	
MSB7800	PBT, Buna-N	105°C	Bracket	150	60	8	
MSB8800	Polipro.	105°C	Bracket	100	60	8	

Vertical Estándar Miniatura

M5000	316 SS	200°C	1/8 NPT	300	30	1, 4, 6, 7	
M5040	Bronce, 316 SS	200°C	1/8 NPT	300	30	1, 4, 6	
M8800	Polipro.	105°C	1/8 NPT	100	30	1, 4, 6, 7	
M8020	316 SS, Polipro.	105°C	1/8 NPT	100	30	1, 4, 6, 7	
M8040	Bronce, Polipro.	105°C	1/8 NPT	100	30	1, 4, 6	
M7000	PBT, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	1
M4500	Bronce, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M4400	316 SS, Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M4008	Polypro., Buna-N	105°C	1/8 NPT	150	30	1, 4, 6	
M9000	Kynar	105°C	1/8 NPT	15	30	1, 6, 7	
M3326	Polypro.	105°C	3/8-16 BH	50	15	1, 6	2
M3326-NO	Polypro.	105°C	3/8-16 BH	50	15	1, 6	2

Horizontal Estándar

M3827-XX	316 SS	200°C	NPT or Bulkhead	200	30	6	
M4249	316 SS	250°C	5/8-11 BH	300	60	2, 4, 6, 7	
M5900	316 SS	200°C	1 x 1/2 NPT	300	30	2, 4, 6, 7	
M5910	316 SS	200°C	1/2 x 1/4 NPT	300	30	2, 4, 6, 7	
M5920	316 SS	200°C	1/2 x 1/2 NPT	300	30	2, 4, 6, 7	
M5970	316 SS	200°C	1/2 BH	100	30	1, 6	
M7790	PBT	150°C	5/8-11 BH	100			

Application

The 6500 Series Senior gauges are designed for use in low pressure tanks 0-25 psig [0-1.7Bar] containing diesel fuel, gasoline, fuel oil and lubricating oils.

Used in many applications such as construction equipment, stationary generators, boats, farm equipment and home heating.

General Information & Features

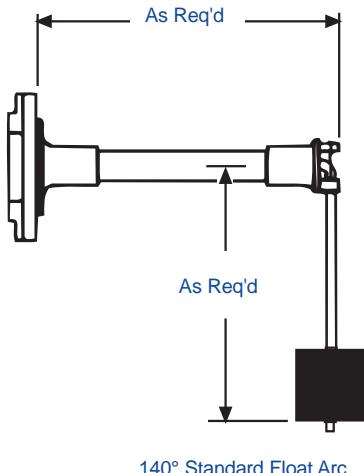
The 6500 Series Senior gauges are available in gear-action models for top, centerline or angle mounting. In lever-action models centerline mounting is only available.

The standard float is nitrile rubber. Aluminum or stainless steel floats are available at extra cost. The gauge is mounted to a mating Senior flange 2 1/2" bolt circle [63,5mm] using four 1/4"-28 x 9/16" long bolts. The gasket is Buna-N.

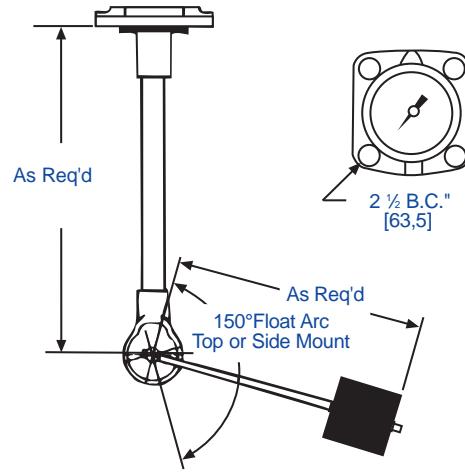


Model #	Action	Mounting	Dial, Sender or Switch Data
6540	Gear	Top	Senior TwinSite® Sender in choice of 0-30, 0-90, or 240-30 Ohm ranges. #5002S00062 direct-reading dials may also be used.
6543		C/L or Angle	
L6543	Lever	C/L	
6550	Gear	Top	Standard switch #5023S00778 S.P.S.T., 150 VAC/50 VDC 1/2 Amp. Please furnish tank drawings and switch points so proper gauge and calibration can be supplied. Other switches available, see DS-364.
6553		C/L or Angle	
L6553	Lever	C/L	
6560	Gear	Top	#5025S00570 Senior side-reading fractional
6580		C/L or Angle	#5002S00062 Senior direct-reading fractional
6583	Lever	C/L	#5002S00547 Senior direct-reading fractional
L6583		Top	#5002S00062 direct-reading fractional
6583-00093	Gear	Top	

Lever Action Gauge

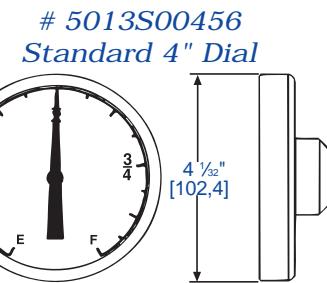
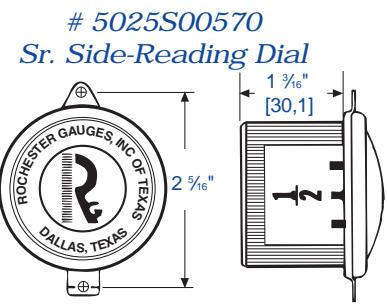
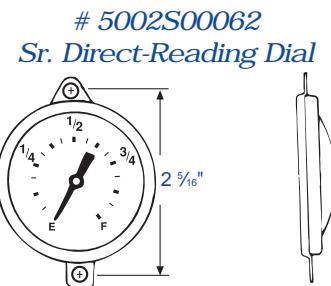


Gear Action Gauge

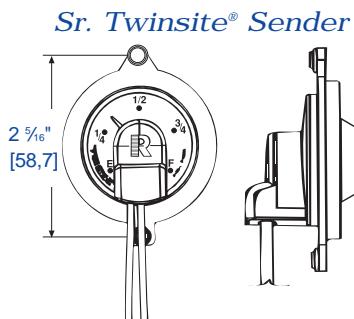


See reverse side for dimensional data, materials of construction, performance, and advice on how to order.

04/28/2015



Note: This dial is used in conjunction with 93-2 mounting bracket and 39-2 bezel.



General Specifications*

Accuracy

Accuracy depends upon proper gauge sizing. Senior dials $\pm 6\%$, TwinSite® dials $\pm 10\%$. Accuracy may be less depending upon tank shape. Accuracy may be less near full and empty. Accuracy may be less if tank is not level. This gauge is not to be used for filling. All accuracy estimates are expressed as a percent of full scale.

Temperature Range

-40°F to +158°F, -40°C to 70°C.

Humidity

Paint exposed portions of gauge, less dial, for marine applications.

Shock & Vibration

Suitable for mobile applications.

Power

0.5 watts maximum for TwinSite® versions.

Tank Pressure

Up to 25 psig [1.7Bar]

Approvals

These direct indicating gauges are UL listed for flammable liquids. Some models UL recognized for marine service.

Note: For installation instructions see MS-501/502 (mounting standard).

Materials of Construction*

Head

Die cast aluminum

Centershaft, Support Tube & Float Rod

Tempered aluminum

Gears, Cross Stud & Bearings

Stainless steel

Drive Magnet

Alnico

Gear Housing

Acetal plastic or aluminum

Float

Nitrile rubber

Gasket

Buna-N, 0015-00004 or 0015-00079

Direct Reading Dial

Aluminum with acrylic crystal, hermetically sealed.

Side Reading Dial

Aluminum with polycarbonate crystal, hermetically sealed.

TwinSite® Sender

Polyamide.

Mounting Bolts

Zinc-plated steel $1/4$ -28 x $5/16$ " long.

When ordering, specify:

1. Gauge model number.
2. Tank diameter and riser height.
3. Mounting location.
4. Ohm range on TwinSite® versions.
5. Preferred switch on switch gauges, if other than standard.
6. Any listed options or preferences.

* Materials and specifications are subject to change without notice.

Pressure ratings subject to change due to temperature and other environmental considerations.



Designed for tank filling applications where a tight fill connection is not required. Threaded body installs onto riser pipe or directly into tank bung.

Features

- Easy to open and close hinged operation
- Positive stop to prevent cover from contacting tank
- Lockable with a padlock
- Integrated venting when closed
- Your company name can be cast into the cover upon request
- **179** and **179CI** have female threads
- **179M** and **179MCI** have male threads

Construction Details

179 & 179M

- Aluminum body
- Aluminum cap
- Zinc plated steel hinge pin

179CI & 179MCI

- Cast iron (powder coated black) body
- Cast iron (powder coated black) cap
- Zinc plated steel hinge pin



Item Number	Material	Size	Weight (lbs)
179--0100 AC	Aluminum	2"	0.75
179--0200 AC	Aluminum	2½"	1.0
179--0300 AC	Aluminum	3"	1.0
179--0400 AC	Aluminum	4"	2.0
179M--0100 AC	Aluminum	2"	0.75
179M--0200 AC	Aluminum	2½"	1.25
179CI-0100 AC	Cast iron	2"	2.50
179MCI0100 AC	Cast iron	2"	2.75



Tank Fittings

Beckett
TANK ACCESSORIES

Product Sheet

Vent Caps

- Available in threaded and slip-on designs
- Slip-on designs solve clearance problems
- Zinc-plated cast iron, zinc-plated steel, zamak, and rust proof aluminum
- Available in sizes from $\frac{3}{4}$ " to 4"
- Each cap includes a screen to prevent insects and debris from entering the vent pipe



Zinc-plated Cast Iron Mushroom Vent Caps

Part No.	Description
14021	$\frac{3}{4}$ " FPT
14022	1" FPT
14023	$1\frac{1}{4}$ " FPT
14024	$1\frac{1}{2}$ " FPT
14025	2" FPT
14027	3" FPT
14028	4" FPT

FPT = Female Pipe Thread



Zinc-plated Steel Slip-on

Part No.	Description
14036	1"
14037	$1\frac{1}{4}$ "
14038	$1\frac{1}{2}$ "
14039	2"

Zamak Slip-on

Part No.	Description
14006	$\frac{3}{4}$ " – 1"

Aluminum Slip-on

Part No.	Description
14009	2"

Tank Fittings

Beckett
TANK ACCESSORIES

Product Sheet

Duplex Tank Bushings

- Available in 3-Way and 4-Way Tap
- Ideal for two line suction and return installations
- Available with or without brass compression fittings

4-Way Tap with Slip-Thru Male Compression Fittings



With Fittings	Part No.	MPT	Return	Supply
	14475	2"	3/8"	3/8"
	14476	2"	1/2"	1/2"
	14477	2"	5/8"	5/8"

Bushing Only	Part No.	MPT	FPT
	14475	2"	3/8"
	14476	2"	1/2"
	14477	2"	5/8"

3-Way Tap with Slip-Thru Male Compression Fittings



With Fittings	Part No.	MPT	Return	Supply
	14468	2"	3/8"	3/8"
	14469	2"	3/8"	1/2"
	14470	2"	1/2"	1/2"
	14471	2"	1/2"	5/8"

Bushing Only	Part No.	MPT	FPT
	14472	2"	3/8"
	14473	2"	1/2"

3-Way Tap with Slip-Thru Male Compression Union



With Union	Part No.	MPT	Return	Supply
	14446	1 1/2"	3/8"	3/8"
	14447	2"	3/8"	3/8"
	14448	2"	1/2"	1/2"

3-Way Tap with Double-Compression Nut



With Nut	Part No.	MPT	Return	Supply
	14434	2"	3/8"	3/8"

Double Tapped Bushings

- Cast iron construction
- Full range of sizes
- Double tapped full FPT thread
- Rugged design with solid hexes for secure wrench grip
- Can be used as reducing bushing for continuous piping



Part No.	MPT	FPT	Hex
14566	1"	1/2"	Outside
14568	1 1/4"	1/2"	Inside
14569	1 1/4"	3/4"	Outside
14570	1 1/4"	1"	Outside
14572	1 1/2"	1/2"	Inside
14573	1 1/2"	3/4"	Inside
14574	1 1/2"	1"	Outside
14575	1 1/2"	1 1/4"	Outside
14576	2"	3/8"	Inside
14577	2"	1/2"	Inside
14578	2"	3/4"	Inside
14579	2"	1"	Inside
14580	2"	1 1/4"	Outside
14581	2"	1 1/2"	Outside
14584	2 1/2"	1 1/4"	Inside

Part No.	MPT	FPT	Hex
14585	2 1/2"	1 1/2"	Inside
14586	2 1/2"	2"	Outside
14588	3"	1"	Inside
14589	3"	1 1/4"	Inside
14590	3"	1 1/2"	Inside
14591	3"	2"	Inside
14592	3"	2 1/2"	Inside
14600	4"	1"	Inside
14601	4"	1 1/4"	Inside
14602	4"	1 1/2"	Inside
14603	4"	2"	Inside
14604	4"	2 1/2"	Outside
14605	4"	3"	Inside
14609	6"	4"	Inside

MPT = Male Pipe Thread, FPT = Female Pipe Thread

For complete listing of all available fittings, see product sheet XXXXXX. For information on all Beckett products, please visit our website.

R.W. BECKETT CORPORATION

USA: R.W. Beckett Corporation • ph: (800)645-2876 • fax: (440)327-1064 | **Canada:** R.W. Beckett Canada Ltd. • ph: (800)665-6972 • fax: (519)763-5656

www.beckettcorp.com

Application and Design

The EM-30 series is a vertical mounted backdraft damper that is designed to allow horizontal airflow and prevent reverse airflow. The damper is opened by air pressure differential and closed by gravity.

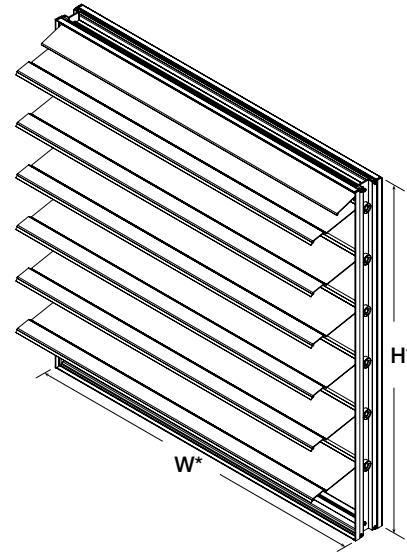
Ratings (See page 2 for specific limitations)

Pressure: 4.0 - 10.0 in. wg (996 Pa- 2491 Pa)
differential pressure.

Velocity: 2500 to 3500 fpm (13 m/s - 18 m/s)

Temperature: 180°F (82°C)

Standard	
Frame Material	6063T5 Extruded Aluminum
Frame Thickness	.125 in. (3.2mm)
Blade Material	6063T5 Extruded Aluminum
Blade Thickness	.070 in. (1.8mm)
Axle	3/4 in. (19mm) metallic
Axle Linkage	1/8 in. (3mm) plated steel
Bearings	Synthetic (acetal) sleeve type
Blade Seals	Vinyl

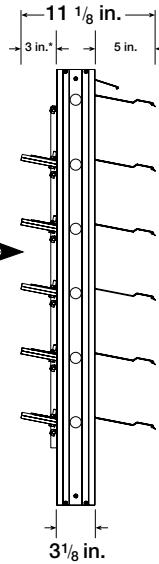


*W & H dimensions furnished approximately 1/4 in. (6mm) under size.

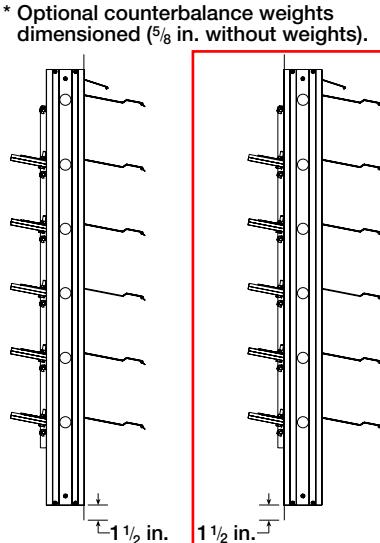
W x H	Minimum Size		Maximum Single Section Size
	With Weights	Without Weights	
Inches	8 x 11	8 x 8	48 x 74
mm	203 x 279	203 x 203	1219 x 1880

Sizes larger than maximum shown will be supplied as two or more equal size smaller dampers required to make up the size specified. These larger multiple damper assemblies require field assembly and may require additional reinforcement (not supplied by Greenheck) to support the assembly.

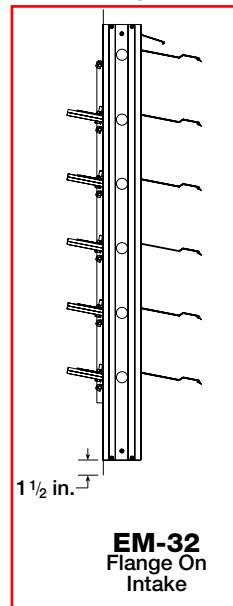
Airflow →



EM-30
No Flange



EM-31
Flange On
Discharge



EM-32
Flange On
Intake

Area ft ² (m ²)	Maximum Set Pressure in. wg (Pa)
4 (.37)	.75 (187)
6 (.56)	.50 (125)
8 (100)	.40 (100)
10 (.93)	.30 (75)
15 (1.39)	.20 (50)
20 (1.86)	.15 (37)
24 (2.23)	.125 (31)

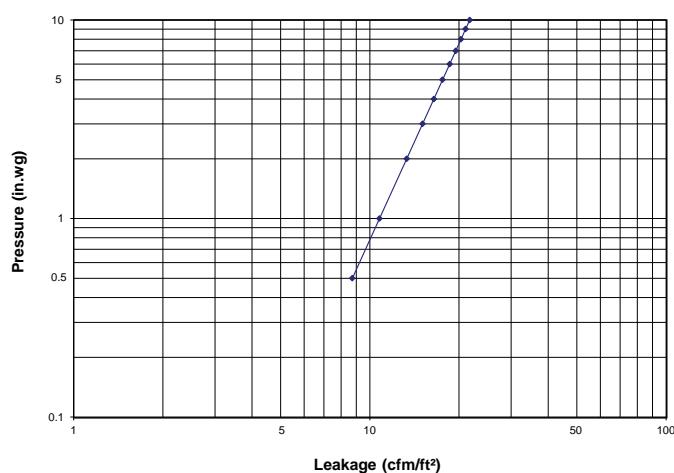
Counterbalance weights may require field adjustment. Instructions are available at www.greenheck.com.

Performance data results from testing a 36 in. x 36 in. (914mm x 914mm) damper in accordance with AMCA Standard 500-D using Figure 5.3 and Figure 5.5. All data has been corrected to represent standard air at 0.075 lb/ft³ (1.201 kg/m³).

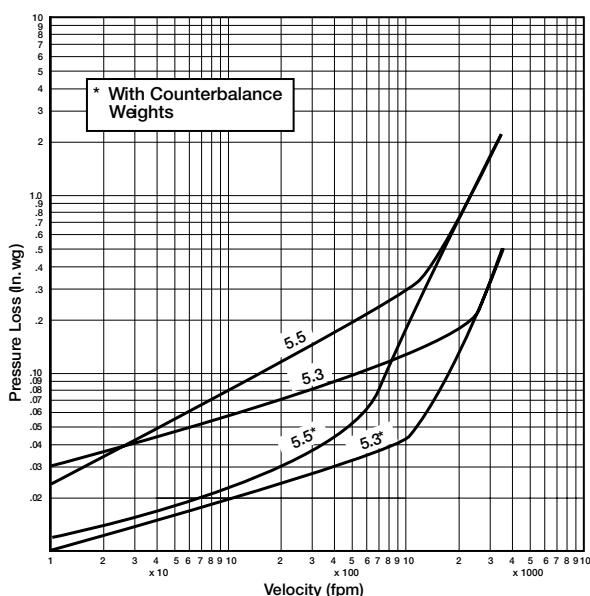
Operational Data			ΔP in. wg (Pa)	Velocity fpm (m/s)
Figure 5.3	Without Weight	Blades Start to Open	0.03 (7.5)	10 (.05)
		Blades Fully Open	0.25 (62)	2500 (12.7)
	With Weights	Blades Start to Open	0.01 (2.5)	10 (.05)
		Blades Fully Open	0.055 (13.7)	1200 (6.1)
Figure 5.5	Without Weights	Blades Start to Open	0.025 (6.2)	10 (.05)
		Blades Fully Open	0.32 (8)	1200 (6.1)
	With Weights	Blades Start to Open	0.012 (3)	10 (.05)
		Blades Fully Open	0.08 (20)	700 (3.6)

Leakage testing was conducted in accordance with AMCA Standard 500D and is expressed as CFM per sq. ft. of damper face area. All data has been corrected to represent standard air at 0.075 lb/ft³ (1.201 kg/m³).

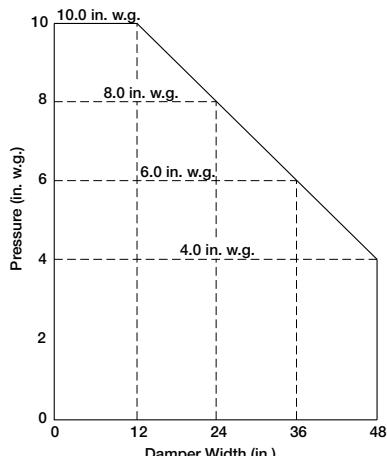
36 in. x 36 in. Damper



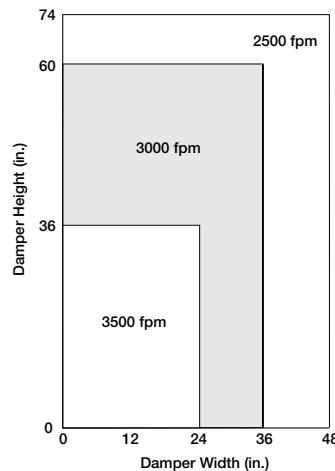
Pressure Drop



Pressure Limitations



Velocity Limitations



Specifications

Backdraft dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules. Dampers shall consist of: heavy gauge 6063T5 extruded aluminum channel frame (0.125 in. [3.2mm] thick) with 3 1/8 in. (79mm) depth; blades from 0.070 in. (1.8mm) 6063T5 extruded aluminum; 3/4 in. (19mm) dia. metallic axles turning in acetal bearings; damper shall be equipped with extruded vinyl blade seals; and internal 1/8 in. (3mm) plated steel blade-to-blade linkage. Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 10 in. wg (2491 Pa), velocities to 3500 fpm (18m/s) and temperatures to 180°F (82°C). Testing and ratings to be in accordance with AMCA Standard 500-D. Basis of design is Greenheck model EM-30.



ProRox® SL 930^{NA}

NEW NAME

Old name: ROXUL RHT® 40

Product description & application

ProRox® SL 930^{NA} is a semi-rigid mineral wool (stone wool) thermal insulation board for intermediate to high temperature industrial applications.

Product properties in accordance with ASTM C612

	Performance							Norms																																
Thermal conductivity	<table border="1"> <tr> <td>T_m (°F)</td><td>100</td><td>200</td><td>300</td><td>400</td><td>500</td><td>600</td><td></td> </tr> <tr> <td>λ (BTU.in/hr.ft².°F)</td><td>0.26</td><td>0.30</td><td>0.37</td><td>0.45</td><td>0.55</td><td>0.67</td><td></td> </tr> <tr> <td>T_m (°C)</td><td>38</td><td>93</td><td>149</td><td>204</td><td>280</td><td>316</td><td></td> </tr> <tr> <td>λ (W/mK)</td><td>0.036</td><td>0.042</td><td>0.052</td><td>0.063</td><td>0.077</td><td>0.094</td><td></td> </tr> </table>							T _m (°F)	100	200	300	400	500	600		λ (BTU.in/hr.ft ² .°F)	0.26	0.30	0.37	0.45	0.55	0.67		T _m (°C)	38	93	149	204	280	316		λ (W/mK)	0.036	0.042	0.052	0.063	0.077	0.094		ASTM C177
T _m (°F)	100	200	300	400	500	600																																		
λ (BTU.in/hr.ft ² .°F)	0.26	0.30	0.37	0.45	0.55	0.67																																		
T _m (°C)	38	93	149	204	280	316																																		
λ (W/mK)	0.036	0.042	0.052	0.063	0.077	0.094																																		
Maximum Service Temperature	<p>Hot Surface Performance: 1200 °F- (650 °C)</p> <p>Non-Combustible</p>							ASTM C411																																
	<p>Linear Shrinkage: < 1 % at 1200 °F- (650 °C)</p>							ASTM C356																																
Reaction to fire	<p>Surface burning characteristics</p> <p>Flame spread index = 0 ; Smoke development index = 0</p>							ASTM E84 (UL 723) CAN/ULC S102																																
Density	<p>Actual Density = 3.5 lb/ft³ - (56 kg/m³)</p> <p>Nominal Density = 4.0 lb/ft³</p>							ASTM C303																																
Corrosion resistance **	<p>Stress Corrosion Cracking Tendency of Austenitic Stainless Steel = Passed</p> <p>Corrosion of Steel = Passed</p>							ASTM C692 ASTM C665																																
Chemical Analysis **	<p>{Salts: Cl⁻ , F⁻ , Na⁺ , SiO₄⁴⁻} Results fall within acceptability limits of ASTM C795</p>							ASTM C795 / ASTM C871																																
Thermal Resistance	<p>R-Value / inch @ 75 °F</p> <p>RSI value / 25.4mm @ 24 °C</p>							ASTM C518 (C177)																																
Water Absorption/ Vapor Sorption	<p>< 1 % Weight</p>							ASTM C1104																																
Compliance	<p>Complies with Type: IVA</p>							ASTM C612																																
	<p>ROXUL offers a wide range of facings, dimensions and thicknesses. Please contact ROXUL for further information.</p>																																							

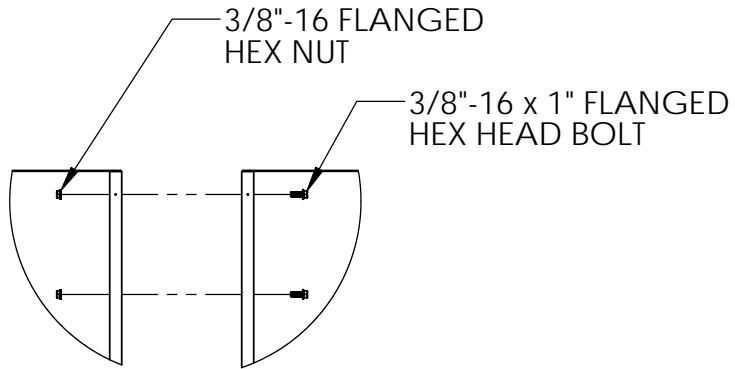
Surface Burning Characteristics: UL Listed to Canadian standard CAN/ULC S102 ; UL Classified to UL 723



NOTE: ** Provisions for lot testing may be required, consult manufacturer.

