This document describes the serial data output from the TM-2025 or TM2030. For technical users. **For TM-2030** see last paragraph.

What data is available: The following "real time" data are available: **Volts 2, Amps, Filtered Amps, Amp-hr, Percent Full,Watts, Days since charged, days since equalized, Volts 1, Filtered Volts 1,** The "filtered volts and amps" are highly filtered (slowly varying) versions of "Volts 1" and "Amps" with filter time constant of about 5 minutes with the TM-2025 and 2.5 minutes with the TM-2030. The following data are NOT available by the serial data: The Logged data (History data) from the TriMetric and the programmed data that you have entered into the TM-2025. Other data may also be occasionally included in the string.

The form of the serial data: The TM-2025 real time data (no logged data) comes out from Pin 4 on J2 as a constantly repeating ASCII data stream at 2400 baud. (The usual: 8 bit, parity none, stop bits=1) Regular data outputs as (with sometimes other additional data too):
V2=00.0,A=49.6,FA=49.6,AH=3.83,%=100,W=1480,DSC=0.00,DSE=0.00,V=29.8,FV=29.8, This shows Volts2, Amps,Filtered Amps, Amp hours, Percent full,Watts, Days since charged, Days since Equalized, Filtered Volts. The output "high" volts (+5V) is "mark" or "idle" state. "Start bit" (logic 0), is about 0 volts.)

More precise description: Refer to page 2. The data emerges between Pin4 and Pin3 (of J2) as a signal with +5V amplitude, with 0 volt reference at Pin3. It is recommended however to use "G1" as the "ground" ("0V") reference (as shown) instead of Pin 3, which is about +0.6 volts with respect to pin 3. G1 is the pin on the 5 pin terminal block that also must be connected to the minus side of the battery system, as indicated in the TM2025 Installation Instructions. With reference to G1, the serial data signal at pin 4 will go from -0.6V to +4.4V signal.

The output (+5V peak) from the serial out comes directly between pins 3 and 4 of J2, which come from the output pins of a Microchip PIC16F884 microcontroller. However current from here should be limited to 5 ma or so because the power source does not have high current capability The MAX232 shown inverts the data for a proper RS232 signal.

Accessing the data: This document shows two ways to access the data. The top example on page 2 shows how to convert the data suitable for output to RS232 port for an older computer or to a USB to RS232 converter. The bottom example shows how it could be interfaced to another microcontroller for further analysis or processing. The purpose of the signal diode (1N4148) and resistor is to shift the level up slightly so it goes from 0 to 5V instead of -0.6 to 4.4V.

