PURKEYS

The Effects of Cold on Batteries

and what to do about it

WATT Keeps You Trucking

House Cleaning

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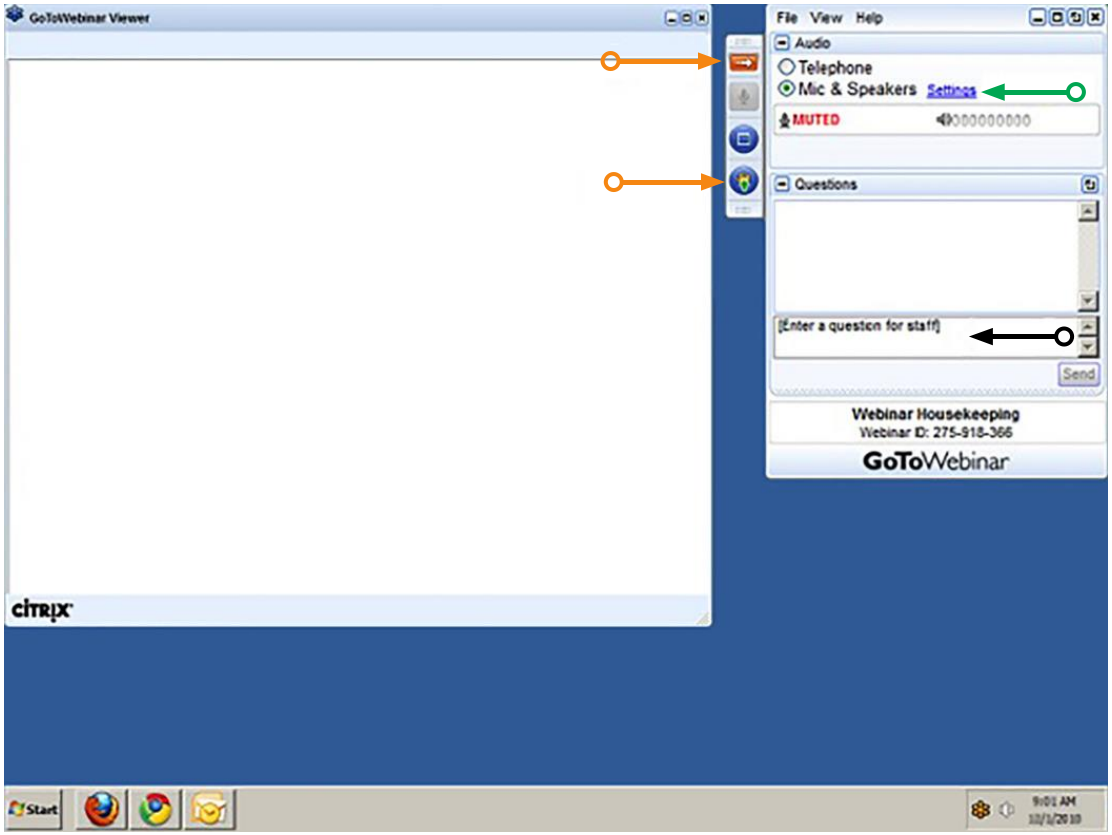

