

IMARK SR-SRX100 Solar Regulator Installation Manual



| SECTION | CONTENTS | Page # |
|---------|----------------------------------|--------|
| | Revision List | 2 |
| | Inclusions | 2 |
| | This Document | 2 |
| | Warnings | 3 |
| 1.0 | Introduction | 5 |
| 2.0 | System Overview | 8 |
| 3.0 | SRX Solar Regulators Description | 11 |
| 4.0 | Installation And Maintenance | 18 |
| 5.0 | Specifications | 29 |
| | | |
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| REVISION LIST | | | |
|---------------|-----------------|--------|----------------|
| Date | Details | Rev. # | Authorised By: |
| 01/08/2019 | Initial Release | 0 | OS |
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INCLUSIONS

The following items are included in the standard package:

- 1 piece SR100 or SRX100 Solar Regulator
- 1 piece Wall Mounting Bracket
- 1 piece Battery Temperature Sensor
- 1 set Mounting Screws
- 1 Operators Manual (on CD) including Parts List






THIS DOCUMENT

This manual has been deliberately written using non-technical terms to provide readers with a simple understanding of how the IMARK SRX Series MPPT Solar Regulators should be installed. This manual provides sufficient detail to enable technically trained people the ability to correctly install these units.

This manual is supplied in soft copy format on CD and includes the following documents as separate files:

| DESCRIPTION | File Name | Revision |
|-------------|-------------|----------|
| This Manual | 757192x.pdf | 0 |
| | | |
| | | |
| | | |

The following graphics may be used throughout this manual to alert users and installers to potential safety hazards or to indicate that this manual should be referred to for the correct instructions.

| | |
|---|--|
|  WARNING | <p style="text-align: center;">WARNING</p> <p>This symbol is used to indicate that there is the potential risk of electrocution unless the equipment is not fully isolated from all power sources. Extreme care should be heeded in these cases.</p> |
|  INFORMATION | <p style="text-align: center;">REFER TO MANUAL</p> <p>This symbol indicates that the user or installer should refer to the specific section in this manual where specific information relating to user operations or settings are required for correct operation.</p> |
|  TIP | <p style="text-align: center;">TIP</p> <p>This TIP symbol indicates that the information provided in this box is only a helpful hint that may assist the user during operation, or the installer during installation.</p> |
|  CAUTION | <p style="text-align: center;">CAUTION</p> <p>The Caution symbol is used where there is no danger to personal safety, BUT, an incorrect setting may cause damage to this equipment, or some other equipment working in conjunction with this equipment.</p> |
|  NOTE | <p style="text-align: center;">NOTE</p> <p>This Note symbol is used to remind installers or users that recording the settings may provide a good record or future reference point should it become necessary to revisit the site.</p> |

WARNINGS



WARNING

WARNING

The voltages used by these Solar Regulators range from 48Vdc up to 500Vdc. These are **LETHAL VOLTAGES**. For your safety, **ALWAYS** isolate this regulator from **ALL** power sources before making any connections or removing any covers. These higher power levels are sufficient to cause electrocution (**DEATH**), and therefore **should only be serviced by competent appropriately qualified technicians**.

- During installation, firstly connect the battery bank to the solar regulator before connecting the PV solar panels. Always disconnect or open the PV solar panel circuit, before disconnecting the solar regulator from the battery bank.
- If multiple regulators are used to charge a common battery bank, ALWAYS ensure that **ALL** solar regulators are connected to the battery bank BEFORE making any other connections. When disconnecting, ALWAYS disconnect **ALL** solar panels BEFORE disconnecting the battery bank.
- These Solar Regulators are designed for indoor installation, or in fully enclosed cabinets. They must not be installed at locations where they may be exposed to rain or moisture, or in locations exposed to direct sunlight.
- Multiple solar regulators can be used to charge a common battery bank. However, the PV input to each solar regulator MUST be completely independent from all other PV inputs.
- Always use appropriately sized cables for the installation.
- Always ensure that all terminations are tight to avoid temperature hot spots caused by loose connections.
- Always ensure that the regulator is correctly grounded using the ground terminal on the bottom of the unit.
- Blocking diodes MUST be installed whenever multiple PV Input Strings are applied to any one of the regulator's PV Inputs.
- Always use insulated tools when working with electrical circuits, and remove any personal jewelry that may cause a short circuit or injury hazard.
- The battery bank must comprise of the same make, type, and age batteries.
- Always extinguish any naked flames when working near batteries.
- Special precautions MUST be taken when these regulators are used with INDUCTIVE LOADS. Please refer to the WARNINGS pages under 4.0 Installation.

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1.0 INTRODUCTION

Thank you for choosing an **IMARK SRX100 Series Solar Regulator**. We trust it will perform to your expectations. We, at Imark, value feedback from our customers and would appreciate any feed-back or suggestions that may lead to Imark having a better product. Such input, good or bad, will help us improve and design better products.

The **IMARK SRX100 series of Solar Regulators** have been designed and manufactured in Australia to meet worldwide market needs. They include the following features:

- Deluxe models with LCD Display & Internet Capability
- All models rated for 100 Amperes based on the battery voltage
- Maximum 500 Voc PV Input permits connection of up to 12 standard 60 cell (250W) panels or 9 standard 72 cell (330W) panels per input.
- Multiple PV Inputs (2 x 2.5kW inputs on 48V models) or (4 x 3kW inputs on 120V models)
- Dual independent Maximum Power Point Tracking (MPPT) satisfies East & West PV Panel orientation
- Interleaved Pulse Width Modulation (PWM) on all models greatly reduces EMI noise
- High Efficiency (~95%)
- Inbuilt Transient Surge Protection on the solar input
- Efficient Convection Cooling
- Over Voltage Protection to protect the battery bank from over charging
- Over Temperature Protection to protect the Solar Regulator from over heating
- Battery Temperature Sensor to protect the Battery Bank from over charging, and to cease or reduce charging on battery over-temperature
- Low Battery Voltage Load Disconnect to protect the battery bank from over-discharging
- Generator starting function with second Delayed Output Signal to control transfer switches
- Remote Alarm Output Terminal
- Remote Signal Output terminal for control of external devices such as generators, lights, or pumps
- Rugged Compact Design (only 420mm x 315mm x 175mm excluding protrusions & model dependent)
- LED's simply indicate operating status or alarm status at all times on all models
- LED's & Illuminated 4x20 alphanumeric LCD to display the current working status on SRX100
- High quality PV connectors enable easy PV Connection
- SD Card Slot and USB Port enables product lifetime storage of historical data
- Easy operational monitoring or setting changes using the IMARK Site Explorer on web browsers over the Internet or with direct laptop connection
- 4RU 19" Rack Mounting arrangement or Wall mounting versions
- Remote LCD Display can program or monitor up to 4 SR/SRX100 regulators in the one system
- 10 Amp Load output to operate external fans or other local DC equipment
- Maximum settings flexibility

The Imark SRX100 regulators are enclosed in metalwork housing with a substantial aluminium heatsink at the rear of the unit. A Mounting Plate is provided to enable easy & secure installation of the units in the chosen location. Plug and Socket connectors are provided for the PV Inputs allowing the PV cables to be simply plugged into the appropriate polarised connector. Connections are included for two or four PV input strings (model dependent), but only one string per input is permitted on each of the PV inputs unless blocking diodes are employed.

The battery connections, due to the larger cable sizes, require the removal of the small cover plate on the front for access to the battery + and – terminals, and require a technically competent tradesman to do this part of the installation.

The 4RU 19" Rack Mounting models use the same extruded heatsink and electronic circuitry as the wall mounting models, and have the same features and identical electrical performance to the wall mounting models. Additionally, the Rack Mounting regulators have two fans included for even better air circulation and cooling.

Two Power Channels

It should be noted that the regulator has two independent MPPT power channels which is ideal for installations with an east facing roof and a west facing roof.

Accordingly, each power channel has its own CANBus Identity, and thus each channel reports its performance individually. Accordingly, the LCD displays only the performance data for the appropriate power channel. It is necessary to select the appropriate power channel through Screen 0.1 to view the performance data of individual power channels. Please refer to section 2.2 where the construction of the regulator is described in more detail.

