

# INSTALLER'S INSTRUCTIONS FOR TRI-METRIC™

Battery system monitor, Models TM-2030-RV and TM-2030-A

revised January 20 2015

**IMPORTANT:** The wiring installation for this meter, especially the shunt installation must be performed by someone knowledgeable in proper wiring, electrical practices, and safety. If you do not have this knowledge please have someone install it who does, or at least get some competent help to supervise the installation.

**To install:**

1. Please read or scan two pages of introductory information in section A.
2. Consult drawings Figure 1 and 2 (pages 7-8).
3. Follow step by step installation instructions in section B.
4. Program the two most important parameters into meter (section C1).

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**A. Before installing the TriMetric meter.** briefly scan this section first

**B. Installation of Meter and Shunt:**

**C1. Entering required two setpoints in TriMetric memory:** How to enter necessary data related to your battery system to ensure the TriMetric displays show correct information on "battery % full."

**C2. Information on the three other (optional) program setpoints.**

**Limited warranty.** Meter is warranted for 4 years against any manufacturing defects. Any meter not meeting the specification or performance description will be replaced or repaired within four years of purchase, provided it has not been subject to abuse or misapplication, and provided the defective unit is shipped to us if we request it. Contact your dealer or us before shipping.

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## **A: What you need to know before installing the TriMetric meter. Review this before installing.**

**Choosing meter location and some benefits of battery monitoring:** To make best use of this monitor, we recommend that it be located where it can be readily observed in the living area where the electrical power is used, such as a kitchen or living room. It displays the current draw or the charging current by either "amps" and "watts". (It is designed to be located up to a few hundred feet away from the battery bank using a cable with 4 or 5 wires from batteries to meter.)

One important use is to learn how much electrical power various appliances draw by looking at the "amps" or "watts" readout first with the appliance off, and then observing how much the current increases when you turn it on. This is inconvenient if the meter is located away from the living area. After a while you will become instinctively familiar with the electrical usage of your appliances, so you won't need to refer to the meter.

Using the "BATTERY % FULL" display, (or "Amp-hours from full") readout you will be able to see approximately how much energy you've withdrawn from the battery bank. If you have "lead acid" batteries--the most commonly used type--the "Volts" readout gives useful information only about the "extreme" cases, when your batteries are mostly charged, or mostly discharged. A well charged 12V lead acid battery while *charging* a 12 volt lead-acid battery will indicate voltage greater than 14.3 volts. However while *discharging* a 12 volt lead acid battery a voltage of 10.8 to 11.6 volts would indicate a battery with low charge (depending on how many "amps" are being withdrawn.) "Volts" is not too informative when the batteries are between 20%-90% charged, since in this case exact voltage depends on several factors, including: *whether* the batteries are being charged or discharged, *how fast* they are being charged or discharged, temperature of the battery, and the recent past history of charge/discharge. For example, if they are charged at a high rate for awhile, the voltage will rise higher than they would be after charging stops, due to what are called "polarization" effects.

**How the TriMetric measures the "Percent full"**. For detailed explanation, see section 6.2 of the TriMetric TM-2030 User's Instructions.

**The TM-2030 can measure voltage only of a second battery system:** This meter measures one battery system comprehensively, including *volts* and battery charging/discharging *amps*, typically for the one that supplies power to appliances so you can measure accurately the *state of charge* (how much energy is in the batteries.) In addition, it will monitor *voltage only* on a second battery having a common negative connection, which could be the engine starting battery.

**Permissible battery voltage:** This meter is suitable for battery systems with nominal voltage from 8 to 65 volts. *It should not be connected to systems which will ever exceed 65 volts.*

**You may choose three different operating levels from simplest to more complex:** The meter comes initially programmed at the lowest Operating Level: L1 which will furnish the most important data. There are also levels "L2" or "L3" which add more functionality, but with more complexity. For new users, begin with L1, and after becoming familiar with the meter advance to L2 or L3 later at any time. L4 adds (only) a more stringent requirement for what is considered to be "charged," intended mainly when using the optional SC-2030 solar charger. These levels are described in the TriMetric User's Instructions.

