



Battery Charging

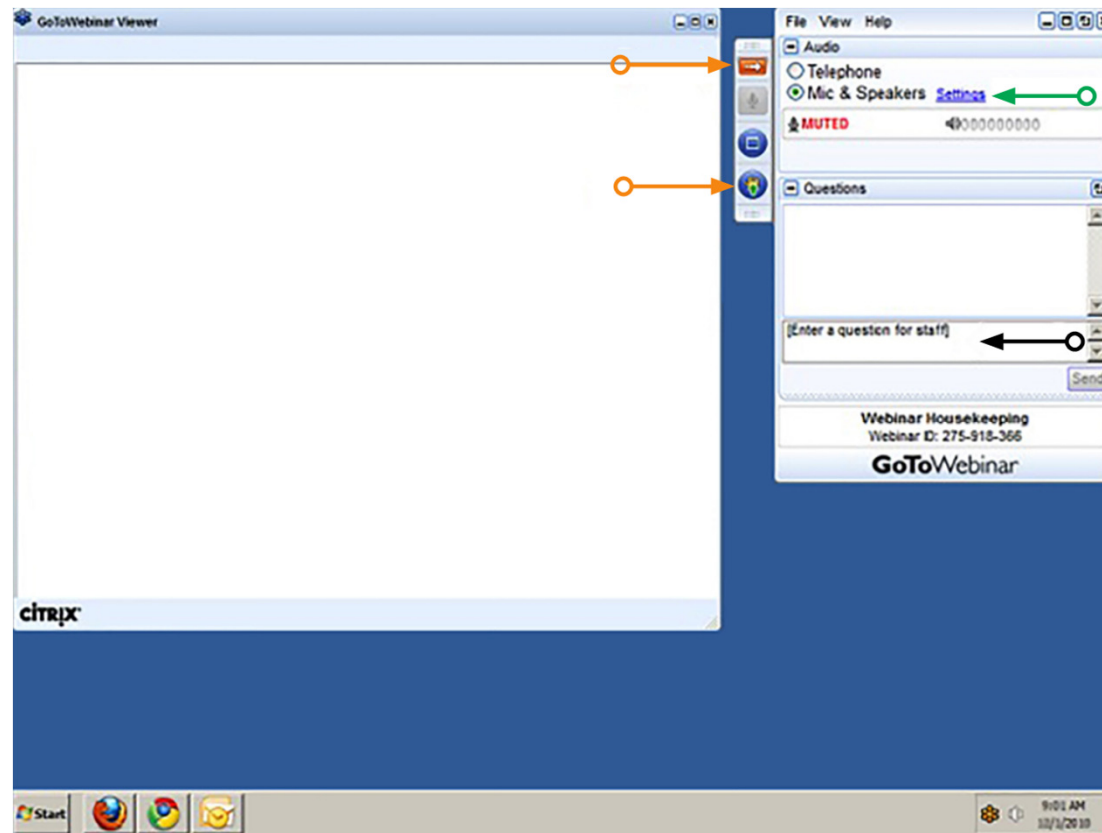
Learning How to
Effectively Charge
Batteries

WATT Keeps You Trucking

House Cleaning

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This Webinar is being Recorded
Please Turn Off Cell Phones



