

C&D TECHNOLOGIES, INC.

Power Solutions

LIBERTY® SERIES 1000 FRONT ACCESS MONOBLOCK VALVE-REGULATED (SEALED) LEAD ACID BATTERIES INSTALLATION AND OPERATING INSTRUCTIONS



FOLLOW MANUFACTURER'S PUBLISHED INSTRUCTIONS WHEN INSTALLING, CHARGING AND SERVICING BATTERIES.

For additional information and
Technical-Warranty Assistance, contact:
C&D TECHNOLOGIES, INC.
1400 Union Meeting Road, PO Box 3053, Blue Bell, PA 19422-0858
800.543.8630 or 215.619.2700, Fax 215.619.7899

Before handling cells or storing cells for future installation take time to read this manual. It contains information that could avoid irreparable damage to the battery and/or void product warranty.

SAFETY PRECAUTIONS

Owners are hereby advised that access to this battery should be limited to personnel who have been trained in the installation, preparation, charging and maintenance on this specific battery type and model.

WARNING



SHOCK HAZARD - PHYSICAL CONTACT WITH UN-INSULATED BATTERY CONNECTORS OR TERMINALS SHOULD BE AVOIDED AT ALL TIMES. CARE SHOULD BE TAKEN TO DISCHARGE STATIC ELECTRICITY FROM ANYTHING OR ANYONE WHO MAY COME IN CONTACT WITH THE BATTERY BY MAINTAINING PHYSICAL CONTACT WITH A GROUNDED SURFACE IN THE VICINITY OF THE BATTERY BUT AWAY FROM THE CELLS AND FLAME ARRESTERS.

ALL TOOLS SHOULD BE ADEQUATELY INSULATED TO AVOID THE POSSIBILITY OF SHORTING CONNECTIONS. DO NOT LAY TOOLS ON THE TOP OF THE BATTERY.



ALTHOUGH C&D TECHNOLOGIES LIBERTY[®] SERIES 1000 (FAM AND LFA) FRONT ACCESS MONOBLOCK BATTERIES ARE SEALED AND EMIT NO GAS DURING NORMAL OPERATION, THEY CONTAIN POTENTIALLY EXPLOSIVE GASES, WHICH MAY BE RELEASED UNDER ABNORMAL OPERATING CONDITIONS, SUCH AS A CHARGER MALFUNCTION. THE BATTERY INSTALLATION LOCATION SHOULD BE A WELL VENTILATED AREA SO AS TO PREVENT HYDROGEN GAS ACCUMULATION IN THE VICINITY OF THE BATTERY FROM EXCEEDING 2% BY VOLUME. NEVER INSTALL BATTERIES IN A SEALED CABINET OR ENCLOSURE. IF YOU HAVE ANY QUESTIONS, CONTACT YOUR LOCAL C&D AGENT.



THIS BATTERY CONTAINS **SULFURIC ACID**, WHICH CAN CAUSE SEVERE BURNS. IN CASE OF SKIN CONTACT WITH ELECTROLYTE, REMOVE CONTAMINATED CLOTHING AND FLUSH AFFECTED AREAS THOROUGHLY WITH WATER. IF EYE CONTACT HAS OCCURRED, FLUSH THE EYE FOR A MINIMUM OF 15 MINUTES WITH LARGE AMOUNTS OF RUNNING WATER AND SEEK IMMEDIATE MEDICAL ATTENTION.

WARRANTY NOTICE

This instruction manual is not a warranty. This battery is sold subject to a limited warranty, which is offered in lieu of all other warranties, express or implied (including the warranties of merchantability or fitness for a particular purpose). A copy of the applicable limited warranty is available upon written request from C&D TECHNOLOGIES, Inc. 1400 Union Meeting Road PO Box 3053 Blue Bell, PA 19422-0858 or in Canada C&D TECHNOLOGIES, Inc. 7430 Pacific Circle Mississauga, ON L5T 2A3 Request Warranty Certificate RS-1827.

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**LIBERTY® SERIES 1000 FRONT ACCESS MONOBLOCK
VALVE-REGULATED (SEALED) LEAD ACID BATTERIES
INSTALLATION AND OPERATING INSTRUCTIONS**

TABLE OF CONTENTS	PAGE
INTRODUCTION	4
PART 1	
RECEIVING AND INSTALLATION	6
SECTION 1.1 - RECEIVING	6
1.1.1 General Information and Precautions	
1.1.2 Safety	
1.1.3 Packing, Inspection at time of delivery	
1.1.4 Accessories package	
SECTION 1.2 - STORAGE	7
1.2.1 Storing charged batteries	
SECTION 1.3 - INSTALLATION AND ASSEMBLY	8
1.3.1 Installation and connection	
1.3.2 Connecting and torquing battery terminal posts	
1.3.3 Paralleling batteries	
1.3.4 Installation inspection prior to connection to charging equipment	
PART 2	
CHARGING AND OPERATION OF BATTERY	12
SECTION 2.1 - CHARGING	12
2.1.1 Boost / initial charge	
2.1.2 Initial 1 boost charge	
2.1.3 Constant voltage charging	
2.1.4 Initial charge records	
2.1.5 Warning labels	
SECTION 2.2 - BATTERY OPERATION	14
2.2.1 Float charge	
2.2.2 Equalizing charge	
2.2.3 Compensating float voltage for ambient temperature	
2.2.4 Over-Voltage	
SECTION 2.3 - MAINTENANCE OF BATTERY MODULES	17
2.3.1 Inspection	
2.3.2 Cleaning modules	
2.3.3 Cell voltage variation	
2.3.4 Effects of temperature	
2.3.5 Record keeping	
2.3.6 Connection maintenance	
2.3.7 Internal Ohmic measurements	
2.3.8 Recommended maintenance	
APPENDIX A - MATERIAL SAFETY DATA SHEET	20
APPENDIX B - WARRANTY PROVISIONS	27
APPENDIX C - VALVE-REGULATED LEAD ACID BATTERY and CHARGER INSPECTION REPORT FORM	28

WARNING

This battery is designed for industrial use only and is not intended for application in vehicular starting, lighting, and ignition and/or operation of portable tools and appliances. The battery should be used only in accordance with manufacturer's written instructions. Use of this product other than in accordance with manufacturer's written instructions may produce hazardous and unsafe operating conditions, leading to damage of equipment and/or personal injury.

The battery should be charged only in accordance with manufacturer's operating instructions. Do not expose the battery to open flame or electrical arc. Do not tamper with cell cover or vents. VRLA batteries contain sulfuric acid, which can cause severe burns. Mishandling or abuse could cause the battery's case to rupture. In case of skin contact with electrolyte, remove contaminated clothing and flush affected areas thoroughly with water. If eye contact has occurred, flush one eye thoroughly for 15 minutes with running water and seek immediate medical attention.

Recommended Tools for Installation and Maintenance

The following list of tools is a general recommendation and is not intended to be a complete list. Each installation may require special tools which can not be specified without specific knowledge of the installation.

Safety

1. Rubber or Neoprene - Acid resistant gloves.
2. Protective apron
3. Face Shield or goggles (ANSI approved).
4. Rubber soled safety shoes/boots.
5. Insulated tools.
6. Portable eye wash for rinsing of eyes in case of contact with electrolyte.

