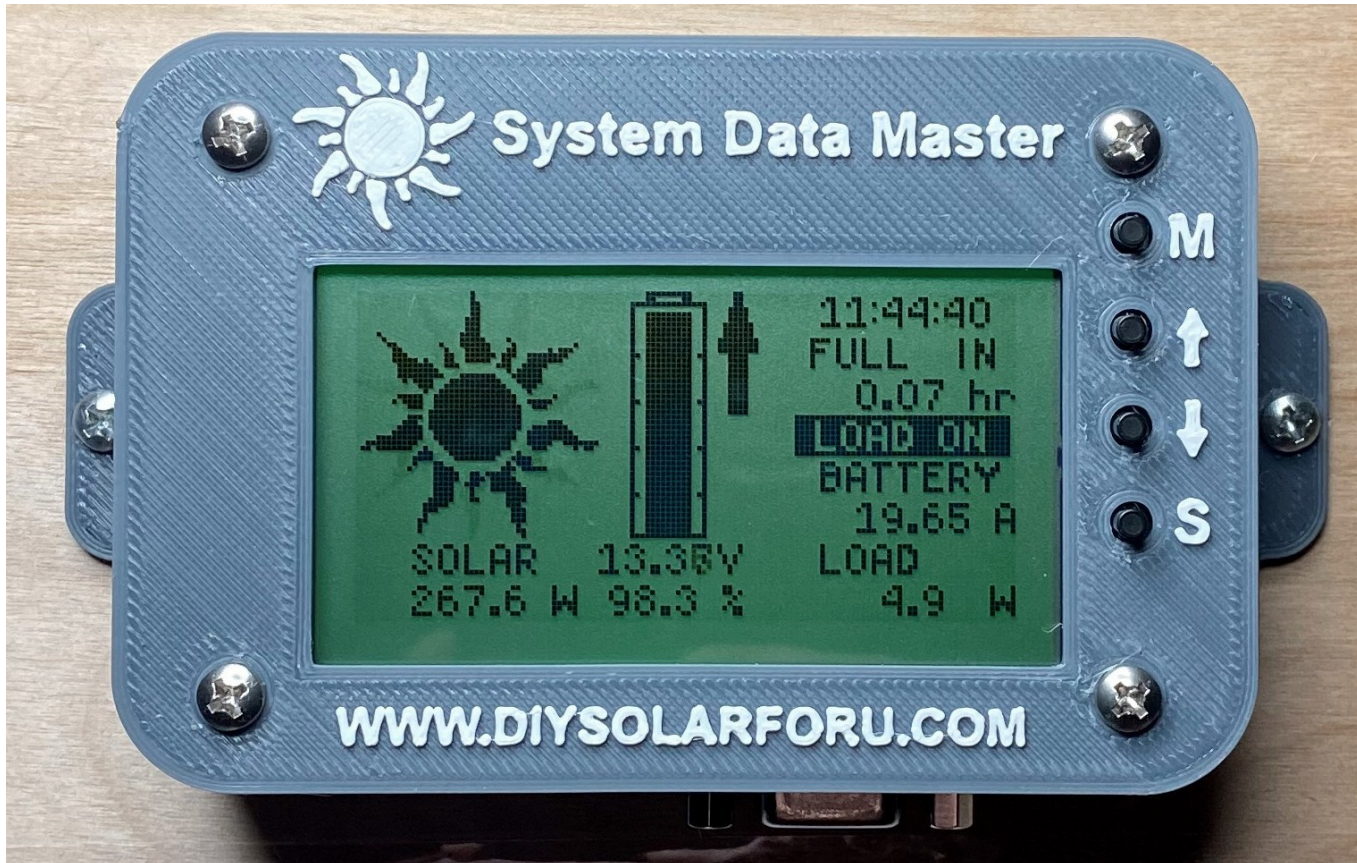
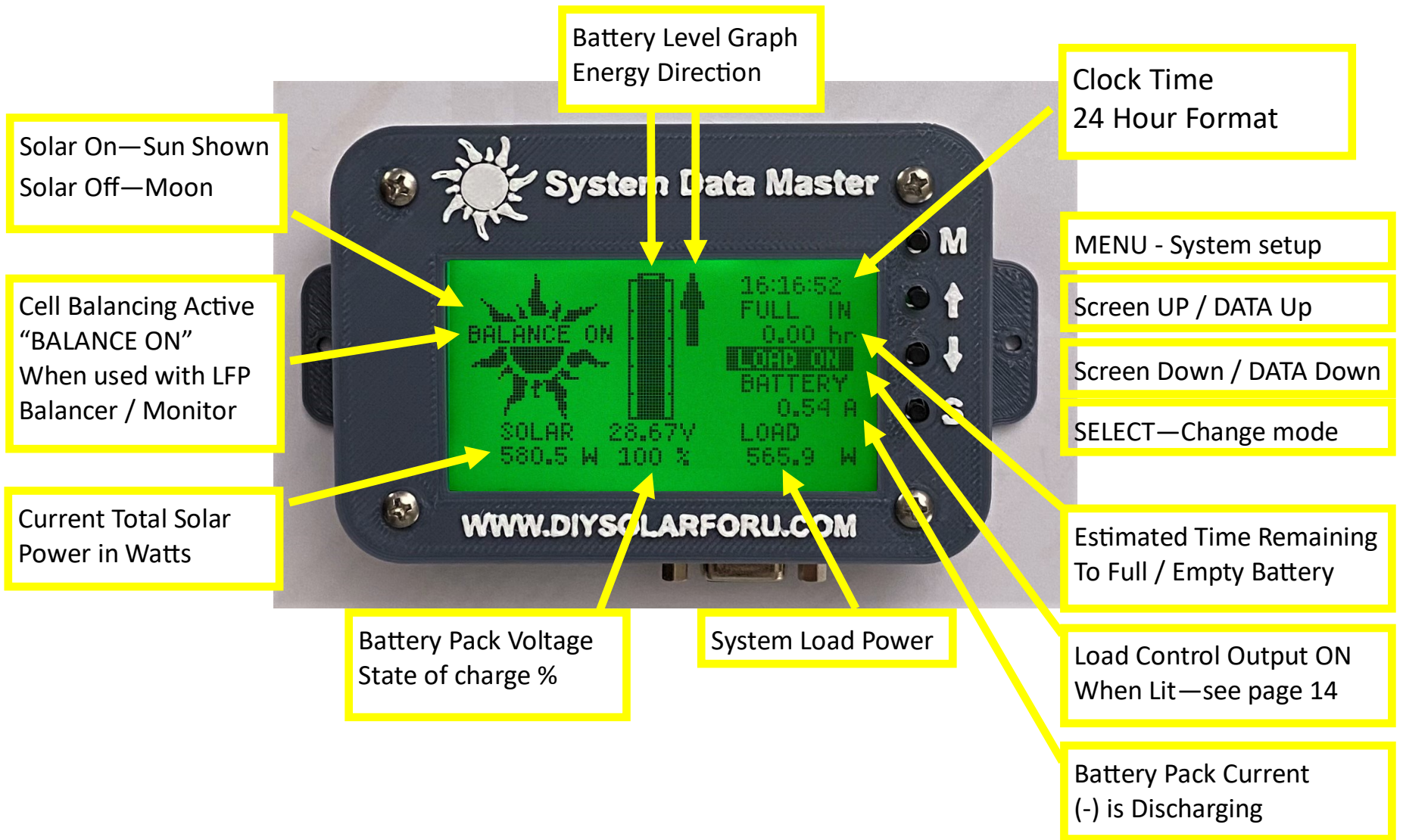


System Data Master Operation Manual



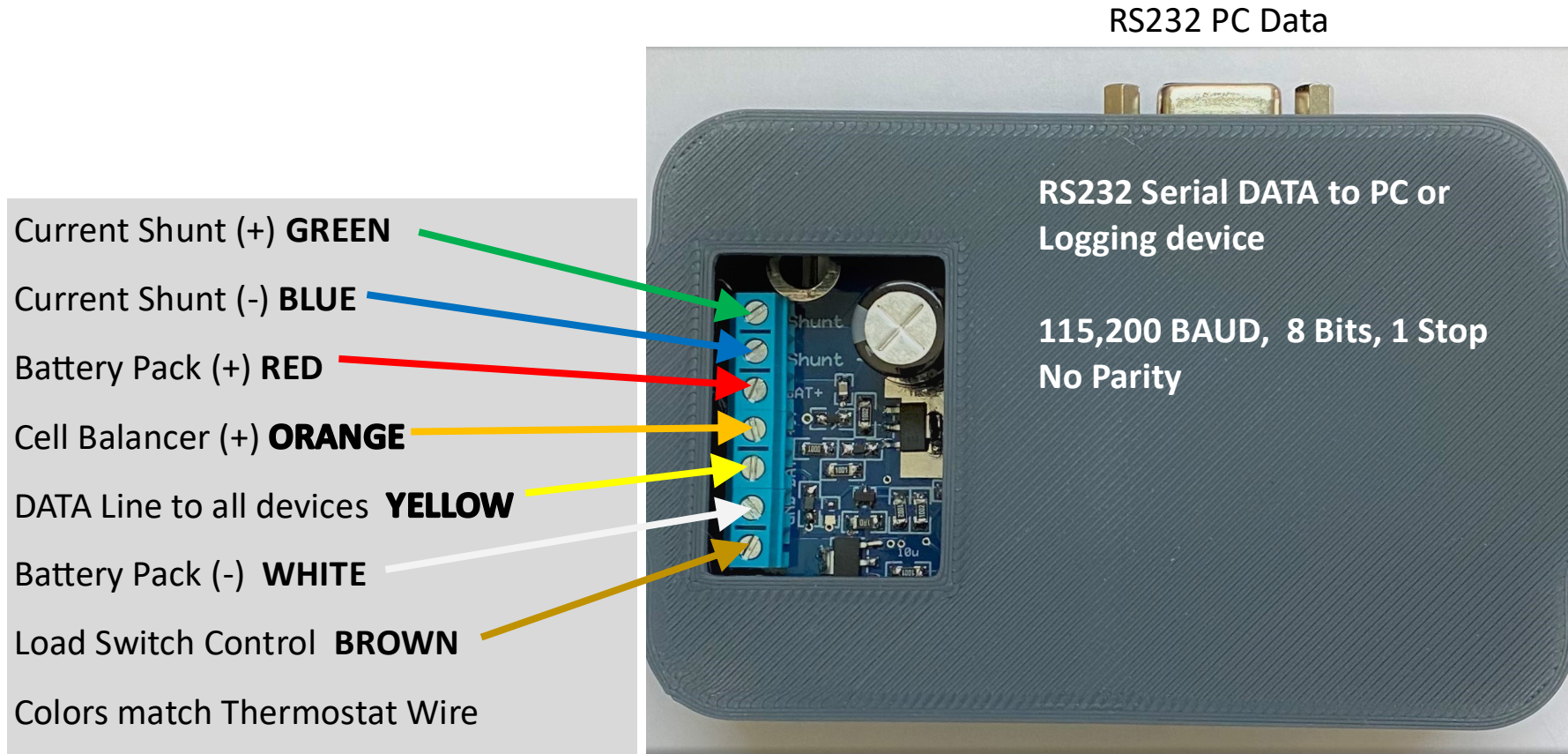
Full System Monitor with Battery Management and Data Logging

Main Screen Display shown



System Data Master—Connections

Bottom View

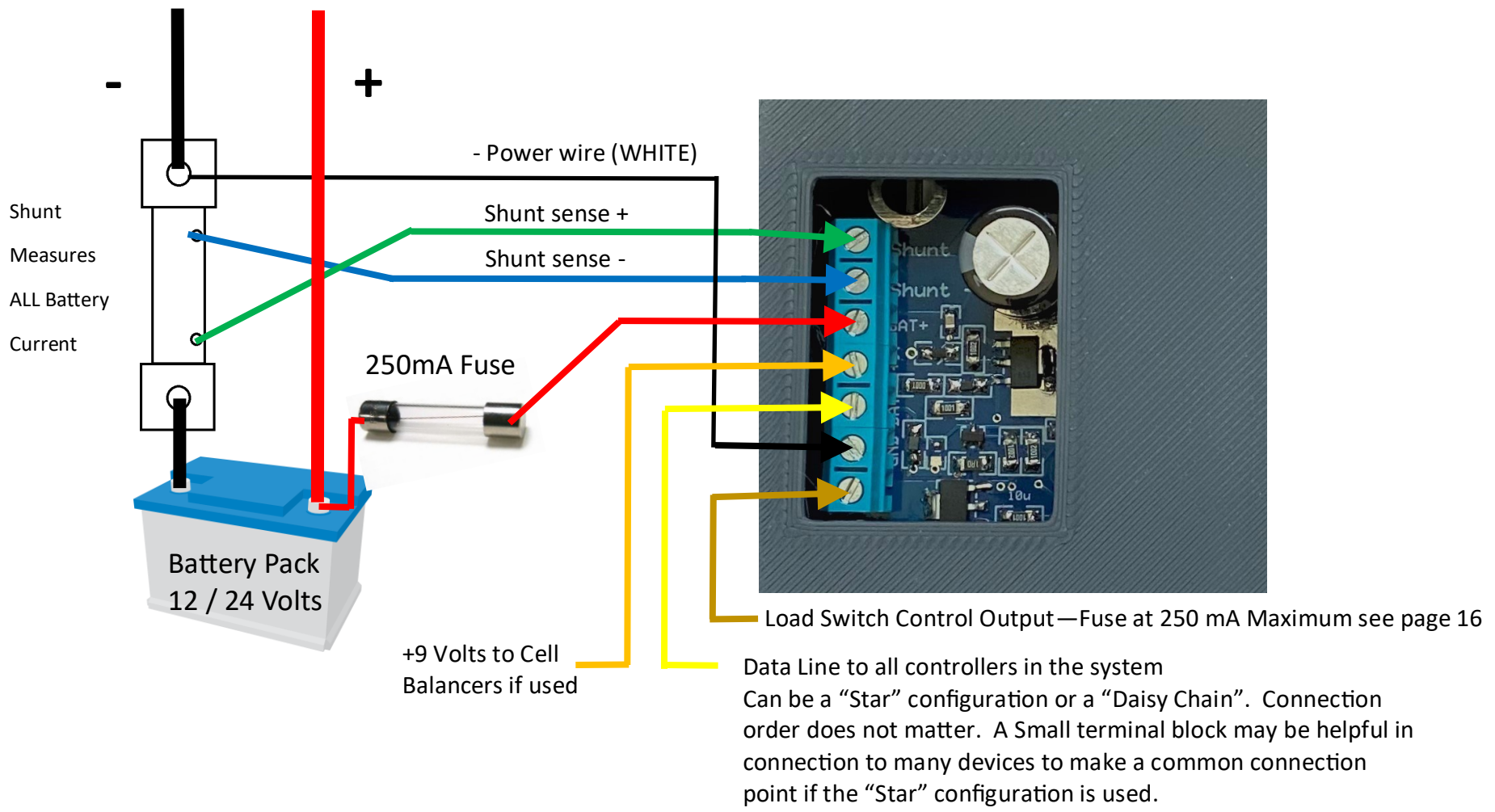


IMPORTANT— When connecting the wires connect the System Data Master end **FIRST**. Then connect the other end to the appropriate point with (+) Battery connected **LAST** and Fused with a **250 mA Fast Acting Fuse**.

Recommended to use 7 conductor 18 AWG Thermostat wire. Pre-Bend the end 90 degrees for easier insertion in to the terminal block.

To Power Distribution Box
 With Circuit Breakers or Fuses
 Negative to Load and Charge Controllers

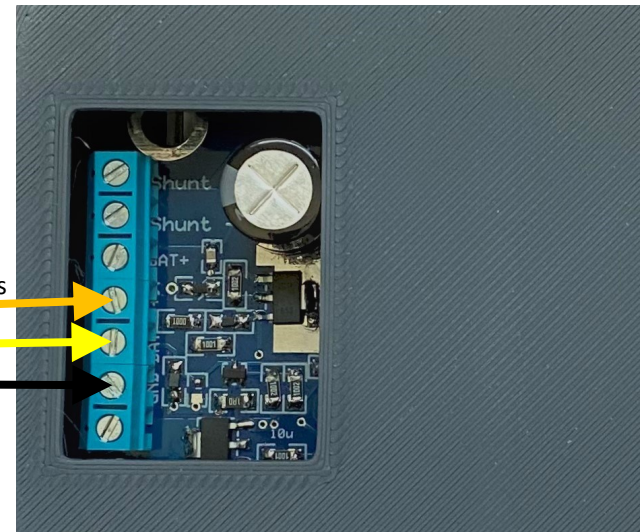
Connection Diagram Bottom View



When Charging a positive voltage will appear on the shunt from GREEN to BLUE and display as positive battery amps

IMPORTANT: Use a Shunt Rated For 2x the Highest Load Expected or it will run HOT.

Cell Balancer DATA Connection Parallel daisy chain connection for 24 volt systems to BOTH Balancers



Data Connection is Optically Isolated from Battery Pack Cells
Inside the Cell Balancer / Monitor unit.

System Data Master Operation V1.43

Data is collected from external devices on the single wire data line every 1.33 seconds. Battery Amps is read from the shunt every 167 mS and averaged / filtered by a 22 Bit Delta Sigma ADC. System Level DATA is saved to EEPROM every 15 Minutes and is an accumulated average of the 675 samples taken every 1.33 seconds. This provides accurate power totals over the entire 24 hour period. Load values are calculated by subtraction of the battery current from the solar current and multiplied by the current battery voltage. There is about a 2 second processing delay from filtering to on screen display information. At Night the battery current is equal to the load current which includes the nominal 50 mA System Data Master current. This can be reduced by dimming the backlight settings.

Battery is considered FULL and the SOC is reset to 100% when both the battery **voltage is above 14.1 / 28.2 *AND* the battery current is less than C/25** where "C" is the Amp hour capacity of the battery pack. C/25 threshold was added in V1.43 to better reflect AGM / Deep Cycle Batteries and also works for LFP (Lithium Iron Phosphate).

When doing first setup its important to clear the **ALARM LOG** on the **ALARM LOG SCREEN** by holding SELECT until a beep is heard and also to clear the **DATALOG MEMORY** in the last page of the **MENU**.

Many different ALARM conditions can be Enabled in the ALARM SETUP screen and what action to take either flashing or flashing and beeping if an alarm is tripped. It is recommended to set these conditions to protect the Batteries for unsafe or undesired conditions.

The load switch output is tied to the Battery Low, Battery Critical, SOC Low, and SOC Critical Thresholds even if that Alarm is not ON. It is also tied to individual cell voltage if using LFP batteries and our LFP Cell Balancer. The LOAD SWITCH OUTPUT will be ON if ***BOTH*** Battery Voltage and SOC are above the low thresholds and all LFP cells are above 3.00 volts. The LOAD Switch output tuns OFF if ***ANY*** Cell voltage hits 2.60 ***OR*** Battery Voltage falls below Critical ***OR*** the SOC% falls below Critical. IF used the LOAD switch can cut off the major system load (NOT the System Master or charge Controllers) to protect the battery from over discharge and damage until Solar Power can bring it back up. Most likely this would occur at night if the batteries get too low so its important to set these thresholds even if the ALARM is not enabled. Cell voltage added to Load Switch in V1.43.

Setup Instructions after Connection



First Step is to do
System Calibration

Set Values to match your shunt.
Use up and down to change the value.
Hold up or down to scroll value faster.

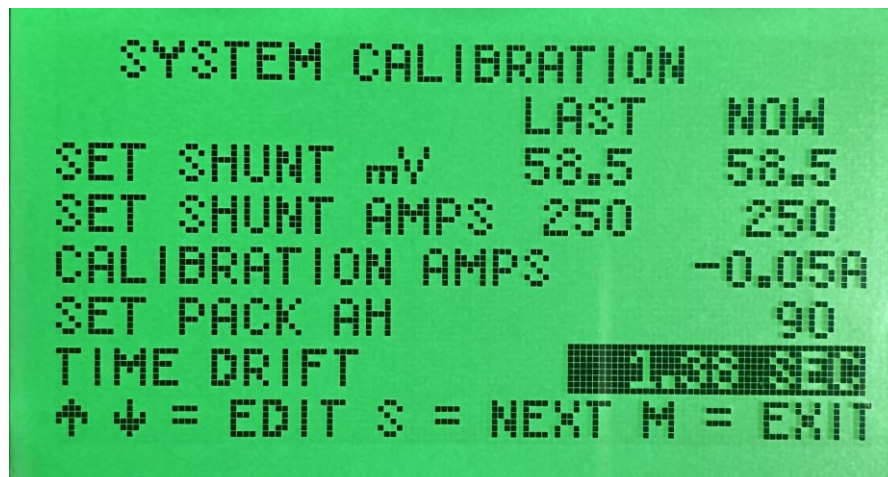
Calibration Amps is the battery current.

Press Select to go to the next number.

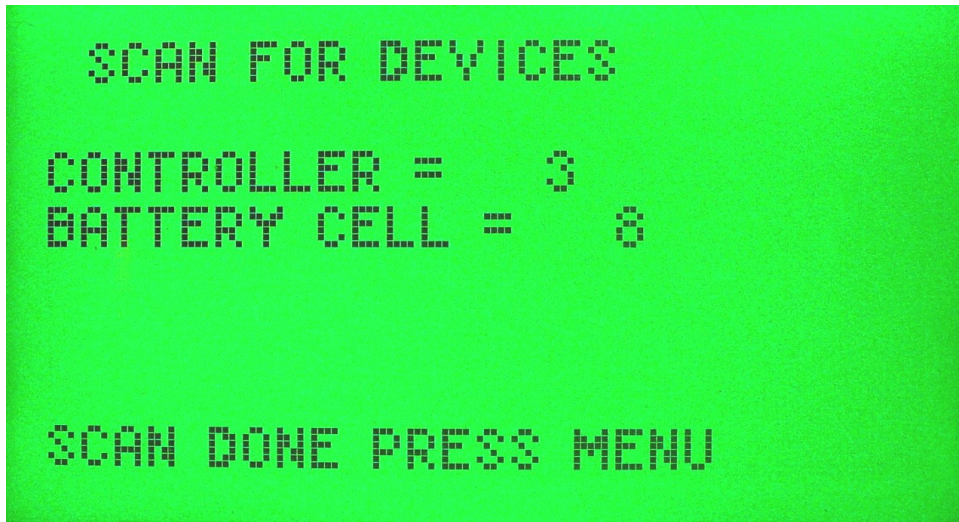
Set Pack AH to the Amp hour capacity of
your Battery Pack in the same manner.

Time Drift is for adjusting clock drift in seconds per day. Increase number if clock is fast. Decrease number if clock is slow. Adjust this in small amounts once per week until near zero drift is achieved.

When done Press MENU "M" to go back.



TIP: You can fine tune by slightly adjusting the mV value



Next Step is to scan for connected devices—number of each will be displayed.

Scan result is then displayed.

If the result does not match the expected number pressing SELECT will rescan.

If no devices are found or number is wrong check your wiring of the data line.

Cells should be 4 or 8 if Cell Balancer units are connected.

When finished press MENU to go back.

ALARMS SET UP PAGE 01

S.O.C. LOW	<input checked="" type="checkbox"/>	OFF
S.O.C. CRITICAL	15.0%	OFF
LOW CELL VOLTS	2.80V	BEEP
HIGH CELL VOLTS	3.70V	BEEP
DATA LOSS		ON
SILENCE TIME	5 MIN	

ALARMS SET UP PAGE 02

PACK VOLTS LOW	<input checked="" type="checkbox"/>	BEEP
PACK CRITICAL	11.0V	BEEP
CONTROLLER HOT		ON
BEEP DIVISOR	38	

Next Step is set up Alarm Conditions

Two levels of state of charge Alarm are provided. LOW from 10% to 99.5% CRITICAL from 1% to 20%

Low Cell Threshold from 2.70V to 3.30V
High Cell Threshold from 3.55V to 3.80V

Data Loss detection is also provided.

Options are OFF, FLASH, BEEP.

BEEP option also flashes the backlight.

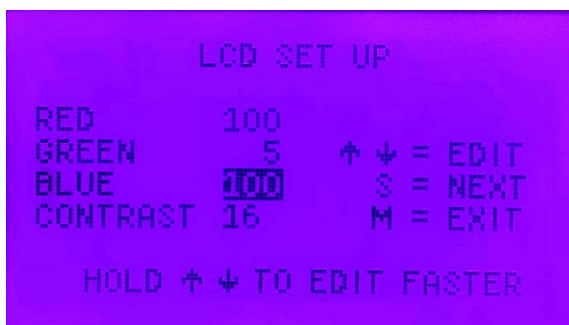
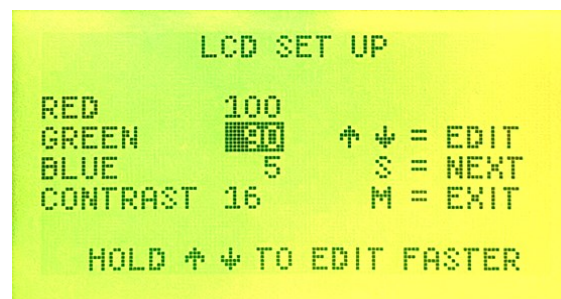
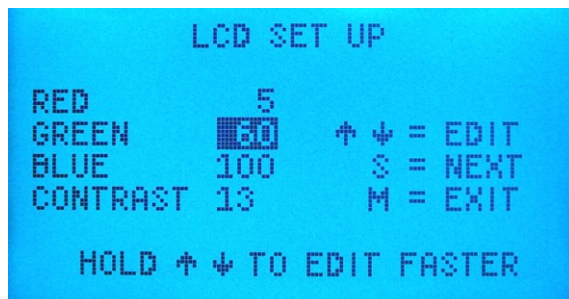
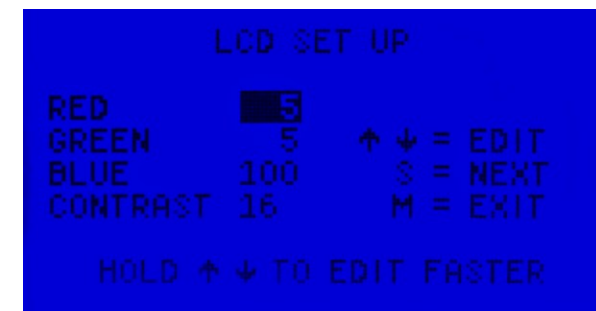
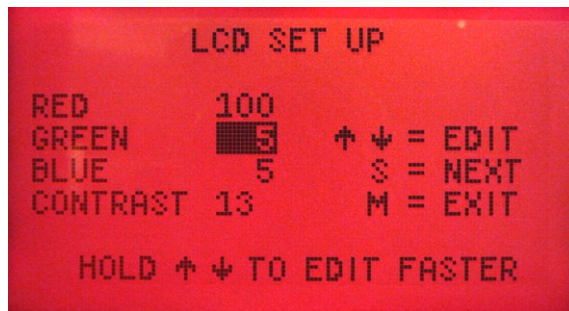
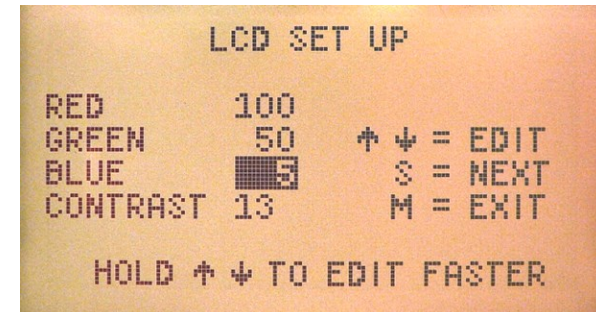
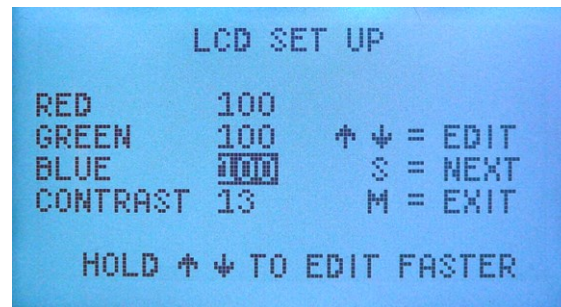
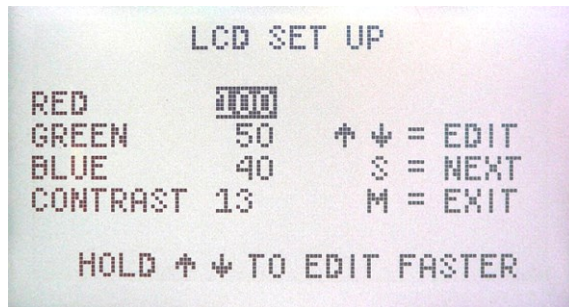
Alarms Silence time from 3 to 240 Min.

Adjust in the same manner as Calibration.

BEEP Divisor tunes the beep frequency.

Press MENU to go back.

LCD Setup—some Color Examples



This sets the RGB Backlight.
Range is from 5% to 100% on
each color.

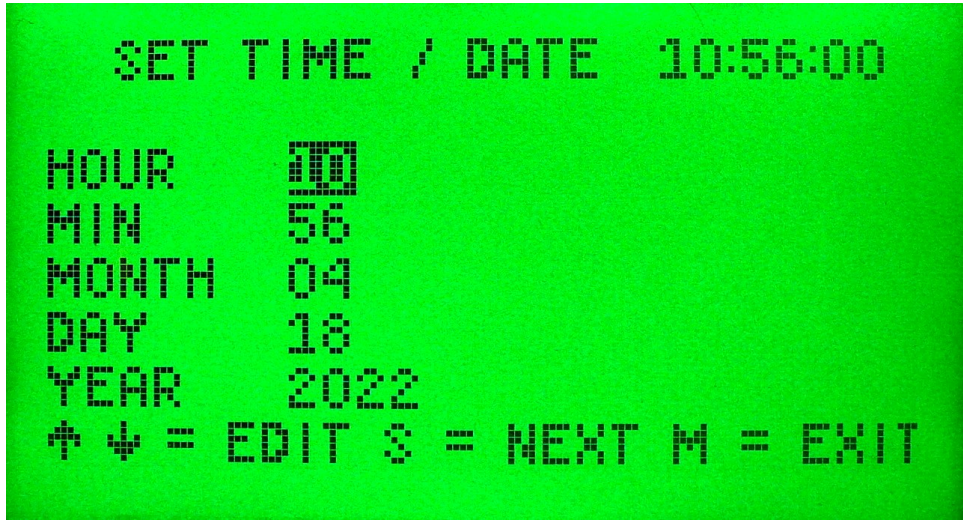
Adjust contrast for best viewing

Press MENU to go back.

Note: Any ALARM will override
the backlight color until cleared
or Silenced.



Set Time and Date.



Use up and down buttons to change the highlighted item.

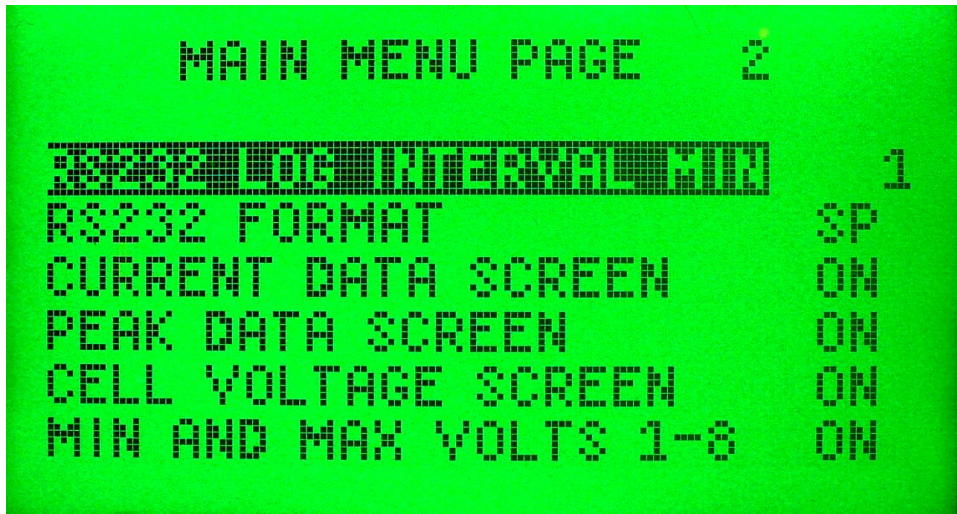
Press SELECT to edit the next value.

Press MENU to exit.

Note—Clock will be frozen at 00 Seconds while editing.



Screen Scrolling in Seconds.
Set to OFF to disable scrolling.



RS232 interval in 1 to 240 min.
Format is "PC" for PC Screen
view or "SP" for Spreadsheet
importing. Set to 0 to disable.

Screen Selections -
Menu Pages 2 thru 5. "ON" is
display screen "OFF" is skip
screen.

```

MAIN MENU PAGE 2
-----
RS232 FORMAT SP 1
CURRENT DATA SCREEN ON
PEAK DATA SCREEN ON
CELL VOLTAGE SCREEN ON
MIN AND MAX VOLTS 1-8 ON

```

```

MAIN MENU PAGE 3
-----
CONTROLLER DATA ON
SOLAR DATA ON
LOAD DATA ON
S.O.C. 96 MIN DATA ON
S.O.C. 8 HOUR DATA ON

```

```

MAIN MENU PAGE 4
-----
S.O.C. 28 DAY DATA ON
SOLAR MONTH KW DATA ON
SOLAR DATALOG ON
LOAD DATALOG ON
S.O.C. DATALOG ON

```

```

MAIN MENU PAGE 5
-----
CELL DATALOG ON
NUMERIC DATALOG ON
ALARM DATALOG ON
OUTPUT DATALOG RS232
ERASE DATALOG MEMORY

```

Screen Enable—ON / OFF selects if a screen is displayed or skipped. All screens can be User disabled except the Main Screen which is Always ON.

Output DATALOG RS232—this performs a Data Dump of all internal data up to 2 years thru the RS232 Serial Port. This can take some time and during the data output all other RS232 activity is suspended. BAUD = 115200, 8 Bits, 1 Stop Bit, No Parity bits.

Erase DATALOG MEMORY—this will clear all saved data and is confirmed on the next screen. When Erasing screen will go RED for about 9 seconds. **This can't be undone.** When doing initial setup this should be done to clear any residual bit states (all "1" factory state).

SCREEN #1 = MAIN SYSTEM SCREEN - ALWAYS VISIBLE

Shows combination of graphic and numeric system data along with Load Switch Status
Solar Power, Load Power, Battery Voltage and Amps, Battery State of Charge
Current Time, Cell Balancing is active, Solar is active, Time until Full or Empty

SCREEN #2 = CURRENT SYSTEM DATA

Shows Solar and load watts, Amp Hours Today, Watt Hours Today, Pack Voltage, and State of Charge

SCREEN #3 = MAXIMUM SYSTEM VALUES

Shows Maximum values for Solar, Load, Amp Hours, and Watt Hours along with lowest Stat of Charge
Values are reset by Holding SELECT—This also resets the cell voltage min and max.

SCREEN #4 = CURRENT CELL VOLTAGES

Shows all 4 or 8 cells voltage if a Cell Balancer / Monitor is connected

SCREEN #5 = MIN AND MAX CELL VOLTAGES

Shows all 4 or 8 cells Min and Max voltage if a Cell Balancer / Monitor is connected
Values are reset on SCREEN #3 by Holding SELECT

SCREEN #6 = CELL VOLTAGE RANGE BAR GRAPH

Graphical version of Screen #5 with current value shown as a horizontal bar thru the vertical bar
Values are reset on SCREEN #3 by Holding SELECT

SCREEN #7 = CONTROLLER NUMERIC DATA

Shows Panel voltage, Detected Battery Voltage, Amps Output, Internal Temperature, and Watts output
Press SELECT to edit which controller is displayed and use the up / down buttons to change. Press SELECT
Again to return to normal mode (change screen with up / down buttons). Auto scroll after 15 seconds.

SCREEN # 8, = SOLAR POWER HISTORY

Adjustable from 12 minutes to 24 hours and adjustable power scale displayed graphically

SCREEN # 9 = LOAD POWER HISTORY

Adjustable from 12 minutes to 24 hours and adjustable power scale displayed graphically

SCREEN # 10 and 11 = STATE OF CHARGE (S.O.C.) HISTORY

Past 96 minutes, and past 8 hours are displayed graphically

SCREEN # 12 = CONTROLLER OUTPUT BAR GRAPH

Shows current power of all connected controllers graphically

SCREEN # 13 = 28 DAY STATE OF CHARGE HISTORY

Shows the past 28 days minimum and maximum Battery Pack Levels in graphical format

THE FOLLOWING SCREENS READ FROM THE INTERNAL DATA LOG MEMORY. DATA IS ACCUMULATED AND AVERAGED OVER 15 MINUTES AND SENT TO THE WRITE BUFFER. DATA IS WRITTEN EVERY 15 MINUTES FROM THE WRITE BUFFER. SOME DATA IS NOT AVAILABLE UNTIL AFTER MIDNIGHT. ON ALL DATA LOGGED SCREENS PRESS SELECT TOGGLES BETWEEN DATE VIEW CHANGE AND SCREEN CHANGE.

SCREEN # 14 = MONTHLY ENERGY TOTALS PAST 2 YEARS IN KWH

Shows each month's total energy like your power bill in KWH generated

This scans the Datalog Memory and can take up to 45 seconds to fill 2 years of data

Current Month is highlighted. Pressing SELECT allows changing the YEAR.

Hold Select for > 2 seconds to update the data by scanning the datalog.

SCREEN # 15 = SOLAR POWER DATA LOG 24 HOUR VIEW

Shows Solar Power graphed over the 24 hour period.

Press Select to edit the Date Viewed.

SCREEN # 16 = LOAD POWER DATA LOG 24 HOUR VIEW

Shows Load Power graphed over the 24 hour period.

Press Select to edit the Date Viewed.

SCREEN # 17 = STATE OF CHARGE (S.O.C.) DATA LOG 24 HOUR VIEW

Shows Battery Pack charge level graphed over the 24 hour period.

Press Select to edit the Date Viewed.

SCREEN # 18 = BATTERY PACK VOLTAGE DATA LOG 24 HOUR VIEW

Shows Battery Pack voltage graphed over the 24 hour period.

Press Select to edit the Date Viewed.

SCREEN # 19 = CELL VOLTAGE DATA LOG 24 HOUR VIEW

Shows Cell Voltage range minimum and maximum graphed over the 24 hour period.

Press Select to edit the Date Viewed.

SCREEN # 20 = NUMERIC SYSTEM DATA LOG 24 HOUR VIEW

Shows MAXIMUM Solar and Load Watts, Amp Hours and Watt Hours for the day, and minimum and max S.O.C.

Press Select to edit the Date Viewed.

SCREEN # 21 = ALARM LOG VIEW—PAST 128 ALARMS SAVED

Shows Alarm condition along with the time and date stamp of when the alarm occurred

No Alarm signals when the alarm condition cleared

Data can show multiple alarm conditions active at the same time

Alarms are saved any time there is a change in the Alarm State

Hold Select > 2 seconds to Erase the Alarm Log.

LOAD SWITCH OUTPUT—this output can turn off a relay or Solid State Switch to disconnect the main load from the battery. This output has a maximum current of 150 mA and should be fused with a **fast acting 250 mA fuse**. Relay coil is connected to battery + on one wire and Load Switch on the other wire. **DO NOT CONNECT THE LOAD OUTPUT DIRECTLY TO BATTERY AS DAMAGE WILL RESULT. ALWAYS USE A FUSE. Use a low current relay coil is recommended.**

This output is controlled by the **Alarm Settings** for **SOC** and **Battery Voltage**. Turn OFF is done when **EITHER** the **SOC** or Voltage goes **BELOW** the Critical Threshold. Turn ON is done when **BOTH** the SOC LOW and Battery LOW are **ABOVE**. V1.43 adds cell voltage thresholds of 3.00 volts ON and 2.60 volts OFF when using our LFP Cell Balancer / Monitor.