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GE Healthcare

Direction 2397208
Revision 8

Signa® 400V/480V TWIN
Catalog M3088TM \ E4505CG
Main Disconnect Panel
Service Manual

Operating Documentation

GE Industrial Systems 55-217305

TABLE OF CONTENTS

GE (USA) CONFIDENTIAL AND PROPRIETARY

CAUTION

A qualified electrician should perform troubleshooting and servicing.

WARNING!

AC AND DC CONTROL POWER IS PRESENT WHEN THE BREAKERS ARE IN THE OPEN POSITION. DE-ENERGIZE BOTH POWER SOURCES PRIOR TO SERVICING THIS PANEL. IF AN OPTIONAL UPS HAS BEEN ADDED 120V UPS OUTPUT POWER IS PRESENT WHEN THE MAIN AND BRANCH BREAKERS ARE OPEN.

480V TO 400V NOTE

This panel has been wired for use at 480V/60HZ, the panel can be converted for use at 380-400-415V/50-60HZ by the changing of the two-transformer primary wiring connections from 480V to 400V. Refer to Section 2-3.

1- Theory of operation

This panel incorporates a number of features desirable by MR installations to minimize down time, protect PDU (Power Distribution Unit) electronics, reduce operating costs by maintaining cryogens, and reduce operational delays after any power outage or emergency generator testing. The panel comes wired for a common feed for the PDU, Cryo Cooler MRCC, Gradient MRCC, Cryo Cooler Compressor, and Magnet Monitor with associated auxiliary equipment (MUX BOX, UPS (Uninterruptible Power Supply) and Modem).

PDU branch circuit is controlled by an electrically held contactor, which opens to protect the PDU electronics on any loss of power. The Cryo Cooler MRCC, Gradient MRCC, Cryo Cooler Compressor and UPS input power circuits utilize an adjustable, time delayed, automatic restart control circuit which restores power after any power outage. The time delay auto restart protects the sensitive electronic, control equipment in chillers and compressors from sags and surges which immediately follow power loss from black outs, storms, utility reclosure operations and out of phase automatic transfer switch operations. The 12V DC relay CR1 controls the operation of the Main Power Auto Restarting Contactor, C1. Operation of the 12V DC battery power supply and battery provide the control power for relay CR1. Relay CR1 must be energized in order for the Main Power Auto Restarting Contactor to close. The 12V DC auto start control circuit controls all the Cryo Cooler Chiller, Gradient Chiller, Cryo Cooler Compressor, and auxiliary equipment. DC battery control circuit protection time is based upon the condition of the battery but is expected to hold for at least 48 hours. The DC Battery has a life of 2 years at which time the battery and power supply must be replaced to assure auto-restart capability.

Power Distribution Unit (PDU), Cryo Cooler MRCC, Gradient MRCC, Cryo Cooler Compressor (CCC), Magnet Monitor, UPS Input Power and UPS output Emergency Off disconnection is also provided by this panel. Two flush-mounted remote emergency off pushbuttons are included with this panel and the cover-mounted emergency off pushbutton provide immediate shutdown for the entire system. Additional remote emergency OFF pushbuttons may be ordered from Gexpro 1-800-200-9760, if required for a particular installation. Remote emergency OFF pushbuttons are listed in Section 5 - Parts List of this manual.

Restoration of power after an emergency off operation is accomplished by first pressing the Main Power ON pushbutton on the cover of the panel and subsequently pressing the PDU ON pushbutton.

The battery power supply indicating light is constantly illuminated while the charger is operating. However, if the indicating light is OFF there is no 12VDC present either from the battery or from the power supply.

A circuit breaker provides power for the UPS Input, MUX BOX, Magnet Monitor, and the Modem as indicated on the attached wiring diagram.

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

Power: Main Circuit Breaker 380-480V, 350Kcmil maximum conductor size.

- 480V - 90A, 150A, Main circuit Breaker
- 415V – 104A, 150A, Main Circuit Breaker
- 400V - 105A, 150A, Main Circuit Breaker
- 380V - 114A, 150A, Main Circuit Breaker

*For 480V installations with existing #1 AWG wire main breaker 125A rating plug will be supplied. Contact Gexpro 414-527-6600 if required.

3 Phase, 3 Wire + Ground
480V, 50/60HZ
380, 400 & 415V 50/60HZ

UL 489 & CSA C 22.2
Interrupting Rating 25,000 AIC Symmetrical 50/60 Hertz

IEC 947-2 Interruption Capacity

- 380-415V, Ue, Icu 15,000 RMS Symmetrical AMPS 50/60 Hertz
- 380-415V, Ue, Ics 10,000 RMS Symmetrical AMPS 50/60 Hertz

ENVIRONMENTAL SPECIFICATIONS

FOR INDOOR USE ONLY

Temperature 59-89.6F (15-32C)

Humidity 30-75% NON-CONDENSING

1-2 PANEL COVER PHOTO

1-1-1 PANEL INTERIOR PHOTO

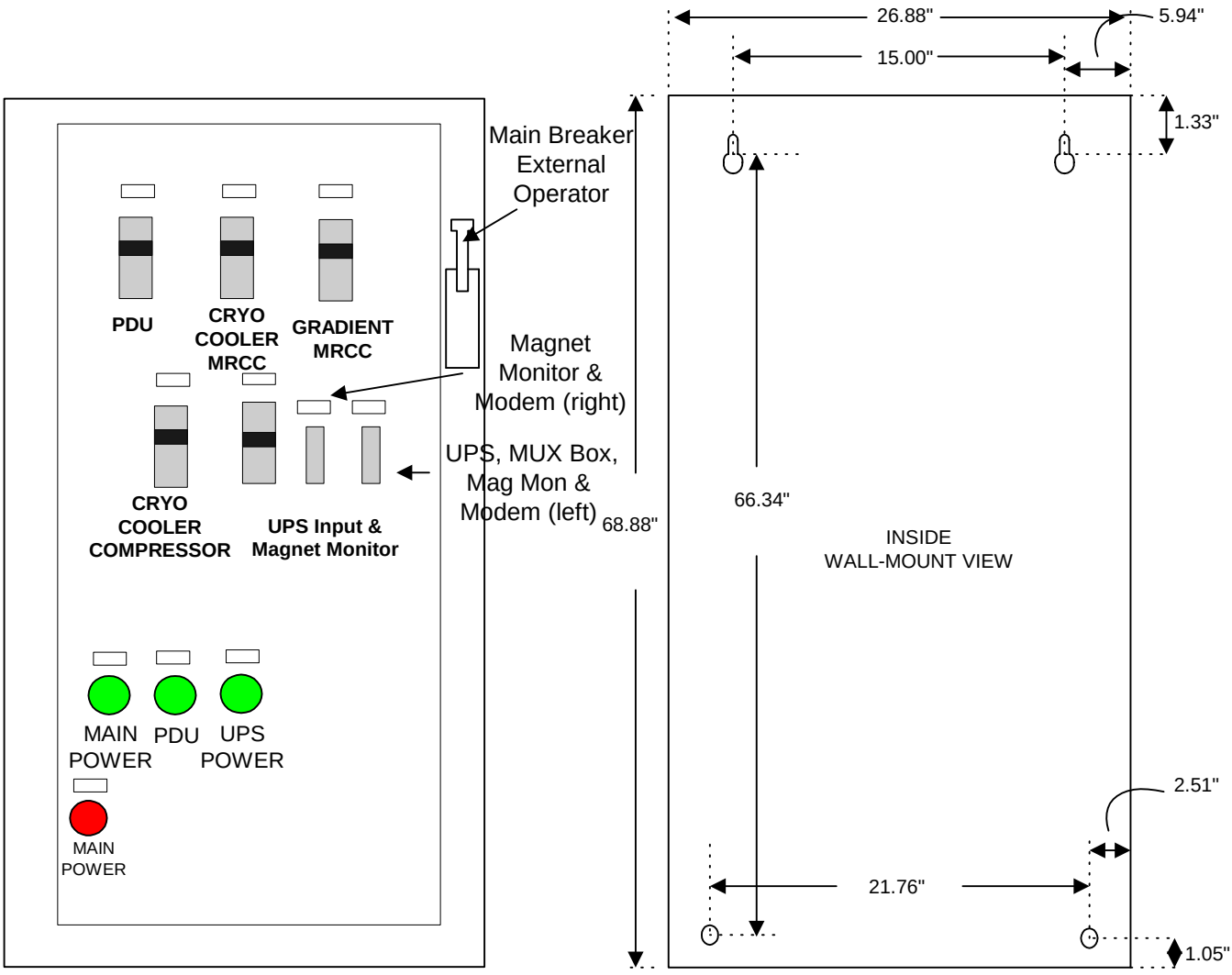
1-2 Panel Dimensions

Refer to Table 1-1 and Illustration 1-1 for the physical dimensions of the panel. The panel may be recessed approximately 7.95 inches (201.9 mm) into the wall for semi-flush installations. See Illustration 1-1 for the front view and mounting pattern of the Main Disconnect Panel.

TABLE 1-1
PANEL EXTERNAL PHYSICAL DIMENSIONS

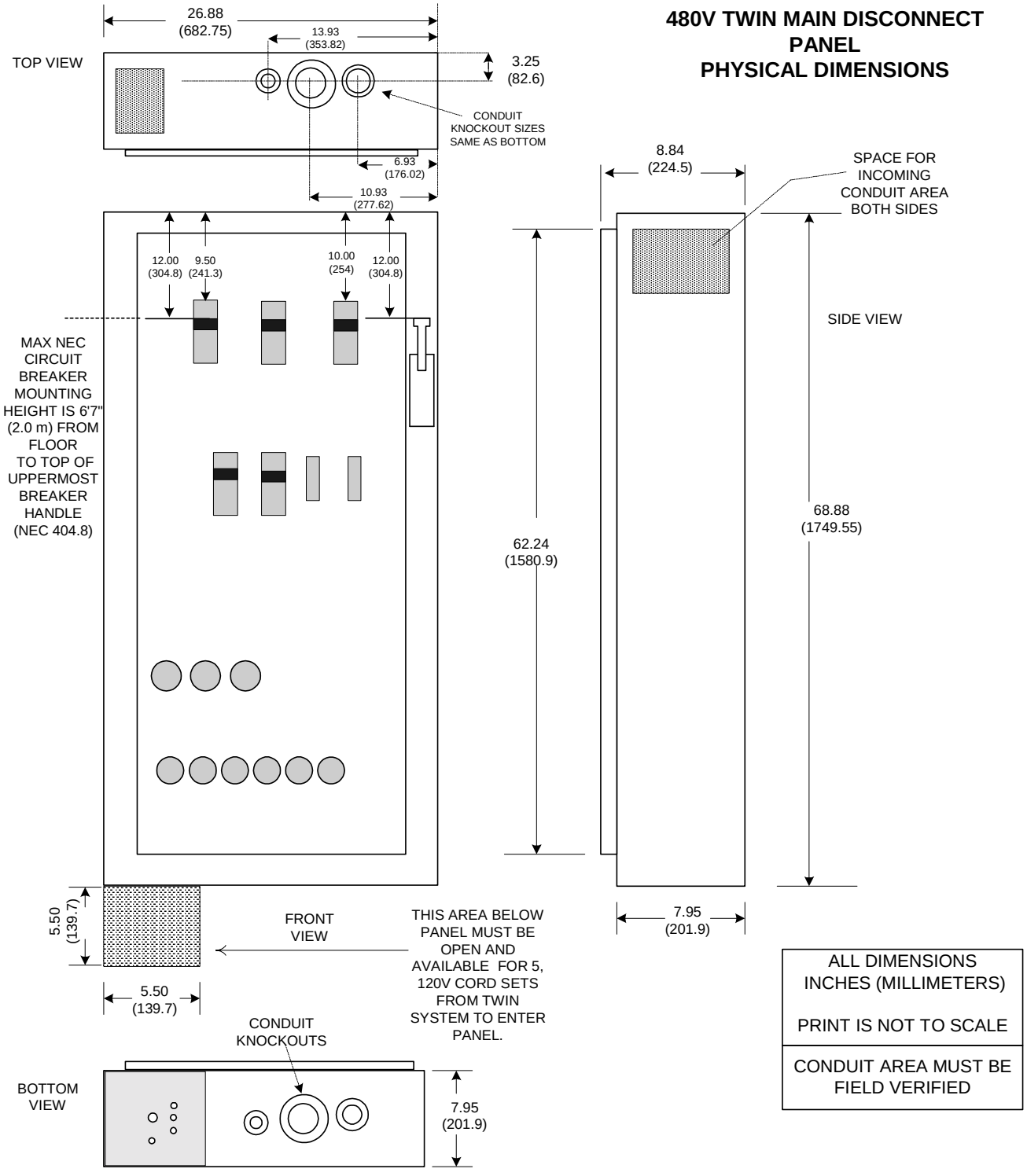
PARAMETER	DIMENSIONS	
Height	68.88 in.	1749.55 mm
Width	26.88 in.	682.75 mm
Depth	8.84 in.	224.5 mm
Weight	350 lbs	158 kg
Door Swing Radius	21.75 in.	552.5 mm

