

# MCC-155 Charge Controller

## Product Manual



## 1. Introduction

The MCC-155 range of solar system charge controllers have been designed for industrial applications where a low cost, robust and solid-state switching solution is required. The controller prevents damage to the battery due to excessive charge or discharge and also provides a convenient place to interconnect the solar array, battery bank and load equipment.

The MCC-155 Charge Controller has connections for one solar array, one battery and one load. The basic function of the regulator is to control the transfer of energy from the array to the battery and load. The state of charge of the battery is sensed by monitoring the battery voltage.

### 1.1. Standard Features of the MCC-155 Charge Controller

- 1.1.1. System Voltages: 12V, 24V, 48V
- 1.1.2. System Polarity: Positive or Negative Earth (PE or NE)
- 1.1.3. System Regulation: Series regulation (i.e. connects the array to the battery for charging)
- 1.1.4. Regulation: Three stage charging (Boost, Equalisation and Float) set by potentiometer
- 1.1.5. Single Array Input with a maximum 15A charging current (solid-state switching)
- 1.1.6. Single Load Output with a maximum 5A load current (solid-state switching)
- 1.1.7. Temperature compensation by a sensor mounted on the controller PCB
- 1.1.8. Charging LED (Green) illuminates to indicate charging
- 1.1.9. High Volts (HV) LED (Red) illuminates to indicate the HV Alarm condition (set by potentiometer)
- 1.1.10. Low Volts (LV) LED (Yellow) illuminates to indicate the LV Alarm condition (set by potentiometer)
- 1.1.11. Load Cut (LC) LED (Red) illuminates to indicate the LC Alarm condition (set by potentiometer)
- 1.1.12. HV, LV and LC conditions operate a Common Alarm relay with changeover contacts available to the user
- 1.1.13. Disable link allows the user to disconnect the Load and the Array (insert link to disable)
- 1.1.14. 20A Battery and 10A Load fuses for over current protection
- 1.1.15. Metal oxide varistors to give induced lightning protection
- 1.1.16. IP65 Polycarbonate enclosure 175mm wide x 125mm high x 75mm deep with grey lid
- 1.1.17. Optional transparent lid if requested
- 1.1.18. Four PG16 glands are provided for Battery, Array, Load and Alarm cables (10-14mm cable diameter)
- 1.1.19. Battery, Array and Load connections are by PCB terminals suitable for 10mm<sup>2</sup> wire
- 1.1.20. Alarm connections are by PCB terminals suitable for 2.5mm<sup>2</sup> wire

## 2. Health & Safety

### 2.1. General

Read this manual thoroughly BEFORE undertaking any work.

Potentially lethal voltages can be present at the terminals within the Unit. Extreme care MUST be taken when performing any of the actions described in this manual. Remove all metallic personal adornments from the hands, wrists and neck before commencing work on a live unit. Ensure all tools are insulated.

### 2.2. Earthing

The MCC-155 Charge Controller can be used with either a Positive Earth or Negative Earth solar system.

### 3. Controller Operation

#### 3.1. General

The Charge Controller uses analogue electronic circuit technology to achieve the necessary functions of a solar system charge controller.

#### 3.2. Battery Connection

The battery connection is used to power the controller and to measure the battery voltage to sense the state of charge of the battery. A precision voltage reference is used to provide the necessary set-points used within the controller.

#### 3.3. Temperature

The temperature is detected by a temperature sensor mounted on the controller PCB assembly and this is used to temperature compensate the battery voltage measurement.

#### 3.4. Regulation

The compensated battery measurement is compared to a reference voltage to provide regulation. When the controller is charging the battery, the charging is interrupted briefly every 15-20 seconds to ensure there is sufficient voltage on the array to charge the battery. If there is sufficient voltage on the array and the battery voltage is below the regulation set-point, then the Charging LED will be illuminated and the Array will be connected to the Battery. When the battery voltage exceeds the Boost Regulation Voltage, the controller will regulate the battery voltage at the Boost Regulation Voltage for the Equalisation Period and then it will switch to the Float Regulation Voltage. The battery voltage must fall below the Reset to Boost Voltage for the controller to return to regulation at the Boost Regulation Voltage.

#### 3.5. Alarms

The controller will activate the High Volts Alarm LED when the battery voltage exceeds the High Volts Alarm Set-point. The controller will activate the Low Volts Alarm LED when the battery voltage drops below the Low Volts Alarm Set-point. The controller will activate the Load Cut Alarm LED, and disconnect the load from the battery when the battery voltage drops below the Load Cut Alarm Set-point. Whenever the HV, LV or LC Alarms are active, a Common Alarm relay will activate. The Common Alarm relay has a volt-free set of changeover contacts available to the user via terminals on the PCB.