**Lightning considerations:** The meter has been designed with reasonably good protection against lightning.

### **SHUNT AND WIRING CONSIDERATIONS**

**A shunt (a very low resistance, accurate, high power resistor) must be wired into your battery system as described in section B of these instructions.** This is how current (amps) and watts are measured by this meter: The "amps" shown on the meter measures whatever current passes through this shunt—so it must be wired in series with the wire which carries the current to be measured. **The shunt is almost always installed between the negative terminal of the battery and all the loads and charging sources** (see Figure 1 on page 7.) It is located near the batteries, since the high current carrying wires must be kept short. The TriMetric meter measures the current ("amps") by measuring the very small voltage drop across this shunt. Watts are calculated by multiplying the "volts" times the "amps".

**Shunt requirements:** There are two choices of shunts which may be used: Most systems will use the 500 amp-50 mV shunt. For smaller systems you can use a 100A/100mV shunt (For this choice the meter must be programmed at Operating Level L3.)

**Who might want to use the 100A/100mV shunt?** (requires Operational Level L3) If you have an unusually small system that uses less than 70 amps maximum (charging or discharging) this shunt will show an extra digit to the right of the decimal point, so you can read currents as low as 1/100 amp. But the 100A/100mV shunt can get too hot with a typical 12V system with a 1000 watt inverter. The 500A shunt will allow readings down to 1/10 amp.

**Technical note:** Incidentally, it is only the shunt *ratio* between amps to mV. which is important to the meter--so, for example, a 200 amp-200 mV. shunt can, from the meter's point of view, be considered equivalent to the 100 amp-100 mV shunt. The implication, when a shunt is rated at "100 amps-100 mV." is that it may safely carry *up to* 100 amps maximum--however in many cases so-called "100 amp" shunts will not carry this much without overheating--especially some of the "mini" shunts of this type. For more information, request : "Information on Shunts" from Bogart Engineering, or from [www.bogartengineering.com](http://www.bogartengineering.com).

**If it is desired to measure *only* total solar input current, or only total load current (and amp-hours):** you must wire the shunt so that only the solar current, or load current will pass through the shunt. The "Battery % Full" display will be meaningless in this case. In this case it would be advisable to use Operating Level L3 which will enable you to turn off the "automatic reset" of amp hours. See also an application note on our web site for more information.

**Meter to shunt cable requirements:** The meter may be located up to a few hundred feet away from the shunt if desired, in an indoor location, with four or five power and control wires (either separate wires, or a cable with wires) connecting between the shunt and the meter.

**Wire size requirements: maximum cable length for "G1" wire (see Fig 2) from meter to shunt:** #26 gauge: 45 feet. #24 gauge: 70 feet. #22 gauge: 100 feet. #20 gauge: 180 feet. #18 gauge: 300 feet. #16 gauge: 400 feet. Use wire with resistance less than 2 ohms total for the G1 wire. The G2 and SIG wires can each be over ten times higher than this with no problem. **Our website has an application note describing how to use Cat 5 cable** for going up to 300 feet.

Five wires are labeled on the connector on the circuit board inside the TriMetric: "G1", "G2", "SIG" and "+B1" and "+B2".) If only one battery system is being measured the +B2 won't be required. It might be advisable to use twisted pair wires in the cable for the G2 and Sig wires if other power wires are being run right next to these, however it should not be necessary otherwise. If twisted pair wire is used, connect as shown in the drawing.

**TriMetric maximum current capability:** The TriMetric will measure current properly up to 999 amps with the 500 A-50 mv shunt. With the 100 A-100 mv shunt the meter measurements will be OK up to 300 amps. However, **at these currents the shunt is going to get too hot.** (The heat produced by the shunt will be proportional to the **square** of the current passing through it, so each time the current is doubled the heat increases by a factor of 4.)

**Serial data output is available that outputs all real time data.** This is a data access method for techies. See application note on the web site or call us for more information.

**Mounting the meter: TM-2030 RV model comes in a white, surface mount box** (3 x 4-1/4 x 1-1/4 inch deep). It can be mounted to a wall with screws at the top and bottom flanges. The **TM-2030 A** can be (flush or not) mounted in many standard "double gang" electrical boxes available in hardware stores.