Installation

1. Lifting sling or platform (dependent on battery size and weight).
2. Insulated tools.
3. Torque wrench.
4. Digital voltmeter (three digit accuracy).
5. Resistance, conductance or impedance meter. (Select one method)
6. Non-metallic brush or pad for cleaning connections.
7. No-Ox-Id grease and brush.

Maintenance

1. Digital voltmeter w/ temperature probe.
2. Torque wrench.
3. Insulated wrenches.
4. Resistance, conductance or impedance meter.

Warning: Do not, under any circumstances, use any petroleum based cleaning or lubricating solutions on the battery jar or cover. Failure to follow this warning may result in cracked or broken jars and will void the warranty.

NOTE: Keep these Installation and Operating Instructions and Layout drawings (if any) near the battery installation at all times.

INTRODUCTION

The batteries referenced in this document are sealed lead acid batteries referred to as FAM and FA batteries. They are constructed with an absorbent glass-mat and are valve-regulated with pasted lead-calcium plates. They are designed to provide long, reliable service life with minimal maintenance. When operated at the recommended float voltage and temperature, the batteries emit virtually no gas or acid mist and do not require special ventilation to be operated safely other than what is generally required by local building codes. However, VRLA batteries should never be installed in a sealed enclosure or cabinet.

RECOMMENDED TECHNICAL REFERENCES AND EXPERTISE

This battery should be installed by a competent professional who has been trained in the installation of this specific type of battery. While not intended to be a complete list, the following recommended practices and codes contain relevant information, and should be consulted for safe handling, installation, testing and maintaining standby batteries. Applicable state and local codes must be followed.

IEEE Std. 485-Latest Rev., IEEE Recommended Practice for Sizing Large Lead Acid Storage Batteries for Generating Stations and Substations (ANSI)

IEEE 1189-Latest Rev., IEEE Guide for Selection of Valve-Regulated Lead Acid (VRLA) Batteries for Stationary Applications

IEEE 1188-Latest Rev., IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead Acid Storage Batteries for Stationary Applications

IEEE 1187-Latest Rev., IEEE Recommended Practice for Installation Design and Installation of Valve-Regulated Lead Acid Storage Batteries for Stationary Applications

IEEE - PAR-1375 "Guide for Protection, Standby Batteries"

NESC, National Electric Safety Code, ANSI C2-1993 (or latest revision)

Copies may be obtained by writing:

The Institute of Electrical and Electronic Engineers, Inc.
345 East 47 Th. Street, New York, NY 10017, USA, www.ieee.org

ANSI-T1.330-Latest Rev., Valve-Regulated Lead Acid Batteries used in the Telecommunications Environment

NEC National Electrical Code NFPA -70 (latest version) available from: National Fire Protection Association Batterymarch Park, Quincy, MA 02269

Federal Codes:

29CFR1926.441 "Safety Requirements for Special Equipment"

29CFR1910.151(c) "Medical Services and First Aid"

29CFR1910.268(g) "Telecommunications"

29CFR1910.305(j) "Wiring Methods, Components and Equipment"

STD 1-8.2(e) "OSHA Standing Directive"

UBC, Uniform Building Code

PART 1 RECEIVING AND INSTALLATION

SECTION 1 - RECEIVING

1.1.1 General Information and Precautions

This battery is designed for industrial use only and is not intended for application in vehicular starting, lighting, and ignition, and/or operation of portable tools and appliances. Use only in accordance with manufacturer's written instructions. Use of this product other than in accordance with C&D TECHNOLOGIES, INC.'s written instructions may produce hazardous and unsafe operating conditions, leading to damage of equipment and/or personal injury.

1.1.2 Safety

Charge only in accordance with C&D TECHNOLOGIES, INC.'s operating instructions.

Do not expose to open flame or electrical arc.

Do not tamper with cell covers or vents. There is no need to remove vents for water addition.

Observe all precautions shown on the inside cover of this manual and page 2.

1.1.3 Packing, Inspection at time of delivery

Reasonable precautions have been taken to pack the battery for shipment to ensure its safe arrival. As soon as you receive the battery, inspect the packing material for evidence of damage in transit. If the packing material is physically damaged or stains are present, make a notation on the delivery receipt **before you accept the shipment / delivery**.

Note: Freight Carriers generally require that concealed damage be inspected by the carriers representative within 15 days from date of delivery to determine responsibility. The resolution of such claims may extend up to 9 months.

1.1.4 Accessories package

Check the contents of the accessories package against the enclosed packing list to determine all connecting hardware and cables have been received. Place accessories in a safe location where they can be easily retrieved. If parts are missing from the package, contact the customer service department at C&D TECHNOLOGIES, attention Customer Service, 1400 Union Meeting Road, Blue Bell, PA 19422, 800-543-8630, within 30 days of receipt at original destination.

SECTION 2 - STORAGE

1.2.1 Storing Charged Batteries

Store batteries indoors in a cool, dry location between 20°F (-7°C) and 90°F (32°C) and place the batteries in service within 6 months after the manufactured date found on each battery module.

NOTE: Batteries which are not placed in service for several months will self-discharge. Boost charges may be applied to individual units or preferably, to the entire battery module. Do not let electrolyte freeze.

TABLE 1 - FREEZING TEMPERATURE VS SPECIFIC GRAVITY

Specific Gravity at 77°F (25°C)	Freezing Temperature	
	Celsius	Fahrenheit
1.000	0.0	+32
1.050	-3.3	+26
1.100	-7.7	+18
1.150	-15	+5
1.200	-27	-17
1.250	-52	-61
1.300	-70	-95
1.350	-49	-56
1.400	-36	-33

Storage limitations

The FAM and FA batteries are warranted against defects in materials or manufacturing or both for a period of **two years** from the date of shipment. To keep the warranty in effect, you must place the units on charge by the date stamped on the shipping carton when stored at 77°F (25°C). If storage beyond this time is required or storage temperature is in excess of 77°F (25°C), monitor battery voltage at monthly intervals, if possible. A convenient measurement technique is to read the open circuit voltage. If the open circuit voltage drops by 0.04 volts per cell from the nominal value, the cell(s) must be given a boost charge at the "Initial/Equalize" voltage. If the batteries are stored for longer than six months without a boost charge, apply a boost charge to the batteries for 12-24 hours at 2.33 vpc. If the battery has less than 13.3 volts on float contact C&D TECHNOLOGIES Technical Services Department for special instructions.

Always complete the record of initial charge and float charge readings as described in the initial charge section of this manual and retain the readings in your files for future warranty reference. Clearly identify your location, the application, C&D model number, the date, and name of the person who took the readings.

The service life of your battery will depend on its ambient temperature, frequency and depth of discharge, discharge rate, charge voltage, and regulation of the battery charger.

SECTION 3 - INSTALLATION AND ASSEMBLY

1.3.1 Installation

Liberty® Series 1000 FAM and FA batteries are best installed horizontally. Physical dimensions for layout may be found in Table 1. Install battery in a cool, dry location away from heat sources. The recommended operating temperature (ambient) is 65-77°F (18-25°C). The allowable temperature range with performance degradation at the extreme temperatures is 32-90°F (0-32°C). Float voltage compensation should be made for temperatures other than 77°F (25°C).