As ROXUL® Inc has no control over installation design and workmanship, accessory materials or application conditions, ROXUL® Inc. does not warranty the performance or results of any installation containing ROXUL® Inc's products. ROXUL® Inc's overall liability and the remedies available are limited by the general terms and conditions of sale. This warranty is in lieu of all other warranties and conditions expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

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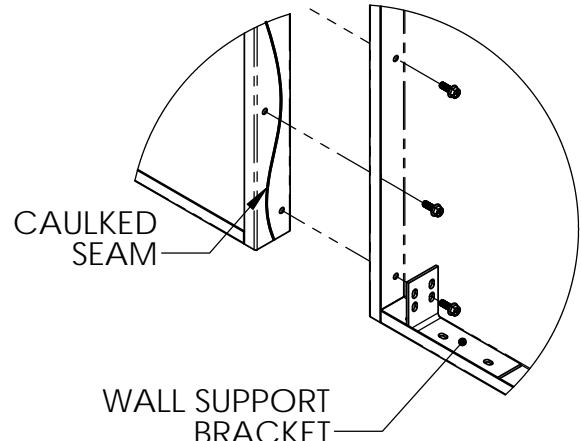
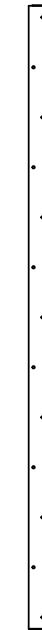
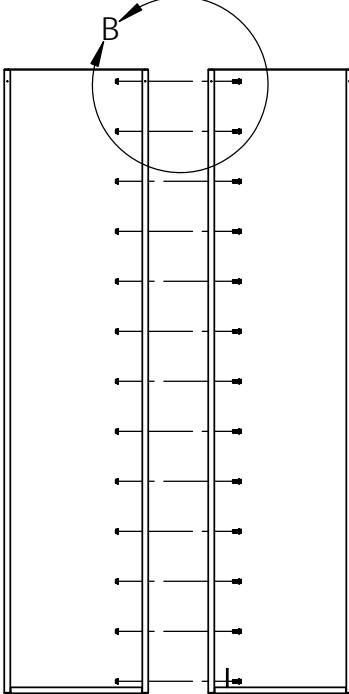
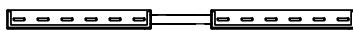
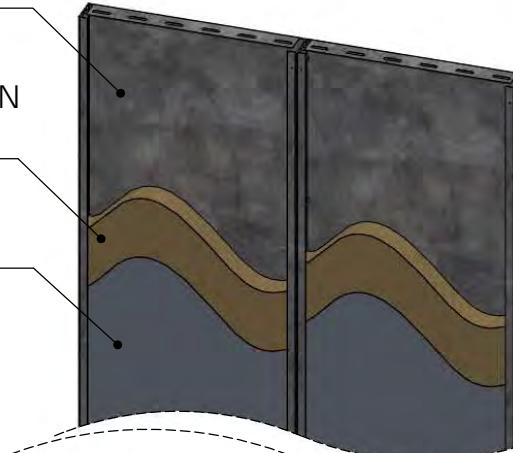
DETAIL B
SCALE 1 : 16

14 GA. OR 12 GA. GALVANNEALED
OR

.100" OR .125" ALUMINUM

2" OR 3", 4# INSULATION
OR
4", 8# INSULATION

22 GA PERFORATED STEEL



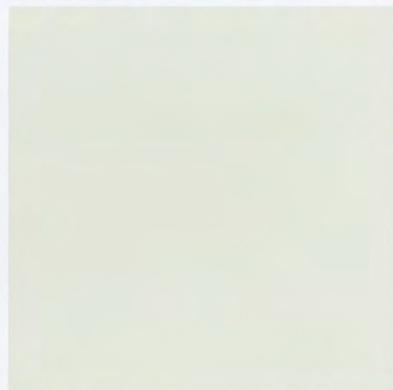
INSPECTED BY:	DATE:	REVISED BY:	DATE:	PROJECT NUMBER #:	STATUS:	ROUTING:
---	---	---	---	---	RELEASED	ENCL
REVISION: RELEASED TO THE FLOOR.		CHECKED BY: NLA	DATE: 03/11/2015	DRAWN BY: NLA	DATE: 03/11/2015	MATERIAL: VARIES
		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: ANGULAR: $\pm 1/2^\circ$ ONE PLACE DECIMAL $\pm .1$ TWO PLACE DECIMAL $\pm .06$ THREE PLACE DECIMAL $\pm .030$		SCALE 1:32 DO NOT SCALE DRAWING	TITLE: CUT SHEET ASSEMBLY	REV.
				SHEET: 1 OF 1	DWG. NO. EKPP-WALL ASSY CUT SHEET	A



671 South Main Street • P.O. Box 57 • Fall River, Wisconsin 53932
Phone: 262-492-4600 • Fax: 920-484-3596 • www.ekpowerproducts.com



BONEWHITE (10310-91095)



OYSTER WHITE (10500-11712)



LIGHT GRAY (10300-71747)



DARK GRAY (10300-71751)



SD CATYELLOW (9910-10503)



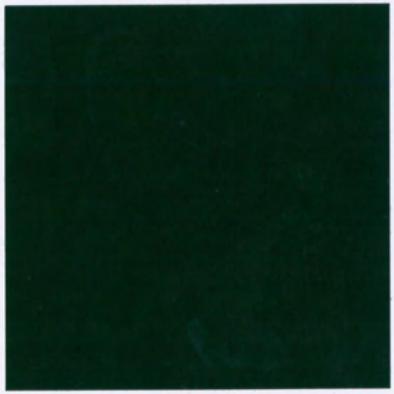
SD CLAY (9810-12389)



COLONIAL RED (10300-30124)



SD CUMMINS GREEN (9710-61525)



FOREST GREEN (10300-61074)



BRONZE (10300-71748)



CNH BLACK (9420-91835)



SD ACCURIDE BLACK II (9910-9845)

All powder coatings are formulated for superior outdoor exposure. Exclusive line of touch up products that match in both color and durability are available.



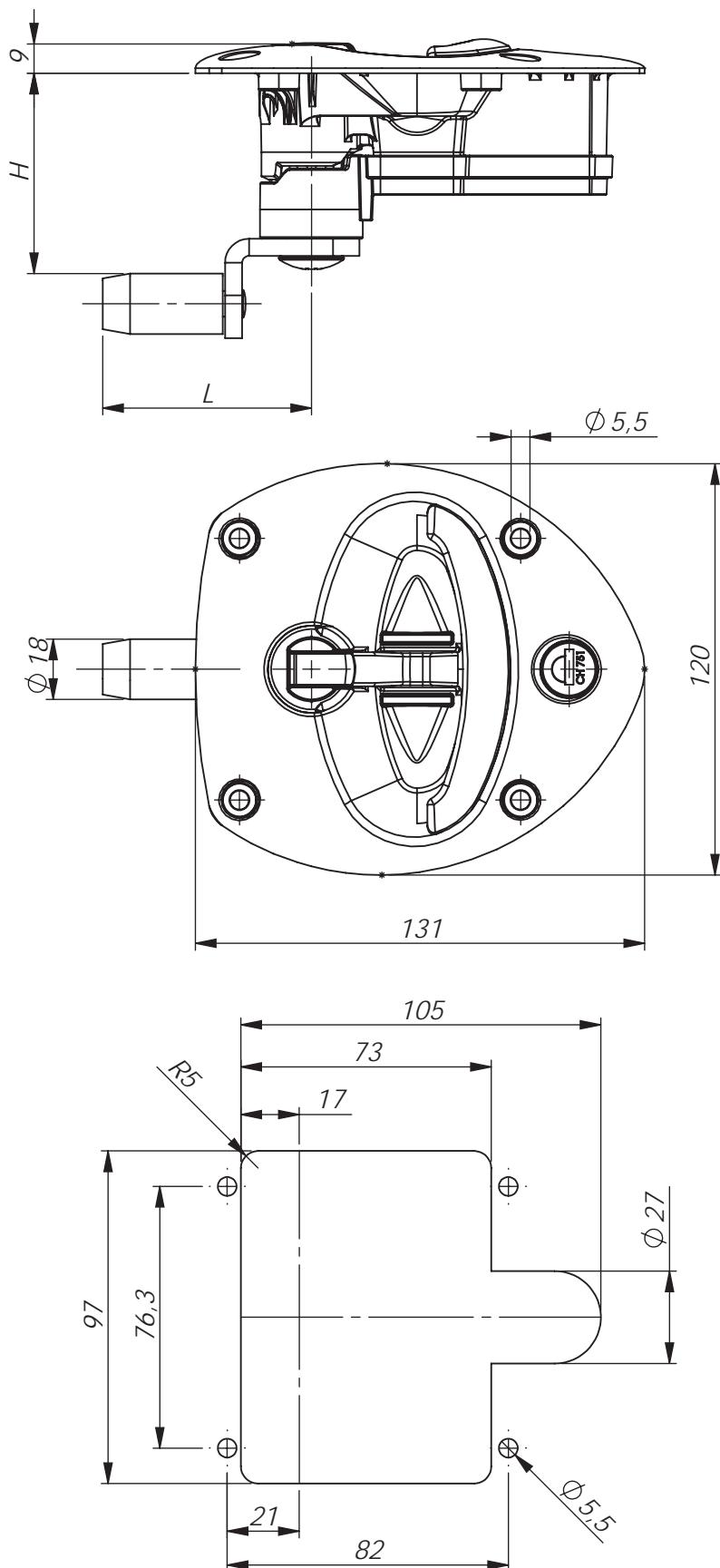
Post Office Box 13, Ellaville, Georgia 31806
800•533•9067 www.tcipowder.com

An **RPM** Company

QUARTER-TURN LATCHING SYSTEMS

Certified according to ISO 9001:2008
and EN14001:2004 by BSI.
All products ROHS-compliant.
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1	Rod latch systems
2	Quarter-turns
3	Hinges
4	Sealing profiles
5	Miscellaneous
6	Stainless



Vector™

**EK Machine Terms and Conditions
and
12 Month Limited Product Warranty**

1. ACCEPTANCE: E.K. Machine Co. Inc. ("Seller") makes all quotations and accepts orders based only on the Product Quotation, Terms and Conditions and 12 Month Limited Warranty stated herein (the "Order") for its enclosures and fuel tanks (the "Products") manufactured for a purchaser (the "Buyer"). No condition stated by Buyer shall be binding upon Seller if in conflict with, inconsistent with or in addition to the Order, unless expressly accepted in writing signed by Seller.

2. PRICES: All prices are: (a) Seller's current prices and are subject to change without notice at any time prior to acceptance of your order; (b) FOB Point of Origin at Seller's plant in Fall River, Wisconsin (or FOB Point of Origin at such warehousing facilities as Seller may establish to serve the territory); and (c) subject to all federal, state and local taxes, or any taxes or other charges imposed by any governmental authority, domestic or foreign, upon the production, sale or shipment of Products sold hereunder, now or hereafter becoming effective, and if not included in the invoice, such amount may be invoiced later, and Buyer shall pay all such taxes.

3. PAYMENT TERMS; NONPAYMENT OF PURCHASE PRICE; COLLECTION COSTS: Net thirty (30) days from the date of INVOICE. No cash discount. If Buyer does not pay amount due in full within 30 days of shipment, interest at one and one-half percent (1.5%) per month shall accrue from the date of shipment. No dispute over the Products shall excuse Buyer from payment for the Products within 30 days of INVOICE. Such charge shall be added to and become an additional part of the purchase price for the Products from the date of shipment. Buyer will also pay all costs of collection incurred by Seller in collecting the purchase price for the Products and enforcing its security interest in the Products, including, without limitation, attorneys' fees and expenses incurred by Seller.

4. DELIVERY: Buyer shall select carrier for delivery of the Products from Seller. The scheduled shipment date is an estimate and is subject to filling prior orders and delays caused by strikes, accidents, shortages or other causes beyond Seller's control. Buyer's acceptance of delivery time from the shipper shall constitute a waiver of any claim for delay, and in no event shall Seller be liable for any incidental or consequential damages arising in connection with delay or non-delivery for any reason. Product that is complete but not shipped beyond 15 days of the acknowledged due date may be assessed a storage fee.

5. LIMITED WARRANTY: Seller warrants that the Products which it manufactures are built and sold in accordance with the product specifications agreed upon between Buyer and Seller and further warrants that its Products will be free from defects in workmanship and materials under normal use and service for a period of 12 months from the date of shipment from the Seller's Fall River, Wisconsin plant. This warranty does not apply or extend to: expendable items, ordinary wear and tear, altered Products, materials not manufactured by Seller, nor to damages or defects caused by accident, abuse, misuse or by improper installation or use as well as any damages caused by third parties (e.g. transportation and rigging). Equipment, accessories and other parts and components not manufactured by Seller are not covered under this Limited Warranty. This warranty is transferable from the buyer to the end user.

This warranty supersedes any and all previous oral, written or implied warranties. There are no other warranties in effect other than those contained in this written Limited Warranty and to the extent permitted by law.

The Buyer must make claim for any breach of any warranty by written notice directly to Seller within thirty (30) days from when Buyer discovers or should have discovered any defect covered under this Limited Warranty. The notification must provide the model number, serial number and purchase order of the Products in question and a detailed report of the alleged defect. Seller reserves the right, at its option, to inspect the Products as installed and repair and/or replace the defective parts where installed or at Seller's Fall River, Wisconsin facility. The parts will be returned to Seller within 21 business days for examination and disposition of the alleged defective parts and Seller shall report back to the Buyer upon completion of the investigation. Should the alleged defective parts prove not to be the responsibility of Seller, as determined by Seller, all the labor, parts and shipping costs will become the responsibility of Buyer, and shall be paid within 30 days.

UNDER NO CIRCUMSTANCES WILL SELLER BE RESPONSIBLE FOR ANY COSTS OR EXPENSES IN CONNECTION WITH REPAIRS MADE BY ANYONE OTHER THAN SELLER UNLESS SUCH REPAIRS HAVE BEEN AUTHORIZED IN ADVANCE WITH A SIGNED WRITTEN PURCHASE ORDER ISSUED BY SELLER FOR THE COST OF THE REPAIRS.

Seller will not be liable for any indirect or consequential damages for loss, damage or injury arising from the sale, installation or use of the Products or from any other cause.

Any other agreement or amendment to this warranty must be made in writing and signed by both parties.

6. DISCLAIMER OF OTHER WARRANTIES: THE WARRANTY DESCRIBED IN PARAGRAPH 5 IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, (INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) WHICH ARE HEREBY EXCLUDED.

7. LIMITATION OF LIABILITY: SELLER'S LIABILITY ON ANY CLAIM OF ANY KIND, INCLUDING NEGLIGENCE, FOR ANY LOSS OR DAMAGE ARISING OUT OF, CONNECTED WITH, OR RESULTING FROM PERFORMANCE OR BREACH OF THE TERMS HEREOF, OR FROM THE DESIGN, MANUFACTURE, SALE, DELIVERY, RESALE, INSTALLATION, TECHNICAL DIRECTION OF INSTALLATION, INSPECTION, REPAIR, OPERATION OR USE OF ANY PRODUCT SOLD BY SELLER TO BUYER, SHALL IN NO CASE EXCEED THE PRICE ALLOCABLE TO THE PRODUCT WHICH GIVES RISE TO THE CLAIM. IN NO EVENT SHALL SELLER HAVE ANY LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH A BREACH OF THE CONTRACT OF SALE OR ANY OTHER DUTY OF SELLER WITH RESPECT TO THE PRODUCT INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES SUCH AS FOR LOST PROFITS, LOST SALES OR INJURY TO PERSONS OR PROPERTY.

8. NOTICE OF CLAIMS: Buyer shall inspect the Products upon receipt and shall notify Seller in writing of any claims including claims for shortage or breach of warranty within 30 days after Buyer discovers or should have discovered facts upon which the claim is based but in no event later than the expiration of the warranty as provided in paragraph (5). Failure of Buyer to give written notice of a claim within the time period or in the form specified above shall be deemed to be a waiver of such claim.

9. LIMITATION OF ACTIONS: No action for breach of any term of this contract of sale or any other duty of Seller with respect to these Products may be commenced more than one (1) year after shipment of Products.

10. INSURANCE: The risk of loss passes to Buyer upon delivery of the Products to the carrier. Insurance against loss or damage to the Products during shipment is the responsibility of Buyer. Until the entire purchase price for the Products is paid in full, Buyer will keep the Products insured against loss or damage by fire and other risks and hazards included on so-called "Special Form" insurance with an Inland Marine or Transit rider on a primary basis and with Seller listed as an additional insured, in an amount at least equal to such purchase price. Losses under such insurance shall be made payable to Seller and any payments under such insurance shall be paid to Seller and applied to the unpaid balance of the purchase price. Buyer will furnish Seller with copies of the policies of such insurance and each renewal thereof.

11. CANCELLATION: Orders may not be canceled except by written notice received by Seller prior to shipment. Charges for the cancellation of an Order will be based on non-recoverable expenses accruing to the Order sustained by Seller plus ten percent of the selling price.

12. GOVERNING LAW: The validity, interpretation and performance of the contract of sale shall be governed by the laws of the State of Wisconsin (not including conflict of law rules). Should a dispute arise with respect to this Order, Buyer shall be liable for Seller's attorneys' fees.

13. ACCEPTANCE OF ORDERS: All Orders are subject to acceptance only at Seller's Fall River, Wisconsin office.

14. DESIGN CHANGES: The designs and specifications of all Products sold may not be changed without a written change order signed by both parties. In the event of any such changes, Seller will have no obligation whatsoever to make similar changes in Products previously ordered.

ACKNOWLEDGEMENT OF RECEIPT

Customer _____

Customer PO# _____

Print Name _____

Signature _____

Date _____

CATERPILLAR LIMITED WARRANTY

Industrial, Petroleum, Locomotive, and Agriculture Engine Products and Electric Power Generation Products

Worldwide

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new and remanufactured engines and electric power generation products sold by it (including any products of other manufacturers packaged and sold by Caterpillar), to be free from defects in material and workmanship.

This warranty does not apply engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; C175, 3500 and 3600 series engines used in locomotive applications; 3000 Family engines, C0.5 through C4.4 and ACERT™ (C6.6, C7, C7.1, C9, C9.3, C11, C13, C15, C18, C27, and C32) engines used in industrial, mobile agriculture and locomotive applications; or Cat® batteries. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

Warranty Period

- For industrial engines, engines in a petroleum applications or Petroleum Power Systems (excluding petroleum fire pump application), or engines in a Locomotive application, or Uninterruptible Power Supply (UPS) systems, the warranty period is 12 months after date of delivery to the first user.
- For engines used in petroleum fire pump and mobile agriculture applications the warranty period is 24 months after date of delivery to the first user.
- For controls only (EPIC), configurable and custom switchgear products, and automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.
- For new CG132, CG170 and CG260 series power generation products the warranty period is 24 months/16,000 hours, whichever comes first, after date of delivery to first user.

- For electric power generation products other than CG132, CG170 and CG260 series in prime or continuous applications the warranty period is 12 months. For standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.
- For all other applications the warranty period is 12 months after date of delivery to the first user.

Caterpillar Responsibilities

If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Cat dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new, Remanufactured, or Caterpillar approved repaired parts or assembled components needed to correct the defect.
- Note:** New, remanufactured, or Caterpillar approved repaired parts or assembled components provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed as if such parts were original components of that product. Items replaced under this warranty become the property of Caterpillar.
- Replace lubricating oil, filters, coolant, and other service items made unusable by the defect.
- Provide reasonable and customary labor needed to correct the defect, including labor to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems, if required.

For new 3114, 3116, and 3126 engines and electric power generation products (including any new products of other

manufacturers packaged and sold by Caterpillar):

- Provide travel labor, up to four hours round trip, if in the opinion of Caterpillar, the product cannot reasonably be transported to a place of business of a Cat dealer or other source approved by Caterpillar (travel labor in excess of four hours round trip, and any meals, mileage, lodging, etc. is the user's responsibility).

For all other products:

- Provide reasonable travel expenses for authorized mechanics, including meals, mileage, and lodging, when Caterpillar chooses to make the repair on-site.

User Responsibilities

The user is responsible for:

- Providing proof of the delivery date to the first user.
- Labor costs, except as stated under "Caterpillar Responsibilities," including costs beyond those required to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems.
- Travel or transporting costs, except as stated under "Caterpillar Responsibilities."
- Premium or overtime labor costs.
- Parts shipping charges in excess of those that are usual and customary.
- Local taxes, if applicable.
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.

(Continued on reverse side...)

- Performance of the required maintenance (including use of proper fuel, oil, lubricants, and coolant) and items replaced due to normal wear and tear.
- Allowing Caterpillar access to all electronically stored data.

Limitations

Caterpillar is not responsible for:

- Failures resulting from any use or installation that Caterpillar judges improper.

- Failures resulting from attachments, accessory items, and parts not sold or approved by Caterpillar.
- Failures resulting from abuse, neglect, and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.
- Failures resulting from unauthorized repairs or adjustments, and unauthorized fuel setting changes.

- Damage to parts, fixtures, housings, attachments, and accessory items that are not part of the engine, Cat Selective Catalytic Reduction System or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).
- Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Cat dealer for more information.

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Cat dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.

Caterpillar's obligations under this Limited Warranty are subject to, and shall not apply in contravention of, the laws, rules, regulations, directives, ordinances, orders, or statutes of the United States, or of any other applicable jurisdiction, without recourse or liability with respect to Caterpillar.

For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

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In USA and Canada: Caterpillar Inc., Engine Division, P. O. Box 610, Moshville, IL 61552-0610, Attention: Customer Service Manager, Telephone (800) 447-4986. Outside the USA and Canada: Contact your Cat dealer.

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CAT® EXTENDED SERVICE COVERAGE (ESC)

2013 Cat Electric Power Standby

Quick Reference Guide

Greenridge REC Center
Extended Warranty:
(48) Month Platinum

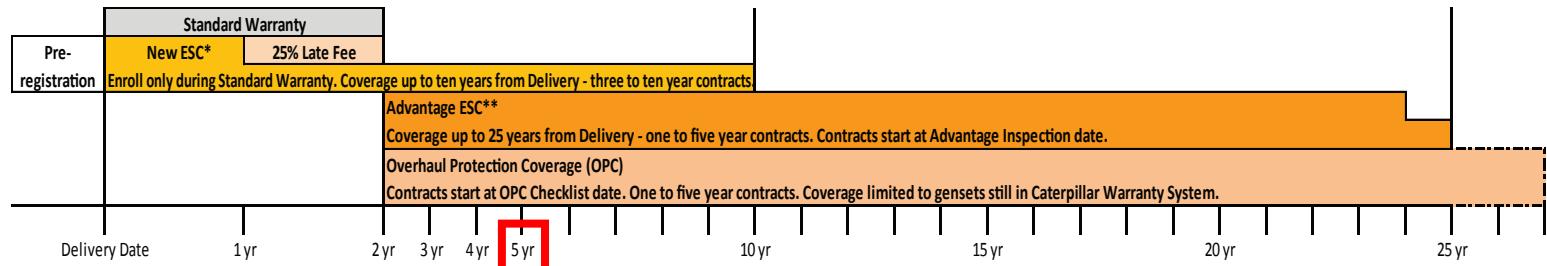
Covered Components List

Coverage Items	Silver	Gold	Platinum*	Item	Silver	Gold	Platinum*
COOLING SYSTEM				AIR INDUCTION & EXHAUST			
Thermostat Housing	✓	✓	✓	Exhaust Manifolds, Studs & Gaskets	✓	✓	✓
Water Manifold Housing	✓	✓	✓	Inlet Air Heater Relay	✓	✓	✓
Jacket Water Precooler	✓	✓	✓	Intake Manifold	✓	✓	✓
Jacket Water Pump		✓	✓	Turbocharger (mounting hardware, lines, waste gaste)		✓	✓
Thermostat			✓	Air to Air Aftercooler Cores			✓
Radiator & Fan			✓	Muffler / Exhaust System			✓
FUEL SYSTEM				Exhaust Guards			✓
Steel Fuel Lines	✓	✓	✓	SHORT BLOCK			
Fuel Shutoff Solenoid	✓	✓	✓	Cylinder Block Casting	✓	✓	✓
Fuel Injectors		✓	✓	Freeze Plug	✓	✓	✓
Fuel Transfer Pump & Housing			✓	Crankshaft	✓	✓	✓
Fuel Priming Pump			✓	Crankshaft Rod, Main & Thrust Bearings	✓	✓	✓
Fuel Shutoff Solenoid			✓	Connecting Rod Assembly	✓	✓	✓
LUBRICATION SYSTEM				Piston, Wrist Pin, Retainer Clip, & Piston Rings	✓	✓	✓
Oil Pan	✓	✓	✓	Oil Jet Tubes	✓	✓	✓
Engine Oil Pump	✓	✓	✓	Cylinder Liner, Seals & Filler Band	✓	✓	✓
Oil Cooler Housing & Core / Bonnet	✓	✓	✓	Main Bearing Cap Bolt	✓	✓	✓
Oil Filter Base	✓	✓	✓	Idler Gears	✓	✓	✓
Crankcase Breather			✓	Timing Gears			✓
Engine Oil Pump Drive			✓	Accessory Drive			✓
Prelubrication Pump			✓	CYLINDER HEAD			
ELECTRIC SYSTEM				Cylinder Head Casting, Sleeves, Bolts & Gaskets	✓	✓	✓
Control Module (ECM)	✓	✓	✓	Freeze Plug	✓	✓	✓
Sensors: All	✓	✓	✓	Spacer Plate & Spacer Plate Gasket	✓	✓	✓
Wiring Harness & Connectors			✓	Intake and Exhaust Valve (all related components)	✓	✓	✓
Starter			✓	Valve Mechanism	✓	✓	✓
Alternator			✓	Valve Cover & Base	✓	✓	✓
ALTERNATOR END				Camshaft, Camshaft Bearings, Key, Gear	✓	✓	✓
Alternator (including rotor, stator, exciter, bearings & coupling)	✓	✓	✓	Camshaft Rear Cover / Seal	✓	✓	✓
Generator Controls (including EMCP, Operator Interface Mounted on Generator)		✓	✓	MISCELLANEOUS			
Power Center (Circuit Breakers, Voltage Regulators, Bus Bar)		✓	✓	Broken nuts/bolts attaching a covered component	✓	✓	✓
FRONT AND REAR COVERS				Dipstick & tube			✓
Front Cover / Plate / Housing / Gears (& Gaskets)	✓	✓	✓	Starter Ring Gear			✓
Vibration Damper	✓	✓	✓				
Flywheel Housing & Gasket	✓	✓	✓				
Crankshaft Front & Rear Seal			✓				

*Platinum covers the entire list of Cat® parts as the engine was originally shipped from the Caterpillar factory, excluding consumables.