About the Presenter



Charley Gipe | Technical Service Representative

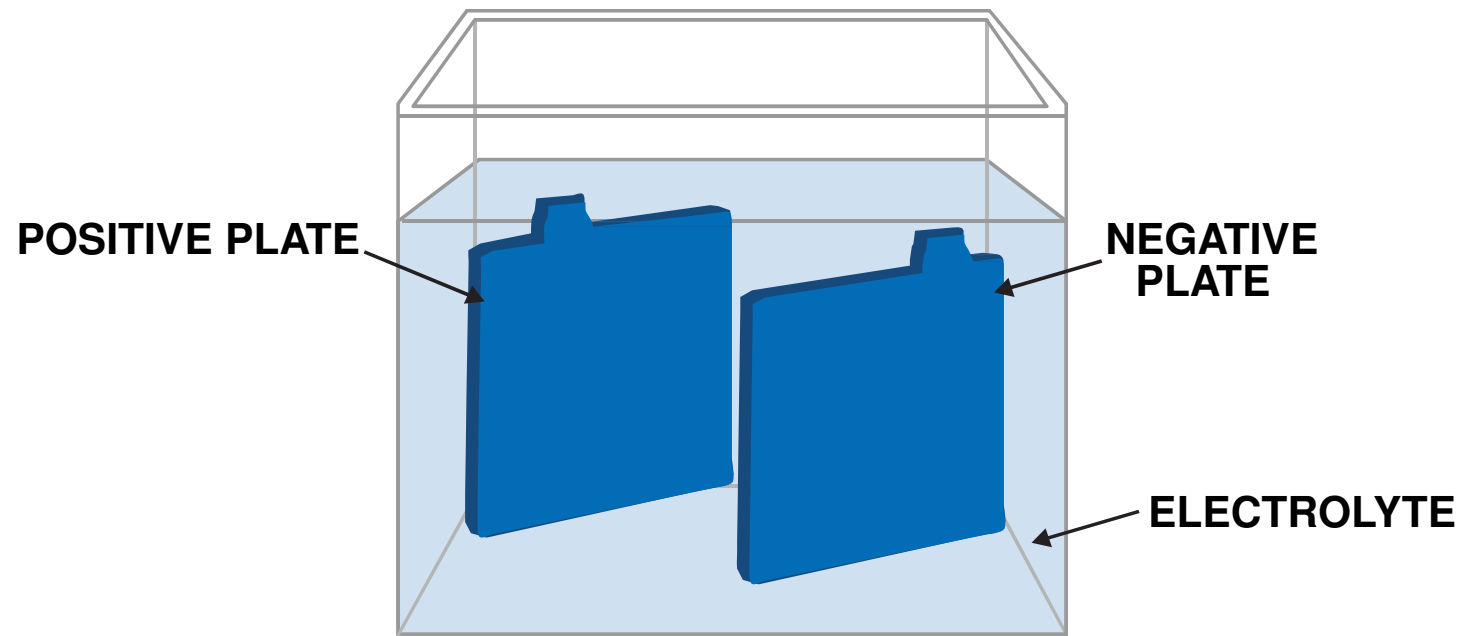
Charley graduated from the University of South Dakota/Springfield in 1984 with an Associates degree in Automotive Technology and a Bachelors Degree in Automotive Science and Technology. He has spent 30 years in the automotive and heavy-duty truck industry working as a technician, trainer, warranty engineer, technical writer and service engineer. He has a wealth of electrical experience and uses it for solving modern day electrical problems fleets face on a daily basis. Charley is an ASE automotive master technician.

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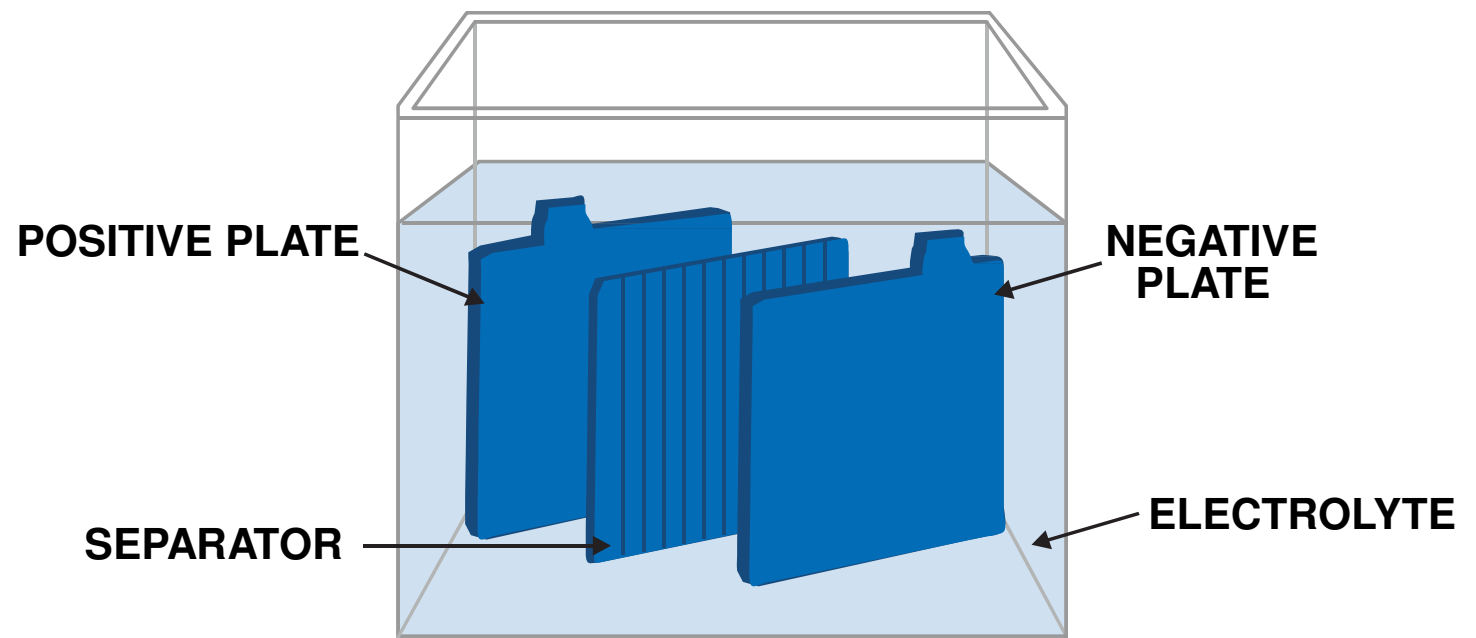
Battery Basics

