The Bahia Honda Camera System
Powering with Wind and Solar

Introduction: The battery system is 24 volts, and amps can be converted to a watt value by multiplying 24volts by the amperage. For example, if the solar panels are producing 16 amps@24voltsDC, the wattage is 384 watts. Also keep in mind that watts are an instantaneous reading of the number of joules used per second. This is an amount of energy used in a given time. Therefore, watts are not a measure of energy, rather a measure of energy usage. Because watts are an instantaneous measurement, which fluctuates with load change and solar and wind production, we use a watt-hour to keep track of energy used (The hour cancels out the seconds in the watt unit, as long as you multiply by 3600: therefore there are 3600 joules in one watt-hour).

Examine Figure 1: The total load **reading** at the time this image was taken was -3 amps (load meter reads -3amps). This meter reads the amps used by the system minus the amps provided by the solar panels. Therefore to determine load, read the amps on the load meter and subtract the solar energy to find the total load (-3amps-1amp = -4amps).

Pay careful attention to the enclosure schematics and enclosure image key, and ensure you are aware of which meters have decimal places. The wind turbine we installed is metered independently of solar or load amps. It will always be zero or a positive value (no decimal on this meter). In this image, you can see that the wind was really blowing and there was not much sun! Although the solar panels only offset the load by one amp, the total amperage used by the system was offset significantly by the wind turbine. With 13 amps of wind added to the net draw by the system (-3 amps), the batteries are receiving 10 amps of net charge at 24 volts (~240watts gain).

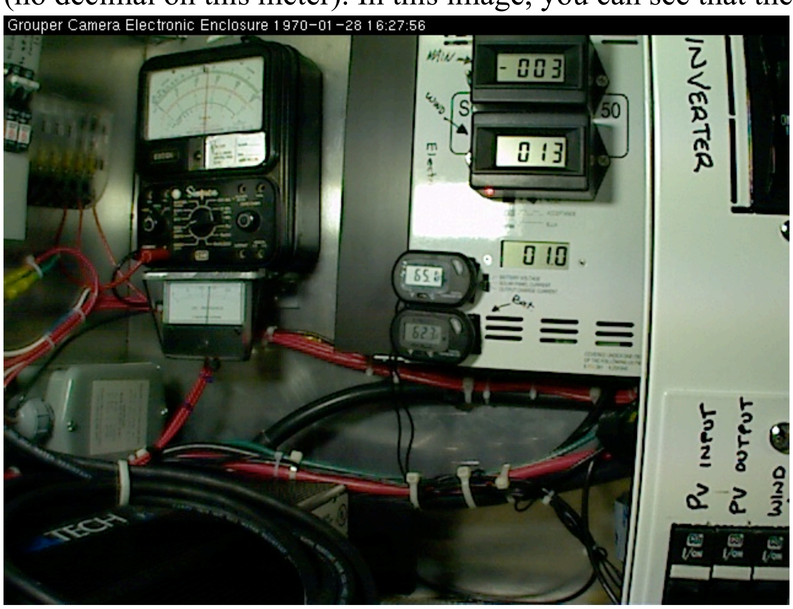

Figure 1: A windy day with little solar gain.

Examine Figure 2: This image shows a sunnier day, with the solar panels providing 14.3 amps, and the wind turbine is producing no energy. We can assume that on that particular day there was little or no wind. The total load used by the system at this time was -3.3 amps. We can tell this because the load meter on figure 2 reads 11amps, which is the total load minus the energy being provided by the solar panels (11amps-14.3amp = -3.3amps).