+Platinum Plus may also include more Cat parts added to the engine by the Cat Dealer or Original Equipment Manufacturer (OEM).

ESC Timeline



*New ESC coverage always starts on the Delivery Date.

**Advantage ESC is only available after the end of the Standard Warranty and before the first overhaul.

+Delivery Date is as stated in Caterpillar Warranty System.



GREEN RIDGE RECREATIONAL CENTER

**Service Entrance Rated
Automatic Transfer Switch**

**Customer: Carter Machinery
Submittal Date: January 3, 2018**

**Submittals for Approval
Tel. # 443-546-3710**

ASCO Power Technologies L.P
Columbia Sales Office
7130 Minstrel Way, Ste 217
Columbia, MD 21045



We Keep Your Power On

January 3, 2018

ASCO POWER TECHNOLOGIES L.P., COLUMBIA SALES OFFICE 7130 MINSTREL WAY, STE 217, COLUMBIA, MD 21045 TEL # 443-546-3710

Automatic Transfer Switch Bill of Material
GREEN RIDGE RECREATIONAL CENTER

ATS DESIGNATION	QTY	AMPS/ POLES	BYPASS	TRANSITION	CATALOG NUMBER	OPTIONAL ACC.	ENCL. DRG.	WIRING DRG.	BOM
-	1	2000/3	NO	OPEN	G03AUSA32000NGXM	11BE,44G,72EE,134	754577-050	1001662	TO BE ENGINEERED
-	1	-	-	-	5705 Remote Annunciator	-	916978-008	917121-006	TO BE ENGINEERED

Note:

Standard Lead Time: Please call ASCO for confirmation

ASCO Order Voltage Confirmation Sheet

To ensure the accuracy of your order, it is important that we confirm the voltages for all line items. This confirmation should be independent of the voltage shown in the ASCO proposal. Please check the box for each line to confirm the information shown is accurate. Please initial and date at the bottom of this form to acknowledge your approval.

Customer: _____

Location: _____

P.O. #: _____

Project Name: _____

Item #1:

Cat. #: _____

Voltage: _____ V

Item #2:

Cat. #: _____

Voltage: _____ V

Item #3:

Cat. #: _____

Voltage: _____ V

Item #4:

Cat. #: _____

Voltage: _____ V

Item #5:

Cat. #: _____

Voltage: _____ V

Customer Name (printed) _____

Initial _____

Date _____

GREEN RIDGE RECREATIONAL CENTER
3AUS Detailed Information

#2	ATS	AMPS: 2000	QTY: 1
Product	: Series 300	Catalog Number	: G03AUSA32000NGXM,11BE,44G,72EE,134
Service Voltage / Hz	: 480V/60Hz	Optional Accessories	: 134,11BE,44G,72EE
By-pass Isolation	: Not Applicable	Product Description	: 3AUS Automatic Service Entrance
No. of Switched Poles	: 3	Neutral Configuration	: Solid [A]
Withstand Rating: Frame = G, Switch Rating = 2000, Series = 300		No. of Cables & Lug Size	: 6, 1/0 to 600 MCM
Enclosure	: 3R(M)-UL Type 3R secure double door enclosure (See Disclaimer 3)	Service	: Three Phase, 4-wire

ACCESSORIES DESCRIPTION

#	Accessory Code	Description
1	134	100% Rated Breaker
2	11BE	Feature Bundle Includes Engine Exerciser/Event Log/RS 485 Enabled/Common Alarm Output Contact
3	44G	Strip heater w/ thermostat, wired to load terminals: 208-600 volts
4	72EE	Quad - Ethernet Module with AES - 128 bit Encryption (includes (2) RJ - 45, (2) RS - 485, (2) TTL, and (2) CAN ports

DRAWINGS FOR APPROVAL

Drawing Number	Description
754577-050	Composite Enclosure Outline and Mounting Diagram
1001662	Three-Phase Wiring Diagram

THREE PHASE WIRING FOR ASCO[®] 300 SERIES TRANSFER SWITCHES (G3ATS/G3NTS) 1000-3200 AMPERES WITH GROUP G CONTROLS

GENERAL INFORMATION

THIS WIRING APPLIES TO 300 SERIES TRANSFER SWITCHES THAT UTILIZE THE "G" FRAME POWER TRANSFER SWITCH RATED 1000-3200 AMPERES.

THE GROUP G CONTROLLER PROVIDES EITHER AUTOMATIC (G3ATS) OR NON-AUTOMATIC [MANUAL] (G3NTS) OPERATION BASED ON ITS FACTORY SETTING ACCORDING TO THE CUSTOMER ORDER REQUIREMENTS.

THE TYPE OF TRANSFER SWITCH PROVIDED CAN BE DETERMINED FROM THE PRODUCT IDENTIFICATION MARKINGS LOCATED ON BOTH THE POWER TRANSFER SWITCH AND THE COVER OF THE GROUP G CONTROLLER.

ALL OPERATIONAL SETTINGS AND SEQUENCES OF THE GROUP G CONTROLLER AND ITS RELATED OPTIONAL ACCESSORIES (1UP, 18RX, 23G) ARE PROVIDED IN THE USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400.

INFORMATION FOR INSTALLATION AND TESTING OF THE TRANSFER SWITCH IS PROVIDED IN THE INSTALLATION MANUAL, ASCO 3ATS & 3NTS, G-DESIGN 1000-3200 A TRANSFER SWITCHES, PART NUMBER 381333-406.

ENGINE CONTROL CONTACTS

FEATURE 7 & FEATURE 8:
ONE SET OF FORM C CONTACTS "NR" (FEAT. 7 N/C, FEAT. 8 N/O) THAT CHANGE POSITION ON EXPIRATION OF THE FEATURE 1C, OVERRIDE MOMENTARY NORMAL SOURCE OUTAGES TIME DELAY, AND RESET ON EXPIRATION OF THE FEATURE 2E ENGINE COOLDOWN TIME DELAY.
AN AUXILIARY CONTACT THAT IS CLOSED WHEN THE TRANSFER SWITCH IS CONNECTED TO THE EMERGENCY SOURCE, IS CONNECTED ACROSS THE N/C CONTACT (FEATURE 7).

AN ADDITIONAL SET OF ENGINE STARTING CONTACTS ARE AVAILABLE ON THE GROUP G CONTROLLER WHEN THE FEATURE SETTING OF THE CONTROLLER OUTPUT CONTACTS "OP1" IS SET TO OPERATE AS "NR2".

ADDITIONAL OPTIONAL ENGINE STARTING CONTACTS "NR2" ARE AVAILABLE WHEN OPTIONAL ACCESSORY 18RX (RELAY EXPANSION MODULE) IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY. OUTPUT CONTACTS "OP2" AND/OR "OP3" PROVIDE THE ENGINE STARTING FUNCTION WHEN THE FEATURE SETTING OF EACH IS SET TO OPERATE AS "NR2".

CONTACTS ARE RATED 5 AMPS RESISTIVE AT 30 VDC MAXIMUM, 100 mA AT 5 VDC MINIMUM.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

LOAD DISCONNECT FEATURE

FEATURE 31: INCLUDES SUB-FEATURES 31F, 31G, 31M, 31N
A SET OF FORM C CONTACTS ARE PROVIDED ON THE GROUP G CONTROLLER AS "OP1". WHEN THE FEATURE SETTING OF "OP1" IS SET TO OPERATE THE CONTACTS AS "FEATURE 31", THE TIME DELAY SETTINGS OF THE SUB-FEATURES ARE AVAILABLE.

"OP1" CAN BE SET TO OPERATE TO PROVIDE THE FOLLOWING FUNCTIONS USING THE TIME DELAY SETTINGS ASSOCIATED WITH EACH SUB-FEATURE;

31F - NORMAL TO EMERGENCY PRE-TRANSFER SIGNAL
31G - EMERGENCY TO NORMAL PRE-TRANSFER SIGNAL
31M - NORMAL TO EMERGENCY POST-TRANSFER SIGNAL
31N - EMERGENCY TO NORMAL POST TRANSFER SIGNAL

THE "OP1" OUTPUT CONTACTS CHANGE POSITION FOLLOWING EACH OF THE ABOVE TIME DELAYS.

ADDITIONAL LOAD DISCONNECT CONTACTS, "FEATURE 31" ARE AVAILABLE WHEN OPTIONAL ACCESSORY 18RX (RELAY EXPANSION MODULE) IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY. OUTPUT CONTACTS "OP2" AND/OR "OP3" WILL PROVIDE LOAD DISCONNECT FUNCTIONS WHEN THE FEATURE SETTING OF EACH IS SET TO OPERATE AS "FEATURE 31".

ALL OUTPUT CONTACTS ("OP1", "OP2", "OP3") SET TO OPERATE AS "FEATURE 31", SHARE THE COMMON TIME DELAY SETTINGS OF SUB-FEATURES 31F, 31G, 31M, AND 31N.

CONTACTS ARE RATED 5 AMPS RESISTIVE AT 30 VDC MAXIMUM, 100 mA AT 5 VDC MINIMUM.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

INPHASE TRANSFER FEATURE FOR LOAD TRANSFER

INPHASE TRANSFER CONTROL INITIATES AN INPHASE TRANSFER OF LOADS BETWEEN LIVE SOURCES. THIS IS USED TO PREVENT NUISANCE TRIPPING OF DISTRIBUTION CIRCUIT BREAKERS AND POSSIBLE DAMAGE TO MECHANICAL LOADS ASSOCIATED WITH OUT OF PHASE TRANSFER.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

SOURCE AVAILABILITY SIGNALS

SIGNALS INDICATING THE AVAILABILITY OF THE NORMAL & EMERGENCY SOURCES IS PROVIDED WHEN OPTIONAL ACCESSORY 18RX (RELAY EXPANSION MODULE) IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY. OUTPUT CONTACTS "RL5" (EMERGENCY SOURCE AVAILABLE) AND "RL6" (NORMAL SOURCE AVAILABLE) CHANGE POSITION WHEN THE SOURCE IS ACCEPTABLE.

CONTACTS ARE RATED 5 AMPS RESISTIVE AT 30 VDC MAXIMUM, 100 mA AT 5 VDC MINIMUM.

NOTES

- SWITCH SHOWN DE-ENERGIZED CONNECTED TO NORMAL SOURCE.
- DEVICE SYMBOLS AND DESIGNATIONS ARE IN ACCORDANCE WITH NEMA PUB. ICS 1, PART 1-101A.
- ALL WIRING IS #16 AWG, TINNED, STRANDED COPPER UNLESS OTHERWISE INDICATED.
- O INDICATES CUSTOMER CONNECTION POINTS.
- INDICATES FACTORY CONNECTION POINTS.
- CONNECTION POINTS THAT HAVE BOTH CUSTOMER CONNECTIONS AND FACTORY CONNECTIONS ARE SHOWN OPEN AS CUSTOMER CONNECTION POINTS.
- THE TRANSFER UNIT IS MOUNTED ON THE BACK INSIDE SURFACE OF THE ENCLOSURE. THE CONTROL PANEL AND ANY OPTIONAL ACCESSORIES ARE MOUNTED ON THE INSIDE SURFACE OF THE DOOR.
- AN OPERATOR'S MANUAL IS FURNISHED WITH EACH AUTOMATIC TRANSFER SWITCH. REFER TO THIS PUBLICATION PRIOR TO INSTALLATION AND OPERATION OF THE SWITCH.
- GROUND STRAP ON CONTROL PANEL IS AFFIXED TO CHASSIS (ENCLOSURE) AT LOWER LEFT CONTROL PANEL MOUNTING STUD.

COMMON ALARM & NOT IN AUTO SIGNALING FEATURES

A SET OF FORM C CONTACTS IS PROVIDED ON THE GROUP G CONTROLLER AS "OP1". THE FEATURE SETTING OF "OP1" CAN BE SET TO OPERATE THE CONTACTS AS A "NOT IN AUTO" SIGNAL.

WHEN "OP1" IS SET FOR "NOT IN AUTO", THE OUTPUT CONTACTS CHANGE POSITION WHEN THE TRANSFER IS BEING INHIBITED FROM TRANSFERRING TO THE EMERGENCY SOURCE (FEATURE 34B) OR THE TRANSFER SWITCH HAS BEEN SET FOR NON-AUTOMATIC (MANUAL) OPERATION.

WHEN OPTIONAL ACCESSORY 11BE "SOFTWARE BUNDLE" IS PART OF THE TRANSFER SWITCH ASSEMBLY, "OP1" MAY ALTERNATIVELY SET FOR A "COMMON ALARM" SIGNAL. THE OUTPUT CONTACTS CHANGE POSITION WHEN A "COMMON ALARM" IS NOT PRESENT AND RESET WHEN A "COMMON ALARM" CONDITION IS PRESENT. THE "COMMON ALARM" SIGNAL CONDITIONS ARE SELECTABLE.

ADDITIONAL "COMMON ALARM" AND "NOT IN AUTO" CONTACTS ARE AVAILABLE WHEN OPTIONAL ACCESSORY 18RX (RELAY EXPANSION MODULE) IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY. OUTPUT CONTACTS "OP2" AND/OR "OP3" WILL PROVIDE SIGNAL FUNCTIONS WHEN THE FEATURE SETTING OF EACH IS SET TO OPERATE AS "COMMON ALARM" OR "NOT IN AUTO".

CONTACTS ARE RATED 5 AMPS RESISTIVE AT 30 VDC MAXIMUM, 100 mA AT 5 VDC MINIMUM.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

EXTERNAL POWER SUPPLY COMPATIBILITY

USE OF AN EXTERNAL POWER SUPPLY IS USEFUL WHEN REQUIRED TO EXTEND THE FOLLOWING CONTROLLER TIME DELAYS BEYOND 6 SECONDS;

FEATURE 1C - OVERRIDE MOMENTARY NORMAL SOURCE OUTAGES
FEATURE 1F - OVERRIDE MOMENTARY EMERGENCY SOURCE OUTAGES

AN EXTERNAL POWER SUPPLY IS ALSO USEFUL WHEN THE TRANSFER SWITCH IS USED WITH COMMUNICATIONS FEATURES BY ENABLING THE CONTROLLER TO CONTINUE COMMUNICATING.

AN EXTERNAL POWER SOURCE MAY BE PROVIDED TO THE CONTROLLER, UNTIL THE NORMAL SOURCE OR EMERGENCY SOURCE IS AVAILABLE, BY USE OF;

- AN EXTERNAL 24 VDC POWER SUPPLY WITH ACCESSORY 18RX (RELAY EXPANSION MODULE) OR
- OPTIONAL ACCESSORY 1UP (UNINTERRUPTIBLE POWER SUPPLY MODULE)

EXTERNAL 24 VDC POWER SUPPLY "1G"

AN EXTERNAL 24 VDC POWER SUPPLY MAY BE USED TO POWER THE CONTROLLER WHEN ACCESSORY 18RX (RELAY EXPANSION MODULE) IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY. OUTPUT CONTACTS "OP2" WILL PROVIDE EXTERNAL 24 VDC POWER SUPPLY FUNCTIONALITY WHEN ITS FEATURE SETTING IS SET TO OPERATE AS "1G". ADDITIONALLY, JUMPERS MUST BE RECONFIGURED ON ACCESSORY 18RX (RELAY EXPANSION MODULE) TO ENABLE THIS FUNCTION AS FOLLOWS;

REMOVE JUMPERS "J1" 1-2 & "J1" 3-4
CONNECT JUMPERS "J1" 5-7 & "J1" 6-8

THE OUTPUT CONTACTS CHANGE POSITION WHEN EITHER THE NORMAL SOURCE OR EMERGENCY SOURCE IS AVAILABLE AND RESET WHEN NEITHER SOURCE IS AVAILABLE. THE "OP2" N/C CONTACT SWITCHES CUSTOMER PROVIDED +24 VDC FROM THE EXTERNAL POWER SUPPLY TO THE CONTROLLER.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

ACCESSORY 1UP (UNINTERRUPTIBLE POWER SUPPLY)

WHEN OPTIONAL ACCESSORY 1UP IS INCLUDED IN THE TRANSFER SWITCH ASSEMBLY, THE CONTROLLER IS PROVIDED WITH LIMITED RESERVE POWER (APPROXIMATELY 3 MINUTES).

LOAD CURRENT METERING

WHEN OPTIONAL ACCESSORY 23GB IS PART OF THE TRANSFER SWITCH ASSEMBLY, THREE PHASE CURRENT MEASUREMENTS ARE AVAILABLE FOR DISPLAY ON THE GROUP G CONTROLLER.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR INFORMATION ON USE.

FOUR-FUNCTION SOFTWARE BUNDLE

WHEN OPTIONAL ACCESSORY 11BE IS PART OF THE TRANSFER SWITCH ASSEMBLY, A FOUR-FUNCTION SOFTWARE BUNDLE IS AVAILABLE TO PERFORM THE FOLLOWING FUNCTIONS;

- SERIAL COMMUNICATIONS (RS-485)
- PROGRAMMABLE ENGINE EXERCISER
- EVENT LOG
- COMMON ALARM SIGNAL CAPABILITY ON GROUP G CONTROLLER "OP1" OUTPUT.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR INFORMATION ON THESE FUNCTIONS.

NON-AUTOMATIC (MANUAL) OPERATION

TRANSFER SWITCH ASSEMBLIES FACTORY SET FOR NON-AUTOMATIC OPERATION PROVIDE USER INITIATED, ELECTRICAL OPERATION OF THE TRANSFER SWITCH TO EITHER AVAILABLE SOURCE. THE TRANSFER SWITCH ASSEMBLY IS PHYSICALLY IDENTICAL TO THAT OF THE AUTOMATIC TYPE.

WHEN THE TRANSFER SWITCH IS SET FOR NON-AUTOMATIC OPERATION, A CUSTOMER PROVIDED SELECTOR SWITCH MAY BE USED TO OPERATE IT FROM A REMOTE LOCATION.

REMOTE CONTROL FEATURES

THE FOLLOWING CONTROL PANEL INPUTS PROVIDE REMOTE CONTROL FUNCTIONS FOR THE TRANSFER SWITCH. EACH FUNCTION CAN BE IMPLEMENTED BY THE CUSTOMER PROVIDING THE FORM OF CONTROL DESCRIBED. EACH CONTROL CONTACT MUST BE SUITABLE FOR A 5 VDC LOW ENERGY CIRCUIT.

EXTERNAL FEATURE 17: REMOTE TRANSFER TO EMERGENCY FEATURE (FOR AUTOMATIC TRANSFER TYPE ONLY) - REQUIRES A CUSTOMER SUPPLIED, NORMALLY CLOSED CONTACT. OPENING OF THE CONTACT CAUSES ENGINE START AND TRANSFER TO THE EMERGENCY SOURCE. RE-CLOSURE OF THE CONTACT ACTIVATES THE FEATURE 3A "RETRANSFER TO NORMAL (IF JUST TEST) TIME DELAY PRIOR TO RETRANSFER. IN THE EVENT THAT THE EMERGENCY SOURCE FAILS WHILE THE TRANSFER SWITCH IS CONNECTED TO EMERGENCY AND THE CUSTOMER SUPPLIED CONTACT IS OPEN, THE TRANSFER SWITCH WILL AUTOMATICALLY RETRANSFER TO THE NORMAL SOURCE.

EXTERNAL FEATURE 6B: REMOTE BYPASS OF RETRANSFER TO NORMAL TIME DELAY - REQUIRES A CUSTOMER SUPPLIED, NORMALLY CLOSED CONTACT. OPENING OF THE CONTACT BYPASSES FEATURE 3A RETRANSFER TO NORMAL DELAY IF ACTIVE.

REFER TO USER'S GUIDE, ASCO GROUP G CONTROLLER FOR AUTOMATIC & NON-AUTOMATIC TRANSFER SWITCHES, PART NUMBER 381333-400 FOR SETTING INFORMATION.

ACCESSORIES

CATALOG NUMBER _____
CERTIFIED TO _____
ASCO S.O. _____

BY _____
DATE _____

FORM REV G _____

PROJECT NAME: _____

REV. TO SHEET _____ ECR NO. _____ BY APP. _____ DATE _____

WIRING _____ DIAGRAM _____

300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS

"G" FRAME, GROUP G CONTROLS

BY _____ DATE _____

MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH THE PROCEDURE MP-I-003.

FOR PLASTIC PARTS SEE MP-I-055

ASSEM. REF. NO. _____

COMPUTER GENERATED DRAWING

SCALE _____ SIZE _____

DWG. NO. _____

1001662

ASCO[®] ASCO POWER TECHNOLOGIES, L.P.

FLORHAM PARK, NEW JERSEY 07932 U.S.A.

