Although this applies to a 1500 the method could be used for any bike if you have the wattage ratings of all the bulbs and accessroies you want to add. You don't even need to take any measurments. I used watts rather than amps since most equipment is rated in watts. The argument about whether it is 12 or 13 or 14 volts isn't really important since all the ratings are only within 10 to 20 percent anyway.

As long as the alternator can still charge the battery there isn't too much load on the system and the alternator will not be trashed. If the battery is good and nearly fully charged any voltage above about 13.5 will indicate the system is capable of charging the battery. If the voltage stays below 13.5 for a long time I'd see about taking off some of the load

There is some question about the rating of the alternator on the 1500. It turns at about 1.8 times engine speed and is rated 550 watts at 5000 rpm. This is alternator rpm and not bike rpm.

From the 1990 Service Manual

These lights are normally always ON
Headlights 2x45w 90.0w
Position Light 2x3.4w 6.8w
Turn Signal/Pos 2x8.0w 16.0w (Position Light Normally ON)
Meter Illumination 4x3.4w 13.6w
LCD Illumination 2x3.0w 6.0w
Brake and Tail 4x7.0w 28.0w (Tail Light Normally ON)

160.4w

Indicator Lights 5x3.4w 17.0w
Indicator Lights 4x1.7w 6.8w

Of this group only 5 should be on at once for a total of 6.8w

My estimate for Ignition System 36.0w

Adding these up 160.4w + 6.8w + 36w = 203.2w for a Stock 1500

Some measurements I made:

Horn 3.5 amps - this seems typical of Honda horns
Air compressor 3.5 amps
Fans 6.0 amps
Brake Lights 8.0 amps
Turn Signals 6.0 amps (Includes cornering lights for SE)
Radio 0.5 amps
Starter 120.0 amps (did not test reverse)

CB - couldn't measure, the RF interfered with the DVM and/or Current Probe

Additionally the SE has handlebar switch lights. Since these aren't specified in my manual I took them to be 3.4w for the pair.

I also have the Honda trunk side marker lights with 3x3.4w lights each for 30.6w more and an auxiliary tail light that has 2 8w bulbs giving me a total tungsten load of 213.8w and total running load of 249.8w I'll call it 250.

For my Wing it looks like I've got about 300 watts to use for accessories. Some of that will have to be saved to recharge the battery after starting, compensate for the brake lights, horns, sitting at stop lights, and other incidentals. If the charging system can charge at a 2 amp rate it will take about 10 minutes to restore the charge taken out by a 10 second crank, a minute at a stop light with the brake lights and turn signals on will take about 4 minutes to recover. So I figure if I save 50 watts for the battery that should be enough to keep the battery up.

This is how I made the measurements and estimates.

I clamped a DC current probe around the negative lead on the battery and turned the key on but didn't start the engine. With a battery voltage of 11.8 volts under load, the current probe registered 18 amps. This calculates out to be 212.4 watts.

The horn, air compressor, and other temporary loads were measured in the same way, key on engine not running and noting the difference in current when each was activated.

Since all the measurements were made with the engine off the current readings should be some what higher with the engine running. However since the biggest load is tungsten and its resistance increases with temperature a higher voltage won't result in as much current increase as with a fixed value of resistance. Some experiments I did earlier indicated that for a tungsten bulb an increase of 30% in voltage across the bulb only resulted in a 20% increase in current. So when the engine is running and with the voltage at 14, instead of 11.8, I would expect a 12% increase in current.

The estimate for the ignition system power of 36 watts is a SWAG using the average coil resistance of 3 ohms, 12 volts to the coil, assuming the current in the coil had to reach 4 amps in 10 milliseconds (@ 6000 rpm) the average current in a coil was 3 amps over a 10 millisecond period, each coil was only on for 10 milliseconds and there are 3 coils for a total average current of 3 amps.

For the stock pre-98 wings the basic load is 200 watts. The alternator runs at 1.8 times engine rpm and can develop 550 watts at 5000 alternator rpm or 2777 engine rpm. It can supply the basic 200 watt load when the bike is running at 1000 rpm but for every additional watt of load the engine needs to run another 5 rpm if the alternator is to supply the energy and not have it come from the battery.

To determine the actual rpm's you need to run you can find out when the battery starts to charge

You can get a good idea of hopw much current your battery is delivering, and or the load of the accessories by measuring the voltage drop across the ground cable from the negative terminal of the battery to the point it attaches to the block. Use a digital volt meter and connect the positive meter lead to the negative terminal of the battery and the negative lead of the meter to the ground cable at the block. Connect to the wire of the cable, not the ring terminal else the readings may be affected by the resistance of the connection betwen the cable and the ring terminal

Set the meter to a millivolt range (200 is fine) and notice when the voltage changes from - to +. As long as the voltage is - the battery is discharging. When it switches to + the battery is charging

The approximate amperage to voltage conversion factor on this case is 1 amp per millivolt - That is for every millivolt shown ot the meter there is 1 amp current in the cable. As a quick check make the connections as described and with the bike not running the meter reading should be about 1 millivolt in the ACC position and about 17-20 millivolts in the ON position - Providing there are no major after market accessories drawing current.