Available Models

The following model configurations are available:

| Imark Stock # | Model # | Details |
|---------------|-------------|--|
| 804810 | SR100-48 | Solar Regulator, 100 Amp for 48Vdc operation, dual-phase PWM & Maximum Power Point Tracking, Wall Mounting |
| 804811 | SR100-48R | Solar Regulator, 100 Amp for 120Vdc operation, dual-phase PWM & Maximum Power Point Tracking, 19" Rack Mounting |
| 804812 | SRX100-48 | Solar Regulator, 100 Amp for 48Vdc operation, dual-phase PWM & Maximum Power Point Tracking, LCD Display, Wall Mounting |
| 804813 | SRX100-48R | Solar Regulator, 100 Amp for 48Vdc operation, dual-phase PWM & Maximum Power Point Tracking, LCD Display, 19" Rack Mounting |
| | | |
| 804815 | SR100-120 | Solar Regulator, 100 Amp for 120Vdc operation, dual-phase PWM & Maximum Power Point Tracking, Wall Mounting |
| 804816 | SR100-120R | Solar Regulator, 100 Amp for 120Vdc operation, dual-phase PWM & Maximum Power Point Tracking, 19" Rack Mounting |
| 804817 | SRX100-120 | Solar Regulator, 100 Amp for 120Vdc operation, dual-phase PWM & Maximum Power Point Tracking, LCD Display, Wall Mounting |
| 804818 | SRX100-120R | Solar Regulator, 100 Amp for 120Vdc operation, dual-phase PWM & Maximum Power Point Tracking, LCD Display, 19" Rack Mounting |
| | | |
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| | | |
| | | |

Available Options

The following versions and/or accessories are available as options at extra cost:

- Remote LCD Display Unit
- SD Cards
- Ambient or Battery Temperature Sensors
- CANBus cables & connectors
- CANBUS Termination Resistors
- Blocking Diodes
- Installation Accessories

Standards

The Imark SRX100 Regulators comply with the following standards:

| Title: | Standard # |
|-------------------|-------------------|
| Electrical Safety | IEC62109 Part 1 |

AS = Australian, NZS = New Zealand

2.0 SYSTEM OVERVIEW

This section describes a typical installation using Imark SR or SRX series Solar Regulators. It includes a system block diagram and explains how the Imark Solar Regulator interfaces with other equipment to form an off-grid solar system. The purpose of the various parts of the system are described briefly. A more detailed description of the Imark SRX regulators is provided in Section 3 of this manual, while detailed installation instructions and a full description of the user interface are described in following sections.

2.1 Overview

The Imark SR Series Solar Regulators are part of a family of solar regulators based on one design platform and using many common components. The models described in this manual are with 100 Amp charge capability, and for either 48, or 120 battery banks only. These models are available in Wall mounting or 19" Rack mounting configurations. Each model is supplied with six LEDs that provide operational status as well as diagnostic information. A full featured back-lighted LCD display is also included with the SRX models and allows entry of settings via the keypad, as well as providing performance data and diagnostic information. Multiple units in a system can communicate with each other via CANBus while an SD Card port is provided for long term storage of performance data. These regulators have numerous built-in protection features to ensure trouble free operation, and have an electrical efficiency of $\geq 95\%$ at full load. These regulators are designed to operate in temperatures from 0° to 50°C with a storage temperature of -30°C up to 70°C and with a non-condensing humidity of up to 95%.

Imark SR Regulators will accept a maximum PV input voltage of up to 500Voc, and require a minimum PV input voltage of approx. twice the battery voltage up to 500Voc maximum. As these regulators have modern sophisticated capabilities, they require programming and installation by suitably qualified tradespeople.

These regulators also have a separate Low Amperage LOAD output, which provides a battery voltage output (up to 10 Amps) to run external equipment, such as fans or other site equipment. Conditions can be applied to this load output based on time, temperature, and/or battery State of Charge (SOC).

All Imark SR/SRX Regulators are provided with a remote battery temperature sense facility to ensure optimum charging of the battery at all temperatures, and to stop charging in the event that the battery bank becomes overheated. An optional 2nd temperature sensor is available for users wishing to monitor the ambient temperature for control of the Load Output, or remote output control for fans, heaters, or airconditioners.

A Remote Output Signal terminal, which can have conditions enabled, based on Battery State Of Charge, Ambient Temperature, Time, or Cycle Period, allows customisation to control external equipment. A separate Generator Control signal terminal (using similar controls) is provided on the Signal connector.

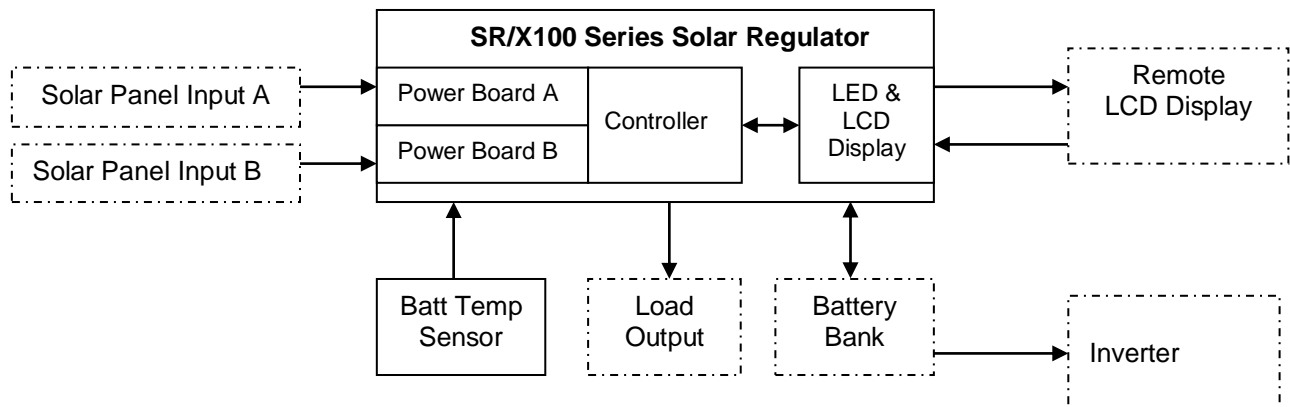
The IMARK Site Explorer is standard with every SRX unit and allows users to monitor the system operation, download historical performance data, or make setting changes easily using their standard web browser. This can be achieved by direct laptop connection or by using the internet.

Various security features are included to prevent unauthorised access, and to prevent malicious or inadvertent tampering with the operational settings.

The optional Remote Control Unit includes the LED's as well as the 4 x 20 LCD module and permits remote display of settings, operating parameters, and for programming the settings or for viewing any alarms, warnings, or shutdown messages.

2.2 Block Diagram

The following diagram shows the general functions of the SRX60, describes the various elements of the system, and the function of each part of the system.



2.2.1 Solar Regulator

The Solar Regulator is the ‘heart’ of any off-grid solar system. The regulator uses the solar panel input power to charge the battery bank, and controls the provision of power from the battery to the Load Terminals. It employs a Maximum Power Point Tracker to obtain the maximum power from the available sunlight. The Imark SRX regulators will automatically select the most appropriate charging mode (based on the installation settings) to provide optimum battery performance and battery longevity. The LCD display panel is installed on all SRX Regulators. The regulator section of the Solar Regulator operates completely independently from the LCD Display Panel and may be operational with or without the LCD Display Panel being operational.

2.2.2 Solar Panel Input

The solar panels (technically known as Photovoltaic Panels) provide the power, derived from sunlight, to the Solar Regulator. The Solar panels can vary from an individual panel to multiple panels arranged as a ‘string’ or multiple strings. Where multiple strings are employed and connected to the one PV Input, each string must be fitted with blocking diodes to avoid circulating currents and to achieve maximum efficiency, even if the panels have by-pass diodes installed (as the bypass diodes perform another function).

Further, the maximum string voltage (V_{oc}), of any string, must NEVER exceed the maximum V_{oc} rating of the Solar Regulator.

2.2.3 Battery Bank

The Battery Bank provides an energy storage medium and is sized to suit the installation. During the daytime, when there is plenty of solar input, the regulator will charge the battery, while also supplying any load requirement from the LOAD terminals. At night, when there is no sunlight, the regulator will supply the load power needs from the battery. If the site is equipped with an Inverter, the Inverter will also draw power directly from the battery. During this period, the battery will become discharged. The depth of discharge will depend on the battery state of charge at sunset, the amount of power being drawn from the battery, and the size of the battery. It is normal practice with standalone off-grid systems, to size the system for 5 days of cloud cover, and for a maximum allowable battery depth of discharge (‘DOD’) of 50%. Where Grid-Power, or a generator, is available as the back-up, the battery sizing will most probably be less.

When operating with sunlight, the regulator will charge the battery in accordance with the different battery charge modes, namely; Bulk, Absorption, Equalise, & Float modes.

2.2.4 Load Output

The Load Output supplies DC power to the DC equipment on site, and the voltage supplied to the Load Output terminals is at the nominal battery voltage.

Various conditions can be applied to the Load Output to disconnect the load output and prevent damage to the battery bank, or to activate lights, fans, and electrical equipment. These conditions can be based on Time, Battery State of Charge (SOC), Ambient Temperature, Battery Voltage, or Time Period (days).

2.2.5 Battery Temperature Sensor

A Battery Temperature Sensor is provided with each Regulator to monitor the battery temperature so that temperature compensation can be employed by the Regulator to correctly charge the battery bank. The temperature sensor should be mounted on a battery terminal post using the 'Lug' terminal. It is normal to install this sensor approximately in the centre of the battery bank. The battery temperature sensor is supplied with 5 metres of cable, which can be shortened or extended if required by the location. Please bear in mind that some batteries do not require temperature compensation. In these cases, the temperature compensation should be set to 0mV/°C/Cell.