About the Presenter

Charley Gipe | Sales & Service Engineer

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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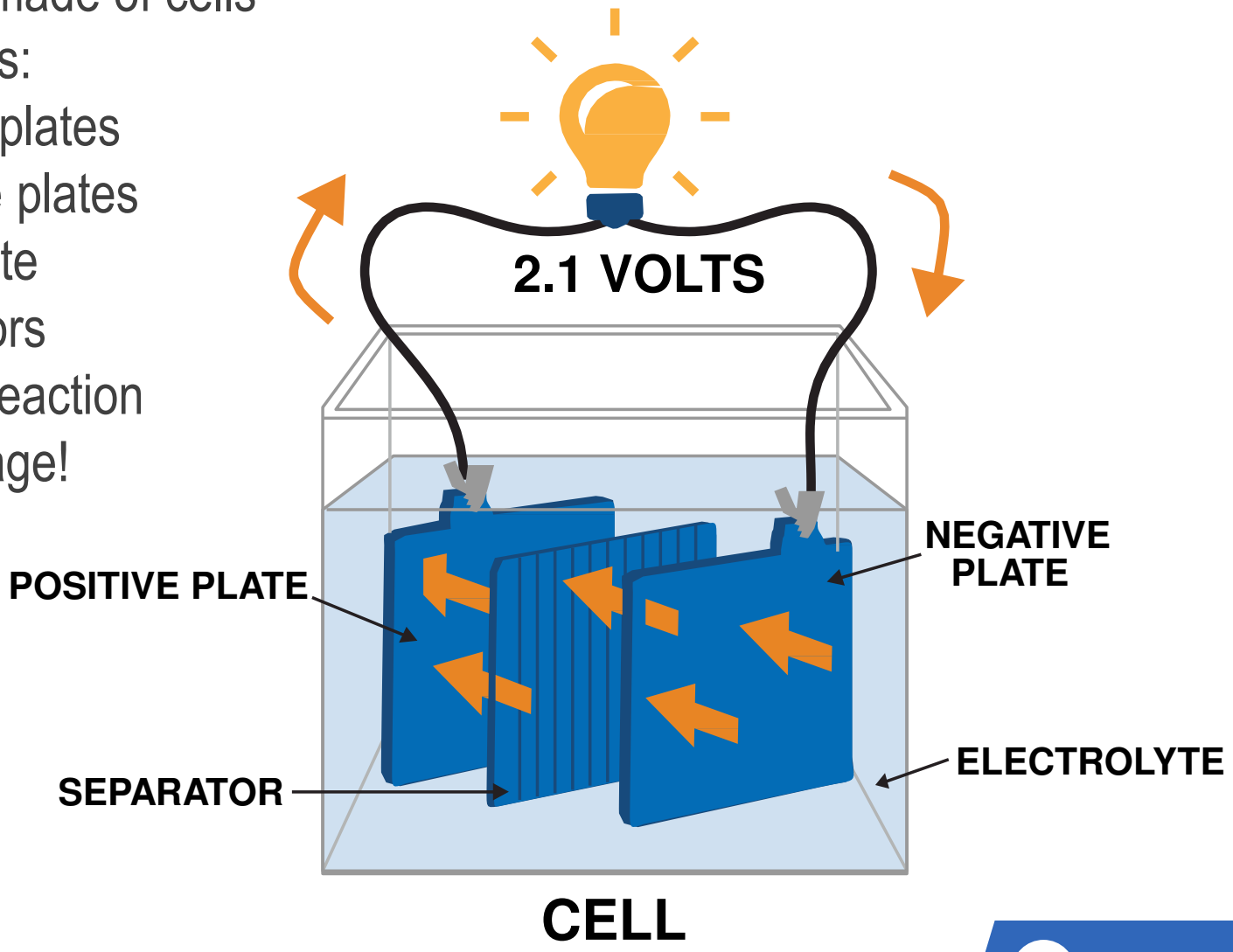
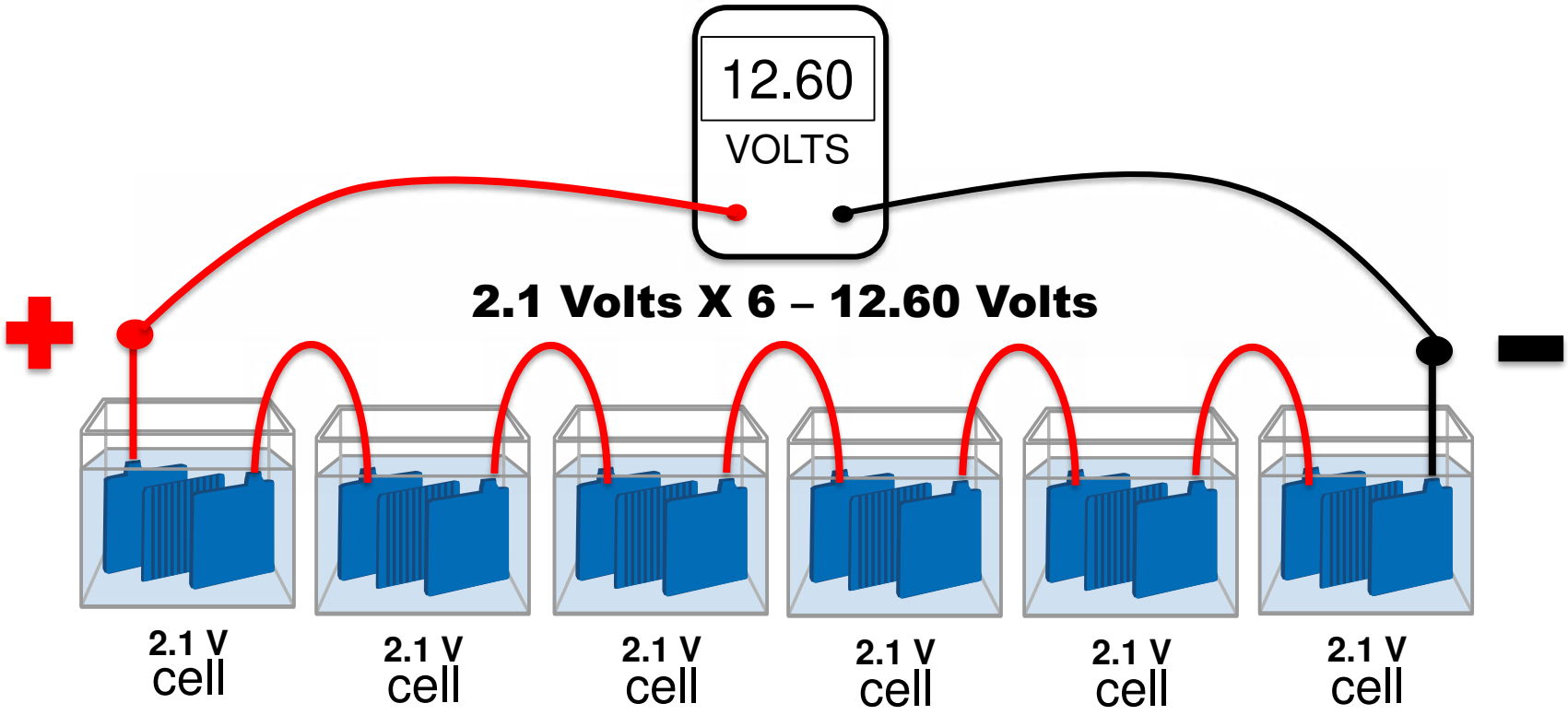
Battery Review - Construction

