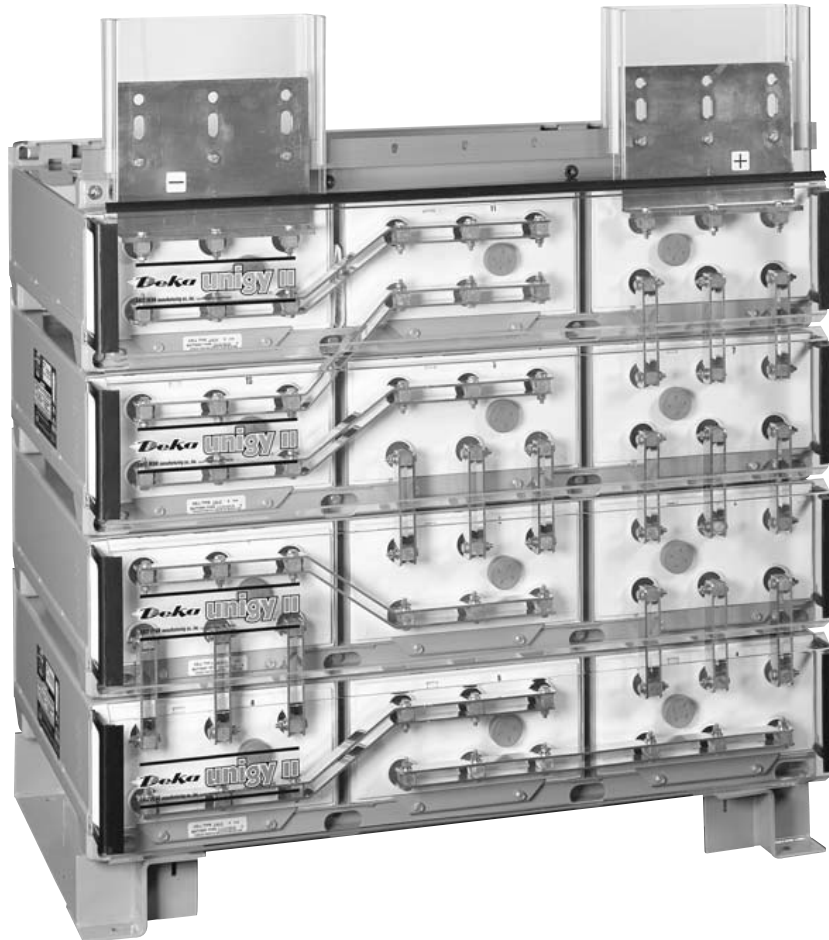


Deka[®] unigy[®] II

S95 Interlock[™] Installation and Operation Manual



**California
Proposition 65
Warning:**

Battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. **Wash hands after handling.**

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⚠ DANGER				
 HIGH VOLTAGE... RISK OF SHOCK. DO NOT TOUCH UNINSULATED TERMINALS OR CONNECTORS.	 SHIELD EYES. EXPLOSIVE GASES CAN CAUSE BLIND- NNESS OR INJURY.	 NO • SPARKS • FLAMES • SMOKING	 SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS.	FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.
DO NOT REMOVE VENT VALVE. WARRANTY VOID IF VENT VALVE IS REMOVED.		VENTILATE WELL WHEN IN AN ENCLOSED SPACE AND WHEN CHARGING.		
SEE INSTALLATION, MAINTENANCE AND OPERATION INSTRUCTIONS FOR IMPORTANT SAFETY PRECAUTIONS.				

California Proposition 65 Warning:	Battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.
---	--

BATTERIES AND RELATED PARTS CONTAIN LEAD
WASH HANDS AFTER HANDLING!
<small>WARNING: Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.</small>
<small>California Proposition 65 Workplace Warning Sign 1/99 Must be posted in workplace near batteries.</small>

SAFETY PRECAUTIONS

Although all valve-regulated batteries have the electrolyte immobilized within the cell, the electrical hazard associated with batteries still exists. **Work performed on these batteries should be done with the tools and the protective equipment listed below.** Valve-regulated battery installations should be supervised by personnel familiar with batteries and battery safety precautions.

Protective Equipment

To assure safe battery handling, installation and maintenance, the following protective equipment should be used:

1. Safety glasses or face shield
2. Acid-resistant gloves
3. Protective aprons and safety shoes
4. Proper lifting devices
5. Properly insulated tools

Procedures

(Always wear safety glasses or face shield when working on or near batteries. Refer to Fig. 1-1, pg. 3)

The following safety procedures should be followed during installation:

1. These batteries are sealed and contain no free electrolyte. Under normal operating conditions, they do not present any acid danger. However, if the battery jar or cover is damaged, acid could be present. **Sulfuric acid is harmful to the skin and eyes. Flush affected area with water immediately and consult a physician if splashed in the eyes.**
2. **Prohibit smoking and open flames, and avoid arcing in the immediate vicinity of the battery.**
3. Do not wear metallic objects, such as jewelry, while working on batteries.
4. Keep the top of the battery dry and clear of tools and other foreign objects.
5. Provide adequate ventilation (**per IEEE standard 1187-1996**) and follow recommended charging voltages.
6. Refer to Material Safety Data Sheet for proper extinguishing method. (See Appendix A, Sect. 4, pg. 15.)
7. **Never** remove or tamper with the pressure relief valves. Warranty void if vent valve is removed.
8. Inspect all flooring and lifting equipment for functional adequacy. Specifically review floor-loading capacity.
9. Adequately secure battery modules to the floor.
10. Connect support structures to ground system in accordance with applicable codes.

! DANGER

HIGH VOLTAGE... RISK OF SHOCK. DO NOT TOUCH UNINSULATED TERMINALS OR CONNECTORS.

SHIELD EYES. EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY.

NO SPARKS, FLAMES, SMOKING

SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS.

FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.

SEE INSTALLATION, MAINTENANCE AND OPERATION INSTRUCTIONS FOR IMPORTANT SAFETY PRECAUTIONS.

VENTILATE WELL WHEN IN AN ENCLOSED SPACE AND WHEN CHARGING.

DO NOT REMOVE VENT VALVE. WARRANTY VOID IF VENT VALVE IS REMOVED.

California Proposition 65 Warning: Battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. **Wash hands after handling.**

Fig. 1-1

RECEIVING & STORAGE

Receiving Inspection

Upon receipt of the battery and at the time of unloading, each package should be visually inspected for damage. If damage is evident, a more detailed inspection of the entire shipment should be conducted and noted on the bill of lading. Record receipt date and inspection data, and notify the carrier of any damage.

Unpacking

1. Always wear eye protection.
2. Check for visible defects.
3. Check the contents of the package against the packing list. Report any missing parts or shipping damage to your East Penn agent or East Penn Mfg. Co. immediately. (See Fig. 2-1, pg. 9.)
4. Never lift the batteries by the terminal posts. Always lift batteries by the module mounting holes with the lifting straps provided. (See Fig. 3-1, pg. 9.)
5. When lifting batteries, the proper equipment is needed such as a forklift or a portable crane. Always check the lifting capacities of the equipment being used and never lift more than one module at a time by the module mounting holes.

Storage

1. Cells should be stored indoors in a clean, level, dry, cool location. Recommended storage temperatures are 0°F to 90°F (-18°C to 32°C). Store in a horizontal position only. Do not store beyond 12 months.
2. Stored lead-acid batteries self discharge and must be given a boost charge six months from the date of manufacture to prevent permanent performance degradation. **Batteries should not be stored for more than 180 days without applying a boost charge of 2.30 VPC ± .01 volts for a maximum of 24 hours.** Record dates and conditions for all charges during storage.

INSTALLATION

Electric Code for Maintenance Access

Refer to ANSI/NFPA-70 National Electric Code for access and working space requirements around the battery. A minimum of 36" aisle space is recommended in front of the battery for service and inspection.*

**Note: Battery system and/or individual module grounding, if required, is the installer's responsibility.*

Floor Anchoring & Module Arrangements

See East Penn Mfg. Co.'s schematic diagram illustration. One is supplied with each shipment. If it cannot be located, contact East Penn Mfg. Co. for a copy. Refer to your delivery number, located on the packing slip. This will aid in obtaining the proper drawing.

Module Installations

Assemble modules per the following details.

NOTE: Batteries are typically packaged in the reverse order for easy installation: Floor channels are on top, followed by the bottom most module. (See Fig. 2-1, pg. 9.)

CAUTION: Never lift more than one module at a time with the lifting slings. (See Fig. 3-2, pg. 10.)

1. Special 1 piece base required for **ZONE 4** with extra hardware included. (See Fig. 3-3, pg. 10.)
2. Unbolt the floor-mounting channel from the top of the battery.
3. Using the two slings provided, lift the top module slightly and slide front. (This will release the interlock tabs and will free itself from the remaining stack.) (See Fig. 3-2, pg. 10.)
4. Using the bolts provided, attach the base channels to the module and then secure the base channels to the floor. **(See local building codes for anchor bolt requirements, anchor bolts not included.)**

5. Remove the next module in the same manner as the first. Place in position and slide back allowing the tabs to lock in place. (No rear bolts required) (See Fig. 3-2, pg. 10.)
6. Each battery is shipped with its own schematic. Make sure the polarity on the batteries matches the drawings.

ELECTRICAL CONNECTION

Connector Assembly

1. The contact surfaces of each individual post on every cell have been cleaned and coated with a thin film of NO-OX-ID "A" grease at the factory. Assure the contact surfaces are free of dust or dirt prior to assembly.
2. The intercell connector surfaces may be cleaned by rubbing gently with a non-metallic brush or pad. Apply a thin film of NO-OX-ID "A" grease which has been supplied.
3. The standard battery is supplied with connector package "A" requiring 2 connectors per post. Place one connector on each side of the post. Install the connectors loosely to allow for final alignment, then torque to 125 ± 5 inch pounds (14.1 ± .5 Nm.) **The installation and direction of the post bolts is important!** (Refer to Fig. 4-1 and 4-2, pg.11; Fig. 4-3, pg. 4. For proper direction when inserting into posts.)
4. Batteries used in high rate discharge applications require multiple connectors per connection. (Refer to optional connector packages in Fig. 4-4, pg. 5.)



Fig. 4-3

Interlock Connector Packages

	Standard	Optional	
	A	B	C
Discharge Requirements	≤900 amps or ≤1700 watts	≤1800 amps or ≤3400 watts	≤2800 amps or ≤5200 watts
Connectors per Post	2	4	6

Fig. 4-4

Terminal Assembly

1. Attach the terminal mounting bracket to the module frame. (See Fig. 5-1 and 5-1A, pg.12 for Side Terminal; See Fig. 5-2, pg. 13 for Top Terminal)
2. Attach the terminal plates or the terminal connectors to the battery posts and then torque to 125 ± 5 inch-pounds ($14.1 \pm .5$ Nm).
3. For cable connection assembly, (See Fig. 7-1, pg. 14.)