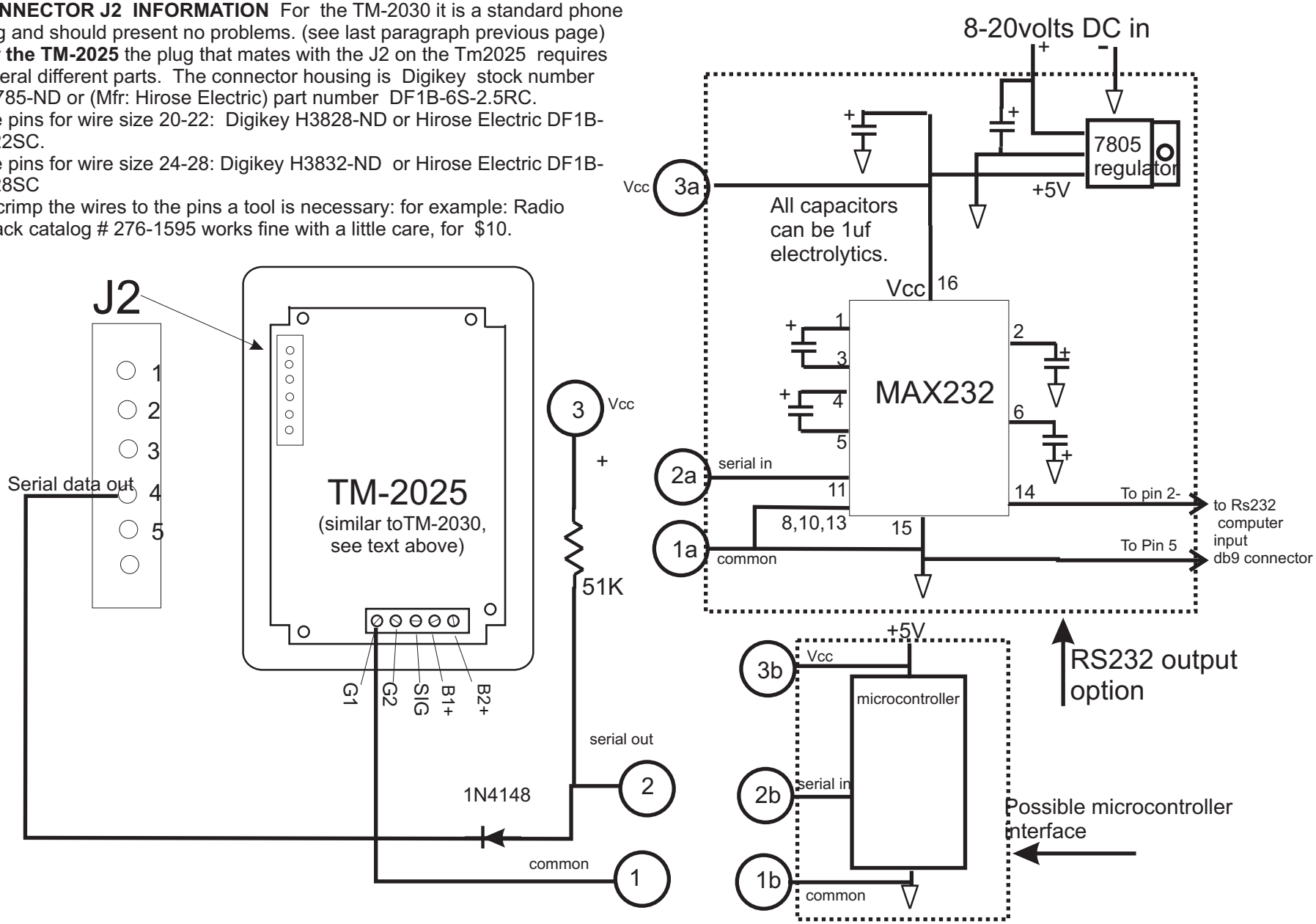
If you want to send it to your computer to read with a serial data reading program, or perhaps to access with your own program-- The schematic on page 2 shows how to convert it to a form that can be sent to a (now old fashioned) RS232 port on your computer, such that was commonly used ten years ago. Most computers how have only a USB port-- so to use that you will need to connect the "RS232 output" to a USB to RS232 converter to convert it to your USB connection on your computer. These are available from Radio Shack, or other company selling computer accessories. The "MAX232" shown in the schematic level shifts, and inverts the data in a form suitable for the RS232 terminal, or for an RS232 to USB converter.
When connected to a computer RS232 port, you can view the data on your computer screen to check that it is working by using the Windows program called "Hyperterminal" or another much easier to use and much better documented program called "Docklight" which is available for free on the web. However if you want to get a version that allows you to save your settings you would need to pay 50 euros for the non free version. This would not be necessary to just check to see that it is working--but in my opinion this program is worth the money if you use these much.

Do you want to interface to a microcontroller to use the data to use or control in some other manner? Then the bottom drawing on page 2 suggests the interface to get a serial input which goes from about 0 to 5 volts. As mentioned before, 5 volts represents the "idle" state, and 0 volts is the start bit level.

This will work with theTM-2025 or newer TM-2030– the drawings below show the TM-2025– but the only difference is the output pinouts for the TM-2030.

For the TM-2030: Although J2 on the TM-2025 looks quite different from on the TM-2030, (the TM-2030 uses a RJ-11 type “phone connector”) the pin connection numbers are the same. The numbers are ordered in an obvious sequence. It only remains to tell you which one is “pin 1”. As you look at J1 on the circuit board, pin 1 will the one closest to the **edge** of the circuit board--pin 4 is 4 away from the edge.

CONNECTOR J2 INFORMATION For the TM-2030 it is a standard phone plug and should present no problems. (see last paragraph previous page)
For the TM-2025 the plug that mates with the J2 on the Tm2025 requires several different parts. The connector housing is Digikey stock number H3785-ND or (Mfr: Hirose Electric) part number DF1B-6S-2.5RC.
The pins for wire size 20-22: Digikey H3828-ND or Hirose Electric DF1B-2022SC.
The pins for wire size 24-28: Digikey H3832-ND or Hirose Electric DF1B-2428SC
To crimp the wires to the pins a tool is necessary: for example: Radio Shack catalog # 276-1595 works fine with a little care, for $10.



TM-2025 TriMetric BATTERY MONITOR SERIAL DATA INFO.	BOGART ENGINEERING 4/1/11	File: TM2025-SerialData.cdr	