- A battery is made of cells
- Each cell has:
  - positive plates
  - negative plates
  - electrolyte
  - separators
- A chemical reaction creates voltage!



Battery Review - Construction

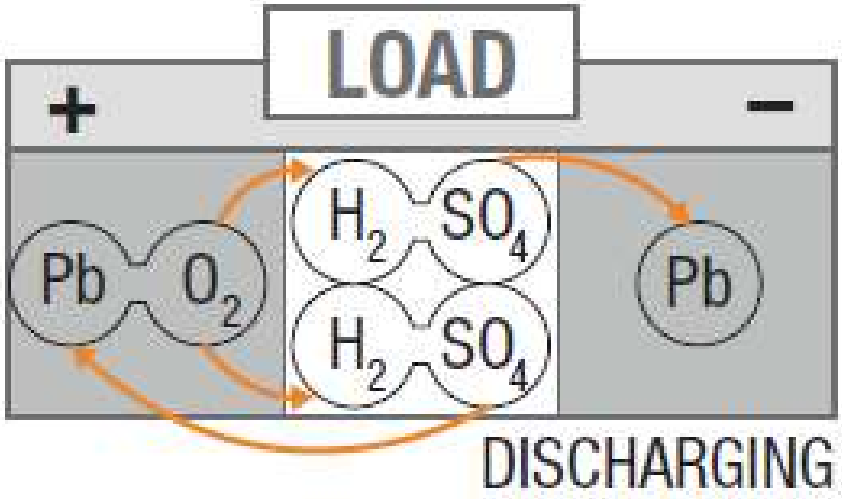
- Connecting cells in series produces more voltage

