



SUBMITTAL DATA

EMERGENCY GENERATOR AND RELATED EQUIPMENT

FOR INSTALLATION AT

**WGAN Radio
Portland, ME**

MCPS PROJECT NO: PS13-000160

REQUESTED BY

KBR / North American Government & Logistics

PROPOSED BY

**MILTON CAT POWER SYSTEMS
16 Pleasant Hill Rd
Scarborough, ME 04070**

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VERSION – S0

SUBMITTAL FOR: APPROVAL

SUBMITTAL BILL OF MATERIALS **CATERPILLAR GENERATOR SET** **AND ACCESSORIES**

WGAN Radio **Portland, ME**

Project Manager: Hans Christensen 207-991-3127

Salesman: Mike Gilbert 207-885-8044

1.0 Caterpillar D60-6 Packaged Engine/Generator Assembly

One (1) outdoor Caterpillar diesel generator set, model D80-6, rated 80kW / 100kVA, 278 full load amps standby power duty, 120/208 volt, 3 phase, 4 wire, 60 hertz, 0.8 power factor, supplied with all standard accessories, plus the following:

- Caterpillar model C4.4 diesel engine, EPA Emergency Stationary Emissions Certified, 4 cylinder configuration, 4.4 liter displacement
- UL2200 Packaged Generator Set
- ACERT Technology
- Base mounted radiator rated for 50 degree C ambient with air discharge adapter, coolant level sensor with alarm
- Dry type air cleaner with service indicator
- Cat ADEM electronic speed control governor, mounted
- Lube oil cooler
- Lube oil filter
- Jacket water heater
- SAE flywheel and housing
- Fuel oil cooler
- Flexible fuel lines
- Initial fill of engine lube-oil and 50/50 mix ethylene glycol/water solution
- Primary Fuel Filter with water separator
- Vibration damper and pulley guards
- Exhaust manifold and turbocharger guards

2.0 Generator Data

- Over sized Caterpillar 4 pole, synchronous, LC2034L frame standby power duty, 105 degree C temperature rise over 40 degree C ambient, Class H insulation
- 278 full load amps at 120/208 volts, 3 phase, 0.8 pf
- Caterpillar R448 voltage regulator, three phase voltage sensing, +- 1/2% regulation, volts per hertz response
- Factory tested in accordance with MIL-705B and NEMA MG1-22 standards
- PMG Excited Generator
- Alternator Strip Heater – (2) 125kW, 120VAC

3.0 Main Line Circuit Breaker

One (1) Generator Mainline Circuit Breaker, 400A, 100% Rated

- NEMA 1 enclosure, vibration isolated, mounted separately on base rails
- Bottom Conduit entry with stub up
- Integral trip unit for thermal and magnetic overload protection.
- UL listed mainline circuit breaker.
- 12VDC shunt Trip

4.0 Generator Mounted Control Panel

Generator mounted (Right Hand Facing) electronic modular control panel (**EMCP 4.2**) with the following instrumentation and controls:

- Environmentally sealed, salt spray resistant front face rated for IP22
- Digital 32- Bit Microprocessor Based System
- Graphical 33 x132 pixel display
- Generator Monitoring:
 - 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 optional CDVR)
- Generator Protection:
 - Generator phase sequence
 - Over/Under voltage (27/59)
 - Over/Under Frequency (81/U)
 - Reverse Power (kW) (32)
 - Overcurrent (50/51)
- Engine Monitoring:
 - Coolant Temperature
 - Oil Pressure
 - Engine Speed
 - Battery Voltage
 - Run hours
 - Crank attempt and successful start counter
- 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
- Controls:
 - Run/Auto/Stop Selector Switches
 - Speed and Voltage adjust
 - Emergency Stop Push Button
 - Engine cycle crank
- Inputs and Outputs:
 - Two dedicated digital inputs

- Six programmable digital inputs
- Six programmable form A dry contacts
- Two programmable form C dry contacts
- Two digital outputs
- Communications:
 - Primary and Accessory CAN data links
 - Modbus RTU (RS-485 Half duplex)

5.0 Starting System

- Quantity one (1) each Caterpillar oversize lead-acid battery, rated 880 cold cranking amps, 80 ampere hours, shipped installed on generator base, battery dry with acid added by Milton CAT at start up
- Battery charger dual rate automatic battery charger rated 10-ampere/12vdc output with charger high/low/malfunction alarm, mounted/wired inside weather enclosure.
- Battery heater (1), 80W, 120 volt, single phase, with thermostat controls, mounted/wired
- Engine coolant heater (1), 1000 watts, 120 volt, single phase, with thermostat controls, isolation valves, mounted/wired
- Battery charging alternator with Pulley/belt guards, mounted
- 12 VDC electric starting motor

6.0 Enclosure / Fuel System / Mounting

Enclosure

- Sound Attenuated Skin Tight Enclosure
- 14 Ga. Powder Coated Steel Construction
- Enclosure Color: White
- Stainless steel flexible exhaust with nuts/bolts/gaskets, installed within housing
- Critical grade silencer, installed within housing
- Exhaust outlet, rain shield, rain cap, installed

Fuel Base Day Tank

- UL 142 Base Tank Assembly
- 156 Usable Gallon
- 110% Rupture basin
- Conduit access stub up area
- Mechanical Level Gauge
- Low Fuel Level Alarm Switch
- High Fuel Level Alarm Switch
- Fuel In Rupture Basin Switch
- Mechanical Fill Port with overflow prevention valve and 5-gallon spill containment
- Supply and pick up tubes for engine connections
- Standard Vent Fittings
- 400 Series Pump Controller with single supply/single return pump float controls – Externally mounted.
- 2GPM, 1/3HP Supply Pump
- 4GPM, 1/3HP Return Pump

Mounting

- Linear vibration isolators, installed between engine-generator assembly and mounting base, seismic zone 4 rated.
- IBC Certification for Generator Set, Fuel Tank and Fuel Tank Controls.

7.0 Start-up & Testing

- Standard Caterpillar 0.8 PF package generator factory certified test report
- Standard Caterpillar factory test report
- A factory trained service technician will perform start-up and tests to meet intent of project specifications
- On site load bank test
- Site Load Transfer Test
- Owner Training

8.0 Documentation

Warranty

- Caterpillar standard two (2) year limited warranty coverage

Manuals

- Three (3) sets of operation/maintenance/parts manuals will be forwarded after shipment of generator set from Caterpillar

9.0 Project Notes

- All site rigging of equipment by others
- All off-loading of equipment at site by others
- Ship loose exhaust component installation by others
- All fuel by others
- Provide separate conduit for annunciator wiring and cables
- Must run AC and DC wiring separately

- ***Package Weight, including fuel tank and enclosure: 4*00 lbs***

10.0 System Drawings

Mechanical

- Generator Set Package Drawings
- Pad design information

Electrical

- Generator Set Electrical Schematics

Interconnects

- Fuel System Interconnect Drawings

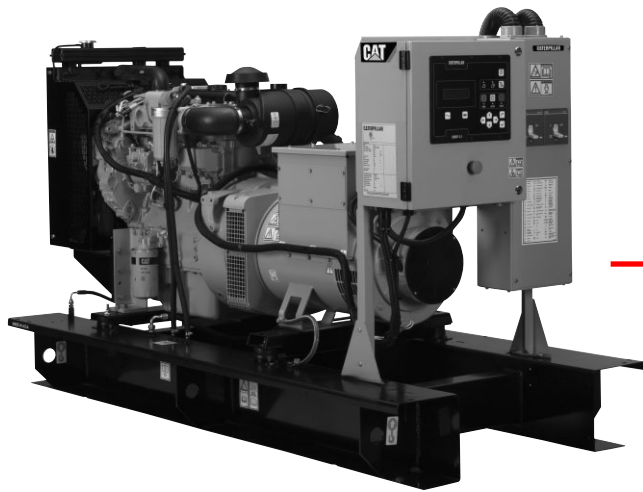


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Section 1
Packaged Engine / Generator Set



STANDBY **80-100 kW**
PRIME **72-90 kW**
60 Hz

Model	Standby kW (kVA)	Prime kW (kVA)
D80-6	80 (100)	72 (90)
D80-2S	80 (80)	72 (72)
D100-6	100 (125)	90 (112.5)
D100-6S	100 (100)	90 (90)

Tier 3 EPA Approved, Emissions Certified

FEATURES

GENERATOR SET

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

ENGINE

- Governor, electronic
- Electrical system, 12 VDC
- Cartridge type filters
- Battery rack and cables
- Coolant and lube drains piped to edge of base

GENERATOR

- Insulation system, class H
- Drip proof generator air intake (NEMA 2, IP23)
- Electrical design in accordance with BS5000 Part 99, EN61000-6, IEC60034-1, NEMA MG-1.33

CONTROL SYSTEM

- EMCP 3.1 digital control panel
- Vibration isolated NEMA 1 enclosure with lockable hinged door
- DC and AC wiring harnesses

MOUNTING ARRANGEMENT

- Heavy-duty fabricated steel base with lifting points
- Anti-vibration pads to ensure vibration isolation
- Complete OSHA guarding
- Stub-up pipe ready for connection to silencer pipework
- Flexible fuel lines to base with NPT connections

COOLING SYSTEM

- Radiator and cooling fan complete with protective guards
- Standard ambient temperatures up to 50° C (122° F)

CIRCUIT BREAKER

- UL/CSA listed
- 3-pole with solid neutral
- NEMA 1 steel enclosure, vibration isolated
- Electrical stub-up area directly below circuit breaker

AUTOMATIC VOLTAGE REGULATOR

- Voltage within ± 0.5% 3-phase and ± 1.0% single phase at steady state from no load to full load
- Provides fast recovery from transient load changes

EQUIPMENT FINISH

- All electroplated hardware
- Anticorrosive paint protection
- High gloss polyurethane paint for durability and scuff resistance

QUALITY STANDARDS

- BS4999, BS5000, BS5514, EN61000-6, IEC60034, NEMA MG-1.33, NFPA 110 (with optional equipment)

DOCUMENTATION

- Operation and maintenance manuals provided
- Wiring diagrams included

WARRANTY

- All equipment carries full manufacturer's warranty.

OPTIONAL EQUIPMENT*

ENCLOSURE

- B Series weather protective enclosure (includes internal silencer system)
 - Single point lift
 - Panel viewing window
 - External emergency stop pushbutton
- Sound attenuated enclosure (includes internal silencer system)

SILENCER SYSTEM – OPEN UNIT

- Level 1 silencer
- Level 2 silencer
- Level 3 silencer
- Mounting kit
- Through-wall installation kits

ENGINE

- Battery heater
- Lube oil drain pump
- High lube oil temperature shutdown
- Lube oil sump heater

CIRCUIT BREAKER

- Auxiliary voltfree contacts
- Shunt trip (100+ amp breakers)

GENERATOR

- Anti-condensation heater
- Permanent magnet generator
- AREP excitation system (3-Phase only)
- Generator upgrade 1 size (3-Phase only)

CONTROL SYSTEM

- No control system
- EMCP 3.2 digital control panel

MOUNTING ACCESSORIES

- Seismic (Zone 4) vibration isolators

FUEL SYSTEM

- UL listed closed top-diked skid-mounted fuel tank base (12/24-hour capacity) with fuel alarm (low level/leak detected)
- Critical high fuel alarm
- Critical low fuel level shutdown

COOLING SYSTEM

- Coolant heater
- Low coolant temperature alarm
- Low coolant level shutdown
- Radiator transition flange

REMOTE ANNUNCIATORS

- 16-channel remote annunciator panel (supplied loose)

MISCELLANEOUS ACCESSORIES

- Toolkit
- Additional operator's manual pack
- Special enclosure color
- UL listing
- CSA certification
- French or Spanish language labels

EXTENDED SERVICE CONTRACTS

- Extended Service Coverage available

TESTING

- Factory test and report at both 1.0 pf and 0.8 pf

* Some options may not be available on all models.
Not all options are listed.

SPECIFICATIONS
GENERATOR

Voltage regulation ± 0.5% 3-phase and ± 1.0% single phase at steady state from no load to full load

Frequency ± 0.25% for constant load, no load to full load

Waveform distortion THD < 4%, at no load

Radio interference Compliance with EN61000-6

Telephone interference TIF < 50, THF < 2%

Overspeed limit 2250 rpm

Insulation Class H

Temperature rise Within Class H limits

Available voltages 1-phase – 120/240, 115/230, 110/220
3-phase – 277/480, 266/460,
120/240, 127/220, 120/208, 347/600

Deration Consult factory for available outputs

Ratings At 30° C (86° F), 152.4 m (500 ft), 60% humidity, 1.0 pf (1-phase), 0.8 pf (3-phase)

ENGINE

Manufacturer Caterpillar

Type 4-cycle

Bore – mm (in) 105.0 (4.13)

Stroke – mm (in) 127.0 (5.00)

Governor Type Electronic

Class G2

Piston speed – m/sec (ft/sec) 7.62 (25.0)

Engine speed – rpm 1800

Air cleaner type Dry, replaceable paper element type with restriction indicator

RATING DEFINITIONS AND CONDITIONS

Standby – Applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The generator is peak rated (as defined in ISO8528-3).

D80-6, D80-2S – C4.4

Aspiration Turbocharged

Cylinder configuration In-line 4

Displacement – L (cu in) 4.4 (269)

Compression ratio 19.2:1

Max power at rated rpm – kW (hp)

Standby 97 (130)

Prime 88 (118)

BMEP – kPa (psi)

Standby 1476 (213)

Prime 1335 (194)

Regenerative power – kW (hp) 13.8 (18.5)

D100-6, D100-6S – C4.4

Aspiration Turbocharged

Cylinder configuration In-line 4

Displacement – L (cu in) 4.4 (269)

Compression ratio 19.2:1

Max power at rated rpm – kW (hp)

Standby 117 (156.9)

Prime 106 (142.1)

BMEP – kPa (psi)

Standby 1612 (233)

Prime 1771 (257)

Regenerative power – kW (hp) 13.8 (18.5)

CONTROL PANEL

- Heavy duty sheet steel enclosure with lockable hinged door
- Vibration isolated from generating set
- LCD display
- AC metering
- DC metering
- Fail to start shutdown
- Low oil pressure shutdown
- High engine temperature
- Low/high battery voltage
- Underspeed/overspeed
- Loss of engine speed detection
- 2 spare fault channels
- 20 event fault log
- 2 LED status indicators
- Lockdown emergency stop push button

Prime – Applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and the generator set can supply 10 percent overload power for 1 hour in 12 hours.

D80-6 (3-Phase)

Materials and specifications are subject to change without notice.

Generator Set Technical Data – 1800 rpm/60 Hz			Standby		Prime	
Power Rating	kW	kVA	80	100	72	90
Lubricating System						
Type: full pressure						
Oil filter: spin-on, full flow						
Oil cooler: watercooled						
Oil type required: API CH4						
Total oil capacity	L	U.S. gal	8	2.1	8	2.1
Oil pan	L	U.S. gal	7	1.9	7	1.9
Fuel System						
Generator set fuel consumption						
100% load	L/hr	gal/hr	24.7	6.5	22.7	6
75% load	L/hr	gal/hr	19.7	5.2	18.2	4.8
50% load	L/hr	gal/hr	14.6	3.9	13.5	3.6
Engine Electrical System						
Voltage/ground: 12/negative						
Battery charging generator ampere rating	amps		65		65	
Cooling System						
Water pump type: centrifugal						
Radiator system capacity incl. engine	L	U.S. gal	17.0	4.5	17.0	4.5
Maximum coolant static head	m H ₂ O	ft H ₂ O	10.2	33.5	10.2	33.5
Coolant flow rate	L/hr	U.S. gal/hr	10 140	2,679	10 140	2,679
Minimum temperature to engine	°C	°F	70	158	70	158
Temperature rise across engine	°C	°F	7	44.6	7	44.6
Heat rejected to coolant at rated power	kW	Btu/min	53.6	3,051	50.2	2,857
Total heat radiated to room at rated power	kW	Btu/min	15.9	905	9.3	529
Radiator fan load	kW	hp	4.8	6.4	4.8	6.4
Air Requirements						
Combustion air flow	m ³ /min	cfm	7.6	268	7.7	272
Maximum air cleaner restriction	kPa	in H ₂ O	8	32	8	32
Radiator cooling air (zero restriction)	m ³ /min	cfm	230	8,135	230	8,135
Generator cooling air	m ³ /min	cfm	26.4	933	26.4	933
Allowable air flow restriction (after radiator)	kPa	in H ₂ O	0.120	0.48	0.120	0.48
Cooling airflow (@ rated speed)						
Rate with restriction	m ³ /min	cfm	192	6,780	192	6,780
Exhaust System						
Maximum allowable backpressure	kPa	in/mercury	15	4.4	15	4.4
Exhaust flow at rated kW	m ³ /min	cfm	18.77	663	16	572
Exhaust temperature at rated kW – Dry exhaust	°C	°F	522	972	524	975
Generator Set Noise Rating* (without attenuation) at 1 m (3 ft)						
	dB(A)		97		97	

Generator Technical Data	277/480V	266/460V	127/220V	120/240V 120/208V	347/600V
Motor Starting Capability: (kVA) (30% voltage dip)					
Self excited	239	223	207	188	239
PM excited**	311	291	270	247	311
AREP excited	311	291	270	247	311
Full Load Efficiencies:					
Standby	91.7	91.6	91.4	90.9	91.7
Prime	91.9	91.8	91.7	91.3	91.8
Reactances (per unit):					
X _d	2.69	2.93	3.21	3.58	2.69
X' _d	0.09	0.10	0.11	0.12	0.09
Reactances shown are applicable to the standby rating.					
X'' _d	0.045	0.049	0.053	0.060	0.045
X _q	1.62	1.76	1.92	2.15	1.62
X'' _q	0.056	0.061	0.066	0.074	0.056
X ₂	0.051	0.056	0.061	0.068	0.051
X ₀	0.005	0.005	0.006	0.007	0.005
Time Constants:	t' _d 50 ms	t'' _d 5 ms	t' _{do} 1480 ms	t _a 8 ms	

* dB(A) levels are for guidance only

** With PMG Excited Option AVR12

Cat[®] ELC

Extended Life Coolant for Caterpillar and original equipment manufacturer (OEM)
diesel and gasoline engines

50/50 Premix



Recommended Use

Cat ELC meets or exceeds the requirements of the following specifications and guidelines:

- Cat EC-1
- TMC RP-329
- TMC RP-338
- ASTM D-3306
- ASTM D-6210
- SAE J1034

Cat ELC also meets the performance requirements of Cummins, Detroit Diesel, International, Mack and Volvo.

Discover the Difference

Cat ELC is developed, tested and approved by Caterpillar to meet the same high standards as all Genuine Cat Parts.

- **Factory-Fill**—Used as standard factory-fill for all Cat machine cooling systems.
- **Lower Maintenance Costs**—Reduces engine coolant and additive costs by as much as 500% compared to conventional coolants. It eliminates the need for supplemental coolant additives, extends coolant change-out intervals and reduces disposal requirements.
- **Advanced Metal Protection**—Incorporates an advanced formula technology with organic acid additive corrosion inhibitors, such as a combination of mono and dicarboxylates for maximum protection of copper, solder, brass, steel, cast iron and aluminum.

CATERPILLAR[®]

Cat ELC for Maximum Coolant Life


Cat DEAC™

 **3000 Hour Life or 333,000 km (200,000 miles)**
Cat Supplemental Coolant Additives Every 250 Hours or 25,000 km (15,000 miles)

Cat ELC (Machines and Commercial Engines)

 **12,000 Hour Life or 6 Years****
(whichever comes first)
Cat Extender Every 6000 Hours*

Cat ELC (Truck Engines)

 **1,000,000 km (600,000 miles) or 6 Years****
(whichever comes first)
Cat Extender Every 500,000 km (300,000 miles)*

* Or one-half of the coolant service life.

** These coolant change intervals are only possible with annual S-O-S Level 2 coolant sampling and analysis.

Typical Characteristics*

Color	Strawberry Red
Boiling protection with 15 psi (1 bar) radiator cap	
50% Cat ELC/50% water	129°C (265°F)
60% Cat ELC/40% water (ELC concentrate added)	132°C (270°F)
Freezing protection	
50% Cat ELC/50% water	-37°C (-34°F)
60% Cat ELC/40% water (ELC concentrate added)	-52°C (-62°F)
Nitrite (50% solution)	500 ppm
Molybdate (50% solution)	530 ppm

*The values shown are typical values and should not be used as quality control parameters to either accept or reject product. Specifications are subject to change without notice.

S-O-SSM services for early problem detection

Protect your investment with Cat S-O-S Coolant Analysis, the ultimate detection and diagnostic tool for your equipment. We recommend S-O-S Level 1 Coolant Analysis according to the engine's Operation and Maintenance Manual, and Level 2 Coolant Analysis annually for all your Cat equipment.

Cat ELC Extender for Longer Life

- Exceeds Cat EC-1 performance requirements
- Protects against cylinder liner/block pitting and cavitation erosion
- Should be added at 500,000 km (300,000 miles) for Cat powered on-highway trucks and 6,000 hours for commercial engines
- Extender is only necessary once during the life of the coolant
- Ensures Cat ELC performance to 1,000,000 km (600,000 miles) or 12,000 hours

Cat ELC Extender and Flush Intervals

Cat ELC Extender should be added after 6,000 hours or 300,000 miles (500,000 km) of operation, and the system should be drained and flushed with clean water after 12,000 hours or 600,000 miles (1,000,000 km). No cleaning agents are needed. If S-O-SSM Services are used regularly, safe operation with Cat ELC may extend beyond 12,000 hours.

Health and Safety

Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. Read and understand the Material Safety Data Sheet (MSDS) before using this product. For a copy of the MSDS, visit us on the web at www.catmsds.com.

CAT® DEALERS DEFINE WORLD-CLASS PRODUCT SUPPORT.

We offer you the right parts and service solutions, when and where you need them.

The Cat Dealer network of highly trained experts can help you maximize your equipment investment.



ATTACHMENTS



ULCERT UL 2200 LISTING

INCLUDES THE FOLLOWING:

ALTERNATOR

Alternator insulation system is UL Recognized (UL 1446). PMG and AREP alternators are available. Automatic voltage regulators are UL Recognized.

WIRE HARNESS

AC, DC, and power harnesses are made with UL Listed wire and UL Listed terminals.

CONTROL PANEL

Control panels are comprised of UL Listed and UL Recognized components. EMCP is UL Recognized.

CIRCUIT BREAKER

Output circuit breaker is 100% rated and UL Listed.

TESTING

All UL Listed sets are designed and rigorously tested in accordance with UL Standard for Safety, UL 2200.

LABELING

Labeling meets UL requirements.

MECHANICAL OPTIONS

Mechanical options do not require UL Listing and, therefore, are not affected. The exceptions to this are:

FUEL TANKS

If a fuel tank is ordered with the unit, it must be UL Listed. Two versions are available: 24 hour integral (FCUL2) and 24/48 hour sub-base (FSBT)

ENCLOSURES

Factory installed enclosures meet UL requirements. Weatherproof and sound attenuated versions are available.

ELECTRICAL OPTIONS

The table below shows electrical options that meet UL requirements:

EBH	Battery Heater
EOS	Lube Oil Sump Heater
WCA1	Low Coolant Level Shutdown
WSS1	Low Coolant Temperature Alarm
AH1H	Anti-Condensation Heater
WHH	Coolant Heater
GOVE5	Electronic Governor (Fully Adjustable)
FSS1	Critical Low Fuel Level Shutdown
FSS2	Low Fuel Level Alarm
FSS5	Critical High Fuel Alarm
PBC5UL	UL Listed Battery Charger
PBC10NU	NFPA Battery Charger, UL Listed

UL Listing is available on all diesel fuelled generator sets up to 175 kW at 60 Hz, 600 vac maximum.

Materials and specifications are subject to change without notice.

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Section 2
Generator Data

GENERATOR DATA

FEBRUARY 18, 2011

For Help Desk Phone Numbers [Click here](#)

Selected Model

Engine: C4.4 **Generator Frame:** LC2024L **Genset Rating (kW):** 80.0 **Line Voltage:** 208
Fuel: Diesel **Generator Arrangement:** 2739590 **Genset Rating (kVA):** 100.0 **Phase Voltage:** 120
Frequency: 60 **Excitation Type:** AREP **Pwr. Factor:** 0.8 **Rated Current:** 277.6
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 39458 /39268 /39521 /841

Spec Information

Generator Specification		Generator Efficiency			
Frame: LC2024L	Type: LC	No. of Bearings: 1	Per Unit Load	kW	Efficiency %
Winding Type: RANDOM WOUND	Flywheel: 11.5		0.25	20.0	90.2
Connection: PARALLEL STAR	Housing: 3		0.5	40.0	92.3
Phases: 3	No. of Leads: 12		0.75	60.0	91.9
Poles: 4	Wires per Lead: 1		1.0	80.0	90.9
Sync Speed: 1800	Generator Pitch: 0.6667				

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.0596	0.0258
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.0742	0.0321
TRANSIENT - SATURATED X'_d	0.1200	0.0519
SYNCHRONOUS - DIRECT AXIS X_d	3.5850	1.5510
SYNCHRONOUS - QUADRATURE AXIS X_q	2.1496	0.9300
NEGATIVE SEQUENCE X_2	0.0680	0.0294
ZERO SEQUENCE X_0	0.0065	0.0028

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	1.4800
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.0500
OPEN CIRCUIT SUBTRANSIENT - DIRECT AXIS T''_{d0}	0.0101
SHORT CIRCUIT SUBTRANSIENT - DIRECT AXIS T''_d	0.0050
OPEN CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T''_{q0}	0.1449
SHORT CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T''_q	0.0050
EXCITER TIME CONSTANT T_e	0.0420
ARMATURE SHORT CIRCUIT T_a	0.0080

Short Circuit Ratio: 0.29	Stator Resistance = 0.0258 Ohms	Field Resistance = 2.12 Ohms
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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:	3.13 Volts	Volts 16.92 Volts
Waveform deviation line - line, no load: less than	2.0%	Excitation current	0.68 Amps	Amps 3.03 Amps
Telephone influence factor: less than	50			

Selected Model

Engine: C4.4	Generator Frame: LC2024L	Genset Rating (kW): 80.0	Line Voltage: 208
Fuel: Diesel	Generator Arrangement: 2739590	Genset Rating (kVA): 100.0	Phase Voltage: 120
Frequency: 60	Excitation Type: AREP	Pwr. Factor: 0.8	Rated Current: 277.6
Duty: STANDBY	Connection: PARALLEL STAR	Application: EPG	Status: Current

Version: 39458 /39268 /39521 /841

Generator Mechanical Information

Center of Gravity		
Dimension X	-337.0 mm	-13.3 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 = 342 kg	* Rotor WT = 128 kg	* Stator WT = 215 kg
754 LB	282 LB	474 LB

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

Generator Torsional Data						
J1 = Coupling and Fan		J2 = Rotor			J3 = Exciter End	
TOTAL J = J1 + J2 + J3						
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
0.4 LB IN. s ²	5.2 MLB IN./rad	2.8 IN.	4.5 LB IN. s ²	6.2 MLB IN./rad	2.8 IN.	0.4 LB IN. s ²
0.042 N m s ²	0.588 MN m/rad	70.0 mm	0.503 N m s ²	0.7 MN m/rad	70.0 mm	0.05 N m s ²
Total J						
5.3 LB IN. s ²						
0.595 N m s ²						

Selected Model

Engine: C4.4 **Generator Frame:** LC2024L **Genset Rating (kW):** 80.0 **Line Voltage:** 208
Fuel: Diesel **Generator Arrangement:** 2739590 **Genset Rating (kVA):** 100.0 **Phase Voltage:** 120
Frequency: 60 **Excitation Type:** AREP **Pwr. Factor:** 0.8 **Rated Current:** 277.6
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 39458 /39268 /39521 /841

**Generator Cooling Requirements -
Temperature - Insulation Data**

Cooling Requirements:		Temperature Data: (Ambient 40 °C)	
Heat Dissipated: 8.0 kW		Stator Rise:	150.0 °C
Air Flow: 19.2 m ³ /min		Rotor Rise:	150.0 °C
Insulation Class: H			
Insulation Reg. as shipped: 100.0 MΩ minimum at 40 °C			

Thermal Limits of Generator

Frequency:	60 Hz
Line to Line Voltage:	208 Volts
B BR 80/40	76.0 kVA
F BR -105/40	86.0 kVA
H BR - 125/40	95.0 kVA
F PR - 130/40	95.0 kVA
H PR - 150/40	100.7 kVA
H PR27 - 163/27	104.5 kVA