Final Assembly Check Procedure

1. For future identification of all cells, number individual cells in sequence, beginning with number one (1) at the positive end of the battery. The last cell of the battery is located at the negative output terminal.
2. Read and record the voltages of the individual cells to assure that they are connected properly. The total battery voltage should be approximately equal to the number of cells connected in series multiplied by the measured voltage of one cell. If the measurement is less, recheck the connections for proper polarity. Verify that all cell and battery connections have been properly torqued.
3. Measure and record the intercell connection resistance using a micro-ohms meter. This helps determine the adequacy of initial connection installation and can be used as a reference for future maintenance requirements. Refer to the recording forms in Appendix B of this manual. Review the records of each connection and detail resistance measurements. Clean, remake, and remeasure any connection that has a resistance measurement greater than **10%** of the average of all the same type connections (i.e. intercell, intermodule, etc.).
4. Battery performance is based on the output at the battery terminals. Therefore, the shortest electrical connection between the battery system and the operating equipment results in maximum total system performance.

Select cable size based on current carrying capability and voltage drop.

Cable size should not provide a greater voltage drop between the battery system and operating equipment than specified. Excessive voltage drop in cables will reduce the desired reserve time and power from the battery system.

Parallel Strings

When paralleling valve-regulated batteries, the capacity, arrangement, and external circuit length should be identical for each battery. Wide variation in the battery circuit resistance can result in unbalanced charging (i.e., excessive charging currents in some batteries and undercharging in others). As a result, cell failures in one battery string and subsequent loss of performance capabilities of that string will result in higher loads in the other parallel string(s), which may exceed the ratings of the battery connections. This can damage the battery system and dramatically shorten battery life.

Module Front Shield Assembly

1. Attach one black clip to each end of the clear shield. (See Fig. 5-3, pg. 13 and 5-4, pg. 5.)
2. Install the fully assembled shield into the tabs on the module. (See Fig. 5-5, pg. 6.)

Top Protective Shield Assembly

For side terminal assembly, attach the black top protective cover to the highest front shield.

For top terminal assembly, cut the black protective cover to fit between the terminals and then attach to the front shield. (See Fig. 5-3, pg. 13.)

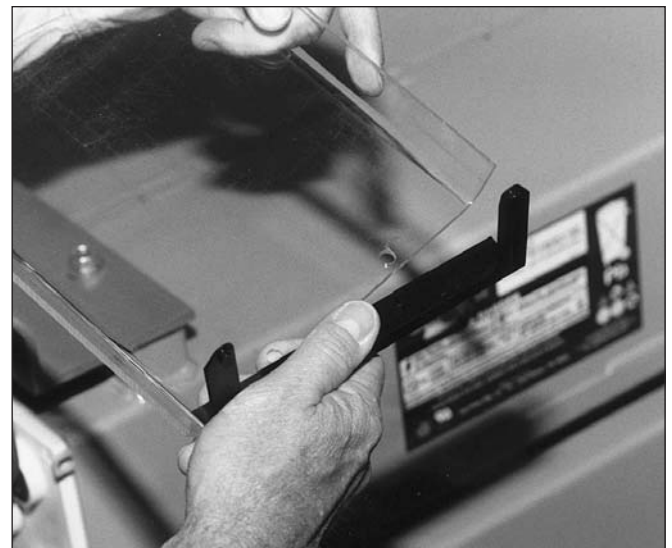


Fig. 5-4

Terminal Plate Shield Assembly

For side terminal shield assembly, (Refer to Fig. 5-1, pg. 12 and 5-6, pg. 6.)

For top terminal shield assembly, (Refer to Fig. 5-2, pg. 13 and 5-7, pg. 6.)



Fig. 5-5

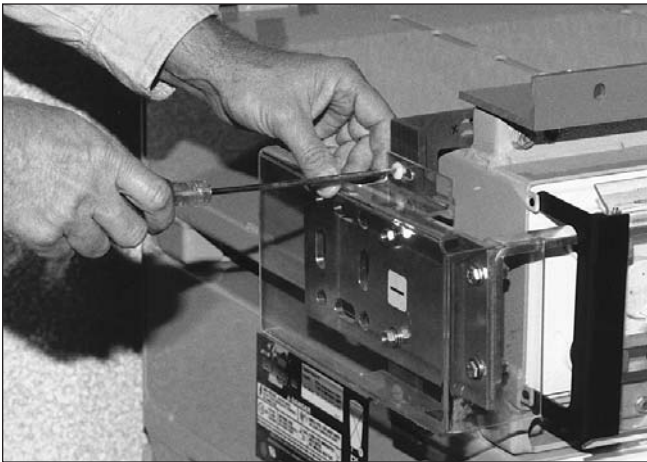


Fig. 5-6

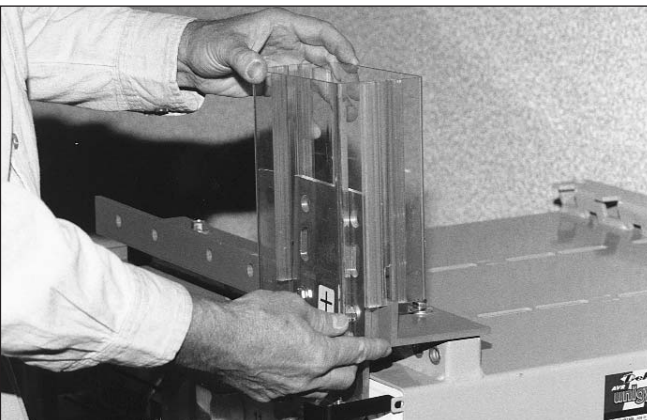


Fig. 5-7

SYSTEM OPERATIONS

Float Voltages

These batteries are designed for 20-year life when floated at $2.25 \pm .01$ volts per cell (VPC) at 77°F (25°C) or less. The charger must be able to maintain the system voltage within $\pm .5\%$ of the desired level at all times. The desired float voltage varies with the temperature according to the table below.

Operating Temperatures

Temperature Degrees F	Temperature Degrees C	Per Cell Float Voltage $\pm .01$
50°	10°	2.25
59°	15°	2.25
68°	20°	2.25
77°	25°	2.25
86°	30°	2.25
95°	35°	2.23

Equalizing

Upon installation of the battery, an optional boost charge of $2.30 \text{ VPC} \pm .01$ volts for a maximum of 24 hours can be applied. **(Note: Verify that the higher battery voltage will not adversely affect the other connected equipment.)** If this is done, be sure to reset the charging equipment back to the proper float voltage. The average battery operating temperature should not exceed 95°F (35°C) and never exceed 105°F (40.5°C) for more than an eight-hour period.

Operating at temperatures greater than 77°F (25°C) will reduce the operating life of the battery. If operating temperatures are expected to remain in excess of 95°F (35°C), contact East Penn for recommendations.

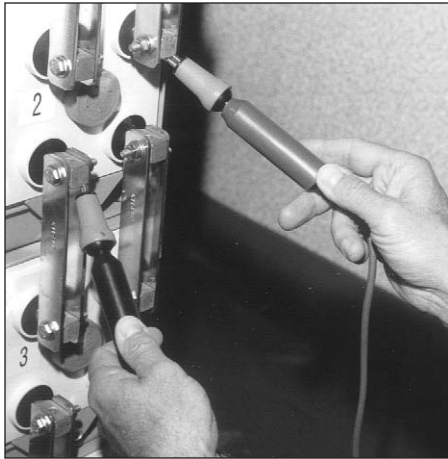


Fig. 6-1

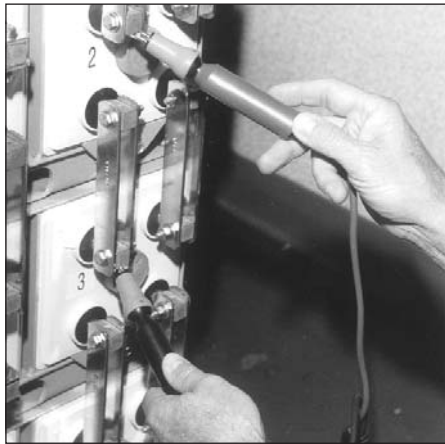


Fig. 6-2

RECORD KEEPING

Voltages, Temperatures & Ohmic Readings

Record keeping is an important part of stationary battery maintenance and warranty coverage. This information will help in establishing a life history of the battery and inform the user if and when corrective action needs to be taken. (Refer to Appendix B, Battery Maintenance Report)

While it is acceptable to operate at temperatures less than 77°F (25°C), it will require longer charging time to become fully recharged. Also, the capacity will be less at operating temperatures below 77°F (25°C).

After installation and when the batteries have been on float charge for one week, the following data should be recorded:

1. Battery terminal voltage
2. Charger voltage
3. Individual cell float voltages
4. Individual cell ohmic readings. Place the meter leads

on the positive and negative posts which are furthest from each other on the same cell. (See Fig. 6-1, pg. 7.)

5. Ambient temperatures
6. Terminal connections should be checked to verify that the installer did torque all connections properly (125 ± 5 in.-lbs.). Micro-ohm readings should be taken across every connection. (Refer to Fig. 6-2, pg. 7.) Refer to meter manufacturer's instructions for proper placement of probes. If any reading differs by more than **20%** from its initial installation value, re-torque the connection to 125 ± 5 inch-pounds. If the reading still remains high, clean contact surfaces according to Step 2 under Connector Assembly.

MAINTENANCE

Always wear eye protection when working on or near batteries. Keep sparks and open flames away from batteries at all times. See Safety Precautions on pg. 3.

Annual Inspection ⁽¹⁾

1. Conduct a visual inspection of the battery.
2. Record the battery terminal voltage.
3. Record the charger voltage.
4. Record the individual cell voltages. Cells should be within ± .05 volts of float voltage.
5. Record individual cell ohmic readings.
6. Record the ambient temperatures.
7. Record all interunit and terminal connection resistances.

⁽¹⁾ Other Maintenance Inspection intervals follow IEEE 1188

Rectifier Ripple Voltage

Acceptable charging ripple (peak to peak) shall be less than 0.5% of the manufacturer's recommended string float voltage or have a duration shorter than 8 milliseconds.

Battery Cleaning

Battery modules and covers should be cleaned with clear water or a mixture of baking soda and water. **Never use solvents to clean the battery.**

Capacity Testing

Capacity tests should not be run unless the battery's operation is questionable. Do not discharge the batteries beyond the specified final voltage. When discharging at higher rates be sure to check the connector chart. (See Fig. 4-4, pg. 5.) Extra connectors may need to be added to prevent excessive voltage drop. When performing capacity testing and recording data use **IEEE 1188-1996** instructions.

Should it be determined that any individual cell(s) need to be replaced, contact your nearest Unigy II Agent or East Penn Service Center.