#### 3.6. Disable Link

The user can Disable the controller by inserting a link onto LK1 in the DS (DISABLE) position. This will force the array and load switching devices to disconnect the array and the load from the battery.

#### 3.7. Protection

The controller provides over current protection by means of fuses for the battery (20A fuse) and the load (5A fuse). Metal oxide varistors are provided to give protection against voltage surges induced by lightning. The controller is protected against reverse connection of the Battery, Array and Load.

#### 4. Controller Set-points

| <b>Fulmen Settings</b>                   | <b>Per cell</b> | <b>12V</b> | <b>24V</b> | <b>48V</b> |
|--|-----------------|------------|------------|------------|
| Boost & Equalisation Regulation Voltage  | 2.45 V          | 14.70 V    | 29.40 V    | 58.80 V    |
| Float Regulation Voltage                 | 2.30 V          | 13.80 V    | 27.60 V    | 55.20 V    |
| High Volts Alarm Trip                    | 2.50 V          | 15.00 V    | 30.00 V    | 60.00 V    |
| High Volts Alarm Reset                   | 2.45 V          | 14.70 V    | 29.40 V    | 58.80 V    |
| Low Volts Alarm Trip                     | 1.95 V          | 11.70 V    | 23.40 V    | 46.80 V    |
| Low Volts Alarm Reset                    | 2.05 V          | 12.30 V    | 24.60 V    | 49.20 V    |
| Load Cut Alarm Trip                      | 1.90 V          | 11.40 V    | 22.80 V    | 45.60 V    |
| Load Cut Alarm Reset                     | 2.10 V          | 12.60 V    | 25.20 V    | 50.40 V    |
| Temperature Compensation Null Temp       | 20°C            | 20°C       | 20°C       | 20°C       |
| Temperature Compensation Rate (per cell) | -5.0mV/°C       | -30mV/°C   | -60mV/°C   | -120mV/°C  |
| Equalisation Period                      | 30 mins         | 30 mins    | 30 mins    | 30 mins    |

| <b>Vented Settings</b>                   | <b>Per cell</b> | <b>12V</b> | <b>24V</b> | <b>48V</b> |
|--|-----------------|------------|------------|------------|
| Boost & Equalisation Regulation Voltage  | 2.40 V          | 14.40 V    | 28.80 V    | 57.60 V    |
| Float Regulation Voltage                 | 2.35 V          | 14.10 V    | 28.20 V    | 56.40 V    |
| High Volts Alarm Trip                    | 2.45 V          | 14.70 V    | 29.40 V    | 58.80 V    |
| High Volts Alarm Reset                   | 2.40 V          | 14.40 V    | 28.80 V    | 57.60 V    |
| Low Volts Alarm Trip                     | 1.90 V          | 11.40 V    | 22.80 V    | 45.60 V    |
| Low Volts Alarm Reset                    | 2.00 V          | 12.00 V    | 24.00 V    | 48.00 V    |
| Load Cut Alarm Trip                      | 1.80 V          | 10.80 V    | 21.60 V    | 43.20 V    |
| Load Cut Alarm Reset                     | 2.00 V          | 12.00 V    | 24.00 V    | 48.00 V    |
| Temperature Compensation Null Temp       | 25°C            | 25°C       | 25°C       | 25°C       |
| Temperature Compensation Rate (per cell) | -5.5mV/°C       | -33mV/°C   | -66mV/°C   | -132mV/°C  |
| Equalisation Period                      | 30 mins         | 30 mins    | 30 mins    | 30 mins    |

| <b>VRLA Settings</b>                     | <b>Per cell</b> | <b>12V</b> | <b>24V</b> | <b>48V</b> |
|--|-----------------|------------|------------|------------|
| Boost & Equalisation Regulation Voltage  | 2.30 V          | 13.80 V    | 27.60 V    | 55.20 V    |
| Float Regulation Voltage                 | 2.25 V          | 13.50 V    | 27.00 V    | 54.00 V    |
| High Volts Alarm Trip                    | 2.40 V          | 14.40 V    | 28.80 V    | 57.60 V    |
| High Volts Alarm Reset                   | 2.35 V          | 14.10 V    | 28.20 V    | 56.40 V    |
| Low Volts Alarm Trip                     | 1.90 V          | 11.40 V    | 22.80 V    | 45.60 V    |
| Low Volts Alarm Reset                    | 2.00 V          | 12.00 V    | 24.00 V    | 48.00 V    |
| Load Cut Alarm Trip                      | 1.80 V          | 10.80 V    | 21.60 V    | 43.20 V    |
| Load Cut Alarm Reset                     | 2.00 V          | 12.00 V    | 24.00 V    | 48.00 V    |
| Temperature Compensation Null Temp       | 25°C            | 25°C       | 25°C       | 25°C       |
| Temperature Compensation Rate (per cell) | -3.3mV/°C       | -20mV/°C   | -40mV/°C   | -80mV/°C   |
| Equalisation Period                      | 30 mins         | 30 mins    | 30 mins    | 30 mins    |

#### 5. Installation

**5.1. Mounting and Position**

The MCC-155 Charge Controller should be installed using either the two mounting feet supplied or using the four fixing points which are hidden by the cover fixing screws (see Figure 1). Ensure that the fixing method employed is sturdy enough to support the weight of the Unit. Position the unit so that it is shaded from direct sunlight, sheltered from extreme weather conditions and oriented so that the cable glands are pointing downwards.

