



# APOLLO SOLAR

## **The T80HV Charge Controller: The Core of the Remote Energy Systems**

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# T80HV MPPT Charge Controllers

## Significant Advantages Over Competitors

- ★ Input Voltage (PV Open Circuit) 180V allowing use of 300+ watt, 72 cell PV modules to charge 48 volt batteries
- ★ Accurate battery voltage sensing for charging to max capacity and long life
- ★ Delivers 80 Amps into batteries at up to 45°C ambient temperature
- ★ Internal Battery State-of-Charge meter
- ★ Efficiency: 98% to 99% all day
- ★ Synchronous Parallel units to 1280A
- ★ Isolated Circuitry for Positive Ground or Negative Ground installations



# Benefits of the T80HV

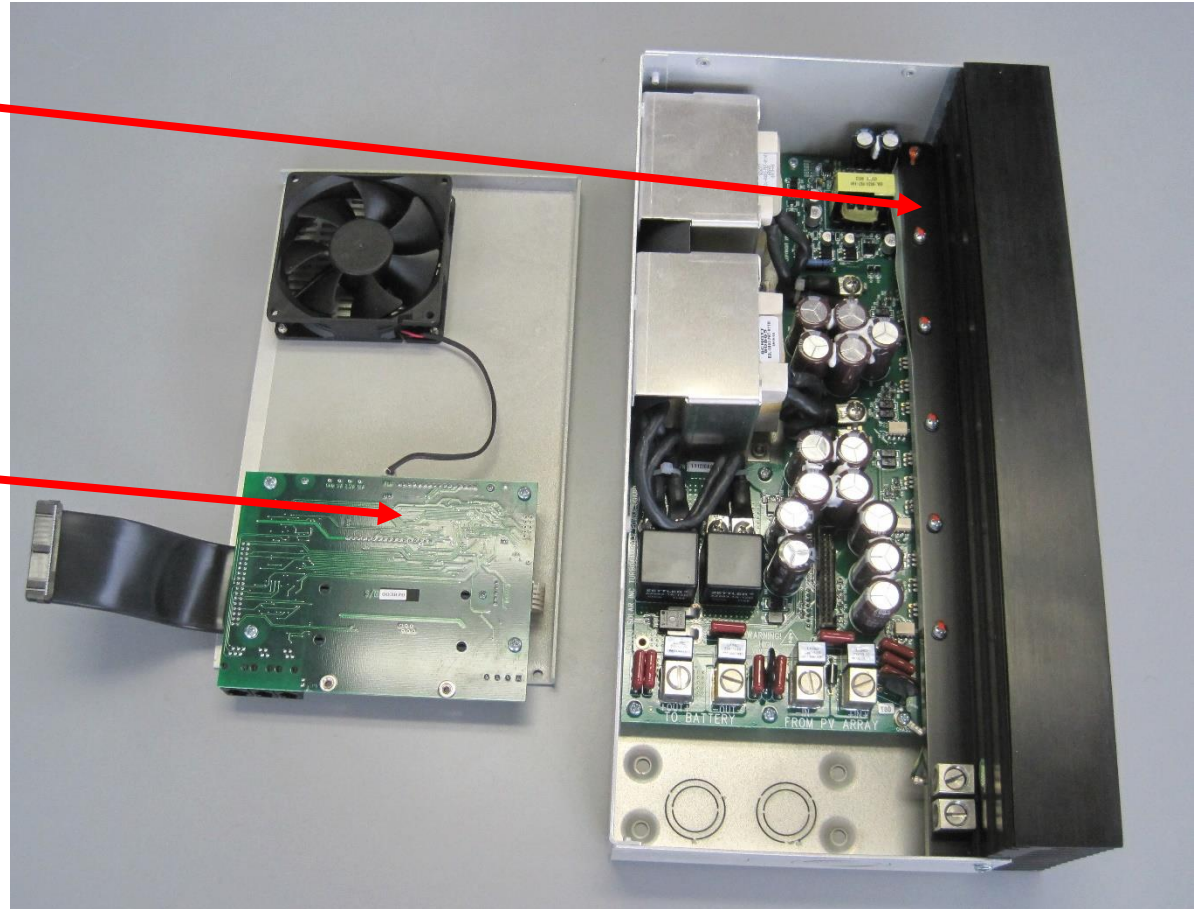
- ★ No Charge Controller has higher output current (80A)
- ★ T80HV can take 180Voc input (Highest in the market)
- ★ Coolest running for best reliability – 5 year warranty
- ★ Highest ambient temperature performance - Full power up to 45°C, Operation to 60°C (Best in the market)
- ★ Best Energy Harvest – Fastest MPPT
- ★ Easiest setup – Just 3 steps
- ★ Synchronous stacking up to 16 units for 1280 Amps
- ★ Built in State-of-Charge meter
- ★ Remote monitoring off all parameters via the Internet