CELL REMOVAL PROCEDURE

1. Before removing cells, review Safety Precautions on pg. 3 of this manual. Contact East Penn Manufacturing Company, Inc. with specific questions or concerns.
2. Refer to Fig. 8-1 through 8-4 (pg. 8) for specific instructions.

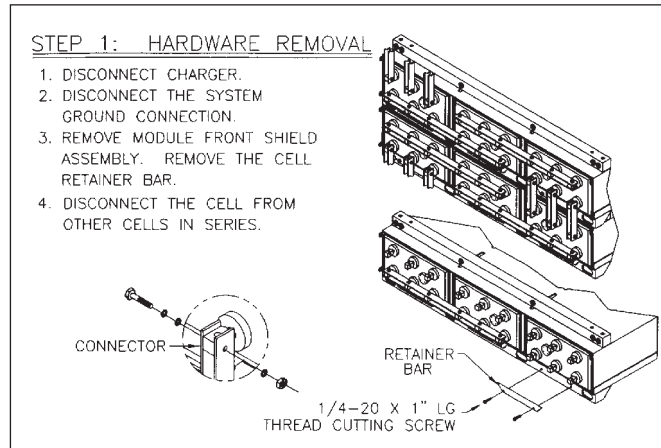


Fig. 8-1

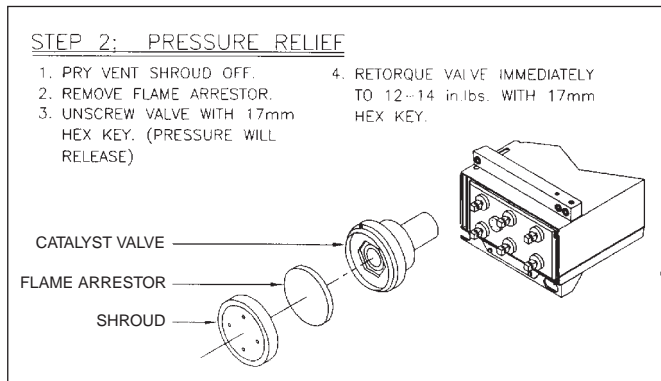


Fig. 8-2

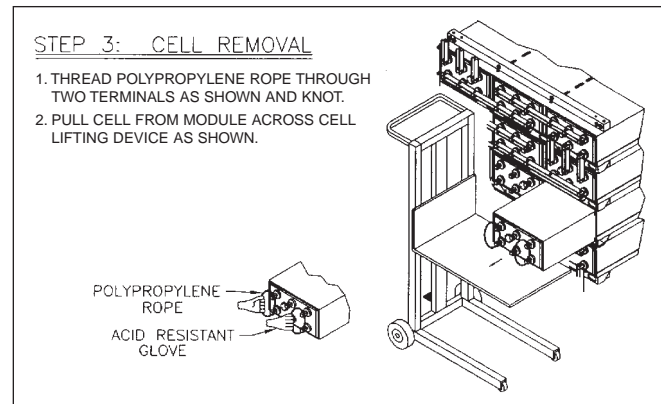


Fig. 8-3

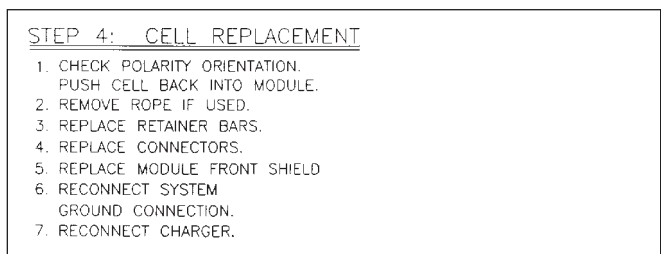


Fig. 8-4

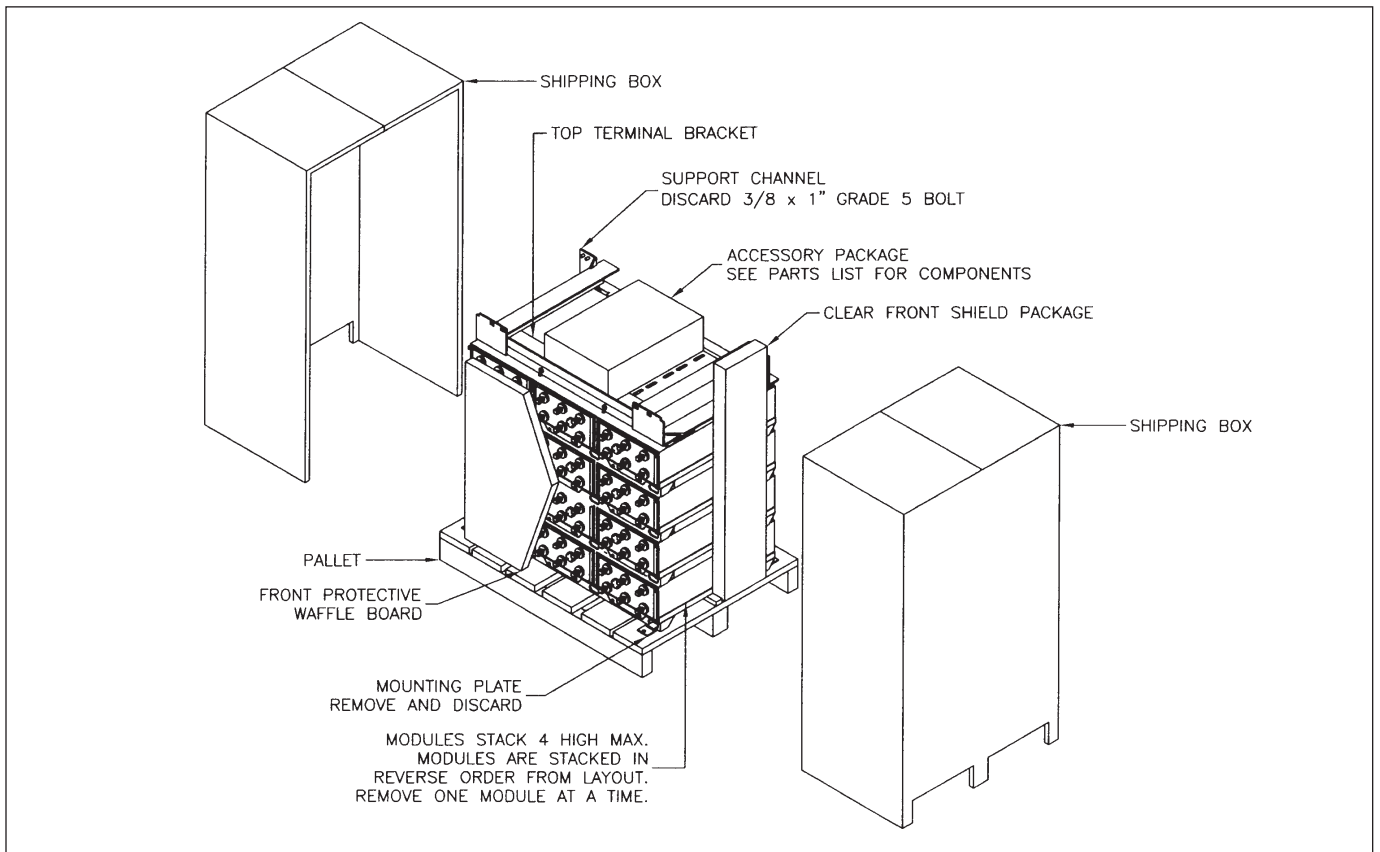


Fig. 2-1

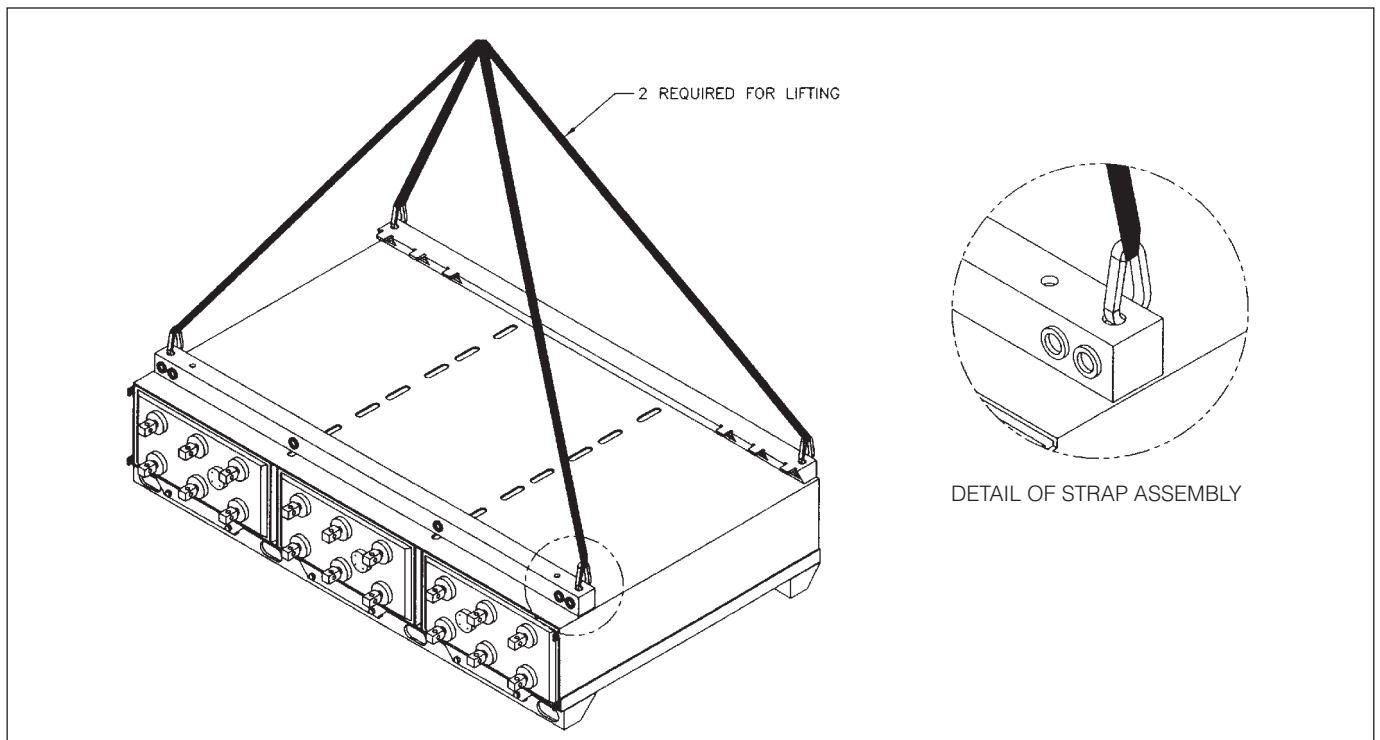


Fig. 3-1

