

**Lead Acid Vehicle and Equipment  
Battery Charging Procedure**Date of  
Publication: 1-25-2021Page  
Number: 1 of 5

EMUDPS-EHS-P023

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**I. PURPOSE**

The purpose of this procedure is to protect Eastern Michigan University's employees and students from injury when charging vehicle and equipment batteries. This procedure also protects buildings and equipment from damage. Charging a dead or low charged battery is more than simply hooking up a charger. You should know which terminal to remove first if you have to remove the battery, which terminal to hook up first on the charger, how long to charge a dead low battery and more.

**II. SCOPE**

This procedure applies to all Eastern Michigan University (EMU) employees, students and those employees working on behalf of EMU who will charge vehicle and equipment batteries owned or operated by the University.

**III. BATTERY CHARGING PREPARATION**

Before charging a battery, you need to be properly prepared. It is very easy to be shocked when the battery has a stored charge. Before you begin, determine if you have to remove the battery from the vehicle or equipment to charge it. Be sure you have the right tools for the job. Some batteries are easily accessible; however, some are under or in the fender and some may even be in the trunk or under the seat depending on the make and model of the vehicle or piece of equipment.

When removing the battery;

- First, disconnect the negative cable from the battery.
- Remove the positive cable from the battery.
- Remove the fasteners that hold the battery in place.
- Remove the battery without contacting the positive and negative terminals simultaneously to the same conductive surface.
- Place the battery on a bench, tabletop or rack that will safely support it.

<b>Subject: Lead Acid Vehicle &amp; Equipment Battery Charging Procedure</b>	<b>EMUDPS-EHS-P023</b>	
<b>Date of Publication:</b> 1-25-2021	<b>Revision:</b> 0	<b>Page:</b> 2 of 5

**IV. HOW TO CHARGE A BATTERY**



- A. Be sure all accessories are off and the lights, including the interior light, are off. If any accessories are left on, they could cause the battery to arc while it is being worked on.
- B. Once the battery has been accessed, remove the negative or ground cable first. This is the cable connected to the terminal labeled NEG. When viewed from the top of the battery, there will be a NEG (-) sign or the embossed abbreviation (NEG) and the positive terminal with a plus (+) sign or embossed abbreviation (POS).
- C. Clean the battery terminals with a terminal cleaning brush and a mixture of baking soda and water to neutralize the battery acid. If the battery terminals and posts have a lot of acid buildup, wear eye protection and a mask so the airborne corrosion does not contact your eyes, nose and mouth. Do not touch your face until after you have washed your hands.
- D. If the battery has removable caps, carefully pry the caps off and check the level of the water. If any of the cells look low, add distilled water only; taking care not to overfill the battery. Most batteries today are “maintenance-free” you will not be able to open them to check the acid level.

**V. CONNECTING THE BATTERY CHARGER**



<b>Subject: Lead Acid Vehicle &amp; Equipment Battery Charging Procedure</b>	<b>EMUDPS-EHS-P023</b>	
<b>Date of Publication:</b> 1-25-2021	<b>Revision:</b> 0	<b>Page:</b> 3 of 5

Follow the instructions for your particular charger. Basic instructions for most chargers include:

- A. Ensure the charger is off.
- B. Connect the positive cable on the charger to the positive terminal on the battery.
- C. Connect the negative cable on the charger to the negative terminal on the battery.
- D. Set the charger to the slowest charge rate.
- E. Turn on the charger and set the timer.**
- F. Never leave the battery unattended when using the “Hold” option.**

**When removing the charger, turn it off first; remove the negative cable then the positive cable.**

## **VI. BATTERY CHARGER INSTRUMENT PANEL USE**

- A. The **CHARGE TIME** timer has an **OFF position**, a **CONTINUOUS (Hold) CHARGE** position and a **Timed** charge range from 0 to 90 minutes.
- B. **OFF** - Ensure the timer is in the OFF position before connecting or disconnecting the clamps from the battery. The charger will not charge with the timer in this position.
- C. **HOLD - CONTINUOUS CHARGE** - This position is used for slow charging or parallel charging and will not turn the charger off. **Do not use this position for fast charging.**
- D. **0 to 90 MINUTES TIMED CHARGE** - The timer will automatically turn the charger off at the end of the preset charging time. Turn the timer past 20 before setting the desired time.