Selected Model

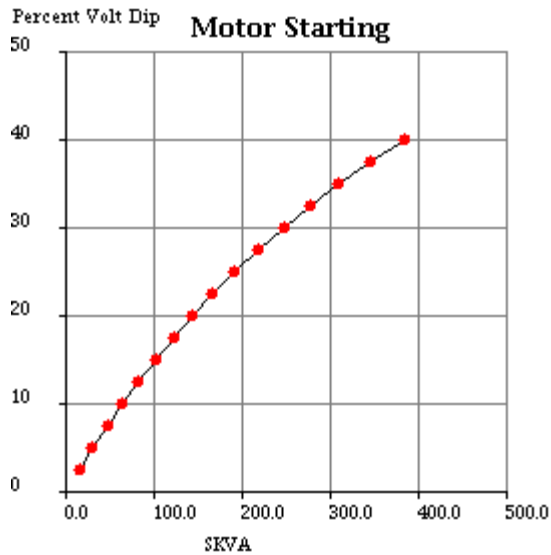
Engine: C4.4 **Generator Frame:** LC2024L **Genset Rating (kW):** 80.0 **Line Voltage:** 208
Fuel: Diesel **Generator Arrangement:** 2739590 **Genset Rating (kVA):** 100.0 **Phase Voltage:** 120
Frequency: 60 **Excitation Type:** AREP **Pwr. Factor:** 0.8 **Rated Current:** 277.6
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 39458 /39268 /39521 /841

Starting Capability & Current Decrement

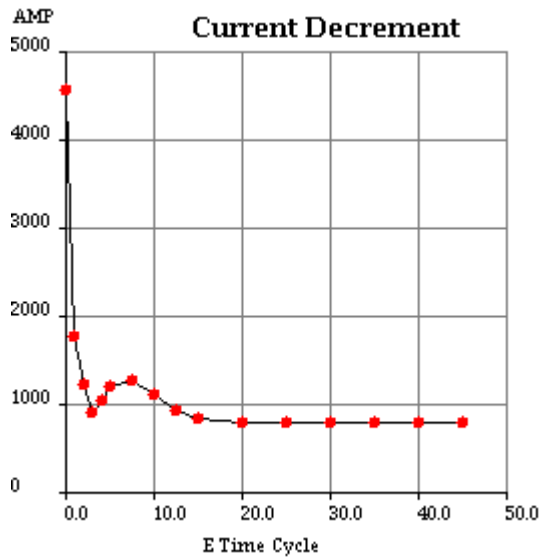
Motor Starting Capability (0.6 pf)

SKVA	Percent Volt Dip
15	2.5
30	5.0
47	7.5
64	10.0
82	12.5
102	15.0
122	17.5
144	20.0
167	22.5
192	25.0
218	27.5
247	30.0
277	32.5
310	35.0
345	37.5
384	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	4,570
1.0	1,765
2.0	1,231
3.0	903
4.0	1,056
5.0	1,199
7.5	1,282
10.0	1,114
12.5	941
15.0	848
20.0	793
25.0	788
30.0	789
35.0	790
40.0	791
45.0	791



Instantaneous 3 Phase Fault Current: 4570 Amps **Instantaneous Line - Line Fault Current:** 3700 Amps
Instantaneous Line - Neutral Fault Current: 6096 Amps

Selected Model

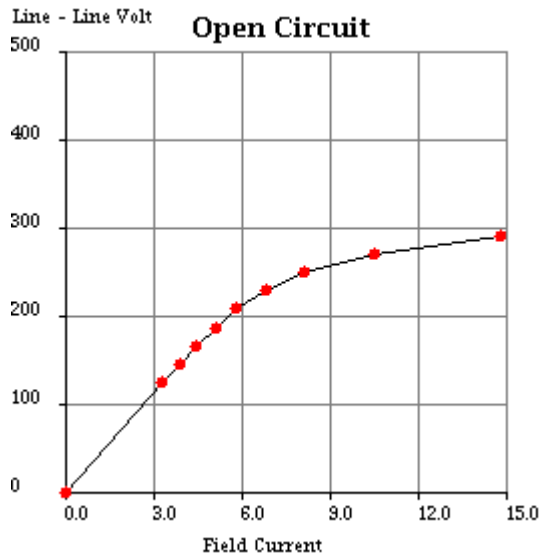
Engine: C4.4 **Generator Frame:** LC2024L **Genset Rating (kW):** 80.0 **Line Voltage:** 208
Fuel: Diesel **Generator Arrangement:** 2739590 **Genset Rating (kVA):** 100.0 **Phase Voltage:** 120
Frequency: 60 **Excitation Type:** AREP **Pwr. Factor:** 0.8 **Rated Current:** 277.6
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 39458 /39268 /39521 /841

Generator Output Characteristic Curves

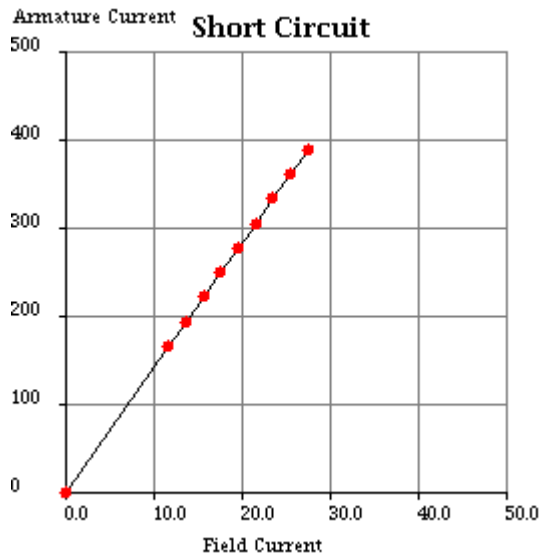
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
3.3	125
3.9	146
4.4	166
5.1	187
5.8	208
6.8	229
8.1	250
10.5	270
14.8	291



Short Circuit Curve

Field Current	Armature Current
0.0	0
11.7	167
13.7	194
15.7	222
17.6	250
19.6	278
21.5	305
23.5	333
25.4	361
27.4	389



Selected Model

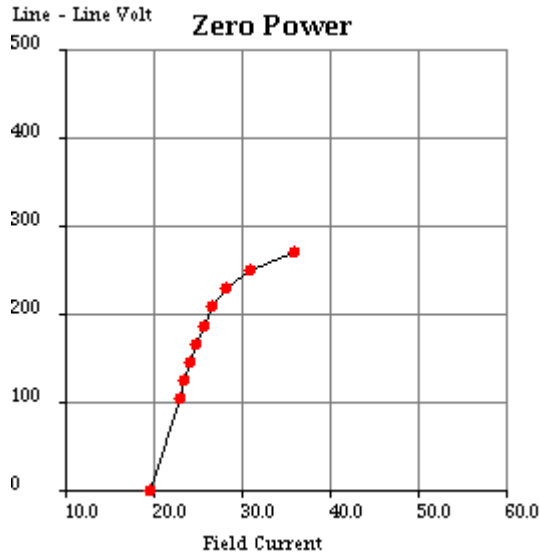
Engine: C4.4 **Generator Frame:** LC2024L **Genset Rating (kW):** 80.0 **Line Voltage:** 208
Fuel: Diesel **Generator Arrangement:** 2739590 **Genset Rating (kVA):** 100.0 **Phase Voltage:** 120
Frequency: 60 **Excitation Type:** AREP **Pwr. Factor:** 0.8 **Rated Current:** 277.6
Duty: STANDBY **Connection:** PARALLEL STAR **Application:** EPG **Status:** Current

Version: 39458 /39268 /39521 /841

Generator Output Characteristic Curves

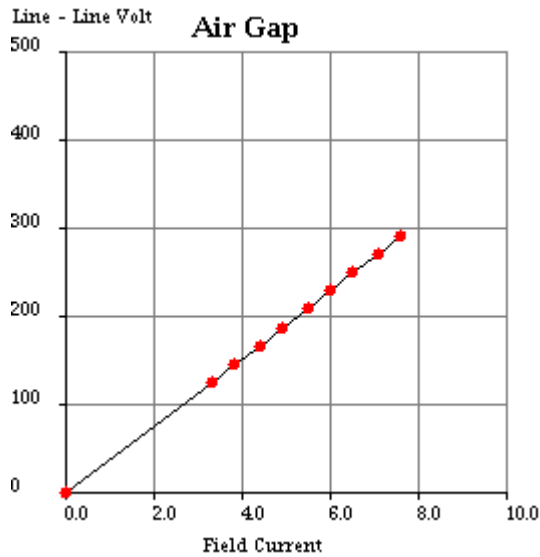
Zero Power Factor Curve

Field Current	Line - Line Volt
19.6	0
22.9	104
23.5	125
24.1	146
24.8	166
25.6	187
26.6	208
28.1	229
30.8	250
35.8	270

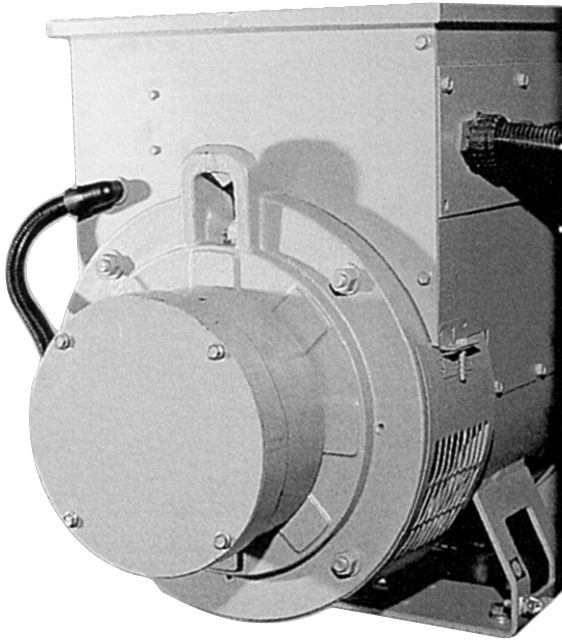


Air Gap Curve

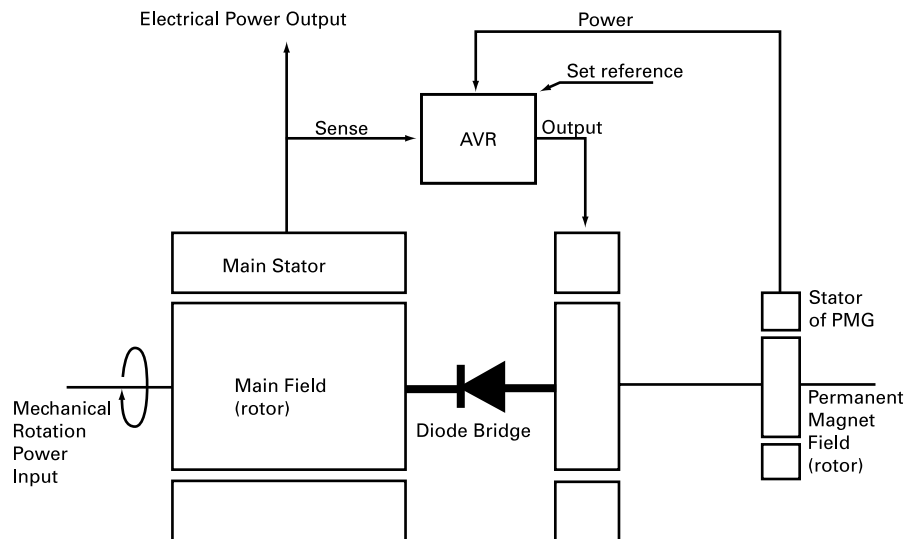
Field Current	Line - Line Volt
0.0	0
3.3	125
3.8	146
4.4	166
4.9	187
5.5	208
6.0	229
6.5	250
7.1	270
7.6	291



AVR12 – PERMANENT MAGNET GENERATOR

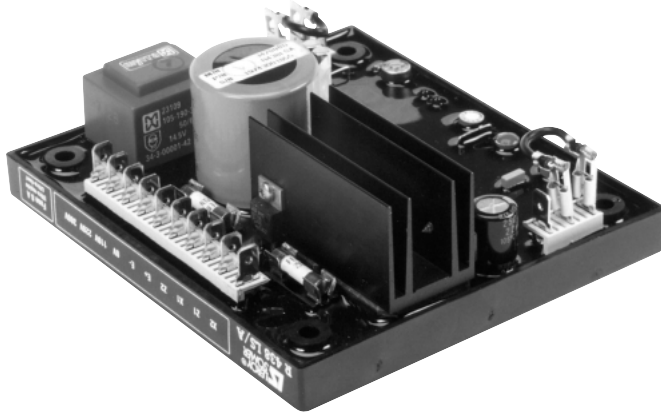


The permanent magnet generator (PMG) option upgrades the excitation system of the generator from the standard self-excited system to a separately-excited system. The PMG couples to the non-drive end of the generator and provides an independent source of excitation power that ensures initial voltage build-up. The PMG improves the voltage response of the generator during transient load application, such as motor starting, and provides a sustained short-circuit current for the operation of protective devices. Isolation of the excitation power ensures that regulation is not affected by non-linear distorting loads.



BLOCK DIAGRAM OF PMG

AUTOMATIC VOLTAGE REGULATOR – R438



The R438A Automatic Voltage Regulator (AVR) is an advanced electronic component that provides closed loop control of the generator output voltage. Used when the generator is configured with the AREP excitation system (Option **AVR14**) or the Permanent Magnet Generator (**PMG**) system (Option **AVR12**) on the following generators:

- 1000 Series Generators
- 2000 Series Generators
- 3000 Series Generators

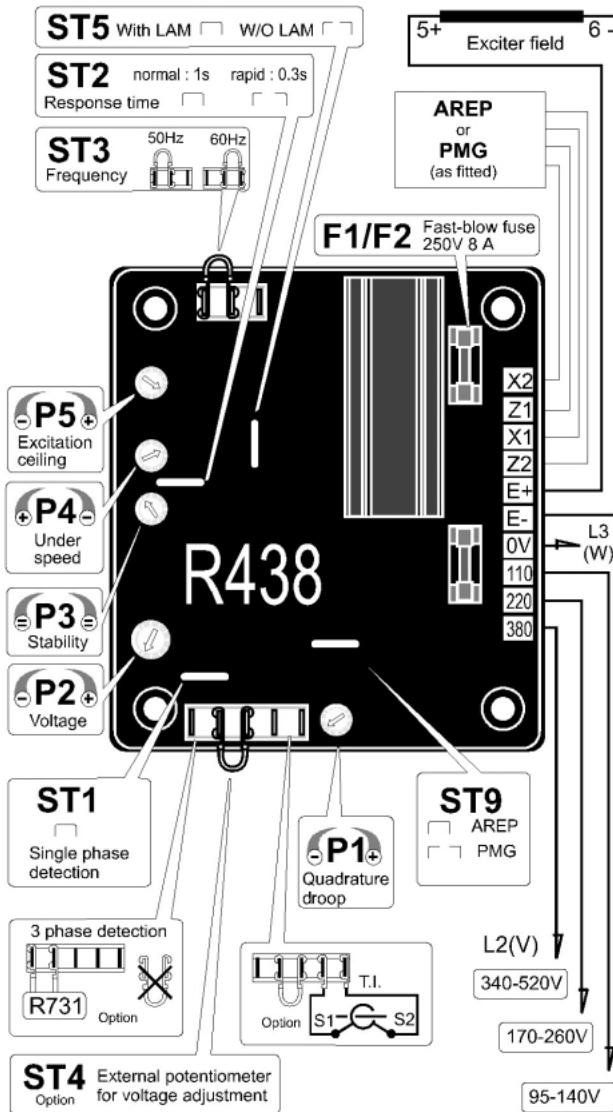
With the AREP excitation system the R438 AVR is powered by two auxiliary windings which are independent of the voltage detection circuit. With the PMG option the R438 AVR is powered by the PMG which is fitted at the rear of the generator.

SPECIFICATION:

- Voltage regulation $\pm 0.5\%$
- Short circuit capability: 300% of I-rated for 10 seconds when in AREP or PMG configuration
- Voltage sensing:
 - 95 to 140 volts (50/60 Hz) or
 - 170 to 260 volts (50/60 Hz) or
 - 340 to 520 volts (50/60 Hz)
- Response time:
 - Normal (1 sec) for $\pm 20\%$ voltage variation or
 - Rapid (0.3 sec) for $\pm 20\%$ voltage variation
- Capable of remote voltage adjustment: $\pm 5\%$

LOAD ADJUSTMENT MODULE (LAM):

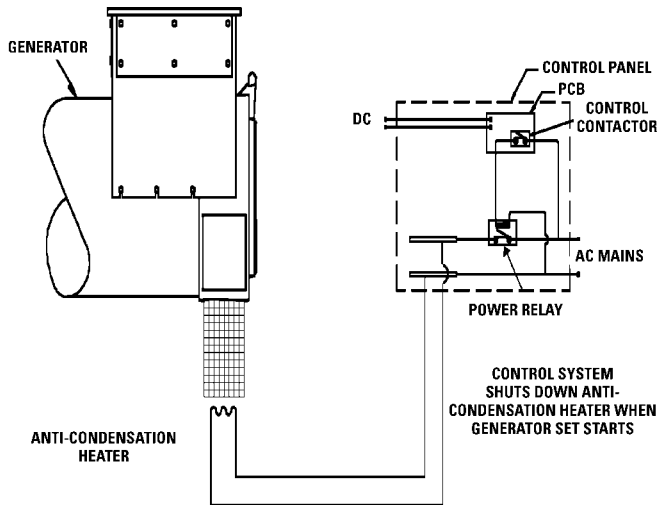
On load impact, the rotation speed of the generator set decreases. When it passes below the preset frequency threshold, the LAM is activated and causes the voltage to drop by approximately 15% and consequently the amount of active load applied is reduced by approximately 25% until the speed reaches it's rated value again.



ADJUSTMENT CAPABILITY:

- Potentiometer **P1** – Quadrature Droop Adjustment
- Potentiometer **P2** – Voltage Adjustment
- Potentiometer **P3** – Stability Adjustment
- Potentiometer **P4** – Underspeed/LAM Threshold Adjustment
- Potentiometer **P5** – Excitation ceiling
- Link **ST1** – Link IN for single phase voltage detection (standard)
- Link **ST2** – Link IN for Normal response time or CUT for Rapid response time
- Strap **ST3** – Strap between middle and left terminal for 50 Hz or between middle and right terminal for 60 Hz
- Strap **ST4** – Strap IN for no remote voltage adjustment or OUT and potentiometer (470Ω, 0.5W min., adjustment range ± 5%) connected to the terminals for remote voltage adjustment
- Link **ST5** – Link IN for LAM or CUT to disable LAM
- Link **ST9** – Link IN for AREP or CUT for PMG

GENERATOR ANTI-CONDENSATION HEATER AH1H



Appropriate when the generator set is to be sited in a low ambient and/or high humidity environment, the heater maintains the AC generator at a suitable temperature to prevent winding corrosion due to condensation.

The heater itself is powered by a 110/120 volt (VAC 120) or 208/240 volt (VAC 240) AC auxiliary supply protected by a fuse inside the main control panel. When the generator set is not running the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed and the engine has stopped.

Section 3
Main Line Circuit Breaker

T5

400/600A, 600V Δ

Electronic and thermal magnetic



T5

Dimensions 3P Fixed Version 8.07H x 5.51W x 4.07D
Weight 8.55 (lbs)

General

The T5 breaker is a 400/600 amp frame with either a microprocessor based over current protective trip system or a thermal magnetic trip unit. ③

Standards

The UL489/CSA 22.2 version of T5 also carries an IEC-60947-2 rating.

Versions

To meet all application requirements, the T5 is available in the following versions:

- T = Thermal-magnetic
- B = Selectable & adjustable LI or LS
- C = Adjustable LSI
- E = Adjustable LSI^G
- D = Molded Case Switch
- E5 = Electronic instantaneous only (MCP)

Trip functions

These trip functions are available:

- L = Long time
- S = Short time
- I = Instantaneous
- G = Ground fault

Performance levels

Each version is also available in different maximum fault interrupting levels:

- N = Normal
- S = Standard
- H = High - UL Current Limiting
- L = Extra high
- V = Very high - UL Current Limiting

Number of poles ④

The T5 is available in two, three and four pole versions. Estimate 4 pole pricing by adding 35% to the 3 pole price and contact your ABB sales person for details.

UL489 / CSA C22.2 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
240VAC	65	100	150	200	200
480VAC	25	35	65	100	150
600VAC	18	25	35	65	100
500VDC ①	25	35	50	65	100
600VDC ②	16	25	35	50	65

IEC 60947-2 Interrupting capacity (kA RMS)

Voltage	N	S	H	L	V
230VAC	70	85	100	200	200
415VAC	36	50	70	120	200
690VAC	20	25	40	70	80
750VDC	16	25	36	50	70

① 2 poles in series.

② 3 poles in series.

③ T5 600A not available with thermal magnetic trip unit.

④ 2 pole available in N version only. 4 pole available in N and H version only.

T5

400/600A, 600V Δ, 100% Rated ①

Electronic (AC only)

300A Frame – 100% rated, electronic trip units (AC only)

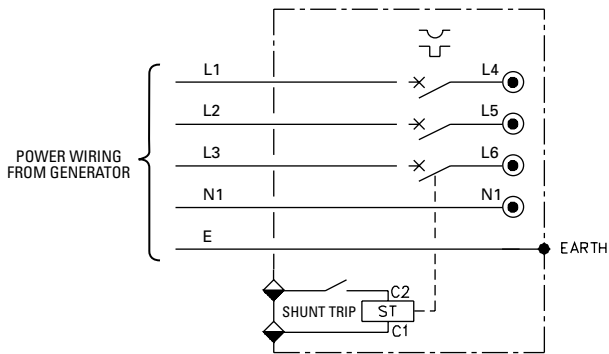
Breaker	IC at 480VAC kA	Trip Unit	3 pole, 600V catalog number
T5N	25	PR221 LS/I PR222 LSI PR222 LSIG	T5NQ300BW T5NQ300CW T5NQ300EW
T5S	35	PR221 LS/I PR222 LSI PR222 LSIG	T5SQ300BW T5SQ300CW T5SQ300EW
T5H UL Current limiting	65	PR221 LS/I PR222 LSI PR222 LSIG	T5HQ300BW T5HQ300CW T5HQ300EW
T5L	100	PR221 LS/I PR222 LSI PR222 LSIG	T5LQ300BW T5LQ300CW T5LQ300EW
T5V UL Current limiting	150	PR221 LS/I PR222 LSI PR222 LSIG	T5VQ300BW T5VQ300CW T5VQ300EW

400A Frame – 100% rated, electronic trip units (AC only)

Breaker	IC at 480VAC kA	Trip Unit	3 pole, 600V catalog number
T5N	25	PR221 LS/I PR222 LSI PR222 LSIG	T5NQ400BW T5NQ400CW T5NQ400EW
T5S	35	PR221 LS/I PR222 LSI PR222 LSIG	T5SQ400BW T5SQ400CW T5SQ400EW
T5H UL Current limiting	65	PR221 LS/I PR222 LSI PR222 LSIG	T5HQ400BW T5HQ400CW T5HQ400EW
T5L	100	PR221 LS/I PR222 LSI PR222 LSIG	T5LQ400BW T5LQ400CW T5LQ400EW
T5V UL Current limiting	150	PR221 LS/I PR222 LSI PR222 LSIG	T5VQ400BW T5VQ400CW T5VQ400EW

NOTE: See pages 16.57 - 16.70 for electrical/mechanical accessories.

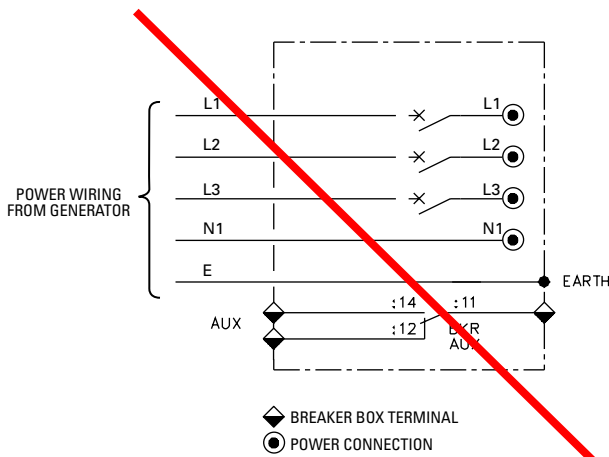
① T5 600A not available in 100% rated frame.



~~AUX - AUXILIARY CONTACTS~~ SHT2 - 12/24 V SHUNT TRIP

Option SHT2 adds a DC operated shunt trip which can be used to automatically open the circuit breaker upon activation of a generator set shut down signal from the generator set control panel, or from a remote signal (supplied by others).

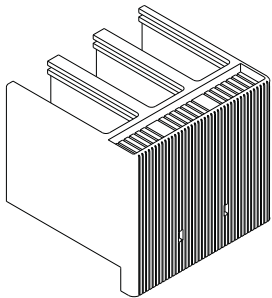
Option AUX adds an auxiliary changeover switch which can be used for remote indication of the circuit breaker status.



Accessories Mechanical T1 - T7



KT3100-3



KT1HTC-3

Standard cable terminal

Frame	Wire Size	Catalog number (set of 3)	Catalog number (set of 4)
T1	14 AWG-1/0	Integral	Integral
T2	14 AWG-1/0	KT2100-3	KT2100-4
T3	14 AWG - 1/0 4 AWG - 300 kcmil	KT3100-3 KT3225-3	KT3100-4 KT3225-4
Ts3	14-2 14-1/0 2-4/0 4-300 kcmil	K3TA ③ K4TB ③ K4TC ③ K4TD ③	K3TA-4 ③ K4TB-4 ③ K4TC-4 ③ K4TD-4 ③
T4	14 AWG-1/0 6 AWG-350 kcmil	KT4100-3 KT4250-3	KT4100-4 KT4250-4
T5 ④	250 kcmil-500 kcmil	KT5300-3	KT5300-4
T5 ①④	(2) 3/0-250 kcmil	KT5400-3	KT5400-4
T5 ②	(2) 3/0-500 kcmil	KT5600-3	—
T6	(2) 250-500 kcmil ③	K6TH ③	K6TH-4 ③
T6 ①	(3) 2/0-400 kcmil ③	K6TJ ③	K6TJ-4 ③
T7 ①	(4) 4/0-500 kcmil	KT7X1200-3	KT7X1200-4

Standard cable lug kits with power control tabs

Frame	Wire Size	Catalog number (set of 3)	Catalog number (set of 4)
T3	14 AWG - 1/0 4 AWG - 300 kcmil	KT3100-3C KT3225-3C	KT3100-4C KT3225-4C
Ts3	14 AWG-1/0 2 AWG-4/0 4 AWG-300 kcmil	K4TBC K4TCC K4TDC	K4TBC-4 K4TCC-4 K4TDC-4
T4	14 AWG-1/0 6 AWG-350 kcmil	KT4100-3C KT4250-3C	KT4100-4C KT4250-4C
T5 ④	250 kcmil-500 kcmil	KT5300-3C	KT5300-4C
T5 ①④	(2) 3/0-250 kcmil	KT5400-3C	KT5400-4C
T6	(2) 250-500 kcmil	K6THC ③	K6THC-4 ③
T6 ①	(3) 2/0-400 kcmil	K6TJC ③	K6TJC-4 ③

Terminal covers for fixed breakers - Low profile-kit includes two pieces

Frame	Catalog number (3 pole)	List Price	Catalog number (4 pole)	List Price
T1	KT1LTC-3	\$ 35	KT1LTC-4	\$ 47
T2	KT2LTC-3	40	KT2LTC-4	54
T3	KT3LTC-3	50	KT3LTC-4	68
Ts3	KTS3LTC-3	55	KTS3LTC-4	74
T4	KT4LTC-3	55	KT4LTC-4	74
T5	KT5LTC-3	60	KT5LTC-4	81
T6	KT6LTC-3	75	KT6LTC-4	101
T7	KT7XLTC-3	80	KT7XLTC-4	108

Terminal covers for fixed breakers - High profile-kit includes two pieces

Frame	Catalog number (3 pole)	List Price	Catalog number (4 pole)	List price
T1	KT1HTC-3	\$ 37	KT1HTC-4	\$ 50
T2	KT2HTC-3	43	KT2HTC-4	58
T3	KT3HTC-3	53	KT3HTC-4	72
Ts3	KTS3HTC-3	58	KTS3HTC-4	78
T4	KT4HTC-3	58	KT4HTC-4	78
T5	KT5HTC-3	63	KT5HTC-4	85
T6	KT6HTC-3	85	KT6HTC-4	108
T7	KT7XHTC-3	90	KT7XHTC-4	115

- ① Comes standard with high profile terminal covers.
- ② Uses front extended spreaded terminals... refer to technical catalog.
- ③ Discount schedule SA.
- ④ Not suitable for use on T5 600A.