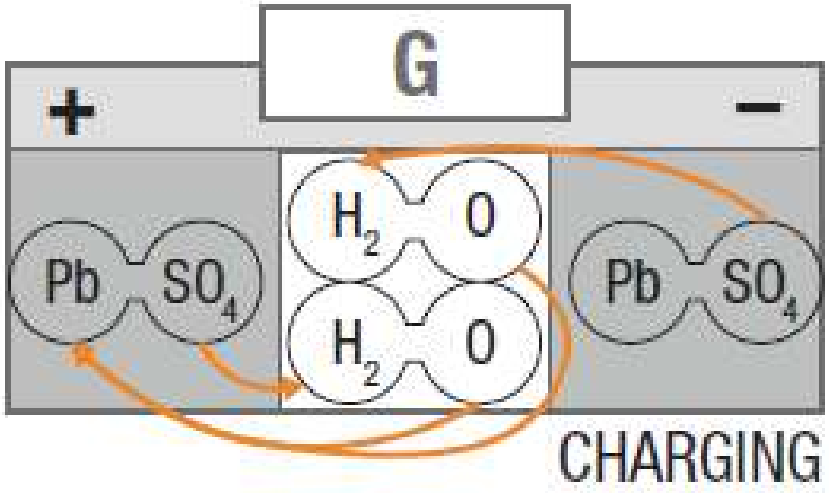


- Basic design for a 12 volt lead acid battery

Battery Review - Chemistry

- What happens when a battery is discharged?
- 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 Review – Determining State of Charge

- 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

How Does Cold Effect the Battery?

- A battery is a chemical reaction
- Cold slows the rate of chemical reactions

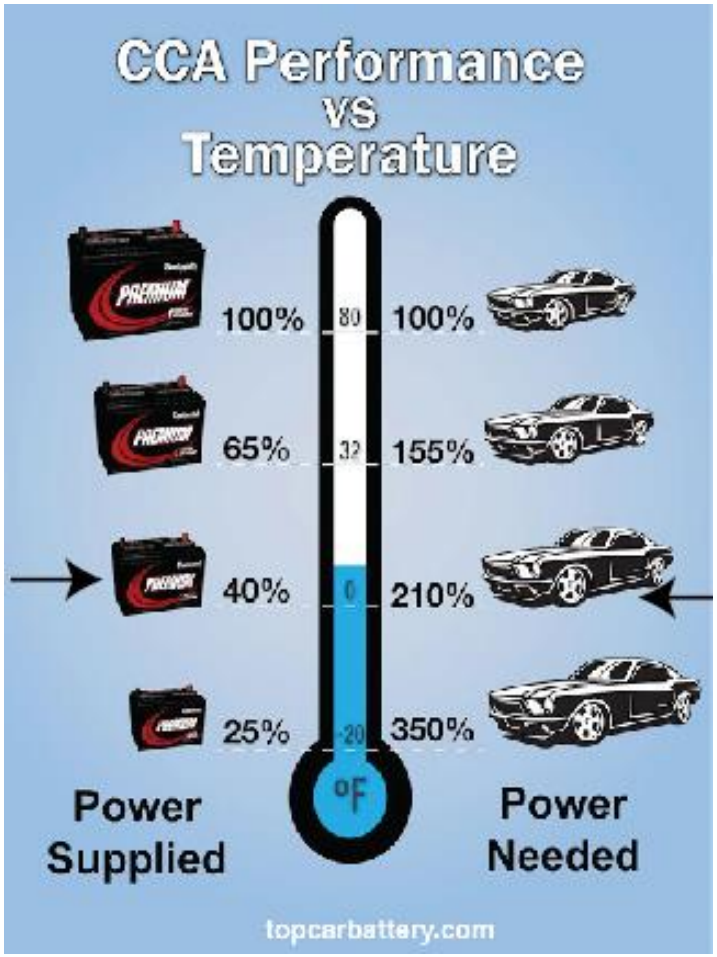
- ***Batteries become "inactive" when they become cold!***