2.2.6 LED or LCD Display

All SRX models are supplied with 6 LED's and a 4x20 character backlighted LCD display for programming and display of operating parameters, and an SD Card port for data storage, as well as including the IMARK Site Explorer software that permits direct connection to a laptop or PC, as well as remote system monitoring over the Internet. Full details covering programming and operation of the Internal LCD unit is provided in Section 6 of this manual.

Note: An SD Card with a storage capacity of 2GB will store the lifetime performance data of one regulator. Larger capacity SD Cards may be installed, but are not necessary. Some larger capacity SD Cards may not operate in the regulator.

2.2.7 Remote LCD Display (Optional)

A Remote LCD Display unit is available as an option and can be installed in a system with up to four SR or SRX regulators. The RLCD unit can be mounted up to 100 metres from the regulators, and includes similar features to the Internal LCD unit.

3.0 SOLAR REGULATOR

This section describes in detail the purpose and operating parameters of the IMARK SRX Regulators. This information will help users better understand how and why the regulator operates as it does, and will also provide technical people with background information that may be helpful when installing these regulators.

3.1 Maximum Power Point Tracking (MPPT)

All SR & SRX Series regulators use MPPT algorithms where the MPPT constantly re-calculates the maximum power point over the whole operating range of the input from the solar panels, determines the maximum power point voltage, and operates at the voltage that produces the maximum PV power input from the available Solar Input. The use of two MPPT algorithms permits two PV panel mounting orientations (e.g. East & West) without compromising performance.

MPPT Mode requires the solar input power produced by the Solar Panels to be presented to the Solar Regulator's PV input. The regulator uses the solar input power to charge the battery and to supply the load, with the load receiving first priority and the surplus power being used to charge the battery.

3.2 Battery Management

The battery management function manages the battery charging parameters. It provides a charging regime that includes the various charge modes, namely: bulk, absorption, equalisation, and float, plus the night mode (storage mode). The battery management system also controls the low battery voltage load disconnect function, over current protection, and provides the ability to set different operating parameters for different battery types and sizes. Over current protection is provided to prevent damage to the battery and/or the regulator in the event that too much battery current is drawn. Further, the battery charge current can be set to prevent charging the battery at a rate higher than the battery manufacturers' recommended maximum charge rate.

3.3 Modes of Operation & Charging

There are several modes of operation which depend on the load, the available source of power, and the battery condition. Mode selection (except standby mode) is made automatically by the regulator based on the settings entered by the technician during installation, and the state of the PV input, Battery, & Load Voltages. Battery Charging occurs in most modes. Brief descriptions of all modes are described as follows:

Night Mode: Night mode occurs when there is no solar input, and therefore the batteries are not being charged. The Load output power requirement is supplied from the battery bank. When the solar panels start producing power and the solar input voltage exceeds approximately twice the battery voltage, the regulator switches to the appropriate Charge mode (normally Bulk Charge mode at the start of the day).

Bulk Charge: During Bulk Charge, the battery voltage level will rise steadily as the battery is being charged. The Bulk charge mode continues until the battery voltage reaches the set Absorption Charge voltage setting (around 57.6Vdc, or 144.0Vdc) at which time the charge mode will change to Absorption mode.

Absorption Charge: Absorption Charge mode commences immediately the battery voltage reaches the Absorption Charge Voltage setting (except when Equalisation Charge occurs). The Absorption Charge mode will maintain charge to the battery bank at the Absorption Charge Voltage setting for the set Absorption Charge Time period, to ensure that the battery is fully charged. When the Absorption Charge period is reached, this charging mode ceases, and the charging mode reverts to Float Charge mode.

Float Charge: Float Charge mode will hold the battery bank voltage at the Float Voltage setting, to maintain full battery capacity, by charging the battery at an appropriate current, further providing there is sufficient solar input power. The charging mode will remain in Float Charge mode for as long as there is uninterrupted solar input power available. Should/when the Solar Input Power ceases, the regulator assumes that the sun has set, and changes to Night mode.

Equalisation Charge: Equalisation Charge mode can be enabled during programming at installation, and will occur automatically after the set time period (# of days) has elapsed. When Equalisation Charge mode is activated (by valid regulator settings), it overrides the normal Absorption Charge cycle and allows the Bulk Charge mode to continue until the Equalisation Voltage is reached. Equalisation Charge mode will then charge the battery at the set Equalisation Voltage for the set Equalisation Time period. After the battery voltage has been held at the Equalisation Voltage for the Equalisation Time, the charge mode will change to Float Charge mode. The Equalisation Charge mode is used to equalise the cell voltages and may be used to prevent stratification of the battery electrolyte.

Note: Equalisation Charge is not required with some battery types.

Standby Mode: The Standby Mode is enabled by pressing the ON/OFF switch on the front panel (for about 5 seconds). In Standby Mode, the regulator is effectively turned OFF, although the microprocessor continues to operate normally (just like switching the TV off at home using the Remote). In these cases, the regulator's LCD display will show 'OFF'.

3.4 Battery Temperature Compensation

Imark SRX regulators include Battery Temperature Compensation which needs to be set (in accordance with the battery manufacturer's requirements) during installation. Battery Temperature Compensation will reduce the battery charging voltage inversely proportional to the battery temperature, to prevent the battery from being overcharged when at elevated temperatures. Battery Temperature Compensation will be disabled at temperatures below 25°C on all models. Battery Temperature Compensation is 0mv/°C/Cell at 25°C. If the battery temperature sensor is NOT fitted, the regulator will assume the battery temperature is 25°C, and will operate with the programmed Battery Settings NOT reduce the battery charging voltages at higher temperatures.

3.5 Internal Temperature Sensor

The temperature of the regulator heatsink is continuously monitored and if the regulator heatsink exceeds 60°C, the maximum Regulator output power is reduced progressively. The regulator will cease operating if the heatsink temperature reaches 80°C. The maximum Regulator output will remain limited until the temperature reduces to less than 60°C. These regulators are designed to operate within an ambient temperature range from 0°C up to 50°C.

3.6 Low Battery Voltage Load Disconnect Function

The load disconnect function is accomplished by disconnecting the Load Output thereby not drawing any DC power from the battery whenever the battery voltage falls below a set voltage. This is set during installation and is to protect the battery bank from over-discharge and damage. The normal battery charging routine continues whenever solar input is present irrespective of whether the Load Output is connected or not.

Hysteresis is required to prevent the load from being reconnected until the battery voltage rises to the re-connect voltage set point i.e. when it is somewhat charged, or has recovered from a heavy discharge. The Load Output will automatically be re-connected when the battery voltage recovers to a suitable level (usually set about 1.0 Vdc above the Low Battery Voltage Load Disconnect voltage).

Even when the load is dis-connected, the regulator will continue charging until the battery voltage reaches the re-connect set point, at which time, the load will be reconnected. The battery management circuit has an automatic reset so that if the battery becomes fully discharged, a fresh battery can be connected and the output will operate correctly without the need to reset the regulator. On SRX models, the Low Battery Voltage Load Release is adjustable from 0.0V-63V on 48V models, or 0.0V-160.0V on 120V models.

NOTE: These settings have NO control over the power being drawn from the battery by an inverter connected directly to the battery.

If the Low Battery Voltage Disconnect setting is the same as the Low Battery Voltage Reconnect setting, this function will be disabled.

3.7 Battery, Load, & Solar Connections

Four polarised MC4 plugs & sockets (8 on 120V models) are included on the terminal panel for the PV Input. As the Battery Cables are much heavier, these cables are input via the large gland nuts on the Terminal Panel, and are connected directly to the “+” and “-” battery terminals internally on the pcb assembly. A small access panel is provided on the front of the regulator allowing the installer access to the required terminals. A 4 way Plug & Socket connector is provided on the terminal panel for the Load connection. Always ensure that the cables are correctly polarised, fully inserted, and that the cable securing screws are tight when making these connections.

3.8 Load Conditions (SRX Models)

Conditions can be applied to the load terminals which can be used to apply further controls to the load output for use with fans, DC Lights, or similar equipment that only needs to run for defined periods, or at set times. Activation can be based on Time of Day, and/or Battery SOC, and/or Ambient Temperature conditions. A frequency or cycle period (in days) can also be set if required.

3.9 Protection Devices

All SR and SRX Series regulators are fitted with transient protection devices on the Solar Inputs to protect the unit from incidental lightning strikes and/or voltage spikes. TVS diodes are internally fitted on the Battery and Load terminals to reduce the possibility of regulator damage being caused by voltage spikes on the Battery and Load terminals. Numerous software controlled protection features are also included to protect the regulator and/or system against over-current, over-voltage, under-voltage, and over-temperature conditions.

3.10 LED Status Indicators

All Regulators are fitted with six LED's to indicate the Battery State of Charge, the operating status or error status of the regulator. A table describing the status indicated by the LED's is provided in Section 5 of this manual.

3.11 Control & Display

One micro-controller is used by the SRX Solar Regulators to manage the solar input, battery charging, load output, the remote signal output, CANBus communications with other regulators, and the LED's. An additional micro-controller is used to manage the 4x20 LCD display, communicate via CANBus with regulators in the system, and includes the IMARK Site Explorer software to provide the Internet capability.