Section 4
Control Panel

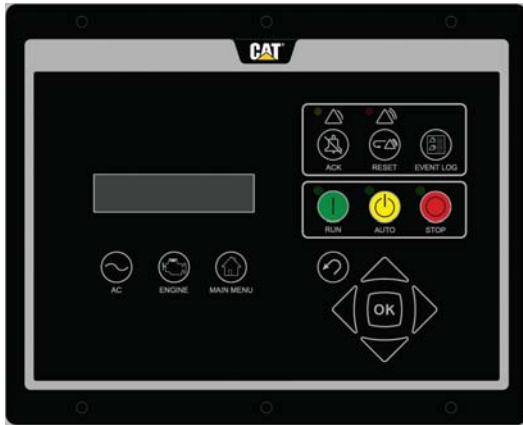


Image shown may not reflect actual package

EMCP 4.2 GENERATOR SET CONTROLLER

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

FEATURES

GENERAL DESCRIPTION

The Cat® EMCP 4.2 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 4.2.

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, 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 28 languages, including character languages such as Arabic, Chinese, and Japanese.
- Advanced engine monitoring is available on systems with an electronic engine control module.
- Integration with the Cat Digital Voltage Regulator (CDVR) provides enhanced system performance.
- 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.
- Reduced power mode offers a low power state to minimize battery power requirements.
- Three levels of security allow for configurable operator privileges.
- Selectable units
 - Temperature: °C or °F
 - Pressure: psi, kPa, bar
 - Fuel Consumption: Gal/hr or Liter/hr

STANDARDS

- UL Recognized
- CSA C22.2 No.100,14, 94
- Complies with all necessary standards for CE Certification
 - 98/37/EC Machinery Directive
 - BS EN 60204-1 Safety of Machinery
 - 89/336/EEC EMC Directive
 - BS EN 50081-1 Emissions Standard
 - BS EN 50082-2 Immunity Standard
 - 73/23/EEC Low Voltage Directive
 - EN 50178 LVD Standard
- IEC529, IEC60034-5, IEC61131-3
- MIL STND 461

EMCP 4.2 GENERATOR SET CONTROLLER

STANDARD FEATURES

Generator Monitoring	<ul style="list-style-type: none"> • Voltage (L-L, L-N) • Current (Phase) • Average Volt, Amp, Frequency • kW, kVA, kVA (Average, Phase, %) • Power Factor (Average, Phase) • kW-hr, kVA-hr (total) • Excitation voltage and current (with CDVR) • Generator stator and bearing temp (with optional module)
Generator Protection	<ul style="list-style-type: none"> • Generator phase sequence • Over/Under voltage (27/59) • Over/Under frequency (81 O/U) • Reverse Power (kW) (32) • Reverse Reactive Power (kVA) (32RV) • Overcurrent (50/51)
Engine Monitoring	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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
Control	<ul style="list-style-type: none"> • Run / Auto / Stop control • Speed and voltage adjust • Local and remote emergency stop • Remote start/stop • Cycle crank
Inputs & Outputs	<ul style="list-style-type: none"> • Two dedicated digital inputs • Six programmable digital inputs • Six programmable form A dry contacts • Two programmable form C dry contacts • Two digital outputs
Communications	<ul style="list-style-type: none"> • Primary and accessory CAN data links • RS-485 annunciator data link • Modbus RTU (RS-485 Half duplex)
Language Support	<p>Arabic, Bulgarian, Chinese, Czech, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Icelandic, Italian, Latvian, Lithuanian, Japanese, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Slovene, Spanish, Swedish, Turkish</p>
Environmental	<ul style="list-style-type: none"> • 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

Section 5
Starting System

World's Toughest Batteries



Premium High Output—Maximum Vibration Resistance

- Vibration Resistance...five times the Industry Standard
- Exclusive “flat top” BCI group 4D & 8D batteries are Maintenance Free and have the industries highest cold cranking amps (CCA)
- Popular BCI group 31 Maintenance Free batteries with industry leading cold cranking amps...up to 1000 (CCA), for electric power, machine or on-highway truck and bus applications. Deep cycle models available for truck, marine or recreational usage

Specifications for Cat Premium High Output Batteries—Available Worldwide

BCI Group Size	Part No.	Cold Cranking Amps**	Reserve Capacity Minutes'	Volts	Amp Hr. Capacity @ 20 Hrs.	Construction	Add Water Maintenance Check Hours	BCI Overall Dimensions			Nominal Weight		
								Length In (mm)	Width In (mm)	Height In (mm)	Wet Lb (kg)	Dry Lb (kg)	Nominal Acid to Fill Qt (liter)
8D	153-5720	1500	465	12	210	C	MF	20.47 (520)	10.8 (275)	9.76 (248)	132 (60)	—	—
8D	101-4000	1400	400	12	190	LAC+	1000	20.7 (526.5)	10.96 (278)	9.76 (248)	132 (60)	86 (39)	18.0 (17.0)
4D	153-5710	1400	425	12	200	C	MF	20.47 (520)	8.58 (218)	9.76 (248)	119 (54)	—	—
4D	153-5700	1125	305	12	145	C	MF	20.47 (520)	8.58 (218)	9.76 (248)	101 (46)	—	—
4D	9X-9730	1300	400	12	190	LAC+	1000	20.75 (527)	8.58 (218)	9.76 (248)	119 (54)	81 (37)	14.8 (14.0)
4D	9X-9720	1000	275	12	140	LAC+	1000	20.75 (527)	8.58 (218)	9.76 (248)	101 (46)	59 (27)	15.9 (15.0)
31	175-4390	1000	180	12	90	C/S	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	175-4370	825	190	12	100	C/S**	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	175-4360	710	185	12	100	C/S***	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	250-0480	710	185	12	100	C/SDT***	MF	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	115-2422	1000	170	12	90	C SAE	MFA	12.9 (328.4)	6.74 (171.2)	9.46 (240.3)	60 (27)	—	—
31	115-2421	950	170	12	90	C SAE +	MFA	12.9 (328.4)	6.74 (171.2)	9.46 (240.3)	60 (27)	44 (20)	6.6 (6.2)
31	9X-3404	950	165	12	100	C SAE	MF	13 (330.2)	6.77 (172)	9.46 (240.3)	58 (26)	—	—
31	3T-5760	750	165	12	100	C SAE	MF	13 (330.2)	6.77 (172)	9.46 (240.3)	55 (25)	—	—
24	153-5656	650	110	12	52	SC	MF	10.98 (278.9)	6.85 (174)	9.0 (229.1)	39 (18)	—	—
65	230-6368	880	140	12	80	SC	MF	11.9 (303.4)	7.5 (190.8)	7.5 (191.4)	45.5 (21)	—	—
74	153-5660	650	110	12	52	SC*	MF	10.98 (278.9)	7.0 (178.2)	8.15 (206.9)	39 (18)	—	—
58	175-4280	500	70	12	35	SC	MF	9.96 (253.1)	7.2 (182.5)	6.9 (176)	31 (14)	—	—
2	153-5690	765	210	6	90	LAC+	1000	10.24 (260)	6.8 (173)	8.72 (221.6)	37 (17)	22 (10)	4.8 (4.5)

Construction Notes:

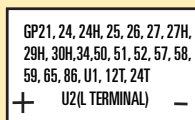
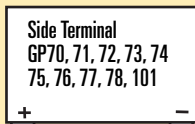
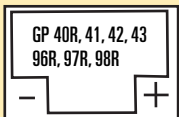
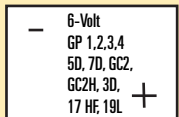
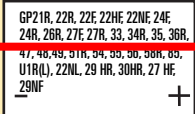
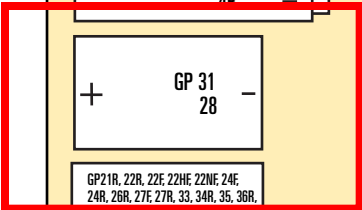
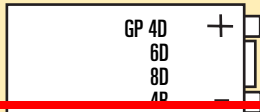
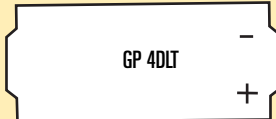
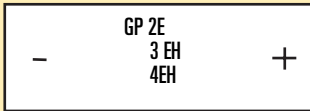
LAC = Low Maintenance, Hybrid Construction
 C=Calcium Lead Alloy Grid Design
 MF=Maintenance Free
 MFA=Maintenance Free with Accessible Vent Caps
 S = Stud Terminals
 + = Shipped Dry Only
 * = Side Terminals
 ** = Starting and Deep Cycle Battery
 *** = Deep Cycle and Starting Battery
 " = For 30 seconds at 0° F (-18° C)
 ' = Minimum of 25 amp output at 80° F (27° C)
 SAE = Uses SAE Posts
 SDT = Dual, Top mounted Terminals, Stud and SAE Post,
 Marine Deep Cycle/Starting Battery
 SC=Silver (Ag) Calcium Alloy Grids for resistance to high underhood temperatures

Rugged Design—Built Tough—Reliable Starting

- Positive and Negative plates are anchored to container bottom and locked at the top of cell element for maximum vibration resistance.
- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage.
- Hefty full-frame grids, no sharp edges, optimum acid/paste combination provides better charge acceptance after deep discharge.
- Manifold vented cover with built-in Flame Arrestor...a safety feature that directs corrosive gases away from the battery and hold-downs.
- Thick, robust container resists rugged treatment typical of heavy-duty commercial use. Embossed part number & descriptors for easy serviceability.

Battery Information

BCI Terminal Locations



Transit Bus Terminal for 8D Part # 250-0473
One piece end terminal.
Right end of Battery.
1/2" - 13 Steel Positive Stud
3/8" - 16 Steel Negative Stud

Type B

Cat Premium High Output Batteries — Built Tough to Exceed Demanding Performance Test Requirements:

100 hour Vibration Testing – Five Times the Industry Standard

- Battery must be able to withstand vibration forces without suffering mechanical damage, loss of capacity, loss of electrolyte or without developing internal/external leaks
- Battery must pass a high rate discharge test after the vibration testing

Five 72-hour Deep Discharge/Recharge Test Cycles

- Battery must recover to 25 charging amps within 20 minutes and meet Industry Electrical Performance Standards

30 Day Complete Discharge Test

- Battery must recover to 25 charging amps within 60 minutes and meet Industry Electrical Performance Standards after recharging

SAE J2185 Life Cycle Test

- Battery subject to deeper discharge and charge cycles at extreme temperatures not normally encountered in starting a machine or vehicle

Cold Soak Test

- Battery cold soaked at sub-freezing temperatures and then tested by starting an equally cold engine



Battery Accessories

- Group 31—Charging Posts for Stud Terminals—Part # 4C-5637
- Screw-in Charging Posts for Side Terminals—Part # 4C-5638
- Wing Nut—Part # 2B-9498 for Part #'s 175-4390/175-4370/175-4360/8C-3628
- Wing Nut—Part # 3B-0723 for Part #'s 8C-3638 and 8C-3639
- Digital Battery Analyzer—Part # 177-2330
- Battery Voltmeter—Part # 4C-6600
- Battery Load Tester—Part # 4C-4911
- Booster Cable 12' (3.66 m)—Part # 4C-4933
- Booster Cable 20' (6.00 m)—Part # 4C-4937
- Heavy Duty Commercial Fast Charger (110V)—Part # 4C-4921
- Heavy Duty Commercial Fast Charger (220V)—Part # 4C-4910

Note: Ratings and Part Numbers are subject to change without notice.



Recycle all scrap batteries.
We accept lead-acid batteries
for recycling.

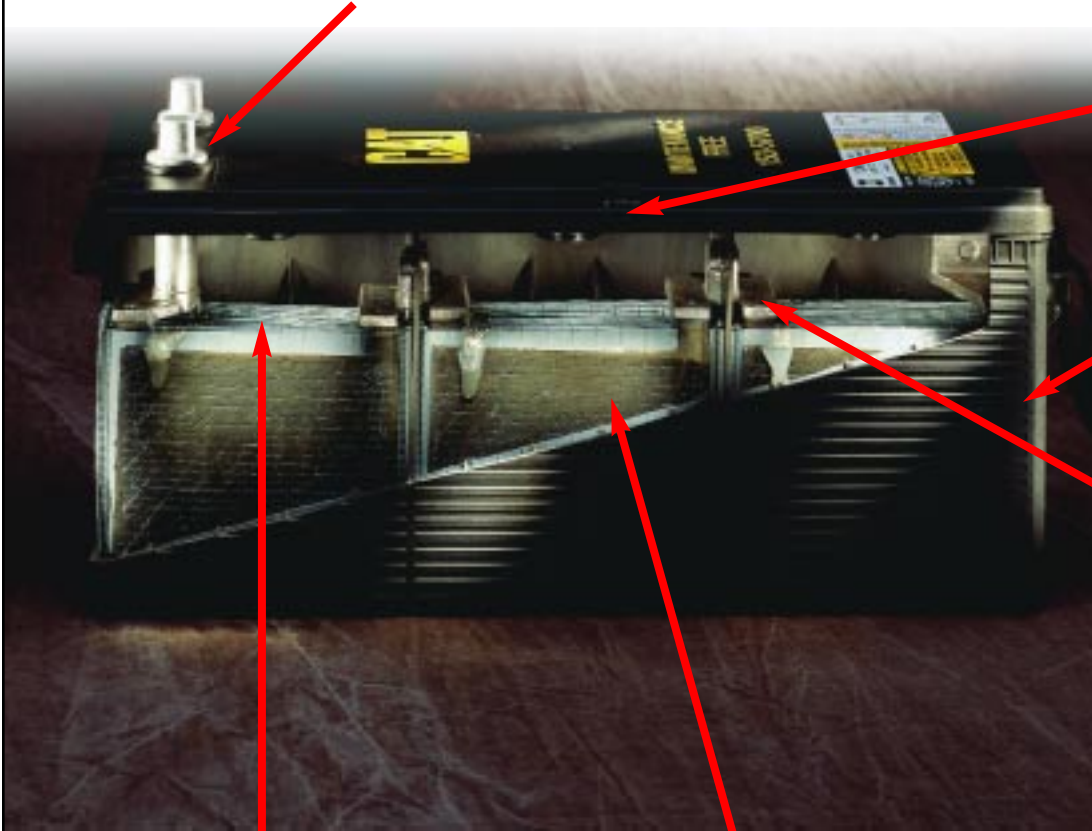
Cat Batteries

Heavy-duty Forged Terminal Post Bushings

Built-in Flame Arrestor

Robust Reinforced Case

Vibration Resistant Plates & Elements



Heavy-duty Grids

Rugged Separators

Robust Components = Long Life + Reliable Starts

- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage that causes corrosion and black posts. Thicker internal terminal posts provide lower electrical resistance and higher cold cranking amp output.
- Rugged microporous polyethylene envelope separators protect against “shorts” and vibration damage. Deep Cycle batteries utilize double insulated Glass mat separators for longer cycling life.
- Maintenance Free batteries utilize calcium lead alloy on both positive and negative plates that reduces gassing and water consumption. Automotive batteries have Silver (Ag) Calcium Alloy Grids for resistance to high underhood temperatures.
- Heavy-duty, full frame battery grids with no sharp edges. An optimum acid/paste combination provides better charge acceptance after a deep discharge.
- Positive and Negative plates are anchored to the container bottom and the cell element is locked at the top for maximum vibration resistance. Straps are thicker, heavier and cast (not welded) into the plates.
- Manifold vented cover with built-in Flame Arrestor...a safety feature that directs corrosive gases away from the battery and hold-downs.
- Robust reinforced case provides extra strength in all temperature extremes. Brickwork design on sides reduces chance of punctures and case flexing. Embossed part number and descriptors for easy serviceability.

For more information, see us today or visit our web site at www.cat.com

Caterpillar. The difference counts.™

CATERPILLAR®

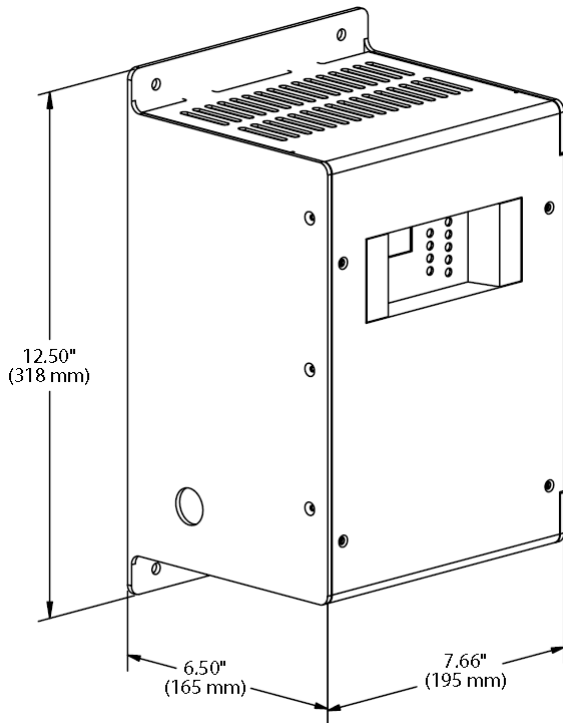


Image Shown may not Reflect Actual Package

UL 10 AMP BATTERY CHARGER

60 Hz only

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	12V
Frequency	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

Prolong the life of your battery with Kim Hotstart thermal battery wraps with or without thermostat.

- Durable, fire-retardant vinyl cover that resists oils and acids.
- All standard battery pads and battery wraps come with 6' grounded cord and plug.
- Fast, easy installation.
- Boosts battery cranking power as much as 75%.

BATTERY THERMAL WRAP — NO THERMOSTAT			
Model Number	Volts	Watts	Length
KBW5015-000	120	50	28"
KBW8015-000	120	80	36"
KBW16015-000	120	160	72"

Thermostatically controlled battery thermal wraps provide optimum heating regardless of ambient temperature.

- At 80°F, the battery will achieve maximum cold cranking amps.
- Battery is constantly maintained at 80°F.
- Provides greater heat rise than plates or pads.
- Thermostat will eliminate battery damage caused by overheating and acid spill.

Thermostat range: 65°F - 80°F

BATTERY THERMAL WRAP — WITH THERMOSTAT			
Model Number	Volts	Watts	Length
KBW5015T-000	120	50	26"
KBW8015T-000	120	80	44"
KBW10015T-000	120	100	56"

Battery Thermal Wrap

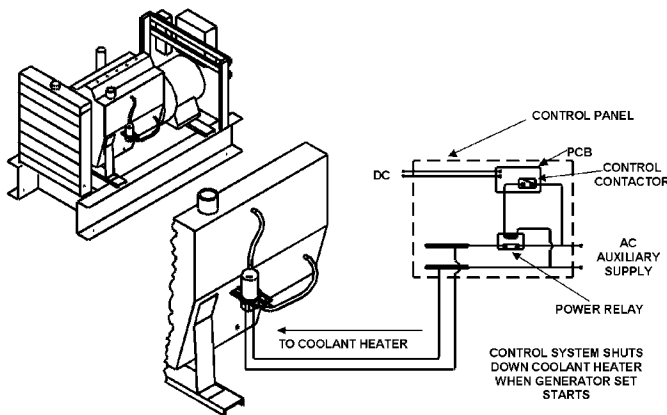




COOLANT HEATER WHH

Appropriate when the generator set is to be sited in a low ambient environment, the heater maintains the engine coolant at a temperature [typically 38° C (100° F)] which facilitates rapid starting and load acceptance. The heater assembly uses UL compliant components (to UL1030) and has CSA certification which is to both CSA & UL standards.

The heater itself is powered by a 110/120 volt (VAC 120) or 208/240 volt (VAC 240) AC auxiliary supply protected by a safeguard breaker inside the main control panel. A thermostatic controller is included to regulate the output temperature to within safe limits. When the generator set is not running, the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal, the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed and the engine has stopped.



FEATURES

- Molded from Polyphenylene Sulfide
- Rust free, corrosion resistant with exceptional tensile strength
- Vibration and shock tested to extreme limits to ensure durability
- Compatible with all coolant additives
- Incoloy element for longer service life

VAC 120

3 Phase Generator Set Models Diesel	Nominal Coolant Heater Power Consumption (Watts)	
	D13-4, D20-6, D25-8, D30-10, XQ20, XQ30, XQ45	1000
D40-6, D50-6, D60-6, D80-6, D100-6, XQ60, XQ80, XQ100	1000	
D125-6, D150-8, D175-2	1500	
Single Phase Generator Set Models Diesel	Nominal Coolant Heater Power Consumption (Watts)	
	D13-4S, D20-6S, D25-8S, D30-8S	1000
D40-6S, D50-6S, D60-8S, D80-2S	1000	
D100-6S	1000	

VAC 240

3 Phase Generator Set Models Diesel	Nominal Coolant Heater Power Consumption (Watts)	
	208 Volts	240 Volts
D25-8, D30-10, D40-6, D50-6	750	1000
D60-6, D80-8, D100-8	750	1000
D125-6, D150-8	1125	1500
Single Phase Generator Set Models Diesel	Nominal Coolant Heater Power Consumption (Watts)	
	208 Volts	240 Volts
D25-8S, D30-8S, D40-6S, D50-6S	750	1000
D60-8S, D80-2S, D100-6S	750	1000

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www.cat-electricpower.com

Market: N. America

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Section 6
Enclosure / Fuel Day Tank / Mounting



Shown with
Optional
Equipment

CAE – SOUND ATTENUATED WEATHERPROOF ENCLOSURES

D25-8 to D100-6

D25-8S to D100-6S

These fully weatherproof, sound attenuated, factory installed, enclosures incorporate internally mounted exhaust silencers that reduce engine noise by -25 dBA and fabricated steel skidbase. Optional UL listed tanks are available. These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites. They are designed on modular principles with many interchangeable components permitting on-site repair.

FEATURES

HIGHLY CORROSION RESISTANT CONSTRUCTION

- Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion
- Zinc plated or stainless steel fasteners
- Body made from steel components treated with polyester powder coating

EXCELLENT ACCESS

- Full length extra wide doors on each side
- Doors top hung and supported by gas struts
- Radiator fill access
- Lube oil and cooling water drains piped to exterior of the enclosure skidbase

SECURITY AND SAFETY

- Lockable access doors
- Stub-up cover sheets for “rodent proofing”
- Cooling fan and battery charging alternator fully guarded
- Fuel fill and battery can only be reached via lockable access doors (only provided when optional fuel tank is ordered)
- Exhaust silencing system totally enclosed for operator safety

TRANSPORTABILITY

- Lifting points on baseframe
- Tested and certified single point lifting facility

OPTIONS

- Control panel viewing window
- Emergency stop push button (red) mounted flush on exterior enclosure wall
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007
- IBC certifiable for 90 mph wind loading
- Special Seismic Certification OSHPD Pre-Approval OSP-0084-10

ENCLOSURE SOUND LEVELS

Generator Set Model	1800 rpm (60 Hz)					
	15 m (50 ft)		7 m (23 ft)		1 m (3 ft)	
	No Load (dBA)	Full Load (dBA)	No Load (dBA)	Full Load (dBA)	No Load (dBA)	Full Load (dBA)
D25-8	57.3	59.6	63.3	65.6	73.3	76.0
D25-8S	57.3	59.6	63.3	65.6	73.3	76.0
D30-10	57.4	57.7	63.4	63.7	74.0	74.6
D30-8S	57.4	57.7	63.4	63.7	74.0	74.6
D40-6	63.5	63.8	69.5	69.8	79.2	79.6
D40-6S	63.6	64.0	69.6	70.0	79.3	79.9
D50-6	63.8	64.2	69.8	70.2	79.5	80.2
D50-6S	63.9	64.3	69.9	70.3	79.7	80.5
D60-6	65.5	66.4	71.5	72.4	81.7	82.4
D60-8S	65.7	66.7	71.7	72.7	81.9	82.6
D80-6	65.3	67	71.3	73	82.7	83.4
D80-2S	65.3	67	71.3	73	82.7	83.4
D100-6	65.3	67.7	71.3	73.7	82.7	83.9
D100-6S	65.3	67.7	71.3	73.7	82.7	83.9

The sound pressure level data shown is quoted as free field and is for guidance only. Actual levels produced may vary according to site conditions.

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www.Cat-ElectricPower.com

Market: N. America

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 Suite 102
 West Allis, WI 53214
 (414) 475-3000
 Fax: (414) 475-3441
 www.globalpowercomponents.com

Fuel Day Tank and Pump System

To:	Mike Gilbert	Quote #:	G-914471-TT Rev. 2
Company:	Milton CAT Power Systems	Date:	April 16, 2013
City/State:	Brewer, ME	Ref:	WGAN
Phone:	(207)991-3130	Gen/Set:	D80-6 CAE 319-8102
Fax:	1-603-415-8468	Footprint	40.95" x 92.72" plus hood

Quantity	Description	
(1)	SB2S – 156 Usable Gallon Sub Base Day Tank - UL #142 Listed	
Standard Features		
Quantity	Part #	Tank Dim: 20"H (plus channels) x 41"W x 138"L Wt: 1475#
1	DW-101	Double Wall Secondary Containment
1	4000	Standard Electrical Stub Up 24" w/Rodent Guard
1	8001	Removable End Plate
1	3650	Dip Tube Supply/Return Fitting Package (1/2" NPT)
1	700-1025	1/2" Fuel Strainer (Y-Style) (for genset supply line)
1	700-1065	1/2" Spring Check Valve (for genset supply line)
1	4306	Fuel in Basin Alarm Float (Side Mount)
1	3502	Basin Drain (1/2" NPT)
1	3005	Locking Manual Fill Cap (2" NPT)
1	1003	Rochester Fuel Level Gauge (2" NPT, swing arm)
1	3152	Standard Vent Cap (2" NPT) w/5" Riser
2	3163	Emergency Pressure Relief Cap (3" NPT)
4	8410	Flush Mount Lifting Plate (minimum 4)
1	Black	Paint Color Black
Options Included:		
1	3515	Vents/Fill Port Located at Radiator End
1	3520	Rain Run-Off Option (Radiator End)
4	8310	C-Channel Basin Support (provided for visual clearance under tank- adds 2.26" to overall height)
1	3155	2" Overfill Prevention Valve
1	3350	2" Skully Connector w/8" Riser
1	8200	5 Gallon Spill Containment (tank mount)
1	3191	1/2" Extra Fitting w/ Plug
1	1380	Series 400 Controller
1	2025	Single Supply Pump System
1	6020	2 gpm Pump, 1/3 HP Motor
1	2010	Single Reverse Pump System
1	6040	4 gpm Pump, 1/3 HP Motor
1	1099	High/Low/Pump On/Pump Off Float Assembly (2" NPT)
2	3600	Additional Dip Tube (1/2" NPT) (inlet for pumps)
1	Special	Plumb Pump Connections to Side of Tank for Site Access
2	700-1025	1/2" Fuel Strainer (Y-Style)
2	700-1065	1/2" Spring Check Valve
1	700-1096	Solenoid Valve (1/2", 120VAC, NC)
1	3195	Extra Piping Connection w/Plug (2" NPT) (spare)

Notes/Exceptions		
1	Note	Tank is constructed as per GPC Standards with listed standard features and options. Tank package meets the intent of the specification.
1	Exception	2.4.D.2.f & g call for 3/8" fitting for dip tubes. 2" fitting with 1/2" NPT dipe tubes are provided.
1	Exception	2.4.D.4 calls for specific control system. GPC Series400 controller provided.

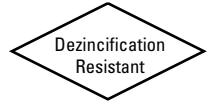
1	Special	IBC Certification for Tank (including GPC pump system)
1	6400	Pump Enclosure (for pump mounting outside of genset footprint)

GPC Series 400 Controller Set for Single Supply/Single Reverse Pump System - Loose Parts

- (2) NIBCO Check Valves model T-480 1/2" NPT. To be installed in supply pump and reverse pump line before pump inlet.
- (2) Mueller Strainers model 11M 1/2" NPT. To be installed in supply pump and reverse pump line before check valve.
- (1) GC Solenoid Valve model S211GF02V5DG4. To be installed in supply pump line before pump inlet and after strainer and check valve.
- (1) Oberdofer model N61K10G01 2GPM supply pump w/Marathon (or Dayton equal) with 1/3 HP motor for supply to tank from main tank.
- (1) Oberdofer model N993 4GPM return pump w/Dayton (or Marathon equal) 1/3 HP motor for reverse from tank back to main tank.