NOTE: Units connected within a battery string are connected in series positive post to negative post to positive post, etc.

If possible the application should allow at least 3/8 of an inch between batteries for proper inter-connection spacing and air circulation. When handling units never lift them by the terminals as this can damage the post seals and cause acid leakage.

Avoid sources of hot or cold air directed on a section of the battery that could cause temperature variations within the battery assembly. Such variations will compromise optimum battery performance such as float voltages of individual cells.

TABLE 1 BATTERY SPECIFICATIONS

Model	FAM 12-100	FA 12-125*	FAM 12-150
Nominal voltage	12 volts	12 volts	12 volts
Number of cells	6 / Unit	6 / Unit	6 / Unit
Rated 8-hr capacity (ampere-hours to 1.75 Vpc)	100 Ah to 10.5 volts	125 Ah to 10.5 volts	150 Ah to 10.5 volts
Internal resistance	0.00042 Ohms	0.000589 Ohms	0.00043 Ohms
Short circuit current	4000 A	2600 A	4610 A
Unit height	9.05 in. (230 mm)	10.12 in. (257 mm)	12.63 in. (323 mm)
Unit length (includes handles)	21.95 in. (558 mm)	16.60 in. (415 mm)	21.95 in. (558 mm)
Unit width (125 mm)	4.94 in. (125 mm)	6.93 in. (176 mm)	4.94 in.
Weight	80 lbs. (41 kg)	120 lbs. (55 kg)	131 lbs. (60 kg)
Plate thickness positive (3.55 mm)	0.140 in. (3.81 mm)	0.150 in. (3.55 mm)	0.140 in.
negative (2.16 mm)	0.085 in. (2.23 mm)	0.088 in. (2.16 mm)	0.085 in.
Terminal	Threaded copper-brass insert. Fasten with 1/4-20 stainless steel hex bolt/washer.	Threaded copper-brass insert. Fasten with 1/4-20 stainless steel hex bolt/washer.	Threaded copper-brass insert. Fasten with 1/4-20 stainless steel hex bolt/washer.

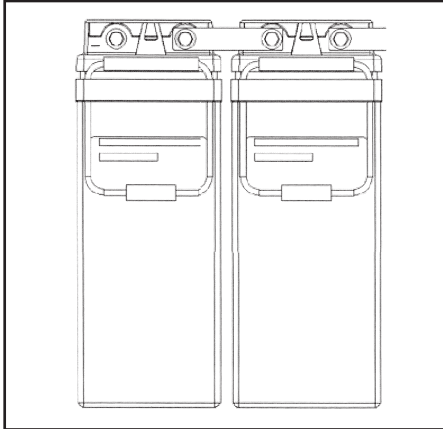
*FA 12-125 consists of (2) FA 6-125 units in an epoxy-painted steel jacket.

Ratings in Amperes at 77°F (25°C)

FV/Time	Models	1 hr.	3 hr.	5 hr.	8 hr.	10 hr.	20 hr.
1.75	FAM 12-100	66.3	28.1	18.5	12.4	10.2	5.5
	FA 12-125	86.3	37.1	24	15.8	12.9	6.8
	FAM 12-150	99.9	43	28.1	18.8	15.4	8.2
1.80	FAM 12-100	64.7	27.6	18.2	12.3	10.1	5.4
	FA 12-125	83.2	35.8	23.2	15.4	12.6	6.6
	FAM 12-150	96.2	42.4	27.8	18.6	15.3	8.1
1.84	FAM 12-100	1 hr	3 hr	5 hr	8 hr	10 hr	20 hr
	FA 12-125	78.7	34	22.2	14.7	12.1	6.4
	FAM 12-150	92.4	41.7	27.5	18.4	15.1	8
1.88	FAM 12-100	57.6	25.3	16.7	11.3	9.3	5
	FA 12-125	72.8	31.6	20.7	13.8	11.3	6
	FAM 12-150	92	41.2	27.3	18.3	15	8
1.90	FAM 12-100	55.1	24.3	16.1	10.9	9	4.8
	FA 12-125	69.1	30.1	19.7	13.2	10.8	5.8
	FAM 12-150	85.3	40.4	27	18.2	14.9	7.9

C&D Front Access products meet or exceed IEEE-485 at time of shipment.
 Additional rates are available at www.cdstandbypower.net

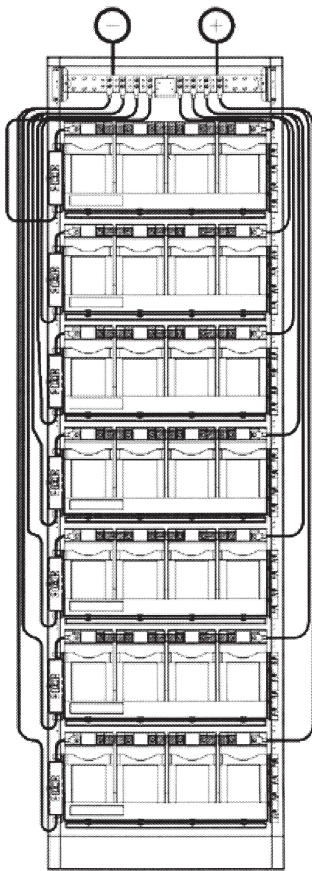
1.3.2 Connecting and torquing battery terminal posts



FAM and FA batteries are available in three 12 volt modules sizes with the following ampere - hour ratings at the 8 hour rate of discharge: 100 Ah, 125 Ah and 150 Ah. Each of the 12 volt modules is terminated with two terminals one each for positive and negative connections. The modules are connected positive to negative from one module to another module in a series arrangement. This is accomplished by fastening the connector or cable lugs from the positive terminal of a module to the negative terminal of the next module. The lug or connector is secured with the appropriate terminal hardware described in Table 1 and tightened to the torque value specified in Table 1.

1.3.3 Paralleling batteries

If the capacity requirement of the system requires more ampere hours than that available in one battery, up to (8) eight batteries of the same ampere hour size may be connected in parallel. More parallel strings may be possible dependent on application parameters and design. Each battery must be of the same voltage and size.



1.3.4 Installation inspection prior to connection to charging equipment

- Check again that all modules are connected positive terminal to negative terminal. Measure the battery, voltage with a digital voltmeter. The voltage should be approximately 12.9 (see table) volts (open circuit) times the number of modules connected in series. Example: 12.9 volts x 4 (FAM12-150) = 51.6 volts, representing a nominal 48 volt system.
- Recheck torque value to make certain that there are no loose connections that could cause a poor connection possibly creating an arc or spark or a hot connection that on discharge could melt the lead components.
- Follow the charger manufacturers instructions and make the connections to the battery with the charger de-energized.

(Other Rack Layouts
Are Available)

PART 2 CHARGING and OPERATION OF BATTERY

SECTION 1 - CHARGING

CAUTION

Always recharge a battery immediately after a discharge to avoid degradation of the plates.