All LED indications displayed on SRX Regulators will also be displayed on any Remote LCD Control Unit (if installed in the system).

3.12 LCD Display & Control Unit (SRX Models)

The LCD Display & Control Unit is installed on the front panel of the regulator and is provided to monitor and display the performance of the regulator, or to program the Regulator with the user settings. The LCD Display & Control Unit has limited control over the regulator and plays no part in the maximum power point tracking, or the battery or the load management of the system. The LCD Display Controller will NOT stop the regulator from operating correctly, even if the internal LCD Display section fails for any reason.

The Internal LCD Display unit includes a 4 x 20 alpha-numeric character display to show operating parameters and can be used to program the Regulator. A buzzer is included within the LCD Display Unit to announce keystroke operation when using the LCD Display. The buzzer will also sound to indicate a ground fault on models equipped with Ground Fault Indication (GFI) function.

Whenever a key is pressed, all LED's on the LCD Control Panel are turned off, except the LED above the 'pressed' key. All LED's return to their normal display condition two seconds after the most recent key-press.

Also note that the LCD Display and Remote Controller units get their power through the battery terminals, and are always active when the battery is connected.

3.13 LCD Control Keys.

The Remote LCD Control Unit has six keys for programming, as follows:

| | | |
|--------------|-----|---|
| UP | ▲ | For navigating the menu and to exit the programming mode |
| DOWN | ▼ | For navigating the menu and to exit the programming mode |
| LEFT | ◀ | For navigating the menu and to enter the programming mode |
| RIGHT | ▶ | For navigating the menu and to enter the programming mode |
| ENTER | ■ | To select and store the indicated setting |
| LEFT & RIGHT | ◀ ▶ | To enter the programming mode (pressed simultaneously) |
| UP & DOWN | ▲ ▼ | To Exit the programming mode (pressed simultaneously) |
| ON/OFF | ■ | To switch the regulator between Normal & Standby modes. |

These keys also operate in the same manner on the Remote LCD Control.

3.14 Remote LCD Control Unit (Optional)

An optional Remote LCD Control Unit can be installed to monitor the performance of the regulator/s remotely, or to program the Regulator/s with the user settings. The Remote LCD Control Unit includes 6 LED's as well as the 4 x 20 alpha-numeric character display to show operating parameters of the connected Regulator/s.

All indicators available on an internal LCD unit are replicated on the Remote LCD Control Unit. A buzzer is also included on the Remote LCD Display Unit to announce keystroke operation when using the LCD Display.

The RCU may be installed up to 100 Metres from the Regulator using a CANBus cable to connect to the installed regulator. However, the Remote Control Unit **MUST** be connected to a regulator using the CAN 1 connector to obtain voltage from the battery to operate.

Note: The Remote LCD Unit has an extra connector on the terminal board. This connector, however, is not yet functional, as it has only been included to cater for future features.

3.15 Terminal Panel

The Terminal panel is located at the bottom of the wall mounting unit, or at the rear of the unit on 19" Rack Mounting units. The following connectors are located on the terminal panels:

- Two MC4 plugs & Two MC4 sockets for easy connection of the Solar Inputs on 48V units.
Four MC4 plugs & Four MC4 sockets for easy connection of the Solar Inputs on 120V units.
- One 4-way 10 Amp connector for the +/- Load Output power.
- One 16-way 1A plug & socket connector for all I/O interface connections. eg. Ambient Temperature Sensor, Battery Temperature Sensor, Remote ON/OFF function, Alarm output, Relay Signal output, and Generator Start Signal output.
- Two 4-way plug & socket connectors for CANBus interface.
- One RJ45 8-way socket for Ethernet connection.
- Two Gland nuts to accept two 50mm² battery cables. Note: The Battery Cables **MUST** be terminated internally as described in clause 3.7 previously.

Note: Battery voltage (for the Remote Control Unit) is only provided on the CAN 1 connector.

3.16 Generator Starting Capability

The 16-way interface connector on the Terminal Panel has two signal terminals for starting generators. One signal output is used to start the generator, while the second signal output (with delayed activation) can be used to activate an external device (such as a change-over switch). This allows generators to be started with no load and then activate an external transfer switch when the delay period elapses. This is a signal terminal only and **cannot** be used to power external equipment.

3.17 Ambient Temperature Sensor Input (Optional)

The 16-way interface connector on the Terminal Panel includes connection terminals to which the external Ambient Temperature Sensor can be connected. This sensor may be used with the Load/Remote functions.

3.18 Remote Shutdown (ON/OFF)

The 16-way interface connector on the Terminal panel includes a terminal that can be used by external control equipment to Shut-Down the regulator if required. Its signal return path is through Pin #8 (GND).

3.19 Alarm Output Signal

The 16-way interface connector on the Terminal panel includes an Alarm Output Signal terminal that can be used by external control equipment to advise of an Alarm condition if required. Its signal return path is through Pin #10 (IGND).

3.20 Relay Signal Output

The 16-way interface connector on the Terminal Panel includes a Relay Signal Output terminal to allow the regulator to activate external devices, such as a generator, air-conditioner, heater, light, etc, if required.

Activation can be based on Time of Day, and/or Battery SOC, and/or Ambient Temperature conditions. A frequency or cycle period (in days) can also be set if required. Its signal return path is through Pin #10 (IGND).

3.21 Ethernet Connector and Cables (SRX Models)

A standard Ethernet cable (usually Blue colour) can be used to connect the Solar Regulator through the RJ45 connector (P2) on the terminal panel to the Internet through an Ethernet Switch or Router.

In cases where the user wants to make a direct connection to a computer, either a standard Ethernet cable (usually blue colour), or an Ethernet Data Crossover cable (usually yellow colour) can be used. These cables are readily available from IT accessory stores.

3.22 SD Card Holder Slot (SRX Models)

The SRX regulators are fitted with a SD Card Holder on the front panel of the regulator. A 2GB SD Card will have sufficient capacity to store the performance data (on a 30-minute basis) for more than the expected lifetime of the product. Data Logging to the SD Card MUST be enabled in Screens 8.1 & 8.2.

All performance data is stored in the **regulator's** EEPROM, and is retrieved from the regulator's EEPROM on a 30 minute basis and stored on the SD Card. Therefore, any data retrieved from the SD Card will only be historical data applying to a prior time period, and may be 30 minutes old. It is possible to retrieve the historical data from the SD card at any time via the Ethernet port, or via the Internet.

Note: Users should always bear in mind that the SD Card must be installed into the SD CardHolder, and enabled in screen 8.1 with Data Logging enabled in screen 8.2 if/when users wish to record the historical performance data or events of the regulator. The software used for the LCD panel may not support all SD Cards or SD Cards with more than 2GB of storage capability.

3.23 USB Terminal (SRX Models)

The SRX regulators are fitted with a USB port on the front panel of the regulator which is provided for future enhancements.

3.24 Terminal Panel (Remote LCD Display unit ONLY)

The Terminal Panel on the Remote LCD Display unit is fitted with the following connectors:

- Two 4-way plug & socket connectors for CANBus interface with the Local LCD Display unit on the regulator, and for external provision of V+ & V- to power the Remote LCD Display unit.
- One RJ45 8-way socket for Ethernet connection.
- One DB9 9-way connector for RS232/485 Communications with external devices. (future option).
- One 3-way 1A plug & socket connector for RS485 communications with external devices.

Note: The CAN1 connector on the SRX Regulator MUST be connected to the CAN1 connector on the Remote LCD Unit to be Powered Up.

3.25 CAN2/RS232/485 (Remote LCD Display unit ONLY) (Future Option)

Local access to the regulator using a PC is available via the RS232/485 terminals on the Remote Control Unit ONLY. RS232 data can only be transmitted over short distances, say 5 metres, while RS485 data can be transmitted over distances of up to 1Km.

Note: The CAN2, RS232, & RS485 capability is only available as a special order at extra cost.

3.26 Adjustments

All Regulators are tested and adjusted for correct operation during production at the factory. However, battery manufacturers do specify different charging settings. Accordingly, all installations will require the installer to check all settings to ensure that they match the specific settings specified by the battery manufacturer. This can be done on site using the LCD Display & keys, or by using the remote access using the Imark Site Explorer software. In all cases, this must be done prior to, or during the commissioning the regulator.

3.27 Password Protection (SRX Models only)

Password protection is provided with SRX models, and provides three control levels, two of which may be password protected. The 'Public' control level does not allow any changes, while the 'User' control level allows the user to change settings that are unlikely to damage the regulator or system should inappropriate settings be entered. The 'Technician' control level is provided for use by technically qualified persons who will be responsible for the correct operation of the system. The 'User' level controls are used to display voltages, power consumption, and to change routinely used settings, such as generator or air-conditioner running conditions. However, the 'User' control level does not allow the user to alter any settings that may affect the correct operation of the Regulator. Any person can view all screens.

4.0 INSTALLATION



WARNING

**DC Voltages up to 500Vdc may be present in this product.
These voltages can be LETHAL.
If you value YOUR LIFE ALWAYS isolate all input and
output connections before removing any covers from the unit.**

Read this manual before commencing the installation, as this manual contains important safety, operational, and installation instructions. In particular, ALWAYS heed the safety instructions.