# Inside the T80HV Charge Controller

The T80HV is an open design focused on letting any heat generated flow out of the enclosure to enhance the long term reliability. The power devices are tied to a massive external heat sink. The inductors have special brackets to conduct their heat to the aluminum shell. The large, variable speed fan is temperature controlled.

The temperature sensor to control the fan and display the heat sink temperature is located near the top of the heat sink.

The second temp sensor is on the Control PC Board at the center of the unit.





# Inside the T80HV Charge Controller

The massive heat sink on the T80HV pumps out all the heat from the FETs.



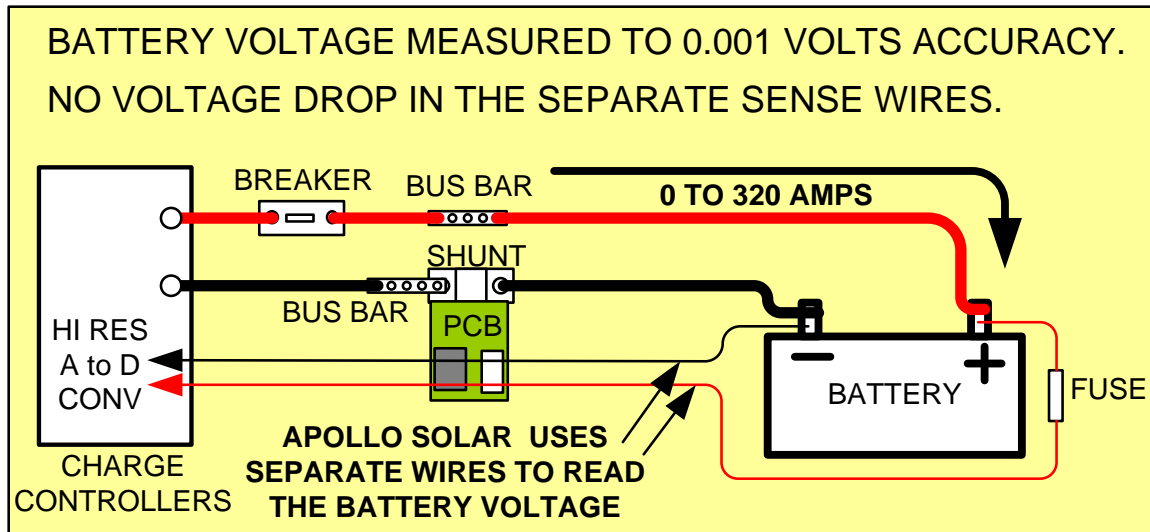
# Precision Battery Charging is Critical for Telecom

## Example: Typical telecom Battery-Based system

- The system is a 48 volt OPzV battery with 4 T80HV Charge Controllers.
- The wiring, circuit breakers, connectors and shunt can total 0.015 ohms.
- The charging current is 80 Amps x 4 = 320 Amps during Bulk mode.
- Therefore, the voltage drop to the battery is  $320 \times 0.015 = 4.8$  volts.
- The specified Absorb voltage point is 57.6 volts to reach 100% capacity.
- Without the T80HV Remote Voltage Sensing, the actual maximum voltage at the battery terminals will be 4.8 volts lower than the setting. The battery gets only  $57.6 - 4.8 = 52.8$  volts or 2.20 volts per cell.
- **The battery charged at 2.20 VPC will only be at 80% of full capacity.**
- If the voltage is manually increased to compensate for the 4.8 volt loss, the charge voltage can go to 62.4 volts which will damage both the battery and the telecom electronics connected to the system.
- **The T80HV Remote Voltage Sensing avoids all these problems. Other Charge Controllers do not have Remote Voltage Sensing.**

# Precision Charging for Max Capacity & Long Life

- Accurate battery set points
- Charging to max capacity and Extended life
- Direct “4-wire” reading of battery terminal voltage
- No current flowing in sense wires means no errors in voltage readings.