2.1.1 General Information and Precautions

To safely charge the Liberty Series 1000 Front Access batteries and avoid damaging the battery and/or connected equipment, observe the following:

- Use only direct current for charging. AC ripple current from charger shall not exceed 5 percent of the 8-hour (Ampere-hour) rating of the battery.
- Be sure charger is turned off before making electrical connections between the battery and system.
- Connect battery positive terminal to charger positive terminal and battery negative terminal to charger negative terminal. Grounding battery may be either to positive or negative terminal of the battery. This will depend upon the system design.
- Be certain that all connections are tight and secured before turning on the charger.

CAUTION

If the proper polarities are not observed when charging the battery, the battery or groups of reverse-connected cells will be irreparably damaged.

2.1.2 Initial 1 boost charge

All cells/units are shipped fully charged but will lose some charge in transit or storage before installation. At the first opportunity, provide an initial charge. This should be done at least by the date stamped on the shipping container if batteries are stored in a clean, dry and cool (between 32°F-77°F [0°C-25°C]) location.

CAUTION

Valve-regulated batteries must receive a boost charge if installation will not occur by the date on the carton or if open circuit voltage drops to 2.11 Volts per cell. Multiply the open circuit voltage by the number of cells in a unit to obtain unit voltage. Use initial/equalize charge voltages as shown in Table 2 or Table 3 for boosting cells at the Initial/Equalize Voltage.

Higher than normal storage temperature (77°F [25°C] nominal) will accelerate internal self-discharge of a battery by a factor of two for each 15°F (9°C) over nominal 77°F (25°C) storage temperature. This, in turn, will reduce the allowable time before initial and subsequent charging.

Therefore it is very important that boost charges be given at the appropriate time to avoid major remedial action or damage to product.

All batteries, including Liberty Series 1000 Front Access, are capable of generating potentially explosive gases when charged at higher than normal voltages typical of initial or equalizing charge. The Liberty Series 1000 Front Access cells are equipped with a “flame arrestor and pressure relief valve” assembly that seals the cells during normal charge and operation but allows it to safely vent in case of overcharge. Removing the cover and/or valve assembly can cause the release of potentially explosive gases and such action will void the warranty.

CAUTION

Never expose a cell or battery to sparks or an open flame. When working on a battery, discharge static electricity on the body, tools, etc., by touching a grounded surface in the vicinity of the battery rack.

2.1.3 Constant voltage charging

The recommended method of providing an initial/equalize charge is to first determine the maximum allowable voltage that may be applied to the connected equipment. Divide this by the number of cells in the battery to obtain maximum average voltage per cell allowed by the equipment. Adjust this number down to a recommended initial value found in Table 3 and continue charging at this voltage for the time specified. Next put the battery at the recommended float voltage for a minimum of 72 hours before any load is placed on the system. The battery is now considered fully charged and is ready for either initial acceptance testing or regular service.

Use only direct current for charging. AC ripple current from charger shall not exceed 5 percent of the 8-hour (Ampere-hour) rating of the battery. Charges should be current limited to 25 ampere per 100AH of the 8-hour rating of the battery.

CAUTION

Excess charge current can increase the battery temperature. The increase in battery temperature will have an effect on battery life.

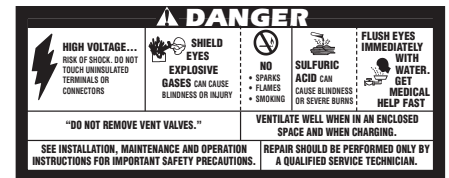
2.1.4 Initial charge records

At the completion of the initial charge and after the cells have been on float charge for approximately one week, record voltages of the individual cells or units, the total battery voltage and ambient temperature. Retain this information in your files for future reference. This information establishes one baseline for future reference. Refer to RS-1511 found in the appendix. Make a photocopy of the form and use it whenever necessary to record readings taken on the battery.

IMPORTANT: Initial charge records and on-going maintenance records are essential for review by C&D TECHNOLOGIES sales/service agents in the event of a problem. Since records can materially affect your warranty, be sure to maintain clear, signed, and dated copies.

2.1.5 Warning labels

C&D TECHNOLOGIES, INC. provided a warning label to assist in maintaining standby batteries and to advise you of certain hazards. **This label may be found on the battery cover** visible to anyone in the immediate vicinity of the battery. Make certain that all individuals who could be operating near the battery read the warning that is intended to inform the individuals of basic safety practices.



SECTION 2 - BATTERY OPERATION

2.2.1 Float charge

The normal charging voltage to maintain the battery is called “Float Charge” and is provided at a potential slightly higher than the full charged open circuit voltage. The over potential is required to maintain properly polarized plates within the VRLA battery. Float voltages may vary from 2.24 - 2.26 volts per cell at 77°F (25°C) depending upon the frequency and depth of discharges.

Assuming full float service a (6) six cell 12 volt module should be floated at 13.67 volts +/- .06 volts at 77°F (25°C).

2.2.2 Equalizing charge

Under normal operating conditions, it should not be necessary to equalize batteries when charged at the recommended voltage in Table 2. An equalizing charge delivered at a voltage higher than the nominal float voltage is used to restore uniform cell voltage to a battery.

Note 1: Some hydrogen gas may be liberated at equalize charging voltage.

An equalizing charge can be provided when individual cell voltages go below the minimum value shown in Table 3 or 0.05 Volts below the float voltage specified in Table 3. Remember to divide the number of cells into unit voltage to arrive at cell voltage. Presence of a minimum voltage does not imply a battery is malfunctioning or that it will not provide the necessary power when called upon.

Note 2: Chargers must be current limited to 25 Amperes per 100-Ampere-hour battery rating. Higher charging currents could potentially destroy the battery by overheating that subsequently causes more current to flow creating a vicious cycle sometimes referred to as “thermal runaway.”

Note 3: Minimum voltage is the point at which plans should be made to provide an equalizing charge. Note that the normal equalize voltage level (initial charge level) will not be effective in VRLA product as the voltage is not high enough to enable the negative plates to charge. An equalizing charge of 2.45 volts per cell can be applied to the string or problem cell/unit for a period not exceeding eight hours. Consult the C&D TECHNOLOGIES Technical Service Department for answers to specific questions.

2.2.3 Compensating float voltage for ambient temperature

VRLA batteries should ideally be operated at 77°F (25°C) to obtain optimum performance and life. If it is necessary to operate outside this temperature it is advisable to increase the float potential by 3 mV/F° (3.6 mV/C°) for lower temperatures and lower the float by 3 mV/F° (3.6 mV/C°) for higher temperatures. See Table 2 below.

**TABLE 2
RECOMMENDED FLOAT VOLTAGE SETTINGS**

AMBIENT TEMPERATURE RANGE				
Farenheit Celsius	67°F-87°F* (19°C-31°C)	80°F-100°F (27°C-38°C)	90°F-110°F (32°C-43°C)	100°F-120°F (38°C-49°C)
VOLTS	2.25	2.24	2.22	2.20
PER	+/-	+/-	+/-	+/-
CELL	0.01	0.01	0.01	0.01

NOTE: The life of a battery will be reduced 50% for each 15°F increase in operating temperature above 77°F. See Table 3 on page 15.