FRONT AND INTERIOR VIEW OF MAIN DISCONNECT PANEL
ILLUSTRATION 1-1

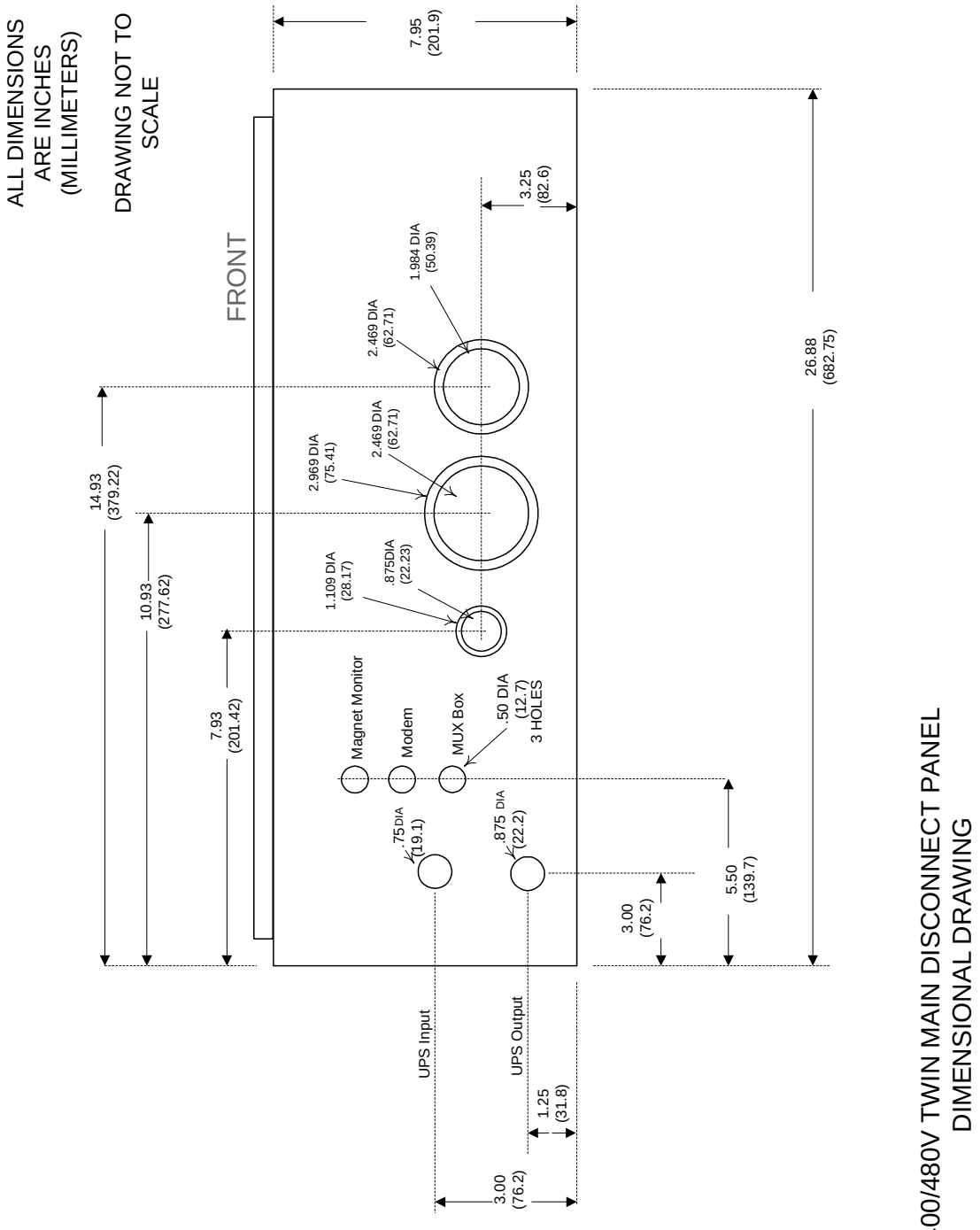


1-3 PANEL LAYOUT AND FULL PHYSICAL DRAWINGS

See Illustrations 1-2 and 1-3 for panel layout and full physical drawings including cable access holes and conduit knockout positions.



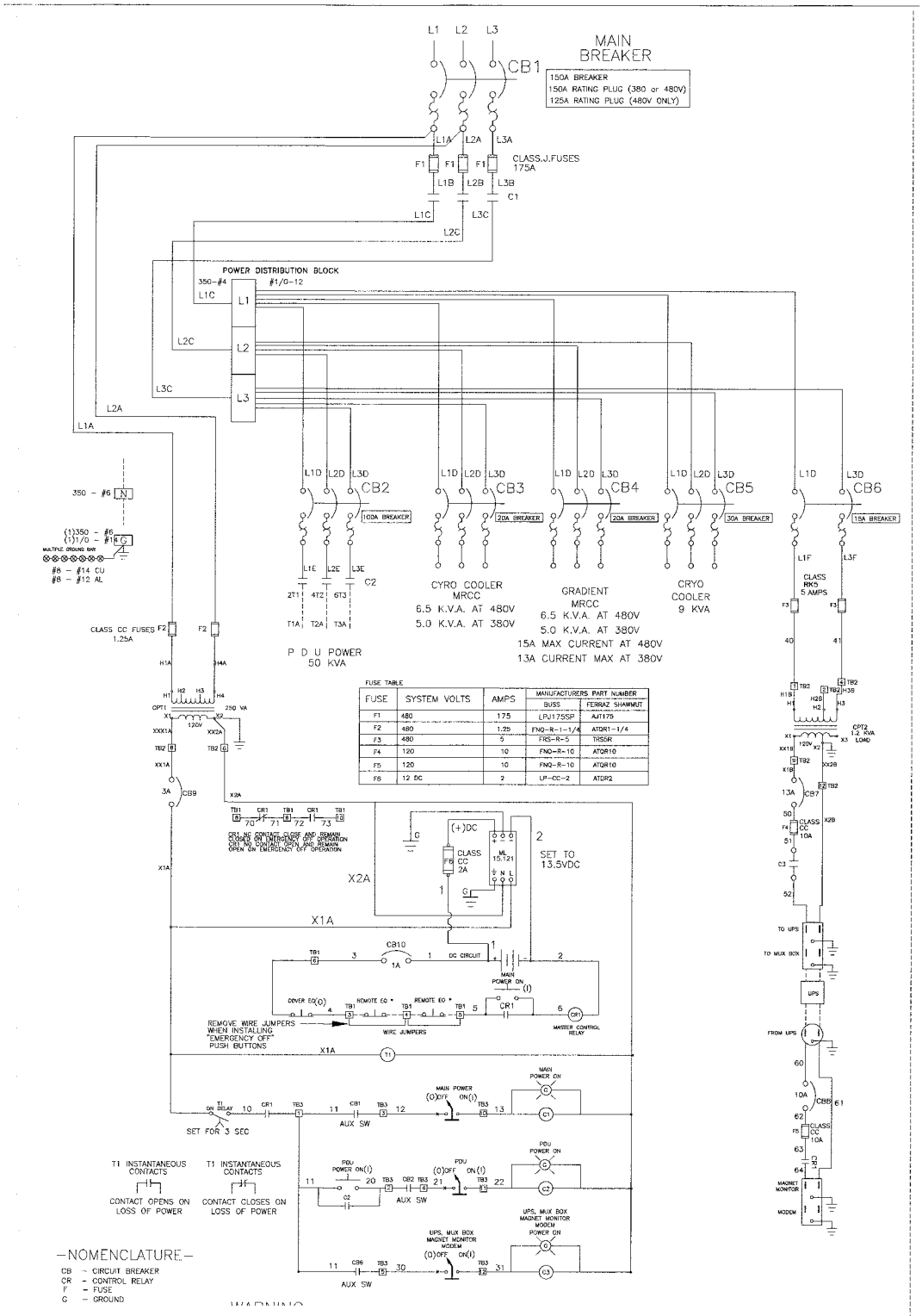
FULL PHYSICAL DRAWINGS
ILLUSTRATION 1-2



DETAILED BOTTOM VIEW
ILLUSTRATION 1-3

1-4 WIRING DIAGRAMS Illustration 1-4 and 1-5 for the Main Disconnect Panel wiring

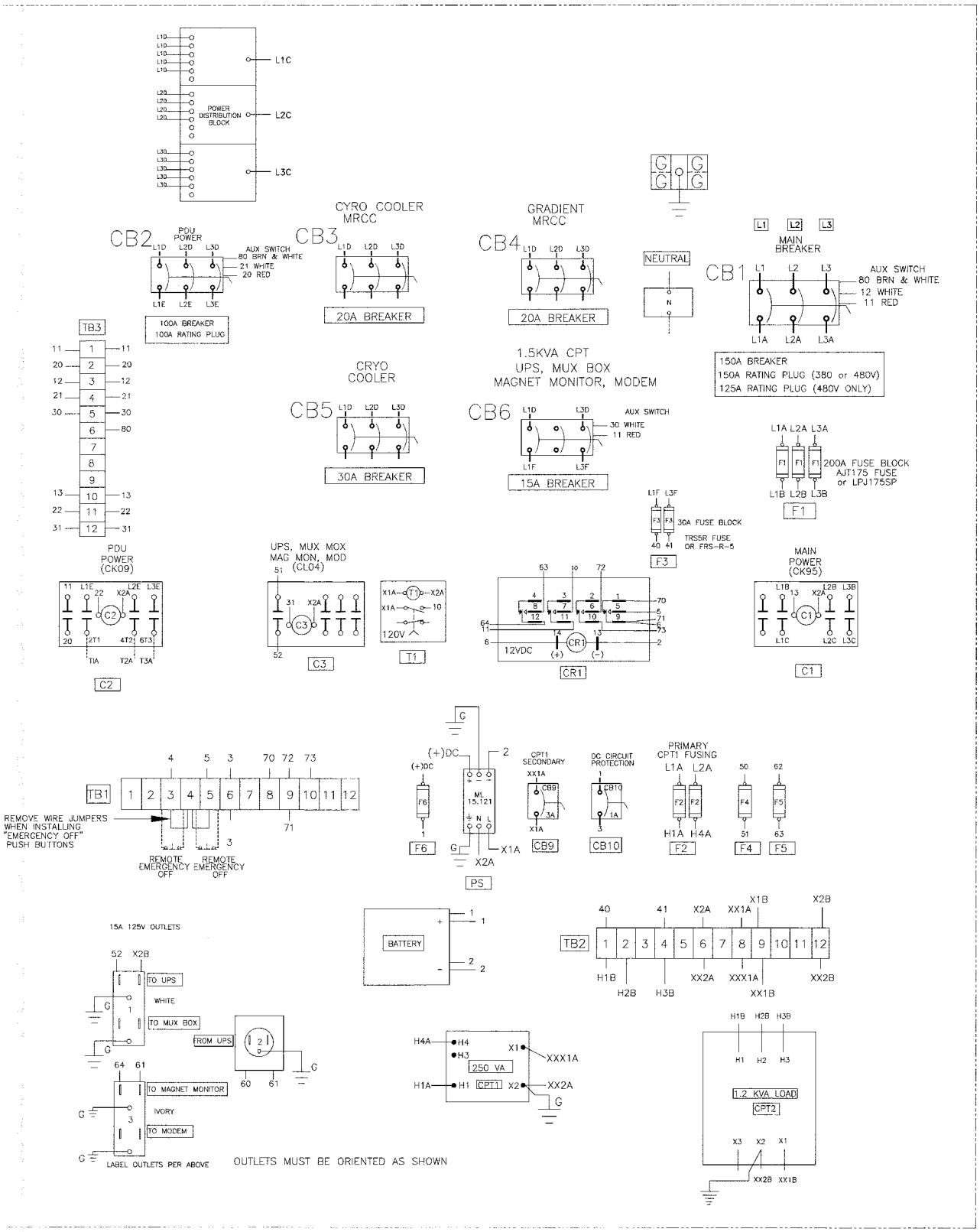
INTERNAL WIRING DIAGRAM
ILLUSTRATION 1-4