How Does Cold Impact Battery Starting?

- A cold battery has reduced performance
  - A fully charged, new battery at 0º F can loose up to 60% of it's performance

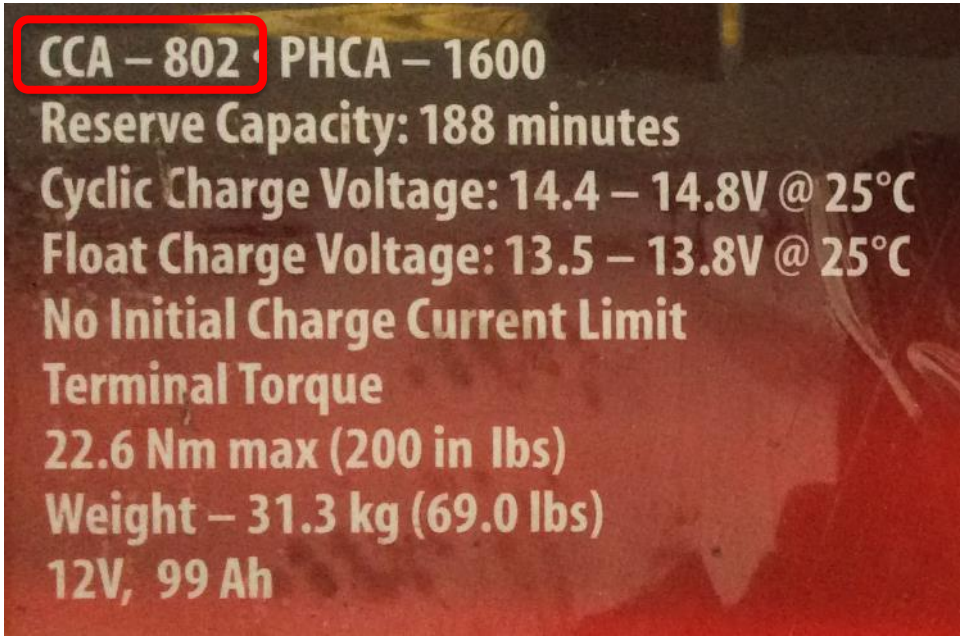
- Engine starting requirements increase in cold weather:
  - Oil is thicker
  - Fuel is more difficult to vaporize

- If cranking requirements exceed the battery performance the vehicle will not start.



What can you do?

- Be sure vehicle has sufficient CCA
  - Check vehicle or engine manufacturers recommendations
- Make sure batteries and the cranking system are functionally tested using the correct procedures and proper equipment
- Use correct weight oil and proper fuel



How Does Cold Impact Battery Testing?