250 lb WWP Bronze Ring Check® Valves

Fire Protection Valve • Inline Lift Type • Rubber Discs • Spring Actuated



250 PSI/17.2 Bar Non-Shock Cold Working Pressure¹³

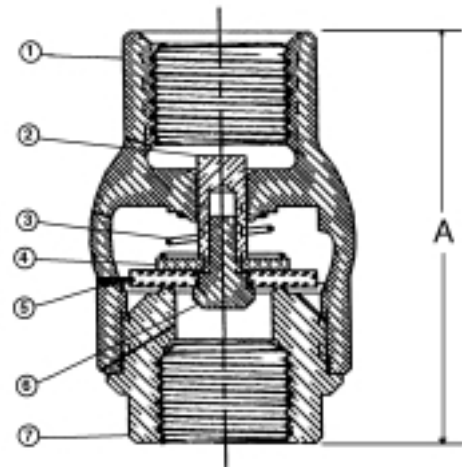
CONFORMS TO MSS SP-80

MATERIAL LIST

PART	SPECIFICATION
1. Body	Bronze ASTM B 584 Alloy C84400
2. Stem	Stainless Steel ASTM A 582 Alloy C30300
3. Spring	316 Stainless Steel
4. Disc Holder	Stainless Steel Type 301
5. Disc	Water, Oil or Gas (Buna-N)
6. Seat Screw	Stainless Steel ASTM A 276 Alloy S43000
7. Body End	Bronze ASTM B 584 Alloy C84400



T-480
Threaded



T-480
NPT x NPT

DIMENSIONS—WEIGHTS—QUANTITIES

Size	Dimensions						T-480		Master Ctn. Qty.
	A		B		C		In.	In.	
In. mm.	In.	mm.	In.	mm.	In.	mm.	In.	In.	
3/8 10	2.00	51	1.38	35	1.44	37	0.41	0.19	100
1/2 15	2.06	52	1.38	35	1.19	30	0.36	0.16	100
3/4 20	2.25	57	1.63	41	1.31	33	0.48	0.22	100
1 25	2.63	67	2.00	51	1.50	38	0.77	0.35	50
1 1/4 32	2.94	75	2.38	60	1.69	43	1.14	0.51	30
1 1/2 40	3.31	84	2.75	70	2.00	51	1.63	0.74	30
2 50	3.69	94	3.38	86	2.31	59	2.27	1.03	10

Ordering: The T-480 has standard Buna-N Discs.
Also available with TFE (Y) Discs; specify T-480-Y.
3/8" thru 2" require 1/2 pound pressure to open.

NIBCO check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position.

WARNING - Valve must be installed downstream of receiver tank if used in line with reciprocating air compressor.

Do Not Use as a Footvalve.

Warning - Do Not Use For Reciprocating Air Compressor Service.

Mueller Steam Specialty

Model: 11-M

WORKING PRESSURES - NON-SHOCK

ANSI 250lb. Class	400 PSI @ 150°F
	250 PSI @ 406°F

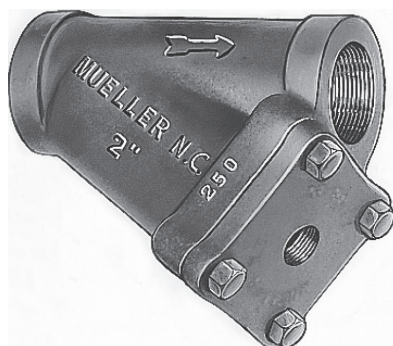
Cast Iron Screwed End “Y” Type Strainers

Class 250

11-M Screwed



Model 11M



Model 11M
Size 4"

SERVICE RECOMMENDATIONS

Used extensively to strain foreign matter from pipe lines and provide inexpensive protection for costly pumps, meters, valves and other similar mechanical equipment.

SCREENS

20 mesh stainless steel screens (1/32" openings) usually furnished in all sizes through 2" for water service and 30 mesh (1/50" openings) for steam service in those sizes. The 2-1/2" and 3" strainers are furnished with perforated stainless steel screens, 3/64" openings for steam and 1/16" openings for water. A large variety of perforated metals and wire mesh screens other than those normally furnished are available. See page B-4.

CONSTRUCTION

All sizes feature a machined seat in the body, designed to make the screen self aligning and at the same time holding the screen securely in place by a straight threaded and gasketed cap.

FEATURES

The machined seats in both the body and cap allow easy assembly and disassembly. The alternative is a strainer which employs a pipe bushing to lock the screen in place which will likely deform the screen, allowing sediment to bypass the strainer.

SELF CLEANING

Self cleaning is accomplished by opening the valve or plug connected to the blowoff outlet.

BLOWOFF OUTLETS

Tapped NPT, sizes specified on page C-7. Not normally furnished plugged.

CAPACITY

Generously proportioned bodies, with screens that have an open area many times greater than the corresponding pipe size, ensure low pressure loss.

PRESSURE DROP: See charts on page C-2.

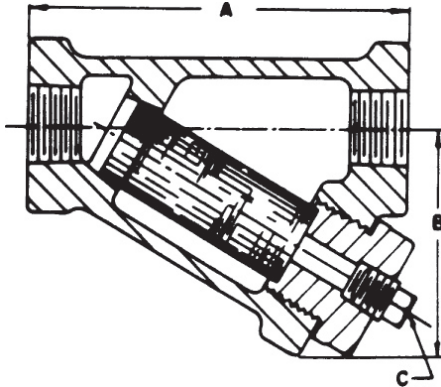
GALVANIZED STRAINERS: Available from stock in all sizes.

INDIVIDUALLY HYDROSTATICALLY TESTED.

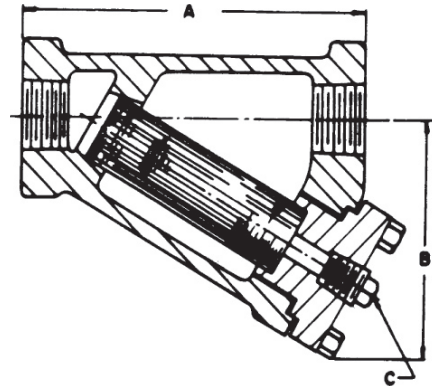
MATERIAL: Body: Cast Iron ASTM A126 Class B
Gasket: Metal filled Grafoil

Mueller Steam Specialty

Dimensions and Weights



Model 11M



Model 11M
4"

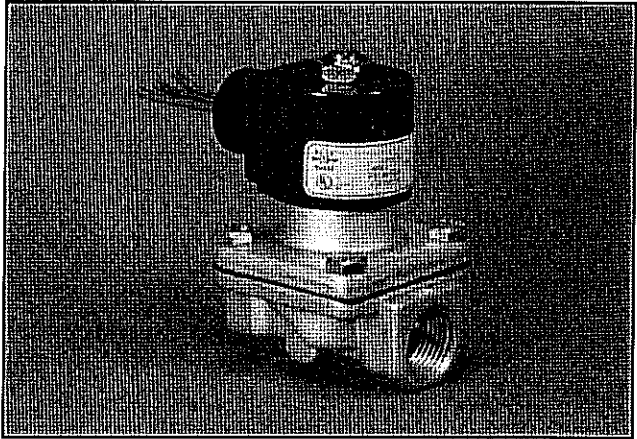
SIZE		in	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4
		mm	6	10	15	20	25	32	40	50	65	80	100
A	in		3-3/16	3-3/16	3-3/16	3-3/4	4	5	5-3/4	7	9-1/4	10	15-3/16
	mm		81	81	81	95	102	127	146	177	234	254	386
B	in		2-1/16	2-1/16	2-1/16	2-7/16	2-5/8	3-3/8	3-7/8	4-3/4	5-7/8	6	11-1/4
	mm		52	52	52	61	66	85	98	121	149	152	286
C	in		1/4	1/4	1/4	3/8	3/8	3/4	3/4	1	1-1/2	1-1/2	1-1/2
	mm		6	6	6	10	10	20	20	25	40	40	40
WEIGHTS													
	lb		1.6	1.6	1.6	2.4	3	5.2	8	12.5	22	30	70
	kg		.72	.72	.72	1.08	1.36	2.3	3.6	5.7	10	13.6	32

Approximate Dimensions and Weights. Apply For Certified Drawings.

S21 Series



- 1/2" NPT
- Brass Body
- 2-Way Piloted
Diaphragm
- Normally Closed



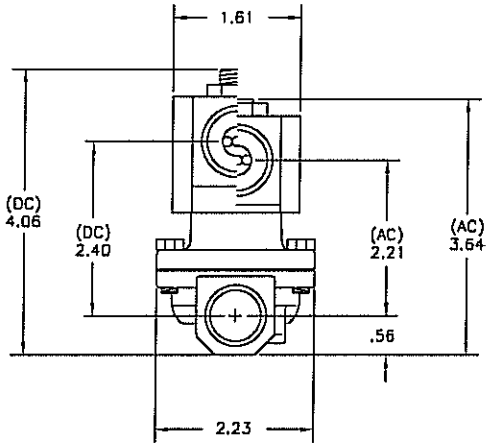
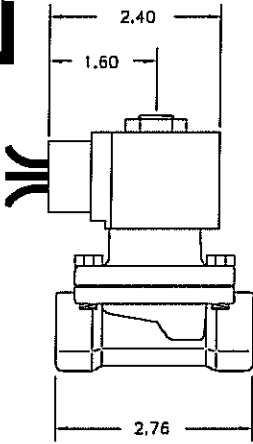
Materials	Seals:	Nitrile, Viton®, Ethylene Propylene
	Orifice: Pilot Main	Stainless Steel Brass Ø 5/8"
Electrical	Standard Housing:	Encapsulated Waterproof Conduit (NEMA 4/4X)
	Optional Housings:	Metallic Conduit, Explosion-proof (NEMA 7), Grommet, Open Frame, Junction Box (single or dual knockouts), DIN; Contact GC Valves Customer Service for others.
	Standard Voltages:	24, 120, 240 AC 60 Hz; 50 Hz available 6, 12, 24 DC; Contact GC Valves Customer Service for Additional Voltages.
	Voltage Tolerance:	±10% of applicable voltage
	Coil Classes:	F, H, N
	Standard Lead Length:	24 inch
Operating Temperature	Ambient (Nominal):	32°F to 125°F
Mounting	Position:	Any
Approvals*	Agency:	UL Listed, UL Recognized, CSA Approved

* Not available for all variations

® Registered Trademark of DuPont Co.

Dimensions/Weight

Weight (lbs.)
2.5



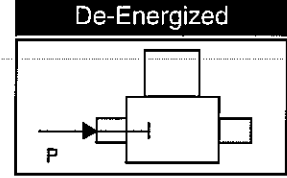
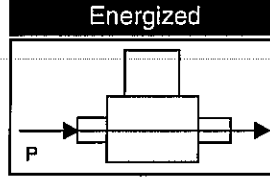
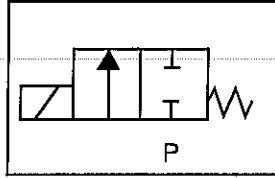
GC Valves Customer Service: 800-828-0484 (7:30am to 4pm ET) or 800-582-4232 (7:30am to 4pm PT)



S211 - 1/2" NPT, Brass Body, Normally Closed

Valve Selection List

Normally Closed



Pipe Size	Orifice Size	C _v	Minimum	Operating Pressure Differential (psi)								Max Fluid Temp. °F	Seal Material	Power Consumption (Watts)		Model Code (120V/60HZ — 110V/50HZ Shown)
				Maximum										AC	DC	
				AC	DC	AC	DC	AC	DC	AC	DC			AC	DC	AC
1/2	1/2	1.8	1	200	150	150	100					230	EPR	8	10	S211GF02000000
	1/2	1.8	1	200	150	150	100	150	100			180	Nitrile	8	10	S211GF02015000
	5/8	4.3	4	200	150	150	100	150	100	—	—	230	Viton	8	10	S211GF02V5DG4
	5/8	1.8	1							50	50	230	EPR	8	10	S211GF02000000

* Class H Coil Recommended for Steam and Other High Temperature Applications

Part Numbering

1	2	3	4	5	6	7	8	9	10	11	12	13
S	2	1	1	G	F	0	2	V	5	D	G	4
Series			Operating Mode	Housing*	Coil Class*	Voltage*		Seal Material	Body Material	Pipe Connection	Orifice Size	
S21			1: Normally Closed	G: Conduit	F: Class F H: Class H	02: 120/60 110/50		C: EPR N: Nitrile V: Viton	5: Brass	D: 1/2" NPT	G4: 5/8"	

* See the "Engineering Guide" for additional voltages, variations and options.

Coil Data

Coil Family			
Type	Size	Frequency (Hz)	
AC	S3	60	50
DC	S4		
		Nominal Power (VA)	
		Inrush	36 36
		Holding	13 14

GC Valves Customer Service: 800-828-0484 (7:30am to 4pm ET) or 800-582-4232 (7:30am to 4pm PT)

DEFINITE PURPOSE MOTORS

Miscellaneous Pump Duty & Car Wash

1-Phase Open Dripproof Carbonator Pump Motors



No. 3K067



No. 5U254

- Type: split-phase
- Insulation: Class B
- Max. ambient: 40°C
- Thermal protection: auto
- Rotation: CW/CCW

pump to motor. UL Recognized and CSA Certified.

Uses: Liquid transfer pumps, vending machine pumps, and other hub-mounted pump applications.

Motors have a threaded conduit hole. Short, slotted shaft for close-coupling the carbonator pump to the motor. Extended hub for direct-mounting

HP	Nameplate RPM 60 Hz	Nameplate RPM 50 Hz	NEMA Frame	Volts @ 60 Hz	Full-Load Amps	Service Factor	Bearing	Mounting	Shaft Dia. (In.)	Mfr. Model	Item No.	\$ Each
1/4	1725	—	48Y	115	5.0	1.0	Sleeve	Cradle	1/2	4725	3K067	✓ 97.70
1/4	1725	—	48Y	115	5.0	1.0	Sleeve	Rigid Base	1/2	H679	5U253	✓ 96.05
1/4	1725	1425	48Z	115/230	4.3/2.2	1.0	Ball	Cradle	5/8	H344	5XB85	✓ 84.30
1/4	1725	1425	48Y	208-240	2.3-2.4	1.0	Ball	Cradle	1/2	H451	2K458	✓ 116.20
1/3	1725	—	48Y	115	6.1	1.0	Ball	Cradle	5/8	H682	5U256	✓ 111.40
1/3	1725	—	48Y	115	5.6	1.15	Sleeve	Cradle	1/2	4406	3K068	✓ 105.85
1/3	1725	—	48Y	115	5.6	1.15	Sleeve	Rigid Base	1/2	H680	5U254	✓ 104.40
1/3	1725	1425	48Y	100-120/200-240	5.5-5.6/2.7-2.8	1.0	Ball	Cradle	5/8	H683	5U257	✓ 119.95
1/3	1725	1425	48Y	100-120/200-240	5.5-5.6/2.7-2.8	1.0	Ball	Cradle	5/8	4805	3K987	✓ 127.70
1/3	1725	1425	48Y	100-120/200-240	5.5-5.6/2.7-2.8	1.0	Ball	Rigid Base	5/8	H681	5U255	✓ 116.45
1/3	1725	1425	48Y	100-120/200-240	5.5-5.6/2.7-2.8	1.0	Ball	Rigid Base	5/8	H712	3VG37	*✓ 147.65
1/3	1725	1425	48Y	220-240	2.7-2.7	1.0	Ball	Cradle	5/8	H450	2K457	✓ 121.45
1/2	1725	—	48Y	115	7.2	1.0	Ball	Cradle	5/8	H926	5XB87	✓ 111.45
1/2	1725	1425	48Y	100-120/200-240	7.1-7.2/3.4-3.6	1.0	Ball	Cradle	5/8	H684	5U258	✓ 182.75

(*) Has 1/2 x 1 1/2" rear shaft extension.

1-Phase Pressure Washer Pump Motors



- Type: capacitor-start
- Enclosure: open dripproof
- Mounting: rigid
- Insulation: Class B
- Max. ambient: 40°C

- Thermal protection: manual
- Bearings: double-shielded ball
- Rotation: CW/CCW, except No. 4UX55 is CWSE

Corrosion-resistant; for use in hot and cold water high-pressure washer applications. UL Recognized and CSA Certified.



No. 5XB90



HP	Nameplate RPM	NEMA Frame	Volts @ 60 Hz	Full-Load Amps	Service Factor	Brand	Mfr. Model	Item No.	\$ Each
3/4	1725	56	115/208-230	11.2/5.8-5.6	1.25	Marathon	C1298	5XB90	✓ 290.00
1 1/2	1725	56	115/230	13.4/6.7	1.20	Marathon	C1299	5XB83	*✓ 359.75
2	3450	56C	115/208-230	15.6/8.8-7.8	1.15	Marathon	C1269	5XB89	✓ 506.50
3	3450	56C	208-230	13-12	1.15	Marathon	C1270	5XB91	✓ 528.50
5	3450	56HCZ	208-230	22.0-20.0	1.15	Dayton	—	4UX55	†✓ 541.50

(*) Capacitor-start, capacitor-run. (†) 3/4 x 1 1/2" Shaft.

3-Phase Wet Environment/Car Wash Motors



No. 5XB81

- Enclosure: totally enclosed fan-cooled
- Mounting: C-face
- Insulation: Class B
- Max. ambient: 40°C

- Thermal protection: auto
- Bearings: double-sealed ball
- Rotation: CW/CCW

When frequent high-pressure washdown is required. Motors

feature 303 stainless steel shafts with contact lip seal and V-ring slinger. UL Recognized and CSA Certified.

HP	Nameplate RPM	NEMA Frame	Volts @ 60 Hz	Full-Load Amps	Service Factor	Nominal Efficiency	Mfr. Model	Item No.	\$ Each
1/2	1725	56C	230/460	2.2/1.1	1.15	72	K606	5XB82	✓ 303.75
3/4	1725	56C	230/460	3.0/1.5	1.15	77	K607	5XB84	✓ 333.25
1	1725	56C	230/460	3.8/1.9	1.15	77	K608	5XB81	✓ 340.50
1 1/2	1725	56C	230/460	5.0/2.5	1.15	80	K610	5XB86	✓ 370.50
2	1725	56C	230/460	6.2/3.1	1.00	81.5	K609	5XB88	✓ 402.75

Split-Phase Sump Pump Motors



No. 5TB78

- Enclosure: open dripproof (No. 3K089 is open)
- Mounting: hub
- Service factor: 1.0
- Insulation: Class B

- Max. ambient: 40°C
 - Thermal protection: auto
 - Bearings: sleeve
- Direct replacement for OEM supplied motor on sump

pumps. Each includes float switch and cord set. UL Recognized and CSA Certified. No. 3K089 has a shaft endshield with extended hub

for mounting directly on 1 1/2" OD pump support column.

Note: Use on other applications, such as glass washers, voids warranty.

HP	Nameplate RPM	NEMA Frame	Rotation	Volts @ 60 Hz	Full-Load Amps	Shaft Dia. (In.)	Shaft Length (In.)	Hub Dia. Dimension (In.)	Mfr. Model	Item No.	\$ Each
1/3	1725	48K	CCWSE	115	5.7	1/2	1 1/8	1 1/2	H641	5TB78	✓ 90.95
1/3	1725	48K	CWSE	115	5.7	1/2	1 1/8	1 1/2	H642	3K089	✓ 113.25
1/2	1725	48K	CCWSE	115	7.3	1/2	1 1/8	1 1/2	H951	5TB80	✓ 81.10

BRONZE CLOSE COUPLED ROTARY GEAR PUMPS

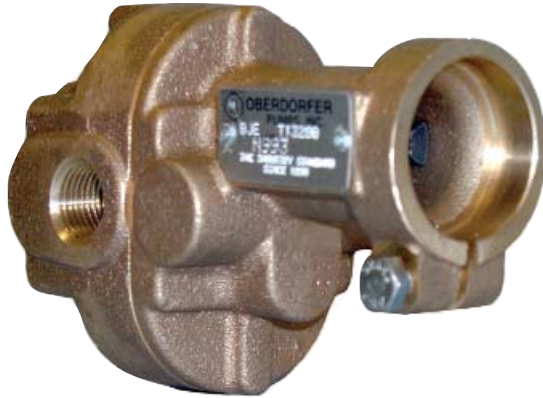


OBERDORFER PUMPS

A Subsidiary of Thomas Industries Inc.

MODEL N993 SERIES

MODEL N993 - 1/2" NPT PORTS STANDARD



Pump	Description
N993	Standard pump with 1/2" ports
N993R	Pump with 1/2" ports & relief valve
N993S5	Pump with Viton®* lip seal
N993RS5	Pump with Viton®* lip seal & relief valve

3/8" NPT Ports Available, add "-03" suffix

FEATURES

- Rugged corrosion resistant bronze construction
- Compact close-coupled design
- Stainless steel shafts
- Durable bronze helical gears provide quiet operation
- Process lubricated carbon graphite bearings
- O-ring cover seal for maximum leak protection
- Buna Lip Seal -standard
- Easy field assembly to a variety of motor frames
 - For compact AC motor pump units - see Close Coupled Bronze Adapterless Rotary Gear Pumps
 - For Danfoss hydraulic motor driven pump units - see adapter 9960
- For bronze pedestal pumps and mechanical seal styles - see model N3000
- For close-coupled ductile iron pumps - see model C993

GENERAL DESCRIPTION

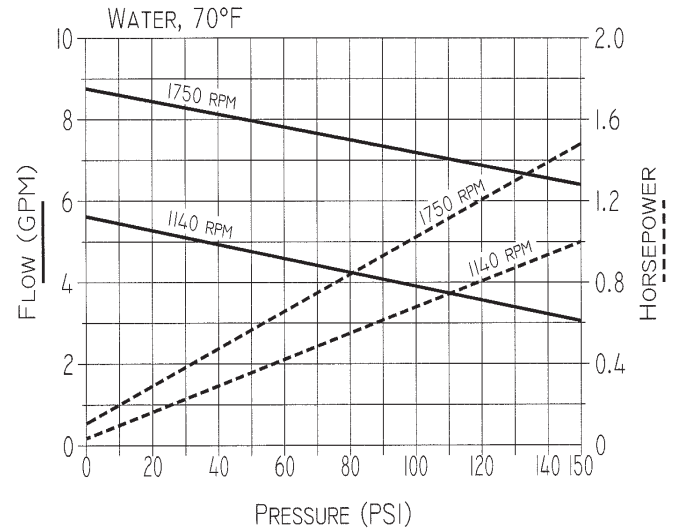
Pump housings and gears are made of top quality bronze, shafts are 303 stainless steel. Bearings are designed of high performance carbon-graphite material selected for wear resistance and long service life.

Gear pumps are positive displacement pumps. Each shaft revolution displaces a definite amount of liquid relatively unaffected by the back pressure in the discharge line. Shaft speed and flow are directly proportional. Recommended pressure limits are 100 PSI for water and non-lubricants, 150 PSI for oil and other lubricants. The maximum shaft speed is 1750 RPM.

SHAFT SEALS

Close coupled gear pumps are normally supplied with a Buna N lip seal. A lip seal made of Viton(R)* is available as an option. For a Viton(R)* Seal, add S5 to the pump model number.

PERFORMANCE



LIQUIDS AND TEMPERATURE

These pumps are suitable for all liquids that are compatible with bronze. Most common liquids are water, oil, and mild chemicals in the pH range of 4 to 11. Viscous liquids require reduced shaft speeds of 1140 RPM or lower. (Consult factory.)

Liquids containing solids, abrasives, powders, or paint pigments are definitely not recommended for gear pumps. If abrasives are unavoidable, use a very low shaft speed.

The recommended liquid temperature range is from 32°F to 140°F for best pump life. If more extreme temperature conditions exist, factory should be consulted. Freezing of water-filled pumps can cause damage and must be avoided. Oils at low temperatures are very viscous requiring a lower speed or extra power.

SUCTION LIFT

As a general rule, the suction lift should be kept at an absolute minimum by placing the pump as close to the liquid source as possible. A gear pump in new condition can lift 20 feet of water in the suction line. A foot valve (preferably with built-in strainer) is recommended at the beginning of the suction line. For a first start-up, the pump should be primed to avoid dry running. Minimum size of the suction pipe is the size of the pump inlet port. For longer suction lines (over 3 feet) or for viscous liquids, the pipe should be at least one size or two sizes larger than the pump inlet port.

ROTATION AND RELIEF VALVE

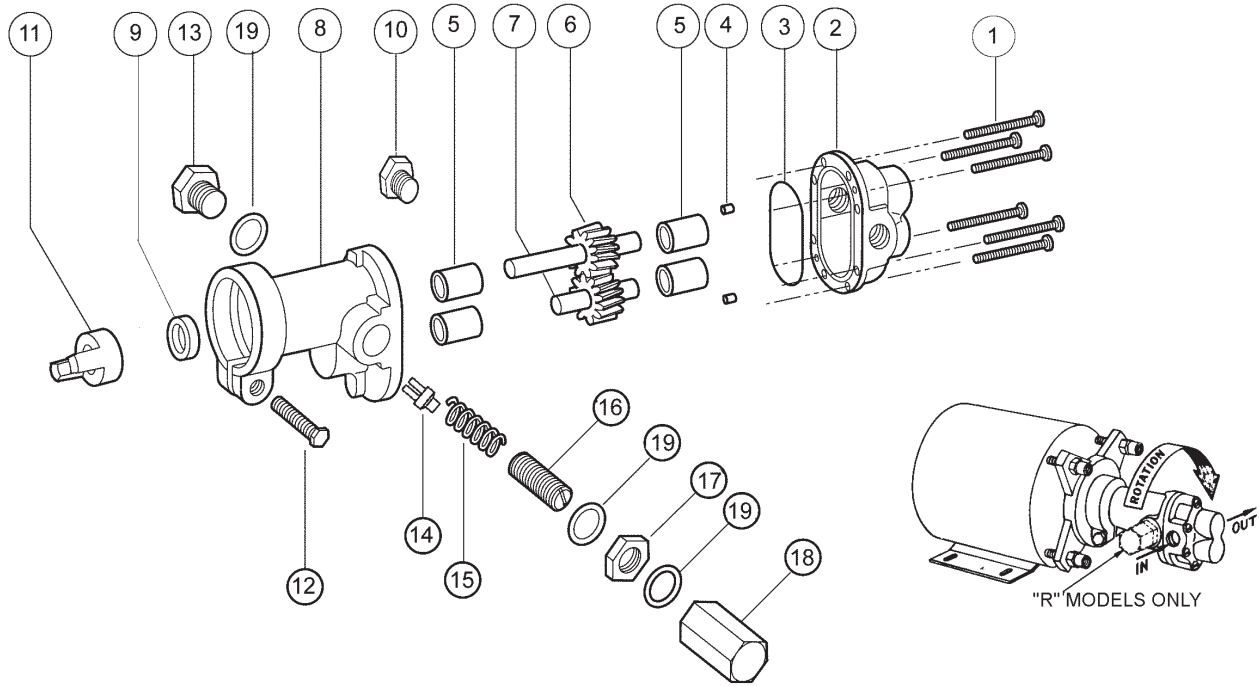
If the discharge line contains any throttling devices such as a shut-off valve, a spray nozzle or other restrictive device, it is necessary to have a relief valve in the system which returns the liquid to the suction side or to the tank. The relief valve is also available as part of the pump itself (R-model pumps). However, built-in relief valves are only good for intermittent service. If used continuously, the pump will overheat. A built-in relief valve is strictly a safety device against overpressure. It will not work successfully as a pressure or flow control device. For this purpose a separate relief valve in the pressure line must be used.

Unless otherwise specified, the pump motor unit is supplied by the factory for shaft rotation counterclockwise from pump shaft end. Reversing motor will reverse "in and out" ports and also requires changing relief valve location. The relief valve is always on the inlet side of this pump series. The factory pressure setting is 50 PSIG. To increase pressure, turn the relief valve adjusting screw in a clockwise direction.

