

The following is taken (mostly) from the TM-2020 User's instructions.

## How the TriMetric or PentaMetric meters keep track of battery % full . How they determine that the batteries are charged.

All of these meters allow you to set the following numbers

“**Battery Capacity**” in amp hours (This measures how much energy your batteries can hold)

“**charged setpoint volts**”

“**charged setpoint amps**”

“**efficiency factor**”

Initially when the meter is first turned on it does not have any way of knowing how full the battery is. The “battery % full” display will start out blank, or with a meaningless number. Here are the steps used to determine the % full

1. First the battery must be initially charged fully and synchronized with the Meter. When the charger is charging the battery, the Meter senses that the battery is charged when two conditions are met: (1) battery voltage must exceed the “Charged setpoint voltage” (which you have previously set.) and (2) the charge current (amps) must decline to below the “Charged setpoint amps” (which you have set).
2. When the above occurs the Meter then declares the battery “charged” by flashing the “charging” light, and resets the “Days since charged” to 0.
3. When the charging is finished, and the batteries start to discharge again then the “Amp hours from full” is reset to 0.00, and Battery%Full is reset to 100%. (This assumes that the “auto reset” is on.)
4. As the battery discharges, the Meter “amp hours from full” gradually go negative at a rate depending on the number of amps, and go positive when charging. For example if the batteries are discharging with “amps” = minus 10.0, the "amp-hours from full" display gradually *decreases* by exactly 10 for every hour that goes by. Similarly, when amps are *positive* 10 amps (charging) the "amp-hours from full" display gradually increases by *almost* 10 amps for every hour. The "almost" has to do with "charge efficiency factor" which can be adjusted by programming the proper “efficiency factor”. If the efficiency factor is set to 100%, the amp-hours will go up by *exactly* 10 per hour (in this case), however if the efficiency factor is 94%, the "amp-hours from full" display goes up by only 94% of 10, or 9.4 amp-hours for every hour. The purpose of this is to account for the fact that you don't get as many amp-hours out of the battery as you put in, so that the Meter "amp-hours from full" display will give a reading of amp-hours which reasonably closely estimates how many amp hours have been removed.
5. With the exception of the TM-2020, *filtered* values of “volts” and “amps” are used to judge when the batteries are charged. ( The TM-2020 just uses the regular values of volts and amps that must hold for 20 seconds.) This means that before using these values they are filtered so as to be only very slowly responsive versions of “volts” and “amps” are used, so that quick variations of voltage or current don't give a false “charged” signal.

The “battery % full” reading of the Meter just puts the “amp hours from full” number in a different form, which depends on the “amp hours “Capacity” number that has been programmed in to the Meter. When the battery is full and the “amp hours from full” value is 0 then the Battery% full will be 100. When the battery is depleted so that the “amp hours from full” goes to a negative value equal to the programmed “capacity” then the Battery% full goes to zero.