



INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS FOR LOW MAINTENANCE DIESEL LOCOMOTIVE AND ENGINE STARTING BATTERIES (Lead-Acid Type)

A. SAFETY PRECAUTIONS

EXPLOSION – can result from the gases produced by a battery.

1. Do not smoke, use an open flame, or create sparks in the vicinity of a battery.
2. Only charge a battery in a well-ventilated area with the battery compartment open for maximum ventilation.
3. Do not charge the battery at a greater current than shown in Section E.

SEVERE BURNS – can be caused by the sulfuric acid contained in the batteries.

1. Do not get acid in eyes, on skin or clothing. In case of contact, flush immediately and thoroughly with clean water. Obtain medical attention when eyes are affected.
2. In handling sulfuric acid, wear a face shield, rubber gloves, and an apron. Avoid spilling acid.
3. Acid can be neutralized using Pro Series PROWASH cat. #94881, or one pound of bicarbonate of soda to every gallon of water. Apply till bubbling stops.

ELECTRIC SHOCK – cells connected in series have HIGH VOLTAGES that could produce a human shock hazard. Be careful when working with any tools around the battery to avoid a possible short circuit. Only authorized personnel should be permitted to work on these batteries.

B. UNPACKING - FRESHENING CHARGE

1. Normally, EnerSys Ironclad batteries are filled with electrolyte of the proper specific gravity and fully charged when shipped. If shipped "Moist-charged" without electrolyte, see Section K. Upon receipt, batteries should be examined for shipping damage or to determine if any electrolyte has been lost by accidental spillage. If any small amount of electrolyte has been lost and the plates appear to be wet, replace with electrolyte of the same specific gravity as in the surrounding cells. If a large amount of electrolyte has been lost and the plates are dry (except for "Moist-charged" cells) such cells will require repair by an EnerSys Service Representative.

2. During transit the battery may have lost some of its charge. If specific gravity of the electrolyte is below 1.220, give a "**Freshening Charge**" by charging, at the rate shown in Section E. **As long as the hourly specific gravity readings of the lowest cell shows an increase, and continue for three hours after the last increase.** See Section E for end of charge gravity readings for cell types.

3. When freshening charge is complete, make a written record of the specific gravity of each cell and note the temperature and the electrolyte level of the pilot cells for future comparison.

C. LOCATION

1. Battery compartment must be well ventilated but in such a way as to keep out water, oil, and dirt. Locate and install the battery so that the cells are easily accessible for inspections, adding water, and cleaning.

2. Batteries in service on moving vehicles should have the trays seated firmly and blocked to avoid shifting. Leave an overall clearance of 1/8". DO NOT WEDGE TIGHT.

D. CONNECTING THE BATTERY

1. Connecting cables must be flexible and long enough to not create a strain on the battery terminals. Arrange the trays so that the position of the terminals goes in a positive to negative fashion. The positive terminal will be painted red, or marked either POS. or +. The negative will be painted black, or marked either NEG. or -.

E. RATINGS

2. Before connecting up the battery, clean all terminals with a wire brush. All connectors should be wiped with a clean cloth and thinly coat with NO-OX-ID grease. After securely tightening, wipe of all excess grease.

3. In connecting the battery to a generator or electrical system, connect the positive of the generator to the positive of the battery and the negative of the generator to the negative of the battery.

WARNING: DO NOT CONNECT ANY "TAPS" TO INTERMEDIATE POINTS ON THE BATTERY. ANY DEVICE CONNECTED TO INTERMEDIATE POINTS WILL OVERWORK ONE SECTION OF THE BATTERY AND CAUSE OVER CHARGING OF THE REMAINING SECTION.

Battery Type	Plates Per Cell	Charge Rate (amps)	DISCHARGE CAPACITY (AH)			Battery Catalog Number	Battery Unpacked Wt. (lbs)	Fully Charged Sp. Gr.	Electrolyte Wt. lbs.
			1.250 SP. GR. @77°F. To 1.70 VPC						
			8HR.	5HR	3HR				
4-LMS-11	11	14	280	243	210	402820	170	1.240-1.260	42
4-LMS-325	11	16	330	285	240	95703	235	1.240-1.260	68
4-LMS-450	17	22	440	390	335	95704	270	1.240-1.260	60
16-LMUD-530 Heated	19	26	530	470	435	400390 400410	1345 1345	1.240-1.260	288
16-LMUD-725 Heated	25	35	725	630	580	501118 402700	1700 1700	1.240-1.260	384

F. SPECIFIC GRAVITY OF ELECTROLYTE

1. The specific gravity of the electrolyte at 77°F, with cells fully charged and the level 1/8" below the bottom of the filling tube, should be according to Section E. The gravity is adjusted within these limits at the factory and will not require adjusting during the life of the battery unless electrolyte is lost. If, however, electrolyte is lost it should be replaced with electrolyte of the same specific gravity as the surrounding cells.