**B. INSTALLATION of METER and SHUNT** If the "+" wire from battery to meter accidentally touches the circuit board it can be destroyed. Carefully following these instructions will make this very unlikely.

- **IMPORTANT:** A qualified person familiar with safe electrical practices and the local electrical code should install this meter--particularly when installing the shunt. **Accidentally shorting the battery with a tool or other metal such as a finger ring can result in severe burns from an arc. Mistakes in wiring could seriously damage your electrical system.**
- **Refer to wiring drawing on last page--please read all notes.**
- **To prevent damage to meter, do not install into a battery system that has a voltage that will rise above 65 volts. It is designed for a maximum "nominal" 48 volt battery system.**
- **A (1Amp, fast-blow) fuse shown** located *near the battery* for each battery in the wiring diagram will protect the wire and the meter even if you accidentally miswire to the terminal block.. If not provided with your meter, such "in line" fuses are available at Radio Shack and other electrical supply stores.

**To install meter and shunt you will need:**

- **One shunt (usually 500A/50mV size)**
- **A length of cable containing 4 or 5 wires long enough to connect from battery system to meter-shown on wiring diagram and end of these instructions.** Or 4 or 5 individual wires may be used. (Five wires if two batteries are being measured.) **The wire used for the + connection of both the main (and secondary battery if used) should have a 1A fuse at the battery end** to protect the wire in case of a short. The following shows minimum size wire for distances shown:  
#26 gauge: 45 feet. #24 gauge: 70 feet. #22 gauge: 110 feet. #20 gauge: 180 feet. #18 gauge: 300 feet. #16 gauge: 400 feet. (These represent distances for approximately 2 ohm wire resistance.)
- **A short length of cable with large bolt eyelets on each end to connect one end of shunt to negative battery terminal:** cable should be of same or larger size (diameter) than the large cable that connects to the + and - terminals of the battery.
- **Suitable wrench or tools for connecting the large cables to battery and shunt**
- **Very small screwdriver for connecting wires to meter terminal block**
- **Small Phillips screwdriver for removing front panel of meter**

- Medium screwdriver for connecting wires to shunt
- For TM-2030-RV only: A drill for making a small hole to permit wires to enter the meter box
- For TM-2030-A only: A “double gang” electrical box of suitable size to accommodate the meter panel.

**STEP 1: Install shunt:** Turn off main breaker to battery. Study diagram Figure 1 and Figure 2 for wiring details. You'll need an additional short length of cable at least as large (in diameter) as the largest cable going to the negative battery connection. It should have bolt lugs at each end to connect from the negative battery terminal to one side of the shunt. The battery cable size must be large enough to accommodate the maximum system charging or discharge amps from the battery.

**Avoid a common mistake:** A solar charger negative wire (or any temporary charger negative) should connect to the **RIGHT** side of the shunt (as shown figure 1). Anything else that could influence current into or out of the battery must **NOT** be connected to the left side of shunt or negative post of battery(s) otherwise the **meter will not measure** the amps correctly. **To avoid another common mistake:** Be sure that if you connected a **grounding point** for the batteries that the ground is **NOT** connected directly to the negative battery post side of the shunt, but to the side of the shunt that is **AWAY** from the negative (load side of shunt as shown in figure 1)

**STEP 2: Prepare to make connections from meter to battery and shunt.** Refer to the wiring diagram on the last page of these instructions to see **how** the wires connect from the meter to the battery system. The terminal block on the TriMetric circuit board accommodates wire size from 16 to 26 AWG. We suggest a cable with different colored wires to reduce the probability of wiring errors. **On the chart below select the colors for each wire.** It has suggested colors if your cable uses these colors—but you may write in your own colors if different. Note that G1 and G2 **may** be the same color, since they connect to the same point at the shunt (although as Figure 2 indicates they must go to two separate terminals G1 and G2 at the meter.) Every system will require a minimum of four wires—but if you also wish to monitor the voltage (only) of a secondary battery, a fifth wire to +B2 will be necessary. The +B1 terminal must be connected to the + terminal of the *main* battery set being monitored—this is the wire that supplies power to operate the meter. If you are also measuring a second battery, its + terminal will be connected to +B2—otherwise it will not be used. We suggest connecting directly to the + battery terminals so that the meter will operate even if a main breaker is turned off.