FUSE	SYSTEM VOLTS	AMPS	MANUFACTURERS PART NUMBER	
			BUSS	FERRAZ SHAWMUT
F1	480	175	LPJ175SP	AJT175
F2	480	1.25	FNQ-R-1-1/4	ATQR1-1/4
F3	480	5	FRS-R-5	TRS5R
F4	120	10	FNQ-R-10	ATQR10
F5	120	10	FNQ-R-10	ATQR10
F6	12 DC	2	LP-CC-2	ATQR2

480V TWIN MAIN DISCONNECT PANEL WIRING DIAGRAM
ILLUSTRATION 1-4

INTERNAL COMPONENT PARTS LAYOUT



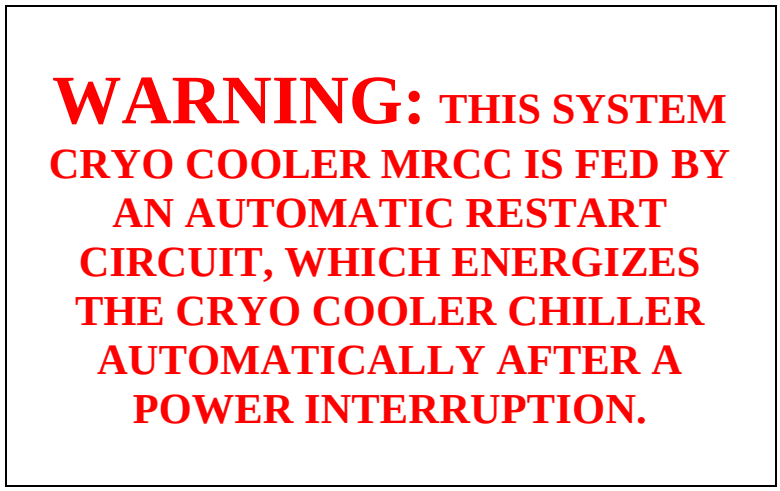
INTERNAL LAYOUT OF COMPONENTS

1-5 WARNING LABELS

Warning labels shown in this section are provided with the MDP and are to be affixed to the Signa Twin system equipment as indicated.

1-5-1 Cryo Cooler MRCC

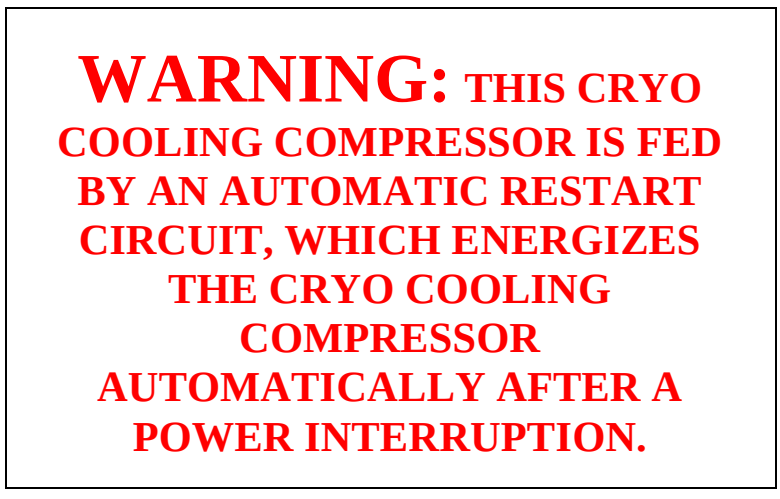
Two warning labels are provided with the MDP. Illustration 1-6 shows Cryo Cooler MRCC warning label, which is to be affixed to Cryo Cooler MRCC Compressor Cabinet.



CRYO COOLER MRCC LABEL
ILLUSTRATION 1-6

1-5-2 Cryo Cooler Compressor

Two Cryo Cooler Compressor warning labels are provided with the MDP. Illustration 1-7 shows the Cryo Cooler Compressor warning label, which is to be affixed to Cryo Cooler Compressor (2 labels).



CRYO COOLING COMPRESSOR WARNING LABEL
ILLUSTRATION 1-7

1-5-3 Gradient MRCC Equipment

Two warning labels for the Gradient Chiller are provided with the MDP. Illustration 1-8 shows the Gradient Chiller warning label, which is to be affixed to each of access sides of the Gradient Chiller.

WARNING: THIS SYSTEM GRADIENT CHILLER IS FED BY AN AUTOMATIC RESTART CIRCUIT, WHICH ENERGIZES THE GRADIENT CHILLER AUTOMATICALLY AFTER A POWER INTERRUPTION.

GRADIENT CHILLER WARNING LABEL
ILLUSTRATION 1-8

1-5-4 Magnet Monitor Equipment

Four warning labels for the Magnet Monitor equipment are provided with the MDP. Illustration 1-9 shows the Magnet Monitor equipment-warning label, which is to be affixed to each of the following:

- Magnet Monitor box
- UPS for Magnet Monitor
- Modem
- Multiplexer (MUX)

WARNING: THE MUX BOX, UPS, MAG MON & MODEM ARE FED BY AN AUTOMATIC RESTART CIRCUIT, WHICH ENERGIZES THESE DEVICES AUTOMATICALLY AFTER A POWER INTERRUPTION.

MUX BOX WARNING LABEL
ILLUSTRATION 1-9

2 INSTALLATION

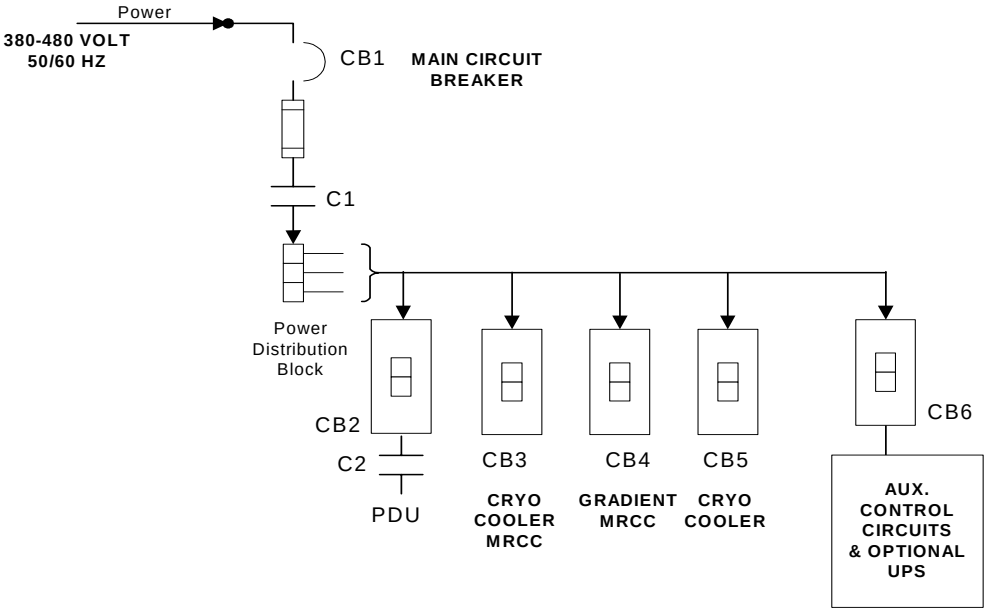
2-1 Installation Single Feed (Refer to Illustration 2-2)

- Incoming power is connected to the main breaker located at the top right side of the Main Disconnect Panel. The preferred location for the incoming conduit is through the top of the enclosure or from the sides near the top. The main breaker maximum wire size is 350kcmil.
- Cryo Cooler MRCC, Cryo Cooler Compressor, and Gradient MRCC are connected directly to the load side of each circuit breaker.
- PDU power is wired to terminals T1A, T2A, and T3A on contactor C2.
- Magnet Monitor Optional UPS power is obtained from this panel from duplex receptacle marked “to UPS” and the UPS output is wired back into this panel to receptacle marked “from UPS”.
- Receptacles are provided for the UPS input, UPS output, Magnet Monitor, Modem and MUX BOX. Each receptacle is marked as to function and also designated in panel layout drawing (see Illustration 1-3).
- Access and clear space is required for the UPS input, UPS output, MUX BOX, Modem, and Magnet Monitor cables to enter the bottom left side of the enclosure and for the installation of their plastic strain relief devices. Refer to Illustration 1-2.
- A short, pre-manufactured, heavy-duty extension cord is provided to connect the “to UPS” receptacle to the recessed single receptacle marked “from UPS” for installations without the optional accessory circuit UPS.
- The HD extension cord may be utilized to jumper between “to UPS” and “from UPS” during construction, UPS failure, or omission of UPS.
- Black plastic strain relief devices are shipped with this panel.
- Mounting height of the “top of the grip of the operating handle when in the highest position” of the highest breakers must not exceed 6ft-7in. (2m) above the floor per 2002 National Electric Code (NEC #404.8).
- Inspect and verify that the push on connectors on the battery are connected to the battery terminals and that wires are securely fastened.
- Verify that battery voltage at the terminals of the battery with the power supply energized is greater than 12.5VDC and that the battery power supply indicating light is on.
- Complete the label on the cover of the panel indicating the location and circuit of the power source providing power to this panel.
- The labels that are supplied indicating “Warning of the automatic restart” must be installed on the front cover, and on the rear cover of the Cryo Cooler MRCC. See section 1-5 “Warning Labels”.
- The four labels supplied indicating “Warning of automatic restart” must be installed on MUX BOX, UPS, Magnet Monitor, and Modem. See Section 1-5 “Warning Labels”.
- Two labels are supplied indicating “Warning of automatic restart”. These labels must be installed on the front and rear covers of Cryo Cooler Chiller.
- Two labels are supplied indicating “Warning of automatic restart”. These labels must be installed on the front and rear covers of Gradient MRCC.

The control circuit wiring must be completed by installing the two remote emergency off pushbuttons as shown on the wiring diagrams on the inside of the door. The orange labeled, factory installed jumper wire must be removed when installing the remote emergency off push buttons. The Main Contactor or PDU Contactor will not have power unless the remote emergency off pushbuttons are installed between terminals 3, 4, and 5 or temporarily jumpered.

For warranty parts or technical assistance contact GEXPRO – Milwaukee, WI (414) 527-6600, Central Time Zone.