BRONZE CLOSE COUPLED ROTARY GEAR PUMPS



EXPLODED VIEW AND PARTS LIST



Pump No.	1	2	3 ²	4	5 ²	6 ²	7 ²	8	9 ^{1,2}	10	11	12	13	14	15	16	17	18	19
	Screw	Body	O-Ring	Dowel Pin	Bearing	Drive Gear Assy.	Idle Gear Assy.	Cover	Lip Seal	Cap Plug	Coupling Half	Screw	Plug Nut	Poppet	Spring	Adj. Screw	Locknut	Bypass Nut	Fiber Washer
	6 Req'd	1 Req'd	1 Req'd	2 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	1 Req'd	3 Req'd
N993	9837-20	9307ND5N	9797-038	8885	5024	32950	32937	9308NN2N	5007	9346	5604	5595	---	---	---	---	---	---	---
N993R	9837-20	9307ND5N	9797-038	8885	5024	32950	32937	9308NN3B	5007	9346	5604	5595	1838	6535	6301	5237	5240	5239	6533

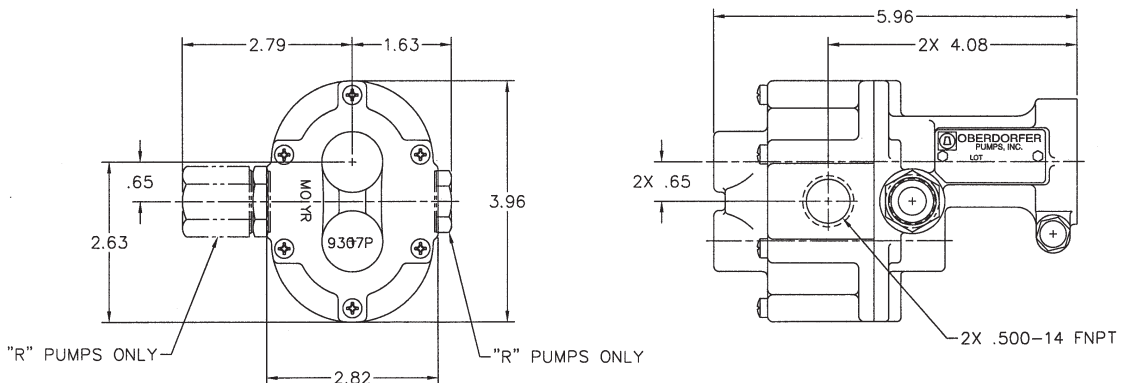
¹Seal # 5007 is Standard Buna N, # 7580 is Viton®-Teflon®*
²Repair Kits contain items 3, 5, 6, 7 & 9. Repair Kit for N993® is #12070.

VARIATIONS

DIMENSIONS

Pump No.	9 ^{1,2}	
	Lip Seal	Repair Kit ²
N993S5	7580	12101
N993RS5	7580	12101

Adapter Kit	Kit Number	Description
M	10562	48 Frame
N	10816	56 Frame
P	11722	S56 Frame
Q	11331	56C Frame (to ¼ HP)
C	11331H	56C Frame (above ¼ HP)
F	11332	IECT1
---	---	Adapterless- Modified 48



*Viton® or equivalent FKM will be used.
 Viton® is a registered trademark of DuPont Dow Elastomers.
 *Teflon® or equivalent PTFE will be used. Teflon® is a registered trademark of DuPont.

BRONZE ROTARY GEAR PUMPS CARBONATOR MOTOR MOUNTED

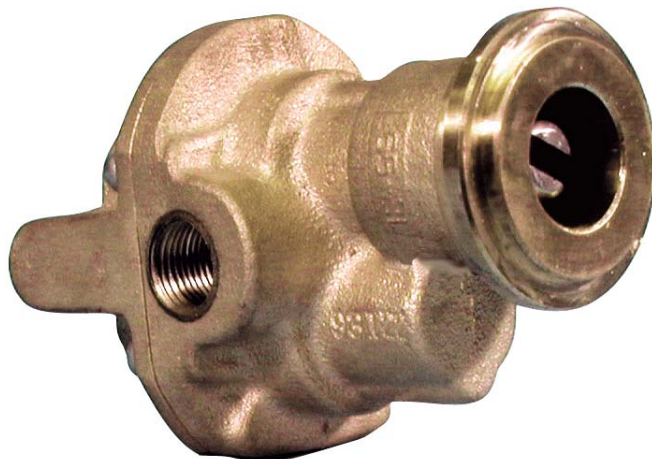
MODEL
N61K10G01



OBERDORFER PUMPS

A Subsidiary of Thomas Industries Inc.

3/8" NPT PORTS



FEATURES:

- Bronze Body
- Bronze Spur Gears
- Self-lubricating Carbon Bearings
- Buna N Lip Seal - Optional Viton Lip Seal
- Carbonator Motor Mount

GENERAL DESCRIPTION

The carbonator motor mounting uses a circular clamp, similar to a hose clamp, as means of attaching the pump to a specially machined hub on the motor. This concept was first developed for the vending machine industry to pump carbonated beverages in soft drink dispensers. The main advantages are compactness and economy due to the elimination of the adapter casting.

The rotary gear pump features an all bronze design and 303 stainless steel shafts with options of non-metallic gears and a variety of shaft seals. The built-in relief valve is available in two options; internal recirculation to suction side or external connection for return line to supply tank.

SUCTION LIFT

For a first start-up, the pump should be primed to avoid dry running. Gear pumps are self-priming, but a foot valve with strainer is recommended at the beginning of the suction line. This will keep the gear chamber primed to insure instant flow when the pump is started. maximum suction lift is 20 feet. The suction line should be as short as possible.

PERFORMANCE

Capacity - Water 60° F 1725 R.P.M.

Pump Series	PSI	2	20	40	60	80	100
N61	GPM	2.1	1.9	1.8	1.7	1.6	1.5

LIQUIDS AND TEMPERATURE

Bronze pumps are suitable for water, oil, and mild chemicals in the pH-range from 4-10. Viscous liquids may be handled with carbonator pumps up to a viscosity of 300 SSU. Higher viscosities require a pump speed lower than 1725 RPM, which is currently not available in carbonator motors.

Liquids containing abrasives, solids, powders or pigments are highly detrimental to pump life and must be avoided. The recommended liquid temperature range is from 32°F to 140°F. If more extreme temperature conditions exist, factory should be consulted. Allowing the liquid to freeze in the pump can cause damage.

ROTATION AND RELIEF VALVE

The relief valve is not intended to be a metering or flow control device. Its main purpose is to function as a discharge pressure relief when the spring tension is exceeded by the discharge pressure. Overheating can occur within 5-10 minutes if the discharge line is completely shut off for extended periods.

Unless otherwise specified, the pump motor unit is supplied by the factory for shaft rotation clockwise from shaft end. Reversing the motor rotation will reverse the "in" and "out" ports and also requires changing the relief valve location. The relief valve is always on the discharge side in this pump series. The factory pressure setting is 50 PSIG. To increase pressure, turn the relief valve adjusting screw in a clockwise direction.

To reverse single phase motors, find instructions on the inside of the junction box cover or on the name plate of the motor.

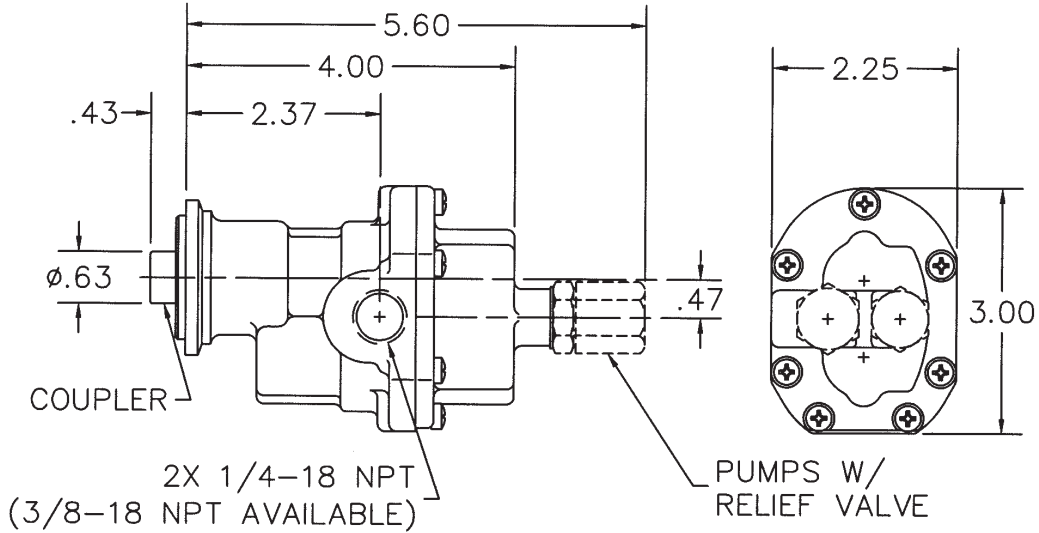
FOR INFORMATION ON OTHER MODELS IN THE N61 SERIES, CONTACT FACTORY.

**MODEL
N61K10G01**

BRONZE ROTARY GEAR PUMPS CARBONATOR MOTOR MOUNTED

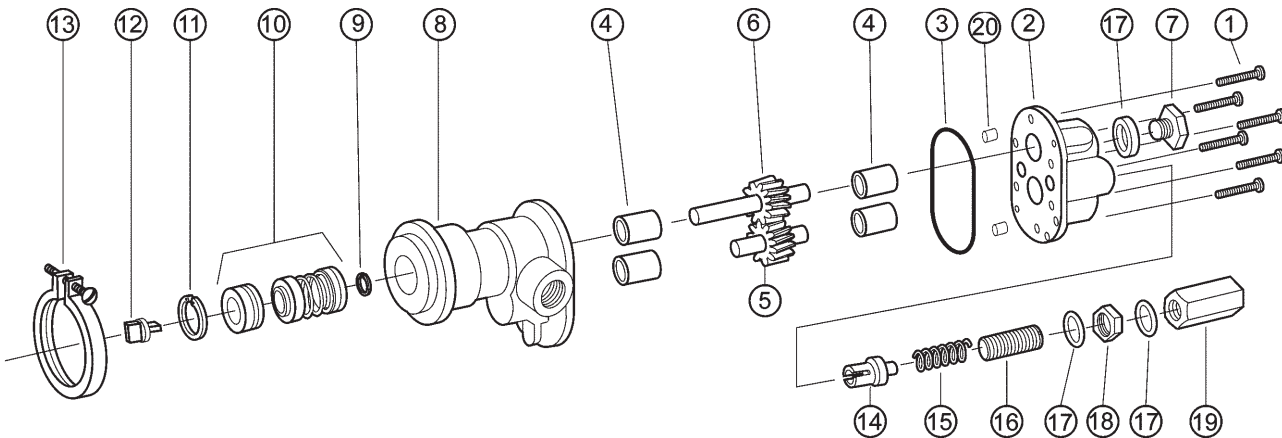


DIMENSIONS



Specifications are subject to change without notice.

EXPLODED VIEW AND PARTS LIST



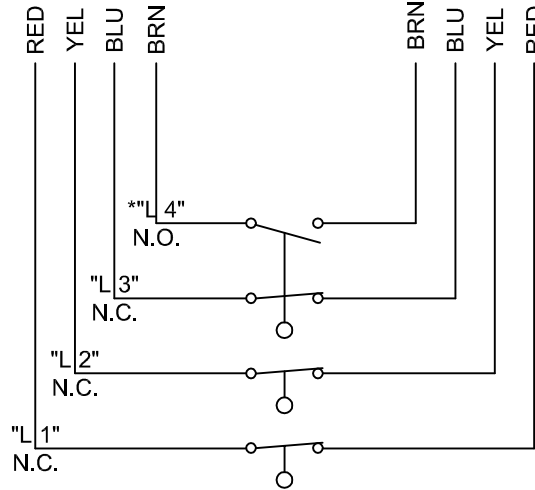
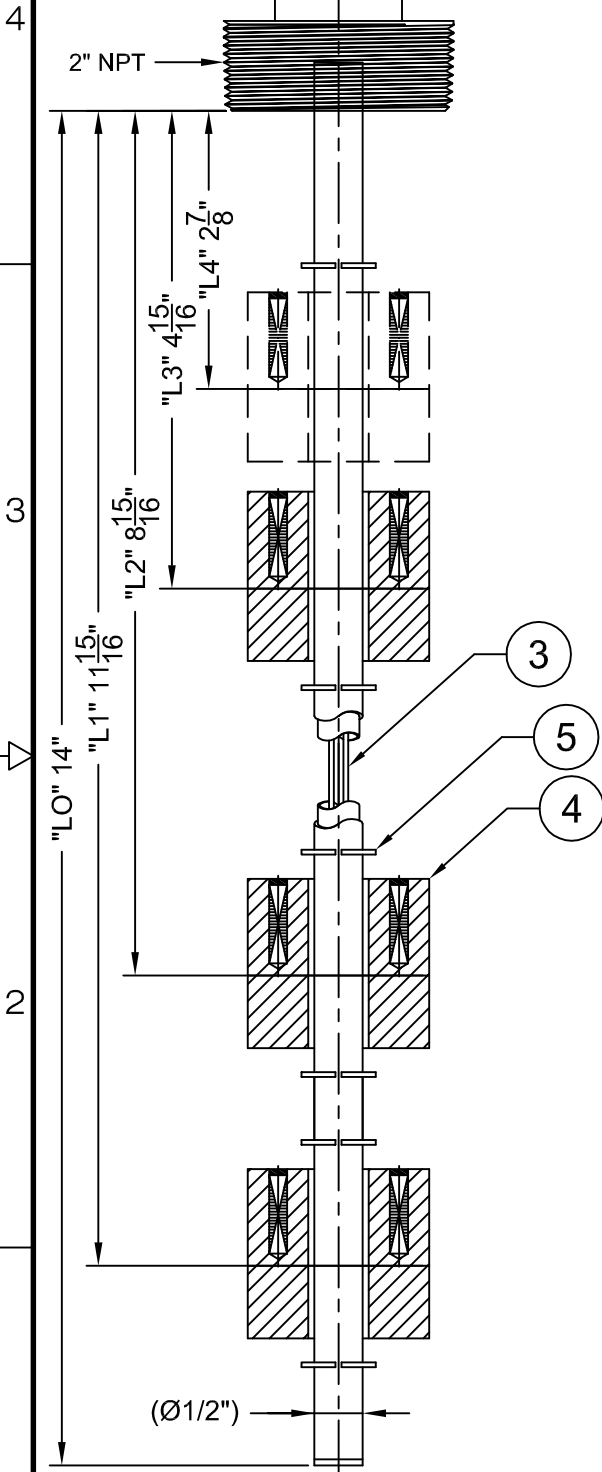
Pump Model	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Repair Kit ¹
	Screw	Cover	O-Ring	Bearing	Idle Gear Assy.	Drive Gear Assy.	Plug Nut	Body	Snap Ring	Seal	Snap Ring	Coupler	Clamp	Poppet/ Ball	Spring	Adjust. Screw	Fiber Washer	Lock Nut	Valve Nut	Dowel Pins	
N61K10G01 - Buna	5385	9314NN5N	9797-033	5024	32110	32663	---	9312NC2N	---	5007	---	9036	8840	---	---	---	---	---	---	8885	11626
N61K20G01 - Viton	5385	9314NN5N	9797-033	5024	32110	32663	---	9312NC2N	---	7580	---	9036	8840	---	---	---	---	---	---	8885	12112

¹ Repair Kit includes items 3,4,5,6,10 and 12

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OR IN PART TO ANYONE WITHOUT
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SOLUTIONS.

REVISION BLOCK				
REV.	E.C.N. NO.	DESCRIPTION	DATE	APPRVD.
00		INITIAL RELEASE	6/27/05	D.T.

(8) 24 AWG UL1061
PVC LEAD WIRES
24"-26" EXTENDED



WIRING DIAGRAM

"DRY" CIRCUITS

NOTES:

- 1.) WETTED MATERIALS:
STEM / MOUTING: BRASS
FLOAT: BUNA-N
RETAINING RING: BeCu
- 2.) TEMPERATURE LIMIT: 180°F MAX.
- 3.) PRESSURE LIMIT: 150 PSIG MAX.
- 4.) ELECTRICAL RATINGS:
4.1. SWITCHING VOLTAGE: 240V AC MAX.
4.2. SWITCHING CURRENT: 0.5 AMP MAX.
4.3. CONTACT RATING: 50VA MAX.
- 5.) MINIMUM SP. GR. : 0.57 S.G.
- 6.) ACTUATION LEVEL TOLERANCE ± 1/8" WITH
FLOAT OVER TRAVEL AT 3/16" TO 1/4" .
- 7.) FLOAT SUBMERGENCE 3/4" REF

5	6	0600-0500-0002	Ø1/2" RETAINING RING	BeCu
4	3	2010-1817-0011	Ø1-7/8" X 1-3/4" FLOAT	BUNA-N
3	1	5000C3377-0001	STEM / SWITCH ASSEMBLY	
ITEM	QTY	PART NUMBER	DESCRIPTION, CATALOG NO. OR FINISHED SIZE	MAT'L
UNLESS OTHERWISE SPECIFIED				
DIMENSIONS ARE IN INCHES, [] ARE IN MM (MILLIMETERS)		MAT'L PART #	DRAWN BY: RAS	DATE: 6/27/05
TOLERANCES: XX=.1 .XX=.01 .XXX=.005		TREAT TREAT	CHKD. BY: D.T.	DATE: 6/27/05
FRACTIONS = 1/64, ANGLES = 30°		FINISH	APPRVD. BY: D.T.	DATE: 6/27/05
MACHINED SURFACES: $\sqrt{63}$ RMS		PLATING	PROJECT NO.	SKETCH NO.
REMOVE ALL BURRS AND SHARP EDGES		MAT'L:	SIZE	FSCM NO.
NEXT ASSY.				DWG. NO. L500C3377-0001
				SCALE .750 SHEET 1 OF 100



**ROCHESTER
GAUGES, INC.**

ISO 9001 AND QS-9000 REGISTERED

Magnetic Liquid-Level Gauges

**6500
Series**

Magnetic Liquid-Level Gauges

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 ½" bolt circle [63,5mm] using four ¼"-28 x ¾" long screws. The gasket is Buna-N.

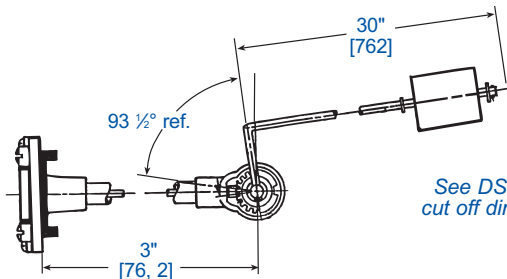


Model #	Action	Mounting	Dial, Sender or Switch Data
6540	Gear	Top	Senior™ TwinSite™ Sender in choice of 0-30, 0-90, or 240-30 Ohm ranges. #5002S00062 direct-reading dials may also be used.
6543		C/L or Angle	
L6543	Lever	C/L	
6550	Gear	Top	Standard switch #5023S00778 S.P.S.T., 150 VAC/50 VDC ½ Amp. Please 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		C/L or Angle	#5002S00547 Senior™ direct-reading fractional
L6583	Lever	C/L	#5002S00547 Senior™ direct-reading fractional
6583-00093	Gear	Top	#5002S00062 direct-reading fractional

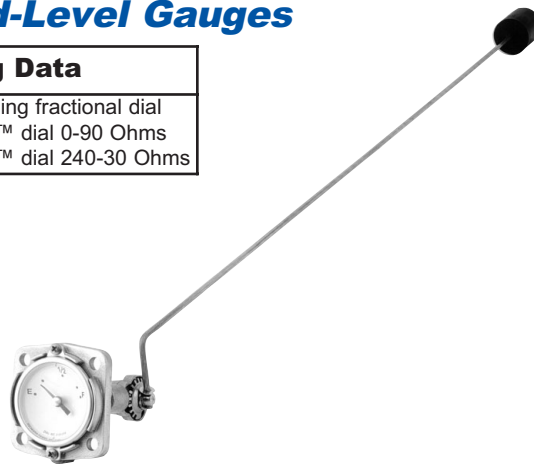
Top Mounting Adjustable Liquid-Level Gauges

Model #	Mounting	Dial or Sending Data
6580-0151	Top	<ul style="list-style-type: none"> #5002S01379 Senior direct-reading fractional dial #P5880S02547 Senior TwinSite™ dial 0-90 Ohms #P5648S02547 Senior TwinSite™ dial 240-30 Ohms

* Also available with 0-90 or 240-30 ohm sender.



See DS-337 for cut off dimensions



Adjustable 6580 Top Mount Gauge

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

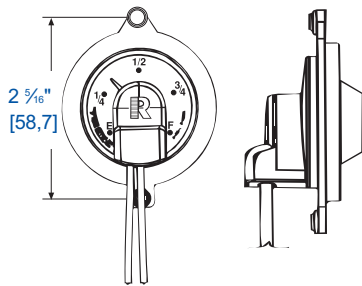
10/14/04

The Measure of Excellence

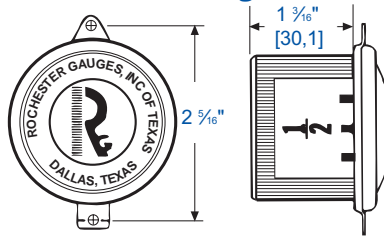
6500 Series

Magnetic Liquid-Level Gauges

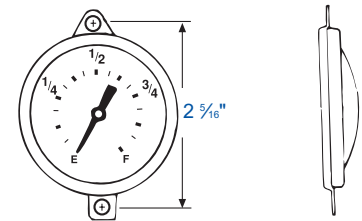
Sr. Twinsite Sender



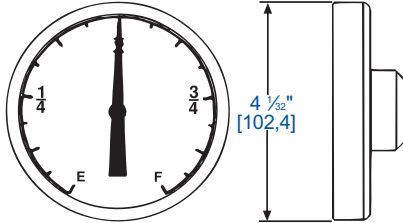
**# 5025S00570
Sr. Side-Reading Dial**



**# 5002S00062
Sr. Direct-Reading Dial**



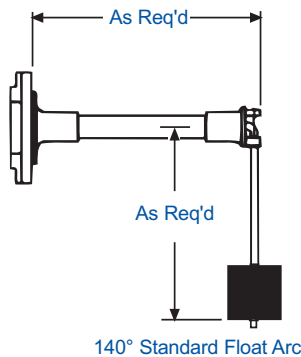
**# 5013S00456
Standard 4" Dial**



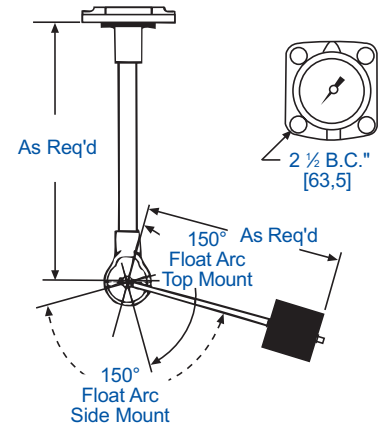
Note: This dial is used in conjunction with 93-2 mounting bracket and 39-2 bezel.

[METRIC]

Lever Action Gauge



Gear Action Gauge



General Specifications*

Accuracy

Accuracy depends on proper sizing of gauge and tank configuration. Normally, direct-reading dials are $\pm 3\%$; TwinSite™ senders are $\pm 7\%$. Vibration improves accuracy.

Temperature Range

-40F to +158°F, -40 to 70C

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 50 psig [3,4Bar]

Approvals

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

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 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

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.

Screws

Zinc-plated steel 1/4"-28 x 9/16" long.

* Materials and specifications are subject to change without notice.

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

Morrison Bros. Co.

2" Fig. 9095S

AST Overfill Prevention Valve

www.morbros.com

The ULC Listed Morrison Overfill Prevention Valve is designed for use on low profile aboveground storage tanks that require a high level shut-off. The valve terminates the fill when the product reaches the preset level. The valve can be retrofitted on existing tanks and fits into a 2" opening.

Features:

- The valve design allows for a full flow fill until it closes.
- The valve flow rate is 53GPM at 30PSI.
- 5 PSI & 5 GPM is the *minimum* flow requirement for valve operation at the *maximum* viscosity of 150 centistokes. The maximum operating pressure is 100PSI.
- Designed for fuel not requiring a drop tube.
- A field adjustable float allows the installer to set the desired shut-off point. The vertical float allows for installation in openings in proximity to the tank walls.
- The valve shut-off length is field adjustable from 2 to 12 inches.
- 2" 305C Locking Cap sold separately.

Now ULC
Listed!



The valve can be installed in various configurations on the tank:

- Installed directly onto the top of the tank without a spill container. A dry disconnect stops any type of spillage after the fill operation.
- Installed between a Morrison 517 Spill Container and the tank top.
- Installed inside a Morrison 2" 518 Spill Container.
- Installed directly into the tank top with 2" NPT piping going to a remote fill.

A tight fill connection is required for operation.

ID Number

9095S-0200 AV
9095S-0500 AV

Adaptor Number

800FSA1000 AA
9095A--0224 MA

Description

2" Part F Male Threaded
2" Part A Female Threaded

Weight

6.1 lbs
6.1 lbs



 Morrison Bros. Co.
Established 1855

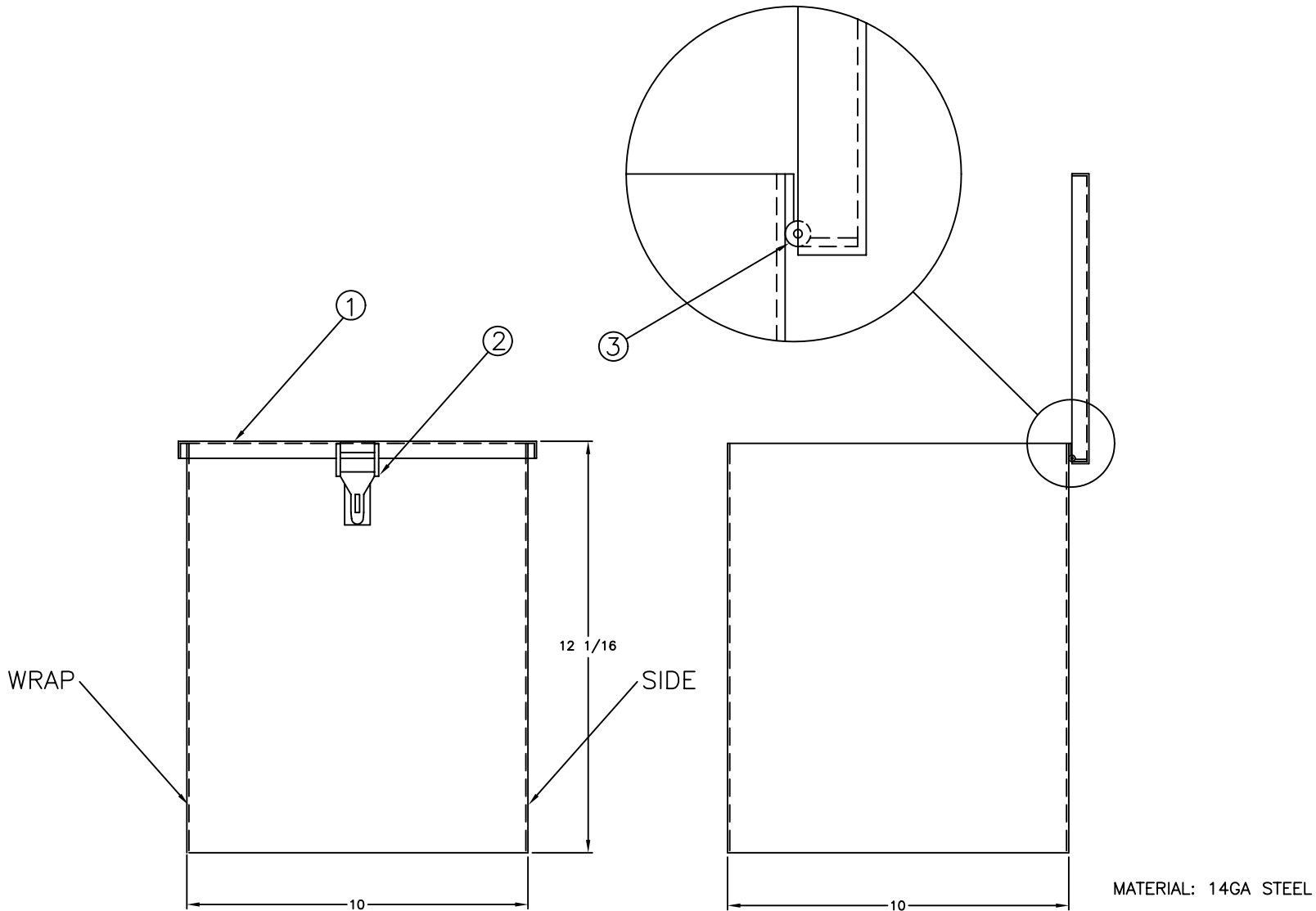
P.O. Box 238 • Dubuque, Iowa 52004-0238
563.583.5701 (tel) • 800.553.4840 • 563.583.5028 (fax)
www.morbros.com

JOB #

STANDARD SPILL CONTAINMENT ASS'Y
(5.1gal ACTUAL CAPACITY)

BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1	-	1	SPILL CONTAINMENT, STANDARD 5 GAL (WELD) - CUT
2	-	1	HASP
3	-	1	HINGE, PIANO



MATERIAL: 14GA STEEL

SPILL CONTAINMENT, STANDARD 5 GAL (WELD) - FAB

OPTION 8200

REVISIONS				REVISIONS			
REV	DATE:	CHANGE MADE	BY	REV	DATE:	CHANGE MADE	BY

DRAWING BY: JMB	DATE: 4/27/01
APPROVED BY:	DWG #: OPT 8200-FAB.dwg





CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NON-STRUCTURAL COMPONENTS AND SYSTEMS

CATERPILLAR has qualified the listed Diesel Engine Generator Set packages as CERTIFIED¹ for seismic application.