- When the Photovoltaic array is exposed to light, it supplies a dc voltage to the PCE.
- These Solar Regulators are designed for indoor installation, or for installation in enclosed cabinets. They must not be installed at locations where they may be exposed to rain or moisture, or in locations exposed to direct sunlight.
- There are no user serviceable parts inside the Imark SRX series regulators. Internal access is only required at installation by the installation technician. Otherwise, it is not necessary to remove any covers, and all covers should be left installed for safety reasons.
- Any fuses, blocking diodes, or circuit breakers (required to comply with local Electrical Standards) are to be installed externally to the Imark regulator.
- Always ensure that all power sources to the regulator are disconnected before commencing installation.
- Always use appropriately sized cables for the installation.
- Always ensure that all terminations are tight to avoid temperature hot spots caused by loose connections.
- Always ensure that the regulator is correctly grounded using the ground terminal on the bottom of the unit.
- Blocking diodes SHOULD be installed whenever more than one solar string per input is employed.
- Multiple regulators **cannot** be installed using a common PV Input.
- All Negative terminals are COMMON
- Always use insulated tools when working with electrical circuits and remove any conductive jewellery from your person.
- The battery bank must comprise of the same make, type, and age batteries.
- Always extinguish any naked flames when working near batteries.
- Always set the correct battery voltage before connecting the PV input.
- Always **connect** the battery supply first, and always **disconnect** the battery supply last.
- When multiple regulators are being installed as a system, always connect ALL battery supply inputs and switch all regulators ON, before applying any solar input.
- Reverse polarising the Battery Terminal **WILL DAMAGE** the regulator and is NOT covered by warranty.
- Connecting the PV Input to the battery terminals may damage the regulator and possibly damage the batteries (if connected).

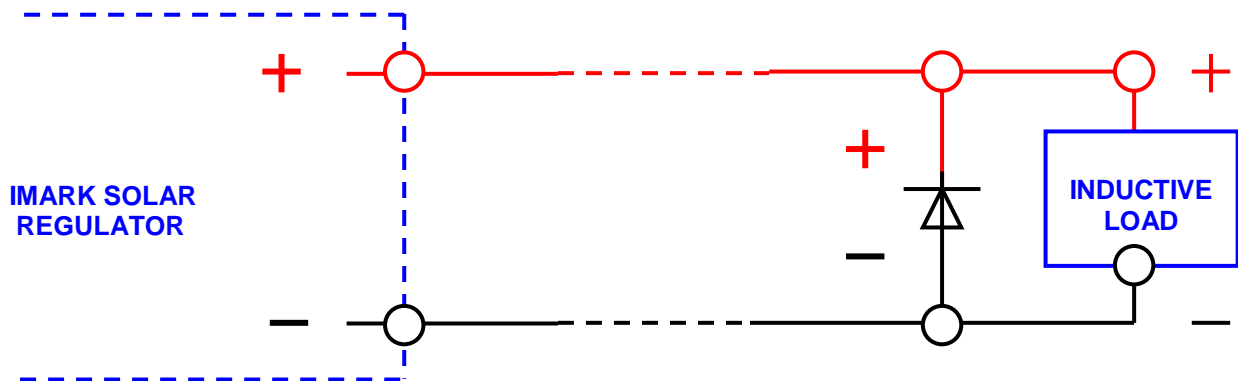
**CAUTION****WARNING****INDUCTIVE LOADS**

Inductive Loads can impose transient voltage spikes or disturbances on the DC power source equipment. It is possible for these voltage disturbances to reverse the polarity on the DC supply lines and even damage the supply equipment (such as this regulator).

The IMARK Regulators include some protection on both the battery connections and the Load connections to reduce the possibility of damage to the regulator.

However, this protection is only designed to protect against small voltage disturbances. The magnitude of a voltage disturbance depends on the equipment being connected to the regulator and is something that is beyond the control of IMARK.

Equipment that imposes inductive loads are electric motors, some inverters, some lights, long cable runs, fans etc. If you are connecting any type of inductive load to the IMARK regulators, a diode should be installed near the inductive load, with correct orientation as shown in this diagram.



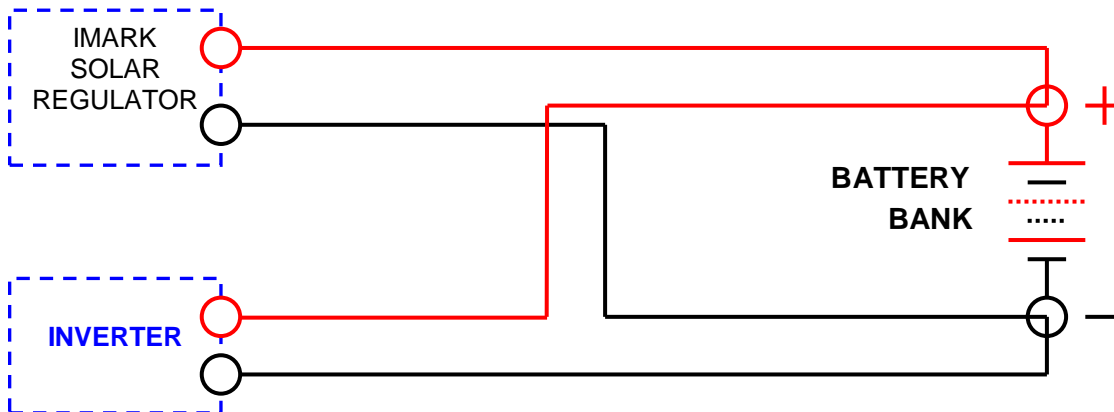
The diode must be:

- ❑ A power diode
- ❑ Rated at 80Volts (48V units) or 200Volts (120V Units) or greater
- ❑ Rated 25% greater than the amperage rating of the regulator.
e.g.SR100 & SRX100 = greater than 125 Amps min
- ❑ Be able to dissipate the heat generated by the load. This may require the diode to be installed on a heatsink.

CONNECTING INVERTERS

Inverters should **NEVER** be connected **directly** to **ANY** terminals of the regulator.
If it is necessary to connect an inverter, it **MUST** be connected **directly** to the battery bank.
Any voltage disturbance created by an inverter should directly travel to the battery before the regulator. (i.e. the regulator and the inverter are separately connected to the battery terminals)

The electrical distance for the voltage disturbance between the inverter and the battery **MUST** be shorter than the distance between the inverter and the regulator.

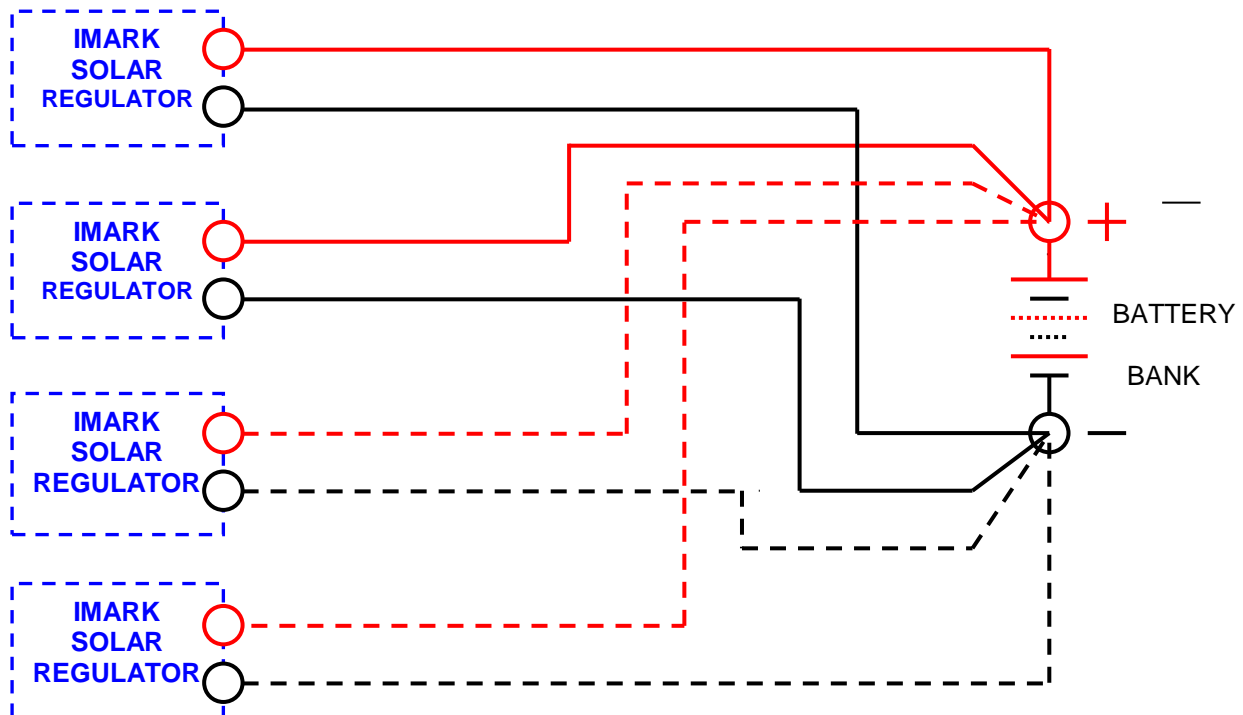


NOTE: Protection devices not shown.