2-2 INCOMING POWER CONFIGURATION



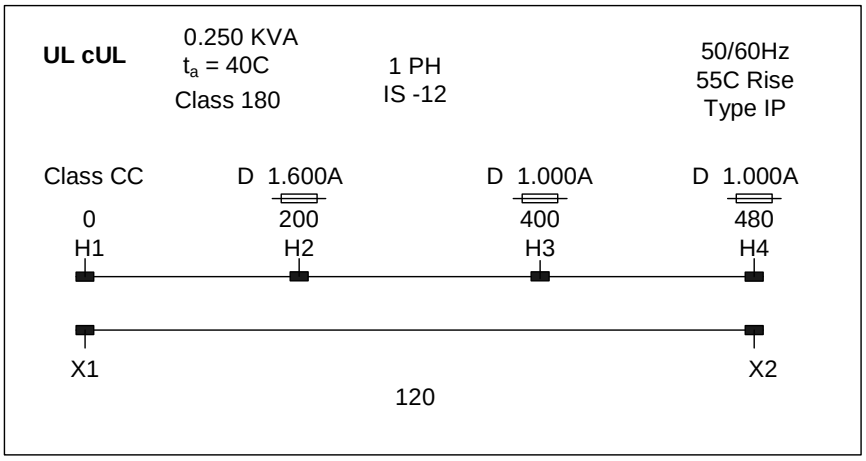
SYSTEM CONFIGURATION
ILLUSTRATION 2-1

2-3 480V, 60Hz TO 380-400-415V, 50/60Hz CONVERSION

THIS PANEL HAS BEEN WIRED FOR USE AT 480V/60HZ, THE PANEL CAN BE CONVERTED FOR USE AT 380-400-415V/50-60HZ BY CHANGING THE TWO TRANSFORMER PRIMARY WIRING CONNECTIONS FROM 480V TO 400V. MAKE SURE THE POWER FEED TO THE MDP ARE DISCONNECTED AND LOCKED OFF.

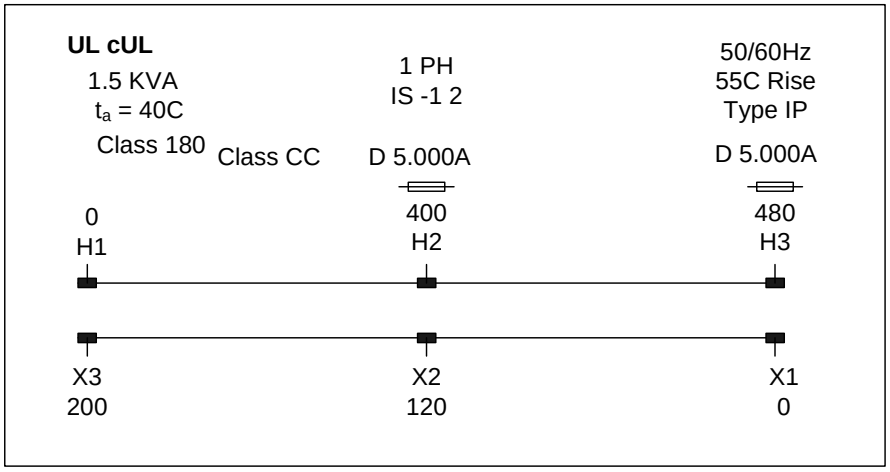
.250KVA Control Transformer, 480V to 380/400/415V Connection

1. Open main circuit breaker and padlock.
2. Open two-pole fuse holder F2.
3. Remove wire originally connected to transformer terminal H4.
4. Connect wire from Step 2 to transformer terminal H3.
5. Close fuse holder F2.
6. Close main circuit breaker.
7. Confirm 120V at CB9 to ground.

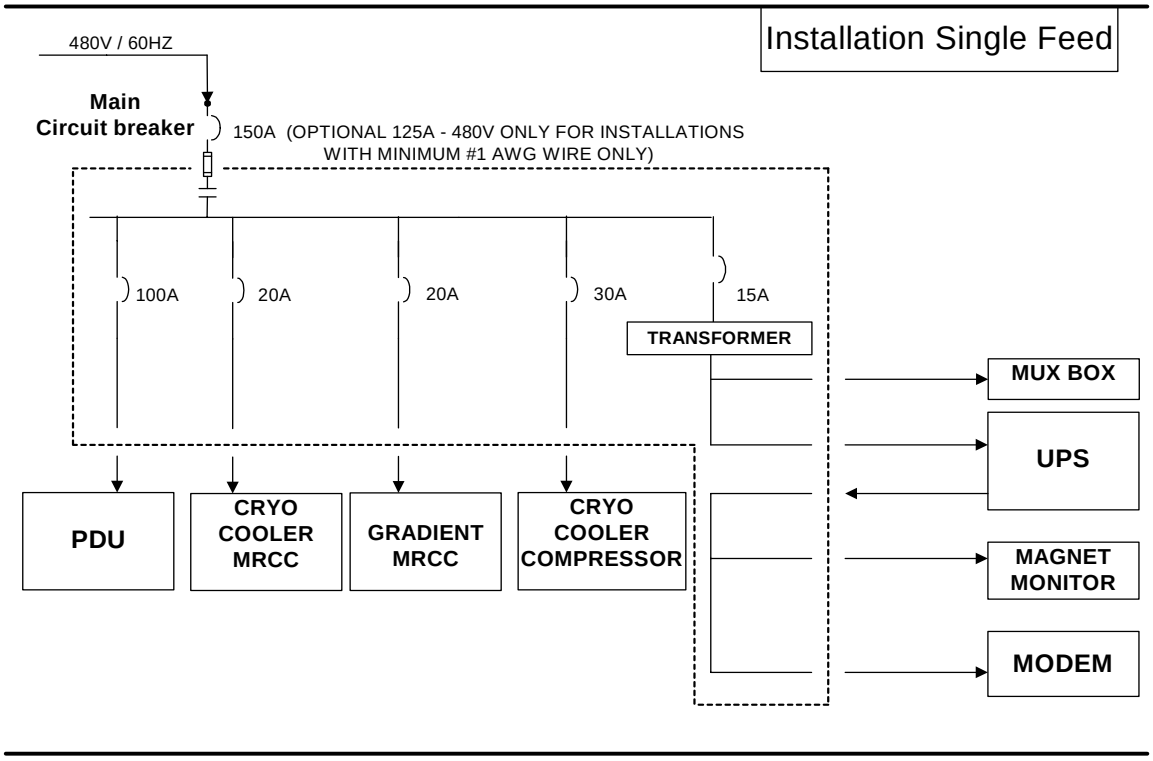


1500VA Transformer, 480V to 380/400/415V Connection

1. Open main circuit breaker and padlock off.
2. Verify that 15-Ampere circuit breaker CB6 is open.
3. Remove two dead front covers for fuse block F3.
4. Remove two TRS5R, 5 ampere fuses.
5. At terminal block TB2 move the wire connected to top of TB2 terminal 4 to TB2 top of terminal 2.
6. Replace transformer primary fuses in fuse block 3 (FB3) with spare 8A, TRS8R fuses shipped with the panel.
7. Replace the dead front fuse holders on fuse block (FB3).
8. Close main Breaker.
9. Close CB6 and confirm 120V to ground at receptacle marked " To UPS" or CB7.



2-4 POWER CONFIGURATION



INCOMING POWER CONFIGURATION
ILLUSTRATION 2-2

A 480V Optional 125A-rating plug may be used if minimum #1 wire is used. Contact Gexpro 414-527-6600, for exchange of the main circuit breaker rating plug for new catalog # SRPE150A125.

2-5 TESTING PANELS

WARNING!

AC AND DC CONTROL POWER IS PRESENT WHEN THE BREAKERS ARE IN THE OPEN POSITION. MAKE SURE NO ONE IS WORKING ON THE EQUIPMENT, WHICH THIS PANEL FEEDS PRIOR TO TESTING THE PANEL.

TESTING ACTION	VERIFY
1. Press the main power ON pushbutton and PDU ON pushbutton. Verify Main Power Contactor; Magnet Monitor and PDU selector switches are all set to ON.	1. All three green pilot lights should be on indicating proper contactor operation.
2. Press any emergency off pushbutton.	2. Both Main Contactor and PDU Contactor must de-energize and stay de-energized. All three green pilot lights must be OFF. Verify that the UPS output is disconnected from Magnet Monitor and Modem.
3. Press the main power ON pushbutton and PDU ON pushbutton. Verify Main Power ON, Magnet Monitor, and PDU selector switches are all set to ON and repeat for the all other emergency off pushbuttons.	3. Both Main Contactor and PDU Contactor must de-energize and stay de-energized after an emergency OFF operation. All pilot lights must be OFF when any emergency off is pressed. Verify that the UPS output is disconnected from Magnet Monitor and Modem.
4. Press the main power ON pushbutton and PDU ON pushbutton. Verify Main Power ON; Magnet Monitor and PDU selector switches are all set to ON.	4. All three green pilot lights should be ON indicating proper contactor operation.
5. Press any emergency off pushbutton.	5. All contactors must de-energize and stay de-energized. All three green pilot lights must be OFF.
6. Starting with the de-energized state of #5, turn OFF incoming power using the externally operated Main Breaker located at the top right side of this panel.	6. All three lights must be OFF indicating loss of power. Confirm disconnection of UPS output from Magnet Monitor and Modem. UPS 120V output power is present at CB8 to ground but disconnected from the Magnet Monitor and Modem by confirming at the Magnet Monitor receptacle that 120 volts is not present.

TESTING ACTION	VERIFY
7. With incoming power OFF from step 6, now restore incoming power to panel (switch main breaker to ON).	7. Upon restoration of power all contactors must remain OFF. All pilot lights must be OFF. UPS output remains disconnected. This demonstrates emergency off function remains disabled during a loss of power. No auto restart after any emergency OFF operation.
8. Press the main power ON pushbutton and PDU pushbutton. Verify Main Power ON; Magnet Monitor and PDU selector switches are all set to ON.	8. All three green pilot lights should be ON.
9. Individually rotate on-off selector switch for the main power contactor, and Magnet Monitor OFF then ON.	9. Each green indicating light should turn OFF and the respective contactor should open in OFF. Each green pilot light should turn ON and its respective contactor close when selector switch is switched to ON.
10. Individually rotate the PDU ON-OFF selector switch for the PDU contactor.	10. The green light for the PDU should turn OFF when the switch is moved to OFF. Moving the switch to ON will not restore the PDU power unless the PDU power ON pushbutton is pressed after the selector switch has been set to ON.
11. Press the main power ON pushbutton and PDU ON pushbutton. Verify Main Power ON; Magnet Monitor and PDU selector switches are all set to ON. Turn OFF incoming power using the panel main circuit breaker of panel and restore power to the panel. This is a simple OFF-then-ON function.	11. All three green indicating lights should turn OFF with loss of power. The Main Power Contactor and Magnet Monitor auxiliary equipment contactor and two green indicating lights must turn ON with the restoration of power indicating the proper operation of the automatic restart feature. PDU pilot light turns OFF on any loss of power and the PDU green pilot light and contactor does not restart automatically.

2-6 FINAL CHECK

1. Verify that power supply indicating light is illuminated. Confirm battery voltage is greater than 12.5VDC. The ideal power supply setting is 13.5VDC.
2. Confirm all wire connections are properly tightened.

3-TROUBLESHOOTING

Auto Restart Function Main Contactor, PDU Contactor, and Magnet Monitor auxiliary equipment will not be de-energized unless the control circuit emergency off pushbuttons are wired as indicated on the wiring diagram. The orange labeled, factory installed jumper wire must be removed when connecting the remote emergency off pushbuttons.

Make sure the emergency off pushbuttons are wired through normally closed contacts.

Operation of any emergency off pushbutton should de-energize relay CR1, shutting the entire system down and disconnecting the UPS output from the Magnet Monitor and Modem.

Check LED lamps for burnt out or broken in shipment.

Check that battery power supply has 120V supply power and that the potemtiometer is set to 13.5VDC output with a DC voltmeter. The power supply DC output voltage must be 12 to 13.5 VDC under normal operating conditions. 13.5VDC is the ideal voltage.