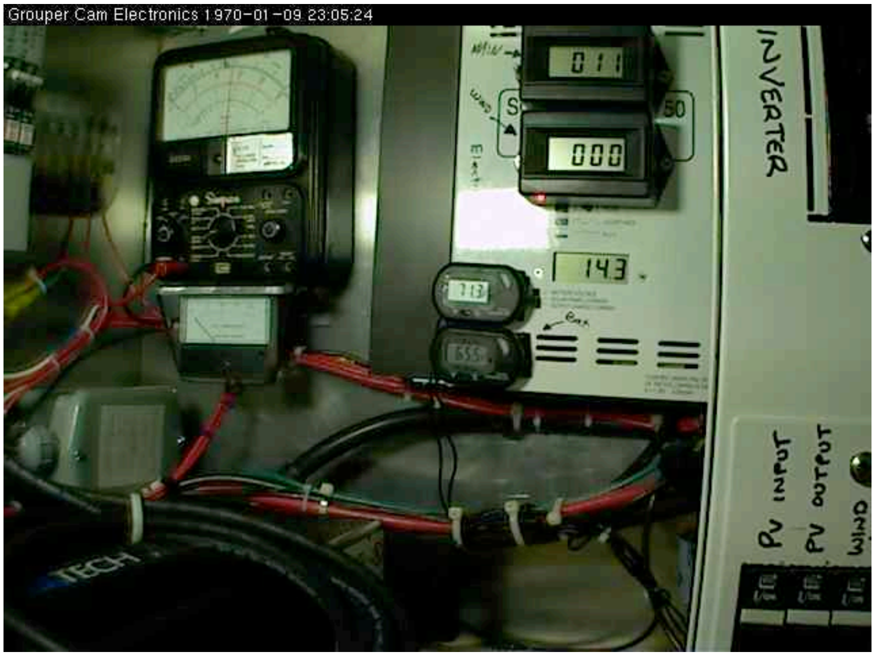

Figure 2: A sunny day with little wind.

Examine Figure 3: Figure 3 shows a sunny day with some wind. We know this because the solar panels were providing 18.7 amps, and the wind turbine was producing 1 amp. The total load used by the system at this time was -4.7 amps. We can tell this because the load meter reads 14amps, which is the total load minus the energy being provided by the solar panels (14amps-18.7amp = -4.7amps). Adding the 1 amp of charge from the windmill, and the battery are receiving a net charge of 15 amps (which at 24 volts is 360 watts)

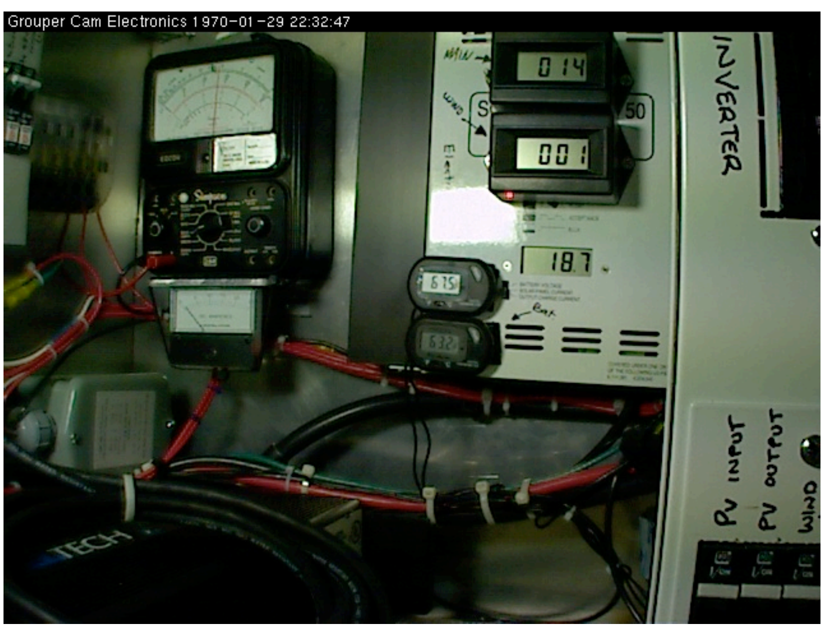

Figure 1: A windy day with little solar gain.

Other calculations: The total watt-hours of the four batteries is 9,600, the usable watt hours being 4,800watt-hours (50% discharge). The four 6V batteries, wired in series, provide 24 volts with 400amphours. The BP160 panels provide a maximum of 160 watts each (640 watts total for four). On a reasonably sunny day (assume 8 hours of sun) the solar panels were producing will produce 5120 watt-hours (assuming 100% efficiency). Therefore, it would take about 1 day to fully charge the batteries from 50% charge. These calculations do not include the charge by the wind turbine. The system uses about 1650watthours per day, allowing the system to run off the batteries alone for about three days maximum. To date, the batteries have never fallen below 75% charge.