PARALLEL REGULATORS

IMARK regulators can be connected in parallel to charge a common battery bank.
HOWEVER, IMARK regulators **CANNOT** be connected in parallel to a common load.
Furthermore, input from PV panels **CANNOT** be connected in parallel to multiple regulators.
IMARK regulators **DO NOT** have any load sharing capability.

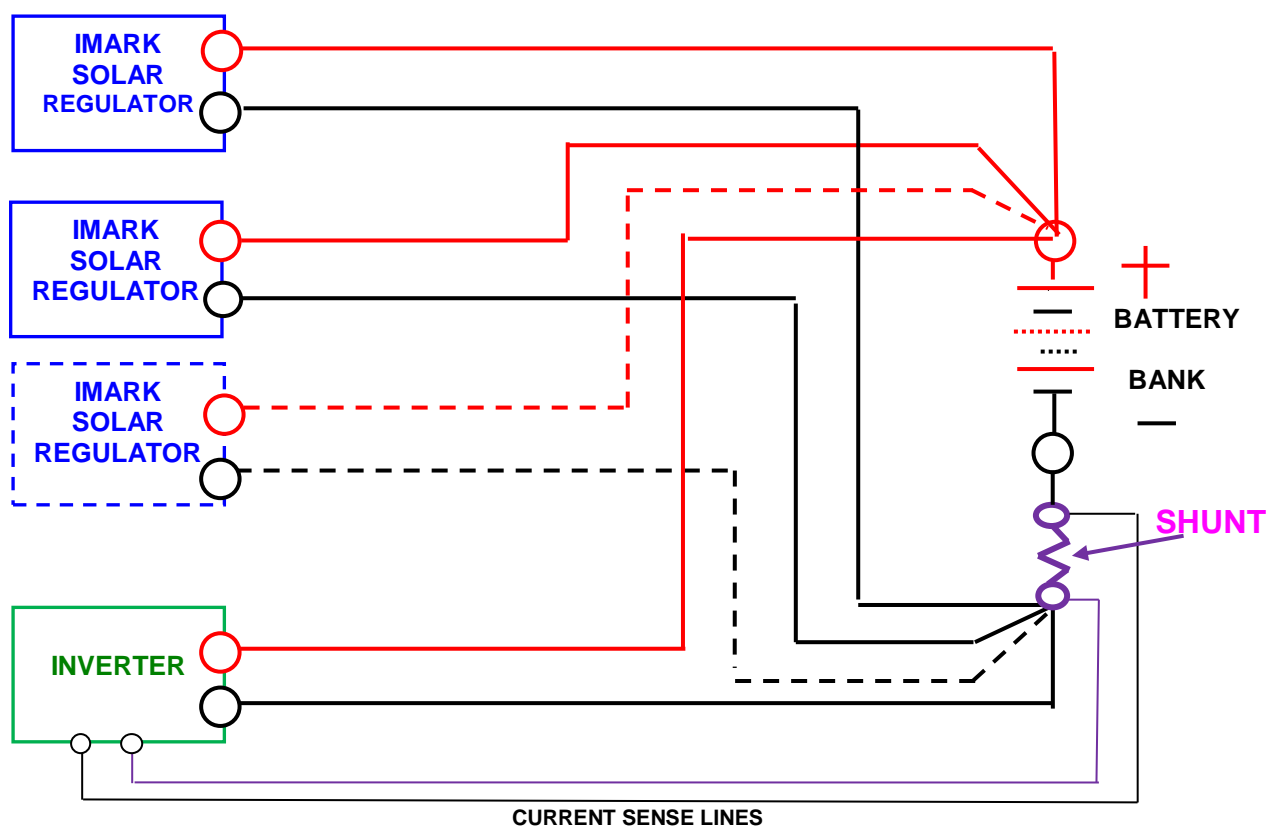
It is advisable to connect individual IMARK regulators directly to the battery bank.



NOTE: Protection devices not shown.

INSTALLATION WITH INVERTERS & CURRENT SHUNTS

Where a **current shunt** is being installed in the battery cable to measure the amount of power being either supplied to, or taken from the battery, the **current shunt** should be installed after the battery cables have been “commoned”, and in a position close to the battery terminal.



NOTE: Protection devices not shown.

**CAUTION**

WARNING

BATTERIES or STORAGE DEVICES WITH INTERNAL CIRCUIT BREAKERS

Batteries with internal protection Circuit Breakers may have the battery connections to external equipment (such as this solar regulator) opened by the BMS. This event may occur when the PV Input is present, and, without the battery being connected, may cause the external equipment to become unstable, and could result in damage to the external equipment.

Accordingly, whenever such storage devices are used, the BMS **MUST** close the connection between terminals P7 & P8 on the 16 way connector (P4) on the SRX100 immediately the BMS opens the Internal Battery Circuit Breaker. This action will reduce the risk of damage to the SRX100 Solar Regulator, and switch the regulator OFF.

The SRX100 will need to be re-started to resume operation when the connection between P7 & P8 (above) is OPENED.

Damage caused to any equipment by failing to follow these instructions is NOT be covered by warranty.

Maintenance

The Imark SR and SRX Regulators do NOT require any regular maintenance or periodic replacement of any components.



INFORMATION

REFER TO MANUAL

The PV Panels and the Battery/s may require periodic maintenance. As these vary from installation to installation, you should refer to the respective manufacturer's instructions.

Cleaning

The Imark SR and SRX Regulators should be kept clean and free of any dust, or grime build-up.

Use a clean soft rag, or soft bristle brush to remove any dust, grime, or moisture from the external parts of the regulator periodically.

And, while you "are at it", check that all covers are correctly located, and that there are no loose or damaged cables present. Remember that high voltage may be present on some cables, so any remedial action should be done by a competent suitably qualified technician.

4.1 Regulator Location



CAUTION

WARNING

If this equipment is not installed, or is used in a manner not specified in this manual, the protection provided by the equipment may be impaired, and not covered by any warranty.

Select a location for the regulator that is NOT exposed to direct sunlight, and NOT exposed to rain or moisture. A flat area of at least 500mm x 400mm is required, with 300mm of air space both above and below the regulator to provide sufficient clearance around the unit to allow free airflow, and entry for the cables.

The regulators are supplied with a panel mounting bracket which allows installers to position the mounting bracket in the desired location, and then when ready, locate the regulator on the mounting plate and secure with the supplied screws. Use at least 4 screws to fix the mounting bracket to the wall, and 4 screws to secure the regulator to the mounting bracket. These screws should be tightened to 2.5nM of torque.

Where more than one regulator is being installed as a system, always allow at least 100mm between units for free air circulation.

PV Installation

The PV array is to be installed as a floating system with the PV frames connected to earth. An external overcurrent or disconnection device **MUST** be installed on all PV Inputs.

Battery Bank Sizing

The size and voltage of the battery bank is to be determined by the site insolation, site loads, and days of autonomy required. The SRX100-48 model supports 48V battery banks, while the SRX100-120 supports 120V battery banks.

The SRX100 Solar Regulators can be programmed to support the following battery types: Flooded, Gel, AGM, Li-On, LiFePO₄, Super Capacitor, and Custom.

It is the installer's responsibility to ensure that the battery charging settings meet the battery manufacturers charging requirements, and that the system is correctly sized.

4.2 Cabling

Always use adequately sized cables. Cable sizes should be increased in high temperature areas. The recommended cable sizes for the various connections are detailed in the cabling table below.

As this product is installed in a PV installation, the battery and PV connections are Over-Voltage Category II.

| Designation | Purpose | Cable Colour | Size mm ² | Cable Amp Rating |
|--------------|---|--------------|----------------------|------------------|
| PV1+ | Connect the Solar Input positive + to this terminal | Red | 4 - 6 | 25 |
| PV1- | Connect the Solar Input negative – to this terminal | Blue | 4 - 6 | 25 |
| PV2+ | Connect the Solar Input positive + to this terminal | Red | 4 - 6 | 25 |
| PV2- | Connect the Solar Input negative – to this terminal | Blue | 4 - 6 | 25 |
| PV3+ | Connect the Solar Input positive + to this terminal | Red | 4 - 6 | 25 |
| PV3- | Connect the Solar Input negative – to this terminal | Blue | 4 - 6 | 25 |
| PV4+ | Connect the Solar Input positive + to this terminal | Red | 4 - 6 | 25 |
| PV4- | Connect the Solar Input negative – to this terminal | Blue | 4 - 6 | 25 |
| Bat + | Connect to the Battery Positive terminal | Red | 25 - 70 | 150 |
| Bat - | Connect to the Battery Negative terminal | Black | 25 - 70 | 150 |
| Load Out 1 + | Connect the Load Positive + to this terminal | Orange | 2.5 | 15 |
| Load Out 1 - | Connect the Load negative - to this terminal | Blue | 2.5 | 15 |
| Load Out 2 + | Connect the Load Positive + to this terminal | Orange | 2.5 | 15 |
| Load Out 2 - | Connect the Load negative - to this terminal | Blue | 2.5 | 15 |

Always check that all cables have the correct polarity before applying any power, and that all cable terminations are both secure and tight.