If DC voltage is less than 11V, replace the power supply and battery. 12V DC relay CR1 controls the operation of all branch circuit contactors.

Operation of the 12V DC battery power supply and battery provide the control power for relay CR1. Relay CR1 must be energized in order for any branch circuit contactor to close.

FOR WARRANTY PARTS OR TECHNICAL ASSISTANCE CONTACT:
GEXPRO – MILWAUKEE, WI. (414)-527-6600 CST

4-1 GENERAL MAINTENANCE

PM Schedule

Task	Frequency	Procedure
DC Power Supply Test	Every six months	Refer to Section 8.
Battery Test	Every six months	Refer to Section 8
Battery Replacement	Every two years	

Power Supply and Battery Maintenance Log

The auto restart circuit requires the 7 Ah DC battery to be functional. Battery life is 2 years at which time it must be replaced. Initial date code on the panel is on the CR243B10453 label inside the door. The GE date code is "BYDD!" where B indicates the panel manufacturing plant, Y indicates the year, DD indicates the week of the year and "!" indicates the decade 2010-2019. When the Power Supply and battery are replaced please mark the installation date on the battery and the following table for future reference. Print out this page before marking the maintenance log file.

Service Date	Power Supply Voltage	Battery Voltage	Service Person Signature
1. Initial Install			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Battery and power supply Test

1. Measure and record battery DC voltage at battery terminals and at the Power Supply terminals + and -.
2. Open fuse holder F6 to disconnect the power supply from the battery.
3. Press the "SYSTEM ON" pushbutton to make sure the relay load is connected to the battery. The following measurements are with only the battery powering the relay.
4. Measure and record the DC battery voltage with fuse F6 opened and the battery only powering the load. The battery voltage must be 12.0 to 13.5VDC. If less than 12.0 volts, try adjusting the power supply potentiometer to 13.5VDC. Abandon the test by closing fuse holder F6 to allow the battery to charge overnight before starting the test all over.
5. Measure the battery voltage after 15 - 30 minutes. If the battery voltage drops to less than 12 volts replace the battery.

Note

The Battery DC voltage must be between 12.0 and 13.5 volts DC, Ideally 13.5VDC. The battery must have enough capacity to energize relays CR1 for generator testing and storms longer than 15 minutes.

Record the panel installation date or battery replacement date on the battery.

Note

Normal operation of DC circuit is from DC power supply with battery fully charged.

If battery is suspect or questionable, replace immediately as this is an insignificant maintenance cost.

Battery and instructions GEHC Cat number 5375947
Power supply GEHC Cat number 5316807

GEXPRO
12221 W. Feerick St.
Milwaukee, WI 53222
Phone 414-527-6600
Fax 414-527-6652

GEXPRO
National Service Center
9100 Purdue Road Suite 300
Indianapolis, IN 46268
Phone 1-800-243-7313, 317-554-3700

Power supply specifications

13. Front Side and User Elements

Fig. 13-1 Front side

A Output Terminals
Screw terminals
Dual terminals for the negative pole allows an easy earthing of voltage
+ Positive output
- Negative (return) output

B Input Terminals
Screw terminals
L Neutral input
N Line (hot) input
⏚ EMI ground
Ground this terminal to minimize high-frequency emissio
For safety reasons, connecting to ground is not required.

C DC-ON LED (green)
On when the voltage is > 10.5V

D Output voltage potentiometer
Turn to set the output voltage. Factory setting is 12.0V.

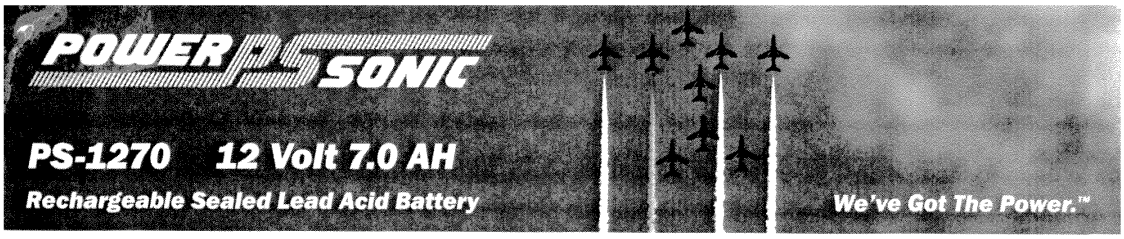
14. Terminals and Wiring

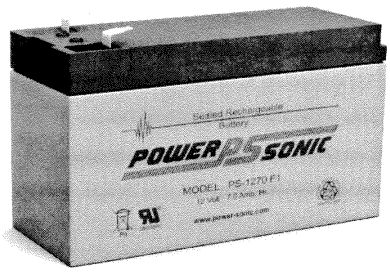
All terminals are easy to access when mounted on the panel. Input and output terminals are separated f other (input below, output above) to help in error-free wiring.

Type	Screw terminals
Solid wire	0.5-6mm²
Stranded wire	0.5-4mm²
American wire gauge	20-10 AWG
Ferrules	Allowed, but not required
Recommended tightening torque	1Nm, 9lb.in
Screwdriver	3.5mm slotted or Pozidrive No 2
Wire stripping length	7mm / 0.275inch

Battery manufacturer Documentation

Specifications.





Features

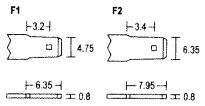
- Absorbent Glass Mat (AGM) technology for superior performance
- Valve regulated, spill proof construction allows safe operation in any position
- Power/volume ratio yielding unrivaled energy density
- Rugged impact resistant ABS case and cover (UL94-HB)
- Approved for transport by air. D.O.T., I.A.T.A., F.A.A. and C.A.B. certified
- U.L. recognized under file number MH 20845

Terminals (mm)

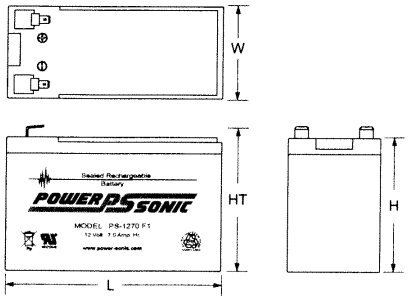
- F1 - Quick disconnect tabs, 0.187" x 0.032"- Mate with AMP. INC. FASTON "187" series

— OR —

- F2 - Quick disconnect tabs, 0.250" x 0.032" - Mate with AMP. INC FASTON "250" series



Physical Dimensions: in (mm)



L: 5.95 (151) **W:** 2.56 (65) **H:** 3.70 (94) **HT:** 3.86 (98)

Tolerances are +/- 0.04 in. (+/- 1mm) and +/- 0.08 in. (+/- 2mm) for height dimensions. All data subject to change without notice.

Performance Specifications

Nominal Voltage ..... 12 volts (6 cells)

Nominal Capacity

20-hr.	(350mA to 10.50 volts)	7.00 AH
10-hr.	(650mA to 10.50 volts)	6.50 AH
5-hr.	(1.2A to 10.20 volts)	6.00 AH
1-hr.	(4.5A to 9.00 volts)	4.50 AH
15-min.	(14A to 9.00 volts)	3.50 AH

Approximate Weight ..... 4.80 lbs. (2.18 kg)

Energy Density (20-hr. rate) ..... 1.49 W-h/in3 (90.95 W-h/l)

Specific Energy (20-hr. rate) ..... 17.50 W-h/lb (38.58 W-h/kg)

Internal Resistance (approx.) ..... 23 milliohms

Max Discharge Current (7 Min.) ..... 21.0 amperes

Max Short-Duration Discharge Current (10 Sec.) ..... 70.0 amperes

Shelf Life (% of nominal capacity at 68°F (20°C))

1 Month	97%
3 Months	91%
6 Months	83%

Operating Temperature Range

Charge	-4°F (-20°C) to 122°F (50°C)
Discharge	-40°F (-40°C) to 140°F (60°C)

Case ..... ABS Plastic

Power-Sonic Chargers PSC-12800A, 12800A-C

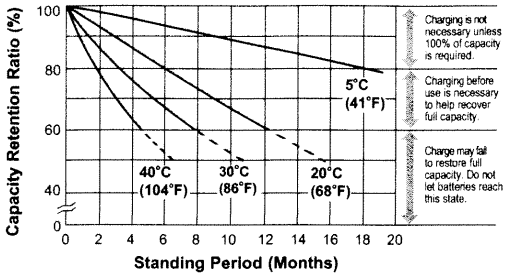
To ensure safe and efficient operation always refer to the latest edition of our Technical Manual, as published on our website.
All data subject to change without notice.

www.power-sonic.com

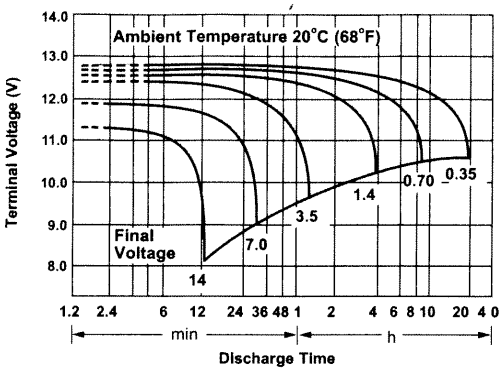
BATTERY DATA SHEET

POWER-SONIC **PS-1270 12 Volt 7.0 AH**

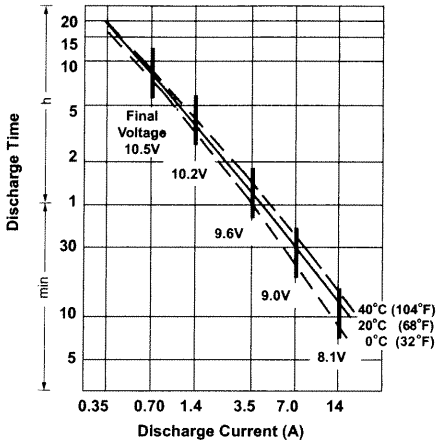
Shelf Life & Storage



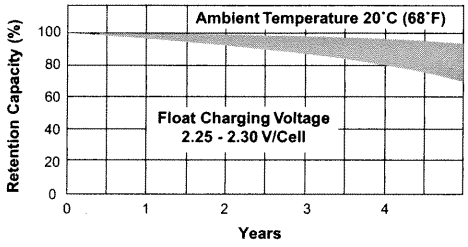
Discharge Characteristics



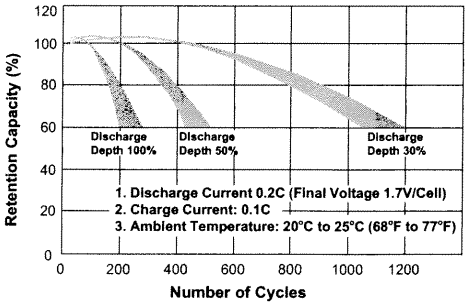
Discharge Time vs. Discharge Current



Life Characteristics in Stand-By Use



Life Characteristics in Cyclic Use



Charging

Cycle Applications: Limit initial current to 2.1A. Charge until battery voltage (under charge) reaches 14.4 to 14.7 volts at 68°F (20°C). Hold at 14.4 to 14.7 volts until current drops to under 70mA. Battery is fully charged under these conditions, and charger should be disconnected or switched to "float" voltage.

"Float" or "Stand-By" Service: Hold battery across constant voltage source of 13.5 to 13.8 volts continuously. When held at this voltage, the battery will seek its own current level and maintain itself in a fully charged condition.

Note: Due to the self-discharge characteristics of this type of battery, it is imperative that they be charged within 6 months of storage, otherwise permanent loss of capacity might occur as a result of sulfation.

Chargers

Power-Sonic offers a wide range of chargers suitable for batteries up to 100AH. Please refer to the Charger Selection Guide in our specification sheets for "C-Series Switch Mode Chargers" and "Transformer Type A and F Series". Please contact our Technical department for advice if you have difficulty in locating suitable models.