**TABLE 3
CHARGE VOLTAGES FOR
LIBERTY SERIES 1000 FRONT ACCESS CELLS
CHARGE VOLTAGES AT 77°F (25°C)**

Cell Type	Open Circuit (Vpc)	Minimum Cell Voltage (Vpc)	Float Voltage (Vpc)	Initial Charge Voltage (Vpc)	Typical Charging Time for Initial Charge
All Liberty Series 1000® FA & FAM	2.15	2.20	2.26 +/- 0.01	2.33 +/- 0.02	12–16 Hours

Note 1:

- 1 - Applies to average cell voltage. Battery voltage should be set at average cell voltage multiplied by the number of cells in unit or string. Individual cell voltages may vary by +/- 0.05 Volts from the average.
- 2 - Charging time will vary due to open circuit stand, temperature and charger voltage available.
- 3 - If cell temperature is below 60°F (16°C), double the charge time for initial or equalize charge.

Note 2:

All lead-acid batteries lose a certain amount of charge when removed from a constant voltage source charger, set at a potential that is higher than the open circuit potential of the battery. As the charge is lost, the electro-chemical process produces lead sulfate in the positive and negative plates of every cell in the battery. If left uncharged for a significant period of time, the lead sulfate will begin to form large crystals of lead sulfate. Because of their size, these crystals may be somewhat difficult to reduce (break down) through normal charging procedures and may inhibit the complete electro chemical process necessary to sustain a healthy lead-acid battery. Frequently, higher-than-normal charging potentials or even more sophisticated remedial approaches may be necessary to recover the affected battery. In cases of sever sulfation, replacement may be the only solution.

2.2.4 Over-Voltage

When a charger is improperly set or a panel meter is improperly calibrated battery over-voltage or under-voltage may result. Higher than normal battery voltage can damage a battery, significantly shortening its service life. This is especially important in valve-regulated product where over-voltage increases gas generation that could cause pressure build-up within the cell. The excess pressure will cause the cells to vent the gases generated, causing premature dry out of the battery electrolyte. Even a small increase in over-voltage, beyond what is recommended in Table 2, increases the corrosion rate of the positive grid element and will contribute to reduced battery life. To avoid over-voltage, periodically check battery voltage with a calibrated digital voltmeter. If an over-voltage is recorded, check and readjust the rectifier and/or panel meter calibration as necessary. Place the battery at the recommended float charging voltage as soon as possible. Restoring the proper float voltage will preclude further damage caused by charging at an over-voltage but it cannot reverse damage that has already been sustained by the battery.

CAUTION

Liberty Series 1000 batteries produce virtually no gas emissions during normal operation. However, potentially explosive gases may be released under abnormal operating conditions or initial/equalize charge. Provide adequate ventilation so hydrogen gas accumulation in the battery area does not exceed one percent. Do not smoke, use open flame or create sparks near battery.

TABLE 4
LIBERTY SERIES 1000 FAM AND FA BATTERY
WARRANTY INFORMATION

Warranty period	Maximum annual average temperature
2 Years full 8 Years pro-rata	77°F (25°C)
1 Year full 4 Years pro-rata	92°F (33.3°C)
½ Year full 2 Years pro-rata	107°F (43.3°C)
3 Months full 1 Year pro-rata	122°F (48.8°C)

SECTION 3 - MAINTENANCE OF BATTERY MODULES

2.3.1 Inspection

Liberty 1000 Series Front access modules are sealed VRLA valve-regulated lead acid batteries and never require the addition of water.

WARNING: Never remove the vents as this will degrade the battery seal and will void the warranty.

2.3.2 Cleaning Modules

Use only a damp cloth to clean modules. Do not use any cleaning agents, because they could damage the battery cases.

WARNING: Do not clean modules with a dry cloth since this could develop a static charge on the plastic containers resulting in a potential spark.

2.3.3 Cell voltage variation

It is expected that module voltages will vary throughout the normal life of the battery. An acceptable variation of +/- 0.05 volts from the nominal cell float voltage is satisfactory. As an example a 12 volt module floating at 2.26 volts per cell or 13.56 volts for the module may vary from 13.26 to 13.86 volts measured at 77°F (25°C) and be acceptable.

2.3.4 Effects of temperature

A lead-acid battery is an electro chemical device. Heat accelerates chemical activity; cold slows it down. Normal battery operating temperature is 77°F (25°C). Higher than normal temperatures have the following effects on a lead-acid battery:

- Increases capacity
- Shortens life

-
- Increases internal discharge or local action losses
 - Lowers cell voltage for a given charge current
 - Raises charging current for a given charge voltage
 - Increases the rate of dry-out of electrolyte

Lower than normal temperatures have the opposite effect and reduce capacity. In general, at proper float voltage, a battery in a cool location will last longer than one in a warm location.

Note: No temperature correction is required when operating at 77°F +/- 10°F, (25°C +/- 5.5°C). The following correction factors apply for range not exceeding +/- 30°F from nominal. For further assistance with temperature correction factors, contact C&D TECHNOLOGIES.

If the operating temperature is other than 77°F (25°C), it is recommended that the float voltage be changed as follows:

For temperatures other than 77°F (25°C), correct float voltage by 2 mV per degree F (3.6 mV per degree C):

- Add 2 mV (0.002 Volts) per degree F (3.6 mV per degree C) below 77°F (25°C)
- Subtract 2 mV (0.002 Volts) per degree F (3.6 mV per degree C) above 77°F (25°C)

Note: Temperature compensation will materially improve battery service life when provided.

2.3.5 Record keeping

As a minimum annual measurements of module voltage should be taken and recorded. On occasion, if a long discharge has been experienced, completely recharge the battery and take a set of voltage readings recording them for future reference if the readings are satisfactory. Provide remedial action or an equalize charge if necessary. **Do not discharge a battery below the design final voltage.** Remedial action may be required if the battery was discharged below its final design voltage. Very deep discharges can, without an immediate recharge, completely deplete the electrolyte and cause hydration. Failure to maintain records may void the warranty.

2.3.6 Connection maintenance

Check the torque of bolted connections annually. Refer to table 1 for initial torque values. The same value may be used for re-torque. Examine the connections for cleanliness and indicate any required action on your records.

2.3.7 Internal Ohmic measurements

There are currently three methods being used today to measure the internal condition of the battery. Those methods are: Impedance, Conductance and Resistance.

Whichever method the end user decides to use, consistency in method must be maintained throughout the life of the product. These measurements provide insight as to the condition of the battery. Do not switch between manufacturers of equipment. Switching between designs can cause abnormal changes which may lead to false readings.

During the first 6–12 months these readings will stabilize. These initial readings should be used as a benchmark or a historical reference. If the measurements exceed the 12 month readings by 20% or more, the manufacturer should be contacted.

2.3.8 Recommended maintenance

Based on IEEE 1188 recommendations for maintenance of VRLA batteries, the following maintenance procedures are recommended. Use the record form enclosed in this manual to record the readings. Failure to maintain records may void the warranty.

Monthly

1. Visual inspection of the battery, general appearance and connections. Check for bulging jars, corrosion build up or any signs of heat damage to the connections.
2. Measure/record the system voltage at battery terminals.
3. Measure/record the float current.
4. Insure that the ventilation equipment is functioning properly.
5. Charger output and voltage.