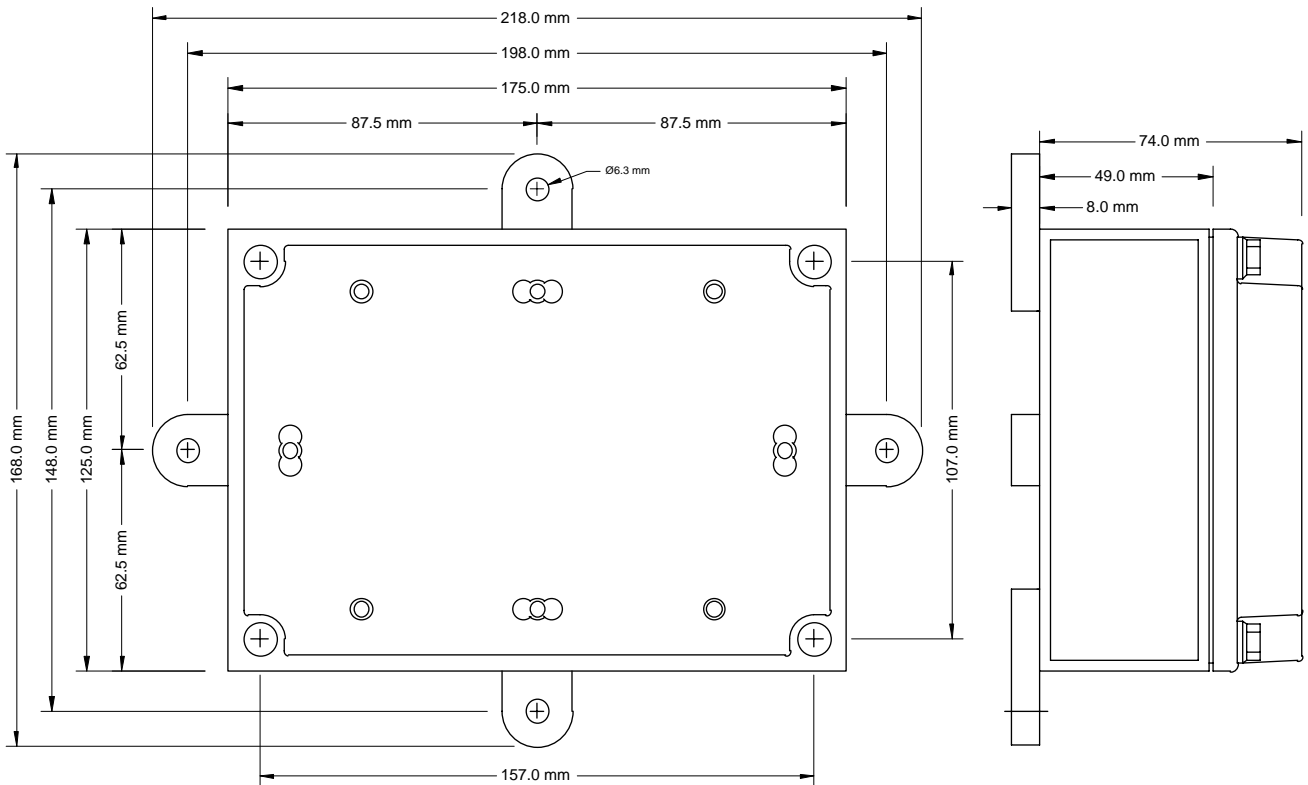


Figure 1

**5.2. Electrical Connections**

**5.2.1. To disable the MCC-155 Charge Controller, ensure the Jumper Link is inserted on LK1 in the DISABLE position.**

5.2.2. Make the electrical connections in the following order:

Connect the PCB terminal BATT +VE to the Battery positive.

Connect the PCB terminal BATT -VE to the Battery negative.

Connect the PCB terminal ARRAY +VE to the Array 1 positive.

Connect the PCB terminal ARRAY -VE to the Array 1 negative.

Connect the PCB terminal LOAD +VE to the Load positive.

Connect the PCB terminal LOAD -VE to the Load negative.

Common Alarm relay contacts: connect to external equipment as required.

**5.2.3. To enable the MCC-155 Charge Controller, ensure the Jumper Link is inserted on LK1 in the ENABLE position.**