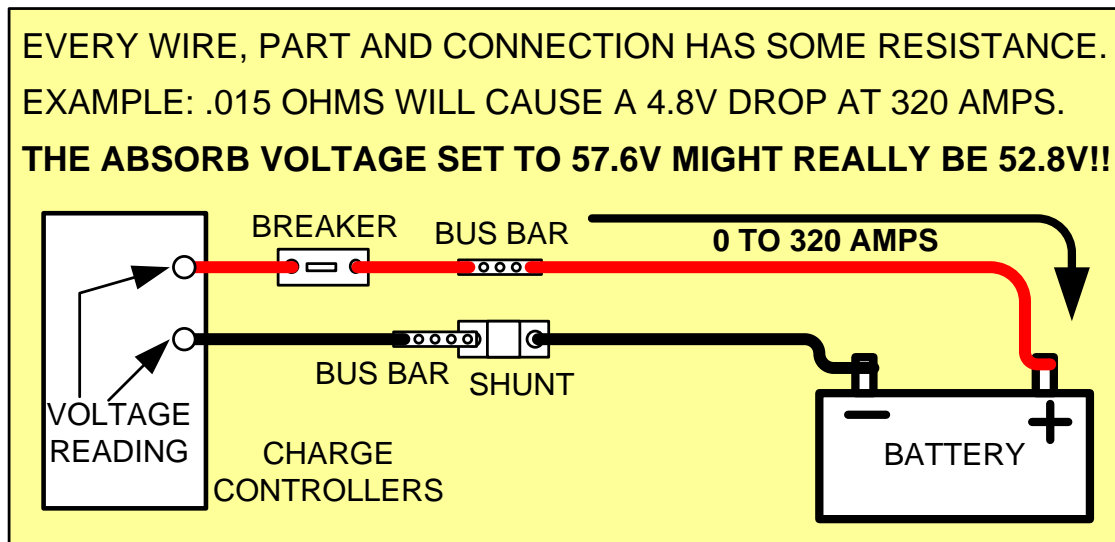


Apollo T80HVs with 4-wire sensing

Other products →

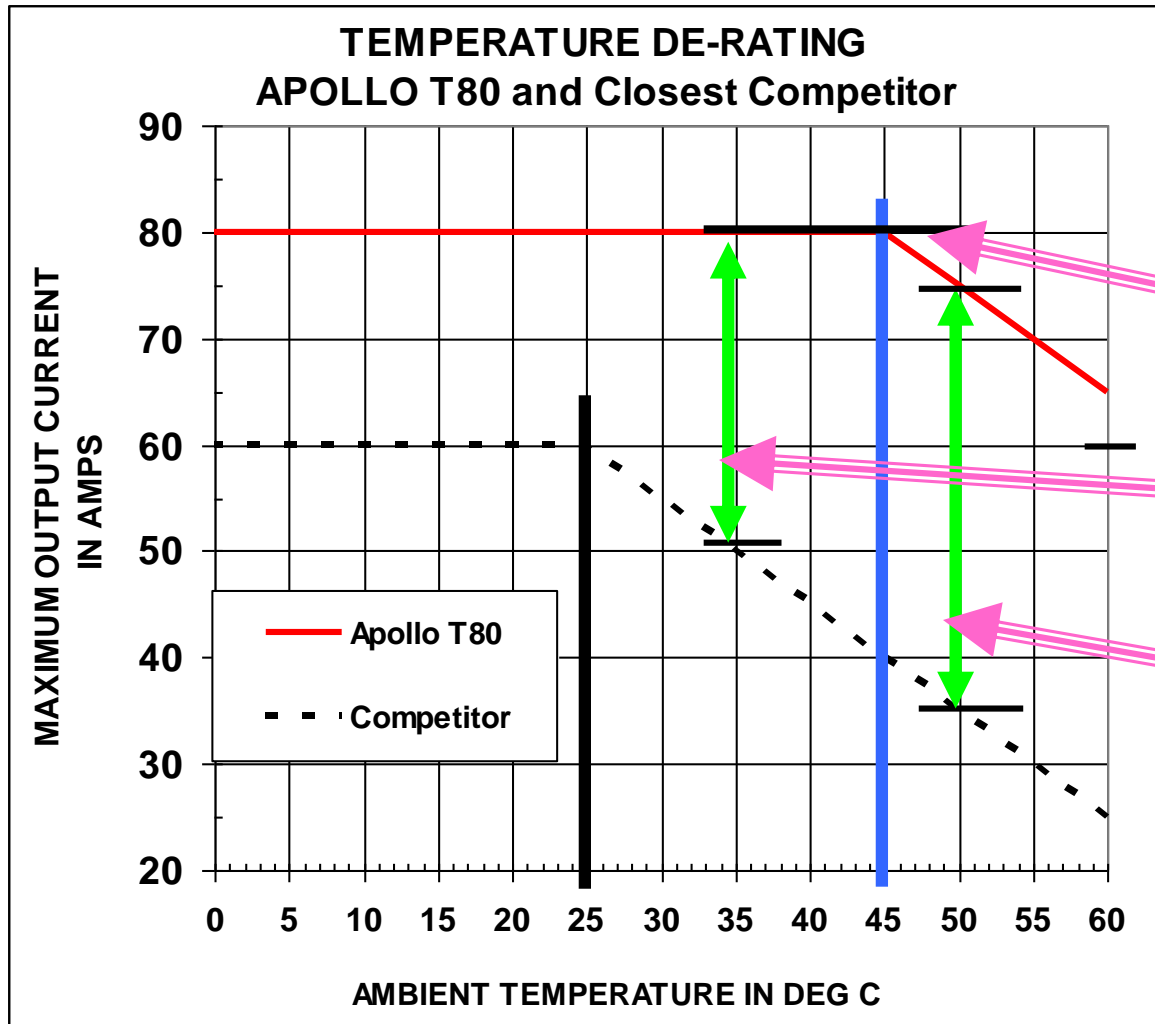
48 Volt System, Without 4-wire sensing.