Quarterly - perform all of the items mentioned above plus listed below.

1. Measure and record internal (one of the following): conductance, impedance or internal resistance of each cell/unit.
2. Measure and record the temperature of the negative terminal on each cell/unit.
3. Voltage of each cell/unit.

Annually - perform all of the items mentioned above plus listed below.

1. Measure and record the resistance of each connection.
2. Measure and record (one of the following): impedance, conductance or internal resistance of each unit.
3. Measure and record the torque of each connection.
4. Measure and record the AC ripple current and/or voltage on the battery.
5. Clean the tops and jars of the battery with a wet towel.
6. If required neutralize any corrosion found at the battery posts with a one to one (1lb to 1 gal) ratio of water and bicarbonate of soda.



STANDBY POWER DIVISION

MATERIAL SAFETY DATA SHEET

SECTION I: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION	
PRODUCT IDENTITY: Sealed, Lead-Calcium Battery CDID: LIBERTY 1000 SERIES LS 12-25, 6-50, 12-100, 6-200, 4-300 & 2-600 LFA 12-100. 6-200 & 2-600 FAM 12-100 & 12-150	MANUFACTURER NAME: C & D Technologies, Inc ADDRESS: 1400 Union Meeting Road P. O. Box 3053 Blue Bell, PA 19422-0858 TELEPHONE: (215) 619-2700 EMERGENCY: (610) 828-9309
24 HOUR EMERGENCY TELEPHONE: (CHEM TEL) 1-800-255-3924	

SECTION II: COMPOSITION / INFORMATION ON INGREDIENTS				
NOTE: The C&D "Liberty Series" batteries are sealed, recombinant design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.				
HAZARDOUS COMPONENT	CAS#	OSHA PEL	ACGIH TLV	% BY WEIGHT
*Lead, Lead compounds	7439-92-1	0.05mg/m3	0.05mg/m3	66-77%
*Sulfuric Acid	7664-93-9	1.0mg/m3	1.0mg/ m3	6 - 9%
Tin	7440-31-5	2.0mg/m3	2.0mg/m3	.1-.3%
Aluminum	7429-90-5	15.0mg/m3	10.0mg/m3	< .01%
*Copper	7440-50-8	1.0mg/m3	1.0mg/m3	≤ .5%
NON-HAZARDOUS INGREDIENTS				
Water	7732-18-5	N/A	N/A	10 -13%
Calcium	7440-70-2	N/A	N/A	.02-.04%
Inert Components	N/A	N/A	N/A	7 - 12%
SECTION 313 (40 CFR 372) LISTED TOXIC CHEMICALS ARE PRECEDED BY AN *.				

SECTION III: HAZARDS IDENTIFICATION				
APPEARANCE AND ODOR: Colorless, Oily Fluid, Vapors are Colorless; Acrid odor when hot or charging.				
RATING CODES: 0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme				
HMIS RATING:	Health: 2	Flammability: 0	Reactivity: 1	Other: 0
NFPA RATING:	Health: 2	Flammability: 0	Reactivity: 1	Other: CORR
TARGET ORGANS: Skin, Eyes, Upper Respiratory Tract		ROUTES OF ENTRY: Inhalation X Skin X Ingestion X		
HEALTH HAZARDS (ACUTE AND CHRONIC): ACUTE: Tissue destruction on contact. May cause 2nd and 3rd degree burns or blindness with prolonged contact. Ingestion will cause corrosive burns on contact. May be fatal if swallowed. CHRONIC: Inhalation of mists may cause upper respiratory irritation.				
SIGNS AND SYMPTOMS: Irritation and burning of exposed tissues.				
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory disorders may be aggravated by prolonged inhalation of mists.				
California Proposition 65 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. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after				

handling.

SECTION IV: FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES:

SKIN / EYES	INGESTION
<ul style="list-style-type: none"> Flush with water for 15 minutes Remove contaminated clothing If irritation continues, seek medical attention 	<ul style="list-style-type: none"> Drink large quantities of milk or water Do not induce vomiting Give CPR if breathing has stopped Seek medical attention immediately

SECTION V: FIREFIGHTING MEASURES

FIRE AND EXPLOSIVE PROPERTIES:

Flash Point: N/A	Flammable Limits (as H ₂ gas):	LEL: 4%	UEL: 74%
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UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen gas may be present when used in a battery. Hydrogen gas and acid mist are generated upon overcharge or in fires. Ventilate area.

EXTINGUISHING MEDIA: Class ABC or CO₂. Caution should be taken not to use CO₂ directly on the battery cell as the thermal shock may cause cracking of the battery case and release of battery electrolyte.

SPECIAL FIREFIGHTING PROCEDURES: Ventilate the area well. SCBA and acid protective clothing are recommended.

SECTION VI: ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF BATTERY IS BROKEN: Neutralize exposed battery parts with soda ash or sodium bicarbonate until fizzing stops. pH should be neutral at 6-8. Collect residue in a suitable container. Residue may be hazardous waste. When neutralized, the battery parts are non-hazardous. Place the broken battery in a heavy gauge plastic bag or other non-metallic container. Provide adequate ventilation, hydrogen gas may be given off during neutralization.

SECTION VII: HANDLING AND STORAGE

Store in a cool, dry area away from combustibles. Do not store in sealed, unventilated areas. Avoid overheating and overcharging. Do not use organic solvents or other than recommended chemical cleaners on the batteries.

SECTION VIII: EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: General room ventilation is sufficient during normal use and handling. Do not install these batteries in a sealed, unventilated area.

PERSONAL PROTECTIVE EQUIPMENT (IN THE EVENT OF BATTERY BREAKAGE):

Eye Protection = chemical goggles or safety glasses with sideshields and a full-face shield.

Protective Gloves = rubber or neoprene

Respiratory Protection = NIOSH approved acid mist respirator, if OSHA PEL is exceeded or respiratory irritation occurs.

Other Protective Equipment = acid resistant apron or clothes.

WORK PRACTICES: Do not wear metallic jewelry when working with batteries. Use non-conductive tools only. Discharge static electricity prior to working on a battery. Maintain an eyewash, fire extinguisher and emergency communication device in the work area.

SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES

ACID: Appearance / Odor: At normal temperatures: colorless, oily fluid / acid odor when hot.

Boiling Point: N/A	Vapor Pressure: N/A
Vapor Density: (air=1): >1	Melting Point: N/A
Evaporation Rate (water=1): N/A	Solubility in water: N/A
Specific Gravity (contained in battery): 1.300+/-0.010	

SECTION X: STABILITY AND REACTIVITY

STABILITY: This battery and contents are stable.
CONDITIONS TO AVOID: Overheating, overcharging which result in acid mist / Hydrogen generation.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong alkaline materials, conductive metals, organic solvents, sparks or open flame.
HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Hydrogen gas may be generated in an overcharged condition, in fire or at very high temperatures. In fire may emit CO, CO2 and Sulfur Oxides.
HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

SECTION XI: TOXICOLOGICAL INFORMATION - SULFURIC ACID

The "Liberty Series" batteries are sealed, recombinant design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.
LD 50: Administration Route: Oral Dose: 2140mg/kg Test Animal: Rat
LDLo: Administration Route: Unreported Dose: 135mg/kg Test Animal: Man
LC50: Administration Route: Inhalation Dose: 510mg/m3 Test Animal: Rat
CARCINOGENICITY: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a category 1 carcinogen (inhalation), a substance that is carcinogenic to humans. "The National Toxicology Program (NTP) has designated strong inorganic sulfuric mists as a known human carcinogen." This classification does not apply to the liquid forms of sulfuric acid contained within the battery. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist at high levels.