Further Information

Please refer to our website www.power-sonic.com for a complete range of useful downloads, such as product catalogs, material safety data sheets (MSDS), ISO certification, etc..

Contact Information

www.power-sonic.com

DOMESTIC SALES	CUSTOMER SERVICE	TECHNICAL SUPPORT	INTERNATIONAL SALES
Tel: +1-619-661-2020	Tel: +1-619-661-2030	Tel: +1-619-661-2020	Tel: +1-650-364-5001
Fax: +1-619-661-3650	Fax: +1-619-661-3648	Fax: +1-619-661-3648	Fax: +1-650-366-3662
national-sales@power-sonic.com	customer-service@power-sonic.com	support@power-sonic.com	battery@power-sonic.com

CORPORATE OFFICE • 7550 Panasonic Way • San Diego, CA 92154 • USA • Tel: +1-619-661-2020 • Fax: +1-619-661-3650

Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

PS, PSH, PSG and PG
Valve Regulated (VRLA) Batteries
Absorbed Electrolyte (AGM)

Section 1 - Product Identification

Manufacturers Name	*Emergency Telephone Numbers:*
Power-Sonic Corporation, **7550 Panasonic Way** **San Diego, CA 92154**	**CHEMTREC (Domestic): (800) 424-9300** **CHEMTREC (International): (703) 527-3887**
	Telephone Number for Information **Power-Sonic Corporation: (619) 661-2020**
	Date Issued: **January 25, 2010**

The information contained within is provided as a service to our customers and is for their information only. The information and recommendations set forth herein are made in good faith and are believed to be accurate at the date compiled. Power-Sonic Corporation makes no warranty expressed or implied.

Section 2 - Hazardous Ingredients/Identity Information

Components	CAS Number	Approx Wt. %	OSHA PEL (µg/m³)	ACGIH TLV (µg/m³)	NIOSH (µg/m³)
Inorganic Lead/Lead Compounds	7439-92-1	65%-75%	50	150	10
Tin	7440-31-5	<0.5%	2000	2000	N/A
Calcium	7440-70-2	<0.1%	N/A	N/A	N/A
Electrolyte: Dilute sulfuric Acid	7664-93-9	14-20%	1000	1000	1000
Fiberglass Separator	-	5%	N/A	N/A	N/A
Case Material: Acrylonitrile Butadine Styrene (ABS)	9003-56-9	5-10%	N/A	N/A	N/A

Inorganic lead and electrolyte (sulfuric acid) are the main components of every Valve Regulated Lead Acid battery supplied by Power-Sonic Corporation. Other ingredients may be present dependent upon the specific battery type. For additional information contact Power-Sonic Corporation Technical Department.

Section 3 - Physical/Chemical Characteristics

Components	Density	Melting Points	Solubility (H2O)	Odor	Appearance
Lead	11.34	621 °F	None	None	Silver-Gray
Lead Sulfate	6.20	1950 °F	40mg/l (60 °F)	None	White Powder
Lead Dioxide	9.40	554 °F	None	None	Brown Powder
Sulfuric Acid	About 1.30	203-240 °F	100%	Sharp penetrating pungent	Clear Colorless Liquid
Fiberglass Separator	N/A	N/A	Slight	None	White Fibrous
Case Material: Acrylonitrile Butadine Styrene (ABS)	N/A	N/A	None	None	Solid

Continued on next page

Material Safety Data Sheet (cont'd)

Section 4 – Flammability Data

Components	Flashpoint	Explosive Limit	Comments
Lead and Sulfuric Acid	None	None	None
Hydrogen		LEL = 4.1%	Sealed batteries can emit hydrogen if overcharged (float voltage> 2.40 VPC)
Fiberglass Separator	N/A	N/A	Toxic vapors may be released. In case of fire, wear self contained breathing apparatus
Acrylonitrile Butadine Styrene (ABS)	None	N/A	Temp over 527°F (300°C) may release combustible gases. In case of fire, wear self contained breathing apparatus

Section 5 - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	Prolonged overcharge on high current, ignition sources. Sulfuric acid remains stable at all temperatures

Incompatibility (Materials to Avoid)

Sulfuric acid: Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers, and water. Contact with metals may product toxic sulfur dioxide fumes and may release flammable hydrogen gas.
Lead Compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen, and reducing agents.

Hazardous Decomposition or Byproducts

Sulfuric acid: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, and hydrogen sulfide.
Lead Compounds: High temperatures above the melting point are likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas. Hazardous Polymerization.

Polymerization: Sulfuric acid will not polymerize

Decomposition Products: Sulfuric Dioxide, Trioxide, Hydrogen Sulfide, Hydrogen.

Conditions to Avoid: Prohibit smoking, sparks, etc. from battery charging area. Avoid mixing acid with other chemicals.

Section 6 - Health Hazard Data

Routes of Entry

Sulfuric acid: Harmful by all routes of entry
Lead compounds: Hazardous Exposure can occur only when product is heated, oxidized, or otherwise processed or damaged to create dust, vapor or fume.

Inhalation

Sulfuric acid: Breathing sulfuric acid vapors and mists may cause severe respiratory problems.
Lead compounds: Dust or fumes may cause irritation of upper respiratory tract or lungs.
Fiberglass Separator: Fiberglass is an irritant to the upper respiratory tract, skin and eyes. For exposure up to 10°F/ use MSA Comfoll with type H filter. Above 10°F use Ultra Twin with type H filter. This product is not considered carcinogenic by NTP or OSHA.

Skin Contact

Sulfuric acid: Severe irritation, burns and ulceration.
Lead compounds: Not absorbed through the skin

Continued on next page

Material Safety Data Sheet (cont'd)

Ingestion

Sulfuric acid: May cause severe irritation of the mouth, throat, esophagus, and stomach.
Lead compounds: May cause abdominal pain, nausea, vomiting, diarrhea, and severe cramping. Acute ingestion should be treated by a physician.

Eye Contact

Sulfuric acid: Severe irritation, burns, cornea damage and possible blindness.
Lead Compounds: May cause eye irritation.

Acute Health Hazards

Sulfuric acid: Severe skin irritation, burns, damage to cornea may cause blindness, upper respiratory irritation.
Lead compounds: May cause abdominal pain, nausea, headaches, vomiting, loss of appetite, severe cramping, muscular aches and weakness, and difficulty sleeping. The toxic effects of lead are cumulative and slow to appear. It affects the kidneys, reproductive and central nervous systems. The symptoms of lead overexposure are listed above. Exposure to lead from a battery most often occurs during lead reclamation operations through the breathing or ingestion of lead dust or fumes.

Chronic Health Hazards

Sulfuric acid: Possible scarring of the cornea, inflammation of the nose, throat and bronchial tubes, possible erosion of tooth enamel.
Lead compounds: May cause anemia, damage to kidneys and nervous system, and damage to reproductive system in both males and females.

Carcinogenicity

Sulfuric acid: The National Toxicological Program (NTP) and The International Agency for Research on Cancer (IARC) have classified strong inorganic acid mist containing sulfuric acid as a Category 1 carcinogen, a substance that is carcinogenic to humans. The ACGIH has classified strong inorganic acid mist containing sulfuric acid as an A2 carcinogen (suspected human carcinogen). These classifications do not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.
Lead compounds: Human studies are inconclusive regarding lead exposure and an increased cancer risk. The EPA and the International Agency for Research on Cancer (IARC) have categorized lead and inorganic lead compounds as a B2 classification (probable/possible human carcinogen) based on sufficient animal evidence and inadequate human evidence.

Medical Conditions Generally Aggravated by Exposure

Inorganic lead and its compounds can aggravate chronic forms of kidney, liver, and neurological diseases. Contact of battery electrolyte (acid) with the skin may aggravate skin diseases such as eczema and contact dermatitis. Overexposure to sulfuric acid mist may case lung damage and aggravate pulmonary conditions.

Emergency and First Aid Procedures

Inhalation
Sulfuric acid: Remove to fresh air immediately. If breathing is difficult, give oxygen
Lead compounds: Remove from exposure, gargle, wash nose and lips, consult physician

Ingestion
Sulfuric acid: Do not induce vomiting, consult a physician immediately.
Lead compounds: Consult a physician immediately

Eyes
Sulfuric acid: Flush immediately with water for 15 minutes, consult a physician.
Lead compounds: Flush immediately with water for 15 minutes, consult a physician

Skin
Sulfuric acid: Flush with large amounts of water for at least 15 minutes, remove any contaminated clothing. If irritation develops seek medical attention.
Lead compounds: Wash with soap and water.

Continued on next page

Material Safety Data Sheet (cont'd)

Section 7 - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled

There is no release of material unless the case is damaged or battery is misused/overcharged. If release occurs stop flow of material, contain/absorb all spills with dry sand, earth, or vermiculite. Do not use combustible materials. Neutralize spilled material with soda ash, sodium bicarbonate, lime, etc. Wear acid-resistant clothing, boots, gloves, and face shield. Dispose of as hazardous waste. Do not discharge acid to sewer

Waste Disposal Method

Spent Batteries - send to secondary lead smelter for recycling. Follow applicable federal, state and local regulations Neutralize as in preceding step. Collect neutralized material in sealed container and handle as hazardous waste as applicable. A copy of this MSDS must be supplied to any scrap dealer or secondary lead smelter with the battery.

Precautions to be Taken in Handling and Storing

Store batteries in a cool, dry, well ventilated area that are separated from incompatible materials and any activities which may generate flames, sparks, or heat. Keep all metallic articles that could contact the negative and positive terminals on a battery and create a short circuit condition.

Electrical Safety

Due to the battery's low internal resistance and high power density, high levels of short circuit current can be developed across the battery terminals. Do not rest tools or cables on the battery. Use insulated tools only. Follow all installation instructions and diagrams when installing or maintaining battery systems.

Fiberglass Separator

Fiberglass is an irritant to the upper respiratory tract, skin and eyes. For exposure up to 10°F/ use MSA Comfoll with type H filter. Above 10°F use Ultra Twin with type H filter. This product is not considered carcinogenic by NTP or OSHA.

Section 8 - Control Measures

Respiratory Protection

None required under normal conditions. If battery is overcharged and concentrations of sulfuric acid are known to exceed PEL use NIOSH or MSH approved respiratory protection.

Engineering Controls

Store and handle batteries in a well ventilated area. If mechanical ventilation is used, components must be acid resistant

Protective Gloves	**Eye Protection**
None needed under normal conditions. If battery case is damaged use rubber or plastic elbow length gauntlets	None needed under normal conditions. If handling damaged or broken batteries use chemical splash goggles or face shield

Other Protective Clothing or Equipment

None needed under normal conditions. In case of damaged or broken battery use an acid resistant apron. Under severe exposure or emergency conditions wear acid resistant clothing.

Work Hygienic Practices

Handle batteries carefully to avoid damaging the case. Do not allow metallic articles to contact the battery terminals during handling. Avoid contact with the internal components of the battery.

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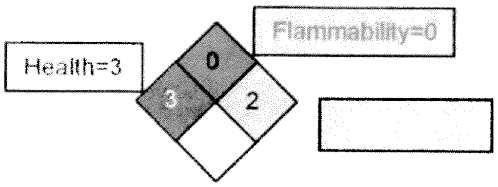
Material Safety Data Sheet (cont'd)

Section 9 Regulatory Information

NFPA Hazard Rating for Sulfuric Acid



Transportation Batteries. Non-Restricted Status

Shipment of Power-Sonic Rechargeable Sealed Lead Acid Batteries
NORTH AMERICA – SURFACE AND AIR SHIPMENTS
Non-Restricted Status

Our non-spillable lead acid batteries are listed in the U.S. Department of Transportation (DOT) hazardous materials regulations, but are excepted from these regulations since they met all of the following requirements found under 49 CFR 173.159 and 49 CFR 173.159(a)

49 CFR 173.159:

(f) Batteries can be considered as non-spillable provided they are capable of withstanding the following two tests, without leakage of battery fluid from the battery:

(1) ***Vibration test.*** The battery must be rigidly clamped to the platform of a vibration machine, and a simple harmonic motion having an amplitude of 0.8 mm (0.03 inches) with a 1.6 mm (0.063 inches) maximum total excursion must be applied. The frequency must be varied at the rate of 1 Hz/min between the limits of 10 Hz to 55 Hz. The entire range of frequencies and return must be traversed in 95 ± 5 minutes for each mounting position (direction of vibrator) of the battery. The battery must be tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for equal time periods.