- 3 items needed to make a battery work:
 - 2 dissimilar materials
 - An electrolyte



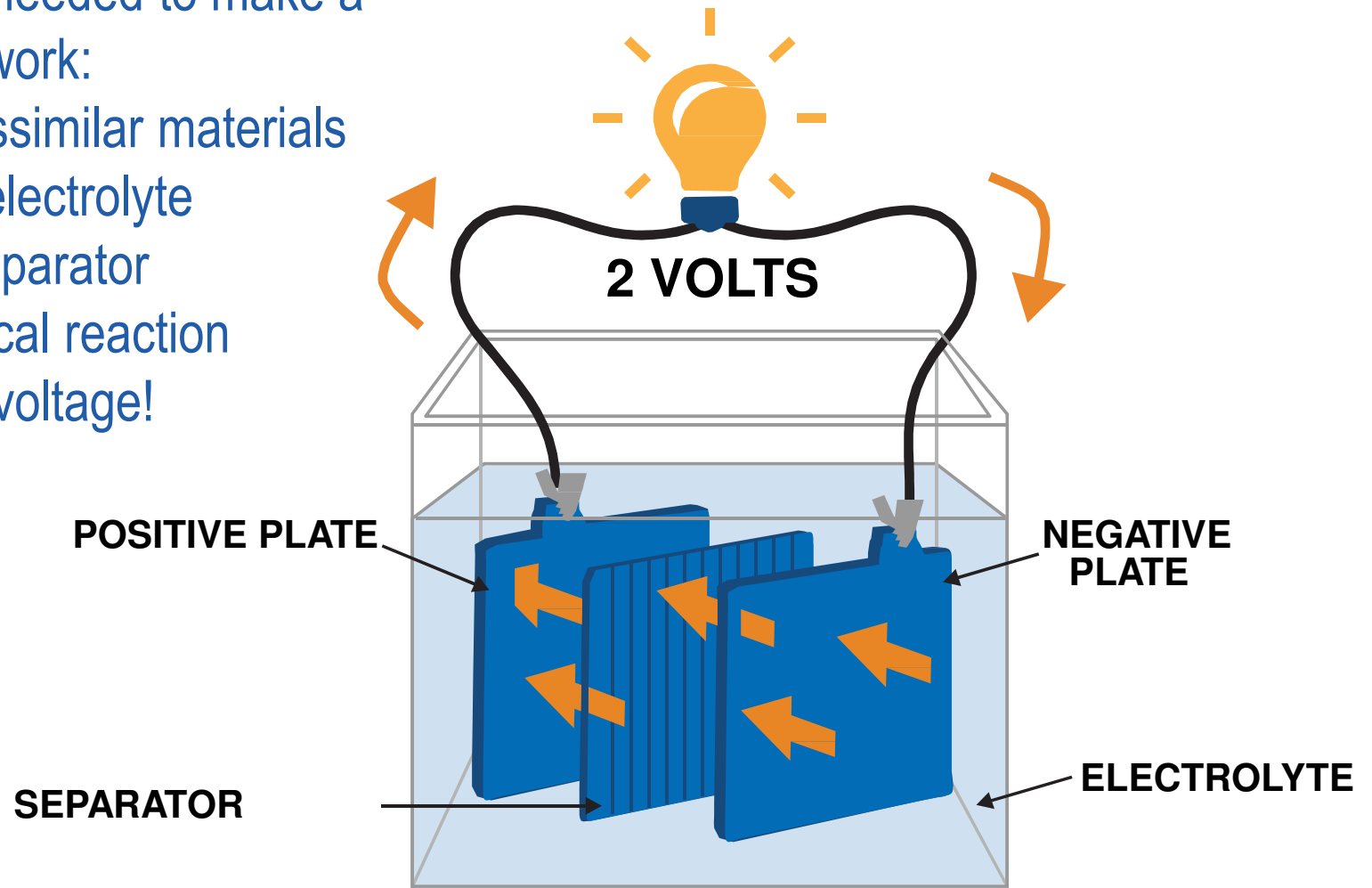