Actual battery voltage will be very different from the desired voltage settings.



APOLLO SOLAR

# Full Power Rating to 45°C (113°F)



*Apollo Solar T80  
can take the heat*

★ *T80 is 80Amps at  
45°C (113°F)*

★ *60% more current  
at 35°C (95°F)*

★ *>Twice the current  
at 50°C (122°F)*

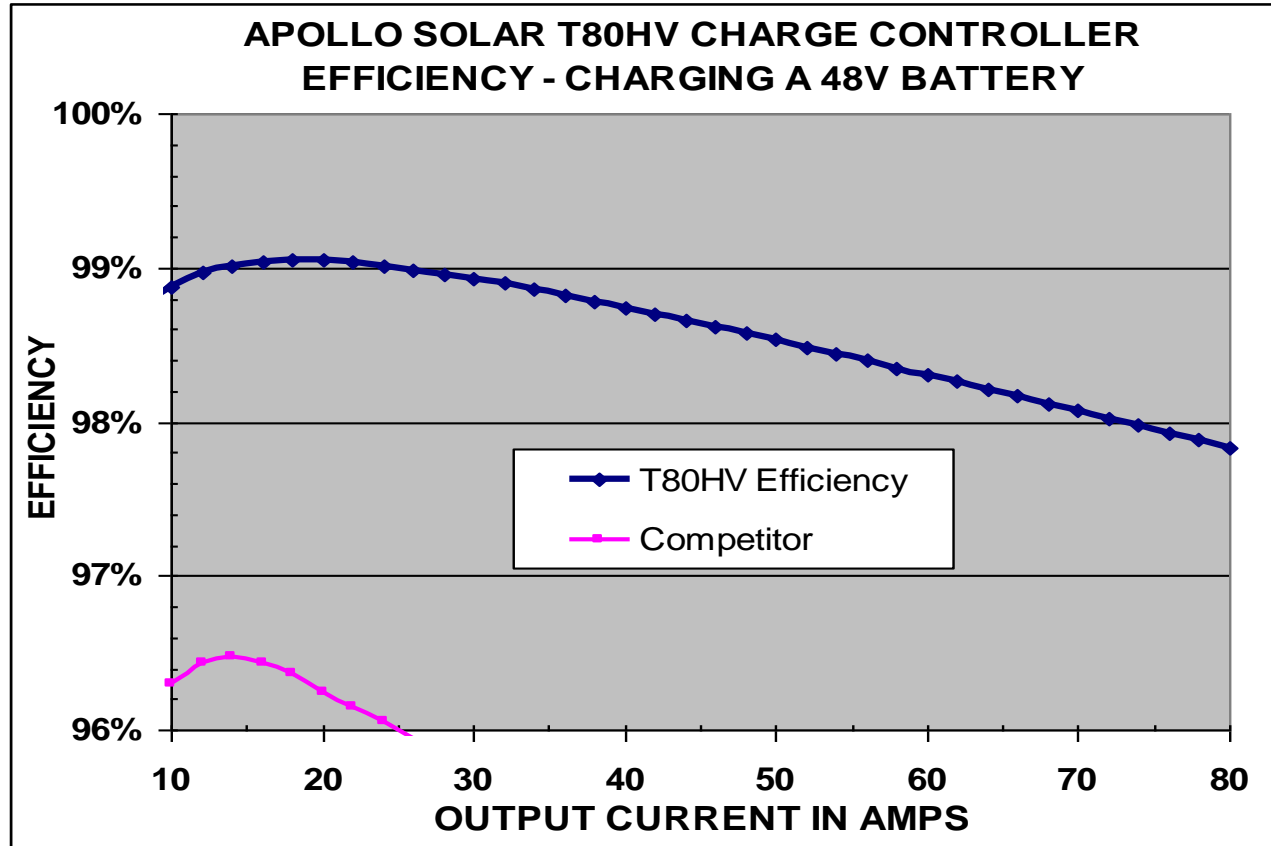
★ *Disclaimer: The de-rating of the competitor's unit  
above 25°C is their own estimate of 1°C/Amp.*