I used the following to come up with the number.

1. A digital VOM with a 20 amp scale and a stated accuracy of 4.5%

2. A 2 ohm 200 watt resistor with a stated accuracy of 1%

3. A clamp on DC current probe with a stated accuracy of 2%

4. Two different digital DC meters with a stated accuracy of 1%

None of this equipment had been calibrated for several years, but I believe the readings to be reasonable.
Unfortunately I didn't save the raw data, only made note of the final number.

Here is how it went.

Disconnect the ground cable from the battery.

Connect the 20 amp VOM in series with the ground cable and the battery.

Connect a DC meter set to 200 ma scale between the end of the ground cable nearest the battery to and the ground cable nearest the oil dipstick. - Note do not connect the meter to the ring terminals - connect it to the wire just where it goes into the ring terminals - otherwise you will get a voltage drop due to the connection resistance between the ground wire and the ring terminals and this is not consistent.

Clamp the current probe around the battery ground cable where ever it is handy.

Connect a DC meter set to 20 volt scale across the 2 ohm 200 watt resistor.

Connect the 2 ohm 200 watt resistor between the battery positive terminal and the ring terminal just above the dip stick.

Make note of all the numbers quickly as the battery will discharge

What they are and what they mean

Voltage across the 2 ohm resistor divide it by 2 = Amps

Output of the current probe = Amps

Amp meter reading = Amps

Voltage across the ground cable = Volts due to Amps flowing or resistance if you chose to call it that

Having established a base line at the 6 amp level I removed the 2 ohm resistor and made note of the amp meter, current probe, and voltage across the cable readings both with the key in ACC and ON. Since they all seemed consistent I decided the data was probably sufficient.

After doing this a several times I came up with a number of .00093 ohms for the cable resistance. Given the limits of the equipment I was using I arbitrarily decided to call it .001 ohm which is most convenient to be called 1 millivolt per amp. Close enough for government work.

Later on I took a somewhat less elegant approach and used a single VOM which had a 10 amp range and a 200 millivolt range. The load was a made up of a couple of 50 watt driving lights used one at a time and two at a time. I connected the amp meter in series with the driving lights and powered the whole thing from the hot side of the battery to the same ring terminal as before. Took a couple of readings to get the amps, then connected the meter across the ground cable as before. When the driving lights were connected again the millivolt readings were very close to indicating 1 millivolt per amp.

Overall I think the voltage across the ground cable can be said to be 1 millivolt per amp with an accuracy of well within 10%

There are three numbers that are significant in judging the state of a charging system for a lead acid battery.

The 12.5-12.8 volt level for full charge under open circuit conditions.

The "float voltage" at which the battery is neither charging or discharging - typically this is 13.2-13.6 volts.

The "end of charge" voltage, usually 14.0-14.5 volts - above this level gassing and electrolyte depletion begin.

The actual numbers depend on the plate material and electrolyte in the battery. Lead-antimony plates range in the lower numbers, lead-calcium plates are slightly higher, while dry-cells and gel-cells are higher yet. There are also variations in manufacturing that will make these numbers less than absolute, but for practical purposes they are close enough.

Even though an alternator is developing only 13.3 volts does not mean the battery is not charging. If the battery has been discharged it will accept a charge even though the applied voltage is only in the float range - It will just not charge as fast.

To determine the regulation voltage of the alternator the bike should be started and run for a few minutes at a high idle to make sure the battery is charged. Then increase the rpm and observe the battery voltage and/or the current as outlined above. At some rpm these numbers will stabilize and a further increase in rpm will not cause a further increase in either voltage or current.

Some other numbers that may be significant for voltage readings.

Note the readings below are for a good battery and alternator which is not overloaded. It is possible for a weak or defective battery to place a significant load on the alternator such that it cannot reach the regulated voltage level.

Voltmeter reads 12 volts.
Alternator failed.
Just started the bike and the battery is charging.
Engine rpm to low.
Battery has a truly shorted cell
(most failures are open cells).

Voltmeter reads 13 volts.
Just started the bike and the battery is charging.
Engine rpm to low.
Alternator ok.

Voltmeter reads 14 volts.
Alternator ok.

Voltmeter reads 15 volts.
Alternator ok.
Possible voltage regulator failure.

Voltmeter reads 16 volts.
Alternator ok.
Voltage regulator failure.

Dick Taylor