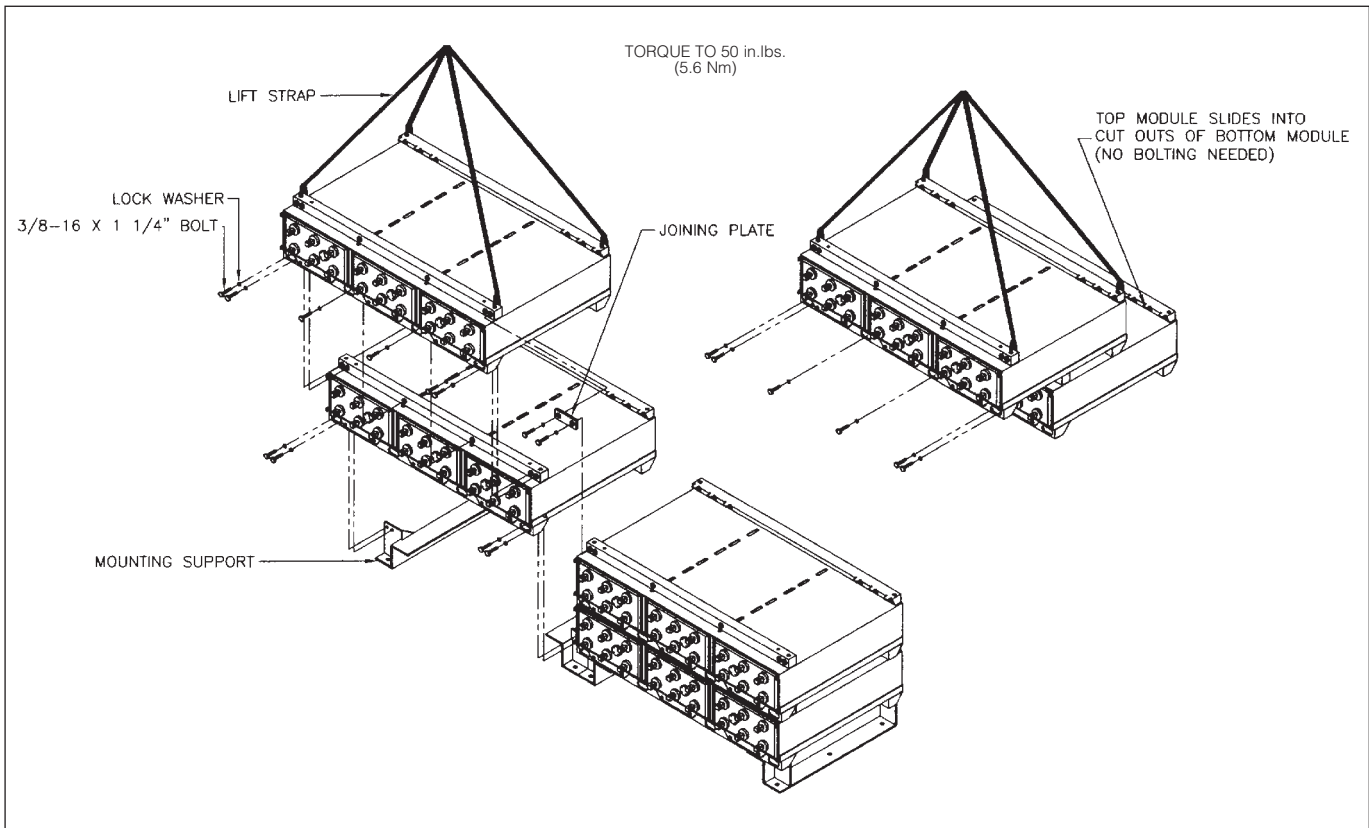


Fig. 3-2

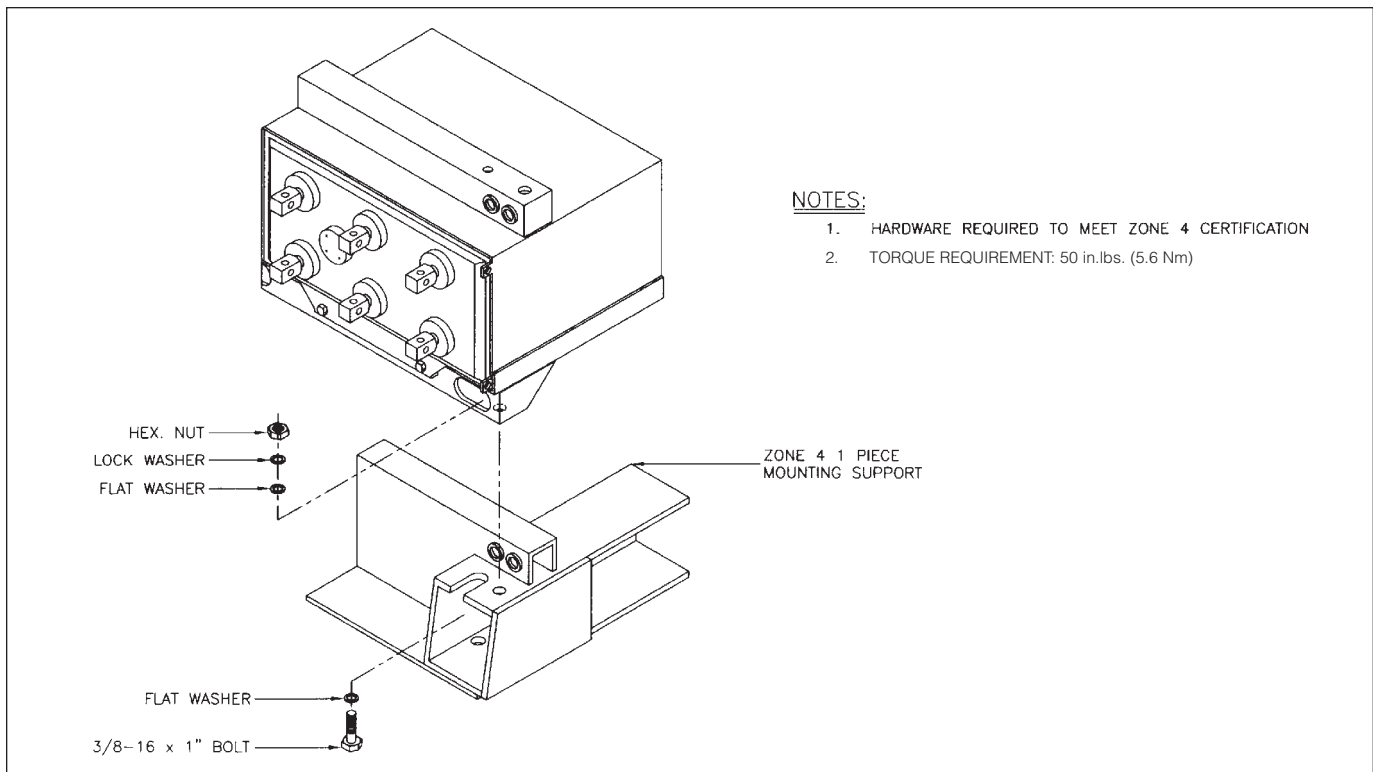


Fig. 3-3

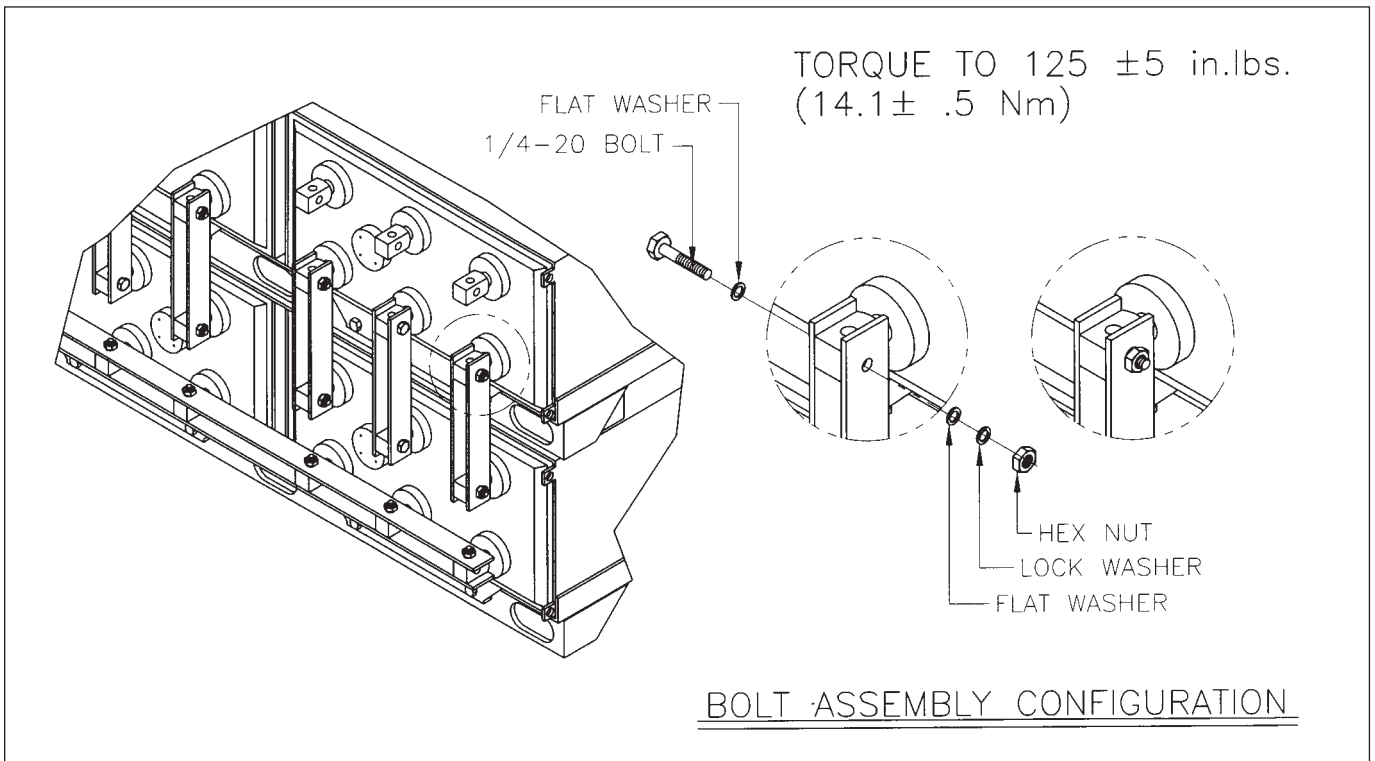


Fig. 4-1

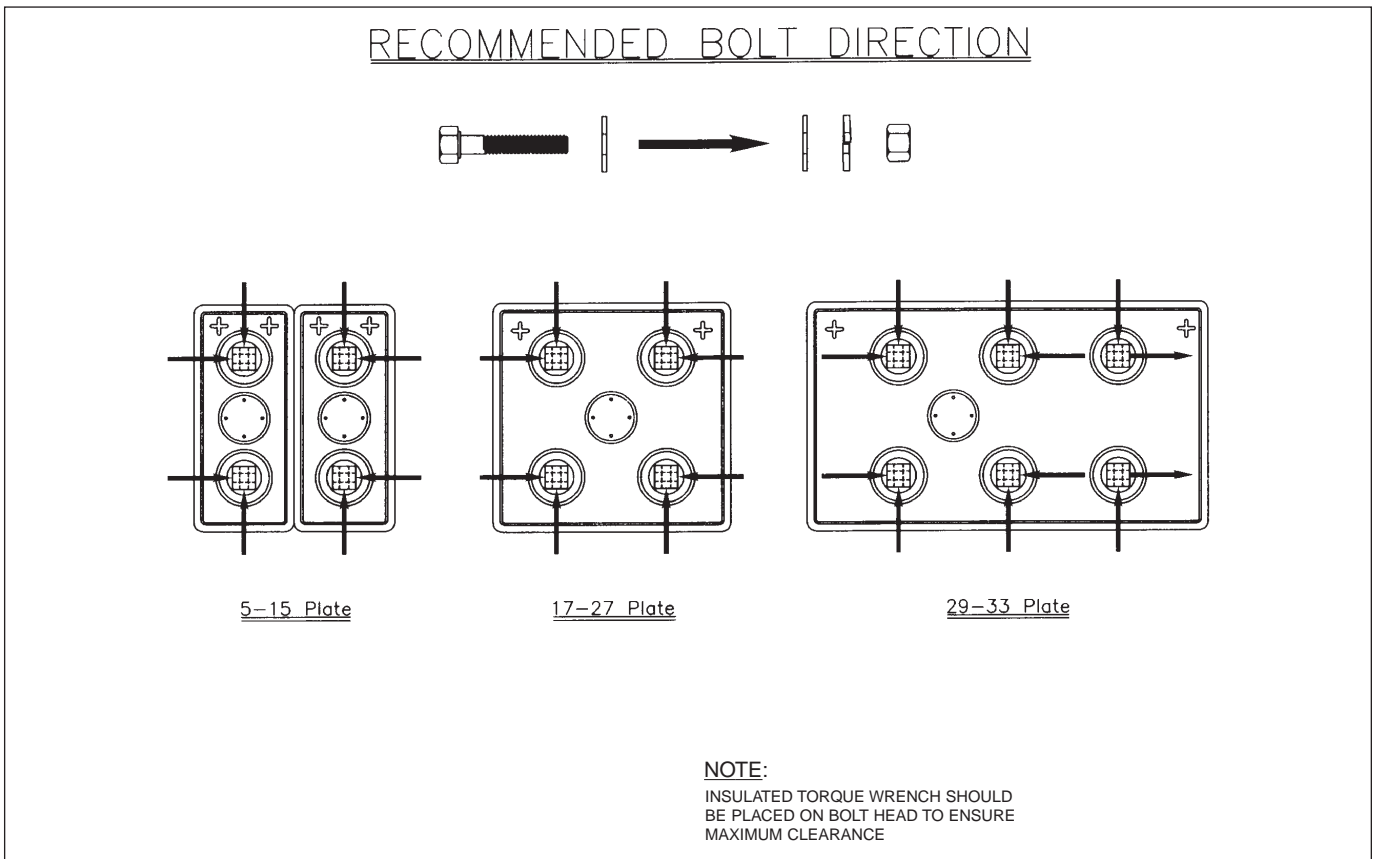


Fig. 4-2

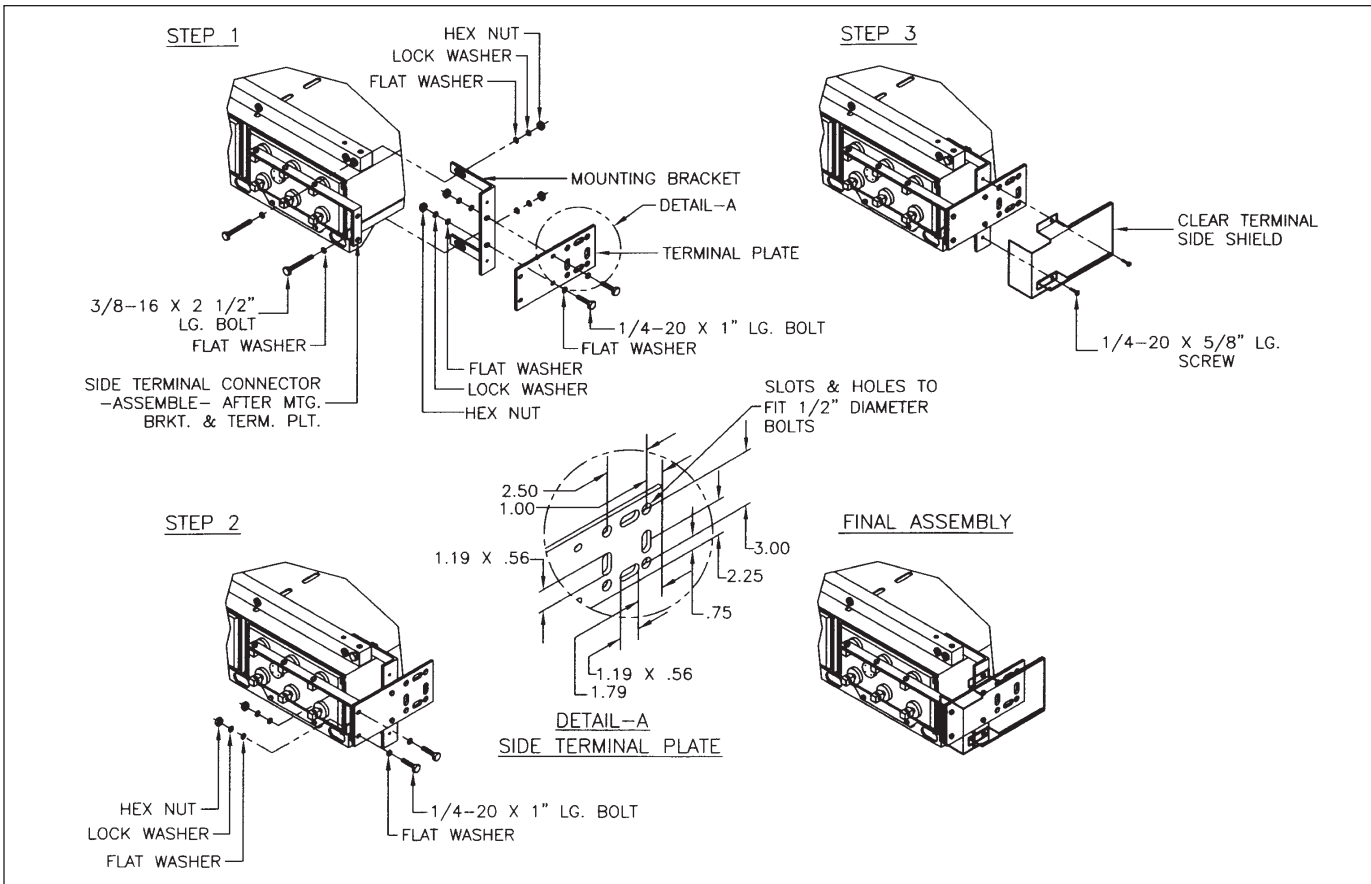


Fig. 5-1

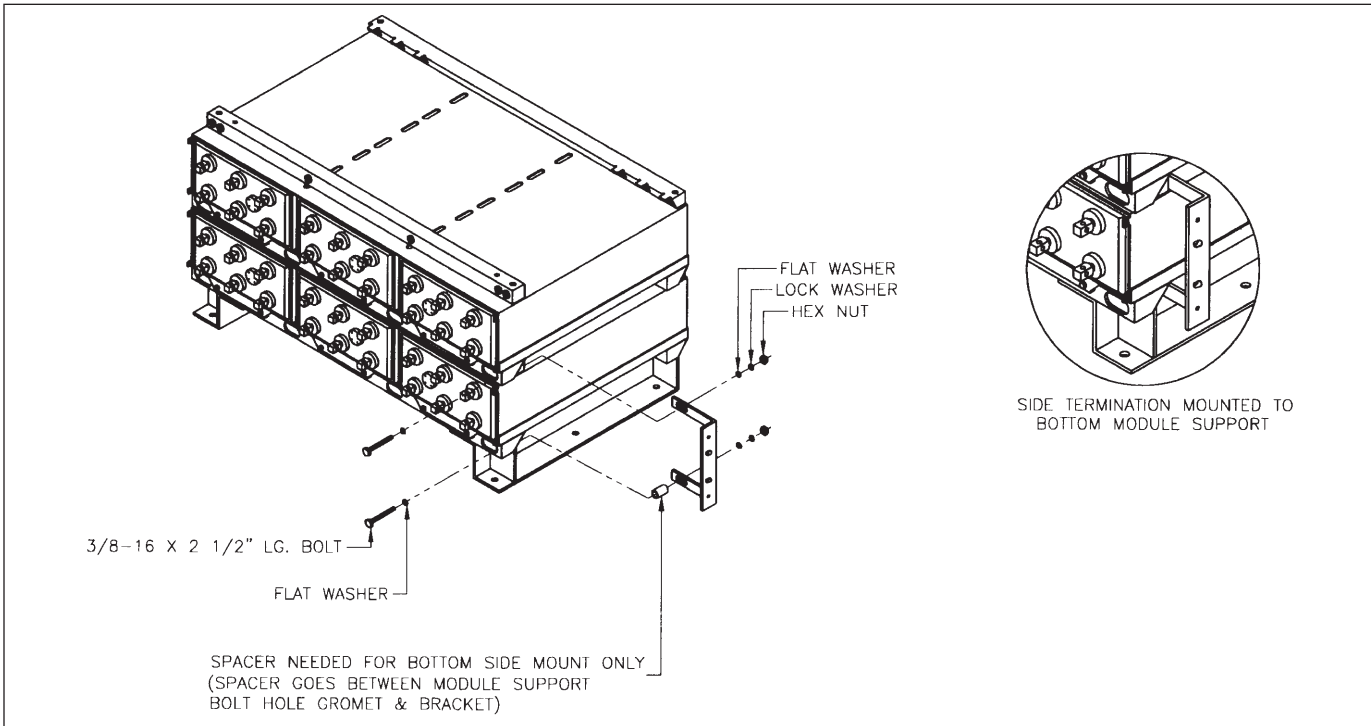