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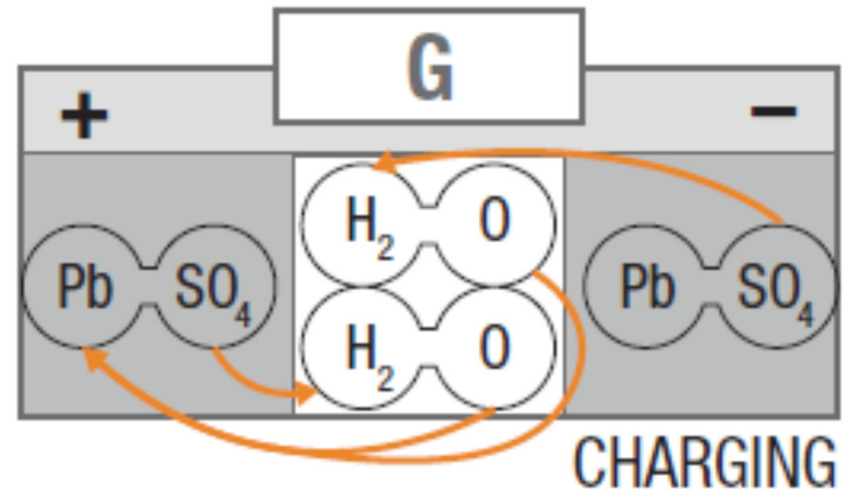
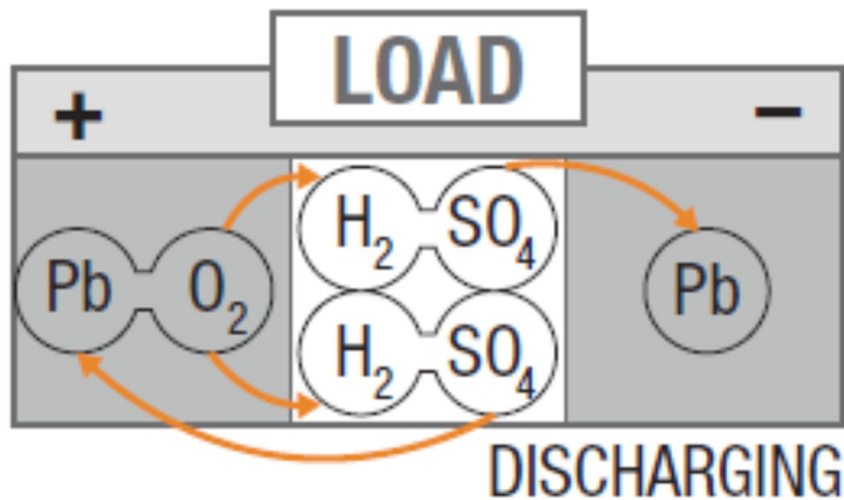
Battery Basics