Note #1:

Load Terminals #1 and #3 have positive polarity while Load terminals #2 and #4 are negative polarity. Accordingly, two DC Load outputs are available. One Load Output is supplied on Pins #1 and #2, while the second Load Output is supplied on Pins #3 and #4. These terminals are internally connected in parallel. Each pair of terminals is rated at 10 Amps at the battery voltage. However, ONLY 10 amps of current is available (shared) over the two Load Outputs. Thus, if one Load Output is drawing of 8 Amps, then the second Load Output will ONLY have 2 Amps of current available at the same time.



CAUTION: Be very careful!

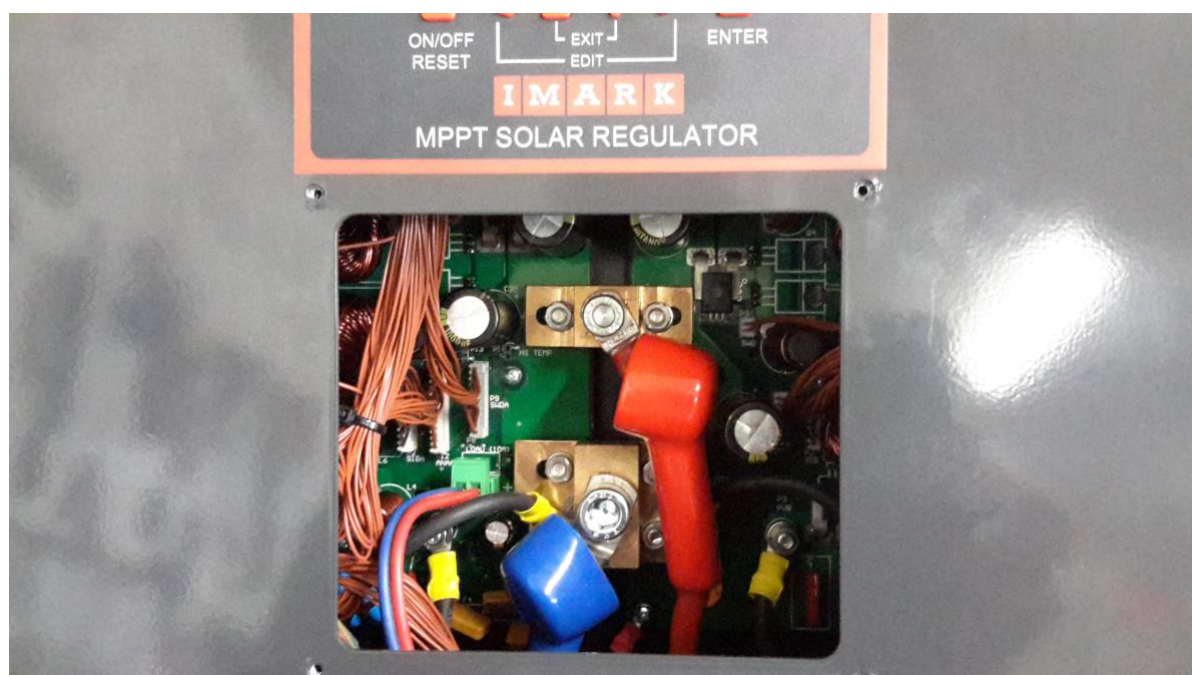
Always have the battery isolated from the regulator as well as having the PV Input to the regulator isolated when connecting these cables.



120V Regulator shown

Battery Connection

Connection of the battery is made through the two large gland nuts on the bottom plate, with the battery cables being internally connected to the Batt + and the Batt – terminals between the two internal power board assemblies as shown in the following graphic.



Always ensure that the bolts that secure the battery cable lugs to the battery terminals within the regulator are tightened securely to 6Nm of torque.

ALWAYS fit the supplied terminal protector over the terminal connections.

As the current flowing through these connections may be up to 100 Amps, a small resistance, say 100mOhms, will cause these terminals to overheat.

Note that I^2R in this example will produce 1kW of heat at the terminals, which can easily damage the pcb and components.

| P4 16 Way I/O Connector | | | | |
|-------------------------|-------------|--|--------|---------------------|
| Position | Designation | Purpose | Colour | Size |
| 1 | SHUNTA | Shunt Output + | | 0.75mm ² |
| 2 | SHUNTB | Shunt Output - | | 0.75mm ² |
| 3 | TBATF+ | Battery Temperature Sensor Input | | 0.75mm ² |
| 4 | TBATF- | * Battery Temperature Sensor Input Neg | | 0.75mm ² |
| 5 | TAMBF+ | Ambient Temperature Sensor Input | | 0.75mm ² |
| 6 | TAMBF- | * Ambient Temperature Sensor Input Neg | | 0.75mm ² |
| 7 | nSROFF | Full Shut-Down (Hardware Shut-down) | | 0.75mm ² |
| 8 | GND | Ground Return | | 0.75mm ² |
| 9 | IREM ON | Isolated Remote ON/OFF (wrt IGND) | | 0.75mm ² |
| 10 | IGND | Isolated Ground Return | | 0.75mm ² |
| 11 | IALARM | Alarm Output Signal Terminal | | 0.75mm ² |
| 12 | IREMOTE | Remote Output Signal Terminal | | 0.75mm ² |
| 13 | IGENSTR | Generator Start Signal Terminal | | 0.75mm ² |
| 14 | IDLYSRT | Delayed Start Signal Terminal | | 0.75mm ² |
| | | Future Use | | 0.75mm ² |
| | | Future Use | | 0.75mm ² |

*The RED wire on the temperature sensors is the positive wire and should be connected to the TBATF+, or the TAMBF+ terminals.

Shunt Connection

The Shunt Outputs on Pins 1 & 2 provide an electronically generated shunt simulation. These Shunt Outputs represent the Current flowing between the SRX100 and the Battery ONLY. The SRX100 has no means of measuring the current being drawn from the battery by other equipment (such as an inverter). It will usually be a positive (charge) reading, but can also be a negative reading, such as when external equipment is connected to the Load Terminal at times when there is NO PV input (night time). This output is calibrated at 50mV/100 Amps. Thus, if the current into the battery is 40 Amps, the reading between these two terminals will be 20mV.

Note: If the connection is reversed, the reading will indicate that the regulator is drawing power (Discharging) from the battery (instead of indicating a Charge current).

| 4 Way DC Output Connector | | | | | |
|---------------------------|-------------|--------------------|---------------|--------------------|--|
| Position | Designation | Purpose | Cable Colour | Cable Size | Maximum Current |
| 1 | Load + | DC Output Positive | Red | 2.5mm ² | 10 Amps shared over the connector at battery voltage |
| 2 | Load - | DC Output Negative | Blue or Black | 2.5mm ² | |
| 3 | Load + | DC Output Positive | Red | 2.5mm ² | |
| 4 | Load - | DC Output Negative | Blue or Black | 2.5mm ² | |

Note:

The combined maximum current available from this 4 way connector is 10 Amps.

Load Terminals #1 and #3 have positive polarity while Load terminals #2 and #4 are negative polarity. Accordingly, two DC Load outputs are available. One Load Output is supplied on Pins #1 and #2, while the second Load Output is supplied on Pins #3 and #4. These terminals are internally connected in parallel. Each pair of terminals is rated at 10 Amps at the battery voltage. However, ONLY 10 amps of current is available (shared) over the two Load Outputs. Thus, if one Load Output is drawing of 8 Amps, then the second Load Output will ONLY have 2 Amps of current available at the same time.

4.3 Interface Connections

The SRX regulators provide several interfacing capabilities depending on the particular installation. Access to operational information is available via:

- Remote access (approximately 100 metres) using the Remote LCD Control Unit
- Directly connected computer using a standard Ethernet cable and the Ethernet port
- Remote access using Ethernet via a Local Area Network
- Remote access anywhere in the world using Ethernet over the Internet

4.4 Terminal Connector Functions

The purpose or function of the I/O terminals (Connector P4) of the solar regulator is common to all SRX100 models (Refer to para. 4.2) and is described as follows:

| Position | Designation | Purpose |
|----------|-------------|---|
| 1 | SHUNT + | Electronically Simulated Shunt Output When Charging, the + is 50mV per 100 Amperes |
| 2 | SHUNT - | |
| 3 | TBATF+ | Battery Temperature Sensor Input * |
| 4 | TBATF- | |
| 5 | TAMBF+ | Ambient Temperature Sensor Input * |
| 6 | TAMBF- | |
| 7 | nSROFF | Full Shut-Down (Hardware Shutdown) (wrt GND) |
| 8 | GND | Ground Return |
| 9 | IREM ON | Isolated Remote ON/OFF (wrt IGND) |
| 10 | IGND | Isolated Ground Return |
| 11 | IALARM | Isolated Alarm Output Signal Terminal (wrt IGND) |
| 12 | IRELAY | Isolated Remote Output Signal Terminal (wrt IGND) |
| 13 | IGENSTR | Isolated Generator Start Signal (wrt IGND) |
| 14 | IDLYSTR | Isolated Delay Start Signal (wrt IGND) |
| 15 | | Future Option |
| 16 | | Future Option |

*The RED wire on the temperature sensors is the positive wire and should be connected to the TBATF+, and the TAMBF+ terminals.