Fig. 5-1A

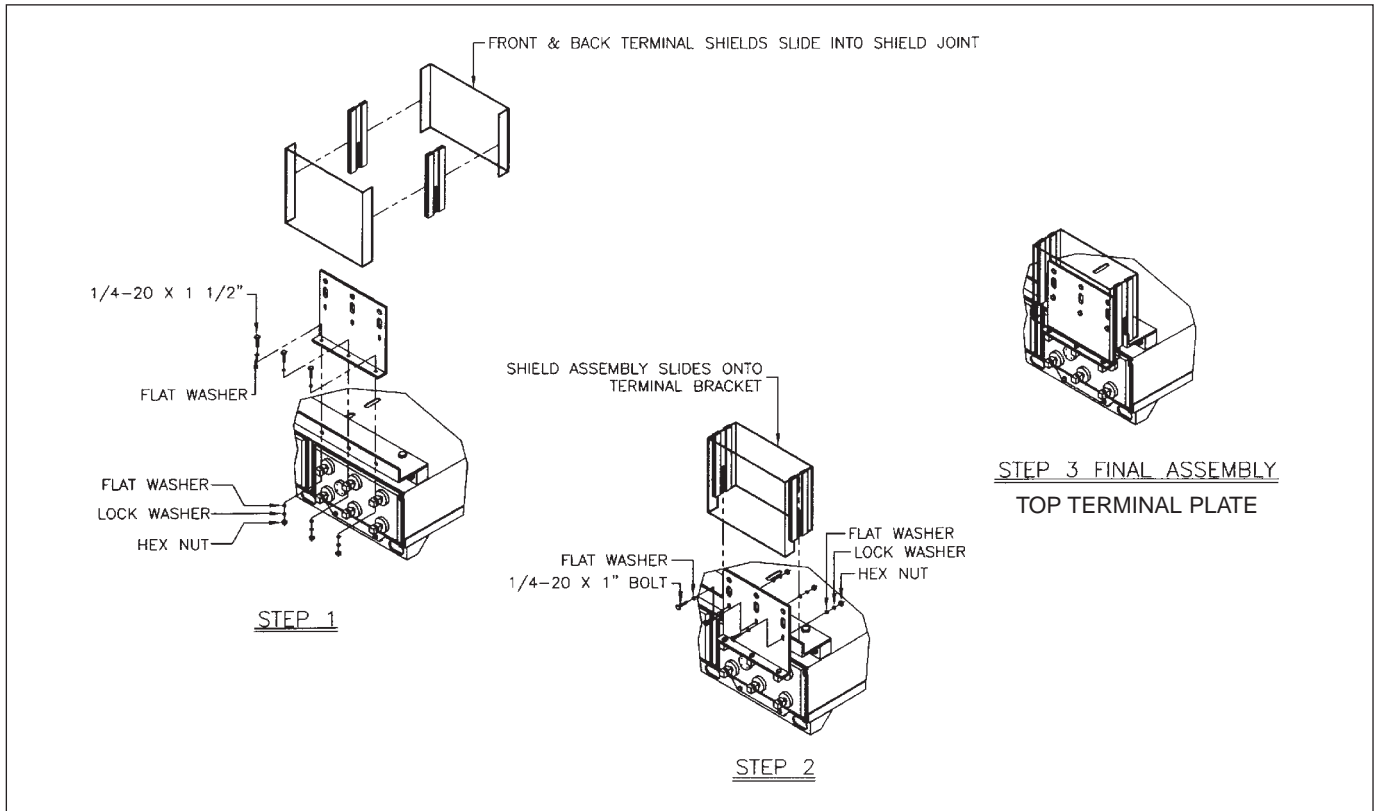


Fig. 5-2

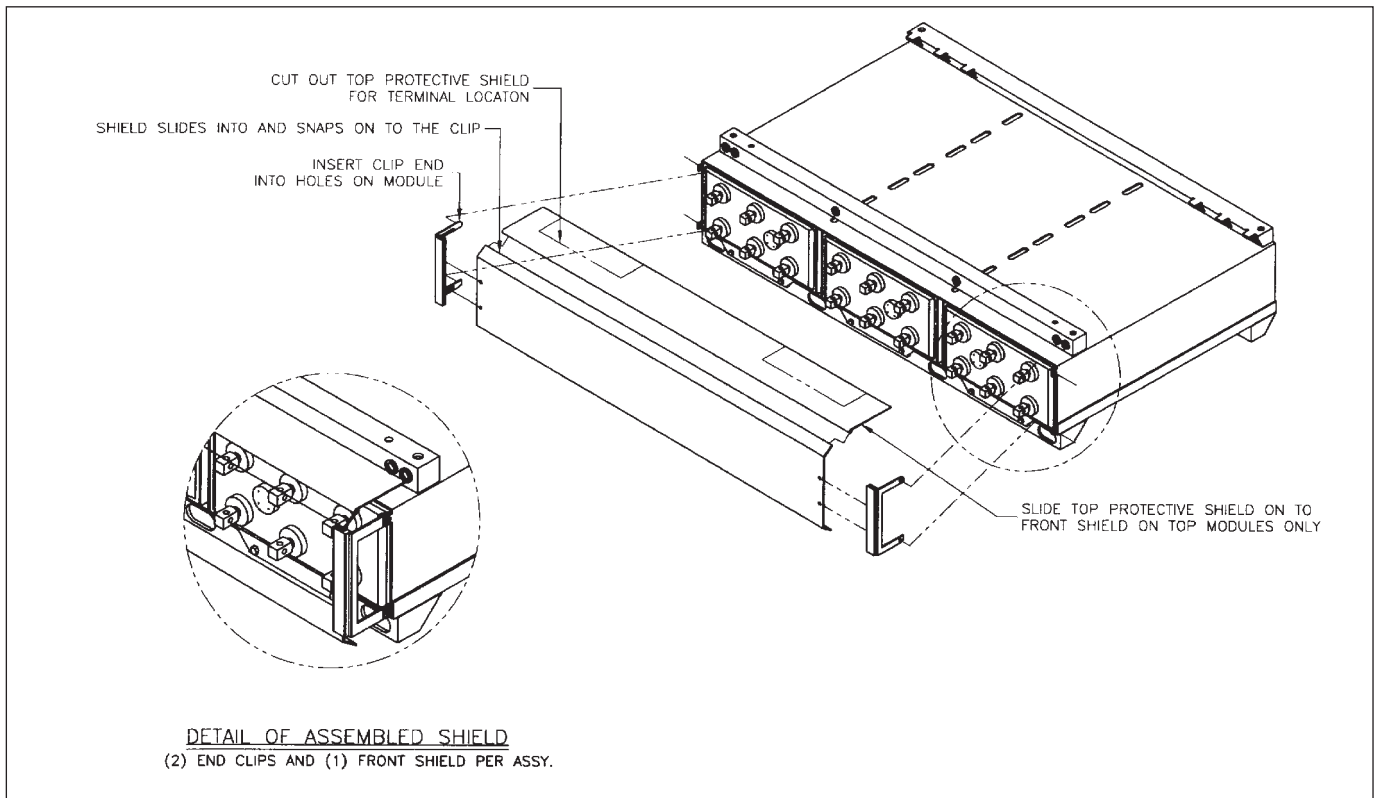


Fig. 5-3

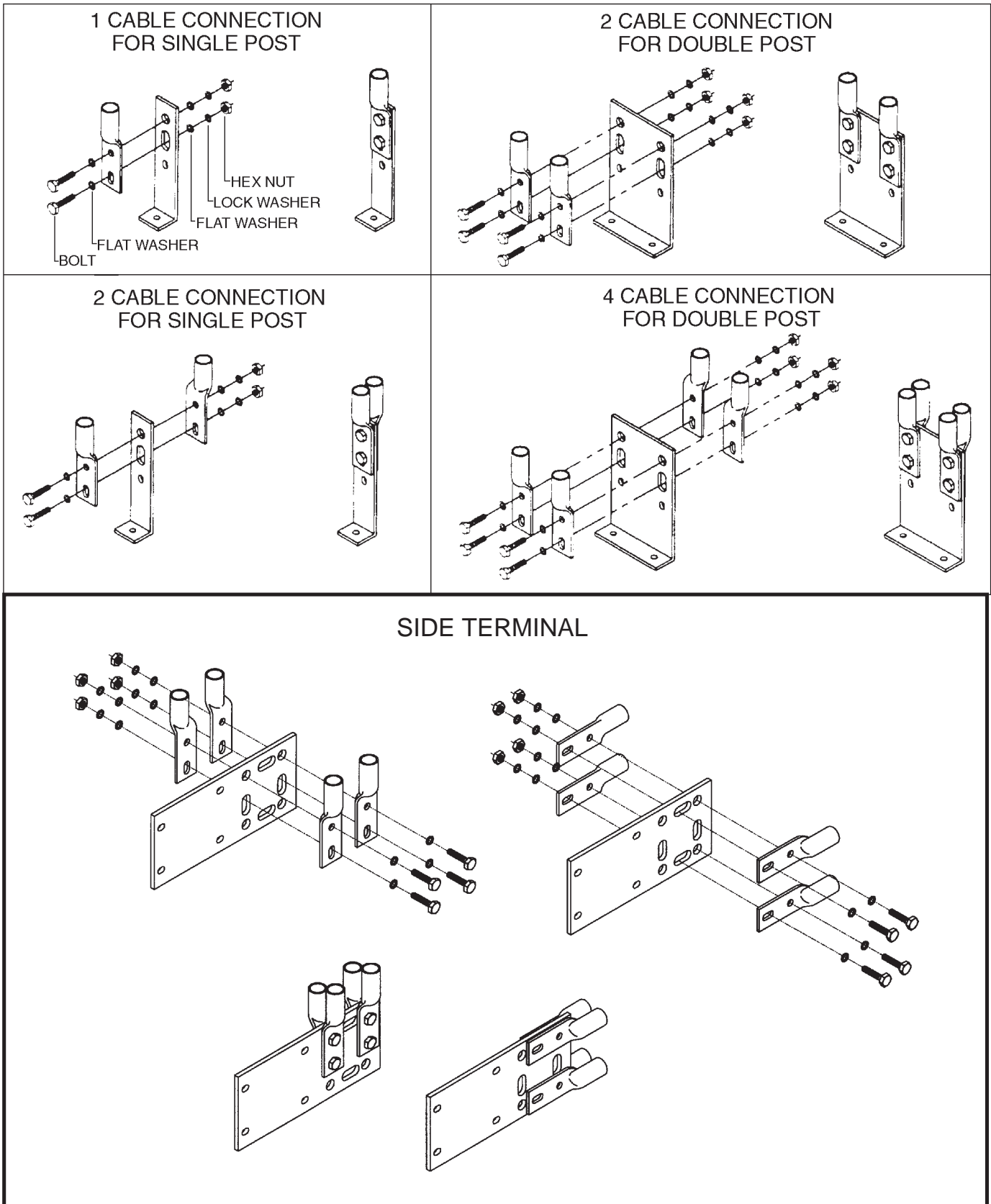


Fig. 7-1

APPENDIX A

– Material Safety Data Sheet –
VALVE REGULATED LEAD-ACID BATTERY –
“BATTERY NON-SPILLABLE 49 CFR 173.159 (d)”