# Apollo Solar sets the record for High Efficiency

Our T80HV MPPT Charge Controller 98% to 99% Efficient



The “Competitor” has a new charge controller called the “HE” version for High Efficiency which struggles to make 96.5% between 10 to 25 Amps output. It does not have the efficiency provided by Apollo, nor the long track record of reliability.

# Real World Battery Charging

## Actual Charts from Apollo Remote Monitoring software

The Solar Irradiance shows the energy available for charging the battery.

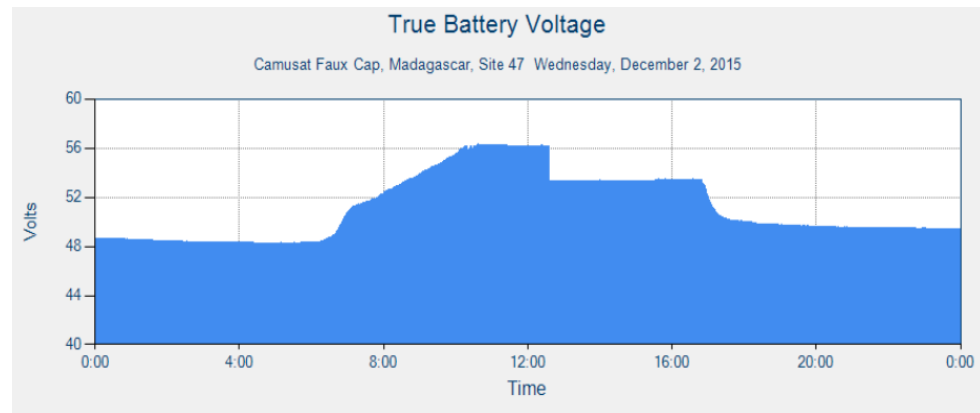
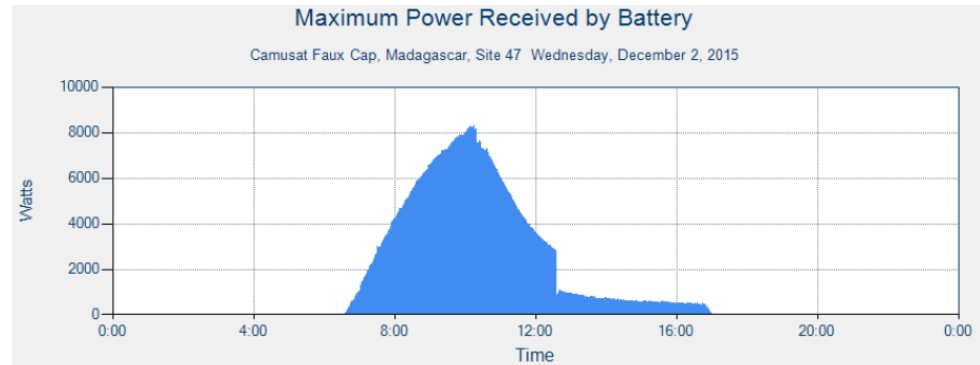
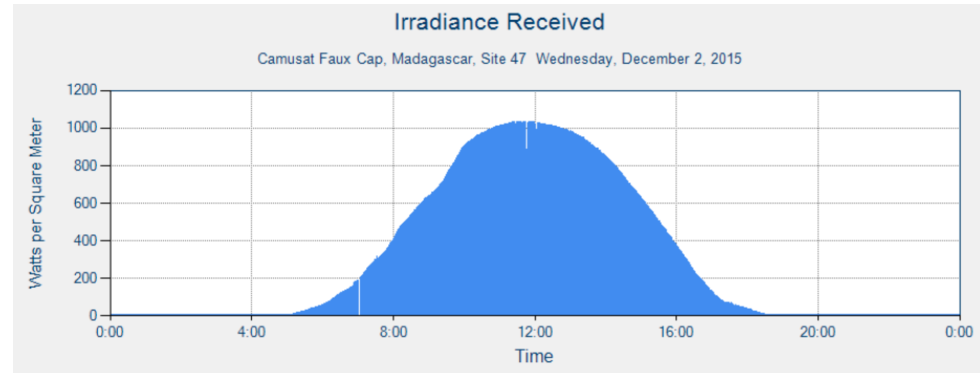
The Bulk Stage (Constant Current) starts 6:30AM and reaches the Absorb Voltage set point (56V) by 10:00AM.