(2) ***Pressure differential test***. Following the vibration test, the battery must be stored for six hours at 24 °C ± 4 °C (75 °F ± 7 °F) while subjected to a pressure differential of at least 88 kPa (13 psig). The battery must be tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for at least six hours in each position.

49 CFR 173.159 (a)

Non-spillable batteries are excepted from the packaging requirements of §173.159 under the following conditions:

(1) Non-spillable batteries must be securely packed in strong outer packaging and meet the requirements of §173.159(a). A non-spillable battery which is an integral part of and necessary for the operation of mechanical or electronic equipment must be securely fastened in the battery holder on the equipment;

(2) The battery and outer packaging must be plainly and durably marked "NON-SPILLABLE" or "NON-SPILLABLE BATTERY." The requirement to mark the outer package does not apply when the battery is installed in a piece of equipment that is transported unpackaged.

(d) Non-spillable batteries are excepted from all other requirements of this subchapter when offered for transportation and transported in accordance with paragraph (c) of this section and the following:

(1) At a temperature of 55 °C (131 °F), the battery must not contain any unabsorbed free-flowing liquid, and must be designed so that electrolyte will not flow from a ruptured or cracked case; and

(2) For transport by aircraft, when contained in a battery-powered device, equipment or vehicle must be prepared and packaged for transport in a manner to prevent unintentional activation in conformance with §173.159(b)(2) of this Subpart.

January 25, 2010

Continued on next page

Material Safety Data Sheet (cont'd)

Shipment of Power-Sonic Rechargeable Sealed Lead Acid Batteries
INTERNATIONAL
Non-Restricted Status

Our non-spillable lead acid batteries also are *excepted* from the international hazardous materials (also known as "dangerous goods") regulations since they comply with the following requirements:

• The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the International Air Transport Association (IATA) Dangerous Goods Regulations;

• The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air; and

• The vibration, pressure differential, and "crack" tests found in Special Provision 238.1 and 238.2 of the International Maritime Dangerous Goods (IMDG) Code.

• Under I.A.T.A. classification Power-Sonic batteries fall under UN number 2800: "Batteries, wet, non-spillable, electric storage".

January 25, 2010

Regulatory Information

RCRA: Spent lead acid batteries are not regulated as hazardous waste by the EPA when recycled, however state and international regulations may very.

CERCLA (superfund) and EPCRA:

(a) Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (superfund) and EPCRA (Emergency Planning Community Right to Know Act is 1,000lbs. State and local reportable quantities for spilled sulfuric acid may vary.
(b) Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA with a Threshold Planning Quantity (TPQ) of 1,000lbs.
(c) EPCRA Section 302 Notification is required if 1,000lbs. or more of sulfuric acid is present at one site. The quantity of sulfuric acid will vary by battery type. Contact Power-Sonic Corporation for additional information.
(d) EPCRA Section 312 Tier 2 reporting is required for batteries if sulfuric acid is present in quantities of 500lbs. or more and/or lead is present in quantities of 10,00lbs. or more.
(e) Supplier Notification: This product contains toxic chemicals which may be reportable under EPCRA Section 313 Toxic Chemical Release Inventory (Form R) requirements. If you are a manufacturing facility under SIC codes 20 through 39 the following information is provided to enable you to complete the required reports:

Regulatory Information continued:

(f)

Toxic Chemical	CAS Number	Approximate % by weight
Lead	7439-92-1	60
Sulfuric Acid	7664-93-9 10-	30
Arsenic	7440-38-2	0.2

If you distribute this product to other manufacturers in SIC codes 20 through 39, this information must be provided with the first shipment in a calendar year. The Section 313 supplier notification requirement does not apply to batteries which are "consumer products". Not present in all battery types. Contact Power-Sonic Corporation for further information.

TSCA
Ingredients in Power-Sonic Corporation's batteries are listed in the TSCA Registry as follows:

Components	CAS Number	TSCA Status
Electrolyte Sulfuric Acid (H2SO4)	7664-93-9	Listed
Inorganic Lead Compound: Lead (Pb)	7439-92-1	Listed
Lead Oxide (PbO)	1317-36-8	Listed
Lead Sulfate (PbSO4)	7446-14-2	Listed
Arsenic (As)	7440-38-2	Listed
Calcium (Ca)	7440-70-2	Listed
Tin (Sn)	7440-31-5	Listed

Power-Sonic Corporation
E-Mail: quality-assurance@power-sonic.com
Website:http://www.power-sonic.com

International Shipment Of Sealed Batteries

Shipment of Power-Sonic Rechargeable Sealed Lead Acid Batteries
INTERNATIONAL
Non-Restricted Status

Our non-spillable lead acid batteries also are *excepted* from the international hazardous materials (also known as "dangerous goods") regulations since they comply with the following requirements:

• The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the International Air Transport Association (IATA) Dangerous Goods Regulations;

• The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air; and

• The vibration, pressure differential, and "crack" tests found in Special Provision 238.1 and 238.2 of the International Maritime Dangerous Goods (IMDG) Code.

• Under I.A.T.A. classification Power-Sonic batteries fall under UN number 2800: "Batteries, wet, non-spillable, electric storage".

January 25, 2010

EU Safety Data Sheet

SAFETY DATA SHEET - SLA BATTERIES

1. Identification of Product and Company

Company: Power-Sonic Europe Ltd
Address: 3 Buckingham Square , Hurricane Way, Wickford , Essex ,SS11 8YQ

Tel: +44 (0)1268 560686

2. Compositions and Information on the main ingredients [3]

CAS no.	Description	Content [1] [% of weight]	Hazard symbol
7439-92-1	Lead Grid (metallic lead, lead alloys with possible traces of additives)	~ 32	T [2]
7439-92-1	Active Mass (Battery Oxide, inorganic lead compounds)	~ 32	T [2]
7664-93-9	Electrolyte [4] (Diluted sulphuric acid with additives)	~ 29	C
	Plastic Container / Plastic Parts [5]	~7	

1) contents may vary due to performance data of the Battery
2) As results of the harm to the unborn children Lead compounds are classified as toxic for reproduction, category 1. As this is not described with a specific hazard symbol, Lead compounds have to labelled with the ‹skull * symbol. Lead compounds are not classified ‹toxic*
3) see chapter 12 - Ecological information
4) Density of the electrolyte varies in accordance to the state of charge
5) Composition of the plastic may vary due to different customer requirements

3. Hazards Identification

No hazards occur during the normal operation of the Lead Acid Battery as it is described in the instructions for use that are provided with the Battery. Lead-acid Batteries have three significant characteristics:

- They contain an electrolyte which contains diluted sulphuric acid. Sulphuric acid may cause severe chemical burns
- During the charging process or during operation they might develop hydrogen gas and oxygen, which under certain circumstances may result in an explosive mixture.
- They can contain a considerable amount of energy, which may be a source of high electrical current and a severe electrical shock in the event of a short circuit.

The Batteries have to be marked with the symbols listed under items 15.

EU Safety Data Sheet (cont'd)

4. First Aid measures

The information is of relevance only if the battery is broken and this results in a direct contact with the ingredients

4.1 General

Electrolyte (diluted sulphuric acid):	sulphuric acid acts corrosively and damages skin.
Lead compounds:	lead compounds are classified as toxic for reproduction (if swallowed)

4.2 Electrolyte (Sulphuric acid)

after skin contact:	rinse with water, remove and wash wetted clothing
after inhalation of acid mist:	inhale fresh air, seek advice of a medical doctor
after contact with the eyes:	rinse under running water for several minutes, seek advice from a medical doctor
after swallowing:	drink lots of water immediately, swallow activated carbon, do not induce vomiting, seek advice from a medical doctor

4.3 Lead compounds

after skin contact:	clean with water and soap
after inhalation:	inhale fresh air, seek advice of a medical doctor
after contact with the eyes:	rinse under running water for several minutes, seek advice of a medial doctor
after swallowing:	wash mouth with water, see advice of a medical doctor

5. Fire fighting measures

Suitable fire extinguishing agents:

CO_2 of dry powder extinguishing agents

Unsuitable fire extinguishing agents:

Water, if the battery voltage is above 120V

Special protective equipment:

Protective goggles, respiratory protective equipment, acid protective equipment, acid-proof clothing in case of larger stationary battery plants or where larger quantities are stored.

6. Measures to be taken in case of accidental release

This information is of relevance only if the battery is broken and the ingredients are released.

In the case of spillage, use a bonding agents agent, such as sand, to absorb spilt acid; use lime/ sodium carbonate for neutralisation; dispose of with due regard to the official local regulations; do not allow penetration into the sewer system, into earth or water bodies

7. Handling and storage

Store under roof in cool ambiance - charged lead-acid batteries do not freeze up to -50°C; prevent short circuits. Seek agreement with local water authorities in case of larger quantities of batteries to be stored. If batteries have to be stored, it is imperative that the instructions for use are observed.

EU Safety Data Sheet (cont'd)

8. Exposure limits and personal protective equipment

8.1 Lead and Lead compounds

No exposure to lead and lead-containing battery paste during normal conditions of use.

8.2 Electrolyte (sulphuric Acid)

Exposure to sulphuric acid and acid mist might occur during filling and charging.

Threshold value in workplace:	occupational exposure limits for sulphuric acid mist are regulated on a national basis.
Hazard symbol:	C, corrosive
Personal protective equipment:	Protective goggles, rubber or PVC gloves, acid-resisting clothing, safety boots
CAS-No:	7664-39-9
R-phrases:	R-35 Causes severe chemical burns
S-phrases:	S-2 Keep out of reach of children S-16 Keep away from sparks or naked flame, No smoking S-26 In case of contact with eyes rinse immediately with plenty of water and seek medical advice S-45 In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)

9. Physical and Chemical properties

	Lead and Lead compounds	Electrolyte (diluted sulphuric acid, 30 to 38.5%)
Appearance		
form:	solid	liquid
colour:	grey	colourless
odour:	odourless	odourless
Safety-related data		
solidification point:	327 °C	-35 to -60 °C
boiling point:	1740 °C	approx. 108 to 114 °C
solubility in water:	very low (0.15 mg/l)	complete
density (20°C):	11.35 g/cm^3	1.2 to 1.3 g/cm^3
vapour pressure (20°C):	N.A.	N.A.

Lead and Lead compounds use in Lead-Acid batteries are poorly soluble in water, lead can be dissolved in an acidic or alkaline environment only.

10. Stability and Reactivity (sulphuric acid, 30 - 35,5 %)

- Corrosive, non flammable liquid
- Thermal decomposition at 338° C
- Destroys organic materials such as cardboard, wood, textiles
- Reacts with metals, producing hydrogen
- Vigorous reactions on contact with sodium hydroxide and alkalis

EU Safety Data Sheet (cont'd)

11. Toxicological Information

This information does not apply to the finished product "lead-acid battery". This information only applies to its compounds in case of a broken product. Different exposure limits exist on a national level.

11.1 Electrolyte (diluted sulphuric acid):

Sulphuric Acid intensely corrosive to skin and mucous membranes; the inhalation of mists may cause damage to the respiratory tract

acute toxicity data:

$LD_{50\ (oral,\ rat)}$ = 2.140 mg/kg

$LC_{50\ (inhalation,\ rat)}$ = 510mg/m^3 /2h

11.2 Lead and Lead compounds

Lead and its compounds used in a Lead Acid Battery may cause damage to the blood, nerves and kidneys when ingested. The lead contained in the active material is classified as toxic for reproduction.