DRAWING REV. G ECR NO. 254970 SHEET 1 OF 7

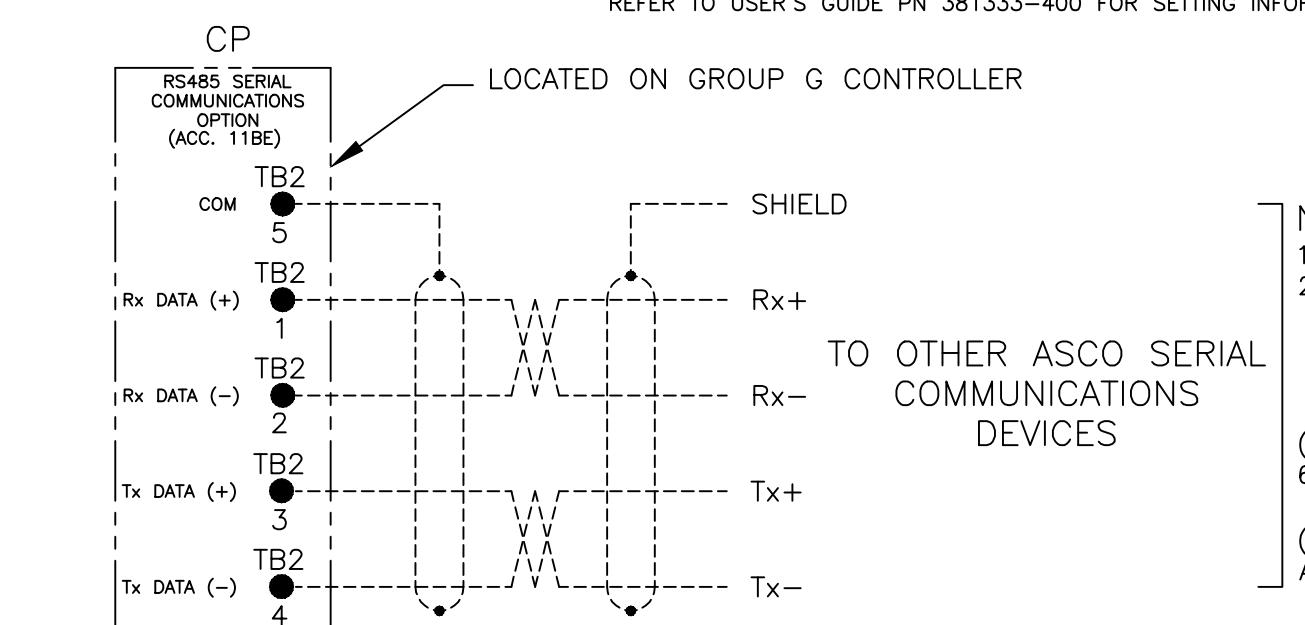
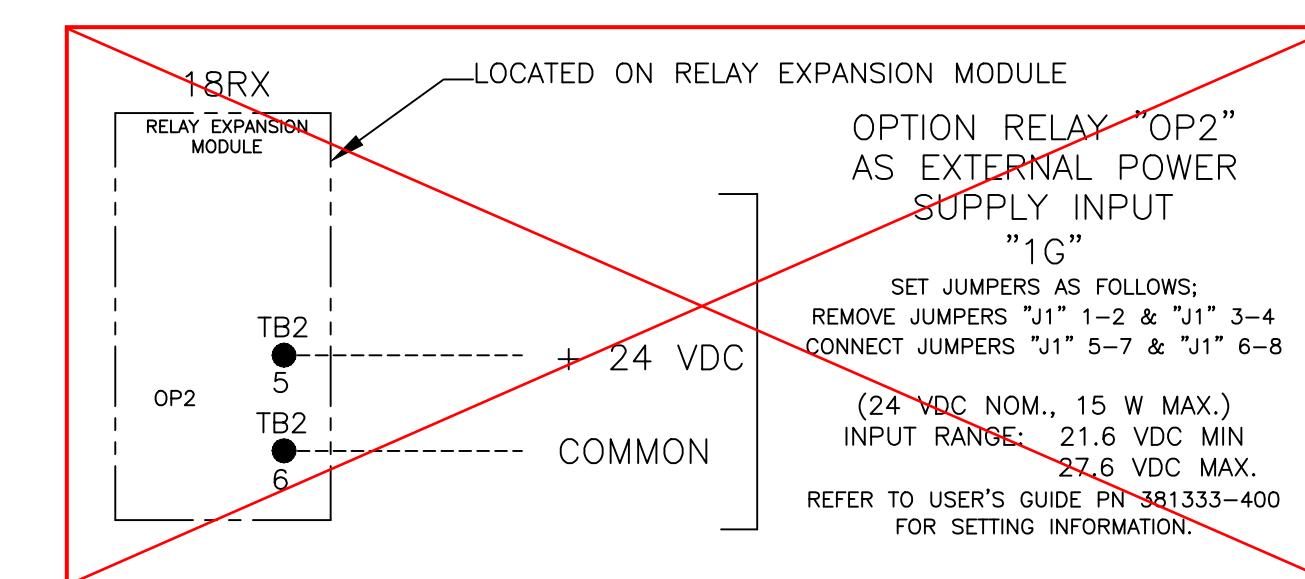
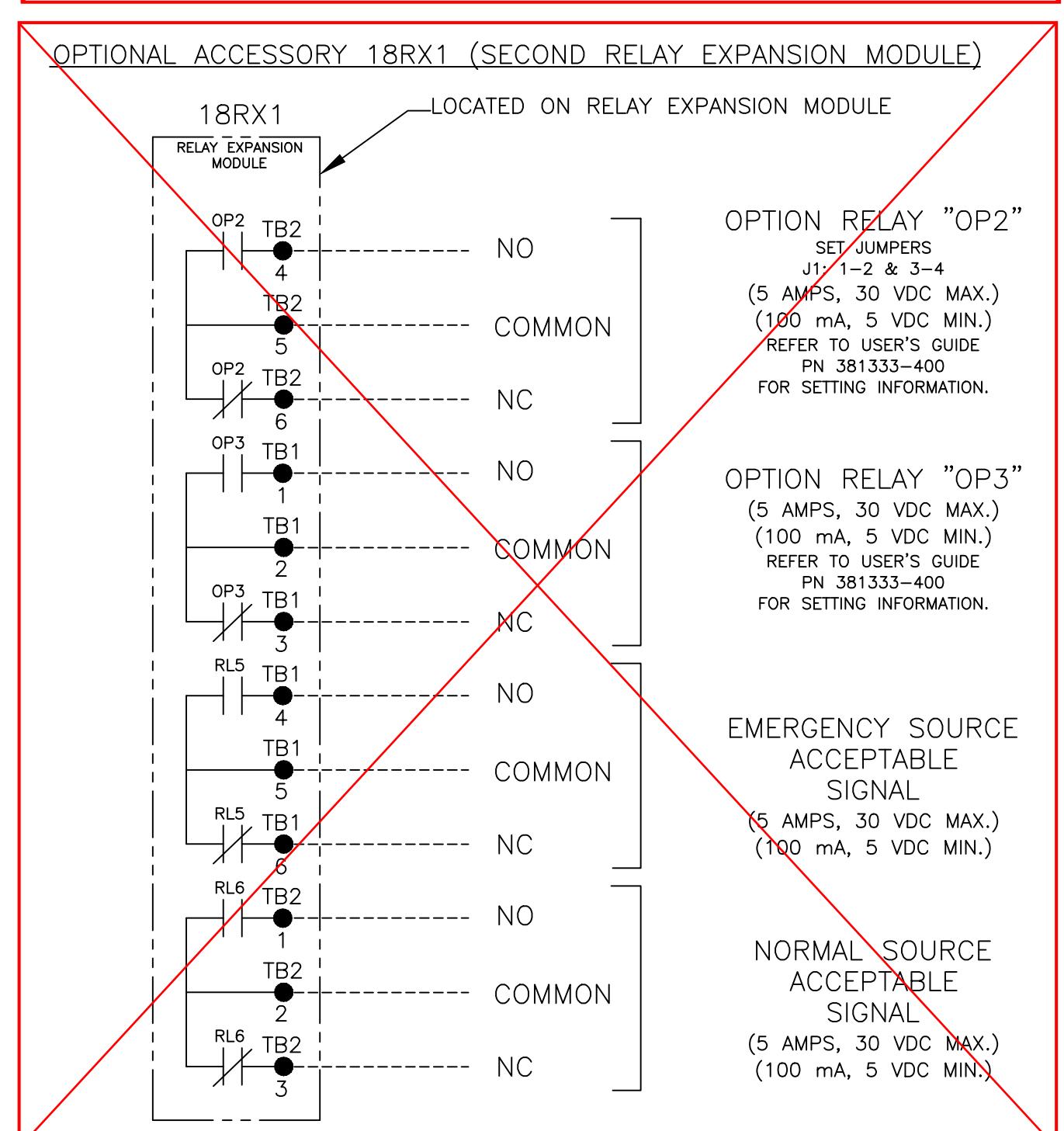
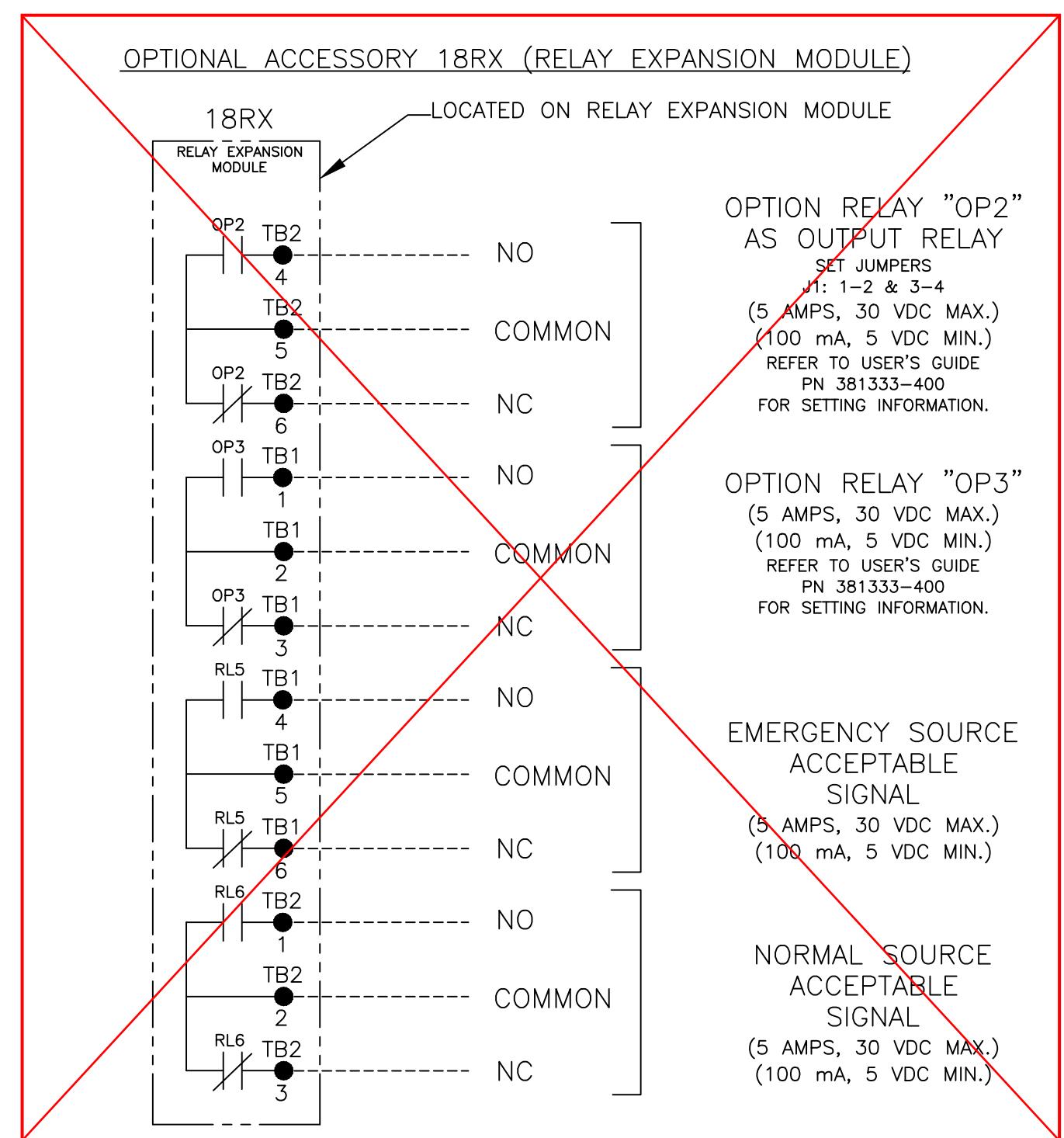
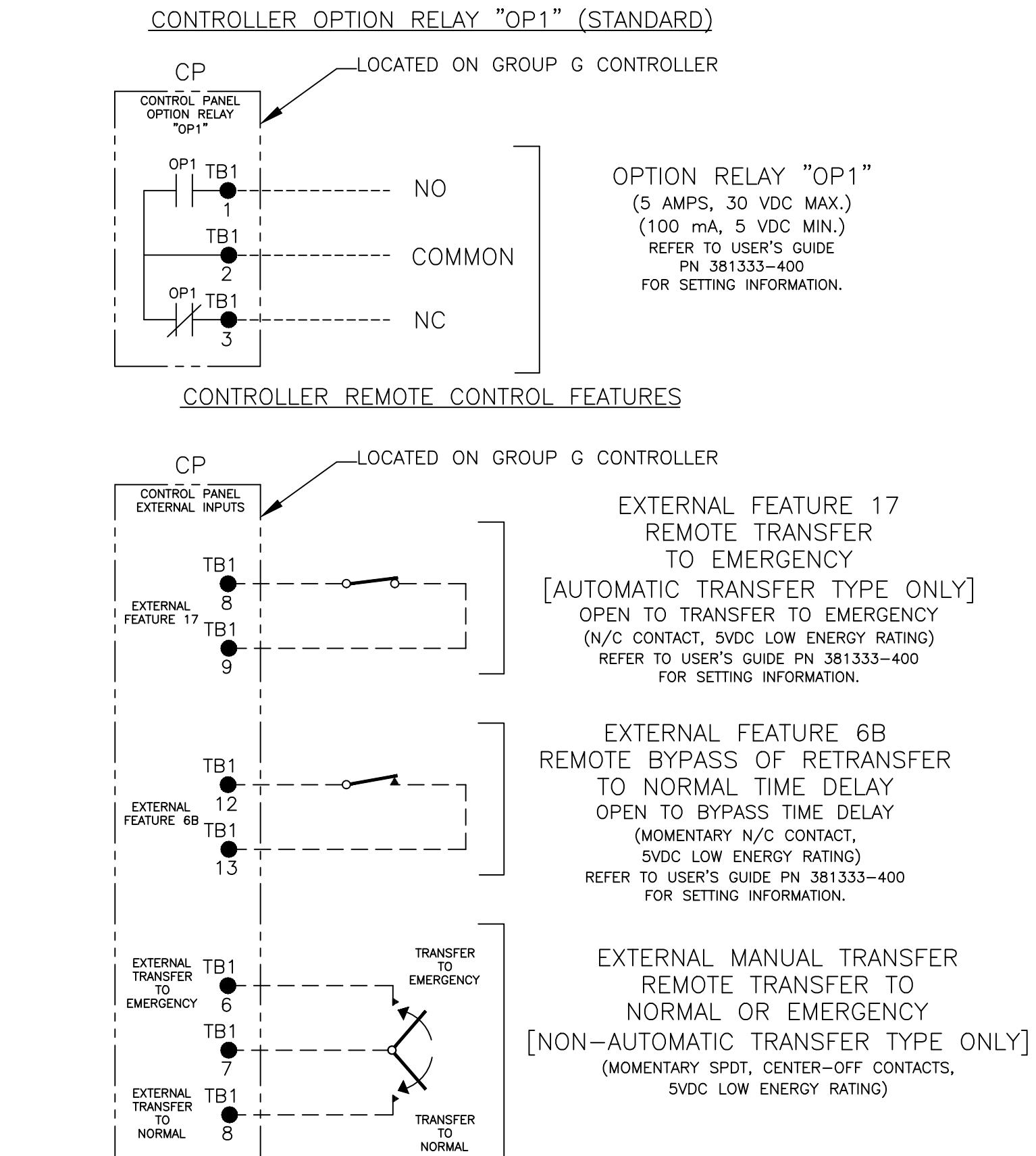
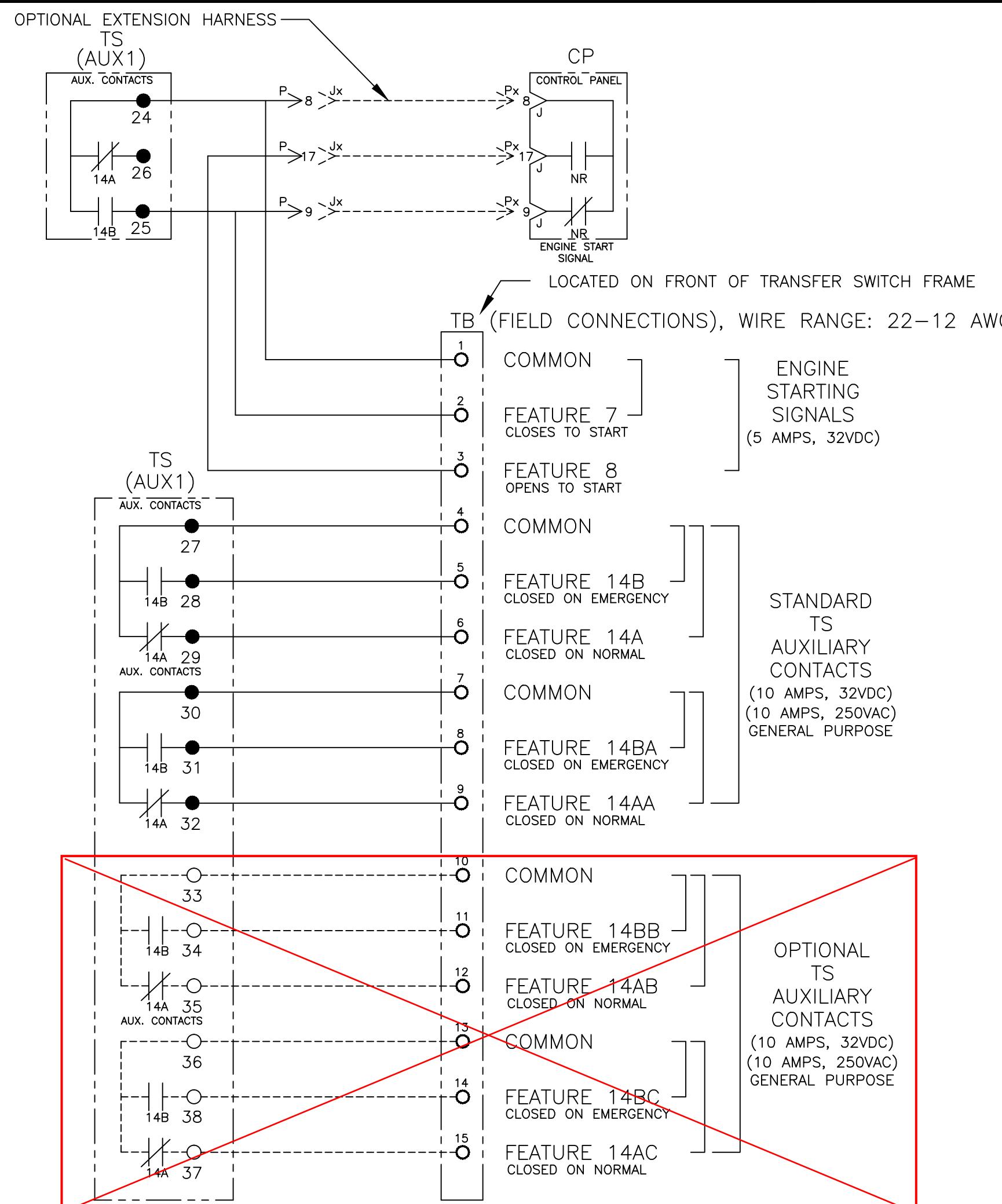
TS FRAME	CATALOG TYPE	NEUTRAL TYPE	PHASE POLES	AMPS	VOLT CODE	CONTROLLER	OPTIONAL ACCESSORY	ENCLOSURE CODE	NEUTRAL TYPE	3 PHASE (3 OR 4 WIRE) CODES 50 OR 60 Hz	CODE	DESCRIPTION	CODE	NOMINAL VOLTAGE	CODE	TYPE	DESCRIPTION	
G	3ATS 3NTS	A B	3	1000 1200 1600 2000 2600 3000 3200	C D E F G H J K L M N P Q R	G	X	C F H L M N P Q R	A B	SOLID SWITCHING	C D E F G H J K L	BLANK C	1	OPEN TYPE (NO ENCLOSURE) GENERAL PURPOSE, INDOOR	208 220 230 240 277 380 400 415 440 460 480 550 575 600	3R 4 4X 12	3R 4 4X 12	OUTDOOR, RAINPROOF, SLEET & ICE RESISTANT INDOOR/OUTDOOR, WATERTIGHT & DUSTTIGHT TYPE 4 PLUS CORROSION RESISTANCE (STAINLESS STEEL) INDOOR, INDUSTRIAL ENVIRONMENTS, OILTIGHT & DUSTTIGHT (SECURE ENCLOSURES)

NEUTRAL TYPE	3 PHASE (3 OR 4 WIRE) CODES 50 OR 60 Hz	CODE	DESCRIPTION	CODE	TYPE	DESCRIPTION
BLANK FOR NONE	BLANK FOR OPEN TYPE	BLANK FOR NONE	BLANK FOR OPEN TYPE	BLANK FOR NONE	BLANK FOR OPEN TYPE	BLANK FOR OPEN TYPE

G	254970	TR	BK	05/26/15

<tbl_r cells="5" ix="1

FIELD CONNECTIONS



NOTES:

1. EARTH GROUND SHIELD AT HOST DEVICE ONLY.
2. FIELD WIRING: USE UL LISTED, STRANDED, TWISTED PAIRS, OVERALL FOIL SHIELD WITH STRANDED DRAIN WIRE SUITABLE FOR RS422 EQUIVALENT TO:
(STANDARD 80°C) BELDEN 9842 OR 9829 OR ALPHA 6202C OR 6222C

(PLENUM RATED) BELDEN 89729 OR 82729 OR ALPHA 5622C

PROJECT NAME:		G		254970	TR	BK	05/26/15
		SEE ECN					
		REV. TO SHEET	ECN NO.	BY	APP.	DATE	
WIRING		DIAGRAM		 THIRD ANGLE PROJECTION			
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS "G" FRAME, GROUP G CONTROLS							
	BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASCO PROCEDURE MP-I-003. FOR PLASTIC PARTS SEE MP-I-055		ASSEM. REF. NO.	COMPUTER GENERATED DRAWING	
DRAWN BY	DJB	10/28/13				SCALE	SIZE
CHECKED	BK	10/28/13	PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.		None	DS	
PROJECT APPROVAL	BK	10/28/13			DWG. NO.		
FINAL APPROVAL			ASCO [®] ASCO POWER TECHNOLOGIES, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A.		1001662		
			DRAWING G REV.	ECN NO.	254970	SHEET	2 OF 7

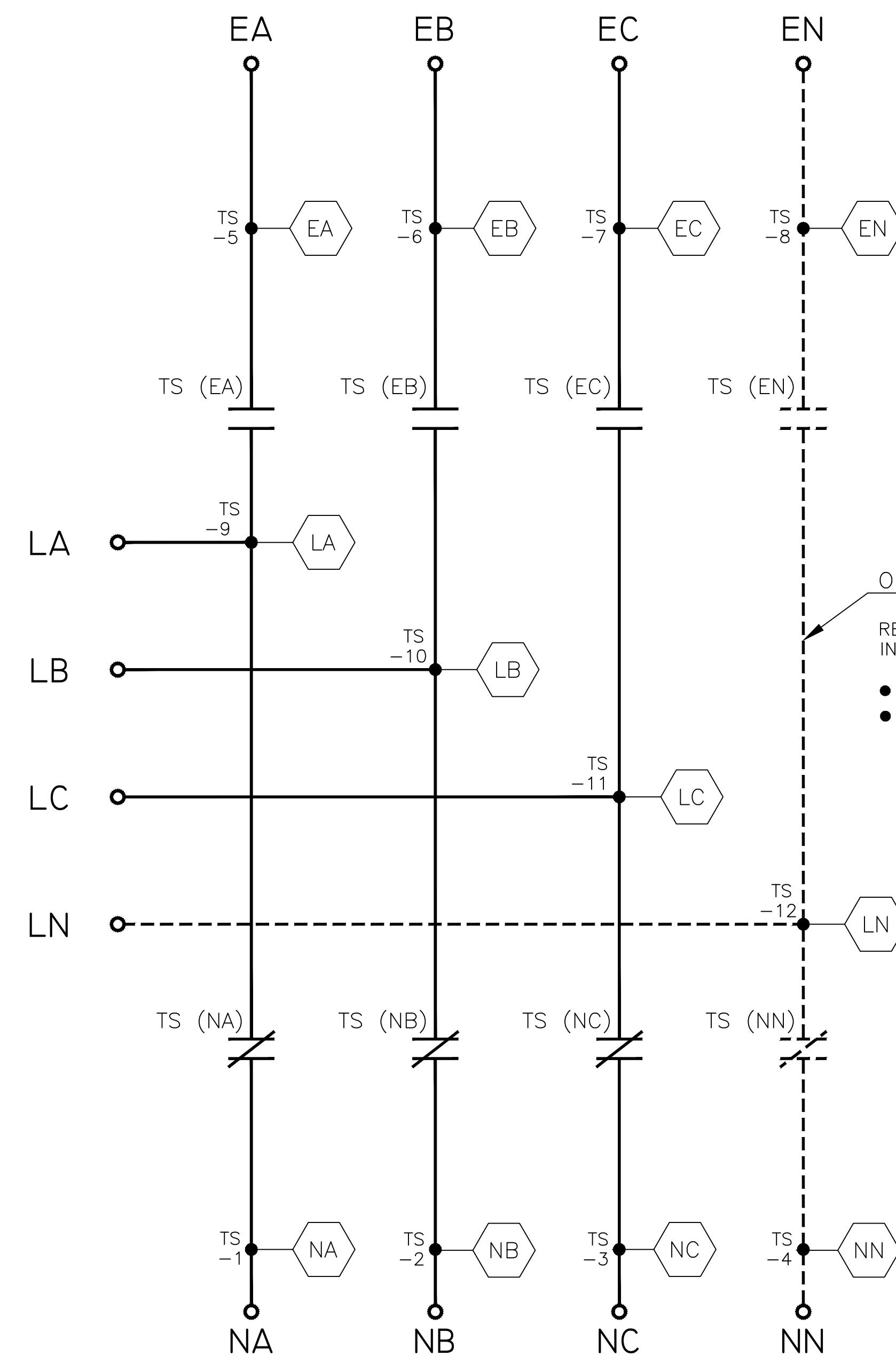
MAIN POWER POLES

TS OPERATOR CIRCUIT

D

D

EMERGENCY

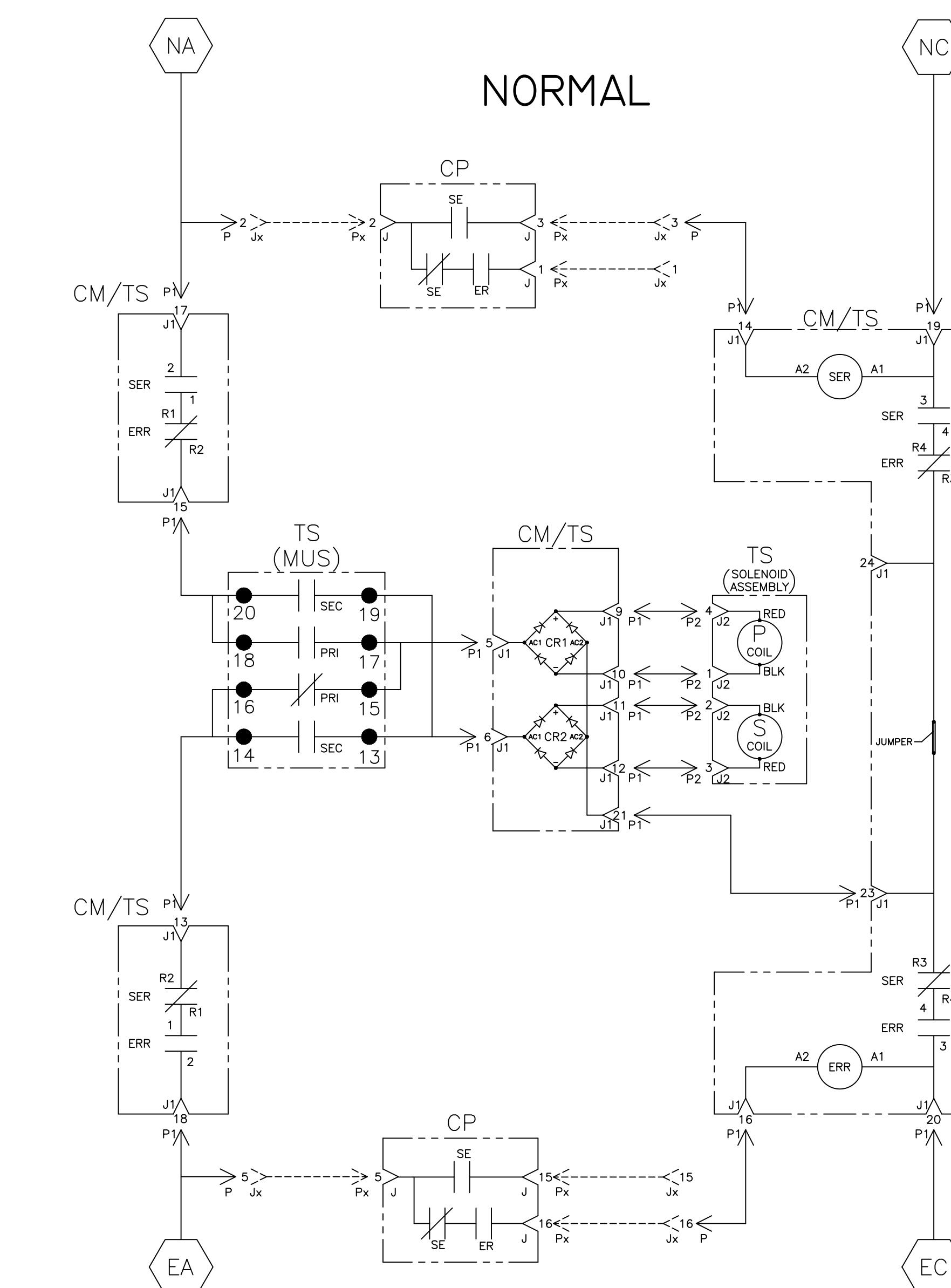


OPTIONAL NEUTRAL TYPES
REFER TO "EXPLANATION OF CATALOG NUMBER CODES" IN CATALOG NUMBER CHART ON SHEET 1.
• SOLID BUS PLATE
• SWITCHING

NORMAL

NOTE:
ATS/NTS SHOWN CLOSED ON NORMAL SOURCE.