- 3 items needed to make a battery work:
 - 2 dissimilar materials
 - An electrolyte
 - A separator
- A chemical reaction creates voltage!



Battery Basics

- What happens when a battery discharges?
- What happens when a battery is charged?
- Charging is reversing the chemical process that took place during the discharge by sending current through the battery in the reverse direction.



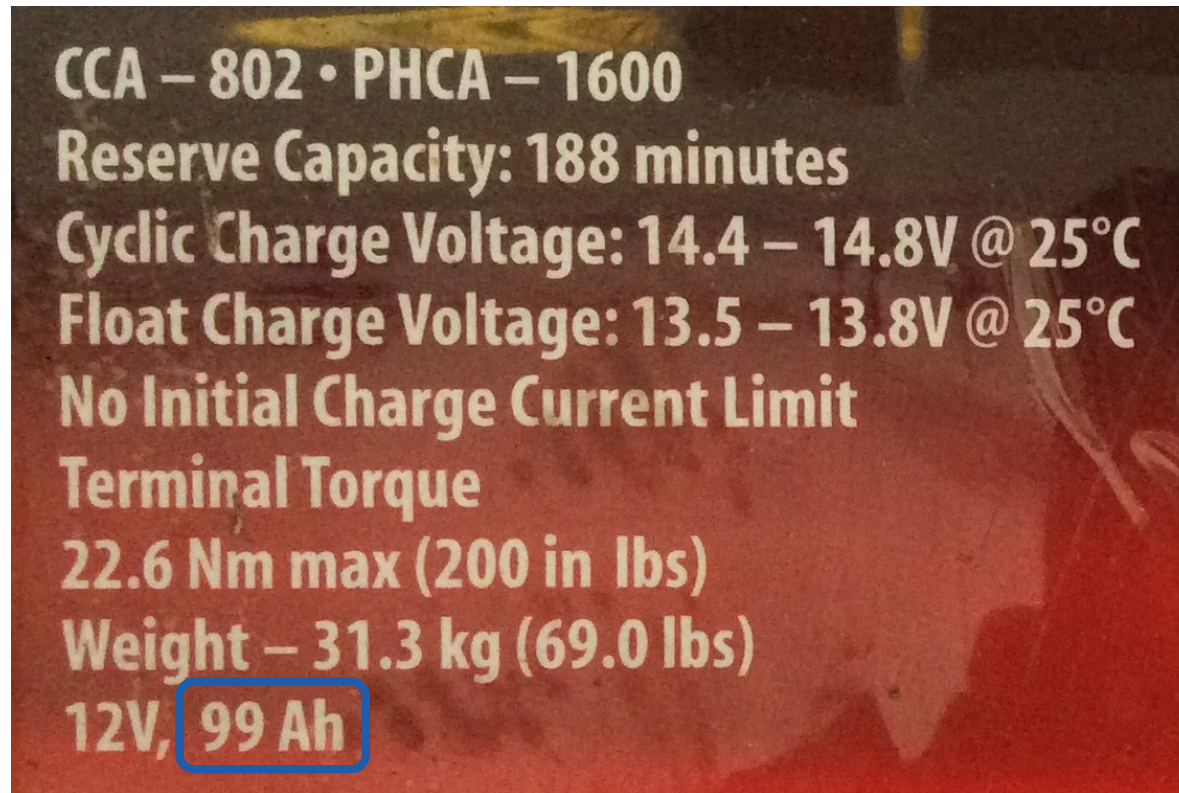
Battery Basics

- Measuring a battery open circuit voltage (OCV) is useful for estimating battery state of charge (SOC)

STATE OF CHARGE COMPARISON		
% CHARGE	FLOODED	AGM
100	12.65	12.8+
75	12.40	12.60
50	12.20	12.30
25	12.00	12.00
0	11.80	11.80

Battery Basics

- The battery Ah (Amp hour) rating is useful for estimating charging times
- It may be published on the battery



- Most group 31 batteries have an 80-100 Ah rating

Battery Basics

- If a 100 Ah battery is completely discharged it must have at least 100 Ah of energy put back into it to become recharged
- This can be achieved in various ways:

$$5 \text{ amps} \times 20 \text{ hours} = 100 \text{ Ah}$$

or

$$25 \text{ amps} \times 4 \text{ hours} = 100 \text{ Ah}$$

- If charging more than one battery in a pack the Ah ratings can be added together to estimate pack charge times. 4 batteries in parallel:

$$100 \text{ Ah} \times 4 = 400 \text{ Ah}$$

Battery Charging

- Factors that affect battery charging
 - Battery or pack size
 - Battery state of charge (SOC)
 - Battery temperature
 - Charger capability
- Consider a truck with 8 completely discharged 100 Ah batteries sitting in a 5° F weather being charged with a partially functional 40 amp charger and you can see why charge times can be extremely long!

Battery Charging

- Battery and charging safety
 - Shield eyes and use PPE (personal protective equipment)
 - No sparks or flames, work in a well ventilated area
 - Remove rings, jewelry and metal watchbands



Battery Charging

- Best Practices
 - Visually inspect batteries for signs of damage, replace if necessary.
 - Clean connections and use charging adapters!
 - Do not clamp directly to the studs!



Battery Charging

- Best Practices (continued)
 - Use automated chargers when possible
 - When charging AGM batteries use AGM settings or follow manufacturers charging recommendations for charging
 - When manual charging watch for overcharge. This includes:
 - Smell
 - Hot to the touch
 - Swollen case
 - Spewing electrolyte
 - Estimate charge times by determining battery (pack) SOC, size and charger performance
 - Set up a charging/testing area and clearly label battery status
 - Inspect charging equipment and if need of service, repair or replace

Battery Charging

- Charger Recommendations
 - Automatic (computer controlled) chargers are recommended because they allow unmonitored charging to be done safe and effectively

For **in-vehicle** pack charging high rate chargers, such as the PAC-100, are recommended



For **out-of-vehicle** charging separate channel chargers, such as the BUSPRO 660, are recommended



Manual chargers can be used, but must be monitored!

Questions & Answers

Thank you!