**Ignore this unless twisted pair wires in a cable are used:** Twisted pair wires are not necessary unless you run the wires very close to other high current carrying wires for 10 feet or more. **However if used,** the wires labeled “G2” and “SIG” should be run with one twisted pair, and if another pair is used, “G1” and “+B1” may be run in an another pair, although twisted pair here will not give any benefit. Clearly establish which wires in the cable are “paired” together. This often requires stripping quite a bit of insulation to see which pairs are twisted together. Then choose one twisted pair for G2 and SIG (the ones for which twisted pair is helpful), and record the wire colors for that pair below in the chart. You may want to use a piece of tape at each end of the cable to tie these two together, to clearly mark the pair. Then you can also choose a pair for G1 and +B1 and record their colors on the chart above, and an extra wire for +B2, if used.

		CONNECTION	WIRE COLOR
		G1	(black?)
		G2	(black?)
		SIG	(white?)
<div style="border: 1px solid black; padding: 5px; display: inline-block;">           TWISTED PAIR (IF USED)         </div> supplies + power to meter →	↙	+B1	(red?)
	↘	+B2	

**STEP 3A: Start by connecting wires at the battery end:** Using chart above for wire colors, first connect both the G1 and G2 wires to the Kelvin terminal on the shunt *farthest* from the minus battery terminal lead, as also shown in Figure 2. (These two wires must join together *only* right at this terminal.) Then connect the SIG wire to the *other* Kelvin terminal that is *closest* to the minus battery connection.

**STEP 3B:** Connect the fuse holder to the main battery + terminal, but don't put in the (1 amp) fuse yet. Connect the other side of the fuse to the wire going to the TriMetric +B1 wire. Then, if you are measuring a secondary battery use a second fuse to connect the secondary battery + terminal to its +B2 wire.

**STEP 4: Connecting meter to wires:** Check that the fuseholders installed in STEP 3B still have their fuses removed.

**TM-2030-RV only:** Take the meter out of its box by removing 4 screws. Drill a hole in the plastic box in a suitable location and size to allow the cable or wires to enter the box. Thread the wires through the hole.

**TM-2030-A only:** The panel can mount in a suitably sized “double gang” electrical box that is mounted 90 degrees from its usual orientation on the wall. Thread the wires through a suitable hole in the box.

The meter circuit board has a 5 pin terminal block on the rear. The five connections are labeled: G1, G2, SIG and +B1 and +B2. Strip insulation off each wire 1/4 inch or so.

**STEP 5:** Use a small screwdriver to loosen the screws on the connector and insert each wire in a separate connector hole using the chart above and/or wiring diagram (Figure 2) to determine which wire goes to which terminal, and tighten each screw to hold the wires securely, taking care that there is no danger of shorts between the wires.

**Then make a final check of the wiring. Install meter in box and finally insert the 1A fuse(s) in the battery fuseholder(s).** Digits should light up on the meter. **If fuse blows, wiring is probably wrong: before replacing fuse:** carefully check that **B1+** wire from battery and fuse goes to proper “B1+” terminal on the meter. (See wiring, Figure 2)

**STEP 6: Do these simple tests to give you confidence that you’ve wired you meter and shunt properly:**

1. When you push “SELECT” to illuminate the front panel light: B1 VOLTS, the battery volts should display.
2. Push SELECT to show AMPS. Turn all charging sources and all loads off, with the inverter completely off (not even in “standby”). Be sure that the meter “amps” display shows very near 0. (0.0 to 0.1 amps.)
3. Check “amps” reading on meter. Turning on a 40 watt load (3 compact fluorescent bulbs) should cause the “AMPS” reading to become more negative by about 3 to 4 amps (12V system) plus a little more for the inverter power. For a 12V system “amps” equals watts divided by 12. For 24 volt system divide watts by 24.
4. Check AMPS charging from every charging source. As you turn each charging source on (solar, alternator, battery charger, etc) be sure that for each source the amps become more positive by about the amount you would expect from that source.