NORMAL



EMERGENCY

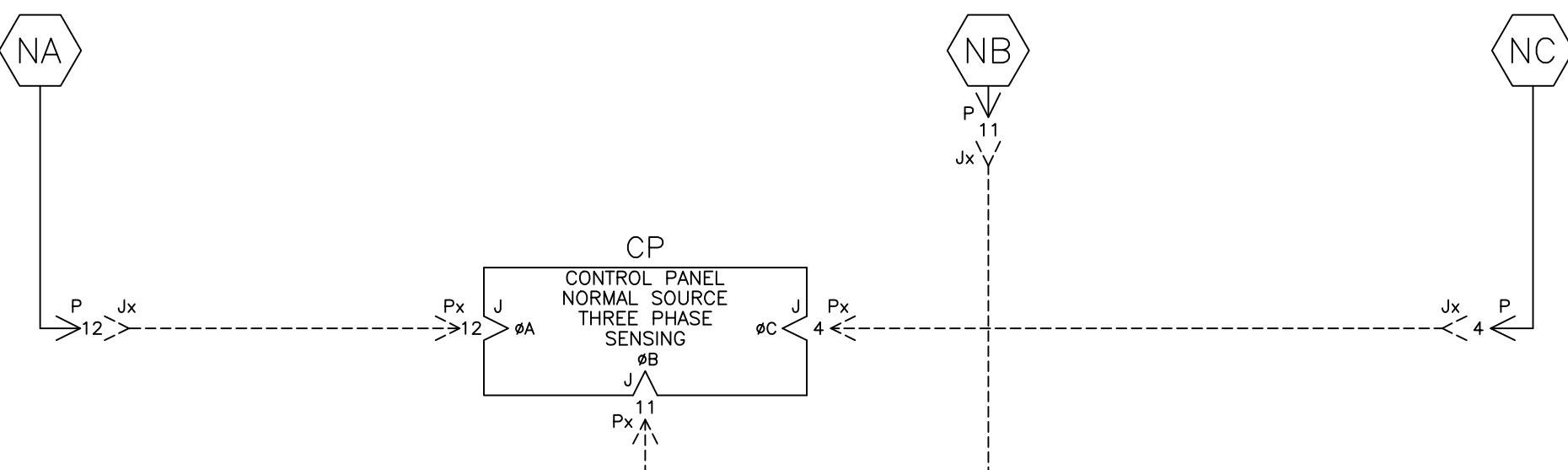
MUS	SOLENOID POSITION			
	NORM	>	AFTER TDC *	<
13-14				
15-16				
17-18				
19-20				

* AFTER SOLENOID PASSES THROUGH
TOP DEAD CENTER POSITION.

PROJECT NAME:		WIRING DIAGRAM	
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS "G" FRAME, GROUP G CONTROLS		THIRD ANGLE PROJECTION	
DRAWN BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH PROCEDURE MP-I-003. FOR PLASTIC PARTS SEE MP-I-055	
DJB	10/28/13	ASSEM. REF. NO.	
CHECKED	DATE	PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.	
PROJECT APPROVAL	10/28/13	COMPUTER GENERATED DRAWING	
FINAL APPROVAL		SCALE	SIZE
		None	DS
DWG. NO.		1001662	
DRAWING REV.		ASCO Power Technologies, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A.	
DRAWING NO.		1001662	
REV. TO SHEET		DRAWING NO. 254970 SHEET 3 OF 7	

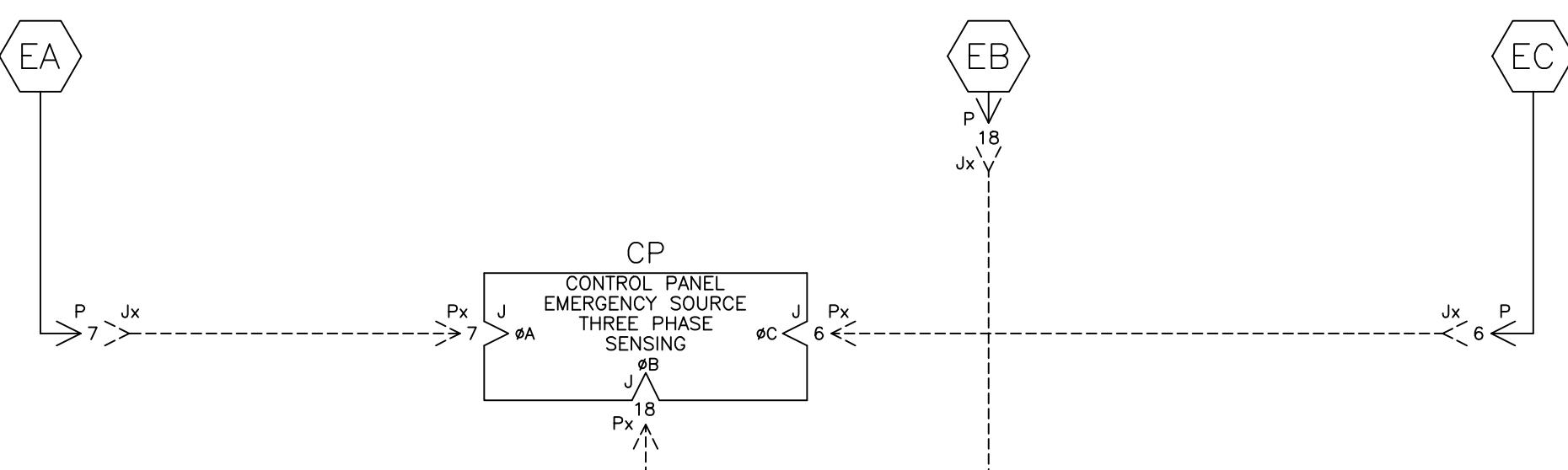
NORMAL SOURCE CIRCUITS

NORMAL



EMERGENCY SOURCE CIRCUITS

EMERGENCY

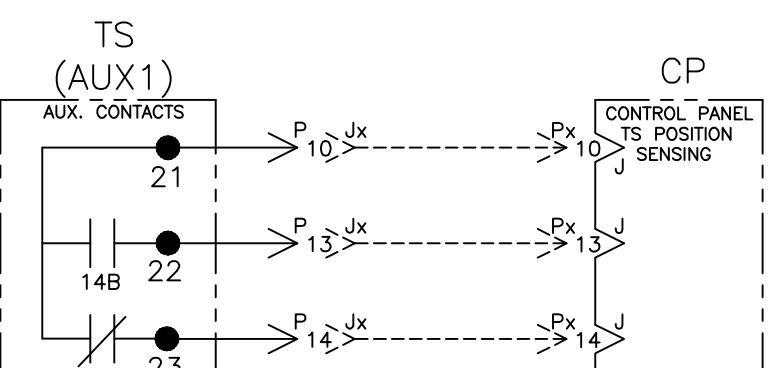


LOAD TERMINAL CIRCUITS

LOAD



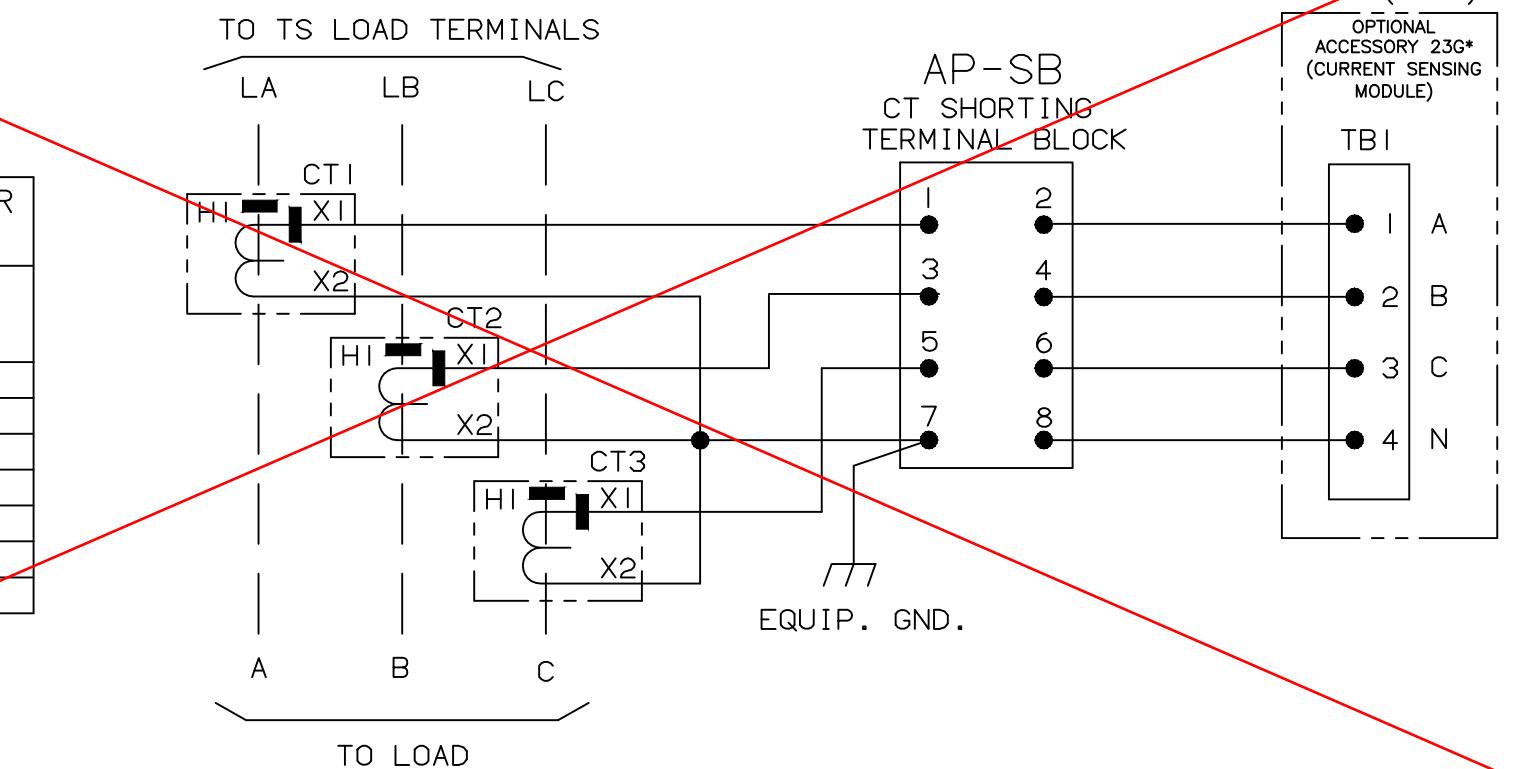
CONTROL SIGNALS & INDICATION



ADDITIONAL CIRCUITS

OPTIONAL ACCESSORY 23GB (LOAD CURRENT METERING)

CURRENT TRANSFORMER RATIO TABLE	
SWITCH RATING	CT RATIO
1000A	1200:5A
1200A	1200:5A
1600A	2000:5A
2000A	2000:5A
2600A	3000:5A
3000A	3000:5A
3200A	4000:5A

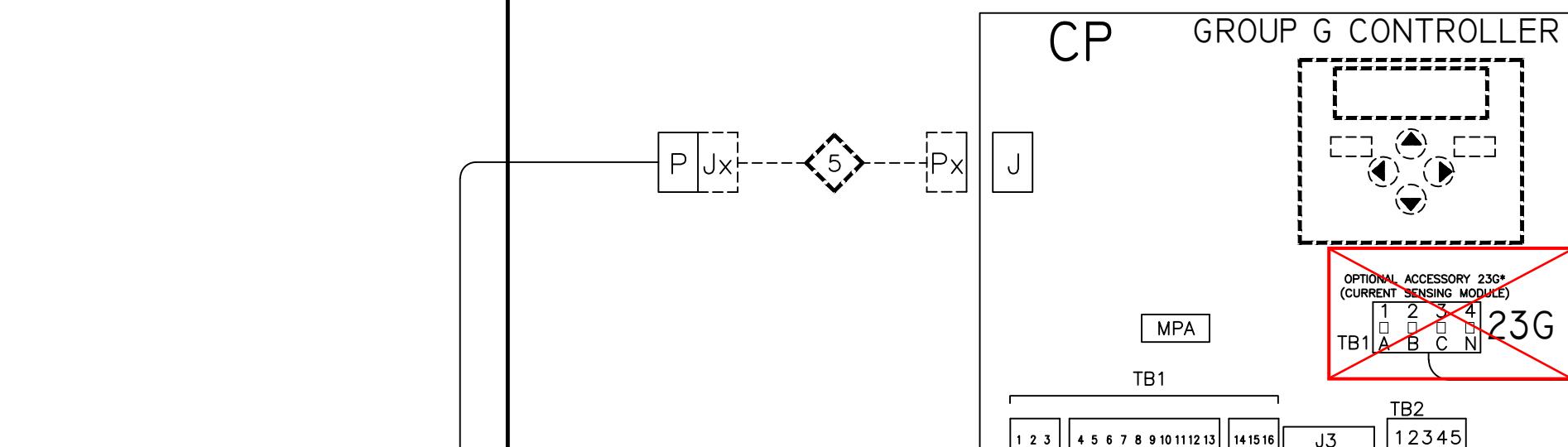
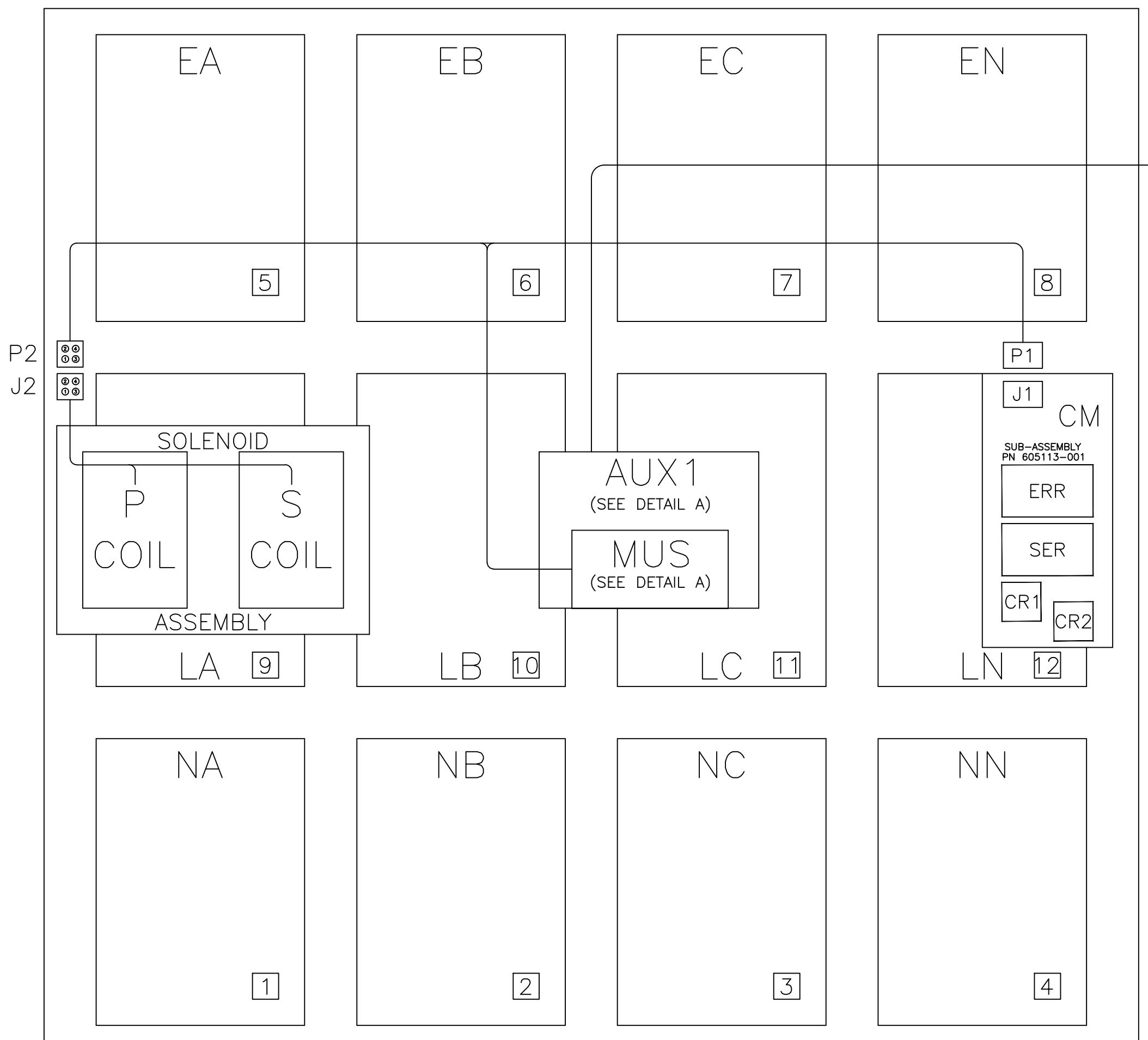


PROJECT NAME: G 254970		REV. TO SHEET	TR	BK	05/26/15
SEE ECN		ECN NO.	BY APP.	DATE	
WIRING DIAGRAM					
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS					
"G" FRAME, GROUP G CONTROLS					
DRAWN BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH PROCEDURE MP-I-003. FOR PLASTIC PARTS SEE MP-I-055.			ASSEM. REF. NO.
DJB	10/28/13				
CHECKED	DATE	PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.			SCALE
					None
PROJECT APPROVAL	DATE				SIZE
BK	10/28/13				DS
FINAL APPROVAL	DATE				DRAWING NO.
					1001662
ASCO [®] ASCO Power Technologies, L.P.					
FLORHAM PARK, NEW JERSEY 07932 U.S.A.					
DRAWING REV. G ECN NO. 254970 SHEET 4 OF 7					

PHYSICAL DIAGRAM

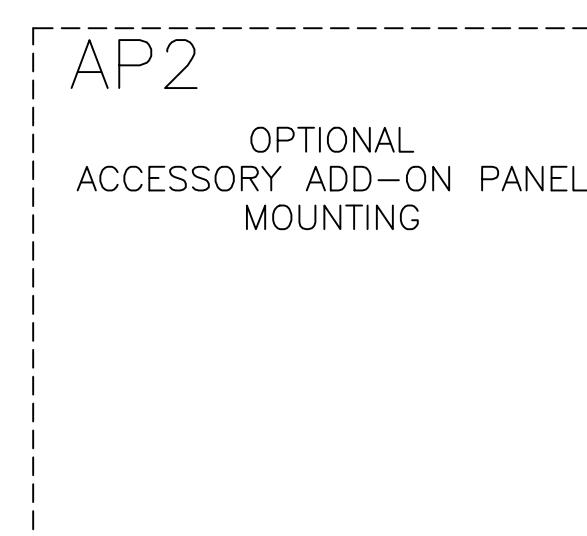
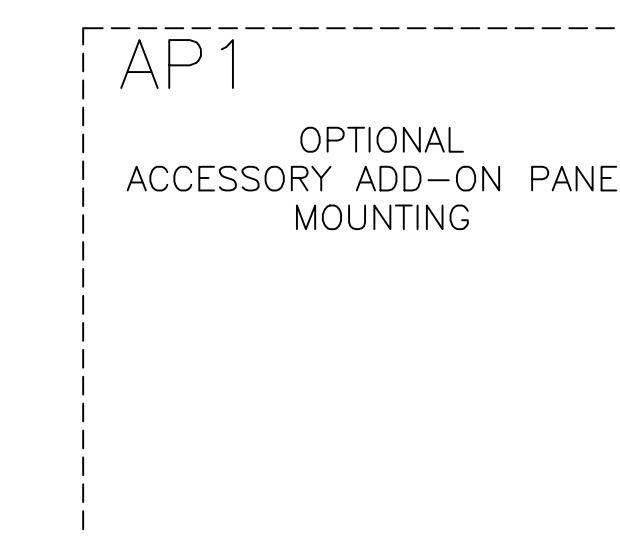
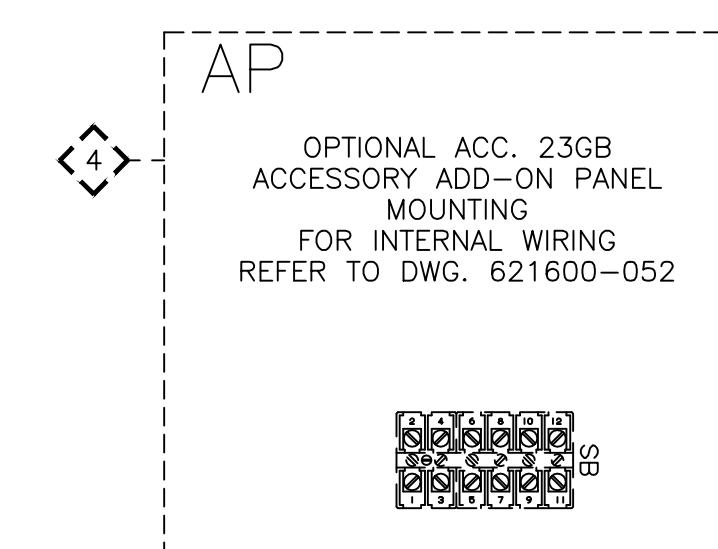
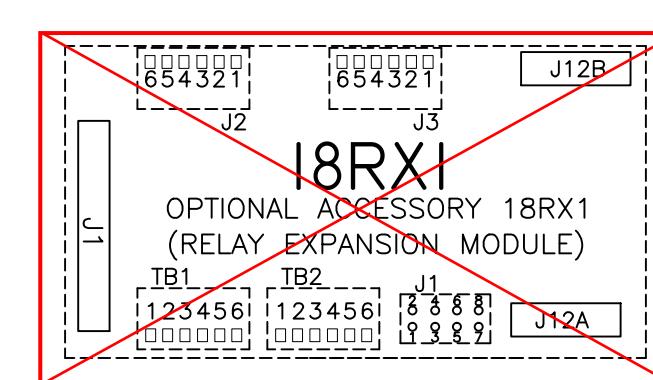
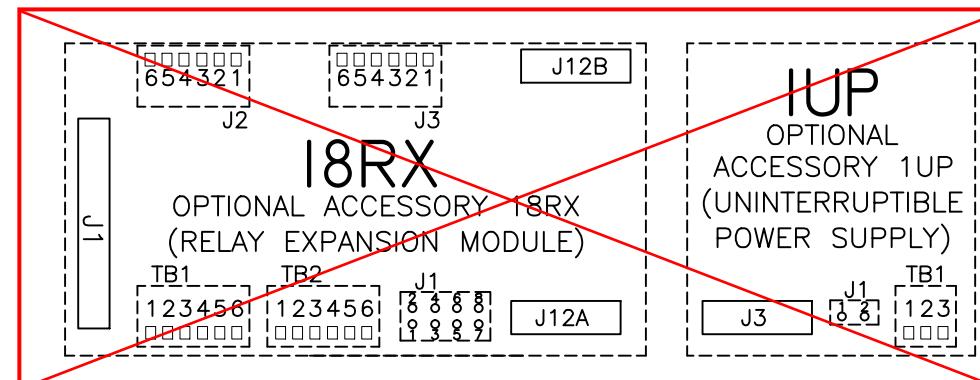
ENCLOSURE

TS (TRANSFER SWITCH)

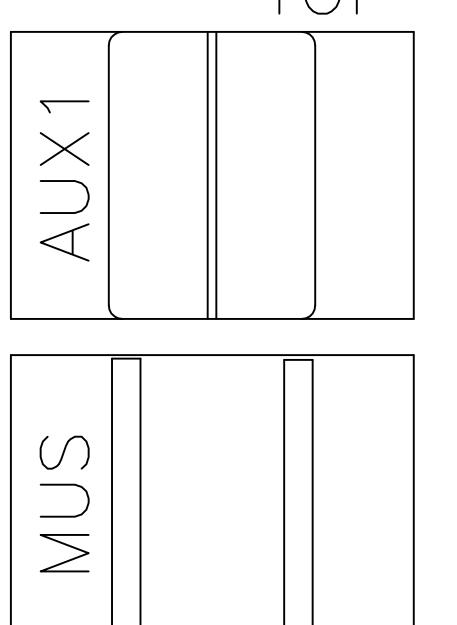


DOOR, INSIDE

TO FIRST OPTIONAL ACCESSORY 18RX (J12A OR J12B) OR 1UP (J3)
[1UP MUST BE LAST ACCESSORY IN CHAIN]
USE CABLE PN 607761 FOR EACH CONNECTION



NOTE: PHYSICAL MAY VARY BASED ON ENCLOSURE PROVIDED.