4.5 CAN1 and CAN2 (P6 & P8)

Communications between multiple Solar Regulators installed as a system is achieved using the CANBus Data Protocol. CANBus uses a 'daisy chain' architecture where extra regulators are just added to the last one. This architecture requires that a Termination Resistor be fitted at the 'end of the chain'. All Imark SRX regulators are shipped with this termination resistor and link mounted on the Terminal pcb assembly. Single regulator installations do not require any changes at installation.

However, when multiple regulators are installed as a system, it is ONLY the last regulator in the 'daisy chain' that requires the termination resistor to be in-circuit. Therefore, where multiple Imark SRX Solar Regulators, or if a Remote Control Unit is installed in a system, it is necessary to remove the internal link (W1) from the terminal pcb (above the CAN2 Connector) assembly on all Solar Regulators (EXCEPT the last regulator in the chain).

Where all W1 links are open, a Termination Resistor plug can be fitted externally on the unused CAN2 connector on the last solar regulator. This Termination Resistor plug (Imark stock # 773991) is available as an option from your supplier or from Imark Communications Pty. Ltd.

Further, in cases where the Remote Control Unit is installed, the Remote Control Unit MUST be connected to the CAN1 connector.

4.6 Multiple Regulator Systems

The Regulators have the capability to be 'stacked' using a master and slave configuration to provide higher power outputs when required by larger systems. CANBus is used for communication between multiple regulators.

In a 'stacked' installation, individual regulators can be set to charge different voltage battery banks, and provide that battery voltage to the load terminals. Further, different Solar Inputs can be applied individually to individual solar regulators inputs, even if all regulators are charging a common battery bank.

Note: Each PV Input on every regulator must have a completely independent Solar input, and each regulator MUST be correctly programmed.

IMARK SR/SRX100-48 and SR/SRX100-120 regulators employ two power-boards internally. The SRX100-48 model has two inputs and accordingly, two individual strings can be input without the use of blocking diodes. In the case of the SRX100-120 regulators, 4 blocking diodes are installed internally. Where multiple Solar input strings are connected to individual regulators, blocking diodes MUST be fitted to each Solar Input string. While it is possible to install blocking diodes at the solar input to each regulator, it is recommended that the blocking diodes be installed on each solar Input string near the solar panels as this will improve the efficiency of the complete installation.

Up to 4 x SR100 or SRX100 regulators can be 'stacked' in a working system with the identities numbered '1' to '8'. As each SRX Unit includes two power-boards (A & B), identities are allocated as follows, and should be programmed according to the following table:

| | Regulator #1 | | Regulator #2 | | Regulator #3 | | Regulator #4 | |
|--------------------------------|--------------|----|--------------|----|--------------|----|--------------|----|
| Power Board | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B |
| CANBus Identity (Board A or B) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| LCD Identity | 1 | | 3 | | 5 | | 7 | |
| Remote LCD | - | | - | | - | | - | |

The procedure for setting the CANBus identities of multiple regulators is described in section 5 (clause 5.2) for SR100 models and in section 7 (Menu Screen 1.6) for SRX100 models, of this document.

Note: Programming two regulators with the same identity number will confuse the internal microprocessor, and may cause incorrect performance data to be displayed on the LCD Screen, and in the data downloads. Further, the LED Indicator lights may display erroneous information or may not even be illuminated.

4.7 CANBus Cables

CANBus cables can be ordered from your supplier or from Imark pre-assembled to your length (Up to 125 Metres). Alternatively, competent technicians can make cables to suit the installation. The following table shows the required Imark parts and the wiring instructions:

| CAN1 Connector | Cable Details | Colour | Signal | CAN2 Connector |
|----------------|---------------|--------|---------------|----------------|
| #728133.04 | #794308 | | | #728133.04 |
| Pin #1 | | Red | V+ | Pin #1 |
| Pin #2 | | Black | V- or CAN_GND | Pin #2 |
| Pin #3 | | White | CAN_H | Pin #3 |
| Pin #4 | | Blue | CAN_L | Pin #4 |

IMARK SOLAR REGULATOR PROGRAMMING SHEET

5.0 TECHNICAL SPECIFICATIONS

| SRX100 SOLAR REGULATOR SPECIFICATIONS | | | | | | |
|---|--|----------------------|---|----------------------|---|----------------------|
| Model # | SR100-24 | SRX100-24 | SR100-48 | SRX100-48 | SR100-120 | SRX100-120 |
| Imark Stock Number | | | 804810 | 804812 | 804815 | 804817 |
| PV Input Voltage Range | 60 – 300Voc dc (Max) | | 120 - 500Voc dc (Max) | | 300 - 500Voc dc (Max) | |
| Nominal DC Battery Voltages | 24 Volts dc (nominal) | | 48 Volts dc (nominal) | | 120 Volts dc (nominal) | |
| Regulator Operating Modes | OFF, Standby, Bulk, Absorb, Float, & Equalise | | | | | |
| Nominal Operating Frequency | 25 kHz | | | | | |
| Charging Modes | Standby (Night), Bulk, Absorb, Equalise, & Float | | | | | |
| Maximum Charge Current | 100 Amps | | | | | |
| Maximum Load Current | 2 x 5 Amps | | | | | |
| Load Voltages | Same as Battery Voltages | | | | | |
| Load Disconnect Voltages | Based on the settings for each regulator | | | | | |
| DC Load Voltage Regulation | Battery Voltage ±50 mVdc | | | | | |
| Status Display Method | 6 x LED's | 6 x LED's + 4x20 LCD | 6 x LED's | 6 x LED's + 4x20 LCD | 6 x LED's | 6 x LED's + 4x20 LCD |
| Historical Data Storage | N/A | SD Card | N/A | SD Card | N/A | SD Card |
| Data Storage Period | Last 15 days in EPROM (all models). Lifetime with SD Card or USB on SRX models. | | | | | |
| Efficiency | >95% | | | | | |
| Operating Temperature Range | 0°C to 50 °C | | | | | |
| Storage Temperature Range | -30°C – +70 °C | | | | | |
| Pollution Degree | 2 | | | | 2 | |
| Ingress Protection | IP20 | | | | IP20 | |
| Maximum Altitude Rating | 2000 Metres | | | | 2000 Metres | |
| Relative Humidity | 0 - 95% non-condensing | | | | | |
| Low Battery Load Release | 0–65 Vdc adjustable | | 0–65 Vdc adjustable | | 0 – 163 Vdc adjustable | |
| Low Battery Load Re-Connect | 0–65 Vdc adjustable | | 0–65 Vdc adjustable | | 0 – 163 Vdc Adjustable | |
| Battery Drain in Standby Mode | 50mW to 100mW (depending on Regulator and LCD states) | | | | | |
| Inputs/Outputs | PV Inputs x 2 or 4, Battery + & Battery -, Load Output x 2 pairs,16 way for external device I/O, CANBus x 2, Ethernet, SD-Card, Keys x 6 | | | | | |
| Dimensions (excluding protrusions) and Weight | 325W x 315L x 185H mm 18.5 Kgs (approx.) | | 375W x 320L x 170H mm 19 Kgs (approx.) | | 375W x 430L x 170H mm 26.5 Kgs (approx.) | |
| Shipping Dimensions and Weight | 440W x 530L x 275H mm 21 Kgs (approx.) | | 440W x 530L x 275H mm 21.5 Kgs (approx.) | | 440W x 530L x 275H mm 29 Kgs (approx.) | |
| Safety Standards | IEC 62109:1, AS5033 | | | | | |
| ERAC Registration | E4049 | | | | | |
| Compliance Markings | N8 | | | | | |

| STANDARD FEATURES | |
|--------------------------------|---|
| Battery Protection | Load Output Disconnect Re-Connect, & Charge Stop based on setup settings |
| Battery Temperature Sensor | Included as standard with 5M Cable and bootlace terminals |
| Remote Output Signal | Automatic selection based on S.O.C., Time, Temperature, & Period conditions |
| Remote Output Signal | Voltage Free signal terminal to activate external equipment (OPEN/CLOSE) with 150mA max sink current x 2 |
| Cooling | Convection (internal DC Fans included on 19" Rack Mounting models) |
| Temperature De-rating | Output current is progressively reduced to 0 Amps from 70°C to 90°C. |
| OPTIONS | |
| Remote Control Unit (Optional) | In-built 4x20 back-lit alphanumeric liquid crystal display with 6 LED Status indicators, 6 keys, CANBus, RS232, RS485, & Ethernet connectors. |
| SD Card (Optional) | Different capacity SD Storage Cards |