The Charger switches to Constant Voltage (or Absorb mode) and continues charging at 56 volts for 2.5 hours.

Then the charger switches to Float mode which is 53 volts at lower current.

The charging continues until 17:00 when the sun is setting.

The battery continues to supply the load with decreasing voltage all night.

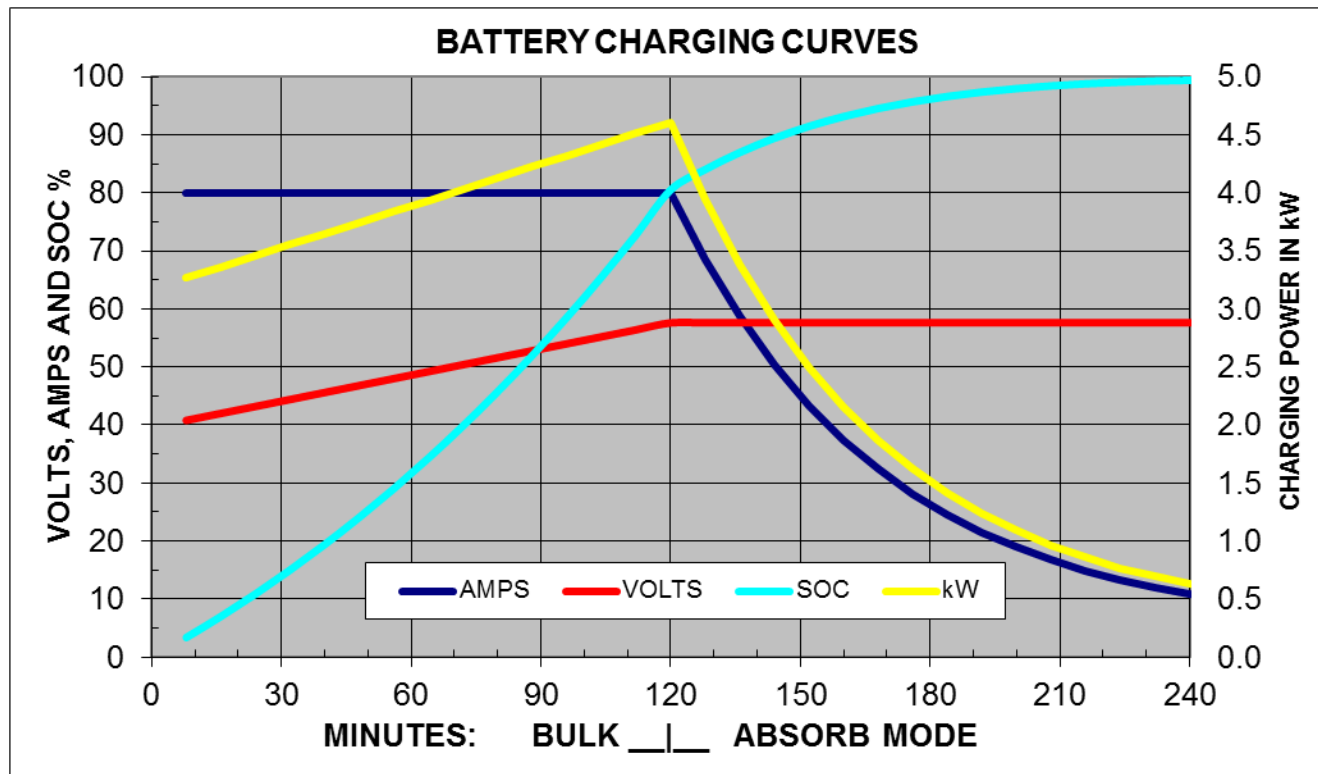


# Battery Charging Voltage, Current and Energy

**Generic Lead-Acid Battery Charging curves are shown below.**

The left side is the Bulk or Constant Current mode. Note the Amp trace is flat. During this mode, the voltage gradually increases until it reaches the Absorb Voltage set point (57 volts in this example).

The mode changes to Constant Voltage and the current and power diminish.

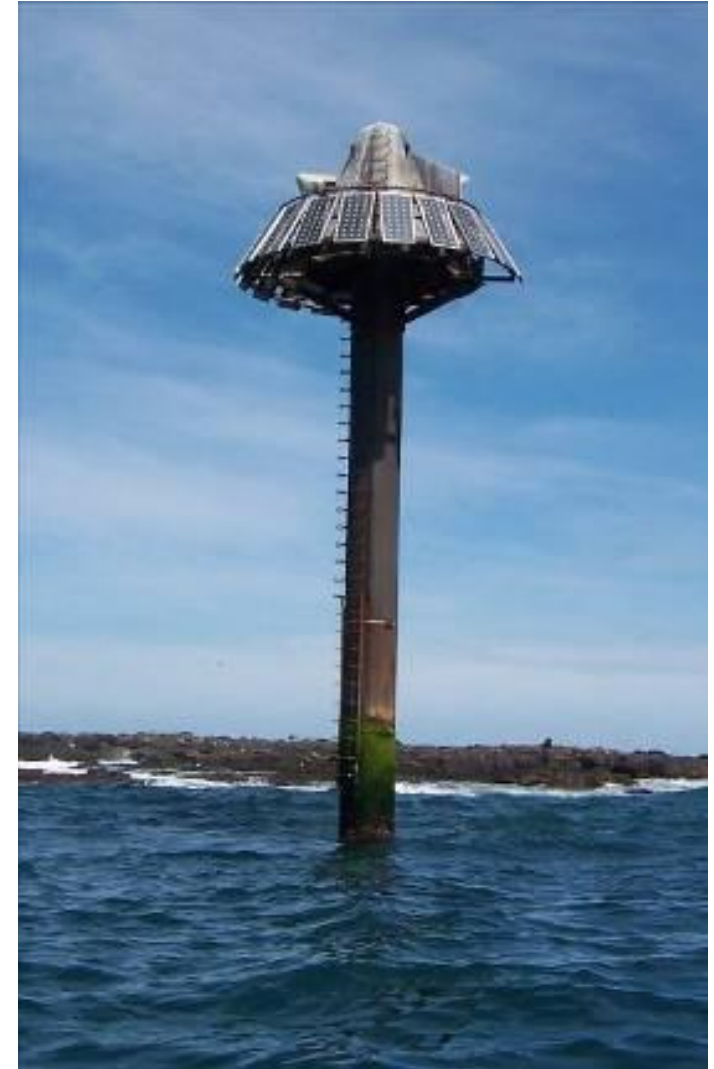


# T80HV Charge Controllers

## The Clear choice when reliability is critical

T80HVs have been powering this navigation aid of the coast of Tasmania since 2008.

The installation techs can be seen in the water below. (Site visits are costly.)



# Apollo Solar T80—The Only Charge Controller to Pass the Rigorous US Army Testing



U.S. Army D-REPS at Ft. Irwin, CA

Photo Courtesy Energy Masters



The Apollo T80 is an integral component in the US Army Deployable Renewable Energy Power Stations to be deployed throughout the world.



# Apollo Solar T80 – Trusted by the US Military for Reliability in Challenging Locations



US Navy remote repeater site uses the Apollo T80 for its proven reliability.



US Army training site in the far North depends on the Apollo Solar T80 for power.

# Apollo Solar - Government Installations



Boeing Corporation and L3 Communications are using the Apollo Solar T80 for US Homeland Security border monitoring sites. Complex remote reporting is the critical feature that only Apollo was able to supply. Photos Courtesy of L3 Communications