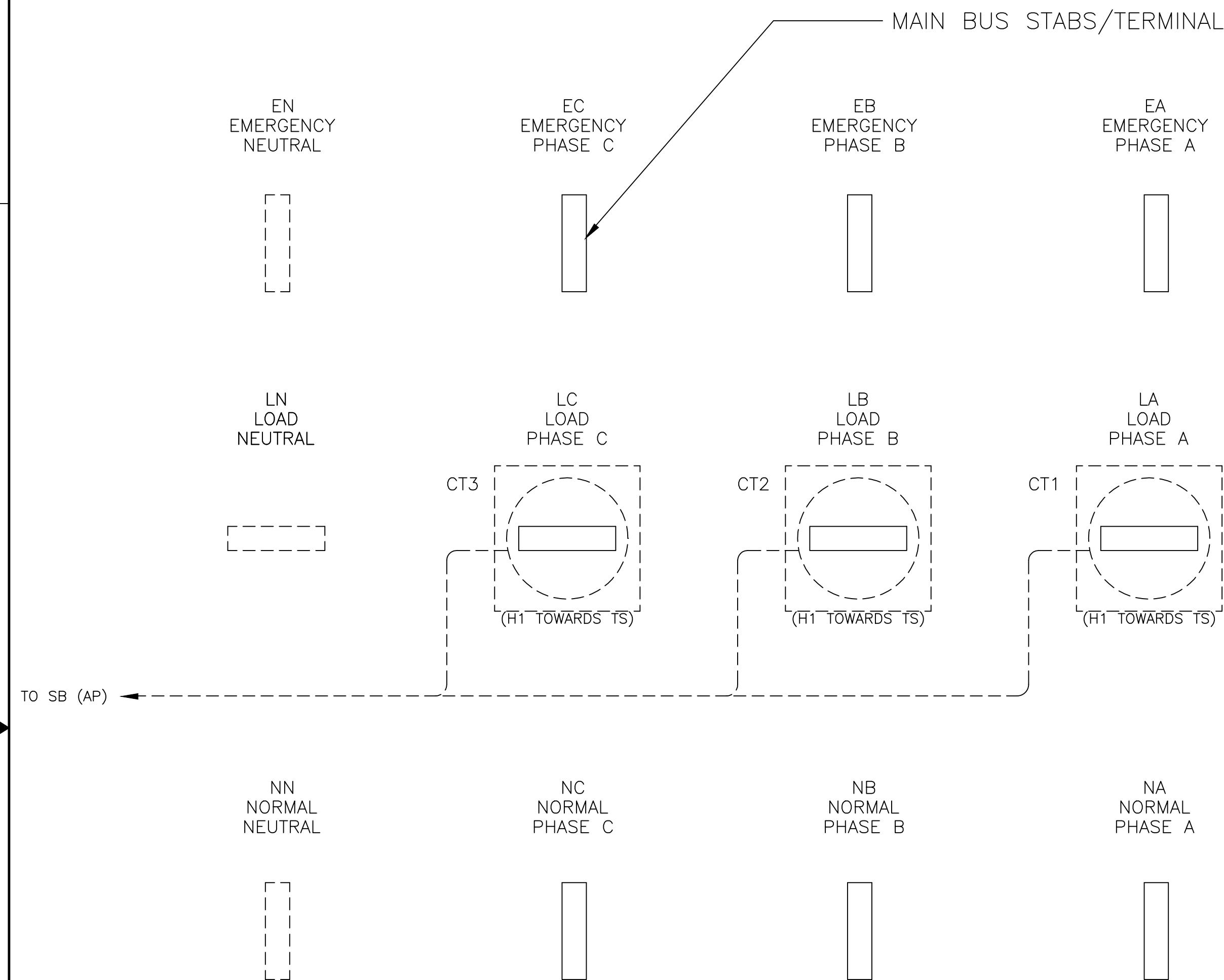
DETAIL A
MUS & AUX1
TOP VIEW

PROJECT NAME: G		254970	TR	BK	05/26/15
SEE ECN					
REV. TO SHEET	ECN NO.	BY APP.	DATE		
WIRING DIAGRAM					THIRD ANGLE PROJECTION
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS "G" FRAME, GROUP G CONTROLS					
DRAWN BY DJB		DATE 10/28/13	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH PROCEDURE MP-I-003. FOR PLASTIC PARTS SEE MP-I-055.		ASSEM. REF. NO.
CHECKED BY BK		10/28/13	PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.		COMPUTER GENERATED DRAWING
PROJECT APPROVAL BY BK		10/28/13			SCALE None SIZE DS
FINAL APPROVAL					DWG. NO. 1001662
ASCO [®] ASCO Power Technologies, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A.					
DRAWING REV. G		ECN NO. 254970	SHEET 5 OF 7		

PHYSICAL DIAGRAM (CONTINUED)

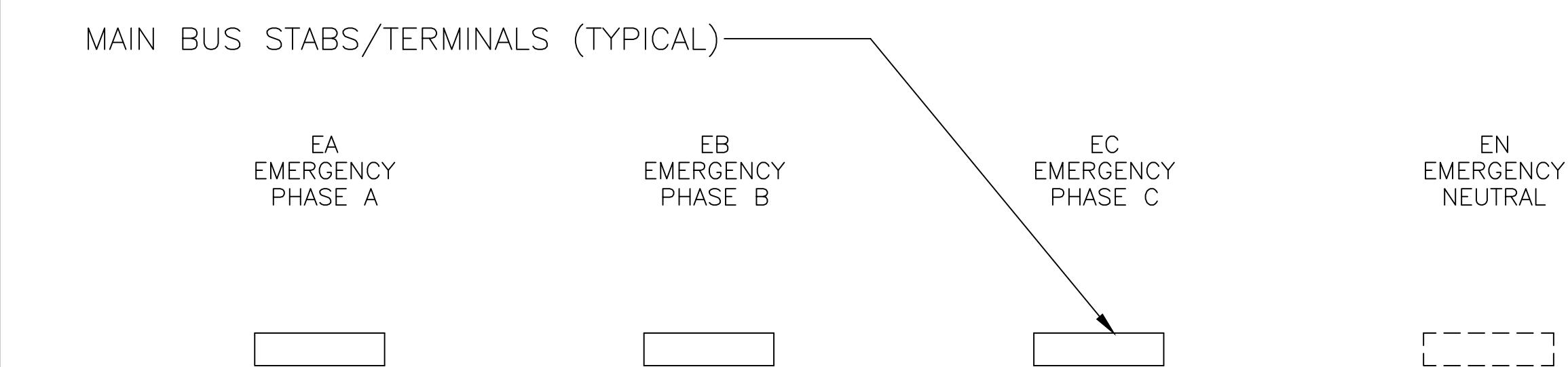
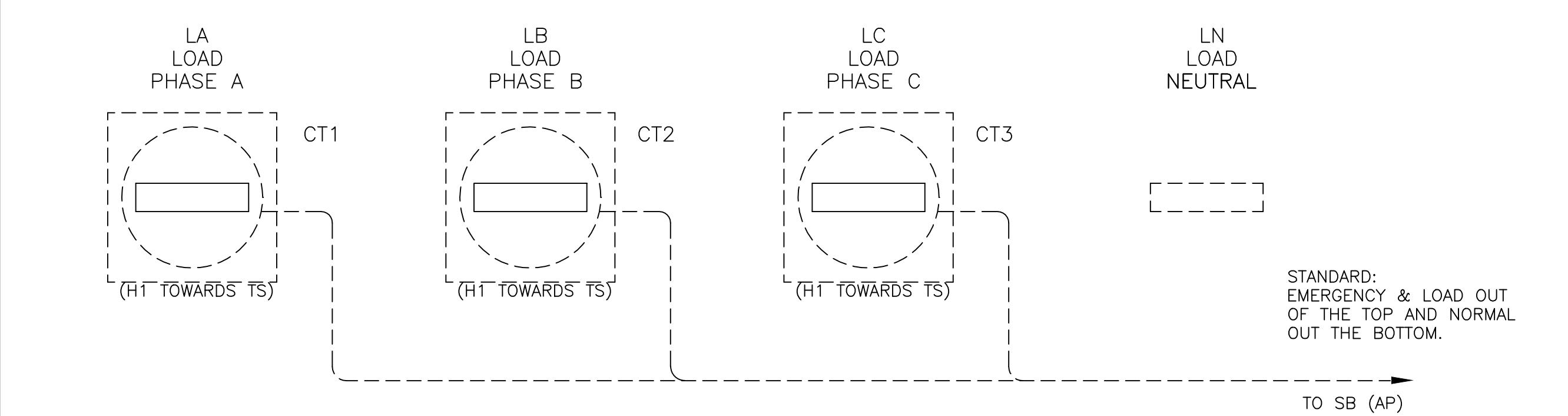
REAR CONNECTED SWITCH

1000 – 3200 AMP. TS REAR VIEW

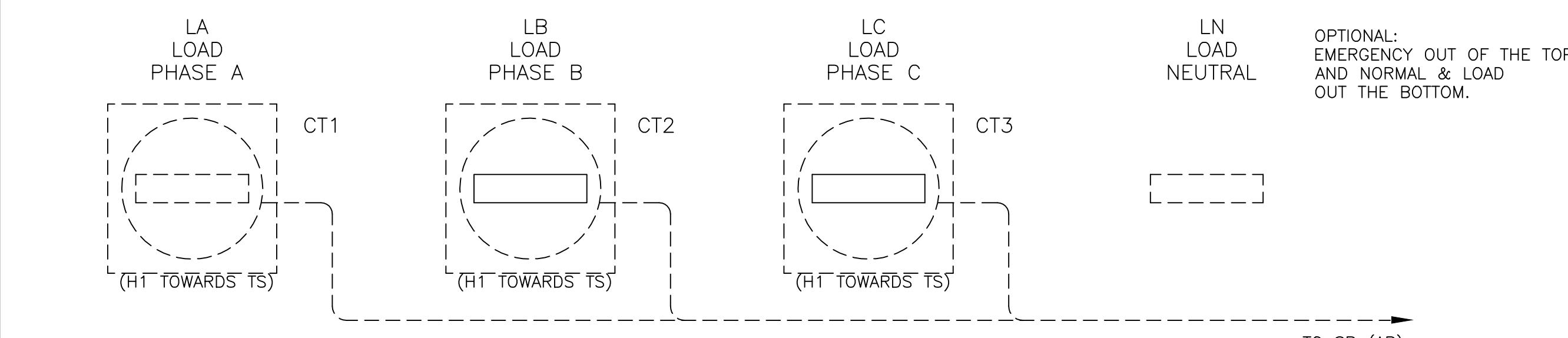
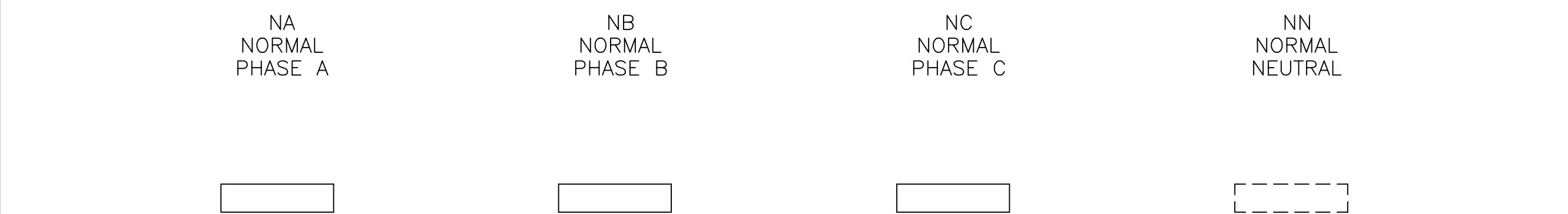
OPTIONAL ACCESSORY 23GB
(LOAD CURRENT METERING)

FRONT CONNECTED SWITCH

1000 – 2000 AMP. TS TOP VIEW

OPTIONAL ACCESSORY 23GB
(LOAD CURRENT METERING)

BOTTOM VIEW



PROJECT NAME:		G 254970 TR BK 05/26/15	
WIRING		DIAGRAM	
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS			
"G" FRAME, GROUP G CONTROLS			
DRAWN BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH PROCEDURE MP-J-003. FOR PLASTIC PARTS SEE MP-J-055	
DJB	10/28/13	ASSEM. REF. NO.	
CHECKED	DATE	PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.	
BK	10/28/13	SCALE	
PROJECT APPROVAL	DATE	SIZE	
BK	10/28/13	DS	
FINAL APPROVAL	DATE	DRAWING NO.	
1001662		1001662	
ASCO		ASCO Power Technologies, L.P.	
FLORHAM PARK, NEW JERSEY 07932 U.S.A.		DRAWING REV. G ECN NO. 254970 SHEET 6 OF 7	

WIRE RUN LISTING

WIRE No.	HARNESS LOCATOR	BOX CHECKED IF HARNESS IS MODIFIED
1 P-2,TS-1	HARNESS 605454 (P,P1,P2,J3) MAIN TS	<input checked="" type="checkbox"/>
2 P-3,PT-14		
3 P-4,TS-3		
4 P-5,TS-5		
5 P-6,TS-7		
4 P-7,TS-5		
6 P-8,TS(AUX1)-24		
6 TS(AUX1)-24,J3-1		
7 P-9,TS(AUX1)-25		
7 TS(AUX1)-25,J3-2		
8 P-10,TS(AUX1)-21		
9 P-11,TS-2		
10 P-12,TS-1		
11 P-13,TS(AUX1)-22		
12 P-14,TS(AUX1)-23		
13 P-16,P1-16		
14 P-17,J3-3		
15 P-18,TS-6		
16 P-19,TS-9		
17 P-20,TS-10		
18 P-21,TS-11		
19 P-22,TS-4		
20 P-23,TS-8		
21 P-24,TS-12		
22 P1-5,TS(MUS)-17		
22 TS(MUS)-17,TS(MUS)-15		
23 P1-6,TS(MUS)-19		
23 TS(MUS)-19,TS(MUS)-13		
24 P1-9,P2-4		
25 P1-10,P2-1		
26 P1-11,P2-2		
27 P1-12,P2-3		
28 P1-13,TS(MUS)-16		
28 TS(MUS)-16,TS(MUS)-14		
29 P1-15,TS(MUS)-20		
29 TS(MUS)-20,TS(MUS)-18		
1 P1-17,TS-1		
4 P1-18,TS-5		
3 P1-19,TS-3		
5 P1-20,TS-7		
30 P1-21,P1-23		
REMOVE WIRES		
6 TS(AUX1)-24,J3-1		
7 TS(AUX1)-25,J3-2		
14 P-17,J3-3		
ADD WIRES		
6 TS(AUX1)-24,TB-1		
7 TS(AUX1)-25,TB-2		
200 P-1		
14 P-17,TB-3		
222 P-15		

WIRE No.	HARNESS LOCATOR	BOX CHECKED IF HARNESS IS MODIFIED
40 TB-4,TS(AUX1)-27		
41 TB-5,TS(AUX1)-28		
42 TB-6,TS(AUX1)-29		
43 TB-7,TS(AUX1)-30		
44 TB-8,TS(AUX1)-31		
45 TB-9,TS(AUX1)-32		

WIRE No.	ADDITIONAL WIRING	CLR	AWG
46 TB-10,TS(AUX1)-33			16
47 TB-11,TS(AUX1)-34			
48 TB-12,TS(AUX1)-35			
49 TB-13,TS(AUX1)-36			
50 TB-14,TS(AUX1)-38			
51 TB-15,TS(AUX1)-37			

WIRE No.	HARNESS LOCATOR	BOX CHECKED IF HARNESS IS MODIFIED
46 P-19,TS-9		
47 P-20,TS-10		
48 P-21,TS-11		
49 P-22,TS-4		
50 P-23,TS-8		
51 P-24,TS-12		

WIRE No.	HARNESS LOCATOR	BOX CHECKED IF HARNESS IS MODIFIED
230 CT1-X1,AP-SB-1		
230 AP-SB-2,CP(23G)-TB1-1		
231 CT2-X1,AP-SB-3		
231 AP-SB-4,CP(23G)-TB1-2		
232 CT3-X1,AP-SB-5		
232 AP-SB-6,CP(23G)-TB1-3		
233 CT1-X2,CT2-X2	GRN	
233 CT2-X2,CT3-X2	GRN	
233 CT3-X2,AP-SB-7	GRN	
233 AP-SB-7,EQUIP, GRD.	GRN	
233 AP-SB-8,CP(23G)-TB1-4	GRN	

WIRE No.	HARNESS LOCATOR	BOX CHECKED IF HARNESS IS MODIFIED
200 Jx-1,Px-1		
1 Jx-2,Px-2		
2 Jx-3,Px-3		
3 Jx-4,Px-4		
4 Jx-5,Px-5		
5 Jx-6,Px-6		
4 Jx-7,Px-7		
6 Jx-8,Px-8		
7 Jx-9,Px-9		
8 Jx-10,Px-10		
9 Jx-11,Px-11		
10 Jx-12,Px-12		
11 Jx-13,Px-13		
12 Jx-14,Px-14		
222 Jx-15,Px-15		
13 Jx-16,Px-16		
14 Jx-17,Px-17		
15 Jx-18,Px-18		
16 Jx-19,Px-19		
17 Jx-20,Px-20		
18 Jx-21,Px-21		
19 Jx-22,Px-22		
20 Jx-23,Px-23		
21 Jx-24,Px-24		

PROJECT NAME:	G 254970	TR	BK	05/26/15
WIRING	SEE ECN			
DIAGRAM	ECN NO.	BY	APP.	DATE
300 SERIES (G3ATS/G3NTS) 3PH 1000-3200 AMPS				
"G" FRAME, GROUP G CONTROLS				
DRAWN BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH PROCEDURE MP-I-003, FOR PLASTIC PARTS SEE MP-I-055		
DJB	10/28/13	ASSEM. REF. NO.		
CHECKED	BK	PROJECT APPROVAL		
10/28/13		WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.		
FINAL APPROVAL		1001662		
ASCO Power Technologies, L.P.				
FLORHAM PARK, NEW JERSEY 07932 U.S.A.				
DRAWING REV.	ECN NO.	DRAWING REV. G ECN NO. 254970 SHEET 7 OF 7		

GREEN RIDGE RECREATIONAL CENTER
ss5705 Detailed Information

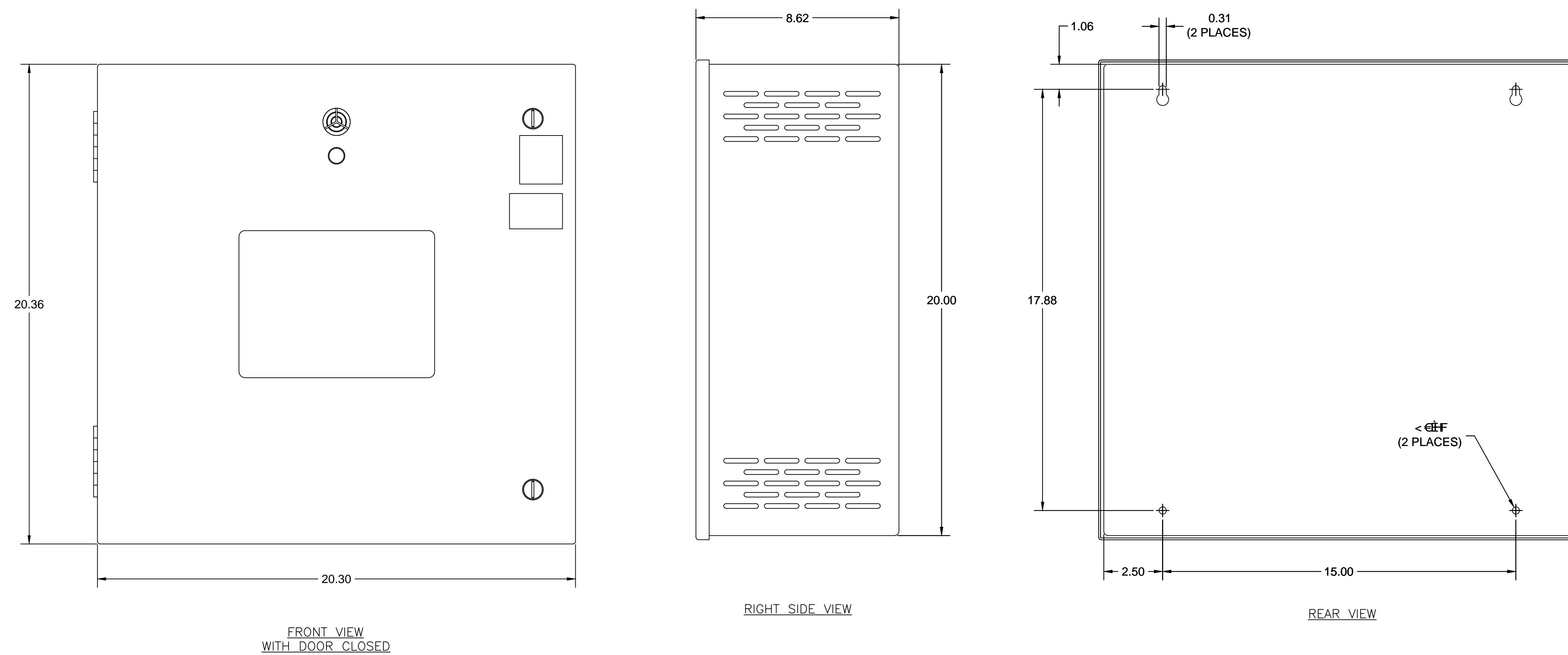
ITEM :	Hardware	QTY : 1
Product Number : 1124485	Description : 5705 Remote Annunciator	
Voltage :	Markings :	
Extended Warranty (Years - Cost)	Not Included	

DRAWINGS FOR APPROVAL

Drawing Number	Description
916978-008	Outline Drawing
917121-006	Wiring Diagram

MOUNTING, ASCO 5705 EIGHT (8) DEVICE ANNUNCIATOR

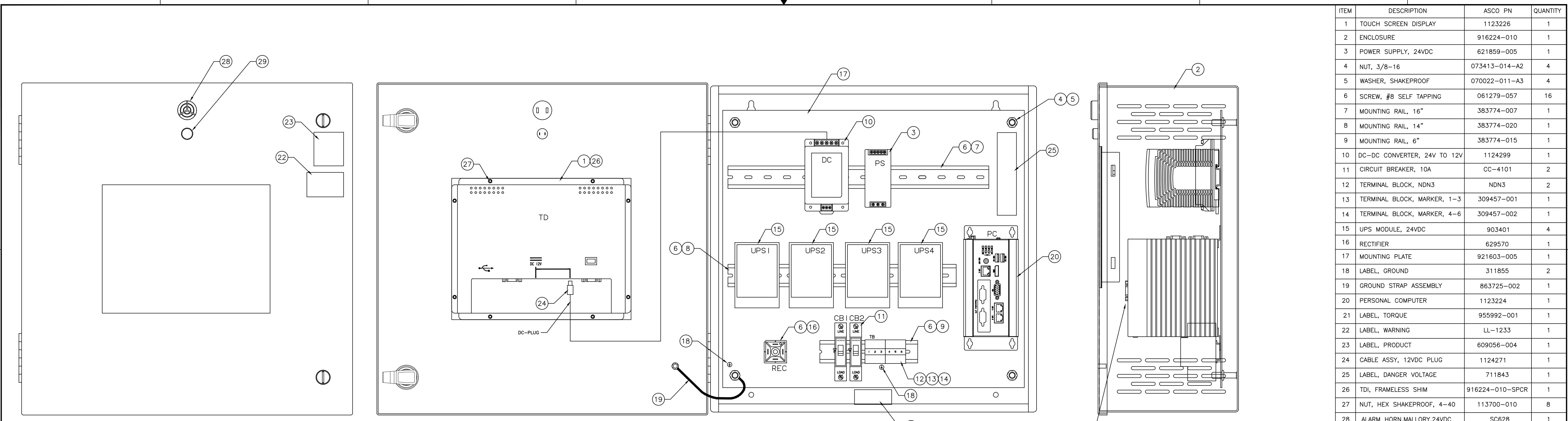
ENCLOSURE MOUNTING



GENERAL NOTES:

1. UL LISTED, TYPE 1 STEEL WALL MOUNT ENCLOSURE.
2. RECOMMENDED CLEARANCES:
FRONT: 24 INCHES

PROJECT NAME:		CAT. NO. 5705	
MOUNTING			
ASCO CAT. NO. 5705, EIGHT (8) DEVICE ANNUNCIATOR			
W/ ALARM HORN AND LED INDICATOR			
BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASME Y14.5M-2003. FOR PLASTIC PARTS SEE MP-I-055	
DRAWN BY	03/18/16	ASSEM. REF. NO.	
CHECKED		COMPUTER GENERATED DRAWING	
PROJECT APPROVAL		PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.	
FINAL APPROVAL		03/18/16	
		DWG. NO. 016978-008	
		ASCO [®] ASCO Power Technologies, L.P. FLORHAM PARK, NEW JERSEY 07932 U.S.A.	
		DRAWING REV. B ECN NO. 260839 SHEET 1 OF 1	

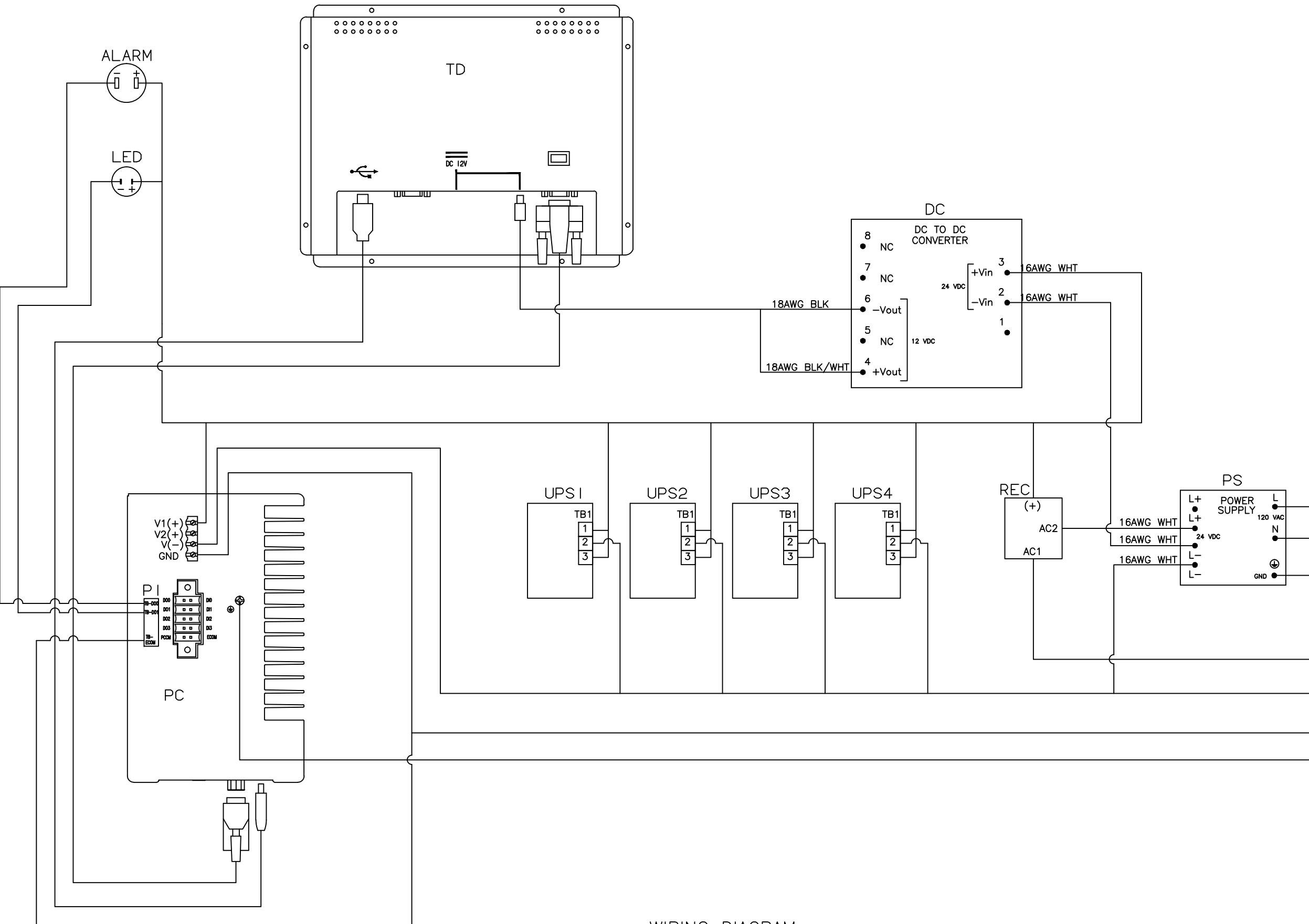


FRONT VIEW
WITH DOOR CLOSED

FRONT VIEW
WITH DOOR OPEN

RIGHT SIDE VIEW

WIRE NO.	WIRE CONNECTIONS	CLR	AWG
1	TB-1, CBI-LINE	WHT	16
2	TB-2, PS-N	GRN	
3	TB-3, PS-GND		
3	PS-GND, PC-GND		
3	TB-3, TB-4		
3	TB-4, EQUIP. GND		
3	EQUIP. GND, PC-CHASIS GND		
3	ENCL. STUD, DOOR STUD		
4	CB1-LOAD, PS-L	WHT	16
5	TB-5, CB2-LINE		
6	TB-6, PS-L(-)		
6	PL-V(-), UPS4-TB1-2		
6	UPS4-TB1-2, UPS3-TB1-2		
6	UPS3-TB1-2, UPS2-TB1-2		
6	UPS2-TB1-2, UPS1-TB1-2		
6	UPS1-TB1-2, PC-V(-)		
6	PS-L(-), DC-2(-V1n)		
7	PS-L(+), BS-AC2		
8	CB2-LOAD, BS-AC1		
9	BS-(+), DC-3(+V1n)		
9	BS-(+), UPS4-TB1-1		
9	UPS4-TB1-1, UPS4-TB1-3		
9	UPS4-TB1-3, UPS3-TB1-1		
9	UPS3-TB1-1, UPS3-TB1-3		
9	UPS3-TB1-3, UPS2-TB1-1		
9	UPS2-TB1-1, UPS2-TB1-3		
9	UPS2-TB1-3, UPS1-TB1-1		
9	UPS1-TB1-1, UPS1-TB1-3		
9	UPS1-TB1-3, PC-V1(+)		
6	PI-TB-ECOM, PS-L(-)	WHT	18
9	LED(+), ALARM(+)		
9	ALARM(+), PC-V1(+)		
11	PI-TB-DOO, ALARM(-)		
12	PI-TB-DOO, LED(-)		
13	DC-PLUG, DC-4(+Vout)	BLK/WHT	
13	DC-PLUG, DC-6(-Vout)	BLK	



WIRING DIAGRAM

NOTES:

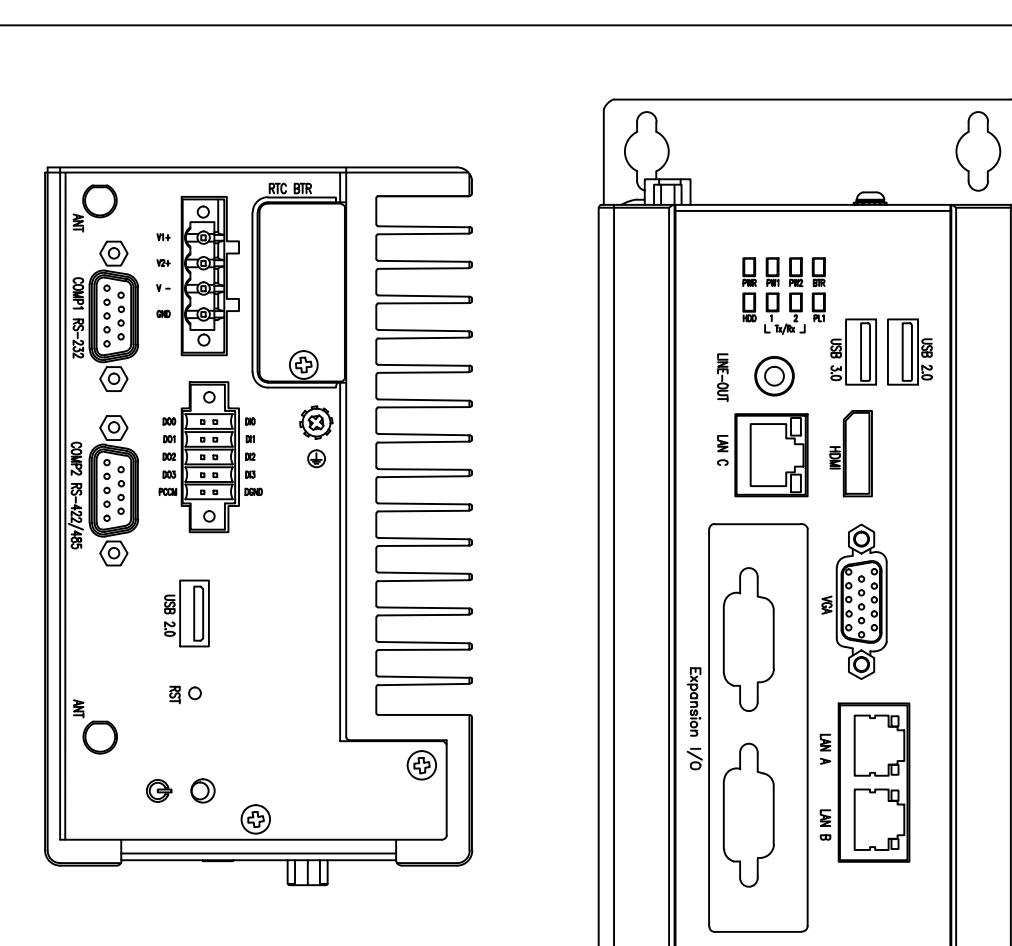
1. FIELD WIRING TO BE INSTALLED IN ACCORDANCE WITH NFPA70: NATIONAL ELECTRICAL CODE (NEC).
2. P1 TERMINAL BLOCK SHIPS WITH ASCO PN: 112324

FIELD CONNECTIONS

WIRE RANGE: (1) 22-10 AWG

TIGHTENING TORQUE: 18 IN-LB

CUSTOMER SUPPLIED SOURCE RATED: 120 Vac/1.3A MAX.
GND
OPTIONAL BACK UP POWER CONNECTION WHICH ALLOW COMMUNICATION WITH THE CAT. 5705 TO BE MAINTAINED UPON THE LOSS OR INTERRUPTION OF SYSTEM VOLTAGE



DETAIL 'A'

D	260839	DL	DL	09/07/16
SEE ECN -	RLO	C/o	&	WIRE
C	262226	DL	JPB	07/19/16
SEE ECN-ITEM 29				
B	260570	DL	JPB	04/22/16
SEE ECN - HRN&LGT ADDED				

PROJECT NAME:	CAT. NO. 5705		
ASSEMBLY WIRING	CAT. NO. 5705		
CAT. NO. 5705, EIGHT (8) DEVICE ANNUNCIATOR			
W/ ALARM HORN AND LED INDICATOR			
BY	DATE	MANUFACTURING TOLERANCES TO BE IN ACCORDANCE WITH ASME Y14.5M-2003. FOR PLASTIC PARTS SEE MP-1-055	
DRAWN BY	JMS	03/18/16	ASSEM. REF. NO.
CHECKED			
PROJECT APPROVAL			PROPERTY OF ASCO POWER TECHNOLOGIES. USE PERMITTED FOR OUR WORK ONLY. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.
FINAL APPROVAL	JMS	03/18/16	DWG. NO.
			017121-006
			ASCO POWER TECHNOLOGIES, L.P.
			FLORHAM PARK, NEW JERSEY 07932 U.S.A.
REV. TO SHEET	ECN NO.	BY APP.	DATE
THIRD ANGLE PROJECTION			
COMPUTER GENERATED DRAWING			
SCALE	3	SIZE	DS
DWG. NO.	017121-006		
DRAWING REV.	D	ECN NO.	260839
			SHEET 1 OF 1

ASCO 5705

8-Device Annunciator

Critical Facility, Power and Energy Management

Effectively manage your critical facility to increase Reliability, Compliance and Efficiency. Whether it is just a generator and transfer switch, a single facility or multiple locations: PowerQuest, the Critical Power Management System (CPMS) gives you the visibility and insight needed to achieve your goals.



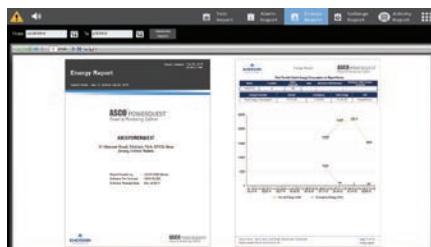
With the ASCO PowerQuest CPMS, you can:

- Understand power system and equipment status throughout the facility
- Quickly identify and resolve alarms to reduce downtime risk and increase reliability
- Monitor KW capacity and demand at any point in the distribution to effectively manage capital investments
- Ensure power quality compliance to increase capital life of business critical equipment and devices
- Leverage existing network infrastructure and add existing legacy equipment
- Analyze comprehensive forensics power quality and sequence of events in millisecond granularity
- Identify utility energy usage and demand billing discrepancies
- Reduce or eliminate power factor and demand penalties
- Monitor, Benchmark and Increase energy efficiency
- Allocate energy cost to departments or processes

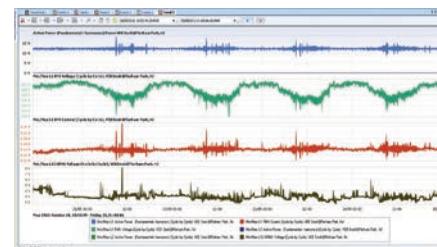
Primary Capabilities and Features



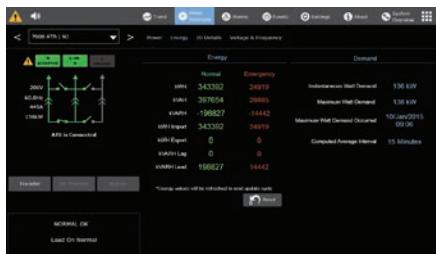
Main Menu



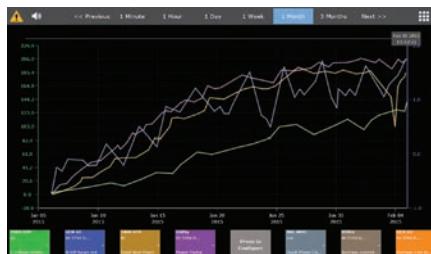
Automated Outage and NFPA Compliance Reports



Power Quality Analytics Supports (1) ASCO 5400 PQM



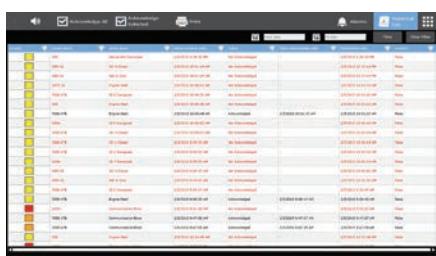
Drill Down
To View Equipment Details



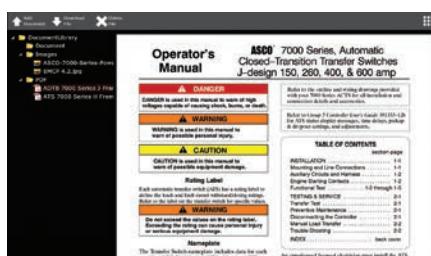
Historical Trending



Active Alarms



Event Log



Reference Library



System Overview

Specifications and Ordering Details

General	
Certification	UL1008
Dimensions (W x D x H)	20in x 20in
Mounting	NEMA 1 Wall Mount
Weight	50 lbs
Power Requirements	24VDC or 120VAC
Communications	
Web Interface	HTTP/HTTPS
Protocols	Modbus and BACnet IP
Security	AES 128-bit Encryption
Email	SMTP

Interface	
LED Indicators	Power, Battery and LAN Status
Storage	128GB Solid State Drive
Lan Ports	Redundant RJ-45 Ethernet
USB Ports	3 x USB
HD Display Ports	1 x VGA, 1x HDMI
Operating Temperature	-4 to 140degF-Display -20 to 60C
Shock Protection	IEC 60068-2-27, 50G
Vibration Protection	IEC 60068-2-64,

ASCO SERIES 300 Service Entrance Power Transfer Switch

The ASCO Service Entrance Power Transfer Switch combines automatic power switching with the necessary disconnecting, grounding, and bonding required for use as service entrance equipment. The power transfer switch meets all National Electrical Code requirements for service entrance use.

Product Features:

- Suitable for use as service entrance equipment.
- Sizes available from 70 - 3000 amps, 600 VAC, 50 or 60 Hz, single or three phase.
- 70 - 400 Ampere listed to UL 1008. 600 - 3000 Ampere listed to UL 891.
- Automatic Transfer Switch is listed to UL 1008 for total system loads.
- Silver plated copper ground and neutral bus with solderless screw type terminals.
- Ground fault trip protection provided on sizes 1000 amps and above.
- Available with solid or switched neutral.

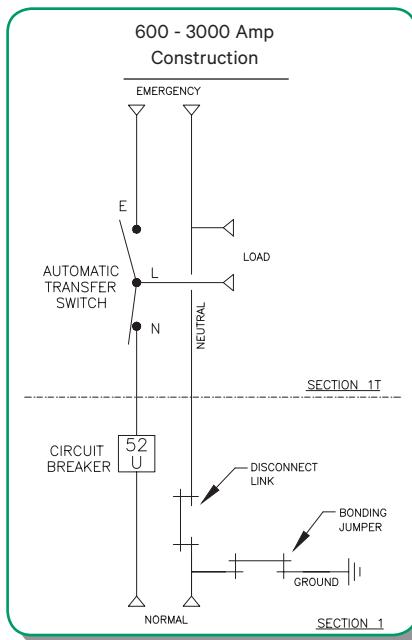
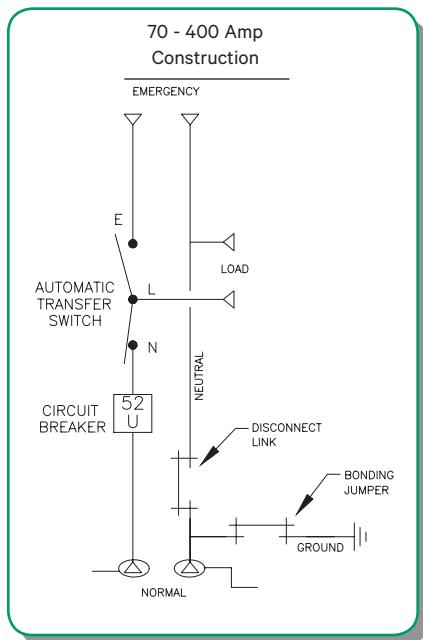


ASCO Series 300
SE Rated 800 amperes Type 1 enclosure



ASCO Series 300
SE Rated 200 amperes in Type 3R enclosure

ASCO Series 300SE products use two types of construction.



Products 400 amperes or less, utilize a single enclosure including a service (utility source) disconnect circuit breaker, as well as the power transfer switch, grounding and bonding provisions.

Products 600 amperes and above, utilize a multi-section switchboard construction including a service equipment section containing the service (utility source) disconnect circuit breaker, grounding, and bonding provisions. A second section contains the power transfer switch.

To order an ASCO SERIES 300SE Power Transfer Switch, complete the following catalog number:

J	03AUS	B	3	0600	N	GX	C
Frame	Product Type	Neutral Code	Phase Poles	Amperes Continuous Rating	Voltage Code	Controller Code	Enclosure
D = 70 - 225 Amp	03AUS = Automatic	A = Solid Neutral	2	0070, 0100, 0150, 0200, 0225 ⁴ , 0250 ⁴ , 0400, 0600, 0800, 1000, 1200, 1600, 2000 2500, 3000	A = 115 B = 120 C = 208 D = 220 E = 230 F = 240 H = 380 J = 400 K = 415 L = 440 M = 460 N = 480 P = 550 Q = 575 R = 600	G = No Optional Accessories GX = Optional Accessories	C = Type 1 (Standard) M = Type 3R Secure Double Door N = Type 4 ² Secure Double Door P = Type 4X ^{5,8} Secure Double Door 304 SS Q = Type 12 ² Secure Double Door R = Type 3RX ^{5,6} Secure Double Door 316 SS S = Type 3RX ^{5,6} Secure Double Door 304 SS V = Type 4X ^{5,8} Secure Double Door 316 SS
J = 150 - 600 ⁷ Amp	03NUS = Non-Automatic	B = Switched Neutral	3				
H = 800 - 1200 Amp	3ADUS = Automatic Delayed Transition						
G = 1600 - 3000 Amp	3NDUS = Non-Automatic, Delayed Transition						

Notes:

- 115-120 volt available 150-400 amperes for 3AUS, 3NUS only.
- Available for 70-1600 amperes, use type 3R for 2000-3000 ampere applications.
- A solid neutral is provided as standard.
- 200, 225 ampere rated switches suitable for use with copper cable only.

Refer to paragraph 310.15 of the NEC for additional information.

5. Type 316 stainless steel is the standard. It provides an improved reduction in corrosion of salt and some chemicals. It is the preferred choice for marine environments.
6. Available only on switches rated 1600, 2000, 2600 and 3000 amperes.
7. J 150-225 ampere for SERIES 3ADUS/3NDUS only.
8. Available only on switches rated 70 - 1600 amperes.

ASCO SERIES 300SE Power Transfer Switch Dimensions and Shipping Weights

UL Type 1 Enclosure⁴

Switch Rating Amps	Phase Poles	Neutral Code	Dimensions, In. (mm)			Approx. Shipping Weight Lb. (kg)
			Width	Height	Depth	
70, 100, 150, 200, 225	2	A	36 (914)	48 (1219)	13 (330)	400 (185)
	2	B	36 (914)	48 (1219)	13 (330)	410 (189)
	3	A	36 (914)	48 (1219)	13 (330)	410 (189)
	3	B	36 (914)	48 (1219)	13 (330)	430 (198)
150, 200, 225, SERIES 3ADUS/3NDUS Only	2	A	36 (914)	48 (1219)	13 (330)	400 (185)
	2	B	36 (914)	48 (1219)	13 (330)	408 (188)
	3	A	36 (914)	48 (1219)	13 (330)	408 (188)
	3	B	36 (914)	48 (1219)	13 (330)	420 (193)
250 ¹ , 400 ¹	2	A	42 (1067)	48 (1219)	15.5 (394)	420 (193)
	2	B	42 (1067)	48 (1219)	15.5 (394)	430 (198)
	3	A	42 (1067)	48 (1219)	15.5 (394)	430 (198)
	3	B	42 (1067)	48 (1219)	15.5 (394)	450 (207)
600 ¹	2	A	38 (965)	91 (2311)	28 (711)	860 (396)
	2	B	38 (965)	91 (2311)	28 (711)	870 (401)
	3	A	38 (965)	91 (2311)	28 (711)	870 (401)
	3	B	38 (965)	91 (2311)	28 (711)	880 (405)
800 ¹	2	A	38 (965)	91 (2311)	28 (711)	1460 (673)
	2	B	38 (965)	91 (2311)	28 (711)	1470 (677)
	3	A	38 (965)	91 (2311)	28 (711)	1470 (677)
	3	B	38 (965)	91 (2311)	28 (711)	1480 (682)
1000 ¹ , 1200 ¹	2	A	38 (965)	91 (2311)	48 (1218)	1460 (673)
	2	B	38 (965)	91 (2311)	48 (1218)	1470 (677)
	3	A	38 (965)	91 (2311)	48 (1218)	1470 (677)
	3	B	38 (965)	91 (2311)	48 (1218)	1480 (682)
1600 ¹ , 2000 ¹	3	A	38 (965)	91 (2311)	48 (1218)	1580 (727)
	3	B	38 (965)	91 (2311)	48 (1218)	1680 (773)
2500 ¹ , 3000 ¹	3	A	38 (965)	91 (2311)	72 (1829)	4590 (2110)
	3	B	38 (965)	91 (2311)	72 (1829)	4690 (2157)

Notes:

- Unit is designed for top and bottom cable entry for all services and load.
- Enclosures for 600 - 3000 amps are freestanding.
- A space heater accessory 44G is required with all service entrance (Type 3R) switches to help reduce

UL Type 3R Enclosure⁴

Switch Rating Amps	Phase Poles	Neutral Code	Dimensions, In. (mm)			Approx. Shipping Weight Lb. (kg)
			Width	Height	Depth	
70, 100, 150, 200, 225	2	A	36 (914)	48 (1219)	16 (406)	500 (232)
	2	B	36 (914)	48 (1219)	16 (406)	520 (241)
	3	A	36 (914)	48 (1219)	16 (406)	520 (241)
	3	B	36 (914)	48 (1219)	16 (406)	530 (246)
150, 200, 225, SERIES 3ADUS/3NDUS Only	2	A	41 (1041)	95.5 (2424)	33 (838)	500 (232)
	2	B	41 (1041)	95.5 (2424)	33 (838)	520 (241)
	3	A	41 (1041)	95.5 (2424)	33 (838)	520 (241)
	3	B	41 (1041)	95.5 (2424)	33 (838)	530 (246)
250 ¹ , 400 ¹	2	A	42 (1067)	48 (1219)	15.5 (394)	500 (232)
	2	B	42 (1067)	48 (1219)	15.5 (394)	520 (241)
	3	A	42 (1067)	48 (1219)	15.5 (394)	520 (241)
	3	B	42 (1067)	48 (1219)	15.5 (394)	530 (246)
600 ¹	2	A	38 (965)	91 (2311)	28 (711)	1200 (555)
	2	B	38 (965)	91 (2311)	28 (711)	1220 (564)
	3	A	38 (965)	91 (2311)	28 (711)	1220 (564)
	3	B	38 (965)	91 (2311)	28 (711)	1240 (574)
800 ¹	2	A	38 (965)	91 (2311)	28 (711)	1520 (703)
	2	B	38 (965)	91 (2311)	28 (711)	1540 (712)
	3	A	38 (965)	91 (2311)	28 (711)	1540 (712)
	3	B	38 (965)	91 (2311)	28 (711)	1580 (731)
1000 ¹ , 1200 ¹	2	A	38 (965)	91 (2311)	48 (1218)	1520 (703)
	2	B	38 (965)	91 (2311)	48 (1218)	1540 (712)
	3	A	38 (965)	91 (2311)	48 (1218)	1540 (712)
	3	B	38 (965)	91 (2311)	48 (1218)	1580 (731)
1600 ¹ , 2000 ¹	3	A	38 (965)	91 (2311)	48 (1218)	2200 (1018)
	3	B	38 (965)	91 (2311)	48 (1218)	2240 (1036)
2500 ¹ , 3000 ¹	3	A	38 (965)	91 (2311)	72 (1829)	5280 (2479)
	3	B	38 (965)	91 (2311)	72 (1829)	5380 (2475)

condensation and protect the circuit breaker. It is recommended when environmental enclosures (Type 4, 12) are ordered for installation outdoors. See Optional Accessories page for space heater options (acc. 44G).