## **VII. HOW LONG SHOULD YOU CHARGE A VEHICLE BATTERY?**

If the battery voltage is below 11.85 and the charger is putting out a 5-amp charge rate, it will take about 12 hours to fully charge a battery with 400 to 500 cold-cranking amps. The same battery will take approximately 6 hours to fully charge if the charge rate is 10 amps. The lower the open-circuit voltage in the battery and the more cold-cranking amps, the longer it will take to charge the battery.

## **VIII. ACID GLASS MAT (AGM) BATTERIES**

Normally, AGM batteries do not vent any gas - unless they are being overcharged. If pressure builds up inside a "sealed" AGM battery, it will eventually be released through a safety release valve. Ordinary wet cell lead-acid batteries do produce hydrogen gas when charging and can produce hydrogen sulfide if overcharged. Because of this, an AGM battery inside a passenger compartment **SHOULD NEVER** be replaced with a conventional battery. For safety, any battery located inside a vehicle must be enclosed in a sealed box that is vented outside the vehicle. This is not necessary with batteries

<b>Subject: Lead Acid Vehicle &amp; Equipment Battery Charging Procedure</b>	<b>EMUDPS-EHS-P023</b>	
<b>Date of Publication:</b> 1-25-2021	<b>Revision:</b> 0	<b>Page:</b> 4 of 5

mounted in the engine compartment because any hydrogen gas or hydrogen sulfide that escapes from the battery will dissipate and has no direct path into the passenger compartment.

**IX. LENGTH OF CHARGE**

- A.** Test the battery for state of charge. Do not charge if it is over 75% charged or the battery is determined to be defective.
- B.** Set charging amps rate for size of battery and state of charge per charts (see charts below).
- C.** Charge for length of time based on the Rate vs. Minutes chart illustrated on page 5.
- D.** Discontinue charge when the specific gravity of electrolyte reaches 1.260 or above. A temperature compensating hydrometer should be used for this reading.
- E.** Discontinue charge if the battery begins to gas excessively or if the temperature of the electrolyte reaches approximately 125°F.
- F.** Do not overcharge batteries. Overcharging results in excessive water loss and eventual damage to the battery.

<b>BATTERY SIZE TABLE</b>			
<b>BATTERY SIZE</b>	<b>SMALL</b>	<b>MEDIUM</b>	<b>LARGE</b>
Ampere Hours	40	60	80+
Reserve Capacity	60	90	100+
Cold Cranking Amps	275	350	400+

<b>STATE OF CHARGE TABLE</b>				
<b>STATE OF CHARGE</b>	<b>75%</b>	<b>50%</b>	<b>25%</b>	<b>DEAD</b>
Specific Gravity	1.225	1.185	1.140	1.110
Open Circuit Voltage- 6 V	6.2	6.05	5.95	5.9
Open Circuit Voltage- 12 V	12.4	12.1	11.9	11.8
Open Circuit Voltage- 24 V	24.8	24.2	23.8	23.6

CHARGE RATE vs. MINUTES CHARGE										
BATTERY SIZE	PERCENT CHARGE	MINUTES								
		15	30	45	60	75	90			
SMALL	0-25	AMPERES	45	30	30	25	25	20		
	25-50		30	20	20	15	15	10		
	50-75		15	10	10	10	5	5		
MEDIUM	0-25		70	50	45	40	35	30		
	25-50		45	30	25	20	20	20		
	50-75		25	15	15	10	10	10		
LARGE	0-25		90	55	55	50	45	45		
	25-50		60	40	35	30	30	30		
	50-75		30	20	20	15	15	15		

**X. REFERENCES**

- A. [Associated Equipment Co.](#)
- B. [Meineke Resource Center](#)

**XI. HISTORY**

Revision	Date	Change(s)
0	1-25-2021	Initial release