12. Ecological Information

This information is of relevance if the battery is broken and the ingredients are released to the environment

12.1 Electrolyte (diluted sulphuric acid)

In order to avoid damage to the sewer system, the acid has to be neutralised by means of lime or sodium carbonate before disposal. Ecological damage is possible by change of pH. The electrolyte solution reacts with water and organic substances, causing damage to flora and fauna. The electrolyte may also contain soluble components of lead that can be toxic to aquatic environments.

12.2 Lead and Lead compounds

Chemical and physical treatment is required for the elimination from water. Waste water containing lead must not be disposed of in an untreated condition.

The former classification of Lead compounds as toxic for the aquatic environment R50/53 had been triggered from test results generated in the 80's for soluble Lead compounds (lead Acetate). The hardly soluble Lead compounds such as Battery Lead Oxide were not tested at this time. Tests on Battery Lead Oxide were carried out in 2001 and 2005. The respective test results conclude that Battery Lead Oxide is not toxic for the environment, neither R50 nor R50/53. From this it follows that the general classification for Lead compounds (R50/53) does not apply to Battery Lead Oxide. As the result of this the Risk Phrase R52/R53 (Harmful to aquatic organisms, may cause long term adverse effects in the aquatic environment) applies to Battery Lead Oxide (see chapter 12 - Ecological Information).

Effects of Battery Lead Oxide in the aquatic environment:

- Toxicity for fish: 96 h LC 50 > 100mg/l
- Toxicity for daphnia: 48 h EC 50 > 100mg/l
- Toxicity for alga: 72 h IC 50 > 10 mg/l

The results demonstrate these Battery Lead Oxide compounds in a concentration of 10 mg/l have no adverse effect on fish and daphnia. A concentration of these Battery Lead Oxide of 10mg/l has no adverse effect on the rate of growth and the biomass. For the classification according to Directive 67/548/EEC the most sensitive adverse effect has to be considered. As a result of the toxicity for alga at > 10 mg/l Battery Lead Oxide has to be classified according to the R-Phrases 52/53 (Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment).

EU Safety Data Sheet (cont'd)

13. Disposal Considerations

Spent lead-acid batteries (EWC 1606/1) are subject to regulation of the EU Battery Directive and its adoptions into national legislation on the composition and end-of-life management of batteries.

Spent Lead-Acid batteries are recycled in lead refineries (secondary lead smelters). The components of a spent Lead Acid are recycled or re-processed.

At the point of sale, the manufacturers and importers of batteries, respectively the metal dealers take back spent batteries, and render them to the secondary lead smelters for processing.

To simplify the collection and recycling or re-processing process, spent Lead-Acid batteries must not be mixed with other batteries.

By no means may the electrolyte (diluted sulphuric acid) be emptied in an inexpert manner. This process is to be carried out by the processing companies only.

14. Transport Regulation

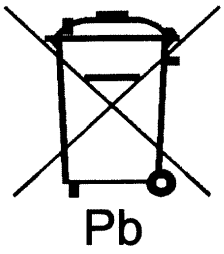
Land Transport	Land Transport (ADR/RID, U.S. DOT) - UN No UN2800 - Classification ARD/RID: Class 8 - Proper Shipping Name: BATTERIES, WET, NON SPILLABLE electric storage - Packing Group ADR: not assigned - Label required: Corrosive - ADR/RID: New and spent batteries are exempt from all ADR/RID (special provision 598)
Sea Transport	Sea Transport (IMDG Code) - UN No UN2800 - Classification: Class 8 - Proper Shipping Name: BATTERIES, WET, NON SPILLABLE electric storage - Packing Group: III - EmS: F-A, S-B - Label required: Corrosive - If non-spillable batteries meet the Special Provision 238, they are exempted from all IMDG codes provided that the batteries terminals are protected against short circuits.
Air Transport	Air Transport (IATA-DGR) - UN No UN2800 - Classification: Class 8 - Proper Shipping Name: BATTERIES, WET, NON SPILLABLE electric storage - Packing Group: III - Label required: Corrosive - If non-spillable batteries meet the Special Provision A67, they are exempted from all IATA DGR codes provided that the batteries terminals are protected against short circuits.

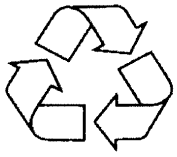
Power-Sonic batteries comply in full with the above detailed transportation provisions and are classified as NON Dangerous

EU Safety Data Sheet (cont'd)

15. Regulatory Information

In accordance with EU Battery Directive and the respective national legislation, Lead-Acid batteries have to be marked by a crossed out dustbin with the chemical symbol for lead below, together with the ISO return/ recycling symbol.





16. Other Information

Products such as batteries are not in the scope of regulation which require the publication of an EU Safety Data Sheet (91/155/EEC).

The information given above is provided in good faith based on existing knowledge and does not constitute an assurance of safety under all conditions. It is the users responsibility to observe all laws and regulations applicable for storage, use maintenance or disposal of the product. If there are any queries, the supplier should be consulted.

However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Battery Recycling

Battery Recycling

Power-Sonic is dedicated to the protection of our enviroment and we would urge you to recycle your old batteries on every occasion.

We in the battery industry are proud of the fact that lead-acid batteries are the enviromental success story of our time. More than 97% of all battery lead is recycled. Compared to 55% of aluminum soft drink and beer cans, 45% of newspapers, 26% of glass bottles and 26% of tires, lead acid batteries top the list of the most highly recycled consumer products.

The lead-acid battery gains its enviromental edge from its closed loop cycle. The typical new lead-acid battery contains 60 to 80 percent recycled lead and plastic. When a spent battery is collected, it is sent to a permitted recycler, where under strict enviromental regulations, the lead and plastic are reclaimed and sent to a new battery manufacturer. The recycling cycle goes on indefinitely. that means the lead and plastic in the lead-acid batteries that you use have been - and will continue to be - recycled many, many times. This makes lead acid battery disposal extremely successful from both enviromental and cost perspectives.

To find out more about recycling, the applicable Federal and State laws and locate battery recycling locations in your area we would direct you to the following sites:

- http://www.earth911.org This is a very comprehensive site, and by entering your zip code the site will direct you to battery recycling depots in your area. Think and act green!
- http://www.batterycouncil.org This site will provide you with more information on the recycling process and direct you to the pertinent Federal and State laws.

European Directives WEEE and ROHS

Power-Sonic Europe Limited, 3 Buckingham Square, Hurricane Way, Wickford, Essex SS11 8YQ
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European Directives WEEE 2002/96/EC and ROHS 2002/95/EC

The ROHS directive (Restriction of Hazardous Substances in Electrical Equipment) covers the same scope as the WEEE directive (Waste Electrical and Electronic Equipment). Batteries and accumulators do not fall into any of the ten categories listed by the WEEE directive (a good summary of these categories may be referenced on www.weeenetwork.com). Therefore we consider that our appropriate response is to declare that our range of products are outside the scope of each of these directives.

The European directive that is directly relevant to batteries and accumulators is Council directive 2006/66/EC, which specifies that batteries containing mercury, lead or cadmium should be collected separately when spent and should carry an identifying label. (An introductory summary may be accessed on a DTI web-site www.dti.gov.uk/sustainability).

Power-Sonic Sealed Lead Acid and Nickel Cadmium batteries conform to Commission Directive 93/86/EEC, which requires that the product is labelled with the WEEE symbol (a crossed-out wheelie bin and the appropriate chemical symbol). This is designed to inform the end user to separate batteries from other waste.

Under existing legislation (currently under review) there is presently no specific framework for battery collection and recycling. In the absence of this, Power-Sonic Europe's policy is to accept returns of our product at the customer's expense (or even competitor product for existing customers who experience difficulty with their former supplier). To ensure proper recycling, we then route the batteries through Environment Agency procedures using approved waste carriers and licensed sites.

September 2006

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5-PARTS LIST

5-1 Renewable Parts

See Table 5-1 for renewable parts for the Twin System main disconnect panel.

Table 5-1
LIST FOR RENEWABLE PARTS

Fuse F4	120	10	FNQ-R-10	ATQR10	2276547-11
Fuse F5	120	10	FNQ-R-10	ATQR10	2276547-11
Fuse F6	12VDC	2	LP-CC-2	ATDR2	
Red PB Operator*			CR104PBG00R1		
Contact Block*			CR104PXC01F		
Name Plate*			CR104PXN2RP009 “Emergency Off”		
SS Wall Plate*			CR2940BD201D		
Selector Switch		-	P9SSMD0V		
Pilot Lamp (Green)		-	080BA9S6LV		
Battery	12 DC	7ah	PS1270		5375947
Power supply	12 DC	1.3A	Puls		5316807
* = Component parts of additional remote emergency OFF pushbuttons.					

All of the above parts are in stock at Gexpro Milwaukee (414)-527-6600.

5-2 Replacement Parts

See Table 5-2 for replacement parts for the MR System main disconnect panel.

Table 5-2
LIST FOR REPLACEMENT PARTS

Part	Manufacturer Part Number		
Power Distribution Block	4000N51P093		
Neutral Block	4000N51P094		
CB1 - Circuit Breaker	SEHA36AT0150		
CB1 - 150 AMP Rating Plug	SRPE150A150		
CB1 – Optional 480V ONLY Rating Plug	SRPE150A125		
CB1 – Lug Qty (4)	TCAL18		
CB1 - Lug Qty (2)	TCAL18LV		
CB2 – 100A Circuit Breaker	SEHA36AT0100	SRPE100A100	(6) TCAL18
CB3 20 AMP Circuit Breaker	FCV36TE020R2		
CB5 – 30 AMP Circuit Breaker	FCV36TE030R	+(6) FCALK13	
CB6 – 15 AMP Rating Plug	FCV326TE015		
CB7 - V-Line Circuit Breaker	EP101ULD13		
CB8 - V-Line Circuit Breaker	EP101ULD10		
F1 Fuse Block	3007N39P011		
F2 Fuse Block	3007N36P002		
F3 Fuse Block	3007N39P023		
F5 & F4 Fuse Blocks	3007N36P001		
F6 Fuse block	3007N36P013		
C1	CK95BE311J		
C2	CK09BE311J		
C3	CL04A310MJ		
CPT1	9T58E0506		
CPT2	9T58E0507		
CR1	4001N42P001		
T1	RL4RA040TJ	BTLF30C	
UPS and MUX BOX-Receptacle, Box, and Cover	3009N13P002	3009N14P001	3009N14P003
MAG MON and Modem-Receptacle, Box, and Cover	3009N13P001	3009N14P001	3009N14P003
Power supply	5316807		
UPS Return-Receptacle, Box, and Cover	3009N12P001	3009N14P002	
Emergency “OFF” PB-On Cover	P9SPNRG		
Main Power and PDU Power “ON” PB’s	P9SPNVG		
PDU, SCC, Cryo Cooler and Modem, UPS “ON-OFF” Selector Switches	P9SSMD0V		
PDU, SCC, Cryo Cooler and UPS, MUX BOX, MAG MON, MOD Light Operators, and Power Supply MOD’s Cord strain relief devices	P9SLVD Heyco 1237, 1517, 1140, 1154	P9PTNVJLV	

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	11-7-2003	L.R.H.	Manual Released
1	2-6-2004	L.R.H	Revised wiring diagram and layout drawing
2	3-27-2005	L.R.H	Changed 5A fuse GEHC FRU #
3	3-12-2006	L.R.H	Changed weight to 350 lbs.
4	5-26-2006	L.R.H	Rating nameplate updated to A-126
5	10-18-2007	L.R.H	Corrected CB3 and CB5 cat # in parts list
6	11-01-2007	L.R.H	Corrected CB3 designation in parts BOM
8	5-7-2010	L.R.H	Chg to power supply and updated maintenance section, added pictures