SECTION I

Manufacturer’s Name: East Penn Manufacturing Co., Inc., Deka Road, Lyon Station, PA 19536
Telephone Number for Information: (610) 682-6361 **Date:** March 15, 2002
Emergency Telephone Number: CHEMTREC: 1-800-424-9300 **Trade Name:** Gel; Absorbed Electrolyte,
 In Washington D.C. or outside continental U.S., call 1-202-483-7616 Sealed Valve Regulated Non-Spillable Battery

SECTION II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components Specific Chemical Identity [Common Name(s)]	OSHA PEL	ACGIH TLV	Range Percent by Weight	Average
Lead, CAS # 7439921	0.05mg/m ³	0.05 mg/m ³	60–75%	67%
Sulfuric Acid, CAS # 7664939	1.00 mg/m ³	1.00 mg/m ³	5–15%	10%
Antimony, CAS # 7440360	0.50 mg/m ³	0.50 mg/m ³	0–0.1%	<0.1%
Arsenic, CAS # 7440382	0.01 mg/m ³	0.01 mg/m ³	0.01%	<0.1%
Polypropylene, CAS # 9003070	N/A	N/A	2–10%	4%
Calcium, CAS # 7440702	1.0 mg/m ³	1.0 mg/m ³	0–0.1%	<0.1%
Tin, CAS # 7440315	2.0 mg/m ³	2.0 mg/m ³	0–0.1%	<0.1%

SECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

Electrolyte (Sulfuric Acid):
Appearance and Odor: Clear, odorless, colorless liquid
Boiling Point: 235–240°F
Evaporation Rate (Butyl Acetate=1): Less than 1.0
Melting Point: N/A
Solubility in Water: 100%
Specific Gravity (H₂O=1): 1.270–1.330
Vapor Density (Air=1): Greater than 1
Vapor Pressure (mm Hg): 10

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Non-Flammable **Flammable Limits:** *Hydrogen Gas
Extinguishing Media: Class ABC extinguisher **LEL:** 4% **UEL:** 74%
NOTE: CO₂ may be used, but not directly on the cell. The thermal shock may cause cracking of the battery case and/or cases.
 * Hydrogen gas may be generated during battery charging.

SECTION V REACTIVITY DATA

Stability: Stable **Condition to Avoid:** Prolonged overcharging, sources of ignition
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, strong oxidizers and water. Contact with metals may produce toxic sulfur dioxide fumes and may release flammable hydrogen gas.
Hazardous Decomposition of By-Products: Sulfuric Acid; Excessive overcharging or fire may create sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, and hydrogen.
Lead Compounds: Contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas.

continued

APPENDIX A (continued)

SECTION VI HEALTH HAZARD DATA

Route(s) of Entry: Not applicable under normal use.

Carcinogenicity: Sulfuric Acid: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mist containing sulfuric acid" as a Category 1 carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid 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: Lead is listed as a 2B carcinogen, likely in animals at extreme doses. Proof of carcinogenicity in humans is lacking at present.

Arsenic: Listed by National Toxicology Program (NTP), IARC, OSHA, and NIOSH as a carcinogen only after prolonged exposure at high levels.

Signs and Symptoms of Exposure: Avoid contact with absorbed electrolyte (sulfuric acid). May cause irritation of eyes, nose and throat. Contact with eyes and skin causes irritation and skin burns. Absorbed electrolyte is corrosive.

Medical Conditions Generally Aggravated by Exposure: Pregnant women and children must be protected from lead exposure.

Health Hazards (Acute and Chronic): Do not open battery, avoid contact with internal components. Internal components include lead and absorbed electrolyte. Electrolyte is corrosive and contact may cause skin irritation and chemical burns.

Emergency and First Aid Procedures (contact with electrolyte):

1. Flush contacted area with large amounts of water for at least 15 minutes. Remove contaminated clothing and obtain medical attention if necessary. Eye wash and/or emergency shower should be readily available.
2. If swallowed, give large volumes of water. **DO NOT** induce vomiting. Obtain medical treatment.

SECTION VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Electrolyte material is corrosive. Contains sulfuric acid. Neutralize any spilled material. Reference 1996 North American Emergency Response Guidebook, #154.

Waste Disposal Method: Lead-acid batteries are completely recyclable. For information on returning batteries to East Penn for recycling, contact your East Penn representative. Dispose of any collected material in accordance with local, state or applicable federal regulations.

Precautions to be Taken in Handling and Storing: Store away from reactive material as defined in Section V, Reactivity Data. Place cardboard between layers of stacked batteries to avoid damage and short circuit. Do not allow metallic materials to simultaneously contact both terminals.

Other Precautions: If battery case is broken, avoid direct contact with internal components. Keep away from ignition sources during charging.

SECTION VIII CONTROL MEASURES

Respiratory Protection (Specific Type): N/A

Eye Protection: Recommended

Ventilation: Must be provided when charging in an enclosed area.

Other Protective Clothing or Equipment: N/A

Protective Gloves: Recommended

Work/Hygienic Practices: Good personal hygiene and work practices are recommended.

SECTION IX OTHER REGULATORY INFORMATION

NFPA Hazard Rating **Sulfuric Acid** **Lead**

Health (Blue)

3

3

Flammability (Red)

0

0

Reactivity (Yellow)

2

0

Note: Sulfuric acid is water-reactive if concentrated.

U.S. DOT: The non-spillable lead-acid battery complies with the provisions listed in 49CFR173.159(d); therefore, must not be marked with an identification number, such as UN2800, or a hazard label, such as corrosive. Also, having passed IATA/ICAAO special provision A67, these batteries are not subject to the air dangerous goods regulations.

RCRA: Spent lead-acid batteries are not regulated as hazardous waste when recycled. Spilled sulfuric acid is a characteristic hazardous waste, EPA hazardous waste number D002 (corrosivity).

CERCLA (Superfund) and EPCRA (Emergency Planning and Community Right to Know Act):

a) Reportable quantity (RQ) for spilled 100% sulfuric acid is 1000 lbs.

b) Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA with a Threshold Planning Quantity (TPQ) of 1000 lbs.

c) Batteries are subject to EPCRA reporting requirements under sections 302/304, 311/312, and 313.

Reporting quantities are as follows: Lead: section 311/312 = 10,000 lbs.

Title III section 313 = 100 lbs.

Sulfuric Acid: section 311/312 = 500 lbs.

Title III section 313 = 500 lbs.

California Proposition 65 Warning: Battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. **Wash hands after handling.**

For additional information concerning East Penn Manufacturing Co., Inc. products or questions concerning the content of this MSDS please contact your East Penn representative. This information is accurate to the best of East Penn Mfg. Co.'s knowledge or obtained from sources believed by East Penn to be accurate. Before using any product, read all warnings and directions on the label.



APPENDIX B

BATTERY MAINTENANCE REPORT

Date _____

Company _____

Address _____

Battery Location and/or Number _____

No. of Cells _____ Type _____ Date Mfg. _____ Date Installed _____

Charger Output _____ Ambient Air Temperature _____ °F

Total Battery Voltage _____ Panel Meter Volts _____ Installer _____

INDIVIDUAL CELL READINGS

Cell No.	Serial No.	Volts	Cell Ohmic Value	Connector Ohmic Value	Cell No.	Serial No.	Volts	Cell Ohmic Value	Connector Ohmic Value	Cell No.	Serial No.	Volts	Cell Ohmic Value	Connector Ohmic Value
1					21					41				
2					22					42				
3					23					43				
4					24					44				
5					25					45				
6					26					46				
7					27					47				
8					28					48				
9					29					49				
10					30					50				
11					31					51				
12					32					52				
13					33					53				
14					34					54				
15					35					55				
16					36					56				
17					37					57				
18					38					58				
19					39					59				
20					40					60				

Remarks and Recommendations _____

Readings Taken By _____

Readings should be taken at installation and at least annually thereafter.

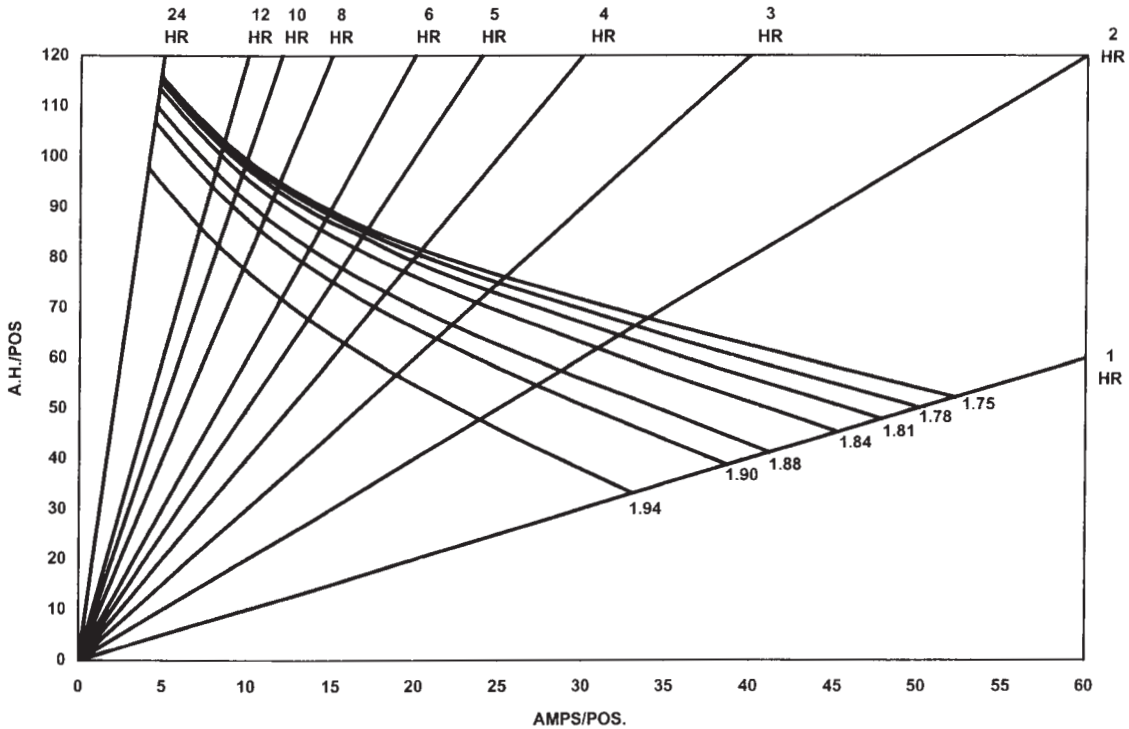
Notation: This form must be completed and submitted with any product warranty claim.

