Second Generation Bicycle Recharging Station

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Team 13

Operations Manual
For ME486c
Document

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1.0 Setting up The Station

There are a few important steps to make to ensure a safe and enjoyable experience when setting up the Second Generation Bicycle Recharging Station. Below are a list of steps that need to be addressed before operating the station.

Step One:

Make sure the front tire is positioned on the black riser block provided with the station. This will prevent the movement of the front tire while in operation.

Figure 1 - Riser Block

Step Two:

Ensure that the rear bike tire is perfectly aligned with the alternator wheel. This can be done by adjusting the screws on the left and right side of the alternator mounting system. This will help prevent premature degradation of both the rear tire and alternator wheel.

Figure 2 - Alternator Wheel and Rear Tire

Step Three:

Inflate the rear tire to exactly 50 psi using any bike pump that has an inline pressure gauge. This step will ensure adequate friction between the rear tire and the alternator wheel.

Step Four:

Adjust the seat height by releasing the seat lever and adjusting the seat stem up or down. When the proper height is attained, close the seat lever again to lock in the height.

Figure 3 - Seat Lever

Once all four steps have been completed, the recharging bicycle station will be ready to ride. Note, if one or more of these steps are not completed, the station may suffer from unnecessary wear and tear or the rider will not be comfortable while riding the bicycle station.

2.0 Operating the Station

Now that the Second Generation Bicycle Recharging Station has been properly set up, the next step is to begin operating the station. In order to operate the bike, one must simply begin riding like a regular bicycle. After a few seconds at a certain speed, the user will feel the alternator kick on and both AC and DC displays will turn on as well as the light plugged into the AC outlet (see below).

Figure 4 - Display System

Important Note: If the Inverter is not turning on (The AC voltage and current display is not turning on nor the small light), this means that the rider was pedaling too fast when starting up the charging station. To avoid this, either change to a higher gear setting or peddle slower when starting up the station.

Once the charging station is up and running, any devices can be plugged in to either the AC or DC outlets. The Recharging Bicycle Station is rated for a maximum output of 300 watts. This means a maximum AC current reading of approximately 3 amps or a DC current reading of around 25 amps.

It is also important to note that the DC voltage displayed is the voltage found at the capacitor and **not** the voltage at the DC outlet. The voltage at the DC outlet is approximately 5.0 volts. Also, the voltage shown on the AC display is around 80-85 volts instead of the common 120 volts found at any household AC outlet. The reason for this is because the current produced from the inverter is called a modified sine wave. Below is a graph showing the modified sine wave with a regular sine wave found in a normal AC outlet.

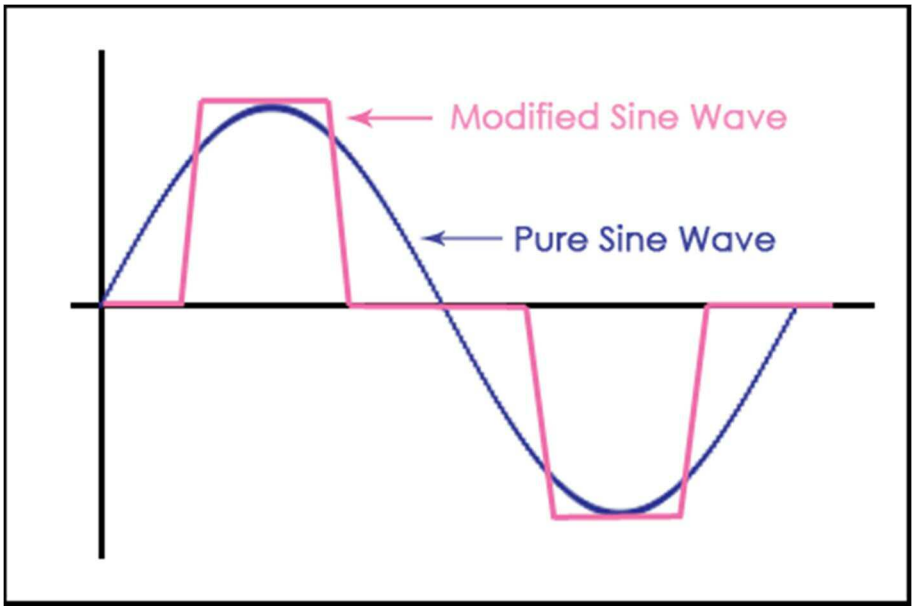

Figure 5 - Pure vs. Modified Sine Wave

This type of sine wave is still capable of powering any device requiring AC power with no harm done. However, some sensitive audio systems may produce weird sounds if being powered by the inverter and therefore should not be plugged into the station.