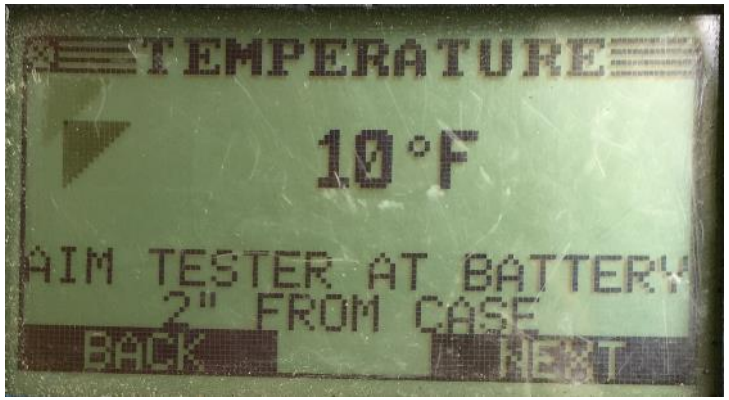
- A cold battery will not perform as well as a warm battery when tested
  - Account for temperature when testing
  - Determine temps using a temp sensor or by estimating by hand

- Failure to compensate for temperature typically leads to ***failing*** a ***good*** battery

What can you do?

- Determine ***battery*** temperature before testing and compensate
  - When manually load testing use temperature comp. chart
  - When using electronic testers provide accurate temp data

Load Test Voltage		
Battery Temperature		Minimum Volts
°C	°F	
21 or above	70 or above	9.6
10	50	9.4
-1	30	9.1
-10	15	8.8
-18	0	8.5
below -18	below 0	8.0



How Does Cold Impact Battery Charging?

- A cold battery will not charge as well as a warm battery
  - Charging times will increase
  - Charging rates will decrease, even if charging current is available

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

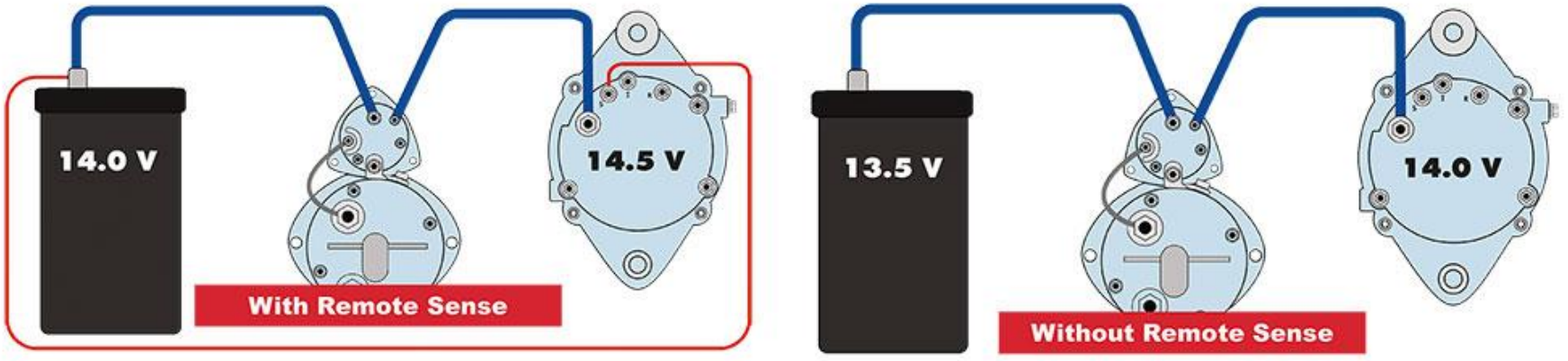
For **out-of-vehicle** charging separate channel chargers, such as the BUSPRO 660, are recommended

- Why do batteries freeze?
  - A fully charged battery won't freeze until -70º F
  - Badly discharged batteries can freeze at temps above 0º F

What can you do?

- Warm cold batteries before charging when possible
  - Bring vehicle/battery into a heated shop
- Use automatic chargers where possible and avoid attended manual charging
- Use remote sense and/or temperature compensated charging systems on vehicles

Remote Sense



Are There Any Benefits for Having a Cold Battery?

Yes!

Storing a battery in a cool/cold dry place is beneficial because:

- The self discharge rate is reduced
- The shelf life of the battery is increased

Avoid storing a battery in a warm/hot place because:

- The self discharge rate is increased
- The battery state of charge drops faster
- The battery shelf life is reduced

Questions & Answers

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Thank you!

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