To obtain accurate gravity readings, corrections must be taken for temperature and levels:

Add 1 point of gravity (.001) for every 3°F above 77°F.
Subtract 1 point of gravity for every 3°F below 77°F.

Subtract 15 points of gravity (.015) for each 1/2" below the recommended level. Add 15 points for each 1/2" above the recommended level.

2. A freshening charge may be required if specific gravity varies more than 30 points among cells, or the average is below 1.220. See Section B.2. If these conditions still exist after charge, an EnerSys Inc. Service Representative should make acid adjustment.

G. CHARGING

1. During battery operation, while in diesel starting, the charge voltage regulator should initially be set to 2.31 volts per cell. This adjustment may vary with operating or climate conditions.

If gravity is 25 points below the full charged gravity, and shows a steady decline, this indicates the charging system is insufficient and the system should be adjusted to give more charge.

If the battery uses more than 1/2" of water per cell per month or the electrolyte temperature is 15°F in temperature higher than ambient temperature, this would indicate the charging system is set too high.

Any adjustments should be made in small increments as to not overshoot the setting needed. In either case battery life will be shortened if not corrected.

2. If a battery becomes considerably discharged through some circumstance it should be given a freshening charge from an external source at the first opportunity. See Section B2

MAINTENANCE

H. INSPECTIONS

At annual inspections read and record the following on the record card in this manual. (Recopy as needed)

- A. Specific Gravity of pilot cells (rotate pilot cells)
- B. Electrolyte Levels – inches above or below the splash cover.
- C. Water Added – Yes or No.
- D. Regulator voltage – Before or after adjustments.

During inspections note the cleanliness and the condition of the connections, clean and tighten if necessary.

Water may be added by using the Pro Series PRO-FILL cat. #92755 LR-RR. This device will insure that the recommended water level is reached.

I. ACCESSORIES

- A. HYDROMETER Catalog #84598
- B. THERMOMETER Catalog #88330
- C. PRO-FILL Catalog #92755 LR-RR

REPAIRS

EnerSys Ironclad, Low Maintenance Diesel Engine Starting Batteries require no normal repairs, overhauling, or electrolyte changes during its life. If any damages or circumstances necessitate such attention, contact your local EnerSys Inc. Service Representative.

SPECIAL SUBJECTS

J. STORAGE OF BATTERIES

1. Batteries should be stored in a cool, clean, dry, and well ventilated location away from any source of heat and protected from direct sunlight.
2. Before storing, it is necessary that the battery be fully charged and the electrolyte be at the proper level and specific gravity. Disconnect any leads to reduce the possibility of discharge during storage. **DO NOT REMOVE ELECTROLYTE OR DISMANTLE THE BATTERY.**

3. If storage temperature is 80°F or higher, check gravity at least monthly; if 60°F, or lower, every two months. If the specific gravity drops 40 points below the full charge value, a freshening charge is necessary.

K. MOIST CHARGED BATTERIES

1. Some batteries are shipped “Moist Charged”, without electrolyte. Until ready for use, they must be stored in a cool dry place. Do not remove the special airtight valves from moist-charged batteries until ready to activate. **Moist-charged cells and batteries are electrically live at all times.** Take proper safety precautions when handling. Refer to the instructions attached to the battery.

2. To prepare for use, obtain a sufficient amount of electrolyte (1.240 sg.) to fill the battery cells. When filling, the electrolyte should be between 77°F and 90°F/

3. On moist-charged batteries, remove and discard the special airtight valves from each cell. Upon completion of filling, replace with standard quarter-turn vent caps provided with the battery.

4. Fill each cell with electrolyte of the proper specific gravity, bringing the level of 1/8” below the bottom of the filling tube. Allow to stand for several hours or overnight. If the level has dropped, add more electrolyte.

5. Give the battery a freshening charge as in Section B.2. At least 8 hours of charging may be necessary if using the charge rates in Section E. If the battery temperature reaches 120°F, discontinue charging until the temperature drops back down to 100°F, then continue.

6. After completion of charge, all cells should have specific gravities of 1.245 – 1.260, corrected for temperature and level. If the gravity is too high, adjust by removing electrolyte and replacing with water only. Charge for another hour to mix the electrolyte and water thoroughly.