**STEP 7:** To get the “Battery % full” data to read correctly you must enter some programmed data as described in the next section. **Also, %FULL will display only three dashes: “ - - - ” until batteries are charged fully for the first time.**

**C1. Now enter two setpoints in TriMetric memory:** The setpoints are P1 and P3. To learn more about what these numbers do refer to USER’S INSTRUCTIONS for TriMetric TM2030 Table 2. The volts, amps and watts will read correctly on the meter even if you do not set these values correctly. “Battery % full”, “Amp hours from full” and “Days since charged” displays will NOT be correct until you properly enter the first three values.

**The meter comes factory set to Operating Level L1**, which is the simplest level of operation. **The brief instructions in the section relate to level L1.** Begin with this which is suitable for most applications—it is easy to change it later (to levels L2 or L3) if after reading the instructions more flexibility, or a higher level of operation is desired. It may be changed at any time by program P7 (see Table 1 on page 7).

**As you determine the following two numbers, write them in column 3 of Table 1 page 7. Then program them in the TriMetric as described at the bottom of page 6 “Programming instructions”, near Table 1.**

**The purpose of these numbers:** The numbers P1 and P2 tell the meter when your batteries have been charged: that is, when the battery voltage goes ABOVE P1, and the charging amps go BELOW P2. Then the meter will reset the “% Full” to 100%, the “amps hours” to 00.0 and your “Days since charged” to zero. P3 calibrates the “Battery% full” display according to your battery size.

### **How to determine value for program item P1: “charged setpoint voltage”**

**Set the P1 value slightly lower than the “absorption charging voltage”** to which your charger or charge controller limits the charging voltage while boosting the battery. **This value should be specified by the battery manufacturer--and whatever chargers you have should be set to this value**, although some chargers cannot be adjusted and--(for reasons that we don’t understand)--some are permanently set lower than battery companies generally recommend. Set the P1 value to 1% to 2% below this “absorption charging voltage.” For a 12 volt system set to 0.1-0.2 volts less than the “absorption charging voltage” setting. For a 24V system 0.2-4 volts less.

**If you don’t have information about the absorption voltage:** Then start with the following: If you have liquid electrolyte batteries (those with watering caps on top) program a P1 value of **14.3** volts for 12 volt systems, or **28.6** volts for 24 volt systems. For Gel or AGM type batteries for 12V systems use **14.0**. However, since probably one reason you bought this meter was to better care for your batteries, we highly recommend at some point reading: **Important information about battery charging to keep from killing your batteries in section 7 of the USER’S INSTRUCTIONS for TriMetric TM2030.**

**Record P1 value** in the space provided for the first item (“Charged setpoint voltage”) of Table 1, column 3 page 7.

**How to determine value for program item P3: “battery system capacity”** This is a number in “amp hours” that indicates how much charge your batteries hold when they are fully charged. For “deep cycle” batteries this number is specified by the battery manufacturer. If several different values of “capacity” are given,

you can use the “20 hour discharge” value. If you have only one battery then use that value: It is more usual to have more than one battery connected together as shown in Figure 1: Batteries A and B are connected “**in series**”. String A-B are then connected “**in parallel**” with string C and D.. **The rule for combining batteries** is that **when you put identical type batteries in series** the amp hour of the series string is the same as the amp hour rating of each single battery in the string. **When you put them in parallel** then you add the amp hours of each battery. **When you have batteries that are both in series and in parallel**, first compute the amp hour of EACH series string. Then add those together for as many series string as you have to get the total value. Put this value in the “battery system capacity” (P3) in Table 1 on page 7. **Values over 1000 amp hours will appear with flashing decimal point: eg 1.02 (decimal point flashing) means 1020 Amp hours.**

**Program item P2 default value is probably already OK:** The “charged setpoint amps multiplier” In our older TriMetric you had to calculate the P2 value to put in. In the TM2030 the default value is 2.0% which represents of value of amps that is 2% of the value that you have placed in P3. This is a reasonable place to start.

**Now that you have values for P1 and P3, program them into the TriMetric as described at the bottom of this page.** The meter should then be set up to properly measure volts, amps, watts, battery %full, amp-hours from full and days since charged.

**C2: Information on the next (optional) three program setpoints: P4, P5 and P6. Do these now, later or never if you like.**

**Selecting value for P4: Do you prefer to read “watts” or “amps”?** This meter allows you to see the flow of energy in or out of the battery by either observing the AMPS or WATTS. Here is how they are related:

$$\text{Watts} = \text{Amps} \times \text{battery volts}$$

When originally received, the AMPS reading is among the **primary** display items, and the WATTS show on the **secondary** display items. If desired, you may switch the order, so that the WATTS show as a primary item, the AMPS show as the secondary item. This is done by the P4 program item described below in Table 1. A small label that says “Watts” is supplied [**will soon be available**] with this meter that may be used to place over the “Amps” nomenclature on the panel if this is desired.

If you are used to thinking in “amps” you may prefer that as your primary display. One advantage of “watts” is that if you are using an inverter to power 120V appliances, the watts display shows you the actual watts to power them. So a 15 watt light bulb at 120V powered by your inverter should show as a draw of about 15 watts (or actually a little more since your inverter/converter is not 100% efficient in its power conversion). Many people find “watts” to be more familiar.

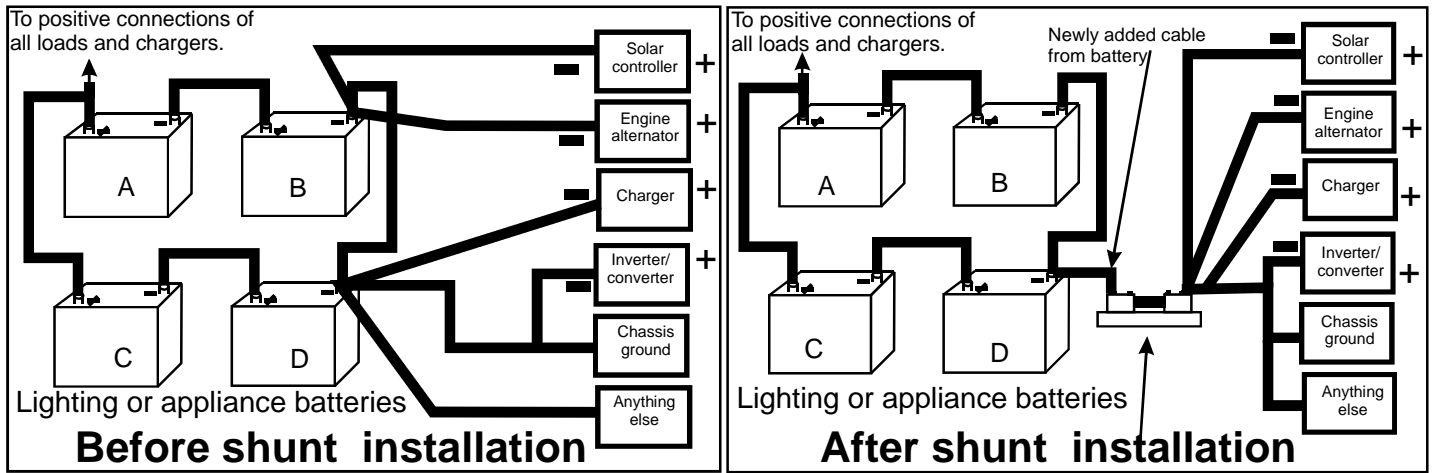
**Selecting a value for P5: “Battery recharge time reminder”:** Lead acid batteries should be periodically fully charged for maximum life—and also for the meter to maintain a more accurate “% Full” display. The default P5 value is programmed as “OFF”—but if you would like to be reminded to fully charge them after they have NOT been charged for several days you can use this to remind you. If you set it to our recommended value of “5”, then after five days of not reaching their charged state (according to the values you programmed in P1 and P2 above) the meter will flash an occasional “Ch F” in the display (when the primary displays are being shown.) This should signal you to charge your batteries. When the batteries are charged the “Charging” lamp will start flashing, and the “Ch.F” in the display will cease flashing.

**Selecting a value for P6: “Battery equalizing time reminder”:** The default setting is “OFF”. For batteries which need periodic equalization, this can be used to remind you when to perform this operation, which is usually recommended for “liquid electrolyte batteries” (but often not the gel or AGM types.) Some chargers perform this automatically, but if yours is requires manual intervention than you may use this to remind yourself to perform this task. You can set in the interval in days that you wish to elapse between equalizations. Then it will flash “Ch E” periodically after that number of days has elapsed to remind you to equalize. **After you have performed the equalization process you will need to MANUALLY RESET the “days since equalization” display by going to this display** and holding the “RESET” button for several seconds, until the number in the display to reset to ‘0’. It does not do this automatically. See section 7 of the **USER’S INSTRUCTIONS for TriMetric TM2030** for more information on equalization.

**How to program numbers P1 and P3 into TM-2030: Refer to Table 1 to right (page 7)**

To **observe** programmed data follow steps 1 and 2. To **change** data follow additional steps 3 and 4.

- (1) **HOLD DOWN** the SELECT button and watch as the display cycles through several different displays. When you see **P1** in the display, immediately release SELECT. If you don’t release quickly enough, just wait longer holding down SELECT until you see the **P1** again, then release. Then the programmable data shown in column 2 for P1 (in Table 1) will alternate with “**P1**”, so you can observe its value.
- (2) Push SELECT repeatedly to observe programmed data P2, P3, etc, as shown in the left two columns in Table 1. After going through all these it will go back to observing normal display data. (Volts, Amps, etc.)
- (3) If during step 2 you see data that you wish to **CHANGE**, push **SELECT and RESET firmly at the same time**. Three green lamps will flash to indicate that you are in the CHANGE mode. Then giving successive pushes to RESET will increase the numbers slowly. Holding RESET down a little longer will speed up the change—and will cause data to cycle more quickly through all the possibilities. To make values go down, you will need to keep increasing until it finally jumps to its lowest value again.
- (4) When satisfied with the data, push SELECT to get out of the CHANGE mode and back into OBSERVE mode. Now continue again as described in step 2.



The above drawing will not show your exact situation--this example is unusually complicated. It is intended to show that you need to first remove every cable or wire that goes to the negative connection on your battery system before installing the shunt. All of these will need to be reconnected to the right side of the shunt as shown in the right drawing.

The shunt may be installed either way. It does not have a polarity.

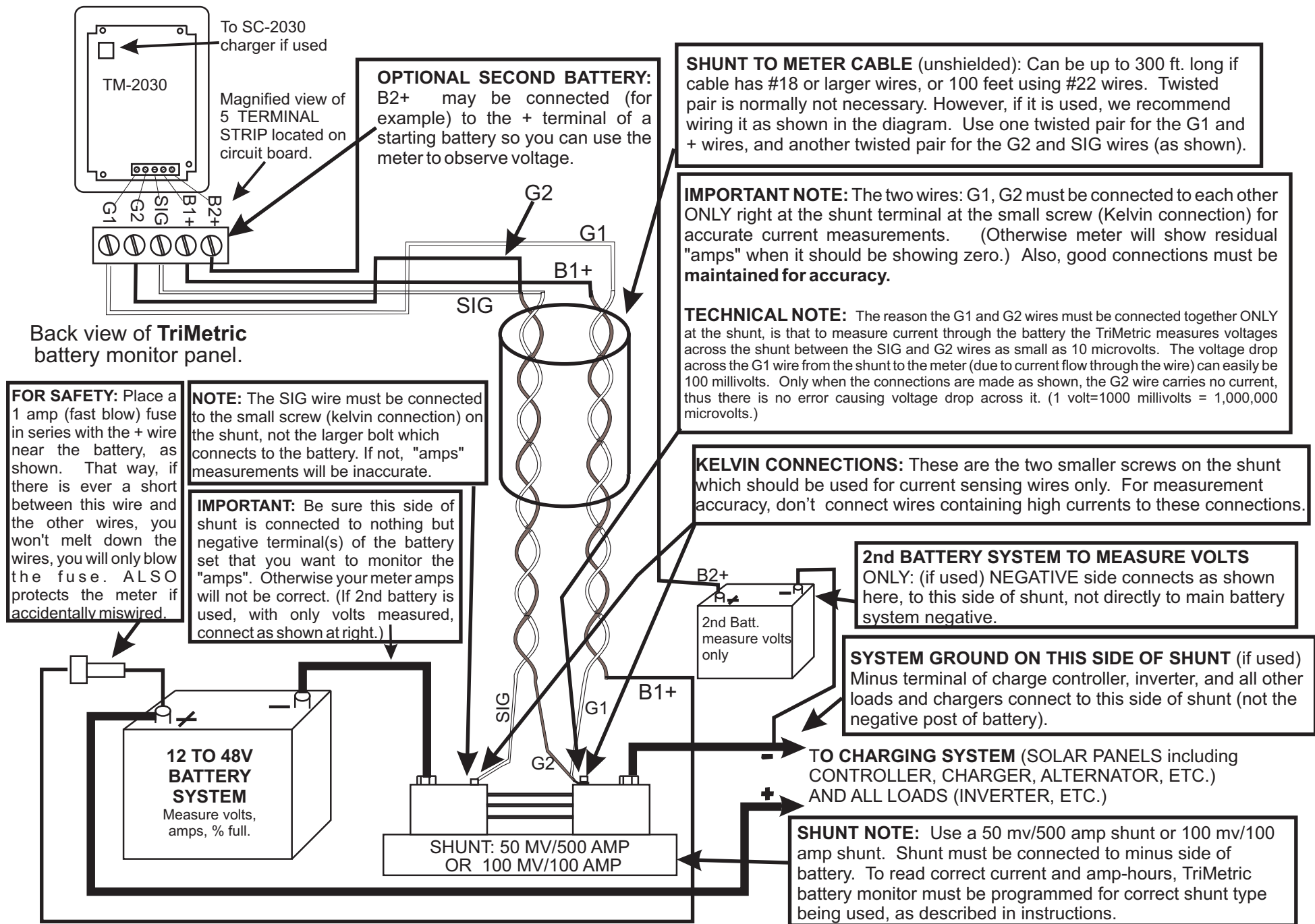
In the diagram above the **left side of the shunt should be connected only to the negative side of battery or battery set.**

**Note ALL other cables/wires must connect to load side (right side on drawing) of shunt. Including ground. Including solar charger negative.** This is necessary for the meter to measure battery "amps" properly and also for the "Battery % full" display on your meter to work. Of course this doesn't mean that your connections on the right side of the shunt will be precisely as shown.

**Figure 1: Where to install shunt**

PROGRAM MODE NUMBER	PROGRAMMABLE DATA and ADJUSTMENT RANGE SEE INSTRUCTIONS TO LEFT (ON PAGE 6)	Factory value
		Your value
P1	"CHARGED" setpoint voltage: <b>10.0 to 65.0V</b>	28.6
P2	"CHARGED" setpoint multiplier: <b>0.1 to 10 percent</b> or <b>OFF</b> "Charged setpoint amps" equals this % multiplied by value in P3	02
P3	"Battery Capacity" Amp-hours: <b>10 to 9,990</b> amp hours NOTE: Flashing decimal point means "multiply number by 1000"	400
P4	For primary display choose "watts" or "amps": <b>Pr =watts A =amps</b> (Secondary display will show the one not chosen.)	A
P5	Days before "time to recharge" reminder: <b>1 to 100</b> days or <b>OFF</b>	OFF
P6	Days before "time to equalize" reminder: <b>1 to 100</b> days or <b>OFF</b>	OFF
P7	Choose OPERATION LEVEL: <b>L1, L2, L3</b> or <b>L4</b> .	L1

**Table 1 PROGRAM DATA AVAILABLE IN OPERATION LEVEL L1.**



**FIGURE 2: TM-2030 TriMetric Battery Monitor Connections**