SECTION XII: ECOLOGICAL INFORMATION

Lead and its compounds can pose a threat if released to the environment. See waste disposal method in Section XIII.

SECTION XIII: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: This battery is recyclable. It is illegal to dispose of lead-acid batteries by any means other than recycling. C&D provides an environmentally responsible nation wide lead acid battery collection and recycling program. Contact your local C&D sales representative for more information.
HAZARDOUS WASTE CODES: D002, D008

SECTION XIV: TRANSPORTATION INFORMATION

All DOMESTIC SHIPMENTS: BATTERY, ELECTRIC STORAGE, WET, NON- SPILLABLE, NOT REGULATED.	
FOR WATER EXPORT AND CANADIAN SHIPMENTS:	
FOR AIR: NON-SPILLABLE, NOT REGULATED. UNITS MEET A67 SPECIAL PROVISION	
REQUIREMENTS OF THE IATA REGULATIONS.	UN OR NA IDENTIFICATION: <u>UN-2800</u>
PROPER DOT SHIPPING NAME: Batteries, Wet, Non-spillable, Electric Storage	
HAZARD CLASS: 8	PACKING GROUP: III
LABEL: Corrosive (NOT REQUIRED FOR CANADA)	NO PLACARDS OR LABELS REQUIRED.

SECTION XV: REGULATORY INFORMATION

See 29 CFR 1910.268(b)(2)

SECTION XVI: OTHER INFORMATION

The information herein is given in good faith, but no warranty, expressed or implied, is made.
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MSDS Preparation / Review Date: 7/05 Revision Number: 21 Prepared by: W. Kozlowski

MATERIAL SAFETY DATA SHEET

SECTION I: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION	
PRODUCT IDENTITY: Sealed, Lead-Calcium Battery CDID: LIBERTY SERIES LS 12-55, 12-80 only; FA 12-125, FAM 12-125	MANUFACTURER NAME: C & D Technologies, Inc. ADDRESS: 1400 Union Meeting Road P. O. Box 3053 Blue Bell, PA 19422-0858
EMERGENCY: (610) 828-9309 24 HOUR EMERGENCY TELEPHONE: (CHEM TEL) 1-800-255-3924	TELEPHONE: (215) 619-2700

SECTION II: COMPOSITION / INFORMATION ON INGREDIENTS				
NOTE: The C&D "Liberty Series" batteries are sealed, recombinant design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.				
HAZARDOUS COMPONENT	CAS#	OSHA PEL	ACGIH TLV	% BY WEIGHT
*Lead, Lead compounds	7439-92-1	0.05mg/m3	0.05mg/m3	60-71%
*Sulfuric Acid	7664-93-9	1.0mg/ m3	1.0mg/ m3	6 – 9%
Tin	7440-31-5	2.0mg/m3	2.0mg/m3	< .1%
Aluminum	7429-90-5	15.0mg/m3	10.0mg/m3	< .01%
*Copper	7440-50-8	1.0mg/m3	1.0mg/m3	<.01%
NON-HAZARDOUS INGREDIENTS				
Water	7732-18-5	N/A	N/A	14-16%
Calcium	7440-70-2	N/A	N/A	.01%
Inert Components	N/A	N/A	N/A	7 -12%
SECTION 313 (40 CFR 372) LISTED TOXIC CHEMICALS ARE PRECEDED BY AN *.				

SECTION III: HAZARDS IDENTIFICATION
APPEARANCE AND ODOR: Colorless, Oily Fluid, Vapors are Colorless; Acrid odor when hot or charging.
RATING CODES: 0= <i>Insignificant</i> 1= <i>Slight</i> 2= <i>Moderate</i> 3= <i>High</i> 4= <i>Extreme</i>
HMIS RATING: Health: 2 Flammability: 0 Reactivity: 1 Other: 0
NFPA RATING: Health: 2 Flammability: 0 Reactivity: 1 Other: CORR
ROUTES OF ENTRY: Inhalation X Skin X Ingestion X
TARGET ORGANS: Skin, Eyes, Upper Respiratory Tract
HEALTH HAZARDS (ACUTE AND CHRONIC):
ACUTE: Tissue destruction on contact. May cause 2nd and 3rd degree burns or blindness with prolonged contact. Ingestion will cause corrosive burns on contact. May be fatal if swallowed.
CHRONIC: Inhalation of mists may cause upper respiratory irritation.
SIGNS AND SYMPTOMS: Irritation and burning of exposed tissues.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory disorders may be aggravated by prolonged inhalation of mists.
California Proposition 65 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. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.

SECTION IV: FIRST AID MEASURES	
EMERGENCY AND FIRST AID PROCEDURES:	
SKIN / EYES	INGESTION
<ul style="list-style-type: none"> • Flush with water for 15 minutes • Remove contaminated clothing • If irritation continues, seek medical attention. 	<ul style="list-style-type: none"> • Do not induce vomiting • Drink large quantities of milk or water • Give CPR if breathing has stopped • Seek medical attention immediately

SECTION V: FIREFIGHTING MEASURES			
FIRE AND EXPLOSIVE PROPERTIES:			
Flammable Limits (as H ₂ gas) LEL: 4%	UEL:74%	Oxygen Index: >32	Flash Point: N/A
UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen gas may be present when used in a battery. Hydrogen gas and acid mist is generated upon overcharge or in fires. Ventilate area.			
EXTINGUISHING MEDIA: Class ABC or CO ₂ . Caution should be taken not to use CO ₂ directly on the battery cell as the thermal shock may cause cracking of the battery case and release of battery electrolyte.			
SPECIAL FIREFIGHTING PROCEDURES: Ventilate the area well. SCBA and acid protective clothing are recommended.			

SECTION VI: ACCIDENTAL RELEASE MEASURES
STEPS TO BE TAKEN IF BATTERY IS BROKEN: Neutralize any spilled electrolyte or exposed battery parts with soda ash or sodium bicarbonate until fizzing stops. pH should be neutral at 6-8 . Collect residue and place in a suitable container. Residue may be hazardous waste. When neutralized, the spill is non-hazardous. Keep untrained individuals away from the spilled material. Place the broken battery in a heavy gauge plastic bag or other non-metallic container. Provide adequate ventilation, hydrogen gas may be given off during neutralization.

SECTION VII: HANDLING AND STORAGE
Store in a cool, dry area away from combustibles. Do not store in sealed, unventilated areas. Avoid overheating and overcharging. Do not use organic solvents or other than recommended chemical cleaners on the batteries.

SECTION VIII: EXPOSURE CONTROLS / PERSONAL PROTECTION
ENGINEERING CONTROLS: General room ventilation is sufficient during normal use and handling. Do not install these batteries in a sealed, unventilated area.
PERSONAL PROTECTIVE EQUIPMENT (IN THE EVENT OF BATTERY BREAKAGE):
Eye Protection = chemical goggles or safety glasses with sideshields and a full-face shield.
Protective Gloves = rubber or neoprene
Respiratory Protection = NIOSH approved acid mist respirator, if OSHA PEL is exceeded or respiratory irritation occurs.
Other Protective Equipment = acid resistant apron or clothes.
WORK PRACTICES: Do not wear metallic jewelry when working with batteries. Use non-conductive tools only. Discharge static electricity prior to working on a battery. Maintain an eyewash, fire extinguisher and emergency communication device in the work area.

SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES	
ACID:	
Evaporation Rate (water=1) : N/A	Vapor Density: (air=1) : >1
Solubility in water: N/A	Vapor Pressure: N/A
Specific Gravity (contained in battery): 1.300 +/- .010	Melting Point: N/A

Appearance / Odor: colorless, oily fluid, acrid odor when hot.	Boiling Point: N/A
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SECTION X: STABILITY AND REACTIVITY

STABILITY: This battery and contents are stable.
CONDITIONS TO AVOID: Overheating, overcharging which result in acid mist / hydrogen generation.
INCOMPATIBILITY (materials to avoid): Strong alkaline materials, conductive metals, organic solvents, sparks or open flame.
HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Hydrogen gas may be generated in an overcharged condition, in fire or at very high temperatures. In fire- may emit CO, CO2 and Sulfur Oxides.
HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

SECTION XI: TOXICOLOGICAL INFORMATION – SULFURIC ACID

The "Liberty Series" batteries are sealed, recombinant design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances.			
LD 50:	Administration Route: Oral	Dose: 2140mg/kg	Test Animal: Rat
LDLo:	Administration Route: Unreported	Dose: 135mg/kg	Test Animal: Man
LC50:	Administration Route: Inhalation	Dose: 510mg/m3	Test Animal: Rat
CARCINOGENICITY: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a category 1 carcinogen (inhalation), a substance that is carcinogenic to humans. "The National Toxicology Program (NTP) has designated strong inorganic sulfuric acid mists as a known human carcinogen." This classification does not apply to the liquid forms of sulfuric acid contained within the battery. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist at high levels.			

SECTION XII: ECOLOGICAL INFORMATION

Lead and its compounds can pose a threat if released to the environment. See waste disposal method in Section XIII.

SECTION XIII: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: This battery is recyclable. It is illegal to dispose of lead-acid batteries by any means other than recycling. C&D provides an environmentally responsible nation wide lead acid battery collection and recycling program. Contact your local C&D sales representative for more information.

HAZARDOUS WASTE CODES: D002, D008

SECTION XIV: TRANSPORTATION INFORMATION

FOR DOMESTIC, CANADIAN, AND EXPORT SHIPMENTS:		
UN OR NA IDENTIFICATION: UN-2794		
PROPER DOT SHIPPING NAME: Batteries, Wet, Filled with Acid, Electric Storage		
HAZARD CLASS: 8	PACKING GROUP: III	LABEL: Corrosive

SECTION XV: REGULATORY INFORMATION

See 29 CFR 1910.268(b)(2)

SECTION XVI: OTHER INFORMATION

The information herein is given in good faith, but no warranty, expressed or implied, is made.

MSDS Preparation / Review Date: 6/07 Revision Number: 14 Prepared by: W. Kozlowski

Appendix B - WARRANTY PROVISIONS FOR LIBERTY® SERIES 1000 FAM and LFA BATTERIES

C&D TECHNOLOGIES valve-regulated lead acid batteries are warranted against defects in materials or manufacturing or both for a period of two years from the date of shipment from C&D factory when **operated in full float** and when stored at 77°F (25°C). Refer to specific warranty certificates for your Liberty 1000 FAM model for float or UPS operation and for storage at other temperatures.

IMPORTANT: Full and pro-rata warranty is reduced for operation exceeding 77°F (25°C) and is adjusted for cycle service (such as UPS service and similar applications). Refer to the specific warranty RS-1827 provided in the time period when the battery was purchased.

Always complete the record of initial charge, float charge and ambient temperature as described in the initial charge section of this manual and retain them in your files for future reference. Clearly identify your location, application, C&D TECHNOLOGIES model number, the date, and name of the person who took the readings.

The service life of your battery will depend on ambient temperature, frequency and depth of discharge, discharge rate, charge voltage, and regulation of the battery charger. A product warranty is available by writing C&D TECHNOLOGIES, INC., 1400 Union Meeting Road, PO Box 3053, Blue Bell, PA 19422-0858.

CAUTION

Due to the operating requirements of valve-regulated batteries, Liberty Series 1000 FAM and LFA batteries are sealed and hydrometer readings cannot be taken. Removal of vents voids warranty.

Appendix C - VALVE-REGULATED LEAD ACID BATTERY and CHARGER INSPECTION REPORT

A sample inspection report form is provided in the following pages of this manual and is referred to as **RS-1511**. This form should be used to record appropriate battery, charger and related system information at timely events such as:

- Initial installation of the battery at which time open circuit voltage of all cells should be recorded.
- The initial charge is provided at equalize or float voltage (if first charge is provided within a short time after receipt of battery).
- The system is finalized and float voltage is established to the battery.
- Whenever equalize charge is delivered to the battery to balance cell potentials.
- At periodic maintenance.
- Following a deep discharge or capacity test.

Important information can be found on unit labels affixed to the battery:

- 1 - Labels contain the:
- Battery Model or Type Identification
 - Ampere-hour Rating (Ah)
 - Shipping Date, from C&D TECHNOLOGIES Factory
 - Order Number

User Note: Make a photocopy of the RS-1511 form shown in the following pages so that additional copies may be made at subsequent inspections.



TECHNICAL SERVICE DEPARTMENT
 1400 UNION MEETING RD.
 BLUE BELL, PA 19422

Inspection by: _____

Date of Inspection: _____

**LIBERTY® SERIES 1000 FAM AND LFA BATTERY AND CHARGER
 INSPECTION REPORT**

User's Name:	Authorized Site Contact:
Installation Location:	Phone No.:
	Other:
System OEM:	Installation by:

BATTERY & CHARGER SYSTEM INFORMATION

C&D Order No.	Appearance of Following Battery Items
C&D Ship Date	Positive Posts
Date Installed	Negative Posts
Battery Model	Cell Covers
Cells x Strings	Presence of Lubricant on Cells <input type="checkbox"/> Yes <input type="checkbox"/> No
Application	
Bus Voltage, Portable Meter	
Bus Voltage, Equipment, Final	
Charger Size, Type, Serial No. & Mfg.	
Ambient Room Temperature	
Last Discharge	
Peak Load Current Amp. or KW	
Typical Load Current/KW	
Cell Arrangement	

COMMENTS AND RECOMMENDATIONS

POWER SYSTEMS DIVISION

1400 UNION MEETING ROAD
P.O. BOX 3053
BLUE BELL, PA 19422-0858 USA
215.619.2700 • FAX 215.619.7899
800.543.8630
customersvc@cdtechno.com
www.cdtechno.com

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