4. Dimensional data is approximate and subject to change. Certified dimensions available upon request.

Extended Warranties for SERIES 300SE Transfer Switches (3AUS/3NUS/3ADUS/3NDUS)

Description
1 Year Extension (Total of 3 Years)
2 Year Extension (Total of 4 Years)
3 Year Extension (Total of 5 Years)

Notes:

- Standard warranty is (24) months, 2 years from date of shipment, extended warranty is in addition to the two years, for a total of 3, 4 or 5 years, except where the warranty period for the circuit breaker shall be limited to 24 months from date of shipment from ASCO.
- Refer to Publication 3223 for warranty terms and conditions.

SERIES 300SE AIC Breaker Rating¹

Switch Rating	AIC Rating (KA)	Voltage
70, 100, 150, 200, 225	25,000	480
150, 200, 225 SERIES 3ADUS/3NDUS Only	35,000	480
250, 400, 600	35,000	480
800	65,000	480
1000, 1200	50,000	480
1600, 2000	65,000	480
2500, 3000	100,000	480

Notes: 1. Refer to SERIES 300 Publication 1195 for switch ratings.

ASCO UL1008 Withstand and Closing Ratings^{1,2,7}
(RMS Symmetrical Amps)

Frame	Switch Rating (Amps)		300, 4000 & 7000 Series				4000 & 7000 Series				7000 Series									
	Transfer Switches	Bypass Switches	Current Limiting Fuses				Specific Breaker			Time Based			Short Time Ratings ³ (sec)							
			480V Max.	600V Max.	Max Size, A	Class	240V Max.	480V Max.	600V Max.	Time (sec)	240V Max.	480V Max.	600V Max.	.13	.2	.3	.5	.1	.13	.3
D	30	-	100kA	-	300	J	22kA	22kA	10kA	0.025	10kA	10kA	10kA	-						
			200kA	35kA	200	J								-						
			35kA	35kA	200	RK1								-						
D	70, 100	-	35kA	35kA	200	RK1	42kA	25kA	10kA	0.025	10kA	10kA	10kA	-						
			200kA	35kA	200	J								-						
D	150	-	35kA	35kA	200	RK1	65kA	25kA	10kA	0.025	10kA	10kA	10kA	-						
			200kA	35kA	200	J								-						
D	200	-	200kA	-	200	J	65kA	25kA	-	0.025	10kA	10kA	-	-						
D	230	-	100kA	-	300	J	65kA	25kA	-	0.025	10kA	10kA	-	-						
E	260, 400	-	200kA	-	600	J	65kA	42kA	35kA	0.05	35kA	35kA	22kA	-						
J	150, 200, 260, 400	150, 200, 230, 260, 400	200kA	200kA	600	J	65kA	50kA	42kA	0.05	65kA	42kA ⁵	35kA	7.5kA	-					
			200kA	200kA	800	L								-						
J	600	600	200kA	200kA	800	L	65kA	50kA	42kA	0.05	65kA	42kA ⁵	35kA	7.5kA ⁹	-					
			200kA	200kA	600	J								-						
H ⁸	600	600	200kA	200kA	1600	L	65kA	65kA	65kA	0.05	50kA	50kA	50kA	36kA						
P ⁸	600	600	200kA	200kA	1600	L	65kA	65kA	65kA	0.05	50kA	50kA	50kA	36kA						
P ⁸	800	800 - 1200	200kA	200kA	1600	L	65kA	65kA	65kA	0.05	50kA	50kA	50kA	36kA						
H	800 - 1200	800 - 1200	200kA	200kA	1600 ⁴	L	65kA	65kA	65kA	0.05	50kA	50kA	50kA	36kA						
Q ⁸	600-1600	600-1600	200kA	200kA	2000	L	65kA	65kA	65kA	0.05	65kA	65kA	65kA	50kA						
S ⁸	800 - 1200	800 - 1200	200kA	200kA	2500	L	100kA	100kA	65kA	0.05	100kA	100kA	65kA	65kA						
G ⁸	1000 - 1200	1000 - 1200	200kA	200kA	2000	L	85kA	85kA	85kA	0.05	85kA	85kA	85kA	-						
G	1600 - 2000 (Front Connected TS Only)	200kA	200kA	2500	L	85kA	85kA	85kA	0.05	85kA	85kA	85kA	-							
G ⁸	1600 - 2000	1600 - 2000	200kA	200kA	2500	L	125kA ⁶	125kA ⁶	100kA	0.05	100kA	100kA	100kA	42kA						
G ⁸	1600 - 2000	1600 - 2000	200kA	200kA	2500	L	100kA	100kA	85kA	0.05	100kA	100kA	85kA	42kA						
G	2600 - 3000	2600 - 3000	200kA	200kA	4000	L	100kA	100kA	100kA	0.05	100kA	100kA	100kA	42kA						
G ⁸	3200	-	200kA	-	4000	L	100kA	100kA	-	0.05	100kA	100kA	-	-						
G	4000	4000	200kA	200kA	5000	L	125kA	125kA	125kA	0.05	125kA	125kA	125kA	85kA						
U ⁸	2600 - 4000	2600 - 4000	200kA	200kA	5000	L	100kA						100kA							

Notes:

- 1) All WCR values indicated are tested in accordance with the requirements of UL 1008, 7th Edition. See ASCO Pub. 1128 for more WCR information
- 2) Application requirements may permit higher WCR for certain switch sizes.
- 3) Short Time ratings are provided for applications involving circuit breakers that utilize trip delay settings for system selective coordination
- 4) Max fuse rating is 1200A on front connected H frame switches
- 5) Switches utilizing overlapping neutral (code "C") have 35kA, 0.050 Sec time based rating at 480V Max
- 6) Rating shown is for Bypass switches only, Transfer Switch rating is 100kA
- 7) See ASCO for Service Entrance Switch ratings
- 8) These frames are only available on the 7000 Series product
- 9) Short Time Rating applies to 600A Bypass switch only, the 600A Transfer Switch does not have a Short Time Rating

TERMS AND CONDITIONS OF SALE

ASCO Power Technologies, L.P. is herein referred to as the "Seller" and the customer or person or entity purchasing goods and/or services ("Goods") and/or licensing software and/or firmware, which are preloaded, or to be used with Goods ("Software") from Seller is referred to as the "Buyer." These Terms and Conditions, any price list or schedule, quotation, acknowledgement, Seller's scope of work, or invoice from Seller relevant to the sale of the Goods and licensing of Software and all documents incorporated by specific reference herein or therein, constitute the complete and exclusive statement of the terms of the agreement governing the sale of Goods and/or license of Software by Seller to Buyer. Seller's acceptance of Buyer's purchase order is expressly conditional on Buyer's assent to all of Seller's terms and conditions of sale, including terms and conditions that are different from or additional to the terms and conditions of Buyer's purchase order. Buyer's acceptance of the Goods and/or Software will manifest Buyer's assent to these Terms and Conditions. Seller reserves the right in its sole discretion to refuse orders.

1. PRICES: Unless otherwise specified in writing by Seller, the price quoted or specified by Seller for the Goods and/or Software shall remain in effect for thirty (30) days after the date of Seller's quotation provided an unconditional authorization from Buyer for the shipment of the Goods and/or Software is received and accepted by Seller within such time period. If such authorization is not received by Seller within such thirty (30) day period, Seller shall have the right to change the price for the Goods and/or Software at the time of shipment. All prices and licensee fees are exclusive of taxes, transportation and insurance, which are to be borne by Buyer.

2. TAXES: Any current or future tax or governmental charge (or increase in same) affecting Seller's costs of production, sale, or delivery or shipment, or which Seller is otherwise required to pay or collect in connection with the sale, purchase, delivery, storage, processing, use or consumption of Goods and/or Software, shall be for Buyer's account and shall be added to the price or bill of lading to Buyer separately, at Seller's election..

3. TERMS OF PAYMENT: Unless otherwise specified by Seller, terms are net thirty (30) days from date of Seller's invoice in U.S. currency. Seller shall have the right, among other remedies, either to terminate this agreement or to suspend further performance under this and/or other agreements with Buyer in the event Buyer fails to make any payment when due, which other agreements Buyer and Seller hereby amend accordingly. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts. If any payment owed to Seller is not paid when due, it shall bear interest, at a rate to be determined by Seller, which shall not exceed the maximum rate permitted by law, from the date on which it is due until it is paid. Should Buyer's financial responsibility become unsatisfactory to Seller, cash payments or security satisfactory to Seller may be required by Seller for future deliveries of Goods and/or Software. If such cash payment or security is not provided, in addition to Seller's other rights and remedies, Seller may discontinue deliveries. Buyer hereby grants Seller a security interest in all Goods and/or Software sold to Buyer by Seller, which security interest shall continue until all such Goods and/or Software are fully paid for, and Buyer, upon Seller's demand, will execute and deliver to Seller such instruments as Seller requests to protect and perfect such security interest.

4. SHIPMENT AND DELIVERY: While Seller will use all reasonable commercial efforts to maintain the delivery date(s) and/or performance dates acknowledged or quoted by Seller, all shipping dates and/or performance dates are approximate and not guaranteed. Seller reserves the right to make partial shipments. Seller, at its option, shall not be bound to tender delivery of any Goods, Parts, and/or Software for which Buyer has not provided shipping instructions and other required information. If the shipment of the Goods, Parts, and/or Software is postponed or delayed by Buyer for any reason, Buyer agrees to reimburse Seller for any and all storage costs and other additional expenses resulting therefrom. For sales in which Buyer's ship to address for the Goods, Parts, and/or Software is outside of the United States, risk of loss and legal title to the Goods, Parts, and/or Software shall transfer to Buyer immediately after the Goods, Parts, and/or Software have passed beyond the territorial limits of the United States. In all other instances risk of loss and legal title to the Goods, Parts, and/or Software shall transfer from Seller to Buyer immediately upon shipment from the FCA Seller's Shipping Point. All shipments of Goods, Parts, and/or Software are made on a Free Carrier (FCA) Seller's Shipping Point basis, per Incoterms 2010, with Buyer responsible for all official export formalities, authorizations, risks and expenses as may be applicable for export from the country of shipment. Any claims for shortages or damages suffered in transit are the responsibility of Buyer and shall be submitted by Buyer directly to the carrier. Shortages or damages must be identified and signed for at the time of delivery.

5. LIMITED WARRANTY: Subject to the limitations of Section 6, Seller's standard warranty that is applicable to the Goods and/or Software at the time of purchase is the only warranty applicable to the sale of Seller's Goods and/or Software and its terms, conditions and limitations are incorporated by reference herein. **THE WARRANTY SET FORTH IN THIS SECTION 5 AND THE WARRANTY SET FORTH IN SECTION 7 ARE THE SOLE AND EXCLUSIVE WARRANTIES GIVEN BY SELLER WITH RESPECT TO THE GOODS AND/OR SOFTWARE AND ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHETHER OR NOT THE PURPOSE OR USE HAS BEEN DISCLOSED TO SELLER IN SPECIFICATIONS, DRAWINGS OR OTHERWISE, AND WHETHER OR NOT SELLER'S PRODUCTS ARE SPECIFICALLY DESIGNED AND/OR MANUFACTURED BY SELLER FOR BUYER'S USE OR PURPOSE.**

SELLER'S WARRANTY EXTENDS ONLY TO PURCHASERS WHO BUY FOR INDUSTRIAL OR COMMERCIAL USE. This warranty does not extend to any losses or damages due to misuse, accident, abuse, neglect, normal wear and tear, negligence (other than Seller's), unauthorized modification or alteration, use beyond rated capacity, unsuitable power sources or environmental conditions, improper installation, repair, handling, maintenance or application or any other cause not the fault of Seller. To the extent that Buyer or its agents have supplied specifications, information, representation of operating conditions or other data to Seller in the selection or design of the Goods and/or Software and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein that are affected by such conditions shall be null and void.

Buyer assumes all other responsibility for any loss, damage, or injury to persons or property arising out of, connected with, or resulting from the use of Goods and/or Software, either alone or in combination with other products/components.

6. LIMITATION OF REMEDY AND LIABILITY: THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER (OTHER THAN THE WARRANTY PROVIDED UNDER SECTION 5) SHALL BE LIMITED TO REPAIR, CORRECTION OR REPLACEMENT, OR REFUND OF THE PURCHASE PRICE UNDER SECTION 5.

SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE AND THE REMEDIES OF BUYER SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE PAID BY BUYER FOR THE SPECIFIC GOODS AND/OR SOFTWARE PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION.

BUYER AGREES THAT SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS SHALL NOT EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, business interruption, loss of use, revenue, reputation and data, costs incurred, including without limitation, for capital, fuel, power and loss or damage to property or equipment.

Buyer expressly acknowledges and agrees that Seller has set its prices and entered into this Agreement in reliance upon the limitations of liability, insurance and other terms and conditions specified herein, which allocate the risk between Seller and Buyer and form a basis of this bargain between the parties.

It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods and/or Software is given without charge, and Seller assumes no obligation or liability for the advice given, or results obtained, all such advice being given and accepted at Buyer's risk.

7. PATENTS AND COPYRIGHTS: Subject to the limitations of the second paragraph of Section 6, Seller warrants that the Goods and/or Software sold, except as are made specifically for Buyer according to Buyer's specifications, do not infringe any valid U.S. patent or copyright in existence as of the date of shipment. This warranty is given upon the condition that Buyer promptly notify Seller of any claim or suit involving Buyer in which such infringement is alleged and cooperate fully with Seller and permit Seller to control completely the defense, settlement or compromise of any such allegation of infringement. Seller's warranty as to utility patents only applies to infringement arising solely out of the inherent operation according to Seller's specifications and instructions of such Goods and/or Software. In the event (i) such Goods and/or Software are held to infringe such a U.S. patent or copyright in such suit, and the use of such Goods and/or Software is enjoined, or (ii) a compromise or settlement is made by Seller, Seller shall have the right, at its option and expense, to procure for Buyer the right to continue using such Goods and/or Software, or replace them with non-infringing Goods and/or Software, or modify same to become non-infringing, or grant Buyer a credit for the depreciated value of such Goods and/or Software and accept return of them. In the event of the foregoing, Seller may also, at its option, cancel the agreement as to future deliveries of such Goods and/or Software, without liability.

8. INSURANCE: Seller shall maintain the following insurance or self-insurance coverage: **Worker's Compensation** in accordance with the statutory requirements of the state in which work is performed. **Employer's Liability** with a limit of liability of \$2,000,000 per occurrence for bodily injury by accident or bodily injury by disease. **Commercial General Liability (CGL)** for bodily injury and property damage with a limit of \$2,000,000 per occurrence and aggregate. CGL includes Contractual Liability. CGL does not include Products and Completed Operations coverage, which is self-insured. **Automobile Liability** insurance that covers usage of all owned, non-owned and leased vehicles and which is subject to a combined single limit per occurrence of \$2,000,000. Automobile Liability insurance includes Contractual Liability and Cross Liability, but not special endorsements. Additional information related to the insurance coverage provided by Seller can be found at <http://www.marsh.com/moi?client=0900>.

9. EXCUSE OF PERFORMANCE: Seller shall not be liable for delays in performance or for non-performance due to acts of God; acts of Buyer; war; epidemic; fire; flood; weather; sabotage; strikes or labor disputes; civil disturbances or riots; governmental requests, restrictions, allocations, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or any events or causes beyond Seller's reasonable control. Deliveries or other performance may be suspended for an appropriate period of time or canceled by Seller upon notice to Buyer in the event of any of the foregoing, but the balance of the agreement shall otherwise remain unaffected as a result of the foregoing. If Seller determines that its ability to supply the total demand for the Goods and/or Software, or to obtain material used directly or indirectly in the manufacture of the Goods and/or Software, is hindered, limited or made impracticable due to causes set forth in the preceding paragraph, Seller may allocate its available supply of the Goods, Software, and/or such material (without obligation to acquire other supplies of any such Goods, Software, or material) among its purchasers on such basis as Seller determines to be equitable without liability for any failure of performance which may result therefrom.

10. CANCELLATION/CHANGES: Buyer may cancel orders only upon reasonable advance written notice and upon payment to Seller of Seller's cancellation charges which include, among other things, all costs and expenses incurred, and, to cover commitments made, by the Seller and a reasonable profit thereon. Seller's determination of such cancellation charge shall be conclusive. Buyer may request changes or additions to the Goods and/or Software consistent with Seller's specifications and criteria. In the event such changes or additions are accepted by Seller, Seller may revise the price, license fees, and dates of delivery and/or performance dates. Seller reserves the right to change designs and specifications for the Goods and/or Software without prior notice to Buyer, except with respect to Goods and/or Software being made-to-order for Buyer. Seller shall have no obligation to install or make such change in any Goods and/or Software manufactured prior to the date of such change.

11. NUCLEAR/MEDICAL: GOODS AND SOFTWARE SOLD HEREUNDER ARE NOT FOR USE IN THE CONTROL AREA OR ANY REACTOR CONNECTED OR SAFETY APPLICATIONS OR WITHIN THE CONTAINMENT AREA OF A NUCLEAR FACILITY OR FOR INTEGRATION INTO MEDICAL DEVICES. Buyer accepts Goods and Software with the foregoing understanding, agrees to communicate the same in writing to any subsequent purchasers or users and to defend, indemnify and hold harmless Seller from any claims, losses, suits, judgments and damages, including incidental and consequential damages, arising from such use, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability.

12. SOFTWARE: Notwithstanding any other provision herein to the contrary, Seller or applicable third party licensor to Seller shall retain all rights of ownership and title in its respective Software, including without limitation all rights of ownership and title in and to its respective copies of such Software. Except as otherwise provided herein, Buyer is hereby granted a nonexclusive, non-transferable royalty free license to use the Software incorporated into the Goods solely for purposes of Buyer properly utilizing such Goods purchased from Seller. All other Software shall be furnished to, and used by, Buyer subject to Seller's (or the licensor's) applicable standard license agreement, the terms of which are incorporated herein by reference.

13. TOOLING: Tool, die, and pattern charges, if any, are in addition to the price of the Goods and are due and payable upon completion of the tooling. All such tools, dies and patterns shall be and remain the property of Seller. Charges for tools, dies, and patterns do not convey to Buyer, title, ownership interest in, or rights to possession or removal, or prevent their use by Seller for other purchasers, except as otherwise expressly provided by Seller and Buyer in writing with reference to this provision.

14. INSPECTION/TESTING/INSTALLATION: Buyer, at its option and expense, may observe the inspection and testing by Seller of the Goods and/or Software for compliance with Seller's standard test procedures prior to shipment, which inspection and testing shall be conducted at Seller's plant at such reasonable time as is specified by Seller. Any rejection of the Goods and/or Software must be made promptly by Buyer before shipment. Tests shall be deemed to be satisfactorily completed and the test fully met when the Goods and/or Software meet Seller's criteria for such procedures. If Buyer does not inspect the Goods and/or Software at Seller's plant as provided herein, Buyer shall have ten (10) days from (i) the date of delivery of goods and/or Software and (ii) from the date of completion of each portion of the services to inspect the Goods and/or Software, and in the event of any non-conformity, Buyer must give written notice to Seller within said period stating why the Goods and/or Software are not conforming. Failure by Buyer to give such notice constitutes unqualified acceptance of the Goods and/or Software. Buyer's sole remedy for non-conforming services shall be correct performance of services incorrectly performed by Seller. Buyer shall be responsible for receiving, inspecting, testing, storing, installing, starting up (unless included in Seller's proposal) and maintaining all Goods.

15. RETURNED GOODS: Advance written permission to return Goods and/or Software must be obtained from Seller in accordance with Seller's then current Return Material Authorization (RMA) procedures and a return authorization number issued. Such Goods and/or Software must be (i) current, unused Goods and/or Software, (ii) free of all liens, encumbrances, or other claims, and (iii) shipped, transportation prepaid, to Seller's specified location. Returns made without proper written permission will not be accepted by Seller. Seller reserves the right to inspect Goods and/or Software prior to authorizing return.

16. BILLABLE SERVICES: Additional charges will be billed to Buyer at Seller's then prevailing labor rates for any of the following: (a) any services not specified in Seller's quotation, Seller's order acknowledgement, or other documents referenced herein and therein; (b) any services performed at times other than Seller's normal service hours; (c) if reasonable site and/or equipment access is denied the Seller service representative; and (d) if it is necessary, due to local circumstances, to use union labor or hire an outside contractor, Seller service personnel will provide supervision only and the cost of such union or contract labor will be charged to Buyer.

17. DOCUMENTATION/BUYER SUPPLIED DATA: Seller shall provide Buyer with that data/documentation which is specifically identified in Seller's quotation. If additional copies of data/documentation are to be provided by Seller, it shall be provided to Buyer at Seller's applicable prices then in effect. Seller's prints and drawings (including without limitation, the underlying technology) furnished by Seller to Buyer in connection with this agreement are the property of Seller and Seller retains all rights, including without limitation, exclusive rights of use, licensing and sale. Possession of such prints or drawings does not convey to Buyer any rights or license, and Buyer shall return all copies (in whatever medium) of such prints or drawings to Seller immediately upon request therefor. To the extent that Seller has been provided by, or on behalf of, Buyer any specifications, description of operating conditions or other data and information in connection with the selection or design of the Goods and/or Software, and/or the provision of Services, and the actual operating conditions or other circumstances differ from those provided by Buyer and relied upon by Seller, any warranties or other provisions contained herein which are affected by such conditions shall be null and void.

18. EXPORT/IMPORT: Buyer agrees that all applicable import and export control laws, regulations, orders and requirements, including without limitation those of the United States, and the jurisdictions in which the Seller and Buyer are established or from which Goods, Software, and Services may be supplied, will apply to their receipt and use. In no event shall Buyer use, transfer, release, import, export, Goods or Software in violation of such applicable laws, regulations, orders or requirements.

19. GENERAL PROVISIONS: These terms and conditions supersede all other communications, negotiations and prior oral or written statements regarding the subject matter of these terms and conditions. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions shall be binding upon the Seller unless made in writing and signed on its behalf by a duly authorized representative of Seller. No conditions, usage of trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these terms and conditions shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification or additional terms shall be applicable to this agreement by Seller's receipt, acknowledgement, or acceptance of purchase orders, shipping instruction forms, or other documentation containing terms at variance with or in addition to those set forth herein. Any such modifications or additional terms are specifically rejected and deemed a material alteration hereof. If this document shall be deemed an acceptance of a prior offer by Buyer, such acceptance is expressly conditional upon Buyer's assent to any additional or different terms set forth herein. No waiver by either party with respect to any breach or default or of any right or remedy, and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressly written and signed by the party to be bound. All typographical or clerical errors made by Seller in any quotation, acknowledgment or publication are subject to correction. Buyer shall not assign its rights or delegate its duties hereunder or any interest herein without the prior written consent of Seller, and any such assignment, without such consent, shall be void.

The validity, performance, and all other matters relating to the interpretation and effect of this agreement shall be governed by the law of the state of New Jersey without regard to its conflict of laws principles. Buyer and Seller agree that the proper venue for all actions arising in connection herewith shall be only in New Jersey and the parties agree to submit to such jurisdiction. No action, regardless of form, arising out of transactions relating to this contract, may be brought by either party more than two (2) years after the cause of action has accrued. The U.N. Convention on Contracts for the International Sales of Goods shall not apply to this agreement. Buyer shall not solicit, directly or indirectly, or employ any employee of Seller during the period any Goods are being provided to Buyer and for a period of one (1) year after the last provision of Goods.

20. INDEMNITY: Each party shall indemnify and hold the other party harmless from loss, damage, liability or expense resulting from damage to personal property of a third party, or injuries, including death, to third parties to the extent caused by a negligent act or omission of the party providing indemnification or a party's subcontractors, agents or employees during performance of services hereunder. Such indemnification shall be reduced to the extent damage or injuries are attributable to others. The indemnifying party shall defend the other party in accordance with and to the extent of the above indemnification, provided that the indemnifying party is: (i) promptly notified by the other party, in writing, of any claims, demands or suits for such damages or injuries; (ii) given all reasonable information and assistance by the other party; (iii) given full control over any resulting negotiation, arbitration or litigation, including the right to choose counsel and settle claims, or the indemnifying party's obligations herein shall be deemed waived.

**RFQ#2018-035
Generator Install
Addendum No. 3**

1. Questions and Generator Specifications

*****IMPORTANT*****

*******Please sign and return with your bid package*******

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Sign Name:

Print Name:

Date: