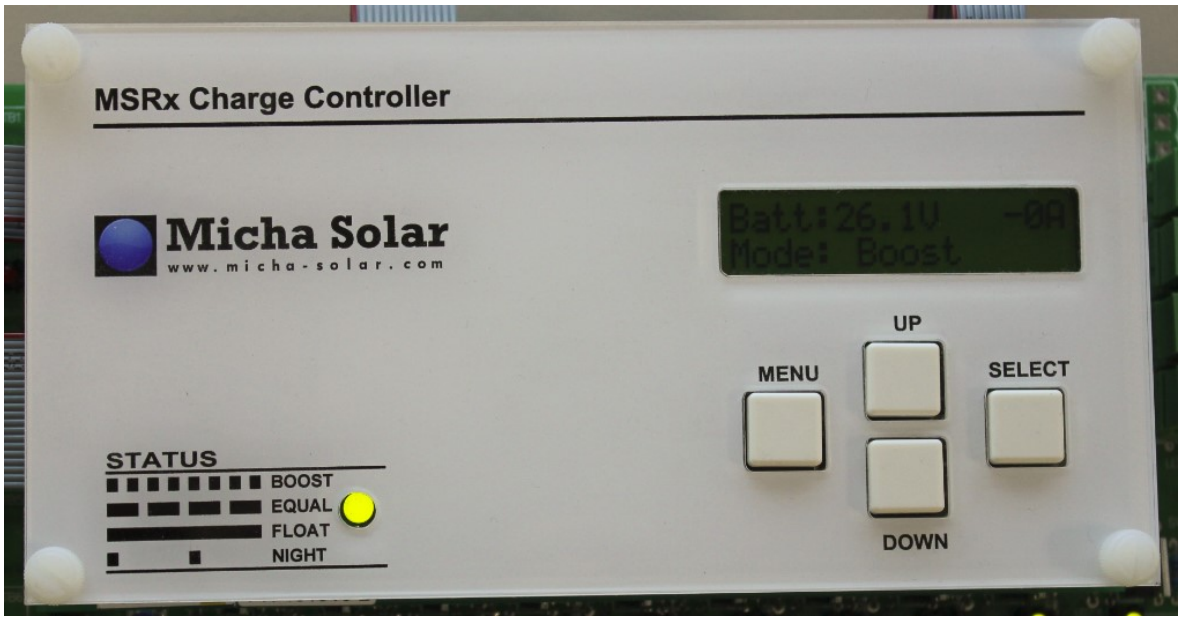
1. Overview

MSRx Charge Controller uses a microprocessor running embedded software to achieve the required operation. Specific hardware has been designed to fulfil different input and output requirements of an industrial charge controller while maintaining a cost effective solution. The MSRx Software is the same for various specific solutions.



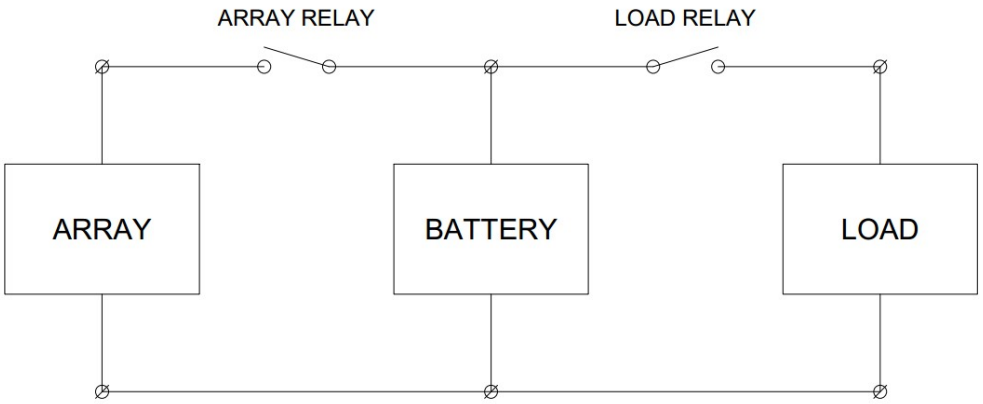
Previous versions of Software may not have all the features described in this Manual

2. Quick Start Guide

2.1. System Concept

The following diagram shows a simple connection drawing of a Solar Power System:

The System shown has 1 x Array Input, 1 x Battery, and 1 x Load Output but the principle is the same if the system has more than one Array Input and more than one Load Output.



The MSRx Charge Controller provides connections for the Array Input, Battery and Load Output.

It controls the Array & Load Relays to control the Battery charging and discharging.

2.2. System Connections:

2.2.1. Connect the Battery to the MSRx Battery Power connections

2.2.2. Connect the Battery to the MSRx Battery Voltage Sense connections

2.2.3. Connect the MSRx Temperature Sensor to the MSRx Battery Temperature Sense connections

2.2.4. Connect the PV Array(s) to the MSRx Array Input connections

2.2.5. Connect the Load to the MSRx Load Output connections

2.3. System Power On:

2.3.1. Turn on the Battery using whatever disconnect device is provided in the system

2.3.2. Ensure the Enable/Disable Link or Switch on the MSRx PSU/Load PCB Assembly (or MSRx Interface PCB Assembly) is in the Enable position

2.3.3. Turn on each Array Input circuit breaker included in MSRx and externally (if fitted)

2.3.4. Turn on each Load Output circuit breaker included in MSRx and externally (if fitted)

3. MSRx General Operation

The MSRx Charge Controller is designed to control the charging of a battery in a solar power system, preventing damage to the battery due to over-charging or under-charging. It provides maintenance and supervisory functions and a convenient place to interconnect the solar arrays, battery bank and load equipment. The controller is designed for industrial use in high ambient temperature applications.

3.1. MSRx Charge Controller Features

Measurement of Battery Voltage and Battery Temperature

Control of a number of Array Input Relays and Load Output Relays

Measurement of Array, Battery and Load Current

Battery Voltage Regulation Control Algorithm

4-20mA Outputs to signal other equipment

Volt-Free Alarm Relay Outputs & Volt-Free Digital Input to connect to other equipment

Communications Port to allow data communications to other equipment

3.2. Battery Voltage and Temperature Measurement

Battery Voltage and Temperature are measured if connected, and used to accurately control the regulation of the battery as required by the battery manufacturer in order to maximise the battery life. To maximise battery life the battery voltage and temperature should be measured at the battery terminals.

The Battery Temperature is used to calculate a Compensated Battery Voltage to control regulation.

An MSRx Temperature Sensor is provided with the controller. Alternatively, a Resistance Temperature Detector (RTD) may be connected to a MSRx RTD Interface Module to measure temperature in hazardous areas.

If the Battery Temperature Sensor has been selected, the MSRx will check for a valid temperature between -25°C and +75°C. Outside of this range a Battery Temperature Alarm will be active.

3.3. Battery Voltage Regulation Modes

Boost Mode: (Battery Needs Charging)

Array Inputs will be connected to the Battery. If the total Array current is greater than the Load current, the Battery will charge and the Battery Voltage will increase. When the Compensated Battery Voltage reaches the Boost Regulation Voltage, the unit will enter the Equalisation Mode.

Equalisation Mode: (Battery Healthy)

Array Inputs will be disconnected and reconnected to the battery to regulate the Compensated Battery Voltage at the Boost Regulation Voltage during the Equalisation Period. This ensures the battery reaches its optimum state of charge. After the Equalisation Period, the unit will enter the Float Mode. If the Test Mode has been enabled then the Equalisation period will be seconds rather than minutes.

Float Mode: (Battery Healthy)

Array Inputs will be disconnected and reconnected to the battery to regulate the Compensated Battery Voltage at the Float Regulation Voltage. If the Compensated Battery Voltage decreases below the Reset-to Boost Voltage, the unit will reset to Boost Mode. This would typically happen overnight.

Night Mode:

If no Array Inputs are Ready-to-Charge, this is shown on Menu 0 as Night Mode. This is typically at night and the charge controller will disconnect the Arrays Inputs from the battery to avoid the battery discharging back through the array.

3.4. Battery Voltage Regulation Algorithm

The Battery Voltage is read every 0.1 seconds (the instant value). If the Compensated Instant Battery Voltage is greater than or equal to the Battery Regulation Voltage, then all the Array Relays will be disconnected and charging will stop immediately.

The Battery Voltage last 8 values are averaged, which is used for the Battery Voltage display. If the Compensated Average Battery Voltage is less than the Battery Regulation Voltage minus the Regulation Hysteresis Voltage (0.3V for 24V system) then an Array Relay will be requested to be connected.

An Array Relay may only be connected if the open-circuit voltage of the PV Array is more than 2V above the Battery Voltage.

The Array Connection Delay is 60 seconds.

After power up, there will be a delay of 60 seconds before the first Array is connected.

After any Array disconnection, there will be a delay of 60 seconds before any Array is connected.

After one Array is connected, there will be a delay of 60 seconds before the next Array is connected.

The Arrays will be connected in the order: 1, 2, 3, 4, 5, 6, 7, 8 (up to the number of Array Relays there are in the particular Charge Controller).

3.5. Array Voltage Measurement

The open-circuit Array Voltage is measured by disconnecting the Array from the Battery. If an Array Input is connected to the Battery then the Array Relay is opened after a time interval to measure the voltage.

3.6. System Normal / Common Alarm

System Normal is active if no Alarms are active.

Common Alarm is active if any Alarm is active.

3.7. High Voltage 1 & 2 Alarms

If the Compensated Battery Voltage is greater than or equal to the High Volts Set Voltage for the High Volts Alarm Delay time, then the High Volts Alarm will be activated. If the Compensated Battery Voltage is less than or equal to the High Volts Reset Voltage then the High Volts Alarm will be de-activated.

2 x High Volts Alarm functions are provided: HV1 and HV2 (HV2 is disabled by default).

When High Volts 1 Alarm is active, all the Array Relays will be disconnected.

3.8. Low Voltage 1 & 2 Alarms

If the Battery Voltage is less than or equal to the Low Volts Set Voltage for the Low Volts Alarm Delay time, then the Low Volts Alarm will be activated. If the Battery Voltage is greater than or equal to the Low Volts Reset Voltage then the Low Volts Alarm will be de-activated.

2 x Low Volts Alarm functions are provided: LV1 and LV2 (LV2 is disabled by default).

3.9. Load Cut 1 & 2 Alarms

If the Battery Voltage is less than or equal to the Load Cut Set Voltage for the Load Cut Alarm Delay time, then the Load Cut Alarm will be activated. After the Load Cut Delay time, then the Load Relay will be disconnected.

2 x Load Cut Alarm functions are provided: LC1 and LC2 (one for each Load Output).

3.10. Disabled Mode

If the Enable/Disable jumper link on the MSRx PSU/Load PCB Assembly (or the Enable/Disable switch on the MSRx MDR Interface PCB Assembly) is set to the Disable position, then the Controller is in the Disabled Mode. Depending on the setting of Menu D Screen 10 (see Section 5.5) the Array Relays and/or Load Relays may be disconnected.

3.11. Battery Temperature Alarm

The Battery Temperature Alarm allows the user to create a Battery Temperature Alarm if the Battery Temperature goes above or below user defined set-points (see Section 5.4 for details)

3.12. Low Charge Alarm

The Low Charge Alarm is designed to indicate when the Solar Power System is in a low state of charge. See Section 5.3.

3.13. Array Failure Alarm

The Array Failure Alarm is designed to monitor each connected Array Input. This could be used to detect if the Arrays are not providing charge or are stolen. See Section 5.3.

3.14. Initial Charge Mode

The Initial Charge Mode is designed to be used once at commissioning to ensure the batteries are in their optimum condition. See Section 5.5.

3.15. Battery Temperature Charging Function

The Battery Temperature Charging Function is provided to disable battery charging above a user set temperature and enable battery charging below a user set temperature. See Section 5.6.

3.16. Boost Charge Inhibit Function

A Digital Input may be programmed to act as the Boost Charge Inhibit Function (See Section 6.15).

When the Boost Charge Inhibit Function is active the Charge Controller will not go into Boost or Equalisation Mode; i.e. it will stay in Float Mode which means the Charge Controller will charge the batteries only up to the Float Regulation Voltage.

3.17. Status LED

A green Status LED is mounted on the MSRx Control PCB Assembly and is used to indicate the present Mode of the Controller as described in the following table:

Mode	Status LED Operation
Boost Mode	Flash : 0.35 sec on - 0.35 sec off
Equalisation Mode	Flash : 1.05 sec on – 0.35 sec off
Float Mode	Steady
Night Mode	Flash: 0.35 sec on – 2.45 sec off
Disabled	Off

3.18. Power Up Screen

```
MSRx Charge
Controller
```

The Power Up Screen appears when power is first applied and is displayed for 3 seconds before the screen moves to Menu 0 Screen 0.

3.19. Test Mode

The Test Mode can be useful for Factory or Site Testing.

The Test Mode can be turned On or Off using Menu 3 Screen 6

The Test Mode will be automatically turned Off after being On for 30 minutes.

<u>While Test Mode is On:</u>

The Temperature Compensation of the Battery Voltage becomes zero compensation.

The Array Inputs will be considered ready to charge (i.e. they will not depend on the Array Voltage).

The time between connecting Array Relays = 1 second (rather than the normal 60 seconds).

The Equalisation Period will be in seconds rather than minutes.

Once a minute a Timed Data Record is written to the Data Log.

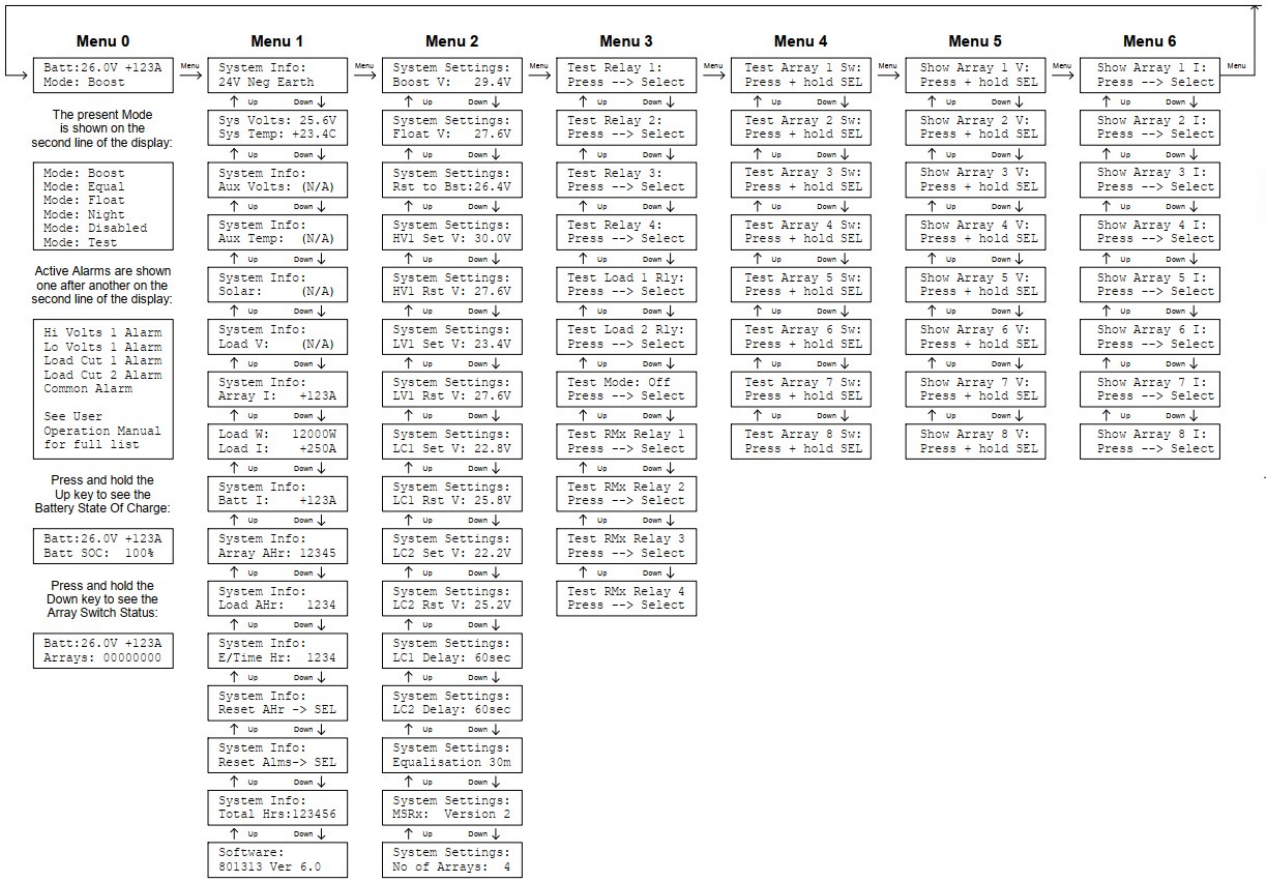
EEPROM Parameters will not be downloaded once a minute to the microprocessor RAM.

Array Voltage Sample Time = 2 seconds

4. MSRx Information Screens

The MSRx Charge Controller has a 2-line by 16-character alphanumeric LCD Display which is used to display system information and settings to the user.

MSRx Information Screens available to the user are shown on the following **Menu Map**:



4.1. Menu Navigation

Menu keypad switch moves the user along the Menus 0 to 6 and back to Menu 0.

Up and **Down** keypad switches moves the user up and down within a Menu.

Select keypad switch activates functions or selects a parameter to change its value.

Pressing **Menu** and **Down** switches at the same time will move the user to **Menu 0 Screen 0**.

Menu 0 Screen 0 is also called the **Home Screen**.

4.1.1. External Switch Input

Menu, Up, Down and Select switches may be duplicated on the exterior of the Controller (using suitable IP rated switches) to allow the user to view the MSRx Information Screens. Alternatively, a single External Switch may be connected to the MSRx Control PCB Assembly on the IN1 switch input and this will provide a limited menu of screens to view some of the controller parameters.

See section 4.9

4.2. Menu 0 – System Information

Menu 0	Screen	System Information Description
Batt:26.5V +123A Batt SOC: 100%	1-Up	Press **Up** switch to see the Battery State of Charge (0-100%)
Batt:26.5V +123A Mode: Boost	Home Screen	Battery Voltage and Current Press **Menu** and **Down** Switches together to return to this screen
Batt:26.5V +123A Arrays: 00000000	1-Down	Press **Down** switch to see the Array Relay Status (0 = Disconnected / 1 = Connected)

Menu 0 Notes:

Battery Current is shown as positive (+) for charge current

Battery Current is shown as negative (-) for discharge current

For a Dual Battery System, Screen 1-Up will show the Battery State of Charge for each Battery Input

Array Relays are also described as Array Switches in this manual.

Menu 0 Screen 0 (Home Screen):

The Home Screen will normally show the present Mode of the unit. If any Alarms are active, the display will show each of the active alarms in sequence. The present Mode will be displayed for 2 seconds followed by the list of alarms for 1 second each. See 4.2.1 for Mode & Alarm Descriptions.

Pressing the Up switch while in Menu 0 will show the Battery State of Charge % (Screen 1U).

Pressing the Down switch while in Menu 0 will show the Array Relay Status (Screen 1D). This screen indicates whether the Array Input is connected or disconnected from the Battery. Reading left to right the display indicates Arrays: 12345678 (depending on the number of Array Inputs).

4.2.1. Menu 0 Line 2 Mode & Alarm Descriptions

Menu 0 Line 2	Mode & Alarm Descriptions
Mode: Boost	Boost Mode
Mode: Equal	Equalisation Mode
Mode: Float	Float Mode
Mode: Night	Night Mode
Mode: Disabled	Disabled Mode
Mode: Test	Test Mode
Initial Charge	Initial Charge Mode
Hi Volts 1 Alarm	High Voltage 1 Alarm active
Lo Volts 1 Alarm	Low Voltage 1 Alarm active
Load Cut 1 Alarm	Load Cut 1 Alarm active (Load 1 Disconnected after delay)
Load Cut 2 Alarm	Load Cut 2 Alarm active (Load 2 Disconnected after delay)
Low Charge Alarm	Low Charge Alarm
Hi Volts 2 Alarm	High Volts 2 Alarm active
Lo Volts 2 Alarm	Low Volts 2 Alarm active
Batt Hi Temp Alm	Battery High Temperature Alarm active
Batt Lo Temp Alm	Battery Low Temperature Alarm active
Batt Volts Alarm	Battery Voltage Sense Alarm
Batt Temp Alarm	Battery Temperature Sense Alarm
Array1 Fail Alarm	Array 1 Failure Alarm
Array2 Fail Alarm	Array 2 Failure Alarm
Array3 Fail Alarm	Array 3 Failure Alarm
Array4 Fail Alarm	Array 4 Failure Alarm
Array5 Fail Alarm	Array 5 Failure Alarm
Array6 Fail Alarm	Array 6 Failure Alarm
Array7 Fail Alarm	Array 7 Failure Alarm
Array8 Fail Alarm	Array 8 Failure Alarm
Earth Leak Alarm	Earth Leak Alarm
Aux Temp Alarm	Auxiliary Temperature Sense Alarm
Hi Load V1 Alarm	High Load Voltage 1 Alarm
Lo Load V1 Alarm	Low Load Voltage 1 Alarm
Hi Load V2 Alarm	High Load Voltage 2 Alarm
Lo Load V2 Alarm	Low Load Voltage 2 Alarm
Aux VIn LV Alarm	Auxiliary Voltage Input: Low Volts Alarm
PV Low O/p Alarm	PV Low Output Alarm
xxxxxxxxxxxxxxx	Digital Input Alarms => See Section 6.15 for full list of descriptions

4.3. Menu 1 – System Information

Menu 1	Screen	System Information Description
System Info: 24V Neg Earth	0	System Voltage: 12V / 24V / 48V System Polarity: Positive Earth or Negative Earth
Sys Volts: 25.6V Sys Temp: +23.4C	1	Shows System Voltage and Temperature See Notes
System Info: Aux Volts: 24.5V	2	Auxiliary Voltage from Analog Input Module if fitted and enabled See Notes
System Info: Aux Temp: +23.4C	3	Aux Temperature from Analog Input Module if fitted and enabled See Notes
System Info: Solar: 1000W/m2	4	Solar Irradiation from Analog Input Module if fitted and enabled See Notes
System Info: Load V: 25.6V	5	Load Voltages See Notes
System Info: Array I: +123A	6	Total Array Current in Amps (If the Array Shunt used is 60-150A then one decimal point is shown)
Load W: 01234W Load I: +12A	7	Total Load Current in Amps / Total Load Watts (If the Load Shunt used is 60-150A then one decimal point is shown)
System Info: Batt I: +123A	8	Total Battery Current in Amps (Calculated from Array Current – Load Current)
System Info: Array AHr:123456	9	Array Current Amp-hours
System Info: Load AHr: 123456	10	Load Current Amp-hours
System Info: E/Time Hr:123456	11	Elapsed Time since last Amp-hour Reset
System Info: Reset AHr -> SEL	12	Press Select to Reset Array Amp-hours, Load Amp-hours, and Elapsed Time Hours
System Info: Reset Alms-> SEL	13	Reset Alarms Press Select to Reset any active alarm
System Info: Total Hr: 123456	14	Total Run Time Hours The Run Time cannot be reset
System Info: Prog 801313 V7.0	15	Program Software Number (801313) and Version Number (7.0)

Menu 1 Notes: see next page

Menu 1 Notes:

If a DRM Analogue Input Module is fitted to the MSRx Controller, it can be enabled to measure and display 1 x Auxiliary Voltage, 1 x Auxiliary Temperature and 1 x Solar Pyranometer. These inputs can be used to measure a second Battery Voltage and Temperature if selected.

Menu 1 Screen 1 – System Voltage and System Temperature (Temp):

Single Battery System: Battery Voltage 1 (BV1) and Battery Temperature 1 (BT1)

BV1 connection is the Battery Voltage Sense Input on the MSRx PSU/Load PCB Assembly

BT1 connection is the Battery Temperature Sensor Input on the MSRx PSU/Load PCB Assembly

Dual Battery System: Battery Voltage 1 & 2 (BV1, BV2) and Battery Temperature 1 & 2 (BT1, BT2)

BV1 connection is the Battery Voltage Sense Input on the MSRx PSU/Load PCB Assembly

BT1 connection is the Battery Temperature Sensor Input on the MSRx PSU/Load PCB Assembly

BV2 connection is the Auxiliary Voltage Input on an Analog Input Module

BT2 connection is the Auxiliary Temperature Sensor on an Analog Input Module

System Voltage may be BV1 or the Average, Highest or Lowest of BV1 and BV2 (see Menu L)

System Temperature may be BT1 or the Average, Highest or Lowest of BT1 and BT2 (see Menu L)

A faulty or disconnected Temperature Sensor will show "---.-C"

Menu 1 Screen 2 – Auxiliary Voltage:

Menu 1 Screen 2 will change depending on functions selected in Setting Menu L:

`System Info:` `Aux Volts: (N/A)`	Screen 2	Menu L Screen 0: Analog Input Module 1 = Disable
`System Info:` `Aux Volts: 26.3V`	Screen 2	Menu L Screen 0: Analog Input Module 1 = Enable Menu L Screen 1: Voltage Input = Enable Menu L Screen 4: Voltage Input = Aux Volts
`BV1 Volts: 26.4V` `BV2 Volts: 26.5V`	Screen 2	Menu L Screen 0: Analog Input Module 1 = Enable Menu L Screen 1: Voltage Input = Enable Menu L Screen 4: Voltage Input = BV1/BV2 Av, Hi, Lo

Menu 1 Screen 3 – Auxiliary Temperature:

Menu 1 Screen 3 will change depending on functions selected in Setting Menu L:

`System Info:` `Aux Temp: (N/A)`	Screen 3	Menu L Screen 0: Analog Input Module 1 = Disable
`System Info:` `Aux Temp: +23.4C`	Screen 3	Menu L Screen 0: Analog Input Module 1 = Enable Menu L Screen 2: Temperature Input = Enable Menu L Screen 4: Temperature Input = Aux Temp
`BT1 Temp: +23.5C` `BT2 Temp: +23.6C`	Screen 3	Menu L Screen 0: Analog Input Module 1 = Enable Menu L Screen 2: Temperature Input = Enable Menu L Screen 4: Temperature Input = BT1/BT2 Av, Hi, Lo

Menu 1 Screen 4 – Solar Irradiation:

Menu 1 Screen 4 will change depending on functions selected in Setting Menu L:

System Info: Solar: (N/A)	Screen 4	Menu L Screen 0: Analog Input Module 1 = Disable
System Info: Solar: 1000W/m2	Screen 4	Menu L Screen 0: Analog Input Module 1 = Enable Menu L Screen 3: Solar Input = Enable

Menu 1 Screen 5 – Load Voltages:

If the MSRx is set as a 19" Rack Controller, the following screen will be shown:

System Info: Load V: 26.5V	Screen 5	Load Voltage is measured at the MSRx Battery Connections

If the MSRx is set as a Version 1 or Version 2 Controller, one of the following screens will be shown:

System Info: Load V: (N/A)	Screen 3	Menu B Screen 3: Load Voltage: None
System Info: Load 1 V: 26.5V	Screen 3	Menu B Screen 3: Load Voltage: Load 1
System Info: Load 2 V: 26.5V	Screen 3	Menu B Screen 3: Load Voltage: Load 2
Load 1 V: 26.4V Load 2 V: 26.5V	Screen 3	Menu B Screen 3: Load Voltage: Load 1 & 2

4.4. Menu 2 – System Settings

Menu 2	Screen	System Settings Description
System Settings: Boost V: 28.8V	0	Boost Regulation Voltage
System Settings: Float V: 28.2V	1	Float Regulation Voltage
System Settings: Rst to Bst:26.4V	2	Reset to Boost Voltage
System Settings: HV1 Set V: 29.4V	3	High Volts 1 Alarm Set (Activation) Voltage
System Settings: HV1 Rst V: 28.8V	4	High Volts 1 Alarm Reset Voltage
System Settings: LV1 Set V: 22.8V	5	Low Volts 1 Alarm Set (Activation) Voltage
System Settings: LV1 Rst V: 24.0V	6	Low Volts 1 Alarm Reset Voltage
System Settings: LC1 Set V: 22.2V	7	Load Cut 1 Alarm Set (Activation) Voltage
System Settings: LC1 Rst V: 24.0V	8	Load Cut 1 Alarm Reset Voltage
System Settings: LC2 Set V: 21.6V	9	Load Cut 2 Alarm Set (Activation) Voltage
System Settings: LC2 Rst V: 24.0V	10	Load Cut 2 Alarm Reset Voltage
System Settings: LC1 Delay: 10sec	11	Load Cut 1 Delay Period in seconds Time between Load Cut 1 Alarm activation and Load 1 disconnection
System Settings: LC2 Delay: 10sec	12	Load Cut 2 Delay Period in seconds Time between Load Cut 2 Alarm activation and Load 2 disconnection
System Settings: Equalisation:30m	13	Equalisation Period in minutes
System Settings: MSRx: Version 2	14	MSRx Control PCB Assembly Hardware: (Default: Version 2) Version 1, Version 2, or 19” Rack
System Settings: No of Arrays: 4	15	Number of Array Inputs: 1-8 e.g. 3 = MSRx3, 8 = MSRx8

4.5. Menu 3 – Test Relays and Loads

Menu 3	Screen	Test Relays & Loads Description
Test Relay 1: Press --> Select	0	Test Relay 1 Press Select to change the state of the Relay contacts and LED
Test Relay 2: Press --> Select	1	Test Relay 2 Press Select to change the state of the Relay contacts and LED
Test Relay 3: Press --> Select	2	Test Relay 3 Press Select to change the state of the Relay contacts and LED
Test Relay 4: Press --> Select	3	Test Relay 4 Press Select to change the state of the Relay contacts and LED
Test Load 1 Rly: Press --> Select	4	Test Load 1 Relay Press Select to change the state of Load 1 Relay and LED
Test Load 2 Rly: Press --> Select	5	Test Load 2 Relay Press Select to change the state of Load 1 Relay and LED
Test Mode: Off Press --> Select	6	Test Mode: Off or On Press Select to change the state of the Test Mode
Test RMx Relay 1 Press --> Select	7	Test Relay Module x Relay 1 Press Select to change the state of the Relay contacts and LED
Test RMx Relay 2 Press --> Select	8	Test Relay Module x Relay 2 Press Select to change the state of the Relay contacts and LED
Test RMx Relay 3 Press --> Select	9	Test Relay Module x Relay 3 Press Select to change the state of the Relay contacts and LED
Test RMx Relay 4 Press --> Select	10	Test Relay Module x Relay 4 Press Select to change the state of the Relay contacts and LED

Menu 3 Notes:

Pressing Select will toggle the state of the Relay for as long as Select is pressed

Screens 7-10 will test one Relay on all connected Relay Modules at the same time:

e.g. Module 1 Relay 1 AND Module 2 Relay 1 etc

(this is just for test purposes to check the operation and wiring of the relay contacts)

4.6. Menu 4 – Test Array Switches

Caution:

Testing the Array Solid-State Switches, (Relays or Contactors depending on Controller design) will connect or disconnect the Array Inputs to or from the Battery.

Menu 4	Screen	Test Array Switches/Relays Description
Test Array 1 Sw: Press + hold SEL	0	Test Array 1 Solid-State Switch / Relay / Contactor
Test Array 2 Sw: Press + hold SEL	1	Test Array 2 Solid-State Switch / Relay / Contactor
Test Array 3 Sw: Press + hold SEL	2	Test Array 3 Solid-State Switch / Relay / Contactor
Test Array 4 Sw: Press + hold SEL	3	Test Array 4 Solid-State Switch / Relay / Contactor
Test Array 5 Sw: Press + hold SEL	4	Test Array 5 Solid-State Switch / Relay / Contactor
Test Array 6 Sw: Press + hold SEL	5	Test Array 6 Solid-State Switch / Relay / Contactor
Test Array 7 Sw: Press + hold SEL	6	Test Array 7 Solid-State Switch / Relay / Contactor
Test Array 8 Sw: Press + hold SEL	7	Test Array 8 Solid-State Switch / Relay / Contactor

Menu 4 Notes:

Pressing Select will toggle the state of the Array Relay for as long as Select is pressed.

4.7. Menu 5 – Array Voltages

Caution:

Showing an Array Input Voltage will disconnect the Array Input from the Battery

Menu 5	Screen	Show Array Voltages Description
Show Array 1 V: Press + hold SEL	0	Show Array 1 open-circuit Array Voltage
Show Array 2 V: Press + hold SEL	1	Show Array 2 open-circuit array voltage
Show Array 3 V: Press + hold SEL	2	Show Array 3 open-circuit array voltage
Show Array 4 V: Press + hold SEL	3	Show Array 4 open-circuit array voltage
Show Array 5 V: Press + hold SEL	4	Show Array 5 open-circuit array voltage
Show Array 6 V: Press + hold SEL	5	Show Array 6 open-circuit array voltage
Show Array 7 V: Press + hold SEL	6	Show Array 7 open-circuit array voltage
Show Array 8 V: Press + hold SEL	7	Show Array 8 open-circuit array voltage

Menu 5 Notes:

Pressing Select will open (or keep open) the Array Relay for as long as Select is pressed

It is only possible to measure the open circuit Array Voltage if there is a PV Array Module connected to the Array Input, and if any Array Input Circuit Breaker is in the ON position.

If the Array Input Circuit Breaker is in the OFF position, then it is not possible to measure the open circuit Array Voltage and the measurement shown will be the battery voltage.

4.8. Menu 6 – Array Currents

Caution:

Showing an Array Input Current will connect that Array Input to the Battery and disconnect all other Array Inputs from the Battery

Menu 6	Screen	Show Array Currents Description
Show Array 1 I: Press --> Select	0	Show Array 1 Current
Show Array 2 I: Press --> Select	1	Show Array 2 Current
Show Array 3 I: Press --> Select	2	Show Array 3 current
Show Array 4 I: Press --> Select	3	Show Array 4 current
Show Array 5 I: Press --> Select	4	Show Array 5 current
Show Array 6 I: Press --> Select	5	Show Array 6 current
Show Array 7 I: Press --> Select	6	Show Array 7 current
Show Array 8 I: Press --> Select	7	Show Array 8 current

Menu 6 Notes:

Pressing Select will connect that Array Input to the Battery and disconnect all other Array Inputs from the Battery for 5 seconds and show the Array Current on the display. The user will be unable to move up and down the Menu during the 5 second period.

It is only possible to measure the closed circuit Array Current if there is a PV Array Module connected to the Array Input, and if any Array Input Circuit Breaker is in the ON position.

4.9. Menu X – External Switch Menu (Added in Software 801313 V6.0)

Menu X	Screen	External Switch Menu
Batt:26.5V +123A Mode: Boost	0	Battery Voltage and Current Mode and active alarms
Load V: 26.0V Load I: 23A	1	Load Voltage and Current
Array 1: 34.5V 15A	2	Array 1 Open-Circuit Voltage and Closed Circuit Current
Array 2: 34.5V 15A	3	Array 2 Open-Circuit Voltage and Closed Circuit Current
Array 3: 34.5V 15A	4	Array 3 Open-Circuit Voltage and Closed Circuit Current
Array 4: 34.5V 15A	5	Array 4 Open-Circuit Voltage and Closed Circuit Current
Array 5: 34.5V 15A	6	Array 5 Open-Circuit Voltage and Closed Circuit Current
Array 6: 34.5V 15A	7	Array 6 Open-Circuit Voltage and Closed Circuit Current
Array 7: 34.5V 15A	8	Array 7 Open-Circuit Voltage and Closed Circuit Current
Array 8: 34.5V 15A	9	Array 8 Open-Circuit Voltage and Closed Circuit Current

Menu X Notes:

Menu X is entered by pressing the switch connected to the MSRx Control PCBA IN1 input.

Menu X provides a limited number of screens with system information.

Pressing the External Switch will loop round the screens in turn.

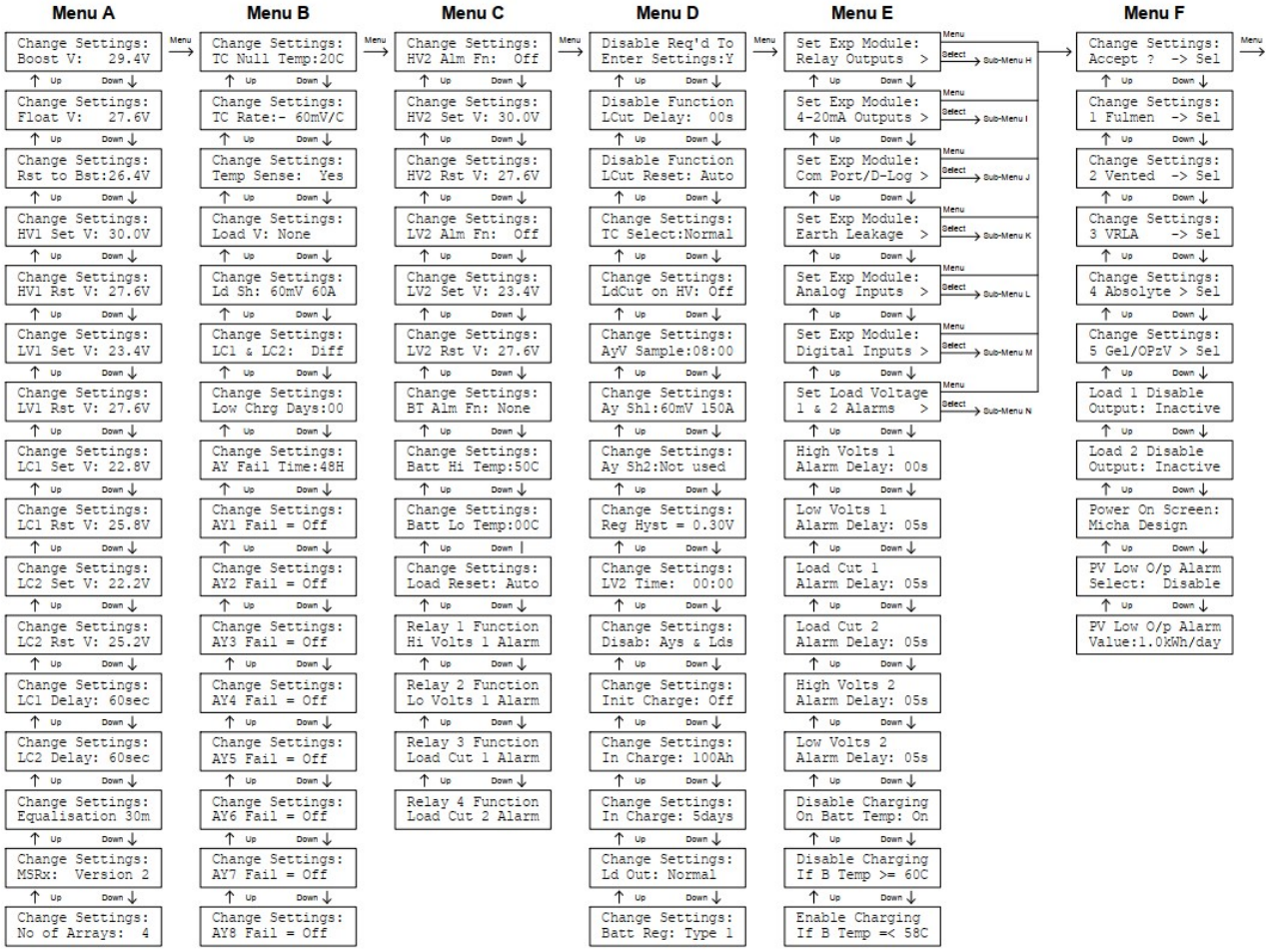
After 4 minutes of no switch presses (External or Internal) the screen will return to the Home Screen.

This Menu allows the user to see a limited number of screens without opening the door (if there is a window installed in the enclosure).

5. MSRx Change Settings Screens

MSRx Change Settings Screens allow a user to modify the parameters used in the controller.

The Screens available to the user are described on the following **Menu Map**:



5.1. Entering the Change Settings Menus

MSRx Standard Charge Controller with default settings:

Press and hold the **Menu**, **Up** and **Down** keypad switches all at the same time, and then press **Select**.

If Menu D Screen 0: Disable Required to Enter Settings = Yes

On the MSRx PSU/Load PCB Assembly or the MSRx Interface PCB Assembly, move the Enable/Disable Switch to the DISABLE position

Press and hold the **Menu**, **Up** and **Down** keypad switches all at the same time, and then press **Select**.

5.1.1. Menu Navigation

The Menu, Up and Down switches are used to navigate to the setting to be changed.

Pressing the Select switch will make the parameter flash. The Up and Down switches are then used to vary the value. The Select switch is pressed again and the value will stop flashing.

The Menu, Up and Down switches are used again to navigate to another setting to be changed or to navigate to the “Accept” screen.

Auto-Repeat: When a setting value is flashing, if the Up or Down switch is pressed and held for more than 0.5 seconds, then the parameter will increase or decrease rapidly.

5.1.2. Accepting Changes to Settings

IMPORTANT:

After adjusting any parameter, the user MUST navigate to the “Accept” screen and press the Select switch.

The unit will not remember any changes to settings unless they are accepted using this screen.

5.1.3. Default Settings

The user can reset some of the battery settings back to factory default settings (presets).

Refer to Section 5.7 and Section 7 for the battery settings which are re-programmed if the user chooses to reset some settings back to the factory default settings (presets).

5.1.4. Exiting the Change Settings Menus

Pressing the Menu switch at one of the Menu F screens, will exit the Change Settings Menus without remembering any changes. The user is taken back to Menu 0.

Pressing the Select switch at the Accept screen (Screen 0) will exit the Change Settings Menus and will remember any changes. The user is taken back to Menu 0.

Pressing the Select switch at any of the battery Settings Default screens will exit the Change Settings Menus and the new default values will be programmed into the unit. The user is taken back to Menu 0.

5.2. Menu A – Change Settings

Menu A	Screen	Change Settings Description
Change Settings: Boost V: 28.2V	0	Boost Regulation Voltage
Change Settings: Float V: 27.4V	1	Float Regulation Voltage
Change Settings: Rst to Bst:25.3V	2	Reset to Boost Voltage
Change Settings: HV1 Set V: 28.8V	3	High Volts 1 Alarm Set (Activation) Voltage (see section 3.7)
Change Settings: HV1 Rst V: 25.8V	4	High Volts 1 Alarm Reset Voltage (see section 3.7)
Change Settings: LV1 Set V: 22.8V	5	Low Volts 1 Alarm Set (Activation) Voltage (see section 3.8)
Change Settings: LV1 Rst V: 27.0V	6	Low Volts 1 Alarm Reset Voltage (see section 3.8)
Change Settings: LC1 Set V: 22.2V	7	Load Cut 1 Alarm Set (Activation) Voltage (see section 3.9)
Change Settings: LC1 Rst V: 27.0V	8	Load Cut 1 Alarm Reset Voltage (see section 3.9)
Change Settings: LC2 Set V: 21.6V	9	Load Cut 2 Alarm Set (Activation) Voltage (see section 3.9)
Change Settings: LC2 Rst V: 24.6V	10	Load Cut 2 Alarm Reset Voltage (see section 3.9)
Change Settings: LC1 Delay: 10sec	11	Load Cut 1 Delay (5 to 240 seconds) Time between LC1 Alarm activated and Load 1 disconnected
Change Settings: LC2 Delay: 10sec	12	Load Cut 2 Delay (5 to 240 seconds) Time between LC2 Alarm activated and Load 2 disconnected
Change Settings: Equalisation 30m	13	Equalisation Period (1 to 90 minutes)
Change Settings: MSRx: Version 2	14	MSRx Control PCB Assembly Hardware: Fixed at “Version 2” (Cannot be changed)
Change Settings: No of Arrays: 4	15	Number of Array Inputs: 1-8 e.g. 8 = MSRx8 = 8 stage Charge Controller

5.3. Menu B – Change Settings

Menu B	Screen	Change Settings Description
Change Settings: TC Null Temp:25C	0	Temperature Compensation Null Temperature The temperature at which zero compensation is applied
Change Settings: TC Rate:- 60mV/C	1	Temperature Compensation Rate: -xxxmV / °C
Change Settings: Temp Sense: Yes	2	Battery Temperature Sensor: Yes/No (Default = Yes) (see notes on next page)
Change Settings: Load V: None	3	Load Voltage: None, Load1V, Load 2V, Load 1&2 (See Menu 1 Screen 5 for details – Section 4.3)
Change Settings: Ld Sh: 60mV 60A	4	Load Shunt 60mV value select: 30A, 60A, 100A, 150A, 200A, 250A, 300A, 400A
Change Settings: LC1 & LC2: Diff	5	Load Cut 1 & Load Cut 2: Diff (Different) or Same (see notes on next page)
Change Settings: Low Chrg Days:00	6	Low Charge Days: 0-15 (default = 0) (see notes on next page)
Change Settings: AY Fail Time:48H	7	Array Fail Time: 1-96 hours (default = 48) Number of hours each selected array input will be monitored
Change Settings: AY1 Fail = Off	8	Array 1 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY2 Fail = Off	9	Array 2 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY3 Fail = Off	10	Array 3 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY4 Fail = Off	11	Array 4 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY5 Fail = Off	12	Array 5 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY6 Fail = Off	13	Array 6 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY7 Fail = Off	14	Array 7 Failure select: Off or On Set to On to select the Array Failure monitoring on this array
Change Settings: AY8 Fail = Off	15	Array 8 Failure select: Off or On Set to On to select the Array Failure monitoring on this array

Menu B Notes: see next page

Menu B Notes:

Menu B Screens 2 – Battery Temperature Sensor:

Battery Temperature Sensor = Yes: (default)

Battery Temperature Sensor fitted. Temperature Compensation will be applied to the Battery Voltage.

Battery Temperature Sensor = No:

Battery Temperature Sensor not fitted. Temperature Compensation will not be applied to the Battery Voltage.

Menu B Screens 5 – Load Cut 1 & Load Cut 2:

When using the Solid-State Relay version of the MSRx, it is possible to connect Load 1 Output and Load 2 Output in parallel to provide a higher rated current capability.

Load Cut 1 & Load Cut 2: Diff (default)

Load Output 1 and Load Output 2 are connected and controlled independently

Load Cut 1 & Load Cut 2: Same

Load Output 1 and Load Output 2 are connected and controlled together

(If Load Output 1 and Load Output 2 are connected in parallel, this parameter MUST be set to: Same)

Menu B Screens 6 – Low Charge Days:

Low Charge Alarm Function

The Low Charge Alarm function is designed to indicate when the Solar Power System is in a low state of charge. A Low Charge Day is defined as being a 24 hour period in which the Array Ahr is less than 90% of the Load Ahr (i.e. the energy being put into the system is less than that taken out). The controller makes a decision one hour after dusk as to whether the preceding 24 hour period was a Low Charge Day or not.

The Low Charge Alarm function can be disabled by setting the Low Charge Days parameter to 0 days (default). The Low Charge Alarm function is enabled by setting the Low Charge Days parameter to a number of days between 1 and 15. The Low Charge Alarm will then be activated if the consecutive number of Low Charge Days is equal to or greater than the Low Charge Days parameter. The Low Charge Alarm will de-activate when a 24 hour period has elapsed which is not a Low Charge Day.

Menu B Screens 7-15 – Array Failure Alarm:

The Array Failure Alarm is designed to monitor each connected Array Input. This could be used to detect if the Arrays are not providing charge or are stolen.

The function works by detecting the array voltage as being greater than the battery voltage during the Array Failure time period. During times of darkness there will be no array voltage, but even on a cloudy day each array input will generate enough voltage to detect its presence. The Array Failure time (Menu B Screen 7) should not be set to less than 24 hours.

The function must be enabled for each connected Array Input using Menu B Screens 8-15.

5.4. Menu C – Change Settings

Menu C	Screen	Change Settings Description
Change Settings: HV2 Alm Fn: Off	0	High Volts 2 Alarm Function: Select Off or On (Default = Off) (See Section 3.7 for operation)
Change Settings: HV2 Set V: 30.0V	1	High Volts 2 Alarm Set (Activation) Voltage (See Section 3.7 for operation)
Change Settings: HV2 Rst V: 27.6V	2	High Volts 2 Alarm Reset Voltage (See Section 3.7 for operation)
Change Settings: LV2 Alm Fn: Off	3	Low Volts 2 Alarm Function: Select Off or On (Default = Off) (See Section 3.8 for operation)
Change Settings: LV2 Set V: 23.4V	4	Low Volts 2 Alarm Set (Activation) Voltage (See Section 3.8 for operation)
Change Settings: LV2 Rst V: 27.6V	5	Low Volts 2 Alarm Reset Voltage (See Section 3.8 for operation)
Change Settings: BT Alm Fn: None	6	Battery Temperature Alarm Function: 0=None, 1=High, 2=Low, 3=Hi&Lo (see notes on next page)
Change Settings: Batt Hi Temp:50C	7	Battery High Temperature Alarm Temperature (see notes on next page)
Change Settings: Batt Lo Temp:00C	8	Battery Low Temperature Alarm Temperature (see notes on next page))
Change Settings: Load Reset: Auto	9	Load Cut Reset Operation: Auto or Manual (Default = Auto) (see notes on next page)
Relay 1 Function Hi Volts 1 Alarm	10	Relay 1 Function Any Alarm Function may be assigned (see next page)
Relay 2 Function Lo Volts 1 Alarm	11	Relay 2 Function Any Alarm Function may be assigned (see next page)
Relay 3 Function Load Cut 1 Alarm	12	Relay 3 Function Any Alarm Function may be assigned (see next page)
Relay 4 Function Load Cut 2 Alarm	13	Relay 4 Function Any Alarm Function may be assigned (see next page)

Menu C Notes: see next page

Menu C Notes:

Menu C Screens 6-8 – Battery Temperature Alarm Operation:

Battery Temperature 1 (BT1) Sensor is connected to the MSRx PSU/Load PCB Assembly

Battery Temperature 2 (BT2) Sensor can be fitted using Micha PN: 103241 DRM Analogue Input Module

The Battery Temperature Sense selection (Menu B Screen 2) must be set to "Yes" for the Battery Temperature Alarm to be enabled (i.e. BT1 Sensor must be fitted).

Battery Temperature Alarm Function select (Menu C Screen 6):

None => No Battery Temperature Alarm

High => Battery High Temperature Alarm only

Low => Battery Low Temperature Alarm only

Hi&Lo => Battery High & Low Temperature Alarm

Battery High & Low Temperature Alarm set-points are adjusted using Menu C Screens 7 & 8

Menu Settings to use BT1 and BT2 Battery Temperature Sensors:

Screen Text	Screen	Setting Description
Change Settings: Temp Sense: Yes	Menu B Screen 2	Battery Temperature 1 (BT1) Sensor: Must be set to Yes to Enable Battery Temperature Alarm
Change Settings: BT Alm Fn: None	Menu C Screen 6	Battery Temperature Alarm Function: None: Battery Temperature Alarm Disabled High / Low / Hi&Lo: Battery Temperature Alarm Enabled
Analog I/p Mod:1 T Input: Disable	Menu L Screen 2	Analogue Input Module 1: Temperature Input Enable: Disable: BT1 only used for Battery Temperature Alarm Enable: See Menu L Screen 5
Analog I/p Mod:1 T In: Aux Temp	Menu L Screen 5	Analogue Input Module 1: Temperature Input Select: Aux Temp: BT2 only used for Battery Temperature Alarm BT1/BT2 Av: BT1 & BT2 used for Battery Temperature Alarm BT1/BT2 Hi: BT1 & BT2 used for Battery Temperature Alarm BT1/BT2 Lo: BT1 & BT2 used for Battery Temperature Alarm

Battery Temperature Alarm Operation:

If the Battery High Temperature Alarm function is selected, then if the Battery Temperature is greater than or equal to the Battery High Temperature set-point, then the Battery High Temperature Alarm function will be activated. If the Battery Temperature is less than the Battery High Temperature set-point by 2 degrees then the Battery High Temperature Alarm function will be de-activated.

If the Battery Low Temperature Alarm function is selected, then if the Battery Temperature is less than or equal to the Battery Low Temperature set-point, then the Battery Low Temperature Alarm function will be activated. If the Battery Temperature is greater than the Battery Low Temperature set-point by 2 degrees then the Battery Low Temperature Alarm function will be de-activated.

Menu C Screen 9 – Load Cut Reset Operation:

Load Reset = Auto: If the Battery Voltage is greater than or equal to the Load Cut Reset Voltage, then the Load Cut Alarm will be deactivated and the Load Relay will be reconnected.

Load Reset = Manual: If the Battery Voltage is greater than or equal to the Load Cut Reset Voltage AND the Menu and Select keypad switches are pressed together, then the Load Cut Alarm will be deactivated and the Load Relay will be reconnected.

Menu C Screens 10-13 – Alarm Relay / Alarm LED Functions:

The MSRx Charge Controller has 4 x Alarm Relay Outputs as standard.

The MSRx Charge Controller may have a maximum of 4 x 4-Channel Alarm Relay Modules fitted with each Module providing 4 x Alarm Relay Outputs (see section 6.10 for programming information).

The MSRx Charge Controller may have a maximum of 4 x 4-Channel Alarm Indicator / Latching Indicator Modules fitted with each Module providing 4 x Alarm LEDs (see section 6.10 for programming information).

Any Alarm Output may be may be programmed to any of the following Alarm Functions:

Displayed Text	Alarm Function Description
Not Used	No alarm function programmed
Hi Volts 1 Alarm	High Volts 1 Alarm
Lo Volts 1 Alarm	Low Volts 1 Alarm
Load Cut 1 Alarm	Load Cut 1 Alarm (Load 1 Disconnect Alarm)
Load Cut 2 Alarm	Load Cut 2 Alarm (Load 2 Disconnect Alarm)
Common Alarm	Common Alarm = any active alarm
System Normal	System Normal = no active alarm
Array Fail Alarm	Array Failure Alarm
Low Charge Alarm	Low Charge Alarm
Hi Volts 2 Alarm	High Volts 2 Alarm active
Lo Volts 2 Alarm	Low Volts 2 Alarm active
Batt Hi Temp Alm	Battery High Temperature Alarm active
Batt Lo Temp Alm	Battery Low Temperature Alarm active
Batt Volts Alarm	Battery Voltage Sense Alarm
Batt Temp Alarm	Battery Temperature Sense Alarm
LC1 Alm Act: Off	Load Cut 1 Alarm Active (Alarm Active = Relay Off)
Earth Leak Alarm	Digital Input: Earth Leak Alarm
O/p Feed Sum Alm	Digital Input: Output Feeder Summary Alarm
Fire Detect Alm	Digital Input: Fire Detect Alarm
DCDC1 Fault Alm	Digital Input: DCDC1 Fault Alarm
OVL Fault Alarm	Digital Input: OVL Fault Alarm
Batt1 Disconnect	Digital Input: Battery 1 Disconnect Alarm
Batt2 Disconnect	Digital Input: Battery 2 Disconnect Alarm
Load MCCB Trip	Digital Input: Load MCCB Trip
Load Volts Relay	Digital Input: Load Volts Relay

Ground Fault Alm	Digital Input: Ground Fault Alarm
Hi Load V1 Alarm	High Load Voltage 1 Alarm
Lo Load V1 Alarm	Low Load Voltage 1 Alarm
Hi Load V2 Alarm	High Load Voltage 2 Alarm
Lo Load V2 Alarm	Low Load Voltage 2 Alarm
CP Common Alarm	Digital Input: CP Common Alarm
Night Mode Alarm	Night Mode Alarm (active when Controller is in Night Mode)
DCDC2 Fault Alm	Digital Input: DCDC2 Fault Alarm
DB1 O/P Feed Alm	Digital Input: Distribution Board 1 Output Feeder Alarm
DB2 O/P Feed Alm	Digital Input: Distribution Board 2 Output Feeder Alarm
Bst Chrg Inhibit	Digital Input: Boost Charge Inhibit (see section 3.16)
Batt CB Status	Digital Input: Battery MCCB Status (On/Off)
Batt CB Trip	Digital Input: Battery MCCB Status (Trip)
DB Trip Com Alm	Digital Input: DB Breaker Trip Common Alarm
Earth Fault Alm	Digital Input: Earth Fault Alarm
59 Over/V Alarm	Digital Input: 59 (Over Voltage) Alarm
27 Under/V Alarm	Digital Input: 27 (Under Voltage) Alarm
Aux VIn LV Alarm	Auxiliary Voltage Input: Low Volts Alarm
Boost Mode Alarm	Boost Mode Alarm (active when Controller is in Boost Mode)
Equal Mode Alarm	Equal Mode Alarm (active when Controller is in Equalisation Mode)
Float Mode Alarm	Float Mode Alarm (active when Controller is in Float Mode)
Water Low Alarm	Digital Input: Water Low Alarm
Door Open Alarm	Digital Input: Door Open Alarm
Batt Power Fault	Digital Input: Batt Power Fault
PV Input Fault	Digital Input: PV Input Fault
DB1 CB Trip Alm	Digital Input: DB1 CB Trip Alarm
DB2 CB Trip Alm	Digital Input: DB2 CB Trip Alarm
PV Low O/p Alarm	PV Low Output Alarm

5.5. Menu D – Change Settings

Menu D	Screen	Change Settings Description
Disable Req'd To Enter Settings:N	0	Disable Switch or Link Required to Enter Settings Menus? Y = Yes / N = No (default)
Disable Function LCut Delay: 00s	1	Disable Function Load Cut Delay: 0-240 seconds (default = 00s)
Disable Function LCut Reset: Auto	2	Disable Function Load Cut Reset: Auto = Automatic (default) / Man = Manual (use Menu 1 Screen 13)
Change Settings: TC Select:Normal	3	Temperature Compensation Function Select: (see notes on next page)
Change Settings: LdCut on HV1:Off	4	Load Cut on High Volts 1 Alarm: (default = Off) (see notes on next page)
Change Settings: AyV Sample:08:00	5	Array Voltage Sample Time: 15 secs to 16 mins (default 8 mins) (see notes on next page)
Change Settings: Ay Sh1:60mV 150A	6	Array Shunt 1 60mV value select: Not used, 60A, 100A, 120A, 150A, 200A, 250A, 300A, 400A, 500A
Change Settings: Ay Sh2:Not used	7	Array Shunt 2 60mV value select: Not used, 60A, 100A, 120A, 150A, 200A, 250A, 300A, 400A, 500A
Change Settings: Reg Hyst = 0.30V	8	Regulation Hysteresis: (see notes on next page)
Change Settings: LV2 Time: 00:00	9	Low Volts 2 Alarm Time: (see notes on next pages)
Change Settings: Disab: Ays & Lds	10	Disable Function: (see notes on next pages)
Change Settings: Init Charge: Off	11	Initial Charge Function: Off / On (default = Off) (see notes on next pages)
Change Settings: In Charge: 100Ah	12	Initial Charge Function: Max = 9990Ah Initial Charge Array Ah (see notes on next pages)
Change Settings: In Charge: 5days	13	Initial Charge Function: Initial Charge Days (see notes on next pages)
Change Settings: Ld Out: Normal	14	Load Output Drive Select: Normal / Inverted (default = Normal) (see notes on next pages)
Change Settings: Batt Reg: Type 1	15	Battery Regulation Type: Type 1 / Type 2 (default = Type 1) (see notes on next pages)

Menu D Notes: see next page

Menu D Notes:

Menu D Screen 0 – Disable Required to Enter Settings Menus:

In some applications the Disable Input is used as a Remote Disable and so the Disable Link or Switch cannot be used to Enter the Settings Menus

Menu D Screen 1 – Disable Function Load Cut Delay:

The Disable Function (Disable Link or Switch or Remote Input) will cut the Loads (Depending on Menu D Screen 10 setting) after a delay that can be set from 0-240 seconds (default = 00s)

Menu D Screen 2 – Disable Function Load Cut Reset:

If the Disable Function Load Cut Reset = Auto (Automatic) then when the Disable Function is inactive the Loads will be re-connected automatically.

If the Disable Function Load Cut Reset = Man (Manual) then when the Disable Function is inactive the Loads will be re-connected only after the user goes to Menu 1 Screen 13 (Reset Alarms) and presses the Select switch.

Menu D Screen 3 – Temperature Compensation Function Select:

None = no temperature compensation applied

Normal = temperature compensation applied above and below the Null Temperature

Low T = temperature compensation applied only below the Null Temperature

Menu D Screen 4 – Load Cut on High Volts 1 Alarm:

Off = Load is connected when High Volts 1 Alarm is active (this is normal operation)

On = Load is disconnected when High Volts 1 Alarm is active

Menu D Screen 5 – Array Voltage Sample Time:

The time between successive array voltage measurement on the same array when connected to the battery. The open-circuit Array Voltage is measured by disconnecting the Array from the Battery. The default value is 8 minutes, i.e. every 8 minutes each array will be disconnected from the battery to measure the open-circuit voltage. This happens sequentially one array each minute. If an array is not connected to the battery, its open-circuit voltage can be measured at any time.

Menu D Screen 8 – Regulation Hysteresis:

During regulation, the controller will disconnect the arrays from the battery when the compensated battery voltage reaches the regulation voltage. It will re-connect the arrays to the battery when the compensated battery voltage falls below the regulation voltage by 0.15V (12V system), 0.3V (24V system) or 0.6V (48V system). This is known as the Regulation Hysteresis and can be adjusted if required.

Menu D Screen 9 – Low Voltage 2 Alarm Time:

Low Volts 2 Alarm Time range: 0 (default), 5mins, 15mins, 30mins, 1, 2, 4, 6, 8, 10, 12 hours

Low Volts 2 Alarm Time = 0: The Low Volts 2 Alarm will operate as normal (this is the default)

Low Volts 2 Alarm Time not equal to 0: When the Low Volts 2 Alarm is active, it will remain active until the battery voltage is greater than or equal to the Low Volts 2 Alarm Reset Voltage OR the Low Volts 2 Time has expired.

It is possible to program an Alarm Relay to be active on the Low Volts 2 Alarm and use the Relay contacts to start a generator. The generator would run for the Low Volts 2 Time or until it reached the Low Volts 2 Alarm Reset Voltage.

Menu D Notes (continued):

Menu D Screen 10 – Disable Function:

The Disable Function is activated using the Enable/Disable jumper link or slide switch (depending on the hardware version) or the Remote Disable Input. See also Menu D Screen 1.

The user can use this screen to select the Disable Function operation:

"Ays & Lds"	= Disable Arrays and Loads	=> disconnects all array relays and load relays (default)
"Ays Only"	= Disable Arrays Only	=> disconnects all array relays
"Lds Only"	= Disable Loads Only	=> disconnects all load relays
"None"	= None	=> no relays disconnected

Menu D Screen 11 – Initial Charge Function:

The Initial Charge Mode is designed to be used once at commissioning to ensure the batteries are in their optimum condition.

If the Initial Charge Mode = On, the unit will remain in the Initial Charge Mode until:

(a) the user sets the Initial Charge Mode = Off, or

(b) the Charging Array Ah is greater than the Initial Charge Array Ah (Menu D Screen 12), or

(c) the Charging Days is greater than the Initial Charge Days (Menu D Screen 13)

(d) power to the MSRx Charge Controller is lost - then the Initial Charge Mode will stop

If the Initial Charge Mode = On, the following conditions will exist:

(a) If the Arrays are ready to charge they will be connected to the battery (i.e. no regulation).

(b) High Volts Alarms will not activate

(c) The Loads will be disconnected

At the end of the Initial Charge Mode, normal operation will automatically resume (i.e. loads connected)

Menu D Screen 14 – Load Output Drive Select:

The controller may be used with normally open or normally closed Load Output Relays:

"Normal"	= Normally Open Load Relays
"Inverted"	= Normally Closed Load Relays

Menu D Screen 15 – Battery Regulation Type:

Battery Regulation = Type 1:

Each Array Input open-circuit voltage is measured to determine if that Array Input is Ready-to-Charge the battery. The Array is considered Ready-to-Charge if the open-circuit voltage is greater than the battery voltage by 2V.

Battery Regulation = Type 2:

All the Array Inputs are considered Ready-to-Charge the battery (i.e. it is not dependent on the Array Input open-circuit array voltage). For this mode, blocking diodes are required in the system to prevent the battery discharging into the PV Arrays at night.

5.6. Menu E – Change Settings

Menu E	Screen	Change Settings Description
Set Exp Module: Relay Outputs >	0	Relay Output Expansion Module settings screens > Press Select to go to Sub-Menu H
Set Exp Module: 4-20mA Outputs >	1	4-20mA Output Expansion Module settings screens > Press Select to go to Sub-Menu I
Set Exp Module: Com Port/D-Log >	2	Com Port/Data Log Expansion Module settings screens > Press Select to go to Sub-Menu J
Set Exp Module: Earth Leakage >	3	Earth Leakage Expansion Module settings screens > Press Select to go to Sub-Menu K
Set Exp Module: Analog Inputs >	4	Analogue Input Expansion Module settings screens > Press Select to go to Sub-Menu L
Set Exp Module: Digital Inputs >	5	Digital Input Expansion Module settings screens > Press Select to go to Sub-Menu M
Set Load Voltage 1 & 2 Alarms >	6	Load Voltage 1 & 2 Alarm settings screens > Press Select to go to Sub-Menu N
High Volts 1 Alarm Delay: 00s	7	High Volts 1 Alarm Delay: (default = 0 seconds) (See Section 3.7 for operation)
Low Volts 1 Alarm Delay: 05s	8	Low Volts 1 Alarm Delay (default = 5 seconds) (See Section 3.8 for operation)
Load Cut 1 Alarm Delay: 05s	9	Load Cut 1 Alarm Delay (default = 5 seconds) (See Section 3.9 for operation)
Load Cut 2 Alarm Delay: 05s	10	Load Cut 2 Alarm Delay (default = 5 seconds) (See Section 3.9 for operation)
High Volts 2 Alarm Delay: 05s	11	High Volts 2 Alarm Delay (default = 5 seconds) (See Section 3.7 for operation)
Low Volts 2 Alarm Delay: 05s	12	Low Volts 2 Alarm Delay (default = 5 seconds) (See Section 3.8 for operation)
Disable Charging On Batt Temp: On	13	Disable Charging on Battery Temperature Function: Off / On (see notes on next page)
Disable Charging If B Temp >= 60C	14	Disable Charging If Battery Temperature is greater than or equal to Parameter (see notes on next page)
Enable Charging If B Temp =< 58C	15	Enable Charging If Battery Temperature is less than or equal to Parameter (see notes on next page)

Menu E Notes: see next page

Menu E Notes:

Menu E Screen 0-5 – Expansion Port Modules:

For full details of the Expansion Port Modules and the Settings Menu, see Section 6

Menu E Screen 13 – Battery Temperature Charging Function: (Default = On)

Disable Charging on Battery Temperature Function = Off:

No change to charge controller operation

Disable Charging on Battery Temperature Function = On:

If the Battery Temperature is greater than or equal to the High Temperature Parameter (set using Menu E Screen 13), then Battery Charging will be Disabled.

If the Battery Temperature is equal to or less than the Low Temperature Parameter (set using Menu E Screen 14), then Battery Charging will be Enabled.

Menu E Screen 14 – Battery Temperature Charging High Temperature Parameter:

Disable Charging If Battery Temperature is greater than or equal to High Temperature Parameter

Parameter can be adjusted from 1-70°C (default = 60°C)

Menu E Screen 15 – Battery Temperature Charging Low Temperature Parameter:

Enable Charging If Battery Temperature is less than or equal to Low Temperature Parameter

Parameter can be adjusted from 0-69°C (default = 58°C)

5.7. Menu F – Change Settings

Menu F	Screen	Change Settings Description
Change Settings: Accept ? -> SEL	0	Press Select to Accept any changes made Press Menu to ignore any changes made
Change Settings: 1 Fulmen -> SEL	1	Press Select to program Fulmen Battery Setting into memory Press Menu to ignore any changes made
Change Settings: 2 Vented -> SEL	2	Press Select to program Vented Battery Setting into memory Press Menu to ignore any changes made
Change Settings: 3 VRLA -> SEL	3	Press Select to program VRLA Battery Setting into memory Press Menu to ignore any changes made
Change Settings: 4 Absolyte > SEL	4	Press Select to program Absolyte Battery Setting into memory Press Menu to ignore any changes made
Change Settings: 5 Gel/OPzV > SEL	5	Press Select to program Gel/OPzV Battery Setting into memory Press Menu to ignore any changes made
Load 1 Disable Output: Inactive	6	Load 1 Disable Output Function: Inactive: Load Output control is normal / Active: Load is Disabled
Load 2 Disable Output: Inactive	7	Load 2 Disable Output Function: Inactive: Load Output control is normal / Active: Load is Disabled
Power Up Screen: Micha Default	8	Power Up Screen: Default = Micha => “MSRx Charge Controller”
PV Low O/p Alarm Select: Disable	9	PV Low Output Alarm: Select: Disable / Enable
PV Low O/p Alarm Below:1.0kWh/day	10	PV Low Output Alarm: Enter a value from 0.1kWhr/day to 9.9kWhr/day

CAUTIONS:

The customer should ensure that the battery settings are suitable for the type of battery and the application.

Setting the wrong battery settings may reduce the life of the battery

If Select is not pressed, then the changes will revert to the previous values within 60 seconds

See Section 7 for the Battery Settings that are held in memory

Menu F Notes: see next page

Menu F Screen 6 & 7 – Load 1 & 2 Disable Output Function:

Inactive: Load Output control is normal

Active: Load is Disabled – i.e. Load is disconnected

This setting can be controlled using the Keypad or by Modbus communication

Menu F Screen 9 & 10 – PV Low Output Alarm Function:

Screen 9 allows the user to Enable or Disable the alarm function.

Screen 10 allows the user to set the energy setting per day – from 0.1kWh/day to 9.9kWh/day

Default value = 1.0Wh/day

If the PV charging energy is less than the setting then the PV Low Output Alarm will be active.

If the PV charging energy is greater or equal to the setting then the PV Low Output Alarm will be in-active.

The decision is made once a day one hour after dusk.

6. MSRx Expansion Port Modules

6.1. 4-Channel Alarm Relay DIN Rail Module

The 4-Channel Alarm Relay DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to provide four Alarm Relay Outputs (Volt-free change-over contacts).

The MSRx Charge Controller may have a maximum of 4 x 4-Channel Alarm Relay Modules fitted.

6.2. 4-Channel Alarm Indicator / Latching Indicator DIN Rail Module

The 4-Channel Alarm Indicator DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to provide four Alarm LEDs. The LEDs are programmed to respond in the same way as the 4-Channel Alarm Relay DIN Rail Modules.

The MSRx Charge Controller may have a maximum of 4 x 4-Channel Alarm Indicator / Latching Indicator Modules fitted.

6.3. 4-20mA Transducer Type A DIN Rail Module

The 4-20mA Transducer Type A DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to provide one 4-20mA output signal (Type A requires an external power source for the 4-20mA signal).

The MSRx Charge Controller may have a maximum of 4 x 4-20mA Transducer Modules fitted.

6.4. 4-20mA Transducer Type B DIN Rail Module

The 4-20mA Transducer Type B DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to provide one 4-20mA output signal (Type B uses an internal dc-dc converter to provide power for the 4-20mA signal).

The MSRx Charge Controller may have a maximum of 4 x 4-20mA Transducer Modules fitted.

6.5. Analogue Input DIN Rail Module

The Analogue Input DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to enable the controller to measure an Auxiliary Voltage, an Auxiliary Temperature, and Solar Irradiation (using a Solar Pyranometer).

The MSRx Charge Controller may have a maximum of 1 x Analogue Input Module fitted.

6.6. 8-Channel Digital Input DIN Rail Module

The 8-Channel Digital Input DIN Rail Module connects to the MSRx Control PCB Assembly Expansion Port to provide 8 x Volt-Free Digital Inputs. The Digital Inputs can be programmed to activate an alarm when the input becomes active. The alarm is seen on the LCD display and may activate an Alarm Relay if required.

The MSRx Charge Controller may have a maximum of 1 x 8-Channel Digital Input Module fitted.

6.7. USB/RS232 Com Port & Data Logger or USB/RS485 Com Port & Data Logger DIN Rail Module

The USB/RS232(or RS485) Com Port & Data Logger Module connects to the MSRx Control PCB Assembly Expansion Port to provide the user with a Com Port which is isolated electrically from the MSRx Charge Controller. Data Logging records operation and status of the charge controller in non-volatile memory.

The MSRx Charge Controller may have a maximum of 1 x USB/Comm Port & Data Log Module fitted.

MSRComms Software (free from Micha Design) may be used to download the Data Log to a PC.

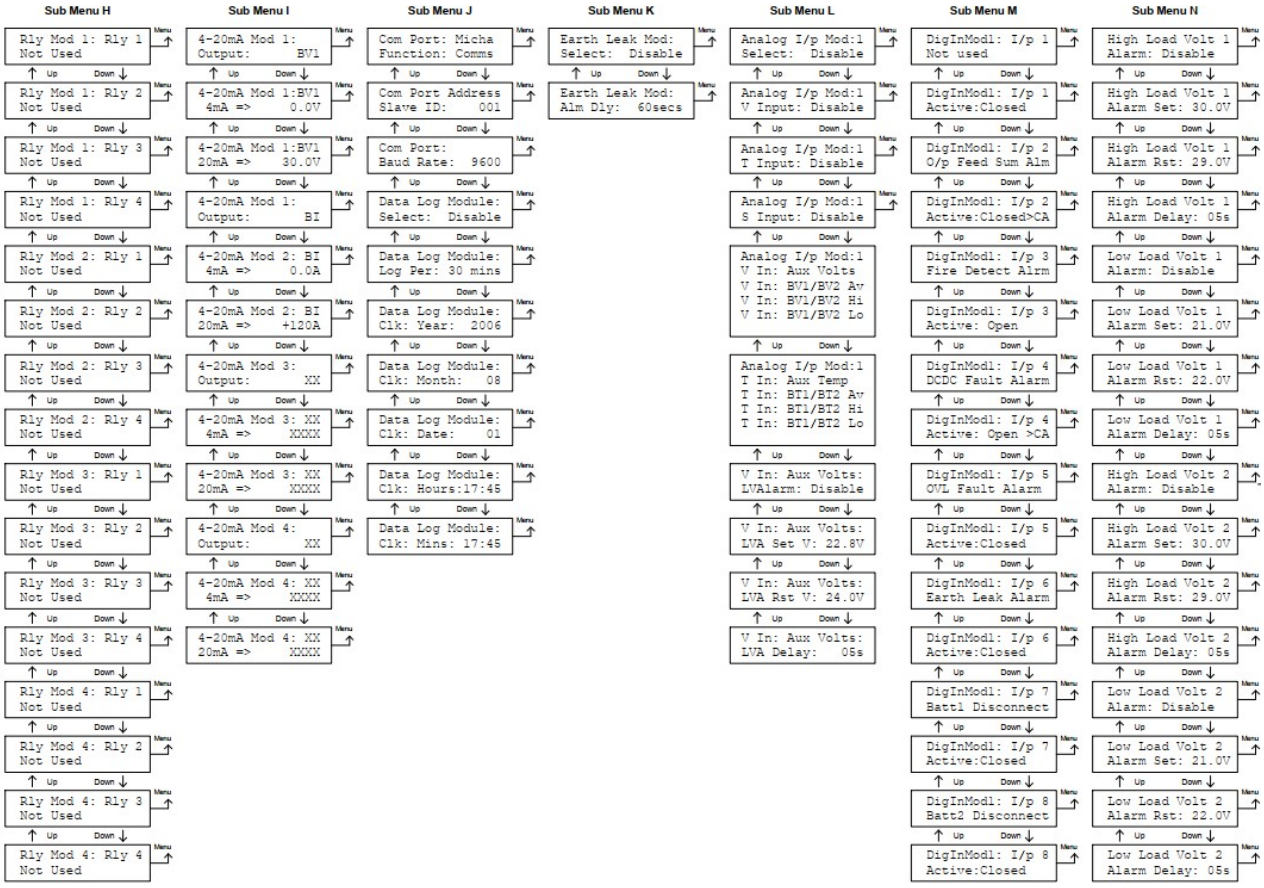
6.8. MSRx RTD Interface DIN Module

The MSRx RTD Interface is designed to allow a PT100 Resistor Temperature Detector (RTD) to be used with the MSRx Charge Controller. The Interface can be supplied in DIN rail or pillar mounting and connects to the MSRx Expansion Port with a ribbon cable supplied.

The MSRx Charge Controller may have a maximum of 1 x RTD Interface Module fitted.

6.9. Expansion Port Settings Menu

MSRx Expansion Port Module Settings available to the user are described on the following **Menu Map**



6.10. Sub Menu H – 4-Channel Relay Output Module Settings

Sub Menu H	Screen	4-Channel Relay / LED Output Module Settings Description
Rly Mod 1: Rly 1 Not Used	0	**4-Channel Relay Output <u>Module 1:</u>** Relay 1 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 1: Rly 2 Not Used	1	**4-Channel Relay Output <u>Module 1:</u>** Relay 2 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 1: Rly 3 Not Used	2	**4-Channel Relay Output <u>Module 1:</u>** Relay 3 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 1: Rly 4 Not Used	3	**4-Channel Relay Output <u>Module 1:</u>** Relay 4 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 2: Rly 1 Not Used	4	**4-Channel Relay Output <u>Module 2:</u>** Relay 1 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 2: Rly 2 Not Used	5	**4-Channel Relay Output <u>Module 2:</u>** Relay 2 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 2: Rly 3 Not Used	6	**4-Channel Relay Output <u>Module 2:</u>** Relay 3 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 2: Rly 4 Not Used	7	**4-Channel Relay Output <u>Module 2:</u>** Relay 4 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 3: Rly 1 Not Used	8	**4-Channel Relay Output <u>Module 3:</u>** Relay 1 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 3: Rly 2 Not Used	9	**4-Channel Relay Output <u>Module 3:</u>** Relay 2 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 3: Rly 3 Not Used	10	**4-Channel Relay Output <u>Module 3:</u>** Relay 3 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 3: Rly 4 Not Used	11	**4-Channel Relay Output <u>Module 3:</u>** Relay 4 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 4: Rly 1 Not Used	12	**4-Channel Relay Output <u>Module 4:</u>** Relay 1 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 4: Rly 2 Not Used	13	**4-Channel Relay Output <u>Module 4:</u>** Relay 2 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 4: Rly 3 Not Used	14	**4-Channel Relay Output <u>Module 4:</u>** Relay 3 Any Alarm Function may be assigned (see Section 5.4)
Rly Mod 4: Rly 4 Not Used	15	**4-Channel Relay Output <u>Module 4:</u>** Relay 4 Any Alarm Function may be assigned (see Section 5.4)

6.11. Sub Menu I – 4-20mA Output Module Settings

Sub Menu I	Screen	4-20mA Output Module Settings Description
4-20mA Mod 1: Output: BV1	0	**4-20mA Output Module 1:** Select Parameter to Output
4-20mA Mod 1:BV1 4mA => 0.0V	1	**4-20mA Output Module 1:** Select Parameter Value for 4mA Output
4-20mA Mod 1:BV1 20mA => 30.0V	2	**4-20mA Output Module 1:** Select Parameter Value for 20mA Output
4-20mA Mod 2: Output: BI	3	**4-20mA Output Module 2:** Select Parameter to Output
4-20mA Mod 2: BI 4mA => 0.0A	4	**4-20mA Output Module 2:** Select Parameter Value for 4mA Output
4-20mA Mod 2: BI 20mA => +120A	5	**4-20mA Output Module 2:** Select Parameter Value for 20mA Output
4-20mA Mod 3: Output: AI	6	**4-20mA Output Module 3:** Select Parameter to Output
4-20mA Mod 3: AI 4mA => 0A	7	**4-20mA Output Module 3:** Select Parameter Value for 4mA Output
4-20mA Mod 3: AI 20mA => 120A	8	**4-20mA Output Module 3:** Select Parameter Value for 20mA Output
4-20mA Mod 4: Output: BV2	9	**4-20mA Output Module 4:** Select Parameter to Output
4-20mA Mod 4:BV2 4mA => 0.0V	10	**4-20mA Output Module 4:** Select Parameter Value for 4mA Output
4-20mA Mod 4:BV2 20mA => 30.0V	11	**4-20mA Output Module 4:** Select Parameter Value for 20mA Output

Sub Menu I Notes:

Parameters:

BV1 =	Battery Voltage 1	BT =	Battery Temperature
BI =	Battery Current	BV2 =	Battery Voltage 2
AI =	Array Current	SOC =	Battery State of Charge
LI =	Load Current	(SOC = 0-100% in 10% steps)	

Notes:

When the 4mA Setting Screen is being viewed, the Output will be 4mA

When the 20mA Setting Screen is being viewed, the Output will be 20mA

6.12. Sub Menu J – Communications Module Settings

Sub Menu J	Screen	Communications Module Settings Description
Com Port: Micha Function: Comms	0	Communications Port Function: Micha Comms / Modbus ASCII / Modbus RTU / Modbus TCP/IP
Com Port Address Slave ID: 001	1	Communications Port Address / Slave ID: Parameter range: 001-247
Com Port: Baud Rate: 9600	2	Communications Port Baud Rate: Select: 9600 or 19200 (Default = 9600)
Data Log Module: Select: Disable	3	Data Log Module Select: Disable / Enable (default = Disable)
Data Log Module: Log Per: 30 mins	4	Data Log Module Logging Period: 15, 30, 60 minutes (default = 30)
Data Log Module: Clk: Year: 2006	5	Data Log Module Time: Set Year
Data Log Module: Clk: Month: 08	6	Data Log Module Time: Set Month
Data Log Module: Clk: Date: 01	7	Data Log Module Time: Set Date
Data Log Module: Clk: Hours:17:45	8	Data Log Module Time: Set Hours
Data Log Module: Clk: Mins: 17:45	9	Data Log Module Time: Set Minutes

Sub Menu J Notes:

Menu J Screen 0 – Communications Port Function:

Micha Comms => Unit will respond to Micha Communications Protocol (default)

Modbus ASCII => Unit will respond as a Modbus ASCII Slave

Modbus RTU => Unit will respond as a Modbus RTU Slave

Modbus TCP/IP => Unit will respond as a Modbus TCP/IP Slave

See Micha Document 801641 for MSRx Modbus Memory Map

Menu J Screens 3-9 – Data Log Module:

If the Data Log Module is Enabled, then the Logging Period and the Data Log Time may be set.

6.13. Sub Menu K – Earth Leakage Module Settings

Sub Menu K	Screen	Earth Leakage Module Settings Description
Earth Leak Mod: Select: Disable	0	Earth Leakage Module Select: Disable / Enable (default = Disable)
Earth Leak Mod: Alm Dly: 60secs	1	Earth Leakage Module Alarm Delay: Parameter range: 5 to 240 seconds (default = 60)

6.14. Sub Menu L – Analog Input Module Settings

Sub Menu L	Screen	Analog Input Module Settings Description
Analog I/p Mod:1 Select: Disable	0	Analogue Input Module 1: Select: Enable to enable the Module
Analog I/p Mod:1 V Input: Disable	1	Analogue Input Module 1: Voltage Input: Enable / Disable
Analog I/p Mod:1 T Input: Disable	2	Analogue Input Module 1: Temperature Input: Enable / Disable
Analog I/p Mod:1 S Input: Disable	3	Analogue Input Module 1: Solar Pyranometer Input: Enable / Disable
Analog I/p Mod:1 V In: Aux Volts	4	Analogue Input Module 1: Voltage Input Select: Aux Volts / Battery Voltage 2 and functions
Analog I/p Mod:1 T In: Aux Temp	5	Analogue Input Module 1: Temperature Input Select: Aux Temp / Battery Temp 2 and functions
V In: Aux Volts: LVAlarm: Disable	6	Voltage Input: Aux Volts: Auxiliary Voltage Input: Low Voltage Alarm: Enable / Disable
V In: Aux Volts: LVA Set V: 22.8V	7	Voltage Input: Aux Volts: Auxiliary Voltage Input: Low Voltage Alarm Set Voltage:
V In: Aux Volts: LVA Rst V: 24.0V	8	Voltage Input: Aux Volts: Auxiliary Voltage Input: Low Voltage Alarm Reset Voltage:
V In: Aux Volts: LVA Delay: 05s	9	Voltage Input: Aux Volts: Auxiliary Voltage Input: Low Voltage Alarm Delay (default 5 seconds)

Sub Menu L Screen 0 Notes:

The Analogue Input Module must be Enabled for the Auxiliary Voltage, Auxiliary Temperature or Solar Pyranometer Inputs to be used.

Sub Menu L Screen 1-3 Notes:

Each Input (Voltage, Temperature, Solar Pyranometer) can be Enabled independently of each other because not all systems will require all three inputs. The input that is required must be Enabled using Screen 1, 2, or 3.

Sub Menu L Screen 4 Notes:

Voltage Input Select:	V In: Aux Volts	Voltage Input = Auxiliary Voltage
	V In: BV1/BV2 Av	Voltage Input = BV1 & BV2 Average
	V In: BV1/BV2 Hi	Voltage Input = BV1 & BV2 Highest
	V In: BV1/BV2 Lo	Voltage Input = BV1 & BV2 Lowest

See Section 4.3 regarding the display of the Auxiliary Voltage Input (Menu 1 Screen 2)

Sub Menu L Screen 5 Notes:

Temp Input Select:	T In: Aux Temp	Temp Input = Auxiliary Temperature
	T In: BT1/BT2 Av	Temp Input = BT1 & BT2 Average
	T In: BT1/BT2 Hi	Temp Input = BT1 & BT2 Highest
	T In: BT1/BT2 Lo	Temp Input = BT1 & BT2 Lowest

See Section 4.3 regarding the display of the Auxiliary Temperature Input (Menu 1 Screen 3)

Sub Menu L Screen 6-9 Notes:

For some applications, the user may wish to have a Low Volts Alarm associated with the Auxiliary Voltage Input (on the Analogue Input Module).

Screen 6 allows the Auxiliary Voltage Input Low Voltage Alarm to be Enabled.

Screen 7 & 8 allows the Alarm Set and Reset voltages to be adjusted.

Screen 9 allows a Delay before Alarm activation to be set.

Note: When the Auxiliary Voltage Input: Low Voltage Alarm is active it will activate the Common Alarm.

6.15. Sub Menu M – 8-Channel Digital Input Module Settings

Sub Menu M	Screen	8-Channel Digital Input Module Settings Description
DigInMod1: I/p 1 Not used	0	**8-Channel Digital Input <u>Module 1: Input 1</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 1 Active:Closed	1	**8-Channel Digital Input <u>Module 1: Input 1</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 2 Not used	2	**8-Channel Digital Input <u>Module 1: Input 2</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 2 Active:Closed	3	**8-Channel Digital Input <u>Module 1: Input 2</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 3 Not used	4	**8-Channel Digital Input <u>Module 1: Input 3</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 3 Active:Closed	5	**8-Channel Digital Input <u>Module 1: Input 3</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 4 Not used	6	**8-Channel Digital Input <u>Module 1: Input 4</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 4 Active:Closed	7	**8-Channel Digital Input <u>Module 1: Input 4</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 5 Not used	8	**8-Channel Digital Input <u>Module 1: Input 5</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 5 Active:Closed	9	**8-Channel Digital Input <u>Module 1: Input 5</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 6 Not used	10	**8-Channel Digital Input <u>Module 1: Input 6</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 6 Active:Closed	11	**8-Channel Digital Input <u>Module 1: Input 6</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 7 Not used	12	**8-Channel Digital Input <u>Module 1: Input 7</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 7 Active:Closed	13	**8-Channel Digital Input <u>Module 1: Input 7</u>** Active Closed / Active Open / Activate Common (see next page)
DigInMod1: I/p 8 Not used	14	**8-Channel Digital Input <u>Module 1: Input 8</u>** An Alarm may be assigned to this Input (see list on next page)
DigInMod1: I/p 8 Active:Closed	15	**8-Channel Digital Input <u>Module 1: Input 8</u>** Active Closed / Active Open / Activate Common (see next page)

Sub Menu M Notes:

Digital Input Alarm Function Descriptions:

Displayed Text	Digital Input Alarm Function Description
O/p Feed Sum Alm	Digital Input: Output Feeder Summary Alarm
Fire Detect Alm	Digital Input: Fire Detect Alarm
DCDC1 Fault Alm	Digital Input: DCDC1 Fault Alarm
OVL Fault Alarm	Digital Input: OVL Fault Alarm
Earth Leak Alarm	Digital Input: Earth Leak Alarm
Batt1 Disconnect	Digital Input: Battery 1 Disconnect Alarm
Batt2 Disconnect	Digital Input: Battery 2 Disconnect Alarm
Load MCCB Trip	Digital Input: Load MCCB Trip
Load Volts Relay	Digital Input: Load Volts Relay
Ground Fault Alm	Digital Input: Ground Fault Alarm
CP Common Alarm	Digital Input: CP Common Alarm
DCDC2 Fault Alm	Digital Input: DCDC2 Fault Alarm
DB1 O/P Feed Alm	Digital Input: Distribution Board 1 Output Feeder Alarm
DB2 O/P Feed Alm	Digital Input: Distribution Board 2 Output Feeder Alarm
Bst Chrg Inhibit	Digital Input: Boost Charge Inhibit Function (see section 3.16)
Batt CB Status	Digital Input: Battery MCCB Status (On/Off)
Batt CB Trip	Digital Input: Battery MCCB Status (Trip)
DB Trip Com Alm	Digital Input: DB Breaker Trip Common Alarm
Earth Fault Alm	Digital Input: Earth Fault Alarm
59 Over/V Alarm	Digital Input: 59 (Over Voltage) Alarm
27 Under/V Alarm	Digital Input: 27 (Under Voltage) Alarm
Water Low Alarm	Digital Input: Water Low Alarm
Door Open Alarm	Digital Input: Door Open Alarm
Batt Power Fault	Digital Input: Batt Power Fault
PV Input Fault	Digital Input: PV Input Fault
DB1 CB Trip Alm	Digital Input: DB1 CB Trip Alarm
DB2 CB Trip Alm	Digital Input: DB2 CB Trip Alarm

Digital Input Alarm Active Closed / Active Open / Common Alarm:

DigInModx: I/p x **Active:Closed**	**Active:Closed =** The Alarm is active when the Volt-Free Digital Input is **Closed**
DigInModx: I/p x **Active:Closed>CA**	**Active:Closed>CA =** The Alarm is active when the Volt-Free Digital Input is **Closed** When the Alarm is active it will activate the **Common Alarm (CA)**
DigInModx: I/p x **Active: Open**	**Active: Open =** The Alarm is active when the Volt-Free Digital Input is **Open**
DigInModx: I/p x **Active: Open >CA**	**Active: Open >CA =** The Alarm is active when the Volt-Free Digital Input is **Open** When the Alarm is active it will activate the **Common Alarm (CA)**

Defaults:

By default the Digital Input Alarms are active when the Volt-Free Digital Input is **Closed**

By default Digital Input Alarms **do not** activate the Common Alarm.

6.16. Sub Menu N – Load Voltage 1 & 2 Alarm Settings

Sub Menu N	Screen	Load Voltage 1 & 2 Alarm Settings Description
High Load Volt 1 Alarm: Disable	0	High Load Voltage 1 Alarm Function: Select: Enable or Disable Alarm
High Load Volt 1 Alarm Set: 30.0V	1	High Load Voltage 1 Alarm: Alarm Set Voltage Adjust
High Load Volt 1 Alarm Rst: 29.0V	2	High Load Voltage 1 Alarm: Alarm Reset Voltage Adjust
High Load Volt 1 Alarm Delay: 05s	3	High Load Voltage 1 Alarm: Alarm Delay Time Adjust: 0-240 seconds
Low Load Volt 1 Alarm: Disable	4	Low Load Voltage 1 Alarm Function: Select: Enable or Disable Alarm
Low Load Volt 1 Alarm Set: 21.0V	5	Low Load Voltage 1 Alarm: Alarm Set Voltage Adjust
Low Load Volt 1 Alarm Rst: 22.0V	6	Low Load Voltage 1 Alarm: Alarm Reset Voltage Adjust
Low Load Volt 1 Alarm Delay: 05s	7	Low Load Voltage 1 Alarm: Alarm Delay Time Adjust: 0-240 seconds
High Load Volt 2 Alarm: Disable	8	High Load Voltage 2 Alarm Function: Select: Enable or Disable Alarm
High Load Volt 2 Alarm Set: 30.0V	9	High Load Voltage 2 Alarm: Alarm Set Voltage Adjust
High Load Volt 2 Alarm Rst: 29.0V	10	High Load Voltage 2 Alarm: Alarm Reset Voltage Adjust
High Load Volt 2 Alarm Delay: 05s	11	High Load Voltage 2 Alarm: Alarm Delay Time Adjust: 0-240 seconds
Low Load Volt 2 Alarm: Disable	12	Low Load Voltage 2 Alarm Function: Select: Enable or Disable Alarm
Low Load Volt 2 Alarm Set: 21.0V	13	Low Load Voltage 2 Alarm: Alarm Set Voltage Adjust
Low Load Volt 2 Alarm Rst: 22.0V	14	Low Load Voltage 2 Alarm: Alarm Reset Voltage Adjust
Low Load Volt 2 Alarm Delay: 05s	15	Low Load Voltage 2 Alarm: Alarm Delay Time Adjust: 0-240 seconds

Sub Menu N Notes:

6.16.1. High Load Voltage 1 Alarm

To enable the High Load Voltage 1 Alarm: Load Voltage selection on Menu B Screen 3 must include Load Voltage 1, and High Load Voltage 1 Alarm, Menu N Screen 0 must be set to Enable.

Alarm Operation:

If Load Voltage 1 is greater than or equal to the High Load Voltage 1 Alarm Set Voltage for the High Load Voltage 1 Alarm Delay time, then the High Load Voltage 1 Alarm will be activated. If Load Voltage 1 is less than or equal to the High Load Voltage 1 Alarm Reset Voltage then the High Load Voltage 1 Alarm will be de-activated.

6.16.2. Low Load Voltage 1 Alarm

To enable the Low Load Voltage 1 Alarm: Load Voltage selection on Menu B Screen 3 must include Load Voltage 1, and Low Load Voltage 1 Alarm, Menu N Screen 4 must be set to Enable.

Alarm Operation:

If Load Voltage 1 is less than or equal to the Low Load Voltage 1 Alarm Set Voltage for the Low Load Voltage 1 Alarm Delay time, then the Low Load Voltage 1 Alarm will be activated. If Load Voltage 1 is greater than or equal to the Low Load Voltage 1 Alarm Reset Voltage then the Low Load Voltage 1 Alarm will be de-activated.

6.16.3. High Load Voltage 2 Alarm

To enable the High Load Voltage 2 Alarm: Load Voltage selection on Menu B Screen 3 must include Load Voltage 2, and High Load Voltage 1 Alarm, Menu N Screen 8 must be set to Enable.

Alarm Operation:

If Load Voltage 2 is greater than or equal to the High Load Voltage 2 Alarm Set Voltage for the High Load Voltage 2 Alarm Delay time, then the High Load Voltage 2 Alarm will be activated. If Load Voltage 2 is less than or equal to the High Load Voltage 2 Alarm Reset Voltage then the High Load Voltage 2 Alarm will be de-activated.

6.16.4. Low Load Voltage 2 Alarm

To enable the Low Load Voltage 2 Alarm: Load Voltage selection on Menu B Screen 3 must include Load Voltage 2, and Low Load Voltage 1 Alarm, Menu N Screen 12 must be set to Enable.

Alarm Operation:

If Load Voltage 2 is less than or equal to the Low Load Voltage 2 Alarm Set Voltage for the Low Load Voltage 2 Alarm Delay time, then the Low Load Voltage 2 Alarm will be activated. If Load Voltage 2 is greater than or equal to the Low Load Voltage 2 Alarm Reset Voltage then the Low Load Voltage 2 Alarm will be de-activated.

6.16.5. Notes:

Any of the Programmable Alarm Relays may be programmed to activate on any of the High & Low Load Voltage 1 & 2 Alarms. See Sections 5.4, 6.10, and 4.2.1.

If Load 1 & Load 2 are set to be connected in parallel for a higher current rating, then Load 1 will be in control and only High & Low Load Voltage 1 Alarms will be available. This option is controlled by Menu B Screen 5: “LC1 & LC2 = Same” – see section 5.3

7. MSRx Default Battery Settings

7.1. MSRx Charge Controller Set-points for FULMEN Batteries (Default Values 1)

Controller Set-points	Volts / Cell	12V System	24V System	48V System
Boost & Equalise Regulation Voltage	2.45 V	14.70 ± 0.12V	29.40 ± 0.24V	58.80 ± 0.48V
Float Regulation Voltage	2.30 V	13.80 ± 0.12V	27.60 ± 0.24V	55.20 ± 0.48V
Reset to Boost Voltage	2.20 V	13.20 ± 0.12V	26.40 ± 0.24V	52.80 ± 0.48V
High Volts 1 Alarm Trip Voltage	2.50 V	15.00 ± 0.12V	30.00 ± 0.24V	60.00 ± 0.48V
High Volts 1 Alarm Reset Voltage	2.30 V	13.80 ± 0.12V	27.60 ± 0.24V	55.20 ± 0.48V
Low Volts 1 Alarm Trip Voltage	1.95 V	11.70 ± 0.12V	23.40 ± 0.24V	46.80 ± 0.48V
Low Volts 1 Alarm Reset Voltage	2.30 V	13.80 ± 0.12V	27.60 ± 0.24V	55.20 ± 0.48V
Load Cut 1 Alarm Trip Voltage	1.90 V	11.40 ± 0.12V	22.80 ± 0.24V	45.60 ± 0.48V
Load Cut 1 Alarm Reset Voltage	2.15 V	12.90 ± 0.12V	25.80 ± 0.24V	51.60 ± 0.48V
Load Cut 2 Alarm Trip Voltage	1.85 V	11.10 ± 0.12V	22.20 ± 0.24V	44.40 ± 0.48V
Load Cut 2 Alarm Reset Voltage	2.10 V	12.60 ± 0.12V	25.20 ± 0.24V	50.40 ± 0.48V
Load Cut 1 Switch Delay	N/A	60 seconds	60 seconds	60 seconds
Load Cut 2 Switch Delay	N/A	60 seconds	60 seconds	60 seconds
Equalisation Time	N/A	30 minutes	30 minutes	30 minutes
Temp Compensation Null Temp	N/A	20 ºC	20 ºC	20 ºC
Temp Compensation Rate	N/A	-30mV / ºC	-60mV / ºC	-120mV / ºC

7.2. MSRx Charge Controller Set-points for Vented Cell Batteries (Default Values 2)

Controller Set-points	Volts / Cell	12V System	24V System	48V System
Boost & Equalise Regulation Voltage	2.40 V	14.40 ± 0.12V	28.80 ± 0.24V	57.60 ± 0.48V
Float Regulation Voltage	2.35 V	14.10 ± 0.12V	28.20 ± 0.24V	56.40 ± 0.48V
Reset to Boost Voltage	2.20 V	13.20 ± 0.12V	26.40 ± 0.24V	52.80 ± 0.48V
High Volts 1 Alarm Trip Voltage	2.45 V	14.70 ± 0.12V	29.40 ± 0.24V	58.80 ± 0.48V
High Volts 1 Alarm Reset Voltage	2.40 V	14.40 ± 0.12V	28.80 ± 0.24V	57.60 ± 0.48V
Low Volts 1 Alarm Trip Voltage	1.90 V	11.40 ± 0.12V	22.80 ± 0.24V	45.60 ± 0.48V
Low Volts 1 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 1 Alarm Trip Voltage	1.85 V	11.10 ± 0.12V	22.20 ± 0.24V	44.40 ± 0.48V
Load Cut 1 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 2 Alarm Trip Voltage	1.80 V	10.80 ± 0.12V	21.60 ± 0.24V	43.20 ± 0.48V
Load Cut 2 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 1 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Load Cut 2 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Equalisation Time	N/A	30 minutes	30 minutes	30 minutes
Temp Compensation Null Temp	N/A	25 ºC	25 ºC	25 ºC
Temp Compensation Rate	N/A	-33mV / ºC	-66mV / ºC	-132mV / ºC

7.3. MSRx Charge Controller Set-points for VRLA Cell Batteries (Default Values 3)

Controller Set-points	Volts / Cell	12V System	24V System	48V System
Boost & Equalise Regulation Voltage	2.30 V	13.80 ± 0.12V	27.60 ± 0.24V	55.20 ± 0.48V
Float Regulation Voltage	2.25 V	13.50 ± 0.12V	27.00 ± 0.24V	54.00 ± 0.48V
Reset to Boost Voltage	2.10 V	12.60 ± 0.12V	25.20 ± 0.24V	50.40 ± 0.48V
High Volts 1 Alarm Trip Voltage	2.40 V	14.40 ± 0.12V	28.80 ± 0.24V	57.60 ± 0.48V
High Volts 1 Alarm Reset Voltage	2.35 V	14.10 ± 0.12V	28.20 ± 0.24V	56.40 ± 0.48V
Low Volts 1 Alarm Trip Voltage	1.90 V	11.40 ± 0.12V	22.80 ± 0.24V	45.60 ± 0.48V
Low Volts 1 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 1 Alarm Trip Voltage	1.85 V	11.10 ± 0.12V	22.20 ± 0.24V	44.40 ± 0.48V
Load Cut 1 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 2 Alarm Trip Voltage	1.80 V	10.80 ± 0.12V	21.60 ± 0.24V	43.20 ± 0.48V
Load Cut 2 Alarm Reset Voltage	2.00 V	12.00 ± 0.12V	24.00 ± 0.24V	48.00 ± 0.48V
Load Cut 1 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Load Cut 2 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Equalisation Time	N/A	30 minutes	30 minutes	30 minutes
Temp Compensation Null Temp	N/A	25 ºC	25 ºC	25 ºC
Temp Compensation Rate	N/A	-20mV / ºC	-40mV / ºC	-79mV / ºC

7.4. MSRx Charge Controller Set-points for Absolyte Cell Batteries (Default Values 4)

Controller Set-points	Volts / Cell	12V System	24V System	48V System
Boost & Equalise Regulation Voltage	2.35 V	14.10 ± 0.12V	28.20 ± 0.24V	56.40 ± 0.48V
Float Regulation Voltage	2.25 V	13.50 ± 0.12V	27.00 ± 0.24V	54.00 ± 0.48V
Reset to Boost Voltage	2.10 V	12.60 ± 0.12V	25.20 ± 0.24V	50.40 ± 0.48V
High Volts 1 Alarm Trip Voltage	2.45 V	14.70 ± 0.12V	29.40 ± 0.24V	58.80 ± 0.48V
High Volts 1 Alarm Reset Voltage	2.40 V	14.40 ± 0.12V	28.80 ± 0.24V	57.60 ± 0.48V
Low Volts 1 Alarm Trip Voltage	1.95 V	11.70 ± 0.12V	23.40 ± 0.24V	46.80 ± 0.48V
Low Volts 1 Alarm Reset Voltage	2.30 V	13.80 ± 0.12V	27.60 ± 0.24V	55.20 ± 0.48V
Load Cut 1 Alarm Trip Voltage	1.90 V	11.40 ± 0.12V	22.80 ± 0.24V	45.60 ± 0.48V
Load Cut 1 Alarm Reset Voltage	2.25 V	13.50 ± 0.12V	27.00 ± 0.24V	54.00 ± 0.48V
Load Cut 2 Alarm Trip Voltage	1.85 V	11.10 ± 0.12V	22.20 ± 0.24V	44.40 ± 0.48V
Load Cut 2 Alarm Reset Voltage	2.10 V	12.60 ± 0.12V	25.20 ± 0.24V	50.40 ± 0.48V
Load Cut 1 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Load Cut 2 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Equalisation Time	N/A	30 minutes	30 minutes	30 minutes
Temp Compensation Null Temp	N/A	25 ºC	25 ºC	25 ºC
Temp Compensation Rate	N/A	-18mV / ºC	-36mV / ºC	-72mV / ºC

7.5. MSRx Charge Controller Set-points for Gel/OPzV Cell Batteries (Default Values 5)

Controller Set-points	Volts / Cell	12V System	24V System	48V System
Boost & Equalise Regulation Voltage	2.35 V	14.10 ± 0.12V	28.20 ± 0.24V	56.40 ± 0.48V
Float Regulation Voltage	2.28 V	13.68 ± 0.12V	27.36 ± 0.24V	54.72 ± 0.48V
Reset to Boost Voltage	2.11 V	12.66 ± 0.12V	25.32 ± 0.24V	50.64 ± 0.48V
High Volts 1 Alarm Trip Voltage	2.40 V	14.40 ± 0.12V	28.80 ± 0.24V	57.60 ± 0.48V
High Volts 1 Alarm Reset Voltage	2.15 V	12.90 ± 0.12V	25.80 ± 0.24V	51.60 ± 0.48V
Low Volts 1 Alarm Trip Voltage	1.90 V	11.40 ± 0.12V	22.80 ± 0.24V	45.60 ± 0.48V
Low Volts 1 Alarm Reset Voltage	2.25 V	13.50 ± 0.12V	27.00 ± 0.24V	54.00 ± 0.48V
Load Cut 1 Alarm Trip Voltage	1.85 V	11.10 ± 0.12V	22.20 ± 0.24V	44.40 ± 0.48V
Load Cut 1 Alarm Reset Voltage	2.25 V	13.50 ± 0.12V	27.00 ± 0.24V	54.00 ± 0.48V
Load Cut 2 Alarm Trip Voltage	1.80 V	10.80 ± 0.12V	21.60 ± 0.24V	43.20 ± 0.48V
Load Cut 2 Alarm Reset Voltage	2.05 V	12.30 ± 0.12V	24.60 ± 0.24V	49.20 ± 0.48V
Load Cut 1 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Load Cut 2 Switch Delay	N/A	10 seconds	10 seconds	10 seconds
Equalisation Time	N/A	30 minutes	30 minutes	30 minutes
Temp Compensation Null Temp	N/A	20 ºC	20 ºC	20 ºC
Temp Compensation Rate	N/A	-30mV / ºC	-60mV / ºC	-120mV / ºC

8. MSRx Software History

Software Number & Version	Software Release Date	Software Changes from previous version
801 313 Ver 3.0	21 Jan 2013	Version 1, 2 & 19" Rack Hardware Selection: Menu A Screen 14 (and Menu 2 Screen 14) Version 2: Array Shunt measuring adjusted to full 60mV input range
801 313 Ver 3.3	01 Dec 2014	Added SNMP2 Communications Selection using Sub Menu J Screen 0: Comms Module: SNMP2
801 313 Ver 3.4	16 Dec 2014	Added PT100 Temperature Sensor capability using MSR RTD Interface Module Added Load Cut Reset Operation: Auto or Manual (Menu C Screen 9)
801 313 Ver 3.5	06 Feb 2015	Remove LCD Power Down Function (was Menu D Screen 15) Added Battery Regulation: Type 1 or Type 2 (Settings Menu D Screen 15
801 313 Ver 3.6	31 Mar 2015	Fixed SNMP communication issues if Battery Temperature was less than +10.0C Fixed SNMP communication issues if Battery Temperature Sensor not selected
801 313 Ver 3.7	24 July 2015	Added Modbus TCP/IP Response for: Battery Voltage / Battery Temperature / Battery Current / Array Current / Load Current / Common Alarm / High Voltage 1 Alarm / Low Voltage 1 Alarm / Load Disconnect 1 Alarm / Load Disconnect 2 Alarm
801 313 Ver 3.8	10 Nov 2015	Added Battery Temperature as a parameter for 4-20mA Outputs Battery Temperature Default: 0.0-60.0°C => 4-20mA
801 313 Ver 3.9	14 Dec 2015	Added DRM 4-Channel Input Module: Added Expansion Port selection Menu Screens
801 313 Ver 4.0	27 Jan 2016	Load Shunt Selection - Expanded the range of Load Shunts that may be selected: 60A,100A,150A,200A,250A,300A (Menu B Screen 4)
801 313 Ver 4.1	30 Mar 2016	Array Shunt Selection – Added 100A to the range of Array Shunts that may be selected: 100A,120A,150A,200A,250A,300A,400A, 500A (Menu D Screens 5, & 6)
801 313 Ver 4.2	26 July 2016	Moved Test Mode Selection from Menu D Screen 3 to Menu 3 Screen 15 Added Temp Comp Function Select (Menu D Screen 3): None, Normal, Low Temp Only Changed Temp Comp Rate Selection (Menu B Screen 1) to be 0 to -240mV/°C Added Load Output Select (Menu D Screen 14) = Normal or Inverted (for N/C Contactors) Changed Battery Temperature Alarm Function to allow greater flexibility Added Adjustable Activation Delays for HV1, LV1, LC1, LC2, HV2, LV2 Alarms
801 313 Ver 4.3	07 Oct 2016	Modified Comms to work with Modbus Poll and Mdbus Added Modbus Exception Responses for Illegal Addresses
801 313 Ver 4.4	12 May 2017	Added Battery Temperature Charging Function Added Menu E Screens 12-14
801 313 Ver 4.5	8 Jun 2017	Added Battery Voltage 2 (BV2) and Battery Temperature 2 (BT2) Inputs using Analogue Input Module: Aux Volts & Temp (Menu 1 & Menu L) Updated Test Relay Menu (Menu 3) Updated Alarm Function descriptions (Menu C & Menu H) Added Programmable Digital Input Functions (Menu M)

801 313 Ver 4.6	9 Jan 2018	Data Logger Initialisation bug – if Data Logger is not attached when MSRx is first born in factory, the Timed & Alarm Record Pointers will not be initialised. This software looks for this condition and initialises the Pointers
801 313 Ver 4.7	22 Feb 2018	Added Digital Input Alarm Functions to Menu M Added 60mV 400A to Load Shunt Selection (Menu B Screen 4) Added 60mV 60A to Array Shunt Selection (Menu D Screens 6 & 7) Added High & Low Load 1 & 2 Voltage Alarms (Menu N)
801 313 Ver 4.8	03 May 2018	Added Modbus RTU Slave Response Menu J Screen 0 => Micha Comms / Modbus ASCII / Modbus RTU
801 313 Ver 4.9	24 May 2018	Added Modbus TCP/IP Slave Response Menu J Screen 0 => Micha Comms / Modbus ASCII / Modbus RTU / Modbus TCP/IP
801 313 Ver 5.0	01 Jan 2019	Modified Battery Voltage Regulation Algorithm No longer use Parameters in Menu D Screens 0,1 & 2
801 313 Ver 5.1	18 Apr 2019	Battery Temperature Alarm now responds to BT1, BT2, BT1 & BT2
801 313 Ver 5.2	25 Apr 2019	Remote Disable used for VFC Input. Menu D Screen 0, 1 & 2 used for Disable Function. Disable Function Load Cut Delay & Reset features added (See Section 5.5)
801 313 Ver 5.3	01 Jul 2019	Number of Array Inputs can be set between 1 and 8 (See Menu 2 or A Screen 15)
801313 Ver 5.4	06 Aug 2019	Add Load Shunt 60mV 30A to Load Shunt Value Selection (Menu B Screen 4)
801313 Ver 5.5	10 Oct 2019	Add CP Common Alarm function to Digital Input Alarm Selection in Menu M (Section 6.14) & Alarm Relay Selection in Menu C (Section 5.4)
801313 Ver 5.6	10 Dec 2019	Software bug found: If the Analogue Input Module is Enabled but the Temperature Input is Disabled and no Temperature Sensor is connected to the Analog Input Module, then an Auxiliary Temperature Alarm (Aux Temp Alarm) will appear on the Home Screen. Bug fixed
801313 Ver 5.7	23 Mar 2020	Add Load 1 & 2 Disable Output Functions (Section 5.7) Disable Output Function = Inactive => Load Output control is normal Disable Output Function = Inactive => Load Output is Disabled (i.e. disconnected)
801313 Ver 5.8	13 July 2020	Add Night Mode Alarm as a programmable alarm function for the Alarm Relays (See Menu C - Section 5.4)
801313 Ver 5.9	09 Nov 2020	Add parameters to Modbus Communication See document 801641-9 (MSRx Modbus Memory Map Specification)
801313 Ver 6.0	03 Dec 2020	Add External Input Switch Function (See Menu X – Sections 4.1.1 & 4.9)
801313 Ver 6.1	21 Jun 2021	New Digital Input Functions: (see Sections 4.2.1 & 5.4 & 6.14) DCDC1 & DCDC2 Fault Alarms / DB1 & DB2 Output Feeder Alarms
801313 Ver 6.2	21 Sep 2021	Add Power Up Screen selection in Menu F Screen 8 (see Section 3.17 & 5.7) Array Switches connected in order 1-8
801313 Ver 6.3	08 Mar 2022	Software 801313 Version 6.3 Add 7 x Digital Inputs (see Sections 3.16 & 4.2.1 & 5.4 & 6.15) Add Boost Charge Inhibit Function

801313 Ver 6.4	02 Aug 2022	Software 801313 Version 6.4 Add Auxiliary Voltage Input Low Voltage Alarm (see Sections 6.13, 5.4)
801313 Ver 6.5	14 Feb 2023	Software 801313 Version 6.5 Add Digital Input Functions: Water Low Alarm / Door Open Alarm / Batt Power Fault / PV Input Fault / DB1 CB Trip Alm / DB2 CB Trip Alm (Section 6.15) Add Alarm Relay Functions: Boost Mode / Equal Mode / Float Mode / Water Low Alarm / Door Open Alarm / Batt Power Fault / PV Input Fault / DB1 CB Trip Alm / DB2 CB Trip Alm (Section 4.2.1)
801313 Ver 6.6	17 May 2023	Software 801313 Version 6.6 Add PV Low Output Alarm function (Section 5.7)
801313 Ver 6.7	30 May 2023	Software 801313 Version 6.7 Add Total Load Power to Display (Menu 1 Screen 7) and Modbus
801313 Ver 6.8	24 Oct 2023	Software 801313 Version 6.8 Removed the need for the Disable Switch to be in the Disable position to enter the Settings Menus (section 5.1) Add Clear Data Log Information Screen during data log clearing Add Data Log Power Up Timed Record at Power Up Add the description of Test Mode (section 3.19)
801313 Ver 6.9	18 Mar 2024	Software 801313 Version 6.9 Menu J Screen 1 – now “Com Port Address / Slave ID” (added “Slave ID”) Re-instated the Disable Function to enter the Settings Menus based on the Settings Menu D Screen 0 setting (section 5.1)
801313 Ver 7.0	03 Feb 2025	Software 801313 Version 7.0 Add Battery State of Charge as a 4-20mA Output option
801313 Ver 7.1	30 April 2026	Software 801313 Version 7.1 Menu J Screen 2 changed to Com Port Baud Rate Selection (9600 or 19200) Menu 4, 5, 6 & B: Changed so all 8 Array Input Settings can be seen at all times Menu E Screen 13: Disable Charging on Battery Temp Function: Default = On Menu A Screen 14: No longer possible to change Hardware Version (This Software only supports MSRx PCB Assembly Hardware Version 2) Menu C: Remove Screens showing old 19” Rack Alarm Relays 5 & 6 When Boost Charge Inhibit Function is active, the Charge Controller will be in Float Mode (unless it is in Night Mode) – i.e. not go into Boost or Equal Modes.

9. Document Revision

Issue	Description	Date	Approved
3.0	Software 801313 Version 6.0 Update	03 Dec 2020	MF
3.1	Software 801313 Version 6.1 Update	21 June 2021	MF
3.2	Software 801313 Version 6.2 Update	21 Sept 2021	MF
3.3	Software 801313 Version 6.3 Update	13 May 2022	MF
3.4	Software 801313 Version 6.4 Update	02 Aug 2022	MF
3.5	Software 801313 Version 6.5 Update	13 Feb 2023	MF
3.6	Software 801313 Version 6.6 Update	11 May 2023	MF
3.7	Software 801313 Version 6.7 Update	30 May 2023	MF
3.8	Software 801313 Version 6.8 Update	24 Oct 2023	MF
3.9	Software 801313 Version 6.9 Update	19 Mar 2024	MF
4.0	Software 801313 Version 7.0 Update	03 Feb 2025	MF
4.1	Software 801313 Version 7.1 Update	30 April 2026	MF