APPENDIX C

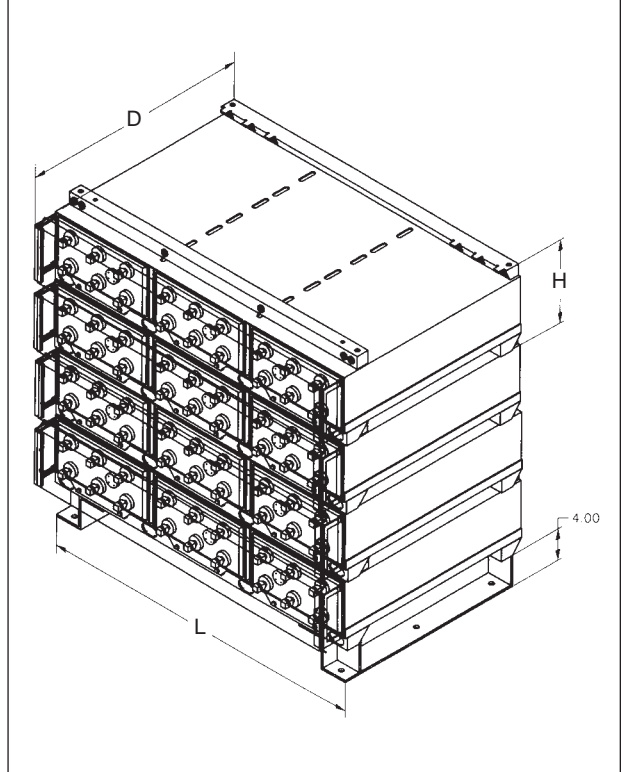
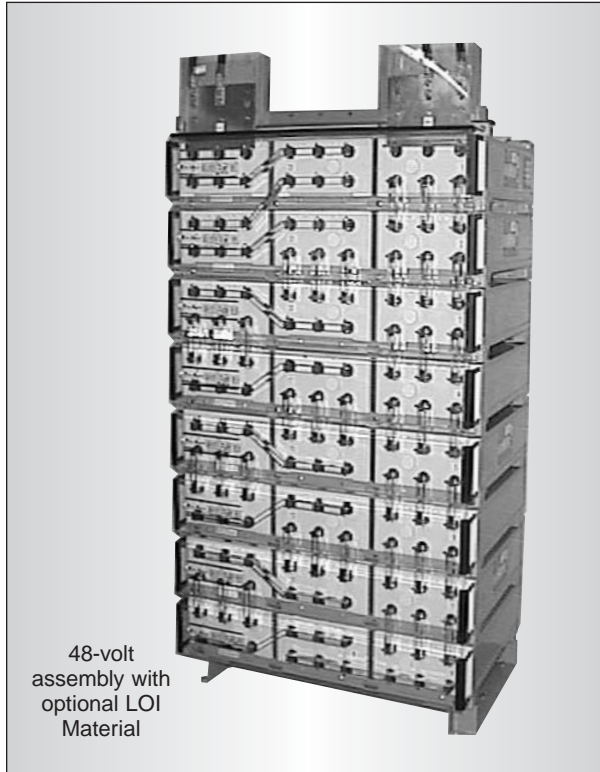
Unigy II S95 Acid Volumes & Weights

Cell Size	Acid Wt gm	Acid Vol cc	Acid Vol gal	Acid Wt lbs	Pure Acid lbs
95-7	4,780	3,635	0.96	10.54	4.41
95-9	6,080	4,624	1.22	13.40	5.60
95-11	7,440	5,658	1.49	16.40	6.86
95-13	8,780	6,677	1.76	19.36	8.09
95-15	10,170	7,734	2.04	22.42	9.38
95-17	11,467	8,720	2.30	25.28	10.57
95-19	12,330	9,376	2.48	27.18	11.37
95-21	14,380	10,935	2.89	31.70	13.26
95-23	15,350	11,673	3.08	33.84	14.15
95-25	16,889	12,843	3.39	37.23	15.57
95-27	18,360	13,962	3.69	40.48	16.93
95-29	19,580	14,890	3.93	43.17	18.05
95-31	20,990	15,962	4.22	46.28	19.35
95-33	22,410	17,042	4.50	49.41	20.66

Unigy II S95 Discharge Curve (1-24 Hours)



MODULE DIMENSIONAL INFORMATION



UNIGY II S95 INTERLOCK MODULE SPECIFICATION

Cell Type	No. of Cells per Module	Nominal Voltage	8 Hr. Capacity @ 1.75vpc	Length [†]		Depth ^{**}		Height [†]		Weight [∞]	
				inches	mm	inches	mm	inches	mm	lbs	kg
AVR95-7	6	12	285	19.00	483	27.12	689	9.54	242	351	159
AVR95-9	6	12	380	23.50	597	27.12	689	9.54	242	442	200
AVR95-11	6	12	475	28.00	711	27.12	689	9.54	242	533	242
AVR95-13	6	12	570	32.50	826	27.12	689	9.54	242	624	283
AVR95-15	6	12	665	37.00	940	27.12	689	9.54	242	715	324
AVR95-17	3	6	760	21.90	556	27.12	689	9.54	242	419	190
AVR95-19	3	6	855	24.15	613	27.12	689	9.54	242	465	211
AVR95-21	3	6	950	26.40	671	27.12	689	9.54	242	510	231
AVR95-23	3	6	1045	28.65	728	27.12	689	9.54	242	556	252
AVR95-25	3	6	1140	30.90	785	27.12	689	9.54	242	602	273
AVR95-27	3	6	1235	33.15	842	27.12	689	9.54	242	644	292
AVR95-29	3	6	1330	35.40	899	27.12	689	9.54	242	693	314
AVR95-31	3	6	1425	37.65	956	27.12	689	9.54	242	735	333
AVR95-33	3	6	1520	39.90	1013	27.12	689	9.54	242	781	354

* includes mount support
** includes front shield

† battery height = 5.50" + (module height - 1.50") x # of modules
∞ weight includes module & cells without hardware

RATINGS IN AMPERES AT 77°F (25°C) TO 1.75 V.P.C.

Cell Type	24hr	12hr	10hr	8hr	6hr	5hr	4hr	3hr	2hr	1hr
AVR95-7	14.5	25.8	29.8	35.6	44.7	51.5	61.2	76.1	101.8	156.6
AVR95-9	19.3	34.4	39.8	47.5	59.6	68.7	81.6	101.5	135.8	208.8
AVR95-11	24.2	43.0	49.7	59.4	74.5	85.8	102.0	126.9	169.7	261.0
AVR95-13	29.0	51.6	59.6	71.2	89.4	103.0	122.4	152.3	203.7	313.2
AVR95-15	33.8	60.2	69.6	83.1	104.3	120.2	142.8	177.6	237.6	365.4
AVR95-17	38.7	68.8	79.5	95.0	119.1	137.3	163.2	203.0	271.6	417.6
AVR95-19	43.5	77.4	89.5	106.9	134.0	154.5	183.6	228.4	305.5	469.8
AVR95-21	48.3	85.9	99.4	118.7	148.9	171.7	204.0	253.8	339.5	522.0
AVR95-23	53.2	94.5	109.3	130.6	163.8	188.8	224.4	279.2	373.4	574.2
AVR95-25	58.0	103.1	119.3	142.5	178.7	206.0	244.8	304.5	407.3	626.5
AVR95-27	62.8	111.7	129.2	154.4	193.6	223.2	265.2	329.9	441.3	678.7
AVR95-29	67.7	120.3	139.2	166.2	208.5	240.3	285.7	355.3	475.2	730.9
AVR95-31	72.5	128.9	149.1	178.1	223.4	257.5	306.1	380.7	509.2	783.1
AVR95-33	77.3	137.5	159.1	190.0	238.3	274.7	326.5	406.1	543.1	835.3

RATINGS IN WATTS PER CELL 77°F (25°C) TO 1.67 V.P.C.

Cell Type	1hr	30min	20min	15min	10min	5min
AVR95-7	309.0	438.7	508.9	554.1	609.1	676.1
AVR95-9	412.0	585.0	678.6	738.8	812.1	901.5
AVR95-11	515.0	731.2	848.2	923.5	1015.2	1126.8
AVR95-13	618.0	877.4	1017.9	1108.2	1218.2	1352.2
AVR95-15	721.0	1023.7	1187.5	1292.9	1421.2	1577.6
AVR95-17	824.0	1169.9	1357.2	1477.6	1624.2	1802.9
AVR95-19	927.0	1316.2	1526.8	1662.3	1827.3	2028.3
AVR95-21	1030.0	1462.4	1696.5	1847.0	2030.3	2253.7
AVR95-23	1133.0	1608.7	1866.1	2031.6	2233.3	2479.1
AVR95-25	1236.1	1754.9	2035.8	2216.3	2436.4	2704.4
AVR95-27	1339.1	1901.1	2205.4	2401.0	2639.4	2929.8
AVR95-29	1442.1	2047.4	2375.1	2585.7	2842.4	3155.2
AVR95-31	1545.1	2193.6	2544.7	2770.4	3045.5	3380.5
AVR95-33	1648.1	2339.9	2714.4	2955.1	3248.5	3605.9

RATINGS IN WATTS PER CELL AT 77°F (25°C) TO 1.75 V.P.C.

Cell Type	1hr	30min	20min	15min	10min	5min
AVR95-7	294.3	399.9	456.3	491.2	532.8	581.4
AVR95-9	392.4	533.2	608.4	655.0	710.4	775.2
AVR95-11	490.5	666.4	760.5	818.7	888.1	969.0
AVR95-13	588.6	799.7	912.6	982.5	1065.7	1162.8
AVR95-15	686.6	933.0	1064.6	1146.2	1243.3	1356.6
AVR95-17	784.7	1066.3	1216.7	1310.0	1420.9	1550.4
AVR95-19	882.8	1199.6	1368.8	1473.7	1598.5	1744.2
AVR95-21	980.9	1332.9	1520.9	1637.5	1776.1	1938.0
AVR95-23	1079.0	1466.2	1673.0	1801.2	1953.7	2131.8
AVR95-25	1177.1	1599.5	1825.1	1965.0	2131.3	2325.6
AVR95-27	1275.2	1732.7	1977.2	2128.7	2308.9	2519.4
AVR95-29	1373.3	1866.0	2129.3	2292.4	2486.5	2713.2
AVR95-31	1471.4	1999.3	2281.4	2456.2	2664.2	2907.0
AVR95-33	1569.5	2132.6	2433.5	2619.9	2841.8	3100.7

Rates subject to change without notification.

EAST PENN manufacturing co., inc.

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