The basis of qualification is by shake table testing and analysis, in accordance with the following International Building Code² (IBC) releases.

IBC 2000, IBC 2003, IBC 2006, IBC 2009

The following model designations and bulleted options are included in this certification. A complete list of certified models, options, and installation methods are detailed in report number VMA-46783-01 as issued by The VMC Group.

Model Designation		Rating (kW)		EPA Rating	Open Genset	Steel Enclosure Option	Sub-base / Integral Fuel Tank Option Dual Wall (UL)
		Standby	Prime				
C 6.6 60 Hz	D125-6	125	114	Tier 3 / Stationary Emergency	Available	Weather Protective and Sound Attenuated	145-378 Gallon Capacity
	D150-8	150	135		Available		
	D175-2	175	158		Available		
C4.4 60 Hz	D40-6S	36	34	Tier 3 / Stationary Emergency	Available		
	D50-6S	37	35		Available		
	D40-6	40	36		Available		
	D60-8S	47	44		Available		
	D50-6	50	45		Available		
	D60-6	60	55		Available		
	D80-6S	60	57		Available		
	D100-6S	77	73		Available		
	D80-6	80	72		Available		
C2.2 60 Hz	D100-6	100	90	Tier 4	Available	Sound Attenuated	52-62 Gallon Capacity
	D20-6S	18	17		Available		
	D20-6	20	18		Available		
	D25-8S	21	20		Available		
	D30-8S	23	22		Available		
	D25-8	25	22.8		Available		
	D30-10	30	27		Available		
C1.5 60 Hz	D13-4S	12	11	Tier 4	Available		
	D13-4	13	12		Available		

This certification includes the open generator set and the enclosed generator set when installed with or without fuel tank. This certification also includes the sub-base tank as a stand-alone accessory. The generator set and included options must be a catalogue design and factory supplied. The generator set and applicable options must be installed and attached to the building structure per the manufacturer supplied seismic installation instructions. This certification excludes all non-factory supplied accessories, including but not limited to mufflers, isolation/restraint devices, remote control panels, remote radiators, pumps, and other electrical/mechanical components.

The above referenced equipment is APPROVED for seismic application when properly installed³ and used as intended. Lookup the interpolated project specific Design Spectral Response Acceleration at Short Periods, S_{DS} , value in the table below as it pertains to the applicable building code and Importance Factor, I_p , and compare to the allowed value. As limited by the tabulated values, below grade, grade, and roof-level installations, as well as installations in essential facilities and for life safety applications, both requiring post event functionality where $I_p=1.5$, are permitted and included in this certification.

This certification covers all applications that fall below the limitations in the chart below.

Genset without Tank		Genset with Tank	
IBC 2000/2003/2006/2009		IBC 2000/2003/2006/2009	
$S_{DS} \leq 2.5$	$S_{DS} \leq 1.25$	$S_{DS} \leq 1.93$	$S_{DS} \leq 0.95$
$I_p \leq 1.5$	$I_p \leq 1.5$	$I_p \leq 1.5$	$I_p \leq 1.5$
$z/h \leq 0.0$	$z/h \leq 1.0$	$z/h \leq 0.0$	$z/h \leq 1.0$

Soil Classes A, B, C, D, E, Seismic Use groups I, II, III, IV, and Seismic Design Categories A, B, C, D, E, and F are all covered under this certification, limited by the S_{DS} value stated above.



CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NON-STRUCTURAL COMPONENTS AND SYSTEMS

The basis of this certification is through successful tri-axis shake testing at the nationally recognized laboratory Qualtech NP, Cincinnati OH, under the witness of the Certified Seismic Qualification Agency, The VMC Group. Seismic shake table testing was conducted in accordance with ICC-ES AC-156 to envelope the required response spectrum (RRS) to maximum flexible region acceleration (A_{FLEX}) of 1.93g and a zero period acceleration (A_{RIG}) of 0.77g.

For calculations and analysis, the Seismic Design Acceleration, F_p/W_p ,⁴ was calculated as 2.9g for Load Resistance Factored Design (LRFD) methods, equivalent to 2.03g for Allowable Stress Design (ASD) methods. All calculations were conducted using ASD analysis methods. This included but was not limited to the skid anchoring requirements, external isolation calculations, internal isolator calculations, enclosure analysis, tank analysis, component stress analyses, and other component attachment calculations. The Seismic Design Acceleration, F_p/W_p , used for calculations and analysis, is defined per the building code (or respective design standard) for the section titled Seismic Design Requirements for Non-structural (architectural, mechanical, and electrical) Components.

Notes and Comments:

1. All equipment listed herein successfully passed the seismic acceptance criteria for shake testing non-structural components and systems as set forth in the ICC AC-156 (2007). The test response spectrum (TRS) enveloped the design response spectrum (DRS) for all units tested. The units cited in this certification were representative samples of a contingent of models and all remained captive and structurally sound after the seismic shake simulation. The units also remained functionally operational after the simulation testing as functional testing was completed by the equipment manufacturer before and after the seismic simulations. Although a seismic qualified unit inherently contains some wind resisting capacity, that capacity is undetermined and is excluded from this certification. Snow/Ice loads have been neglected and thus limit the unit to be installed both indoors (covered by an independent protective structure) and out of doors (exposed to accumulating snow/ice) for snow/ice loads no greater than 30 psf for all applications.
2. The following building codes are addressed under this certification:
 - IBC 2000 – referencing ASCE 7-98 and ICC AC-156
 - IBC 2003 – referencing ASCE 7-02 and ICC AC-156
 - IBC 2006 – referencing ASCE 7-05 and ICC AC-156
 - IBC 2009 – referencing ASCE 7-05 and ICC AC-156
3. Refer to the manufacturer supplied installation drawings for anchor or isolator installation locations and mounting hole size. Other installation details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads as defined on the installation drawings. The installing contractor is responsible for observing the installation requirements detailed in the seismic installation drawings and the proper installation of all anchors and mounting hardware.
4. When the site soil properties or final equipment installation location are not known, the soil site coefficient, F_A , defaults to the Soil Site Class D coefficient. Soil Classes A, B, C, D, E, Seismic Use groups I, II, III, IV, and Seismic Design Categories A, B, C, D, E, and F are all covered under this certification, limited by the S_{DS} values on page 1, respective to the applicable building code, Importance factor, and z/h ratio. A seismic importance factor, $I_p=1.5$, applies to this certification to include essential facility requirements and life safety applications for post event functionality.
5. For this certificate to remain valid, it must correspond to the "IBC Seismic Certification Decal" and Caterpillar BOM as found with the unit. This will confirm the unit was built in conformance to the IBC seismic design criteria as a selected Caterpillar order option.

Certification Issued By: The VMC Group
Document Control Number: VMA-46783-01C (Revision 2)

Issue Date: 07/22/2011
Expiration Date: 09/30/2013



John P. Giuliano, PE
President, The VMC Group

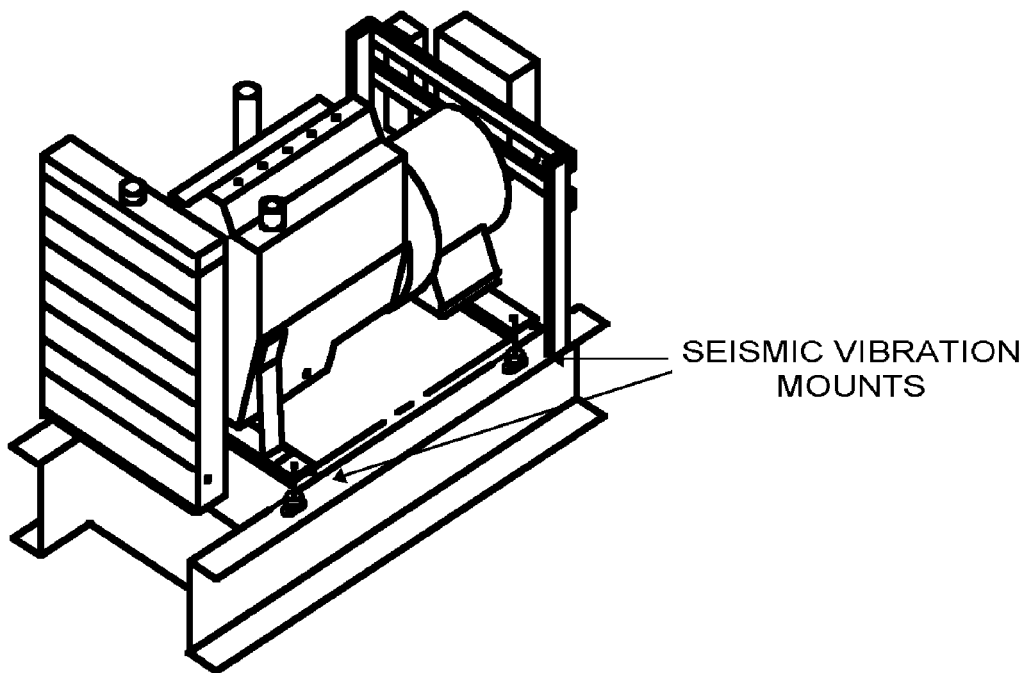
Steven W. Niehaus
Electric Power Product Manager
Caterpillar



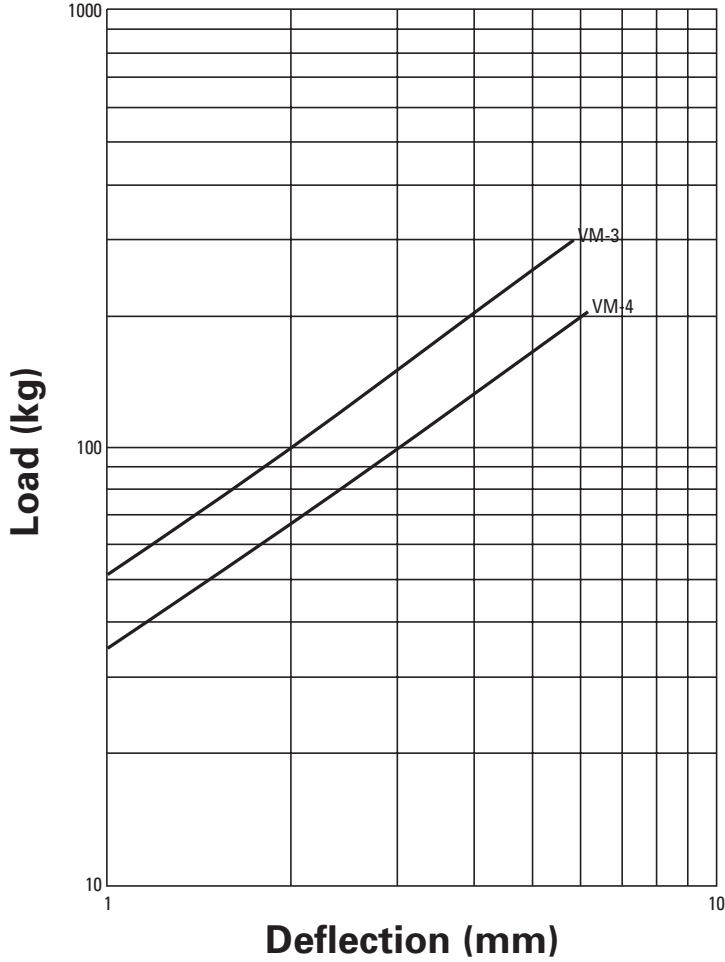
Sample isolator

VIB4 Seismic Vibration Isolators (Zone 4)

For regions where seismic tremors are experienced, this option can be used in place of the standard anti-vibration mounting arrangement. These seismic zone 4 vibration isolators are designed to withstand the high shear forces that can arise under such seismic activity as per the 1994 Uniform Building Code. Isolators are positioned between the engine/generator mounts and the generator set base frame. The vibration isolators are matched to ensure minimal oscillation levels during generator set operation.



Load vs Deflection



Diesel	
Engine Model	Vib-Mt
D25-6	VM-4
D25-6S	
D30-8	
D30-6S	
D40-4	VM-3
D40-4S	
D50-4	
D50-4S	
D60-4	
D60-6S	
D80-6	
D80-2S	
D100-6	
D100-6S	
D125-6	
D150-8	
D175-2	

Information contained in this publication may be considered confidential.

Discretion is recommended when distributing.

Materials and specifications are subject to change without notice.

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www.cat-electricpower.com

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Section 7
Startup and Testing



Power Systems Division

79 Robertson Blvd
Brewer, ME 04412
Tel: (207) 991.3127
Fax: (207) 991.3170

General Engine-Generation Installation Information and Guidelines

General

All connections must be flexible and self-supporting. No weight or strain may be applied to cast elbows.

All wiring must be a minimum of #14 THHN or equal. *Wiring must be stranded. Solid-core wire must not be used.*

The maximum allowable air temperature in the generator area is 125 F. Sufficient airflow through the engine area is required to dissipate heat from engine block radiation, generator radiation, and provide adequate combustion air. Engine roof louvers must not restrict airflow to an engine-mounted radiator by more than 1/2" of water column. As a rule of thumb, the air outlet "Free Air Area" must be 1.5x the radiator core area, and the air inlet "Free Air Area" must be 2x the radiator core area.

All fuel and water piping must be thoroughly flushed and cleaned *before final connections to the engine are made.*

Any fire protection devices must be set for high enough temperatures to compensate for ambient temperature rises caused by engine-generator heat radiation. Likewise, engine room ventilation control thermostats must be mounted unconventionally to allow accurate readings of the temperatures affecting engine operation.

For remotely mounted cooling systems only, all external piping systems must rise continuously to the surge tank of the remote radiator or heat exchanger system. Standard heating system *diaphragm-type surge tanks will not function properly in the engine jacket water circuit.* In cases where piping cannot rise, bleed lines to the riser must be installed where air traps occur.

Fuel Systems

Diesel Engines Only:

Two fuel lines are required from the main tank: one supply and one return. Fuel lines must be separately run from the main tank to each unit or day tank. *Boiler feed lines may not be tapped for engine fuel supplies or returns.* Some concessions may be made for high-pressure fuel manifolds. Each supply line must have a foot valve, and return lines must not be restricted in any way.

Diesel Engines with Day Tanks:

The bottom of the main fuel tank must be less than 15' below the inlet to the day tank pumps, and less than 200' away from the day tank. *The top of the main tank must be below the level of the engine fuel injectors.* If either of these poses a problem, additional design work will be required to accommodate the physical configuration.

Natural Gas Engines Only:

Low Pressure Gas Engines and Olympian generator sets require minimum gas pressure as indicated on the engine spec sheet. NG engines require one fuel supply line, as indicated on the installation drawing. For High Pressure Gas Engines consult your project manager for pressure requirements

Milford, MA 508.634.3400	Cranston, RI 401.946.6350	Warner, NH 603.746.4671	Scarborough, ME 207.883.9586	Clifton Park, NY 518.877.8000	Buffalo, NY 716.694.7200	Binghamton, NY 607.772.6500
Wareham, MA 508.291.1200	Hopkinton, NH 603.746.4611	Brewer, ME 207.989.1890	Richmond, VT 802.443.4228	Syracuse, NY 315.426.1358	Rochester, NY 585.475.1330	

Section 8
Documentation

Effective with sales to the first user on or after December 1, 2010

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 to Caterpillar Motoren (CM) product; engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; 3500 and 3600 Family 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 applications; or Cat batteries. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

Warranty Period

- For new industrial engines, engines in a petroleum applications or Petroleum Power Systems, 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 Mobile Agricultural applications the warranty period is 24 months after date of delivery to the first user.
- For controls only (EPIC), configurable, and custom switchgear products, as well as automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.
- For electric power generation products 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 Remanufactured Generator (GenEnds) products 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 Remanufactured engines, the warranty period is 6 months (12 months for mobile agricultural and standby electric power generation applications) 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.

(continue on the 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 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.

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.

For personal or family use engines or electric power generation products, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Cat dealer or other authorized repair facility, call (800) 447-4986. If you have questions concerning this warranty or its applications, call or write:

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

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

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED.

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, IF CATERPILLAR IS THE SUPPLIER TO THE USER, CATERPILLAR'S LIABILITY SHALL BE LIMITED AT ITS OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN, AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

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.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

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

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.

Section 9
Project Notes

Project Notes

Shipped Loose Items:

- Misc fuel system parts for remote supply/return lines.

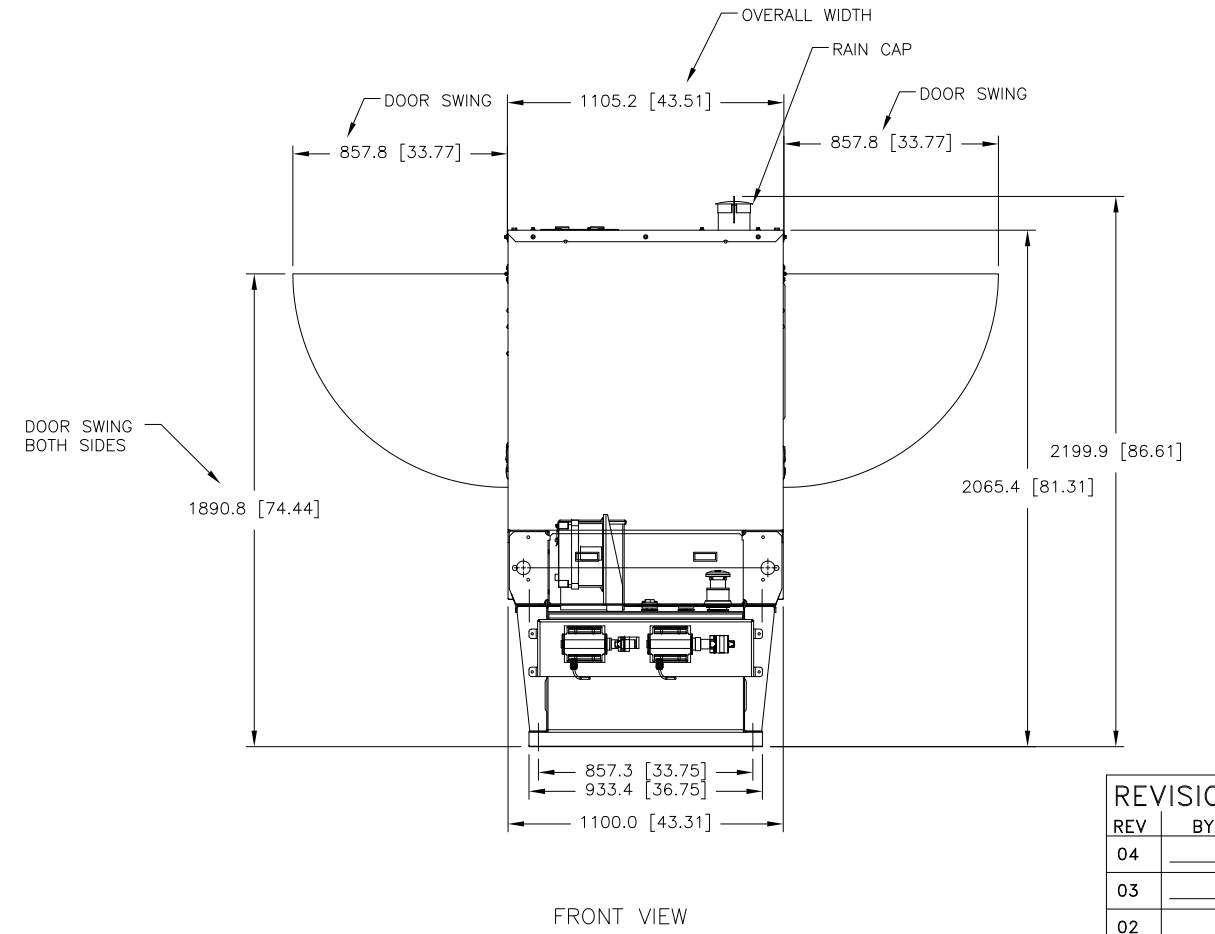
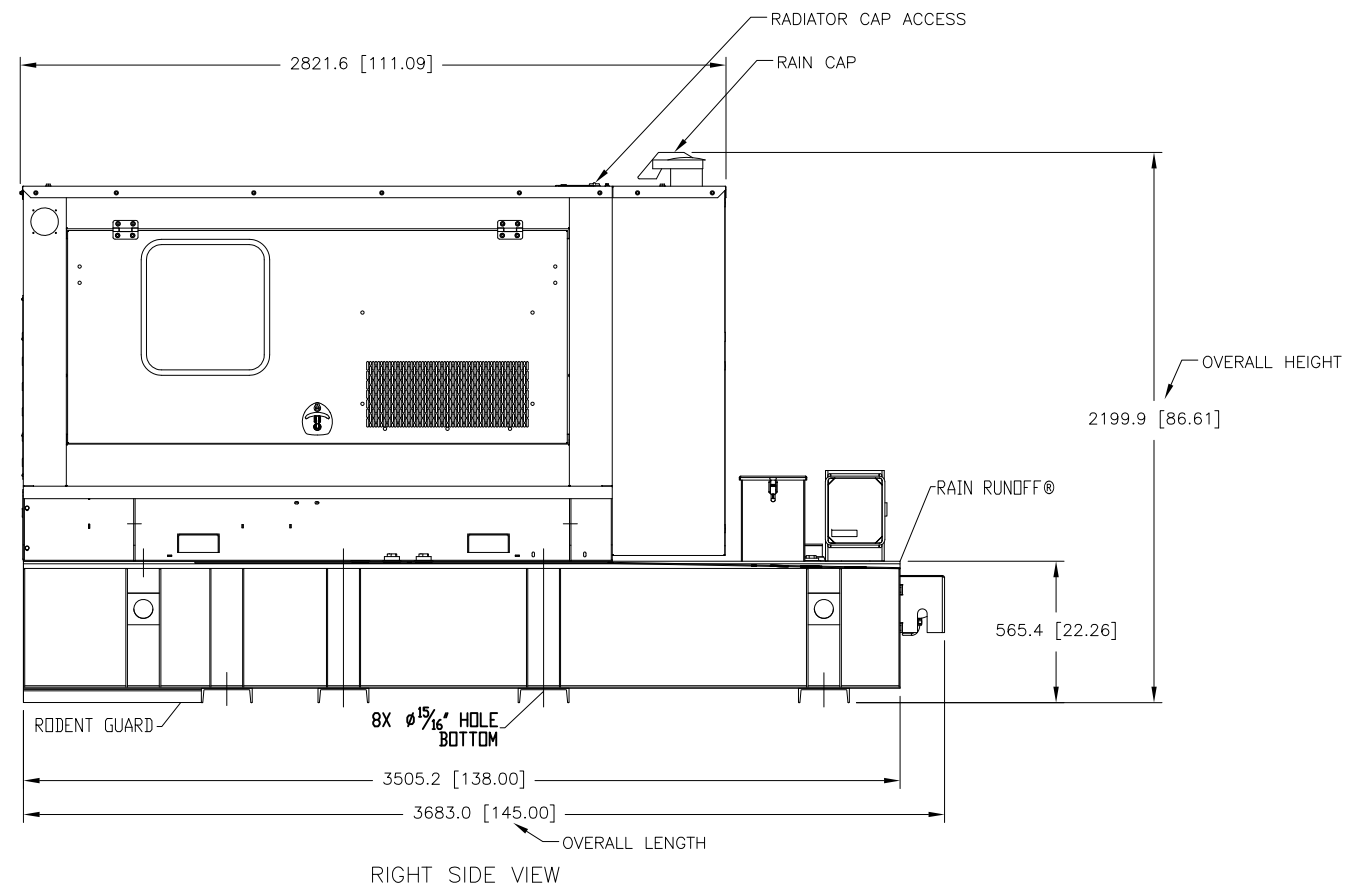
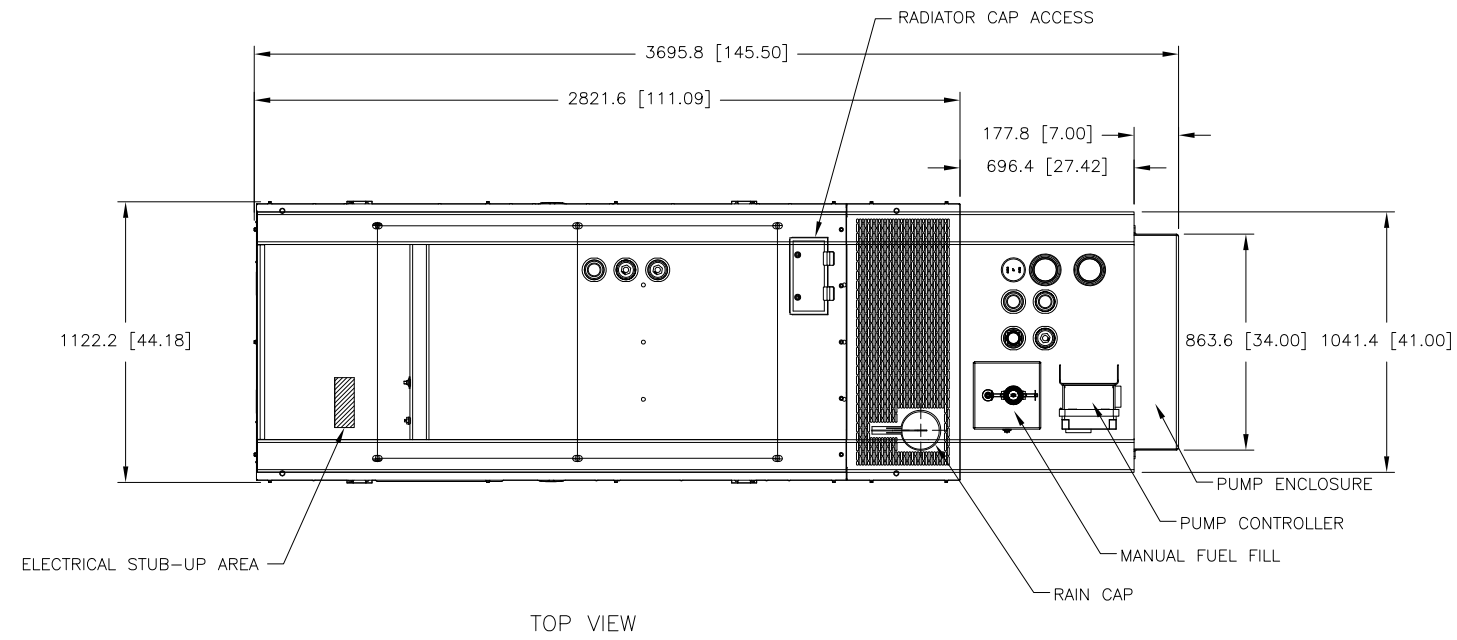
Electrical Wiring Requirements:

- 20A, 120VAC circuit to feed:
 - 120VAC Battery Charger
 - 120VAC/ 1000W Jacket Water Heater
 - (2) 120VAC / 125kW Alternator Strip Heaters
 - 120VAC / 80W Battery Heater
- Auto-Start Circuit
 - (2) 12AWG

Total Package Weight, Including Enclosure and Fuel Tank:

- 4,600 lbs

Section 10
Drawings

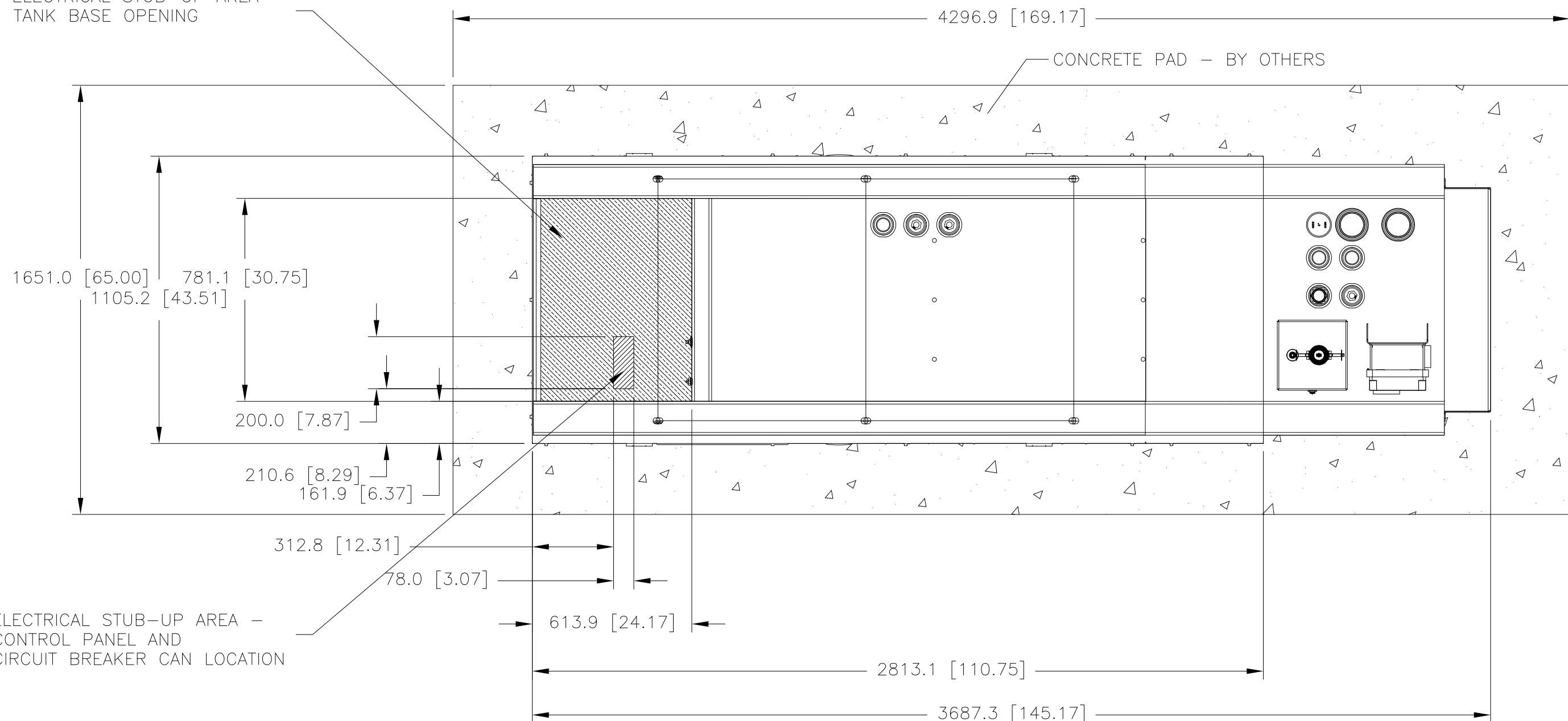


REV	BY	DATE
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00	Hans	04/29/13

DIMENSIONS WITHOUT ARROWHEADS ARE LOCATED FROM PARALLEL ZERO PLANE.