3.0 Making the Station Mobile

The Second Generation Bicycle Recharging Station is equipped with the ability to be easily transportable. This can be done in a few easy steps.

Step One:

Remove the bolt locking the alternator into place by unscrewing the single wing nut found near the bottom of the mounting system. Hold onto this bolt as it will be used to secure the alternator mounting system into the upright position.

Step Two:
Lift up the rear section of the bike, allowing the legs of the alternator mounting system to hang freely in the air.

Step Three:
Rotate both legs of the Alternator Mounting System into the upright position as seen in Figure # below. Once both legs are up the rear tire, the charging station can be set back onto the ground.

Figure 6 - Mounting Station in Upright Position

Step Four:
Lock the alternator to the latch found near the back of the seat using the bolt and wing nut removed during step one.

If done correctly, the bike should now be able to move freely. Also, the bike can be ridden in this configuration. However, it is important to note that the additional weight of the alternator and mounting system will create uneven weight distributions that will create a difficult riding situation. It is suggested that anyone who rides the bike in this configuration know what they are doing and take extra safety precautions to prevent harm to themselves or others nearby.

4.0 Additional Important Information

The Second Generation Bicycle Recharging Station is a very capable design when used in the correct way. However, it can also be very dangerous is not handled correctly. Please follow all steps stated above and if anything does not seem right about the station, STOP IMMEDIATELY to prevent unwanted harm to the rider or the charging station.

4.1 Spare Alternator Wheels

During testing, it was found that if the alternator wheel was not properly aligned with the rear tire or if there wasn't enough friction between both wheels, premature degradation of the alternator wheel would occur. To account for this, spare wheels were built and left with the charging station. If the alternator wheel does need to be replaced, simply remove the wheel from the alternator, then remove the steel rim and attach it to the new wheel. The alternator wheel is attached to the alternator via compression so simply wiggle it around to move it free. Below is a picture of what a wheel looks like once it has degraded and what a new wheel looks like without the inner steel rim installed

Figure 7- Worn Wheel vs. New Wheel

4.2 Additional Terminals

The Second Generation Bicycle Recharging Station also has an additional terminal for attaching external loads directly to the capacitor. This terminal provides DC current at

around 15 volts and can power almost any device that connects to a car battery. Below is a picture of the openings on the terminal block where external loads can be attached.

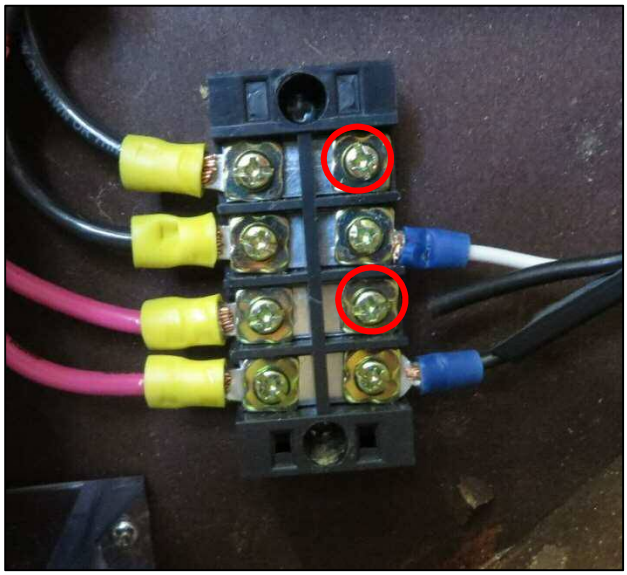

Figure 8 - Open Terminals on Terminal Block