MILTON CAT POWER SYSTEMS DIVISION	D80-6 Sound Attenuated Enclosure with 156 Gallon Sub Base Day Tank	
	ALL DIMENSIONS IN INCHES	DRAWN BY: H. CHRISTENSEN
	NOT TO SCALE	CHECKED: H. CHRISTENSEN
	DATE: April 2013	APPROVED: H. CHRISTENSEN
	DWG No. WGAND80	SHEET 1 OF 1

ELECTRICAL STUB-UP AREA -
TANK BASE OPENING



ELECTRICAL STUB-UP AREA -
CONTROL PANEL AND
CIRCUIT BREAKER CAN LOCATION

Notes:

- Approx Generator Enclosure Footprint: 43.5" x 110.75"
- Approx Fuel Tank Footprint: 43.5" x 145.17"
- Approx Electrical Stub Area: Circuit Breaker & Control Wires: 3.07" x 7.87"
- Additional Clearances of 34" on sides for Door Access Required
- Approx Package Dry Weight: 4600lbs

REV	BY	DATE
04	_____	_____
03	_____	_____
02	_____	_____
01	_____	_____
00	Hans	04/29/13



D80-6 Sound Attenuated Enclosure with
156 Gallon Sub Base Day Tank - Pad Detail

ALL DIMENSIONS IN INCHES
NOT TO SCALE
DATE: April 2013
DWG No. WGAND80PAD

DRAWN BY: H. CHRISTENSEN
CHECKED: H. CHRISTENSEN
APPROVED: H. CHRISTENSEN
SHEET 1 OF 1

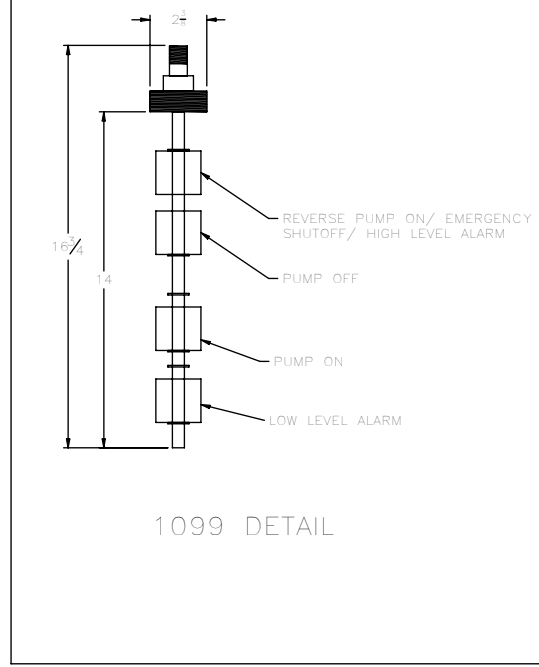
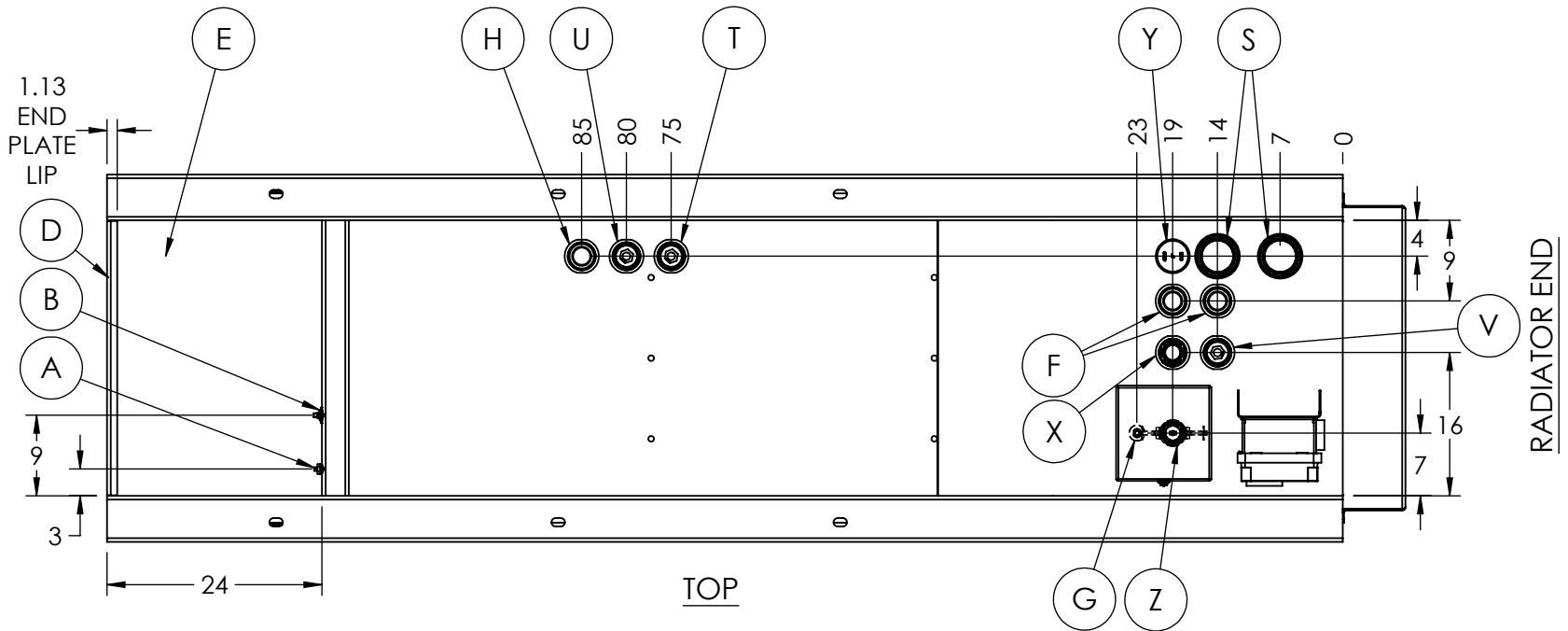
DIMENSIONS WITHOUT ARROWHEADS ARE
LOCATED FROM PARALLEL ZERO PLANE.

JOB #	TANK CAPACITY ACTUAL	TANK CAPACITY USEABLE	TANK WEIGHT	GENSET MODEL	GENSET FOOTPRINT
21373	173 GAL	156 GAL	1575 LBS	D80-6, CAE	40.95" X 92.72"

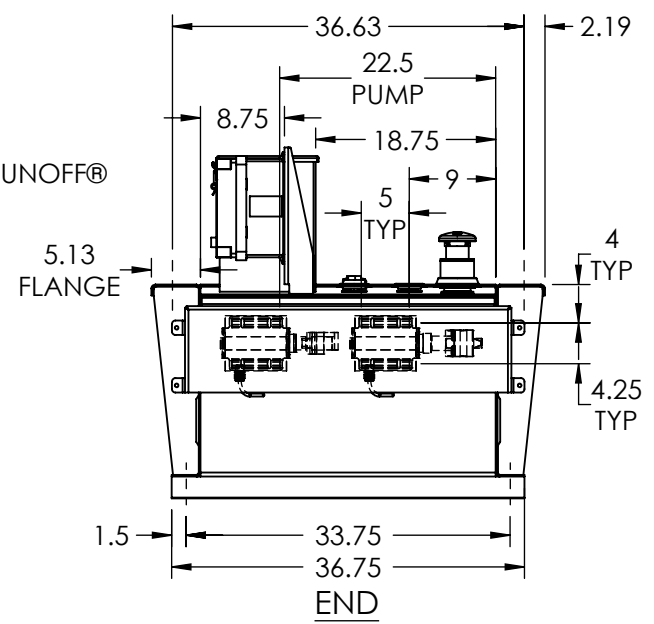
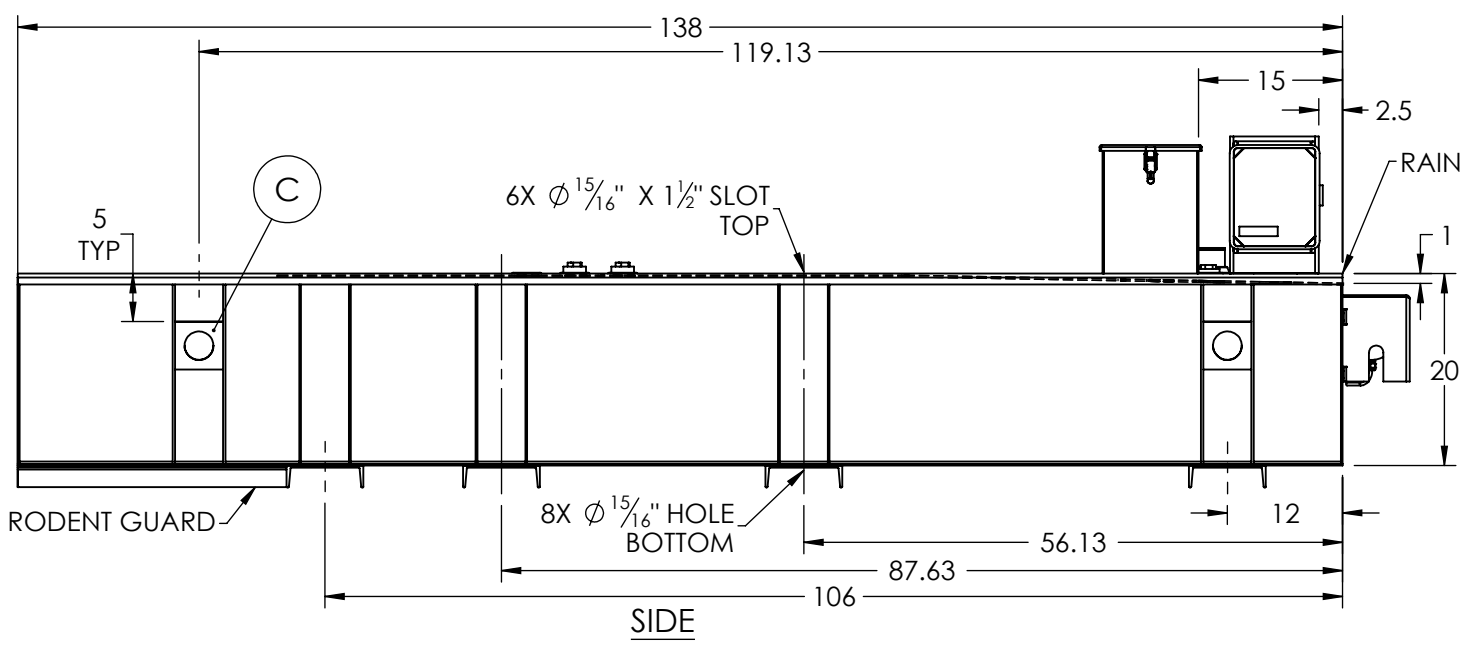
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APPROVED BY:	DATE:
--------------	-------

CENTER COUPLINGS IN TANK TOP AND WELD LEVEL



BILL OF MATERIALS			
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
S	3163	FLANGE, 3", EMERGENCY VENT	2
T	3650R	FLANGE, 2", FUEL RETURN W/ 1/2" DIP TUBE	1
U	3650S	FLANGE, 2", FUEL SUPPLY W/ 1/2" DIP TUBE	1
	700-1025	1/2" FUEL STRAINER (Y-STYLE)	1
	700-1065	1/2" SPRING CHECK VALVE	1
V	1099	F. COUPLING, 2", HIGH/LOW/PUMP ON/OFF FLOAT ASSEMBLY	1
X	1003	FLANGE, 2", FUEL LEVEL GAUGE	1
Y	3152	FLANGE, 2", PIPE, 5" LENGTH, TBE, STANDARD VENT	1
Z	3155-CB	H. COUPLING, 2", CLAY & BAILEY OVERFILL PREVENTION VALVE	1
	3010	2", PIPE, TBE, 8" LENGTH	1
	3350	2" FEMALE, SCULLY CONNECTOR	1
A	4306	FUEL IN BASIN ALARM	1
B	3502	FLANGE, 1/2", BASIN DRAIN	1
C	8410	1/4" FLUSH MOUNT LIFTING PLATE	4
D	8001	REMOVABLE END PLATE - 1-1/8" BEND	1
E	4000	24" STANDARD ELECTRICAL STUB UP W/ RODENT GUARD	1
F	3600	FLANGE, 2", ADDITIONAL 1/2" DIP TUBE	2
G	3190	FLANGE, 3/8", FITTING W/ PLUG	1
H	3195	FLANGE, 2", FITTING W/ PLUG	1
	8310	C8X11.5 C-CHANNEL BASIN SUPPORT	4
	8200	5 GALLON SPILL CONTAINMENT BOX	1
	1380	SINGLE W/ REVERSE SERIES 400 CONTROLLER (PORTS)	1
	2025	SINGLE SUPPLY PUMPING SYSTEM	1
	6020	1/3 HP CARBONATE MOTOR, SINGLE PHASE	1
		115/208-230V, 50/60HZ, 48YZ FRAME	
		BRONZE CLOSE COUPLED 2 GPM	1
		ROTARY GEAR PUMP 1/4" PORTS	
	2010	REVERSE PUMP SYSTEM	1
	6040	1/3 HP CARBONATE MOTOR, SINGLE PHASE	1
		115/208-230V, 50/60HZ, 48YZ FRAME	
		BRONZE CLOSE COUPLED 4 GPM	1
		ROTARY GEAR PUMP, 3/8" PORTS	
	700-1025	1/2" FUEL STRAINER (Y-STYLE)	2
	700-1065	1/2" SPRING CHECK VALVE	2
	700-1096	1/2" SOLENOID VALVE (120VAC, NC)	1
	6400	PUMP ENCLOSURE	1
	3520	RAIN RUNOFF® OPTION	1
DW-101		DOUBLE WALL SECONDARY CONTAINMENT	
BLACK		PAINT COLOR	

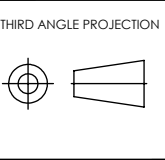


REV.	DESCRIPTION	DATE	BY



GLOBAL POWER COMPONENTS
 6682 W. GREENFIELD AVE
 WEST ALLIS, WI 53214
 PH (414)475-3000 FAX (414) 475-3441
 www.globalpowercomponents.com

Underwriters Laboratories Inc. Listed
 MH18481
 FILE NO. MH46743
 MH25279



CUSTOMER NAME:
MILTON CAT POWER SYSTEMS
 JOB REFERENCE:
WGAN RADIO / FEMA
 DRAWING REFERENCE:
X

DATE
4/22/2013
 DRAWN BY
JRS

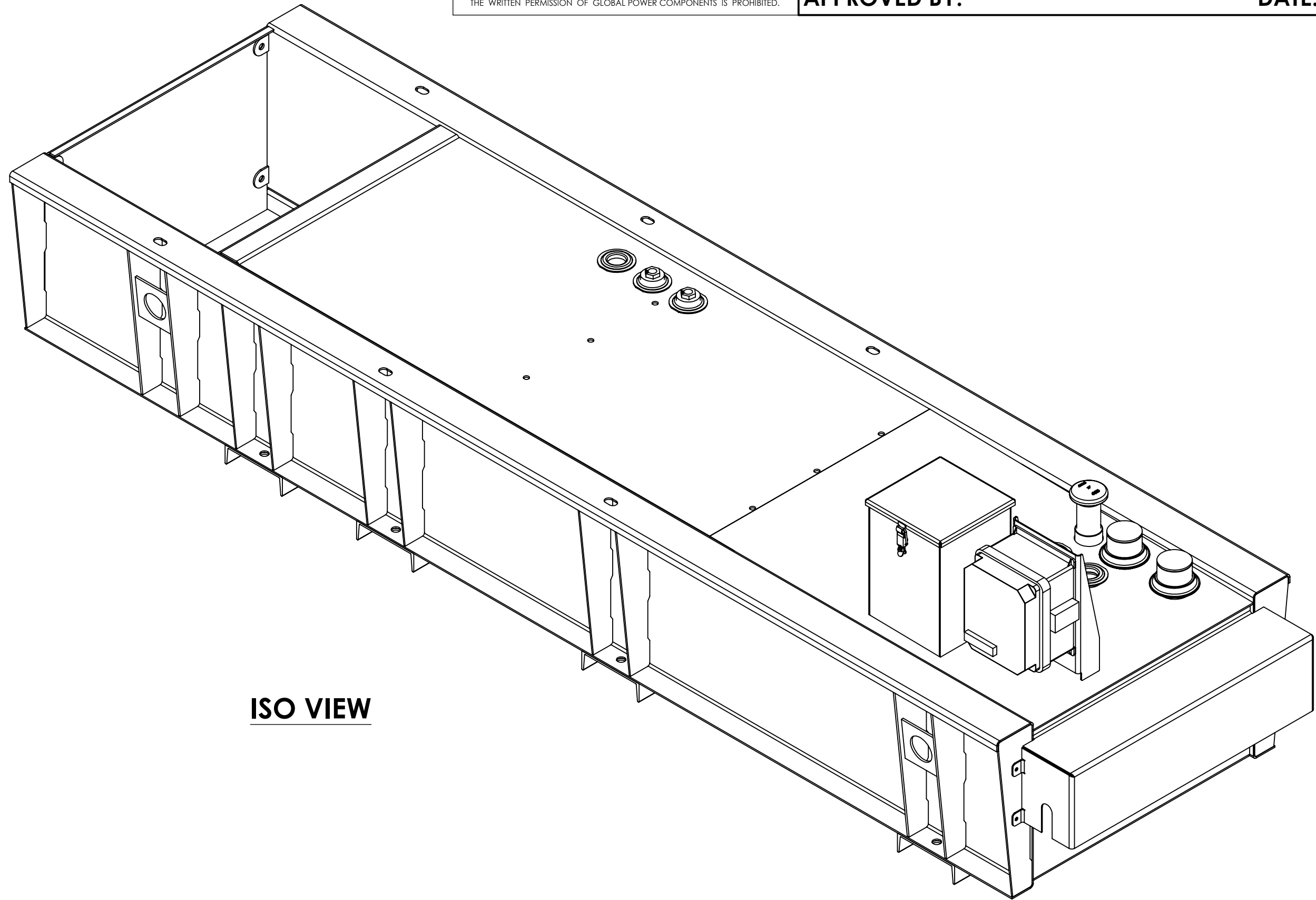
DESCRIPTION SUBBASE TANK WITH RUPTURE BASIN & STUB UP		REV.
SIZE B	DWG. NO. 15-21373	SHEET 2 OF 7
SCALE: 1:20		

JOB #
21373

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APPROVED BY:

DATE:



ISO VIEW



GLOBAL POWER COMPONENTS
6682 W. GREENFIELD AVE
WEST ALLIS, WI 53214
PH (414)475-3000 FAX (414) 475-3441
www.globalpowercomponents.com

Underwriters
Laboratories[®] Inc.
Listed
MH18481
FILE NO. MH46743
MH25279
THE TOLERANCES ARE:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ONE PLACE .XX ± .1
TWO PLACE .XXX ± .05
ANGLE ± 2°
HOLE DIA. ± .005

THIRD ANGLE PROJECTION

CUSTOMER NAME:
MILTON CAT POWER SYSTEMS
JOB REFERENCE:
WGAN RADIO / FEMA
DRAWING REFERENCE:
X

DATE	4/22/2013
DRAWN BY	JRS

DESCRIPTION	SUBBASE TANK WITH RUPTURE BASIN	
SIZE	B	DWG. NO.
SCALE: 1:10	15-21373	REV.
		SHEET 3 OF 7

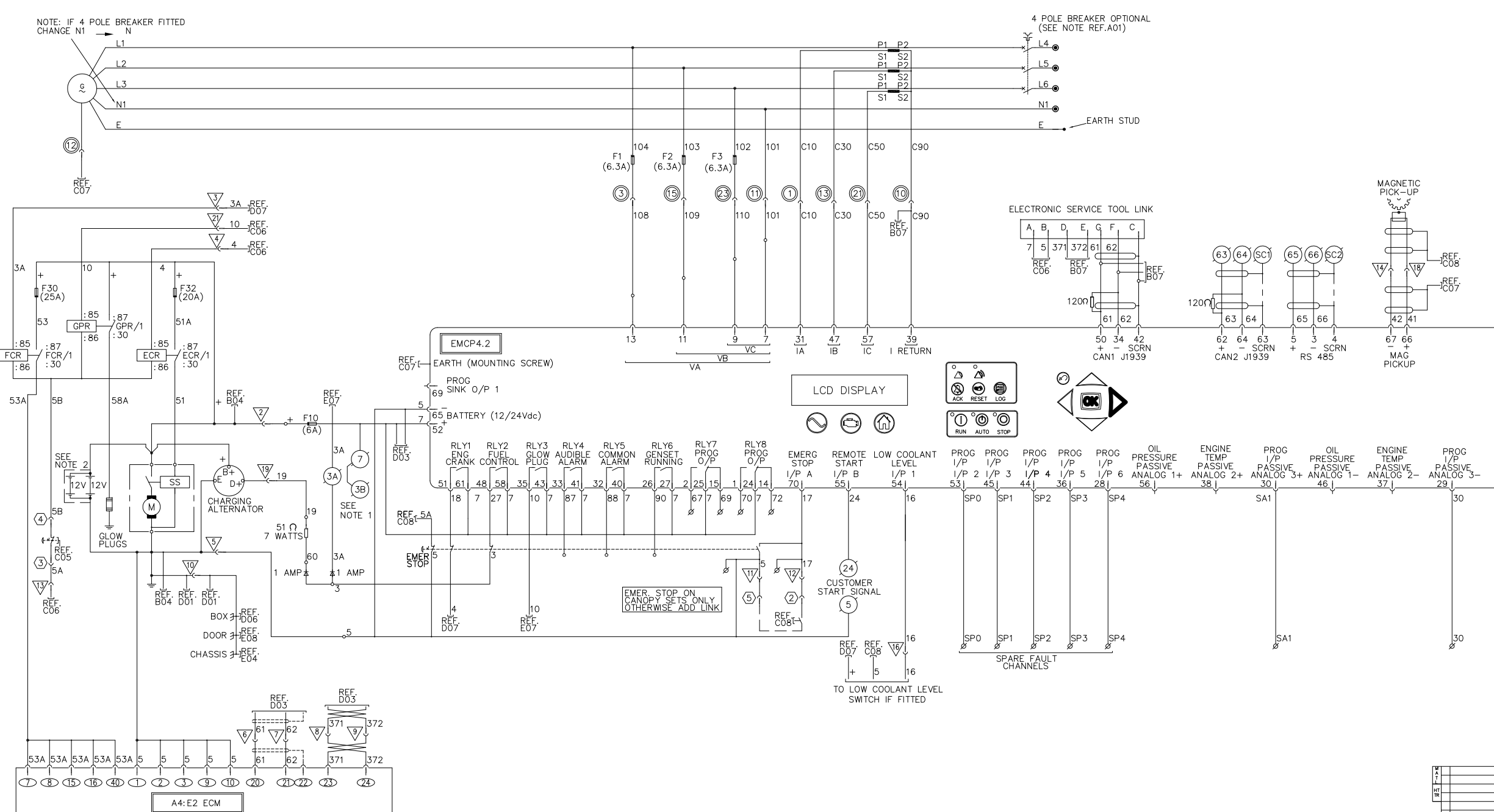
ABBREVIATIONS

A.V.R.	AUTOMATIC VOLTAGE REGULATOR
AC	ALTERNATING CURRENT
DC	DIRECT CURRENT
SRN	SCREEN FROM SCREEN CABLE
RLY	RELAY
I/P	INPUT
ALR	ALARM RELAY
GRR	GENERATOR RUN RELAY
FCS	FUEL CONTROL SOLENOID
FCR	FUEL CONTROL RELAY
ECR	ENGINE CRANK RELAY
GPR	GLOW PLUG RELAY

SYMBOLS

	FUSE		CUSTOMER TERMINAL
	EMERGENCY STOP PUSHBUTTON		INTERNAL PANEL TERMINAL
	RELAY COIL		OUTGOING/INCOMING PANEL TERMINAL
	SCREEN CABLE		CONTROLLER 70-WAY CONNECTOR
	DIODE		ENGINE SOCKET
	RELAY CONTACT N/O		POWER TERMINAL
	EARTH		INTERNAL AC TERMINAL BLOCK
	CIRCUIT BREAKER		GENERATOR SOCKET
	RESISTOR		CANOPY E-STOP SOCKET
	CURRENT TRANSFORMER		ECM SOCKET
	BUZZER / SIREN		
	SOLENOID		

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1E0198R LETTERS 1E0013Y CONFIDENTIALITY 1E2733 DRAWING - AUTOCAD 1E0011 INTPR & TOL SPEC NO. NAME DRN J.HITCHCOX CHK C.MCILROY APPR W.SMYTH DESIGNED BY EXP. PREP. PROJ. PROX. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN mm DIMENSIONS W/O TOL ARE BASIC SCALE NONE THIRD ANGLE PROJECTION SHEET 2 OF 2 00 05JUL11 DATE CATERPILLAR INC. THE INFORMATION HEREON IS THE PROPERTY OF CATERPILLAR INC. AND/OR ITS SUBSIDIARIES. WITHOUT WRITTEN PERMISSION, ANY COPYING, TRANSMISSION, TO OTHERS, AND ANY USE EXCEPT THAT FOR WHICH IT IS ISSUED, IS PROHIBITED. DIAGRAM - WIRING (EMCP 4.2 3P4W ELEC) (C6.6) 373-6509 DES. CONTROL. W599 DK SUB 11					



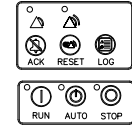
NOTE: IF 4 POLE BREAKER FITTED CHANGE N1 → N

4 POLE BREAKER OPTIONAL (SEE NOTE REF.A01)

ELECTRONIC SERVICE TOOL LINK

MAGNETIC PICK-UP

LCD DISPLAY



EMER STOP ON CANOPY SETS ONLY OTHERWISE ADD LINK

TO LOW COOLANT LEVEL SWITCH IF FITTED

NOTE 1: LINK TERMINALS 7 & 3B FOR NORMAL OPERATION WITH THE SERVICE TOOL

LINK TERMINALS 7 & 3A FOR COMMUNICATION WITH THE SERVICE TOOL

GENSET MUST NOT BE STARTED WITH 7 & 3A LINKED

NOTE 2: FIT SECOND BATTERY IN PARALLEL ONLY FOR C6.6 TAG4

1	TE0198R	LETTERS
2	TE0013Y	CONFIDENTIALITY
3	TE2733	DRAWING - AUTOCAD
4	TE0011	INTPR & TOL
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1E0198R LETTERS
 1E0013Y CONFIDENTIALITY
 1E2733 DRAWING - AUTOCAD
 1E0011 INTPR & TOL

SPEC NO. NAME
 DRN J.HITCHCOX
 CHK C.MCILLROY
 APPR W.S.MYTH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCH DIMENSIONS W/O TOL ARE BASIC

SCALE NONE
 1" = 1" (1:1)
 SHEET 1 OF 2

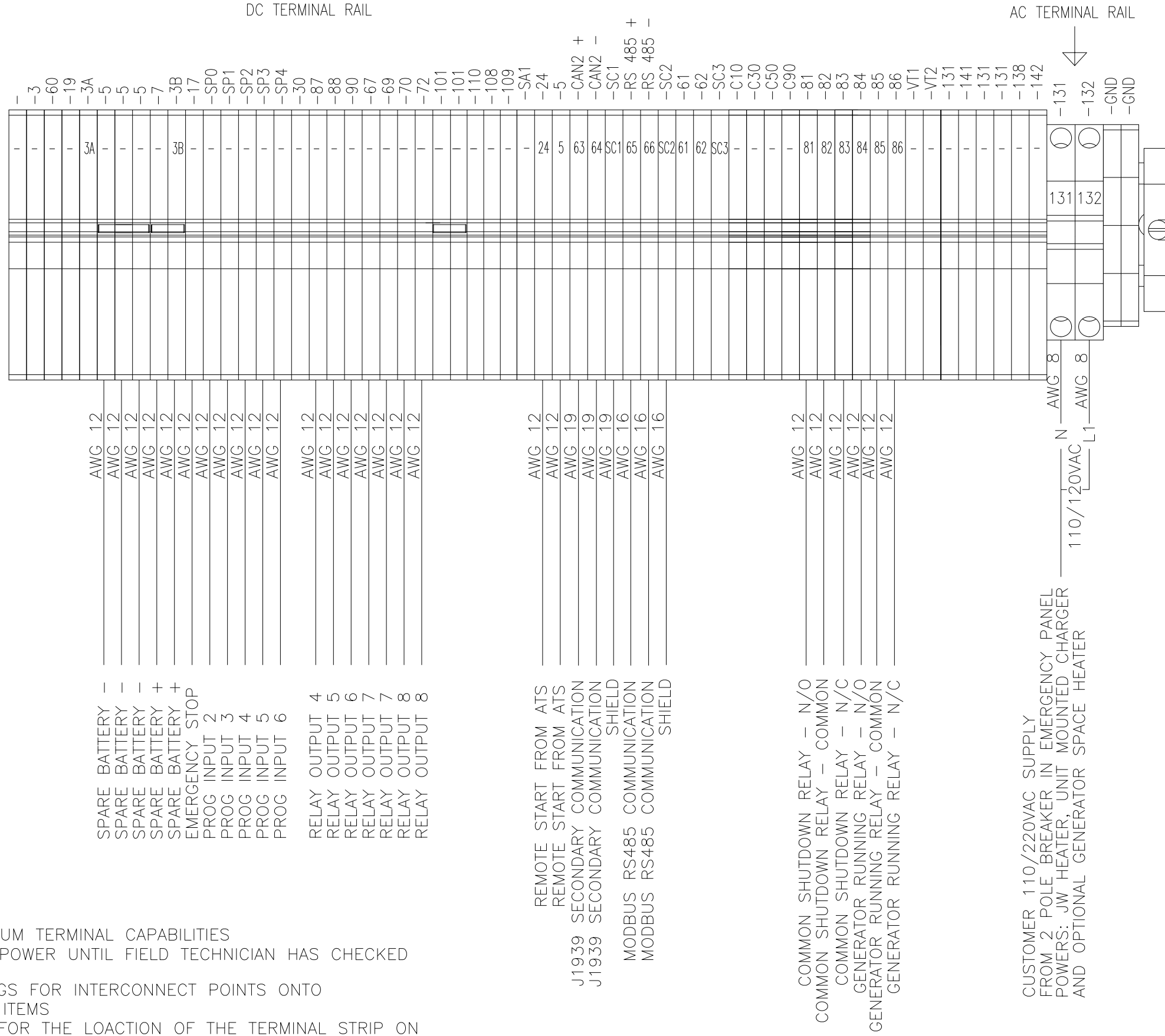
00 05JUL11
 CHK DATE

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DIAGRAM-WIRING
 (EMCP 4.2 3P4W ELEC) (C6.6)
 373-6509

DESIGNER: W599
 CHECKER: []
 SUBMITTER: []

WIRE IDENT:-



NOTES:

WIRE SIZES ARE MAXIMUM TERMINAL CAPABILITIES

DO NOT TURN ON AC POWER UNTIL FIELD TECHNICIAN HAS CHECKED WIRING

SEE SEPERATE DRAWINGS FOR INTERCONNECT POINTS ONTO

OPTIONAL SHIP LOOSE ITEMS

SEE SEPERATE SHEET FOR THE LOACTION OF THE TERMINAL STRIP ON GENSET

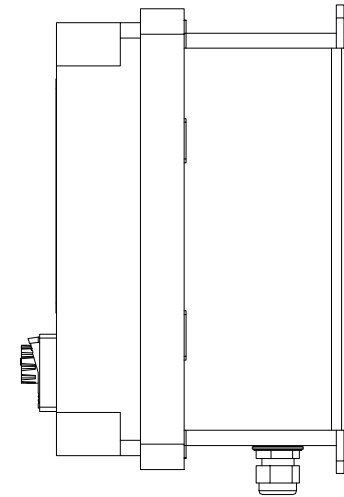
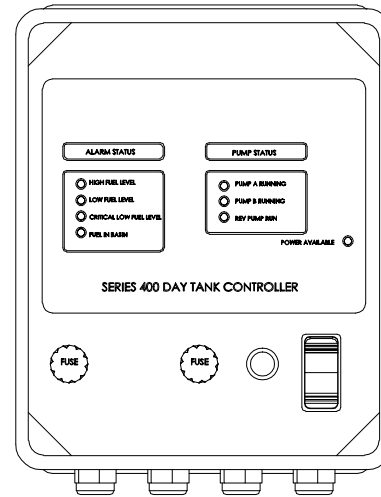
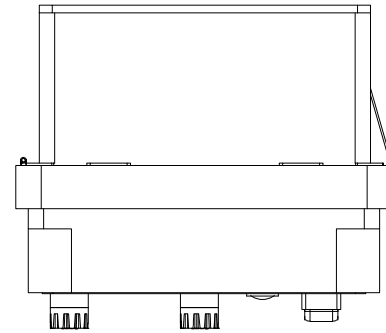
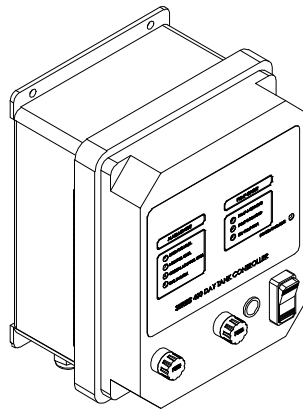
DIMENSIONS WITHOUT ARROWHEADS ARE LOCATED FROM PARALLEL ZERO PLANE.

REV	BY	DATE
04	_____	_____
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02	_____	_____
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00	_____	_____

<p>POWER SYSTEMS DIVISION</p>	Compact Product EMCP 4.2 Control Panel MILTON-CAT POWER SYSTEMS	
	ALL DIMENSIONS IN INCHES	DRAWN BY: H. CHRISTENSEN
	NOT TO SCALE	CHECKED: H. CHRISTENSEN
	DATE: June 2012	APPROVED: H. CHRISTENSEN
	DWG No. EMCP42TB	SHEET 1 OF 1

SERIES 400 CONTROLLER

SINGLE WITH REVERSE PUMP

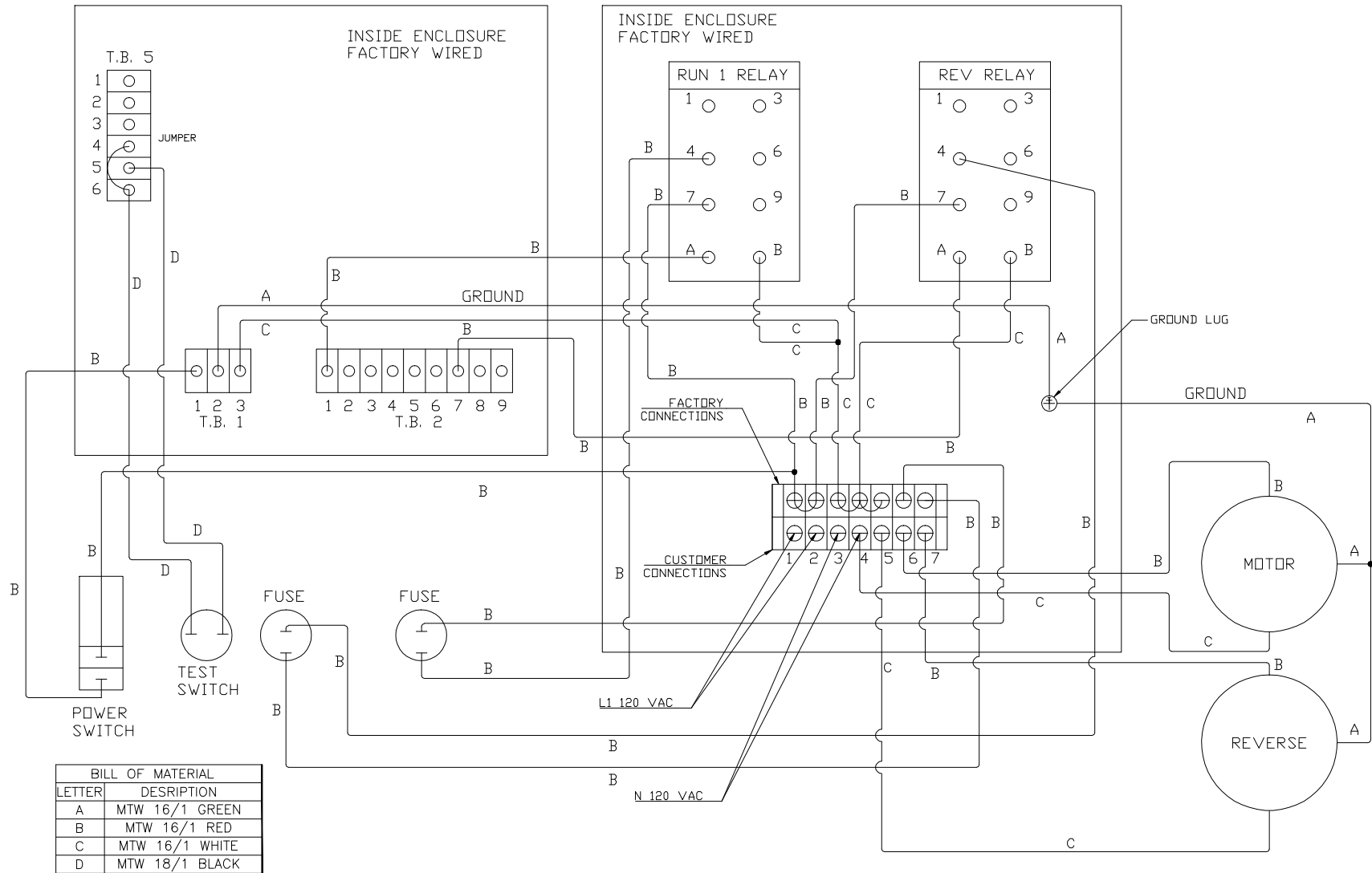


REVISIONS				GLOBAL POWER COMPONENTS	
REV	DATE	CHANGE	BY		
				MODEL: SERIES 400 CONTROLLER	
				SINGLE W/ REVERSE PUMP/MOTOR SYSTEM	
				DRAWING NUMBER : S/R-001	
				DRAWN BY: DV	PAGE: 1 OF 4
				SCALE: N/A	3/25/09



SERIES 400 CONTROLLER		
SALES	ENG.	

SINGLE WITH REVERSE PUMP WIRING DIAGRAM



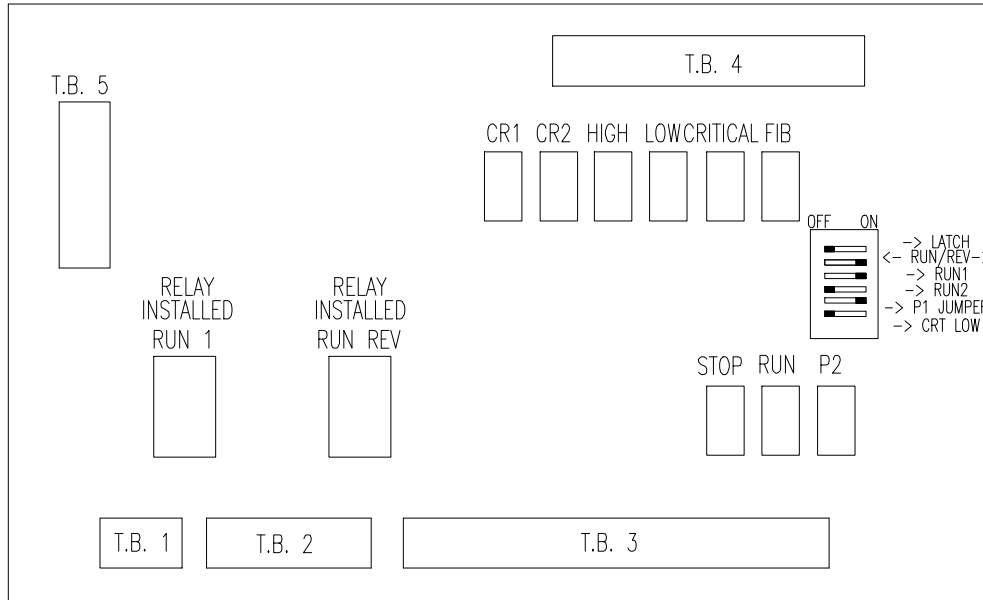
BILL OF MATERIAL	
LETTER	DESCRIPTION
A	MTW 16/1 GREEN
B	MTW 16/1 RED
C	MTW 16/1 WHITE
D	MTW 18/1 BLACK

REVISIONS				GLOBAL POWER COMPONENTS	
REV	DATE	CHANGE	BY	MODEL: SERIES 400 CONTROLLER	
				SINGLE W/ REVERSE PUMP/MOTOR SYSTEM	
				DRAWING NUMBER : S/R-002	
				DRAWN BY: DV	PAGE: 2 OF 4
				SCALE: N/A	3/25/09



SERIES 400 CONTROLLER	
SALES	ENG.

SINGLE WITH REVERSE PUMP/MOTOR



REAR VIEW - DAY TANK CONTROLLER CIRCUIT BOARD

CIRCUIT BOARD CONNECTIONS

T.B. 1	1	120 VAC POWER INPUT (FACTORY CONNECTION)
	2	GROUND (FACTORY CONNECTION)
	3	120 VAC NEUTRAL (FACTORY CONNECTION)
T.B. 2	1	PUMP #1 120 VAC POWER OUTPUT (FACTORY CONNECTION)
	2	
	3	
	4	
	5	
	6	
	7	REVERSE PUMP - 120 VAC POWER OUTPUT (FACTORY CONNECTION)
	8	
	9	

T.B. 3	1	
	2	
	3	HIGH FUEL LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	4	HIGH FUEL LEVEL SWITCH (FACTORY CONNECTION)
	5	PUMP OFF LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	6	PUMP OFF LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	7	PUMP ON LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	8	PUMP ON LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	9	LAG PUMP ON FLOAT SWITCH (FACTORY CONNECTION)
	10	LAG PUMP ON FLOAT SWITCH (FACTORY CONNECTION)
	11	LOW FUEL LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	12	LOW FUEL LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	13	CRITICAL LOW FUEL LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	14	CRITICAL LOW FUEL LEVEL FLOAT SWITCH (FACTORY CONNECTION)
	15	FUEL IN BASIN FLOAT SWITCH (FACTORY CONNECTION)
	16	FUEL IN BASIN FLOAT SWITCH (FACTORY CONNECTION)
T.B. 4	1	FUEL IN BASIN N.O. ALARM CONTACT (CUSTOMER CONNECTION)
	2	FUEL IN BASIN N.C. ALARM CONTACT (CUSTOMER CONNECTION)
	3	FUEL IN BASIN COMMON ALARM CONTACT (CUSTOMER CONNECTION)
	4	CRITICAL LOW FUEL LEVEL N.O. ALARM CONTACT (CUSTOMER CONNECTION)
	5	CRITICAL LOW FUEL LEVEL N.C. ALARM CONTACT (CUSTOMER CONNECTION)
	6	CRITICAL LOW FUEL LEVEL COMMON ALARM (CUSTOMER CONNECTION)
	7	LOW FUEL LEVEL N.O. ALARM CONTACT (CUSTOMER CONNECTION)
	8	LOW FUEL LEVEL N.C. ALARM CONTACT (CUSTOMER CONNECTION)
	9	LOW FUEL LEVEL COMMON ALARM (CUSTOMER CONNECTION)
	10	HIGH FUEL LEVEL N.O. ALARM CONTACT (CUSTOMER CONNECTION)
	11	HIGH FUEL LEVEL N.C. ALARM CONTACT (CUSTOMER CONNECTION)
	12	HIGH FUEL LEVEL COMMON ALARM CONTACT (CUSTOMER CONNECTION)
T.B. 5	1	
	2	
	3	
	4	(+12 VDC) TO POWER SWITCH (FACTORY CONNECTION)
	5	(TEST) TO POWER SWITCH (FACTORY CONNECTION)
	6	(+VDC) TO POWER SWITCH (FACTORY CONNECTION)

- NOTES:
- ALL CONNECTIONS ARE NOT APPLICABLE FOR EVERY UNIT ONLY ORDERED OPTIONS WILL BE PROVIDED FOR CONNECTION
 - DIP SWITCH SETTINGS FOR SINGLE REVERSE SYSTEM
LATCH-OFF RUN/REV-ON RUN1-ON RUN2-OFF P1JUMPER-ON CRTLOW-OFF

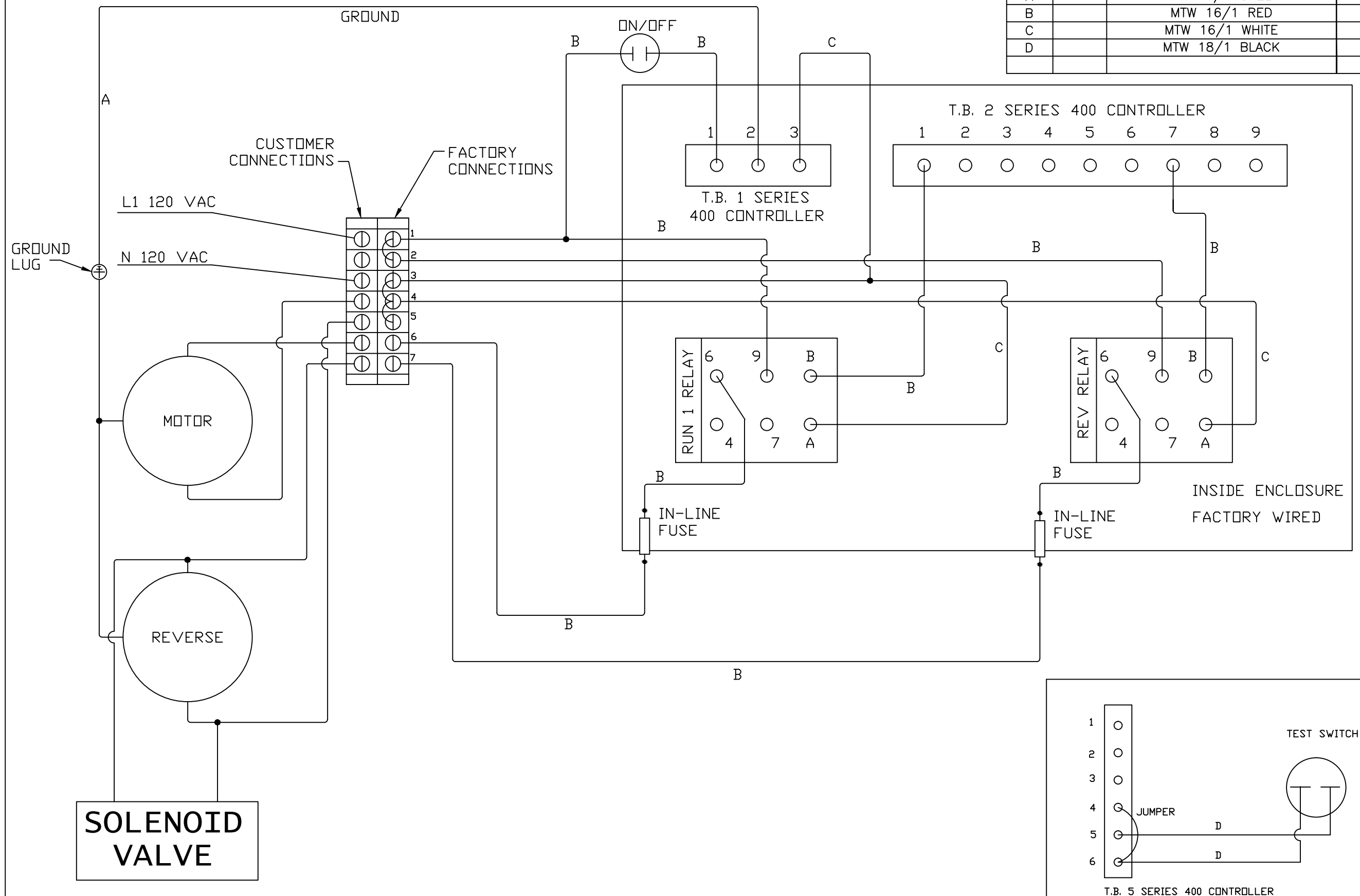
REVISIONS				GLOBAL POWER COMPONENTS	
REV	DATE	CHANGE	BY	MODEL: SERIES 400 CONTROLLER	
				SINGLE W/REVERSE PUMP/MOTOR SYSTEM	
				DRAWING NUMBER: S/R-003	
				DV	PAGE: 3 OF 4
				SCALE: N/A	03/25/09



SERIES 400 CONTROLLER		
SALES	ENG.	

SINGLE W/ REVERSE PUMP/MOTOR/SOLENOID

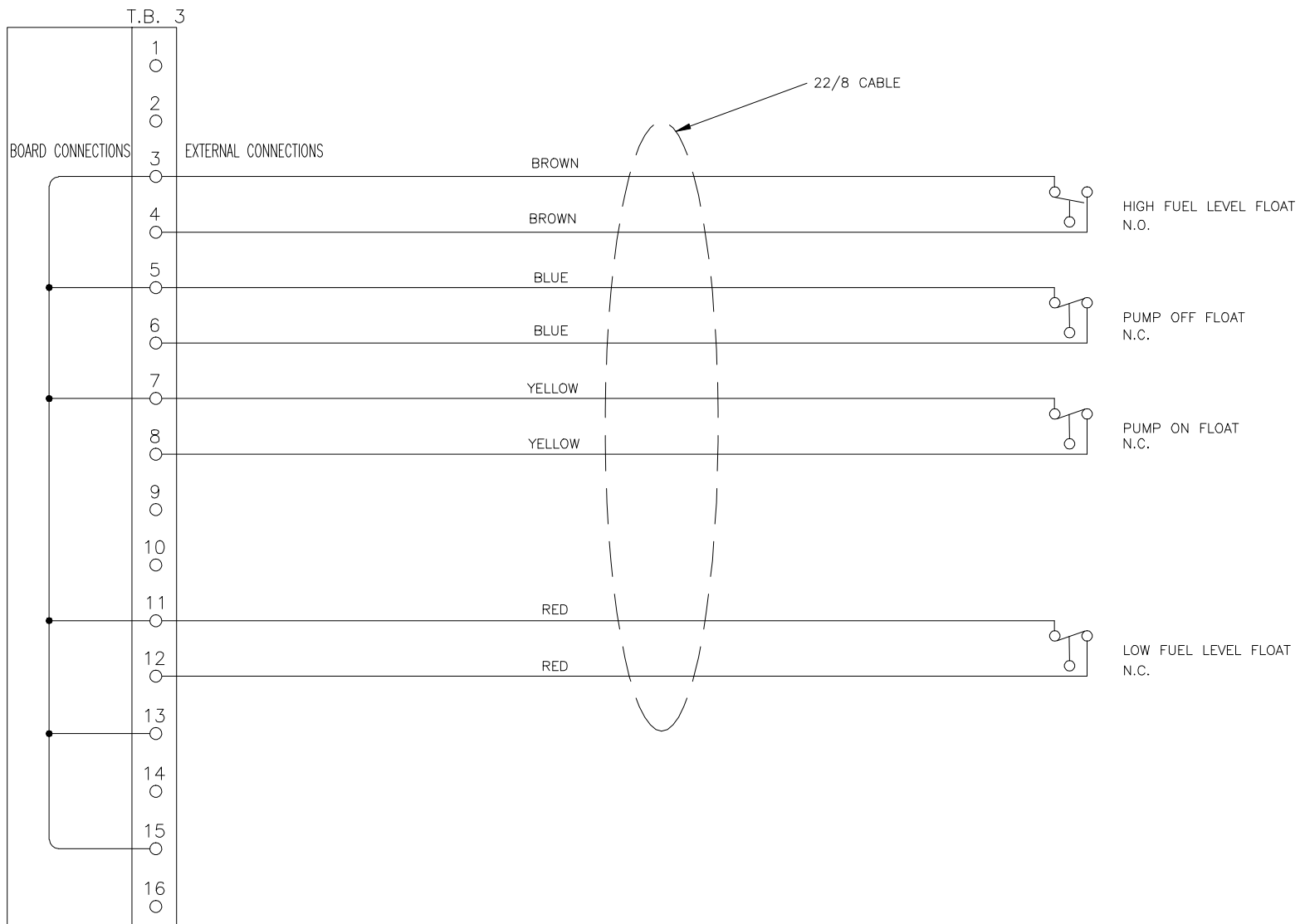
BILL OF MATERIAL	
LETTER	DESCRIPTION
A	MTW 16/1 GREEN
B	MTW 16/1 RED
C	MTW 16/1 WHITE
D	MTW 18/1 BLACK



REVISIONS				GLOBAL POWER COMPONENTS	
REV	DATE	CHANGE	BY	MODEL: SERIES 400 CONTROLLER	
				SINGLE W/ REVERSE PUMP/MOTOR SYSTEM	
				DRAWING NUMBER : SINGLE-02	
				DRAWN BY: DV PAGE: 2 of 2	
				SCALE: N/A 10/02/08	



SINGLE W/ REVERSE WIRING DIAGRAM		
SALES	ENG.	



REVISIONS		GLOBAL POWER COMPONENTS	
REV	DATE	CHANGE	BY

MODEL: DAYTANK CONNECTION DIAGRAM
 1099 FLOAT WIRING
 DWG. NUMBER : 1099 FLOAT AND CONTROL
 DRAWN BY: KWS | PAGE: 1 of 1
 SCALE: N/A | DATE: 06/02/11



DAYTANK CONTROLLER/1099 FLOAT WIRING

SALES ENG.

JOB: