RM3-400/410/420 Series Installation and Operation Guide

Refer to the separate SC200 or SC100 system controller handbook for full details of the system controller operation - www.powerquality.eaton.com/DC-Manuals.

About This Guide

Scope

This guide covers installation, operation and maintenance of the RM3-400/410/420 Series.

Refer to the separate SC200 or SC100 system controller handbook for full details of the system controller operation - www.powerquality.eaton.com/DC-Manuals.

Audience

This guide is intended for use by:

- Installers competent in:
    - installing and commissioning dc power systems
    - safe working practices for ac and dc powered equipment
    - the relevant local electrical safety regulations and wiring standards
- Operators and maintenance staff competent in:
    - operation of dc power systems
    - safe working practices for ac and dc powered equipment

Related Information

The following documentation applies to models with an SC200 or SC100 system controller only (see Model Numbers on page **2**):

- SC200 System Controller Operation Handbook - IPN 997-00012-50
- SC100 System Controller Operation Handbook - IPN 997-00012-63
- SiteSure-3G Installation and Operation Guide – IPN 997-00012-51

Reporting Problems with this Guide

Please use this email address to report any problems you find in this guide:

Eaton DC Product Marketing Communications
EMAIL: DCMarketingNZ@eaton.com

For Further Information and Technical Assistance

For further information and technical assistance see Worldwide Support on page **79**.

Overview

IPN 997-00012-62E   June 2010

1

RM3-400/410/420 Series DC Power Systems

Model Numbers

AC Supply Voltage (Nominal)	System Controller	Internal I/O Board Fitted	Model Numbers	
			With AC cords	**With IEC sockets**
120V	-	-	RM3-400-0230	RM3-400-0630
208-240V	-	-	RM3-400-0330	
120V	SC100	-	RM3-410-0220	RM3-410-0620
208-240V	SC100	-	RM3-410-0320	
120V	SC100	✓	RM3-410-0221	RM3-410-0621
208-240V	SC100	✓	RM3-410-0321	
120V	SC200	-	RM3-420-0220	RM3-420-0620
208-240V	SC200	-	RM3-420-0320	
120V	SC200	✓	RM3-420-0221	RM3-420-0621
208-240V	SC200	✓	RM3-420-0321	

The RM3-400/410/420 Series provide 24V or 48V (nominal) for communications and data equipment in a compact 1U module.

Two product types are available:

- RM3-400 models accommodate up to three rectifier modules and are used as a stand-alone dc power system (fixed output voltage and no controller, alarms or communications capability) or as an extension power shelf.

- RM3-410 and RM3-420 models accommodate one or two rectifier modules and have an SC200 or SC100 system controller. The system controller provides extensive configuration and communication capabilities.

Options include:

- Rectifier modules (see Specifications on page **57**):

  24V: APR24-3G - 1000W output at 120Vac, 1440W output at 208-240Vac

  48V: APR48-ES - 1200W output at 120Vac, 2000W output at 208-240Vac, or
  APR48-3G - 1100W output at 120Vac, 1800W output at 208-240Vac, or
  EPR48-3G - 550W output at 120Vac, 900W output at 208-240Vac

- Either SC200 or SC100 system controller (see details on page **5**)

- An RM3-400 can be connected to an RM3-410 or RM3-420 to create a system with up to five rectifier modules and a system controller.

- Models with a system controller have an internal input/output (I/O) board. See details on page **67**.

- An external SiteSure-3G I/O module can be connected to models with an SC200 system controller. See details on page **21**.

Front Views

RM3-400 Models
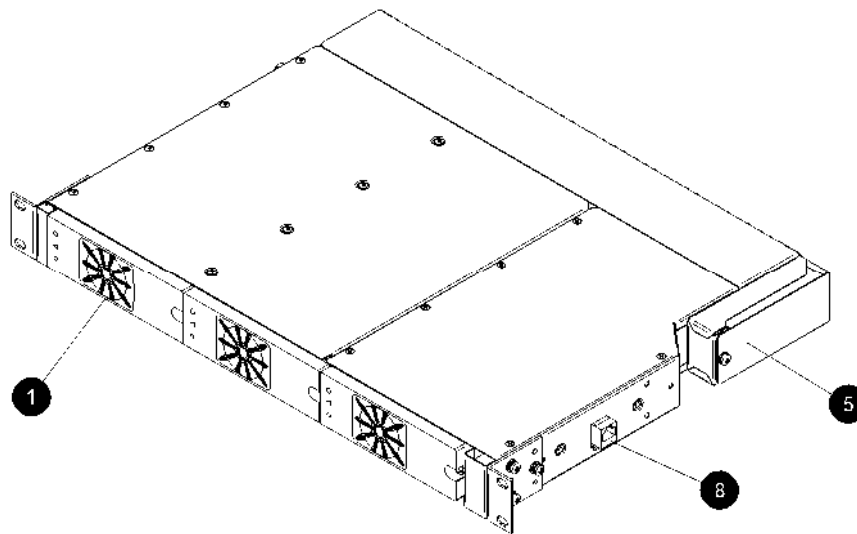
RM3-410 and RM3-420 Models
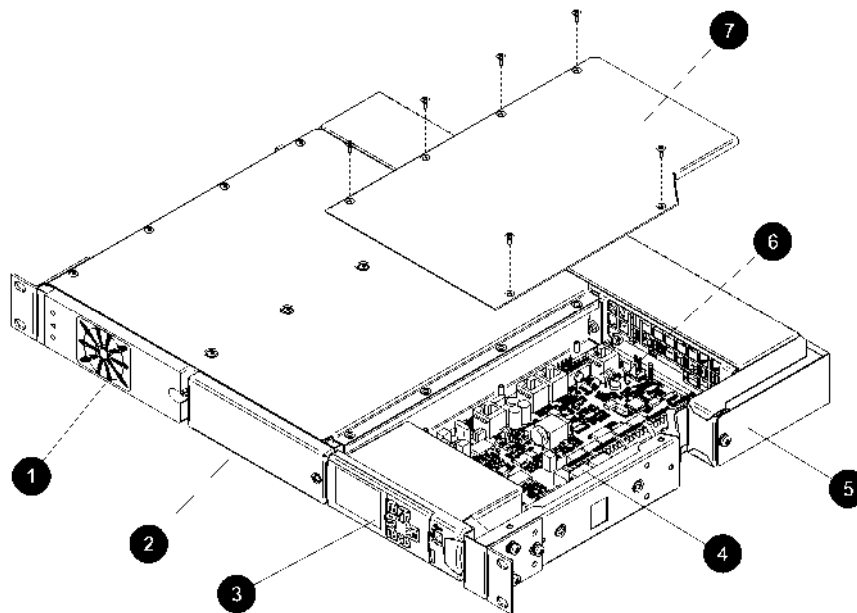
❶ Rectifier modules (see details on page **4**). Up to 3 in RM3-400 models, 1 or 2 in RM3-410/420 models.

❷ Rectifier blank panel RM3B-A01 (for un-used rectifier positions)

❸ SC200 or SC100 system controller (see details on page **5**)

❹ Voltage feed module with socket for connection to an extension power shelf (see details on page **23**) or an optional SiteSure-3G I/O module (SC200 only, see details on page **21**).

❺ DC output terminals (M6)

❻ Input/Output board (some models only, see details on page **67**)

❼ Top cover

❽ Rectifier communications connector (connects rectifiers to SC200 or SC100 when RM3-400 is used as an extension power shelf, see details on page **23**)

IPN 997-00012-62E   June 2010

3

Rear View

❶ External communications and I/O cable entry (for some models only)

❷ DC cable entry

❸ AC cord sockets to suit IEC plugs, or (see inset) ac cords fitted to some models (one per rectifier position)

❹ Protective earthing terminal (M6). See details on page **17**.
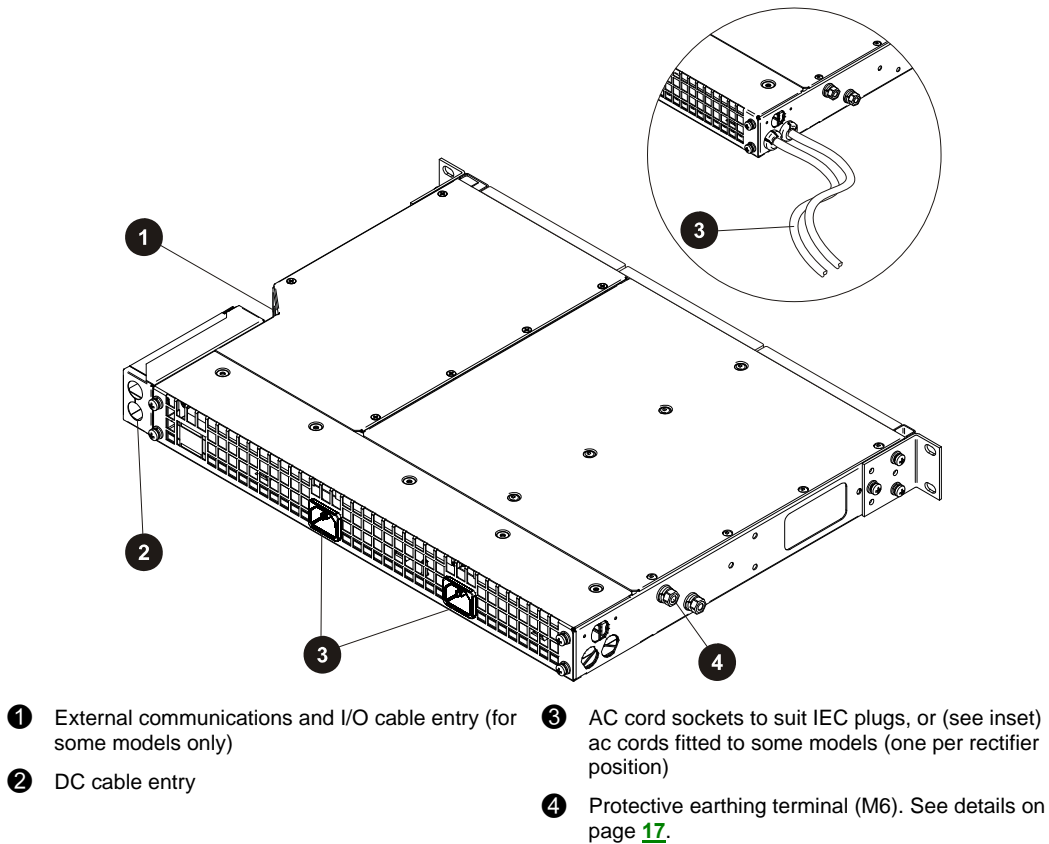
Rectifiers

RM3-400/410/420 Series are fitted with either 48V, 2000W (APR48-ES); 48V, 1800W (APR48-3G); 48V, 900W (EPR48-3G) or 24V, 1440V (APR24-3G) rectifiers. The rectifiers are fan-cooled and hot-pluggable.

See Specifications on page 57 for further information. See Troubleshooting on page 44 for details of rectifier alarms.

Top: APR48-ES

Bottom: APR24-3G and APR48-3G

❶ Power On LED (Green)

❷ Minor Alarm LED (Yellow)

❸ Major Alarm LED (Red)

❹ Serial Number

❺ Retaining Screw. Tighten to 1.5Nm (13.3 inch-pounds).
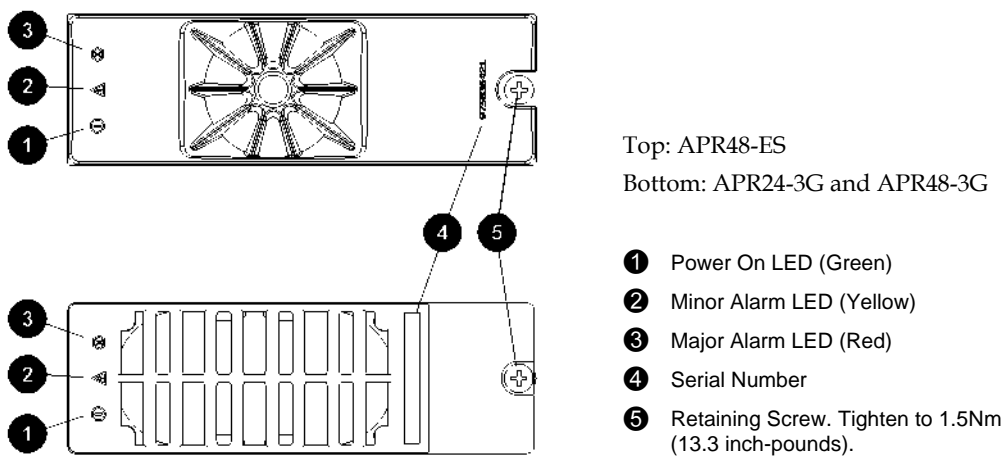
System Controller (RM3-410 and RM3-420 Models only)

The SC200 or SC100 system controller provides control, communications and alarm functions.

The system controller is supplied pre-configured. Configuration changes can be made with the keypad, or via a PC connected to the USB connector (SC200) or RS232 (SC100) connector. Or changes can be made remotely (see External Communications on page 7).

For basic operating information see System Controller on page 33. For further details refer to the System Controller Operation Handbook (see Related Information on page i).

See Troubleshooting on page 47 in the System Controller Operation Handbook for details of system controller alarms.

SC200 System Controller

The SC200 system controller is an advanced control and monitoring solution which provides a full suite of communications options, including built-in Ethernet interface, Web server, and SNMP agent.

Alarm notifications may be by SNMP traps, SMS text messaging, dial-out to PowerManagerII remote monitoring software, or relay contact closures.

❶ Power on LED (green)

❷ Minor alarm LED (yellow)

❸ Critical/Major alarm LED (red)

❹ Color LCD

❺ Soft keys (2)

❻ Navigation keys (4)

❼ USB 1.1 connector (12Mb/s)

❽ Retaining screw

❾ Power and system communications connector

❿ RS232 connector

⓫ Ethernet connector and status LEDs
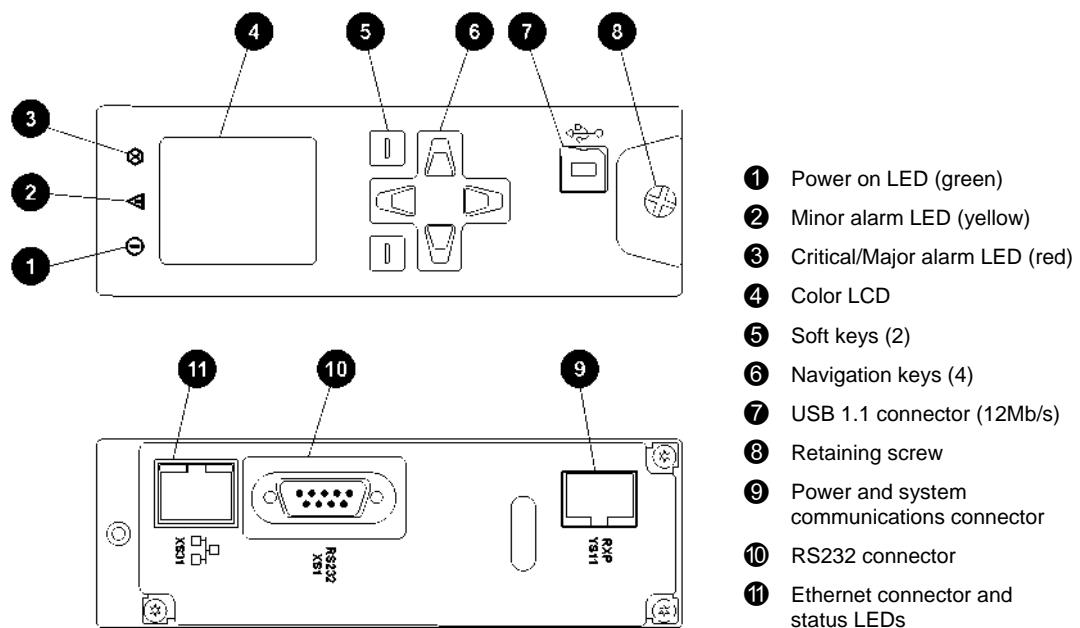
SC100 System Controller

The SC100 system controller is a full-featured control and monitoring solution which provides alarm notifications via dial-out modem to PowerManagerII remote monitoring software, SMS text messaging, or by relay contact closures.

❶	Power on LED (green)
❷	Minor alarm LED (yellow)
❸	Critical/Major alarm LED (red)
❹	LCD
❺	Navigation keys (4)
❻	RS232 D9M connector
❼	Retaining screw
❽	Power and system communications connector
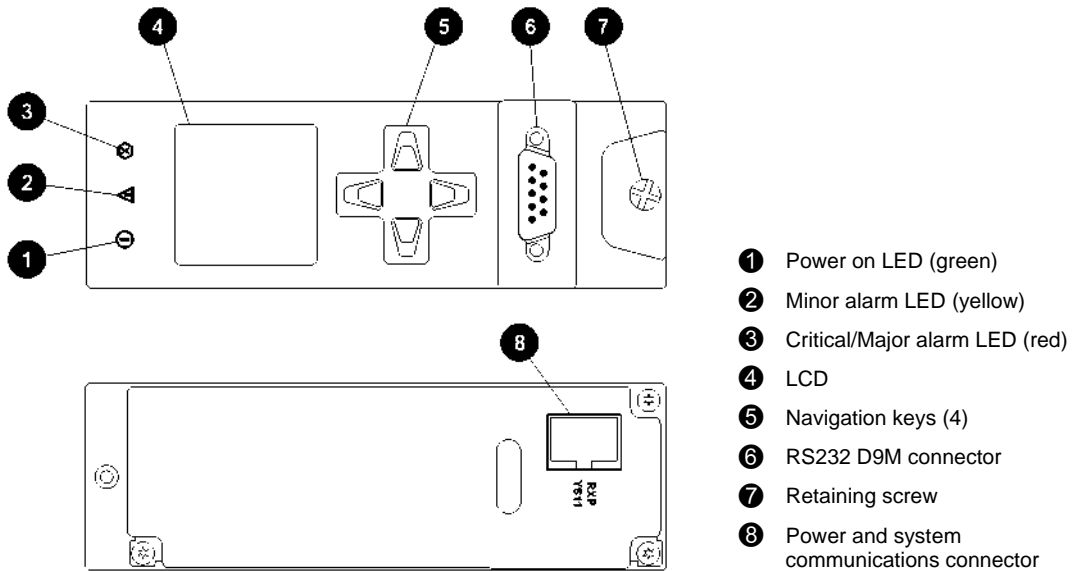
Compatible Software

The following software is compatible with the SC200 or SC100 system controller:

- DCTools Configuration Software. Latest version is available free from www.powerquality.eaton.com/downloads.

- PowerManagerII Remote Control and Monitoring Software. Contact your Eaton dc product supplier for further information (see Worldwide Support on page).

- Recommended web browsers (SC200 only): Microsoft Internet Explorer 8 (IE6 is compatible but with reduced performance), Mozilla Firefox 3.0.

Other Features

External communications

Refer to the system controller handbook for information on these communications options.

Communications options	SC200	SC100
Communication with *DCTools* via USB	✓	-
Communication with *DCTools* or *PowerManagerII* via RS232	✓	✓
Communication with *DCTools* or *PowerManagerII* via an external PSTN or GSM modem (dial-in and dial-out on alarm)	✓	✓
Communication with *DCTools* or *PowerManagerII* via Ethernet	✓	-
Communication with web browser software via an IP network	✓	-
Communication with a Network Management System (NMS) using SNMP	✓	-
Communication with a Building Management System (BMS) using Modbus	✓	-
Alarm and status messages to GSM Short Messaging Service (SMS) text capable cell phones	✓	✓
Communication with an alarm management system using voltage-free relay contacts (on an IOBGP I/O board)	✓	✓

Battery Mid-point Monitoring Option (SC200 only)

Battery Mid-point Monitoring provides a cost-effective method for the early detection of internal battery faults. The voltages of the two halves of a battery string are measured and the system controller generates an alarm signal if a voltage imbalance is detected.

A voltage imbalance is an indication that one or more cells has an internal fault. Further investigation can then isolate the faulty cell(s) and action can be taken to correct the problem and prevent a total battery failure.

To connect the Battery Mid-point Monitoring option see details on page **22**. If a *String Fail* alarm is generated see Troubleshooting on page **44**.

To ensure reliable operation Mid-point Monitoring operates only when the battery is in float charge and after a configurable lockout period since the last battery discharge, Fast Charge, Equalize or Battery Test.

Battery Time Remaining

The SC200 or SC100 obtains characterization data from either periodic battery discharges (SC100) or every full battery discharge (SC200) (to the specified end voltage).

During a battery discharge, the SC200 or SC100 uses this characterization data to calculate an estimated time until the battery will reach a specified end voltage.

If a battery disconnect LVD is fitted then the end voltage will usually be the voltage at which the LVD disconnects the battery.

Battery Time Remaining is designed for a constant power load. The accuracy of the time remaining calculation will be reduced if the dc power system is connected to a predominantly resistive (constant current) load.

For details refer to *Battery Time Remaining* in the SC200 or SC100 System Controller Operation Handbook (see Related Information on page i).

Overview

Warnings

This section contains important warnings. Read these warnings before installing or operating RM3-400/410/420 Series dc power systems.

Electrical Safety

- The case of a RM3-400/410/420 Series dc power system is a fire enclosure as specified in UL 60950-1. The system is to be installed in an enclosed cabinet.
- The dc power system may be powered from multiple ac sources. All power sources must be isolated before internally servicing the equipment.
- The dc power system must be connected to a suitable and readily accessible disconnect device(s). The ac plug may be suitable as the disconnect device. See details on page **14**.
- The dc power system is not compatible with IT (Impedance Terra) ac supply. For advice see Worldwide Support on page **79**.
- A registered electrician (or suitably qualified person) must check the integrity of the installed cabling, BEFORE the dc power system is powered up.
- Tasks must be performed in the sequence documented in this guide.

Location and Environment

- The RM3-400/410/420 must be installed in a Restricted Access Location (dedicated equipment rooms, equipment closets, or similar) in accordance with the U.S. National Electric Code (NEC), ANSI/NFPA No. 70, and according to the applicable local codes.
- For ease of access and to maintain optimum system cooling, observe the clearances stated on page **17**.
- Ensure the ambient temperature and humidity are within the ranges in the Specifications on page **58**.
- Dust build-up within the RM3-400/410/420 may cause premature failure. In dusty environments filter the ventilation air entering the equipment room. Ensure regular cleaning of the air filters.
- Do not allow water or any foreign object to enter the RM3-400/410/420. Do not place objects containing liquid on top of or near the unit.

Hazardous Energy Levels

- Rectifiers and batteries contain hazardous energy levels. Only personnel trained and experienced in dc power systems are to service/maintain this equipment.
- Always use insulated tools.
- Do not short-circuit the live and common bus bars or cables.

Rectifiers

- Do not install the rectifiers until the room has been cleaned and is dust free.
- To reduce the risk of electric shock and maintain optimum system cooling, always cover empty rectifier slots with blanking panels.
- To avoid electrical shock, do not place hands inside the rectifier magazine.
- Rectifier cases may exceed 100ºC (212ºF), especially after prolonged operation. Use suitable gloves when removing a rectifier from the magazine.
- Do not attempt to disassemble faulty rectifiers. Return them (in their original packaging) with a completed Equipment Incident Report on page **77**.

⚠️ **Servicing and Maintenance**

- The RM3-400/410/420 contains hazardous voltages and hazardous energy levels. Before undertaking any maintenance task refer to the Warnings on page <u>10</u>.
- If a maintenance task must be performed on a "live" system then take all necessary precautions to avoid short-circuits or disconnection of the load equipment, and follow any "live-working" instructions applicable to the site.
- Only perform the maintenance tasks described in the Maintenance chapter. All other tasks are classified as Servicing. Servicing must only be performed according to specific instructions and only by personnel authorized by Eaton. This includes disassembly and/or servicing of any modules.
- For further information on Servicing contact your local Eaton dc product supplier, or refer to the contact details on page <u>79</u>.

⚠️ **EMC Compliance**

- This Eaton product ("the equipment") has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the Federal Communications Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.
- The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this installation guide, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation.
- If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.
- Changes or modifications to the equipment not approved by Eaton Corporation could void the FCC authority to operate the equipment.

Inspecting the Equipment and Reporting Damage

Unpack the equipment and inspect it carefully for possible damage that may have occurred while in transit. Do not use any damaged equipment.

Report any damage immediately, using a completed Equipment Incident Report on page <u>77</u>.

📖 *Keep the original packaging to use if any item needs to be returned for replacement or repair.*

12

Overview

Installation Tasks

Before starting the installation, review the following information:

- Required Equipment and Tools on page **71**
- Warnings and Cautions on page **10**
- Inspecting the Equipment and Reporting Damage on page **11**

Complete the Installation tasks in the following order:

Task	Description	Reference
1	Check the AC Supply and Grounding	See details on page **14**
2	Move Mounting Brackets (if required)	See details on page **16**
3	Mount the RM3-400/410/420 in the Rack	See details on page **17**
4	Connect Input/Output Cabling (some models only)	See details on page **19**
5	Connect Optional External I/O Module (some models only)	See details on page **21**
6	Connect Mid-point Monitoring (if required - SC200 only)	See details on page **22**
7	Interconnect RM3-400 (if used as an extension power shelf)	See details on page **23**
8	Connect the Output Cables	See details on page **24**
9	Connect to the AC Supply Point	See details on page **25**

For installation of external communications see Communications Options in the System Controller Operation Handbook.

Task 1 - Check the AC Supply and Grounding

It is important that the ac supply for the RM3-400/410/420 dc power system includes the correct levels of protection.

Step 1 - High ac voltage protection at the site

1. Check if the ac voltage is expected to exceed 275V (L-N or L1-L2).
2. If so, then it is strongly recommended that an external high voltage protection unit (HVPU) be installed. This will automatically disconnect the ac at high voltage and reconnect it at normal voltage.
3. Install the HVPU as in the following diagram.
4. Connect the High VAC alarm output to one of the Digital Inputs on the I/O Interface Board (see the diagram on page **67** for location).

   The High VAC alarm signal lines must be isolated from the ac supply by a voltage-free relay contact.
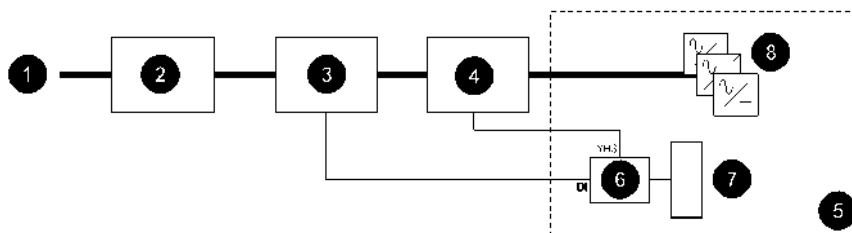
❶ AC supply   **❺** DC power system

❷ Primary transient protection devices   **❻** I/O Interface board

❸ High voltage protection unit with alarm output   **❼** SC200 or SC100 system controller

❹ Secondary transient protection devices (MOVs)   **❽** Rectifiers

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Step 2 - Check the type of ac supply

Check the type of ac supply. Only the types of ac supply listed in the Specifications on page **57** are suitable for the RM3-400/410/420.

> *Only use an ac supply referenced to ground, or with a protection system so that the phase-ground voltage cannot exceed the rating of the rectifier.*

Step 3 - Disconnect device and overcurrent protection

1 The socket outlet(s) shall be installed near to the RM3-400/410/420 and shall be readily accessible.

2 Each socket shall be protected by an overcurrent protection device (a circuit breaker suitable for Branch Circuits and rated 15A or less).

3 The external circuit breaker(s) must be two-pole type wired in each conductor, if:

- the ac supply is 2W (see Specifications on page **57**), or
- the ac supply is 1W+N but the neutral is not clearly identified.

Step 4 - Check ac discrimination

Each rectifier has two internal fast-acting fuses. Under certain internal fault conditions these fuses will blow.

If there is insufficient discrimination between these fuses and an upstream ac supply-disconnect device supplying the RM3-400/410/420 then the ac supply to all rectifiers will be disconnected if a rectifier fuse blows.

1 Check the time-current (tripping) curve(s) of all ac supply-disconnect device(s) upstream of the RM3-400/410/420 with the following curve for the rectifier fuses.

> *Refer to the manufacturer's data for tripping curves.*

2 No action is required if the time-current curves of the upstream ac supply-disconnect devices are entirely to the right of the curves for the rectifier fuses.

3 If the curve of an upstream ac supply-disconnect device crosses the curve for the rectifier fuse there may not be adequate discrimination. Contact your Eaton dc product supplier for advice (see Worldwide Support on page **79**).

> *There is a maximum rating for the first upstream circuit breaker(s). See Step 3.*
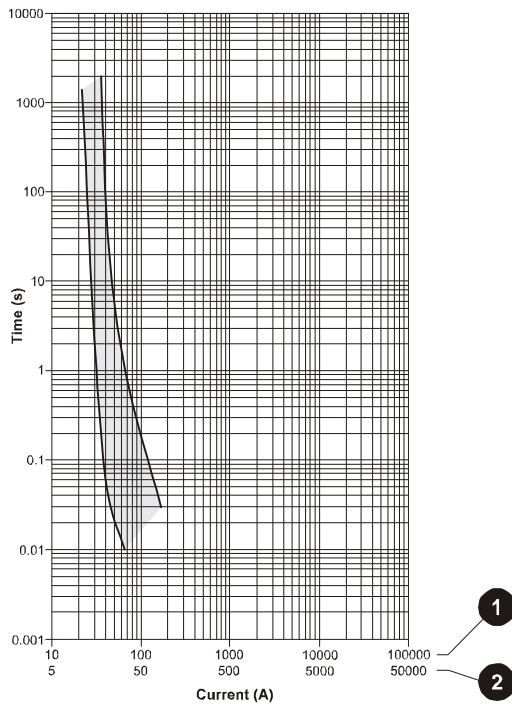
Time-Current Curve (minimum and maximum)

❶ APR24-3G, APR48-3G and APR48-ES internal fuses (IEC 60127-2)

❷ EPR-3G internal fuses (IEC 60127-2)

Sources:

Schurter SP 5x20 Pigtail data sheet.

Step 5 - Check the grounding arrangements at the site

Confirm that all grounds are brought together at one "star" point so that surge currents cannot flow in "ground loops" and create large voltages.

Procedure complete

Task 2 - Move Mounting Brackets (if required)

RM3-400/410/420s are pre-assembled with 19-inch rack-mounting brackets as shown in the diagram on page 3.

If required, the brackets can be moved to an alternate position or replaced with brackets for use in 23-inch wide racks.

Step 1 - Remove brackets

1 Remove top cover.

2 Undo the screws holding each bracket.

3 Remove the brackets and internal plates.

Step 2 - Fit 23-inch mounting brackets (if required)

Step 3 - Fit brackets in alternate position (if required)
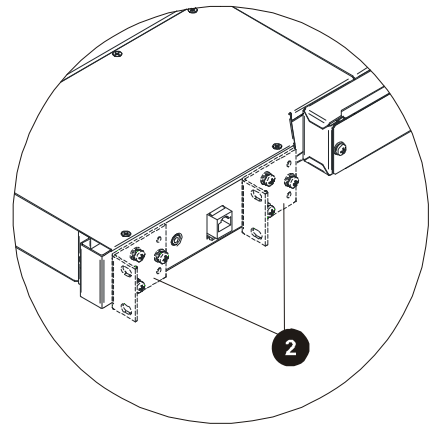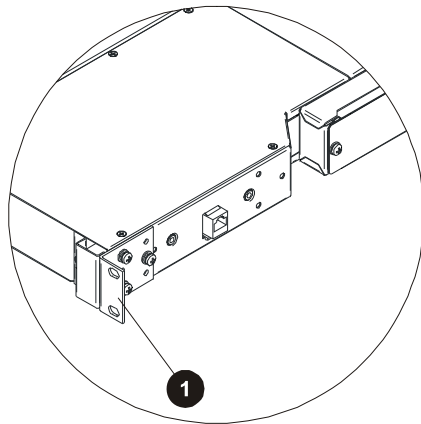
❶ Rack-mounting bracket (available for 19-inch and 23-inch wide racks)   ❷ Alternative bracket positions

Step 4 - Replace top cover

Procedure complete

Task 3 - Mount the RM3-400/410/420 in the Rack

Step 1 - Check clearances

RM3-400/410/420s require the following minimum clearances for access and adequate air flow:

Front: 24" (600mm)

Rear: 4″ (100mm)

Above/below: No restriction

Step 2 - Mount the RM3-400/410/420

1   Fit cage nuts in the correct positions to match the screw holes in the RM3-400/410/420 rack mounting brackets.

2 Attach the RM3-400/410/420 using four rack mounting screws. Tighten the screws.

> *For 23" wide racks use the optional 23" mounting brackets. See Spare Parts on page 72.*
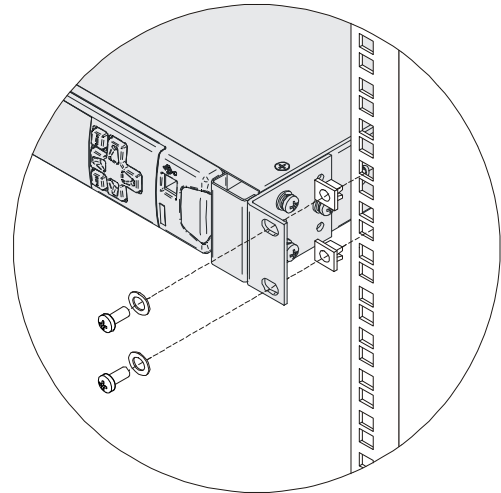
Step 3 - Protective earthing conductor

The building installation shall provide a means for connection to protective earth, and the RM3-400/410/420 is to be connected to that means:

1 A Service Person shall check whether or not the socket-outlets from which the RM3-400/410/420 is to be powered provide a connection to the building protective earth.

> *If this connection is provided then no further action is required. Proceed to Step 4.*

2 If not, the Service Person shall arrange for the installation of a Protective Earthing Conductor from the separate protective earthing terminal to the protective earth wire in the building:

- Connect a Protective Earthing Conductor to the chassis of the RM3-400/410/420 as shown in the following diagram. Use:

Wire:	Multi-strand, copper conductor, 8 AWG with green/yellow insulation
Strip length:	½" (12mm)
Crimp lug:	FCI-Burndy type YAV8C-L3
Crimp tool:	FCI-Burndy type MY29-11

- Tighten terminal to 3.9 - 4.5Nm (35 - 39 inch-pounds).

- Terminate the Protective Earthing Conductor at a point connected to the protective earth wire in the building.
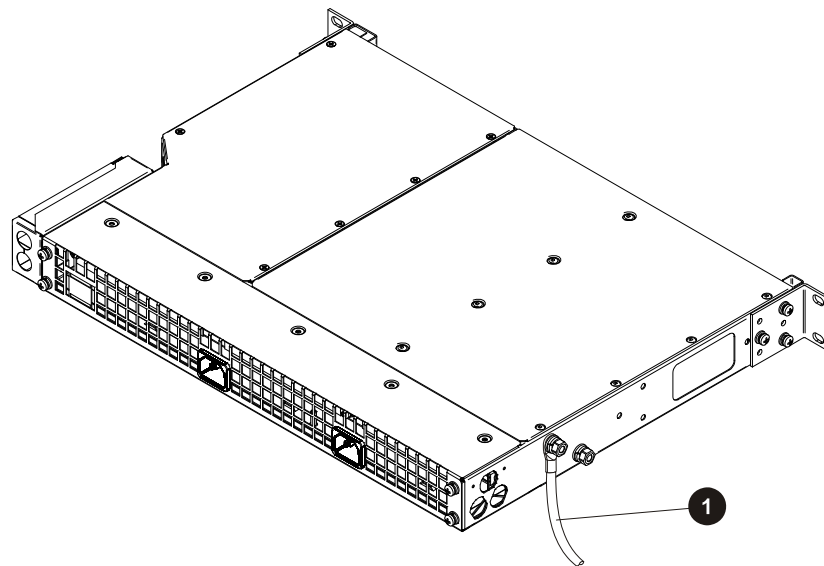
❶ Protective earthing conductor to protective earth wire in building.

Step 4 - Check Output Reference to Ground

The grounding arrangement of your communications equipment determines how the dc common of the dc power system is referenced to ground.

The dc output of the RM3-400/410/420 is "floating" (not bonded to ground).

If the grounding policy at the site requires that the dc supply must be bonded to ground, then this connection must be made external to the RM3-400/410/420.

Procedure complete

Task 4 - Connect Input/Output Cabling (some models only)

This task only applies to RM3-410 and RM3-420 models (see Model Numbers on page **2**) in the following circumstances:

- The RM3-410 or RM3-420 is to be connected to an RM3-400 extension power shelf (see details on page **23**), or
- The RM3-410 or RM3-420 is fitted with an input/output (I/O) board (see Input/Output Board on page **67**) and connection to external sensors/devices is necessary.

Step 1 - Remove top cover

See the diagram on page **3**.

Step 2 - Connect RJ45 patch cable (if required)

If the RM3-410 or RM3-420 is to be connected to an RM3-400 extension power shelf:

1 Connect an RJ45 patch cable to a spare RJ45 socket (S1, S2 or S3) on the voltage feed module. See the diagram on page **3**.

2 Feed the patch cable through the I/O cable entry hole ready to be connected to the extension power shelf (see details on page **23**).

Step 3 - Terminate I/O cabling (if required)

		• Connect only voltage-free switch or relay contacts to Digital Inputs.
	⚠	• Do not exceed the voltage and current limits of the relay contacts.
		• For wire size and I/O ratings see Specifications on page **59**.

If the RM3-410 or RM3-420 is fitted with an input/output (I/O) board:

1 Route the cabling from the external sensors/devices through the cable access hole to the I/O board.

2 Visually check the cable for damage.

3 Test the insulation and continuity of the cabling.

4 Terminate the wires into the push-connect terminal blocks as in the following diagram.

5 Use cable ties to secure the cable and prevent strain on the connectors.

6 Configure the inputs and outputs after completing the installation and all the Startup Tasks on page **28**.

    ⧠ *For configuration details see Digital Inputs and Digital Outputs in the System Controller Operation Handbook.*
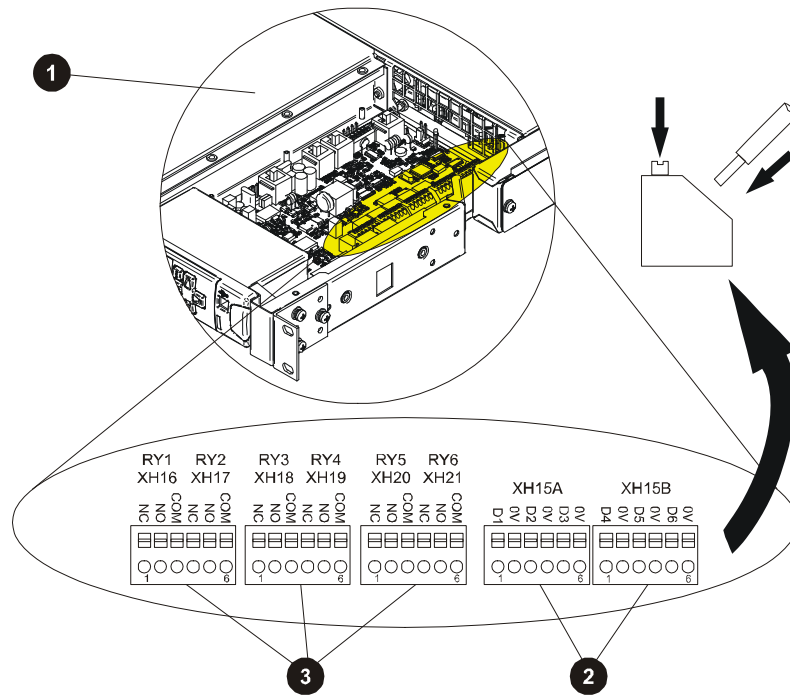
❶	RM3-410/420 with top cover removed.	❸	Alarm relay (digital output) terminals (push-connect type).
❷	Digital input terminals (push-connect type).		

Step 4 - Replace the top cover

Procedure complete

Task 5 - Connect Optional External I/O Module (some models only)

Optional SiteSure-3G input/output modules can be connected to models with an SC200 system controller (see Model Numbers on page **2**). A SiteSure-3G input/output module has the following features.

	SiteSure-3G
Digital Inputs	10
Digital Outputs (relays)	6
Analog Inputs (-10V to +10V)	4
Current Sense Inputs	3
Temperature Sense Inputs	2
Bus Voltage Input (0-60V)	1
Enclosure	Wall or panel mounting plastic case

Use the following procedure to connect a SiteSure-3G input/output module, if required.

Step 1 - Remove the top cover

Step 2 - Terminate the cabling

1 Route CAT 3 patch cable (4 pair, 26AWG, UTP, 75°C) from the SiteSure-3G module to the rear of the dc power system.

2 Terminate the cable with RJ45 plugs.

3 Test the insulation and continuity of the conductors.

4 Connect the cable to a spare RJ45 socket (S1 or S2) on the Voltage Feed Module board. See the diagram on page **3** for location.

   If there is no spare socket or additional SiteSure-3G input/output modules are to be connected then use an RJ45 splitter.

5 Use cable ties to secure the cable and prevent strain on the connectors.

6 Connect the cable to socket YH11 on the SiteSure-3G module.

Step 3 - Replace the top cover

Procedure complete

For details on setup refer to the SiteSure-3G Installation Guide. See Related Information on page **i**.

Task 6 - Connect Mid-point Monitoring (if required - SC200 only)

This task only applies to RM3-420 models when Battery Mid-point Monitoring is required. See description of Battery Mid-point Monitoring on page **7**.

Step 1 - Connect sense wires to the I/O board

1 Remove top cover. See the diagram on page **3**.

2 Route the Mid-point Monitoring sense wires to the I/O board via the cable access hole.

3 Connect the sense wires to connected XH12.

*If more than four battery strings are to be monitored (maximum is eight) then connect a second IOBGP I/O board. Follow the procedure for SiteSure-3G connection on page **21**.*

4 Replace top cover.

Step 2 - Connect sense wires to batteries

*The Mid-point Monitoring sense wires must have short-circuit protection fitted close to the battery terminals. Use the Battery Mid-point Monitoring kits from Eaton (see Spare Parts on page **72**) or equivalent.*

1 Connect a Mid-point Monitoring sense wire to the middle interconnecting link on each string of batteries (see following diagram).

Connect the wire from XH12A pin 1 to string 1, and so on.

If there are an odd number of 2V cells per string, then connect the sense wires to the interconnecting link on the side of the central cell closer to the Common battery terminal.

2 Tighten the terminals according to the battery supplier's/manufacturer's installation instructions.

3 Insulate any un-connected sense wires.

4 Secure all sense wires to avoid any strain on the terminations.
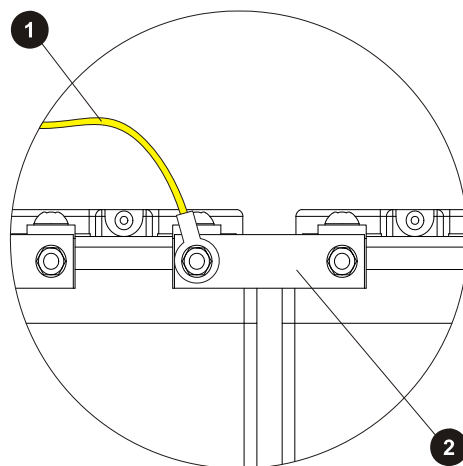
1 Mid-point Monitoring sense wire from XH12A on the input/output board

2 Middle interconnecting link

Procedure complete

Task 7 - Interconnect RM3-400 (if used as an extension power shelf)

This Task only applies to an RM3-400 when it is used as an extension power shelf supplying the same dc-powered equipment as an RM3-410 or RM3-420 dc power system.

Step 1 - Connect rectifier communications

Connect from the RM3-400 RJ45 socket to TB1 screw terminal block on the voltage feed module in the RM3-410 or RM3-420 dc power system.

Connect: RJ45 pin 4 - TB1 A, RJ45 pin 5 - TB1 B.
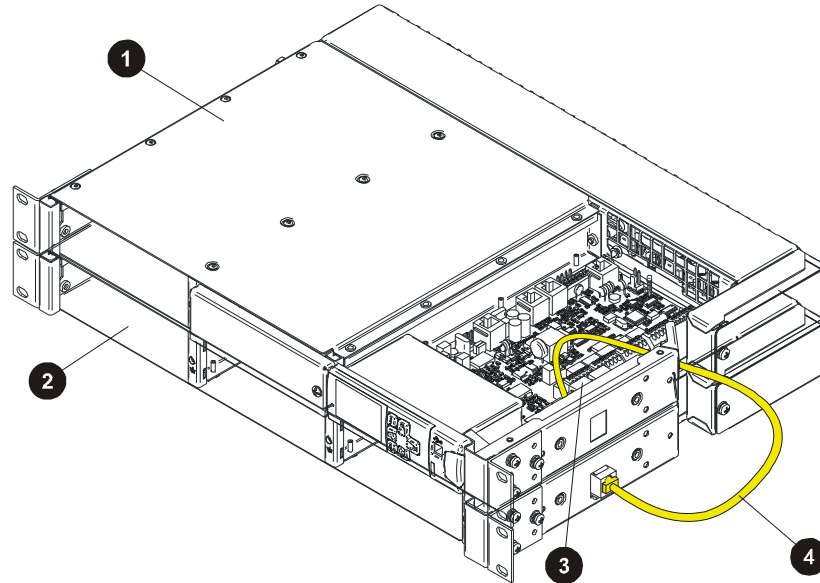
1 RM3-410 or RM3-420 dc power system (top cover removed)

2 RM3-400 extension power shelf

3 TB1 screw terminal block on the voltage feed module

4 Cable from RJ45 to TB1

Step 2 - Check that dc cables are in parallel

Check that the dc output cables of the RM3-400 extension power shelf and the RM3-410 or RM3-420 dc power system are connected in parallel.

The rectifier communications of an RM3-400 and an RM3-410 or RM3-420 dc power system must not be connected if they are supplying separate dc-powered equipment.

Procedure complete

Task 8 - Connect the Output Cables

Step 1 - Select cables

USA/Canada:

To maintain UL compliance use the following cable sizes and crimp lugs depending on model:

RM3-400 models:

Wire*:	Multi-strand, copper conductor, 1 AWG
Strip length:	5/8" (16mm)
Crimp lug:	FCI-Burndy type YAV1C-L1
Crimp tool:	FCI-Burndy type MY29-11 (Die index 42)

RM3-410/420 models:

Wire*:	Multi-strand, copper conductor, 4 AWG
Strip length:	1/2" (13mm)
Crimp lug:	FCI-Burndy type YAV4C-L
Crimp tool:	FCI-Burndy type MY29-11 (Die Index 40)

Other countries:

Use the following cable sizes and crimp lugs depending on model:

RM3-400 models:

Wire*:	Multi-strand, copper conductor, 50mm^2
Crimp lug:	M6 x 50mm^2

RM3-410/420 models:

Wire*:	Multi-strand, copper conductor, 25mm^2
Crimp lug:	M6 x 25mm^2

*These are the minimum cable sizes. For long cable runs use larger cables to avoid excessive voltage drop at high current.

Step 2 - Connect cables at RM3-400/410/420

1 Open the dc output terminal cover and route the cables through the cover to the dc output terminals. See location on page **3**.

2 Connect the cables and tighten the terminals to 3.9 - 4.5Nm (35 - 39 inch-pounds).

3 Close the dc terminal cover.
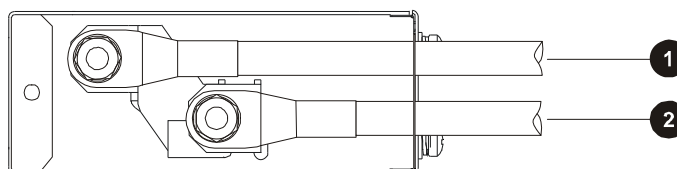
❶ Negative output cable   ❷ Positive output cable

Step 3 - Connect the cables at the equipment to be powered

Follow the instructions provided by the equipment supplier/manufacturer.

Step 4 - Check terminations, secure cables and test insulation

1 Check all terminations are correct and are tightened.

2 Secure the cables with cable ties to ensure there will be no strain on the terminals.

3 Test the insulation resistance of the cables.

Procedure complete

Task 9 - Connect to the AC Supply Point

Step 1 - RM3-400/410/420 systems with IEC cord sets

If the RM3-400/410/420 has permanently connected ac cords then go to Step 2.

Connect one of the cord sets provided to each IEC connector on the rear of the RM3-400/410/420.

If the cord sets are missing or must be replaced then refer to Spare Parts on page 72 for replacement items.

Step 2 - Connect at the ac supply point

1 Check the ac supply point is isolated.

2 Connect the ac cords to the ac supply point.

3 Label the connection at the ac supply point.

4 Secure the cords to ensure there is no strain on the terminals.

Procedure complete

Do not switch on the ac supply at this stage.

Installation Completed

Installation of the RM3-400/410/420 is now complete. Follow the instructions in Start-Up on page 28 to make the system operational.

26

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Overview

Start-Up Tasks

Complete all the Installation tasks (see details on page **14**) before starting these Start-Up tasks. Complete the Start-Up tasks in the following order:

Task	Description	Reference
1	Insert the rectifiers	See details on page **28**
2	Complete the Pre-Power-Up Checklist	See details on page **29**
3	Connect to the ac supply	See details on page **29**
4	Configure the dc power system (some models only)	See details on page **30**
5	Apply dc power to dc-powered equipment	See details on page **31**

Task 1 - Inserting the Rectifiers

⚠️
- Do NOT install the rectifiers until the room has been cleaned and is dust free.
- Do NOT switch on the ac supply at this stage.

Step 1 - Unpack the rectifiers

Unpack the rectifiers and inspect them carefully for possible transport damage. Report any damage immediately using a completed Equipment Incident Report on page **77**.

📝 *Keep the original packaging to return a rectifier for replacement or repair, if required.*

Step 2 - Fit first rectifier

1 Align the rectifier with the left side of the shelf.

2 Push in the rectifier until the retaining screw contacts the shelf.

3 Check the rectifier's rear connector is correctly aligned with the shelf connector, or damage may occur.

4 Tighten the retaining screw to 1.5Nm (13.3 inch-pounds). This will locate the rectifier in its rear connector.
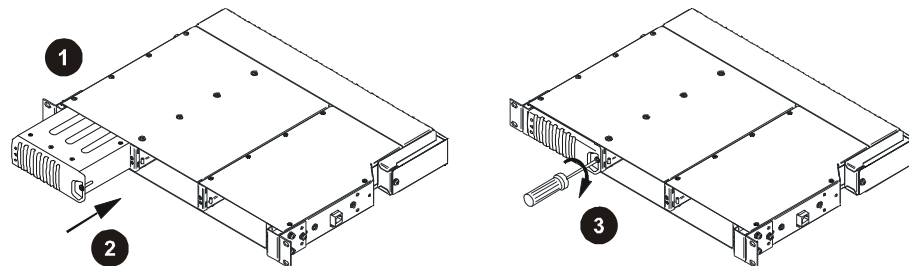
Step 3 - Repeat for other rectifiers or fit blank panels

If not already fitted, fit rectifier blank panels in any vacant rectifier positions.

Procedure complete

Task 2 - Pre-Power-Up Checklist

Complete the checklist to confirm initial work is complete before progressing further.

☐ All cabling is installed, securely tied and correctly insulated

☐ Ground bonding is correct (see details on page **17**)

☐ Output cabling has the correct polarity

☐ A registered electrician or other suitable approved person has checked the integrity of the installed cabling

☐ All covers are in place and all empty rectifier slots are covered with blanking panels

☐ Equipment to be powered is switched off

☐ RM3-400/410/420 is disconnected from the ac supply

☐ The site is clean.

Task 3 - Connect to the AC Supply

⚠ • A registered electrician (or suitably qualified person) must check the integrity of the installed cabling, BEFORE the dc power system is powered up.

1 Connect the RM3-400/410/420 to the ac supply.
   • All rectifiers start up (after the startup delay).
   • The rectifier alarm LEDs will turn on for a short time. The rectifier yellow alarm LEDs will flash.

2 If an SC200 or SC100 system controller is fitted (some models only):
   • The system controller will turn on (green Power On LED is on) when the rectifiers start.
   • When the system controller has completed its start-up sequence (rectifiers are registered) the rectifier yellow alarm LEDs will turn off.

3 After start-up of the system controller (if fitted):

- Press any system controller key to silence the alarm.

  ⬚ *Depending on the configuration file settings, one or both alarm LED(s) may be on and the system controller will display some system alarm messages. This is normal. For an explanation of alarm messages see Alarm Descriptions in the System Controller Operation Handbook.*

- The LCD shows the summary screen. See details on page **35**.

  ⬚ *If no dc-powered equipment is connected the current will be 0A.*

- Check all rectifiers are running and only the rectifier green Power On LEDs are on (no alarm LEDs).

- Use the system controller keypad to check that all rectifiers are registered. See details on page **36**.

⬚ *If any problems see Troubleshooting on page **44**.*

Task 4 - Configuring the dc power system (some models only)

1 If the dc power system does not have an SC200 or SC100 system controller (see Model Numbers on page **2**) then ignore this Task.

⬚ *Systems without a system controller will operate at the rectifiers' factory-set default settings (see Specifications on page **57**).*

2 If a system controller is fitted then the operational settings of the dc power system are adjustable and are stored in a configuration file loaded into the system controller. Refer to Configuration File in the System Controller Operation Handbook (see Related Information on page **i**).

The system controller is supplied pre-loaded with a configuration file.

- If this configuration file has been customized for the site then no further configuration changes will be necessary.

- If the configuration file is not fully customized for the site then check the following settings and change if necessary. It is important that these settings are correct before progressing further.

Parameter	Action*
Float Voltage	Set to the value recommended by the equipment manufacturer.
Battery Capacity	Set to zero (means no battery is installed).
Temperature Compensation	Set to *Disabled*.
Low Voltage Disconnect (LVD)	Set to *Disabled*.

** For further details and navigation refer to the System Controller Operation Handbook (see Related Information on page **i**).*

Other configuration settings can be changed after all Start-Up tasks are complete. For details on how to customize the system's configuration see System Operation in the System Controller Operation Handbook (see Related Information on page **i**).

Task 5 - Applying Power to the dc-powered Equipment

⚠️ **Reverse Polarity**

- Always check that the dc cables have been terminated to the correct system polarity BEFORE connecting dc power to the load equipment.

Step 1 - Check dc voltage and polarity

⬇️ Check the dc output voltage and polarity of the power system.

Step 2 - Connect load equipment

⬇️
1 Switch on the load equipment (refer to the equipment manufacturer's instructions).
2 Check the equipment powers up.

Step 3 - Check the rectifier currents (some models only)

⬇️ If a system controller is fitted:
1 Check the rectifier currents.
2 Verify the load current is as expected for the connected equipment.

Procedure complete

Start-Up Completed

Start-Up of the RM3-400/410/420 is now complete and the system is operational.

For information on alarms, or operation problems see Maintenance on page **43**.

RM3-410 and RM3-420 Models

For RM3-410 and RM3-420 models the following chapter describes how to use the SC200 or SC100 system controller. For full details on how to customize the system configuration settings, and how to setup the remote communications options refer to the System Controller Operation Handbook (see Related Information on page **i**).

32

Configuration File

The operational settings of the dc power system are stored in a configuration file loaded into the SC200 or SC100 system controller.

The SC200 or SC100 is supplied pre-loaded with a configuration file. If this configuration file has been customized for the site then no further configuration changes will be necessary.

Otherwise, it is important that the settings of this configuration file are checked and changed as required for site-specific conditions. In particular, settings that may affect the performance and life expectancy of the battery must be checked and set according to the battery manufacturer's recommendations.

Some settings in the configuration file can be edited using the system controller's keypad (see details on page **36**), or all settings can be edited using a PC/laptop with DCTools/Web (see details on page **38**) or remotely, see Communications Options in the System Controller Operation Handbook.

Backup and Restore

The configuration file settings in the SC200 or SC100 can be saved to (Backup) or loaded from (Restore) a PC/laptop using DCTools/Web.

Backup and Restore can be used to:

- Load a standard (master) configuration file into an SC200 or SC100 for customization.
- Copy a customized configuration file from one SC200 or SC100 to others (at similar sites).
- Save a copy of a customized configuration file. This is recommended in case the SC200 or SC100 has to be replaced.

► **To use DCTools for Backup and Restore**

1 Connect to the SC200 or SC100 with DCTools. See Communications Options in the System Controller Operation Handbook.

2 In DCTools go to *File* > *ICE Backup/Restore* and follow the prompts.

⬚ *The saved file does not include site specific settings including Site Identity, IP Address, S3P Address, battery characterization data.*

► **To use a web browser for Backup (SC200 only)**

1 Connect to the SC200 via a web browser. For details see Ethernet Communications in the System Controller Operation Handbook.

2 Go to *Tools*.

3 Select *Backup Tool*.

4 Select the file type:

- **System Snapshot (*.dcs):** Configuration file including site specific settings.
- **Configuration (*.dcc):** Configuration file without site specific settings - Site Identity, IP Address, S3P Address, battery characterization data).

5 Click *Proceed* to Backup the configuration.

► **To use a web browser for Restore (SC200 only)**

1 Connect to the SC200 via a web browser. For details see Ethernet Communications in the System Controller Operation Handbook.

2 Go to *Tools*.

3 Select *Restore Tool*.

4 Select the file type:

- **System Snapshot (*.dcs):** Configuration file including site specific settings.
- **Configuration (*.dcc):** Configuration file without site specific settings - Site Identity, IP Address, S3P Address, battery characterization data).
- **Fragment (*.dcf):** Restore part of a configuration file (such as battery characterization data).

5 Click *Next*, and then select a file name to *Restore* a configuration.

Starting the SC200 or SC100

When dc power is applied to the SC200 or SC100 (via the RXP connector YS11) the start-up sequence begins.

SC200
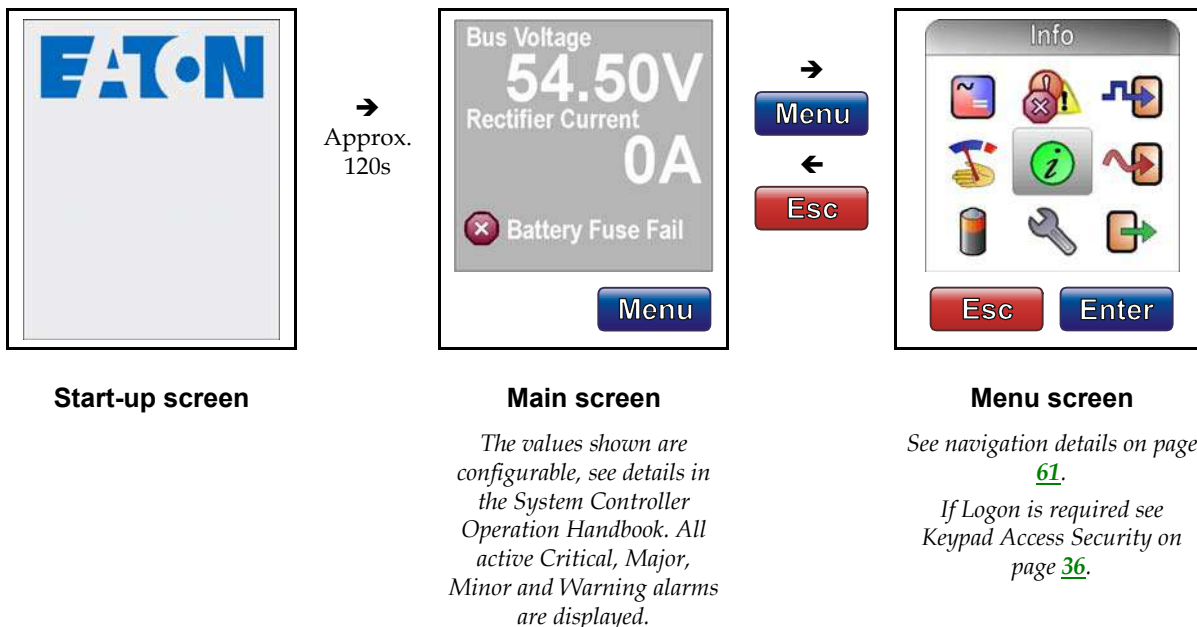
Start-up screen	**Main screen**	**Menu screen**
	The values shown are configurable, see details in the System Controller Operation Handbook. All active Critical, Major, Minor and Warning alarms are displayed.	*See navigation details on page 61.* *If Logon is required see Keypad Access Security on page 36.*

SC100
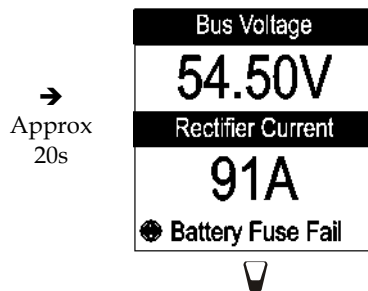
Start-up screen	**First status screen**	**Main menu**
	All active alarms are displayed.	*See details on page 62.*
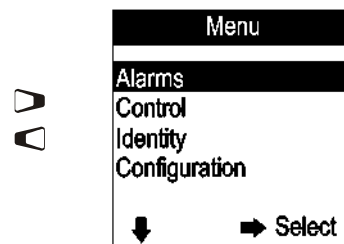
SC200 or SC100 Operation using the Keypad and Screen

❶ LCD
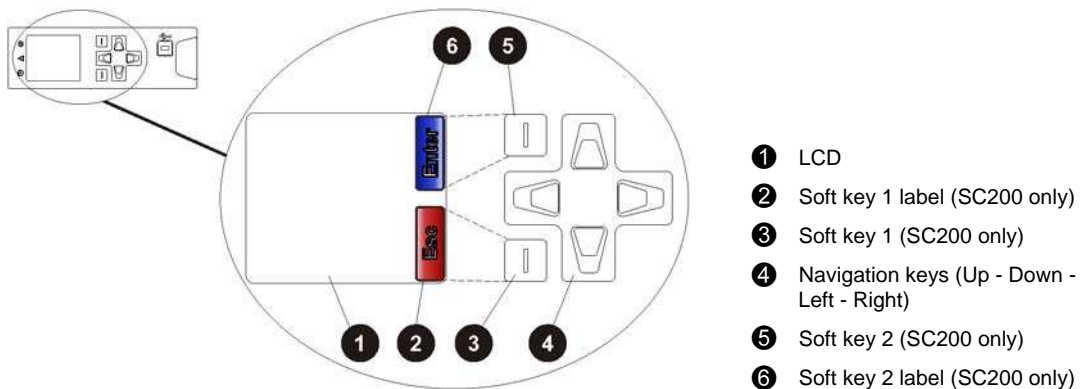
❷ Soft key 1 label (SC200 only)

❸ Soft key 1 (SC200 only)

❹ Navigation keys (Up - Down - Left - Right)

❺ Soft key 2 (SC200 only)

❻ Soft key 2 label (SC200 only)

Keypad Access Security

SC200 System Controller

This feature prevents accidental or unauthorized changes to settings from the SC200 keypad.

> All access to change an SC200's settings will be lost if:
>
> • All communications are disabled (see S3P Access and HTTP/HTTPS Access in the System Controller Operation Handbook), and
>
> • Keypad access is *Read Only*, or *PIN Protected* and the keypad access PIN is lost.
>
> The SC200 will continue to function, but no configuration changes can be made. Contact your Eaton dc product supplier or Eaton for advice (see Worldwide Support on page **79**).

► **To use DCTools/Web to enable/disable keypad access**

- In DCTools/Web go to *Communications* > *Front Panel*.
- Set *Access* to:
  - *Unprotected* - keypad access is allowed to view and change parameters, or
  - *Read Only* - keypad access is allowed to view parameters only, or
  - *PIN Protected* - keypad access is allowed to view and change parameters if the correct 4-digit number is typed in the *Access PIN* field. Otherwise, *Read Only* access is allowed.

► **To use the SC200 when access is set to PIN Protected**

- At the Main Screen press *Menu*. The *Logon* screen appears.
- If the *Access PIN* is not known then press *Skip* to use the SC200 with *Read Only* access.
- If the *Access PIN* is known:
  - Use the Left and Right keys to access each digit position. Use the Up and Down keys to change the digits.
  - When the correct digits are entered, press *Logon*.

  Keypad access will return to PIN Protected mode when the display returns to the Main Screen.

SC100 System Controller

This feature prevents accidental or unauthorized changes to settings from the SC100 keypad.

► **To use DCTools/Web to enable/disable keypad access**

- In DCTools/Web go to *Communications*.
- Set *UI Access* to:
  - *Unprotected* - keypad access is allowed, or
  - *Protected* - keypad access is denied (can be temporarily over-ridden, see below).

► **To temporarily enable keypad access at the SC100 when access is set to Protected**

- Press *Up* and *Down* keys together for 5 seconds.

  Keypad access is now temporarily enabled. Keypad access control reverts back to Protected mode after the display goes back to the Summary screen.

Alarm Indicators

Visual indicators

Power on LED (green)

Minor Alarm LED (yellow)

Critical/Major Alarm LED (red)

??? The system value cannot be displayed because of a failed, disconnected or unconfigured sensor.

Audible indicator

- One beep – indicates an invalid key press
- Three beeps every 2 seconds – refer to the alert message on the display (SC200 only)
- One beep every 2 seconds – Minor alarm is active
- Continuous sound – Critical/Major alarm is active

  Critical/Major alarms always override Minor alarms.

► **To stop the audible indicator**

- Press any key

  The audible indicator will restart at the next active alarm or alert message.

► **To enable/disable the audible alarm indicator**

Either:

- On SC200 go to: Alarms > Alarm Settings > Audible Alarms > Edit.
- or on SC100 go to: Menu > Configuration > Audible Alarm.

Or:

- In DCTools/Web go to: *Alarms > Alarm Configuration*.

  When Disabled, the audible indicator will still indicate an invalid key press.

SC200 or SC100 Operation Using a PC/Laptop

DCTools is configuration software for editing a system controller's configuration file (on-line) and monitoring the operation of Eaton's dc power systems. It is available free from www.powerquality.eaton.com/downloads.

Using DCTools via USB (SC200 only)

DCTools can be run on a PC/laptop connected to the SC200's USB port.

  DCTools can also be run on a remote PC/laptop connected to the SC200's RS232 serial port (via a modem) or Ethernet port. For remote PC/laptop connection details see Communications Options in the System Controller Operation Handbook.

Before you start you will need:

- The latest version of *DCTools* available from www.powerquality.eaton.com/downloads.
- A PC/laptop with USB port and USB A/B cable (RadioShack 55010997, Jaycar WC7700, or equivalent).

► **To connect a PC/laptop to the SC200:**

1 Download the latest version of *DCTools* from www.powerquality.eaton.com/downloads.
2 Install *DCTools* on the PC/laptop.

3   Connect a USB A/B cable from a USB port on the PC/laptop to the USB port on the SC200.

⬚   *See the diagram on page 5 for location of the USB port.*

4   *DCTools* will now connect to the SC200.

⬚   *If connection is not successful refer to DCTools Help (press F1) or Troubleshooting on page 44.*

5   For details of the SC200 control and monitoring functions available via *DCTools see* System Operation in the System Controller Operation Handbook.

⬚   *For help using DCTools press F1.*

Using DCTools via RS232

DCTools can be run on a PC/laptop connected to the SC200 or SC100's RS232 port.

⬚   *For remote PC/laptop connection details see Communications Options in the System Controller Operation Handbook.*

Before you start you will need:

•   The latest version of *DCTools* available from: www.powerquality.eaton.com/downloads.

•   A PC/laptop with RS232 port and DB9 F/F Null-modem cable (RadioShack 55010600, Jaycar WC7513, or similar. Cross-over connections: 5-5, 2-3, 3-2.)

►   **To connect a PC/laptop to the SC200 or SC100:**

1   Download the latest version of *DCTools* from: www.powerquality.eaton.com/downloads.

2   Install *DCTools* on the PC/laptop.

3   Connect a null-modem cable from the COM1 RS232 port on the PC/laptop to the RS232 connector on the SC200 or SC100.

⬚   *Ensure the cable is secured so that no force is applied to the RS232 connector as this may damage the connector.*

⬚   *If COM1 port is not available or for more details see Direct RS232 Communications in the System Controller Operation Handbook.*

4   Start DCTools to open the Connection List. Check the box for the *COM1* connection.
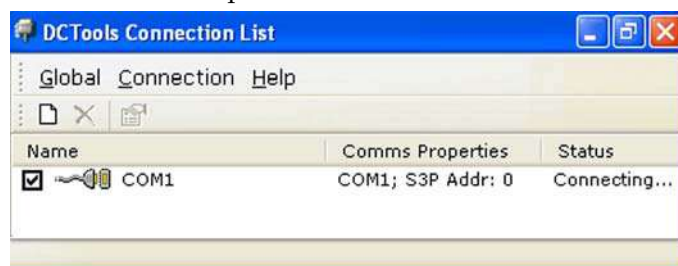
5   *DCTools* will now connect to the SC200 or SC100.

⬚   *If connection is not successful refer to DCTools help (press F1) or Troubleshooting on page 44.*

6 For details of the SC200 or SC100 control and monitoring functions available via *DCTools* *see* System Operation in the System Controller Operation Handbook.

⌨ *For help using DCTools press F1.*
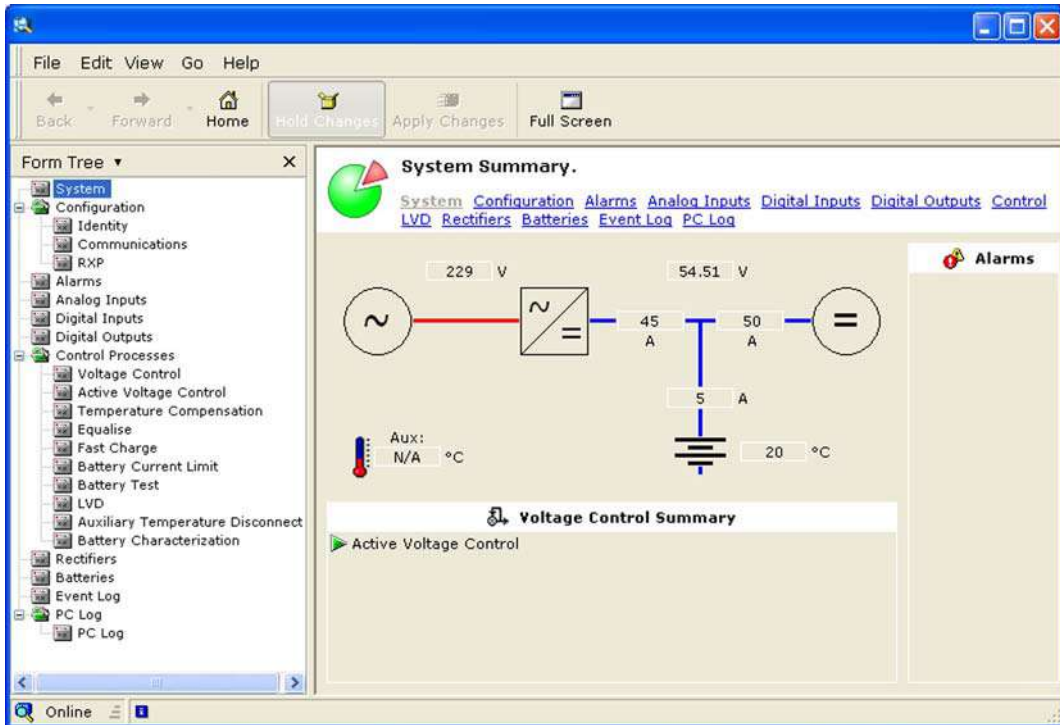
SC200 or SC100 Identity Information

The following identity information is stored in the SC200 or SC100.

Parameter	Description	Where to find:
Serial Number	The SC200 or SC100 serial number (factory set).	SC100: Menu > Identity >SC100 Identity
Software Version (App Version)	The version of the embedded software in the SC200 or SC100 (factory set).	SC200: Settings > Info DCTools/Web: Configuration > Identity

If required, the following site specific information can be stored in the SC200 or SC100 to assist site management.

Parameter	Description	Where to find:
System Manufacturer	The manufacturer of the dc power system.	
System Type	The RM3-400/410/420 model number.	
System Serial Number	The RM3-400/410/420 serial number.	
System Location	Location of RM3-400/410/420 at the site.	DCTools/Web: Configuration > Identity
Site Name	Name of the site.	
Site Address	Address of the site.	
Site Notes	Any notes relevant to site access, location or other matters.	
Contact	Contact name, phone number, and so on.	
Configuration Name	Reference name of the configuration file in the SC200 or SC100.	

42

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Overview

⚠️

- The RM3-400/410/420 contains hazardous voltages and hazardous energy levels. Before undertaking any maintenance task refer to the Warnings on page **10**.
- If a maintenance task must be performed on a "live" system then take all necessary precautions to avoid short-circuits or disconnection of the load equipment, and follow any "live-working" instructions applicable to the site.
- Only perform the maintenance tasks described in the Maintenance chapter. All other tasks are classified as Servicing. Servicing must only be performed according to specific instructions and only by personnel authorized by Eaton. This includes disassembly and/or servicing of any modules.
- For further information on Servicing contact your local Eaton dc product supplier, or refer to the contact details on page **79**.

Troubleshooting

Use the table to troubleshoot minor installation and operational problems. For additional assistance see contact details on page . Return items for replacement or repair with a completed Equipment Incident Report on page .

System Problems

Problem	Possible Cause	Required Action
All rectifiers are off (no LEDs on) and system controller display is blank.	AC supply to the system is off and batteries are not connected or are fully discharged.	Restore ac supply.
Green LED of one or more rectifiers is off.	AC supply to rectifier(s) off or one or more phases are off.	Restore ac supply.
	Rectifier(s) not fully inserted.	Insert rectifier and tighten retaining screw.
	Internal rectifier fault.	Remove the rectifier and insert another one in the same slot. If second rectifier fails to start, then there is a fault with the rectifier position. Check ac connections. If the second rectifier operates normally, then the first rectifier is faulty and must be returned for service.
All rectifier LEDs flash.	The rectifier is responding to an *Identify* command from the system controller.	None, this is normal operation. See details in the System Controller Operation Handbook.
Rectifier yellow LED flashes	System controller is starting (RM3-410/420 models).	Wait for system controller to complete start-up.
	Rectifier has not registered with the system controller.	**RM3-400 models only:** This is normal operation (no system controller fitted). **Other models:** Remove, and then re-insert the rectifier. Replace the rectifier with another rectifier. If second rectifier fails to register, then there is a fault with the rectifier position. Check rectifier comms bus wiring. If second rectifier registers, then first rectifier is faulty and must be returned for service.

Problem	Possible Cause	Required Action
Rectifier yellow LED on.	Rectifier power limit or current limit is active.	Power system is charging the batteries. If required, activate the Battery Current Limit control process.
	Load current exceeds the total rectifier capacity.	Install additional rectifiers.
	Rectifier temperature turndown is active due to low ac supply voltage or high ambient temperature.	Power system will return to normal operation when the ac supply voltage and/or ambient temperature are within the specified ranges. See Specifications on page **57**.
	System controller has shut down the rectifier. (Depending on model, rectifier may also click every 5-15 seconds.)	Normal operation. See Rectifier Shutdown in the System Controller Operation Handbook. If required, restart the rectifier.
Rectifier red LED on.	Very high or low ac voltage, or ac supply failed.	Power system will return to normal operation when the ac supply voltage is within the specified range. See Specifications on page **57**.
	DC overvoltage	Remove and re-insert rectifier(s) or shut down and restart using *DCTools/Web*.
	Internal rectifier fault.	Replace the rectifier.
Low system output voltage (rectifiers not in current limit).	Rectifiers off.	Restore the ac supply.
	Temperature Compensation is active and the battery temperature is above the reference temperature.	None. This is normal operation (if batteries are connected). Disable Temperature Compensation if no batteries connected.
	Battery Test or Battery Characterization is active.	None. Output voltage will return to normal when Battery Test or Battery Characterization is completed.
	Incorrect float voltage setting at system controller.	Correct the float voltage setting of the system controller. Record new setting.
Low system output voltage and rectifier yellow LEDs are on (rectifiers are in current limit).	Load is too high for rectifier capacity.	Install additional rectifiers.
	Battery is recharging after ac supply failure.	Check battery has recharged within expected time.

IPN 997-00012-62E   June 2010

45

Problem	Possible Cause	Required Action
High system output voltage.	Temperature Compensation is active and the battery temperature is below the reference temperature.	None. This is normal operation (if batteries are connected). Disable Temperature Compensation if no batteries connected.
	Equalize or Fast Charge is active.	None. Output voltage will return to normal when Equalize or Fast Charge is completed.
	Incorrect float voltage setting at system controller.	Correct the float voltage setting of the system controller. Record new setting.
	Faulty rectifier.	Locate the rectifier with the highest output current and remove this one first. If the first rectifier removed is not faulty, remove each of the remaining rectifier modules one at a time, until the faulty rectifier is found. (The output voltage returns to normal when faulty rectifier is removed.) Replace faulty rectifier with one that is working. Return the faulty rectifier for service.
String Fail Alarm (SC200 only)	The Battery Mid-point Monitoring system has detected a voltage imbalance in one of the battery strings.	See Battery Mid-point Monitoring on page **56**.
	A Battery Mid-point Monitoring sense wire is disconnected.	Check the sense wires.

System Controller Problems (RM3-410/420 Models only)

Problem	Possible Cause	Required Action
SC200 or SC100 displays a dc power system alarm message.		See Alarm Descriptions in the System Controller Operation Handbook.
SC200 or SC100 LCD is blank and green Power On LED is off.	RXP/power cable is disconnected from the SC200 or SC100.	Connect cable from connector YS11 to the dc power system voltage feed module (see Connections on page **69**). Wait for start-up to complete.
	The ac supply is off and the batteries are not connected because the Low Voltage Disconnect (LVD) has disconnected.	None. The power system including the SC200 or SC100 will return to normal operation when the ac supply is within its specified voltage range.
	Faulty Voltage Feed Module (VFM) or faulty SC200 or SC100.	Replace faulty unit.
SC200 or SC100 LCD is blank and green Power On LED is on.	SC200 or SC100 is in start-up mode	Wait for start-up to complete. See Starting the SC200 or SC100 on page **35**.
	Faulty SC200 or SC100	Replace faulty SC200 or SC100.
SC200 or SC100 Red LED or Yellow LED is on.	An alarm is active.	Check the type of alarm on the LCD or with *DCTools/Web* or *PowerManagerII*. See Alarm Descriptions in the System Controller Operation Handbook.
Unable to change settings from SC200 or SC100 keypad.	Keypad access is set to *Read Only* or *PIN Protected*.	See Keypad Access Security on page **36**.
Monitor OK relay (RLY6) is de-energized.	An active alarm, digital input or analog input is mapped to this relay.	Check relay mapping. See Alarms, Analog Inputs, or Digital Inputs in the System Controller Operation Handbook.
	SC200 or SC100 or I/O board software corrupt or hardware fault.	Replace faulty unit.
Incorrect battery or load current readings.	Bus voltage sense polarity is incorrect.	Check the bus voltage sense polarity and correct if necessary.
	Incorrectly configured shunt inputs.	Check shunt mapping and gain is correct.
	Current is within the *Battery State Threshold*. See details in the System Controller Operation Handbook.	None, normal operation.

Problem	Possible Cause	Required Action
SC200 or SC100 or DCTools/Web displays **???** or **N/A**	Failed, disconnected or unconfigured sensor.	Replace, connect or configure sensor.
	Faulty or disconnected voltage feed module.	Replace or connect voltage feed module.
	Incorrect I/O board mapping (SC200 only).	Check I/O board mapping. See details in the System Controller Operation Handbook.
SC200 or SC100 displays **Config Error**	Missing or invalid configuration file.	Either: Load a valid configuration file into the SC200 or SC100. See Backup and Restore on page **34**, or Change one or more configuration settings using the SC200 or SC100 keypad or DCTools.
	Incorrect rectifier voltage, because installed rectifiers have different output voltages.	Check that all rectifiers are of the same type and replace as necessary.
DCTools connection problem (*Target Failed to Respond* error)	Connection problem	Refer to following communications problems.
USB communications problem (SC200 only)	Incorrect, disconnected or faulty cable.	Check a USB A/B cable is plugged into the USB port and a PC USB port. Replace faulty cable.
	SC200 or SC100 serial communications are disabled.	Check *S3P Access* is enabled. See details in the System Controller Operation Handbook.
	DCTools not installed on PC or wrong version.	Install latest version of DCTools. Download from www.powerquality.eaton.com/downloads.
	Password required to change settings.	See Write Access Password in the System Controller Operation Handbook.

Problem	Possible Cause	Required Action
Modem/RS232 communications problem.	Incorrect, disconnected or faulty cable.	Check an RS232 straight-thru cable is plugged into XS1 and the modem. Replace faulty cable.
	Access to RS232 connector XS1 is restricted.	Use a DB9 ribbon cable extension (Farnell part number 869-6411).
	Incorrect communications settings.	See PSTN Modem Communications or GSM Modem Communications in the System Controller Operation Handbook.
	Incorrect modem setup string.	Refer to the AT command section in the modem's manual.
	Modem not powered or other modem problem.	Refer to the modem's manual.
	Incompatible modem.	Contact your Eaton dc product supplier or Eaton for advice. See Worldwide Support on page **79**.
	Password required to change settings.	See Write Access Password in the System Controller Operation Handbook.
Serial communications are disabled (SC200 only)	*S3P Access* is disabled.	*Set S3P Access* to Enabled. See details in the System Controller Operation Handbook.
Ethernet communications problem (SC200 only)	Incorrect, disconnected or faulty cable.	Check a network patch cable is connected from XS31 to a live network outlet. Replace faulty cable.
	Ethernet link is not active.	On the Ethernet connector (XS31) check: Yellow LED is continuously lit to show link is active. Green LED flashes to show traffic is reaching the SC200. See the diagrams on page **5** for position of the Ethernet connector.
	Incorrect communications settings.	See Ethernet Communications in the System Controller Operation Handbook.
	SC200 serial communications are disabled.	Check *S3P Access* is enabled. See details in the System Controller Operation Handbook.
	Password required to change settings (using DCTools or PowerManagerII).	See Write Access Password in the System Controller Operation Handbook.

Problem	Possible Cause	Required Action
Web communications problem (SC200 only)	Ethernet communications problem.	See previous entry.
	Cannot connect to web server.	Check IP address and other settings in SC200 are correct. Check correct IP address is used in web browser address bar. See Ethernet Communications in the System Controller Operation Handbook. Check *HTTP Access* or *HTTPS Access* is enabled. See Web Access Security in the System Controller Operation Handbook.
	Cannot log on to web server.	Incorrect Logon ID or Password, or no active users setup. Use DCTools to set up an active user. See Web Access Security in the System Controller Operation Handbook.
	Web communications lost (*Comms Lost* error message).	Check that the SC200 is operating. Check the Ethernet communications connections. See previous entry. Check web browser type and version. See Compatible Software on page 6.
	Lost Logon ID and/or Password.	Use DCTools to set up a new Logon ID and/or Password. See Web Access Security in the System Controller Operation Handbook.
	Default User log on is not available.	*Default User* is not setup or not active. Use DCTools to set up a *Default User*. See Web Access Security in the System Controller Operation Handbook.
	A user cannot change settings, Backup or Restore, Execute Commands, Upgrade Firmware, or Edit User List.	Check the user's access levels. See Web Access Security in the System Controller Operation Handbook.
SC200 time/date is incorrect (SC200 only)	Time/date is different on SC200 compared to DCTools/Web.	None. Time shown on SC200 is UTC. Time on PC running DCTools/Web is local time.
	Time needs to be set.	See SC200 Internal Clock in the System Controller Operation Handbook.
	SC200 time can be set, but is incorrect when SC200 restarts.	Internal battery is dead. Return SC200 for service. (If removed, the battery must be disposed of according to the manufacturer's instructions.)

Problem	Possible Cause	Required Action
I/O board Power/Comms OK LED is off	I/O board is not powered or faulty.	Check connection to YH3 on I/O board. See Connections on page 69. Replace I/O board if faulty.
I/O board Power/Comms OK LED is flashing.	I/O board is responding to an *Identify* command from the SC200 or SC100.	None, this is normal operation. See details in the System Controller Operation Handbook.

Replacing or Adding a Rectifier

Rectifiers can be replaced without switching off the dc power system and disconnecting the equipment it powers.

- To reduce the risk of electric shock and maintain optimum system cooling, always cover empty rectifier slots with blanking panels.
- To avoid electric shock do not place hands inside the rectifier shelf.
- Do not attempt to disassemble faulty rectifiers. Return them (in their original packaging) with a completed Equipment Incident Report on page 77.

Removing a Rectifier
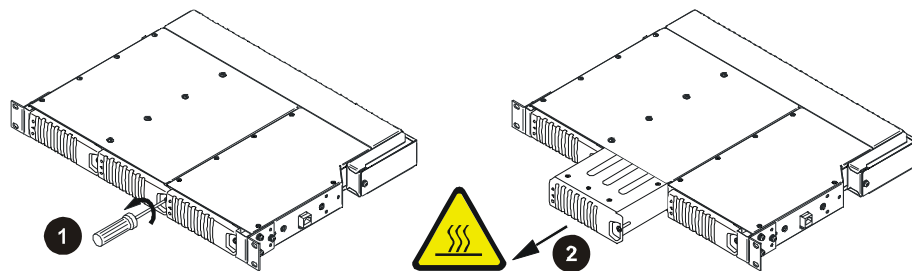
Step 1 - Undo the rectifier retaining screw

This will release the rectifier from its rear connector.

Step 2 - Pull out the rectifier

- The rectifier may be hot, especially after prolonged operation. Use suitable gloves.
- To avoid damage do not rest the rectifier on its connector.

Step 3 - Replace rectifier or fit blank panel

Insert a replacement rectifier into the empty slot (see details in following section), or fit a blank panel.

Procedure complete

Installing a Replacement Rectifier

Step 1 - Remove rectifier blank panel (if fitted)

| Step 2 - Align the rectifier with the guides |
| --- |

Step 3 - Push in the rectifier

1 Push in the rectifier until the retaining screw contacts the shelf.

2 Check the rectifier's rear connector is correctly aligned with the shelf connector, or damage may occur.

3 Tighten the retaining screw to 1.5Nm (13.3 inch-pounds). This will locate the rectifier in its rear connector.

4 Check that the rectifier's Power On LED turns on (after the startup delay) and the alarm LEDs turn off.

☐ *The rectifier will automatically register with the system controller and download its operating parameters. No adjustments are required.*
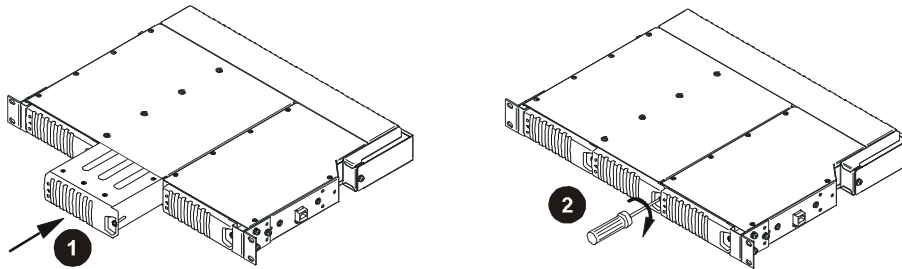
Procedure complete

Replacing the System Controller (some models only)

This procedure only applies to RM3-410/420 models (see Model Numbers on page **2**).

The SC200 or SC100 system controller can be replaced without switching off the dc power system and disconnecting the equipment it powers.

Before you start you will require:

- A PC/Laptop with *DCTools** connected to the system controller or (SC200 only) a web browser* connected to the system controller via an IP network.

  *See Communications Options in the System Controller Operation Handbook.

- A replacement SC200 or SC100 system controller.

  A new system controller is factory loaded with a 48V (nominal) default configuration file. DCTools/Web (SC200 only) can be used to modify the configuration file already loaded in a system controller. However, a system controller configured for a particular nominal system voltage (48V or 24V) can only be converted to the other nominal system voltage by loading a new configuration file.

- A copy of the appropriate configuration file, either:
  - use the configuration file saved from the existing system controller, or
  - contact your Eaton dc power system supplier to obtain a master configuration file to suit the dc power system. This file will have to be customized for the site.

Step 1 - Backup the configuration file of the old SC200 or SC100 if possible

If the old system controller is still operational use DCTools/Web to backup its configuration file.

*See Backup and Restore on page **34**.*

Step 2 - Remove the system controller

1 Undo the system controller retaining screw. See the diagram on page **5**.

2 Partly withdraw the system controller.

3 Label, and then disconnect the cable(s) from the rear connectors.

When the system controller stops communicating the rectifier output voltage will be unchanged for 2 minutes. After 2 minutes the rectifier output voltage will change to the Float Voltage and the rectifier yellow LEDs will flash.

Step 3 - Insert the new system controller

1 Connect the cable(s) to the rear connectors.

*The system controller will start. See Starting the SC200 or SC100 on page **35**. Various alarms may appear because of incorrect configuration file settings. Press any key to silence the alarm.*

2 Insert the system controller and tighten the retaining screw.

Step 4 - Download the configuration file

1   Connect to the system controller with *DCTools/Web*. See details on page <u>38</u> in the System Controller Operation Handbook.

2   If a copy of the old configuration file, or a master configuration file is available, then use *DCTools* to restore (download) it to the new system controller.

    ☐   *See Backup and Restore on page <u>34</u> in the System Controller Operation Handbook.*

    ☐   *If you receive an error message about the MIB file version, please contact your Eaton dc product supplier for advice.*

3   If a copy of the old configuration file, or a master configuration file is not available, then use the keypad or *DCTools/Web* to change the configuration settings to the correct values (provided the system controller is set for the correct nominal system voltage).

Step 5 - Check the system controller operation

1   Map the I/O board (SC200 only):

- In DCTools/Web go to: *RXP*.

- Copy the I/O board serial number(s) from the *RXP Devices* table to the *I/O Board to Serial Number Mapping* table to map an *IOB Number* to each I/O board (overwrite an existing serial number if required).

    ☐   *If multiple SiteSure-3G modules are connected use the I/O board Identify function to physically identify each module. See details in the System Controller Operation Handbook.*

2   Check that the system controller has registered all rectifiers.

3   Check all control processes, alarms and current measurement(s).

4   Check the power system identification parameters and communications settings.

5   Change the configuration file as required to ensure that the system controller operates as intended.

6   Check the system controller time (SC200 only). See details in the System Controller Operation Handbook.

Procedure complete

Return the faulty system controller with a completed Equipment Incident Report on page <u>77</u>.

Replacing the Input/Output Board (some models only)

This procedure only applies to RM3-410/RM3-420 models with an Input/Output (I/O) board (see Model Numbers on page <u>2</u>).

Before you start you will require:

- A PC/Laptop with *DCTools** connected to the system controller or (SC200 only) a web browser* connected to the system controller via an IP network.

    ☐   **See Communications Options in the System Controller Operation Handbook.*

- A replacement input/output board.

- An anti-static wrist strap to prevent damage to the static sensitive components on the input/output board.

Step 1 - Withdraw RM3-410/RM3-420 from the rack

1 If the ac cords and dc cables are long enough then the RM3-410/RM3-420 can continue to operate. Go to 2.

If the ac cords and/or dc cables are not long enough then:

- Switch off the dc-powered equipment.
- Disconnect the ac cords from the ac sockets, and/or
- Remove the dc terminal cover and disconnect the dc cables (see the diagram on page **3**).

2 Undo the four screws holding the RM3-410/RM3-420 in the rack and withdraw.

Step 2 - Remove top cover to access I/O board

See the diagram on page **3**.

Step 3 - Replace the I/O board

1 Label then disconnect all cables.

If the RM3-410/RM3-420 is operating the SC200 or SC100 will show various alarms. Press any button to silence the alarm.

2 Remove the I/O board, place the board in an anti-static bag and return for service. See Equipment Incident Report on page **77**.

3 Connect all cables to the new I/O board.

4 Fit the I/O board in the RM3-410/RM3-420 on the supporting posts.

SC200 only: If the RM3-410/RM3-420 is operating the SC200 will show a New Hardware alarm. Press any button to silence the alarm.

Step 4 - Replace top cover

Step 5 - Replace RM3-410/RM3-420 in rack

1 Attach the RM3-410/RM3-420 using four rack mounting screws. Tighten the screws.

2 If necessary:

- Reconnect the dc cables and replace the dc terminal cover.
- Reconnect the ac cords to the sockets.
- Switch on the dc-powered equipment.

3 Either:

- Connect a PC/Laptop with *DCTools* to the system controller, or
- SC200 only: Connect a PC/Laptop with a web browser to the system controller via an IP network.

*See Communications Options in the system controller Operation Handbook (see Related Information on page **i**).*

4 SC200 only: In *DCTools/Web* go to: *RXP*. Copy the I/O board serial number from the *RXP Devices* table to the *I/O Board to Serial Number Mapping* table to map an *IOB Number* to the I/O board (overwrite existing serial number).

⬚ *All alarms will clear.*

Procedure complete

Battery Mid-point Monitoring (String Fail) Alarm (SC200 only)

Use the following procedure if a *String Fail* alarm is generated.

Step 1 - Identify the faulty battery string

1 Press any button on the SC200 to silence the alarm.

2 Connect to the SC200 using DCTools/Web. Go to *Batteries > Mid-point Monitoring*.

3 Click + to expand the *Mid-point Monitoring* table to identify which battery string has failed.

Step 2 - Check cell/monobloc voltages

1 Use a suitable voltmeter to measure the individual cell/monobloc voltages. Measure on the cable lugs and inter-connecting bars so that loose connections will also be detected.

2 The faulty or poorly connected cell/monobloc has the voltage with the greatest deviation from the average.

Step 3 - Check cell/monobloc terminals

1 Check the terminal connections of the cell/monobloc are correctly tightened and clean.

⬚ *Refer to the battery manufacturer's instructions for correct terminal torque settings.*

2 In DCTools/Web go to *Batteries > Mid-point Monitoring*. Click *Clear String Fail*.

3 If the alarm clears then the fault is fixed. No further action is required.

Step 4 - Service or replace faulty cell/monobloc (if required)

1 If the alarm is still present then follow the battery manufacturer's instructions on servicing or replacing the faulty cell/monobloc.

2 After the faulty cell/monobloc has been serviced or replaced clear the alarm (see Step 3).

Procedure complete

Certifications

Electrical Safety	UL 60950-1 CE-mark EN60950-1
Electromagnetic Compatibility (EMC)	FCC, IC, CE-mark, C-Tick

System Input

Input Voltage	120V, 208-240V (nominal)	
Input Current Rating (maximum)		
RM3-400 models:	1W + N + PE (120V nom.):	3 x 12A
	2W + PE (208-240V nom.):	3 x 12A/ph
RM3-410/420 models:	1W + N + PE (120V nom.):	2 x 12A
	2W + PE (208-240V nom.):	2 x 12A/ph
Frequency	50-60Hz	
Maximum Ground Leakage Current	1.3mA per rectifier	

System Output

Output Voltage (nominal)	24V or 48V *Dependent on rectifier type.*	
Output Voltage		
Range (only with SC200 or SC100): Preset Voltage:	20 - 32V or 43 - 58V 27.0V ± 0.1V or 54.5V ± 0.1V	
Output Power (maximum) with APR24-3G Rectifiers, 20-32V		
RM3-400 models:	120V ac: 208-240V ac:	2.77kW 4.32kW
RM3-410/RM3-420 models:	120V ac: 208-240V ac:	1.85kW 2.88kW
Output Power (maximum) with APR48-ES Rectifiers, 48-58V		
RM3-400 models:	120V ac: 208-240V ac:	3.6kW 6.0kW
RM3-410/RM3-420 models:	120V ac: 208-240V ac:	2.4kW 4.0kW
Output Power (maximum) with APR48-3G Rectifiers, 48-58V		
RM3-400 models:	120V ac: 208-240V ac:	3.3kW 5.4kW
RM3-410/RM3-420 models:	120V ac: 208-240V ac:	2.2kW 3.6kW

Output Power (maximum) with EPR48-3G Rectifiers, 48-58V

RM3-400 models:	120V ac:	1.65kW	
	208-240V ac:	2.7kW	
RM3-410/RM3-420 models:	120V ac:	1.1kW	
	208-240V ac:	1.8kW	

Output Current (maximum) with APR24-3G Rectifiers, 20-32V

RM3-400 models:	120V ac:	114A
	208-240V ac:	150A
RM3-410/RM3-420 models:	120V ac:	76A
	208-240V ac:	100A

Output Current (maximum) with APR48-ES Rectifiers, 48-58V

RM3-400 models:	120V ac:	75A
	208-240V ac:	125A
RM3-410/RM3-420 models:	120V ac:	50A
	208-240V ac:	83.3A

Output Current (maximum) with APR48-3G Rectifiers, 48-58V

RM3-400 models:	120V ac:	68.75A
	208-240V ac:	112.5A
RM3-410/RM3-420 models:	120V ac:	45.8A
	208-240V ac:	75A

Output Current (maximum) with EPR48-3G Rectifiers, 48-58V

RM3-400 models:	120V ac:	34.4A
	208-240V ac:	56.25A
RM3-410/RM3-420 models:	120V ac:	22.9A
	208-240V ac:	37.5A

Fuses

Rectifier (internal) ac input fuses (F1, F2)	APR24-3G:	16A, 250Vac, fast acting
	APR48-ES:	16A, 250Vac, fast acting
	APR48-3G:	16A, 250Vac, fast acting
	EPR48-3G:	8A, 250Vac, fast acting
Rectifier (internal) auxiliary fuse (F3)	All models:	250mA, 250Vac, fast acting, interrupt rating 1500A min.

Environment

Ambient Temperature Range	-40°C to 50°C [-40°F to 122°F]
Relative Humidity *(operating and storage)*	<95% (non condensing)

Dimensions H, W, D

All models	1U, 19" or 23" mounting, 13.2" [335 mm]*

* Additional clear air space is required at rear for rectifier exhaust air venting. See details on page 17.

Weight

RM3-400 models	9.8 lb [4.4kg]*
RM3-410/RM3-420 models with SC200 or SC100 and I/O board	10.4 lb [4.7kg]*
Rectifier module	3.7 lb [1.7kg]

* Excluding rectifiers

Digital Outputs/Alarm Relays (IOBGP)

Number of Digital Outputs/Relays	6 (one also used for Monitor OK alarm)
Contact Arrangement	One changeover contact per relay
Contact Rating	0.1A @ 60V dc maximum
Connectors	Screwless terminal blocks
Wire Size	0.5 - 2.0mm² [20 - 14 AWG]
Isolation	Relay connections are isolated to 500V dc from all other circuitry, earth and system common.

Digital Inputs (IOBGP)

Number of Digital Inputs	6
Connectors	Screwless terminal blocks
Wire Size	0.5 - 2.0mm² [20 - 14 AWG]
Input Types	Voltage-free switch or relay contacts only
Input Range	Live Bus to Live Bus + 5V
Input Common	Same bus as used for current shunts (Live bus is standard)
Input Protection	Protected against damage from short circuit to live or common bus

Temperature Sense Inputs (IOBGP)

Number of Temperature Sense Inputs	2
Range	2.53V to 3.43V (-20 to +70°C [-4 to +158°F])
Resolution	< 0.01V (< 1°C [1.8°F])
Accuracy	±1°C [1.8°F] at 25°C [77°F], ±2°C [3.6°F] over rated temperature range
Maximum Cable Length	20m (65 feet)
Connector	RJ45

Current Sense Inputs (IOBGP)

Number of Current Sense Inputs	3
Range	–50 to +50mV
Resolution	<50µV
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range
Connector	RJ45

Battery Mid-point Monitoring (SC200 only)

Number of Strings	Standard:	4
	Maximum:	24 (with additional IOBGP-01 I/O boards)
Range	–35V to +35V	
Resolution	<30mV	
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range	

Communications (some models only)

USB (SC200 only)	Version:	1.1 (12Mbits/s)
	Connector:	USB B (female)
RS232	Interface:	RS232 (DTE)
	Connector:	DB9M
Ethernet (SC200 only)	Interface:	10baseT
	Connector:	RJ45
	Protocols:	TCP/IP, SNMP, S3P over IP, http (Web), https (secure Web), SNTP, Modbus-TCP, Serial Server
	MAC Address:	See details in the System Controller Operation Handbook.
	Web browser:	Microsoft Internet Explorer 8 (IE6 is compatible but with reduced performance), Mozilla Firefox 3.0.
External modem options	Type:	PSTN or GSM
	Operation:	Dial in/Dial out on alarm*

* Can operate as a backup for Ethernet communications (SC200 only).

Powering Business Worldwide

SC200 Menu

At each menu screen press *Enter* to access the associated configuration menu screen(s).

These menus have multiple configuration menu screens. See details in the System Controller Operation Handbook.

SC100 Menu

The following diagram shows the Status Screens and main navigation.

❶ Any active alarms are displayed in rotation.

❷ Scroll to show any other rectifiers.

❸ List of any active alarms.

❹ Operate control processes.

❺ SC100, I/O board and rectifier identity information.

❻ Configure control processes.
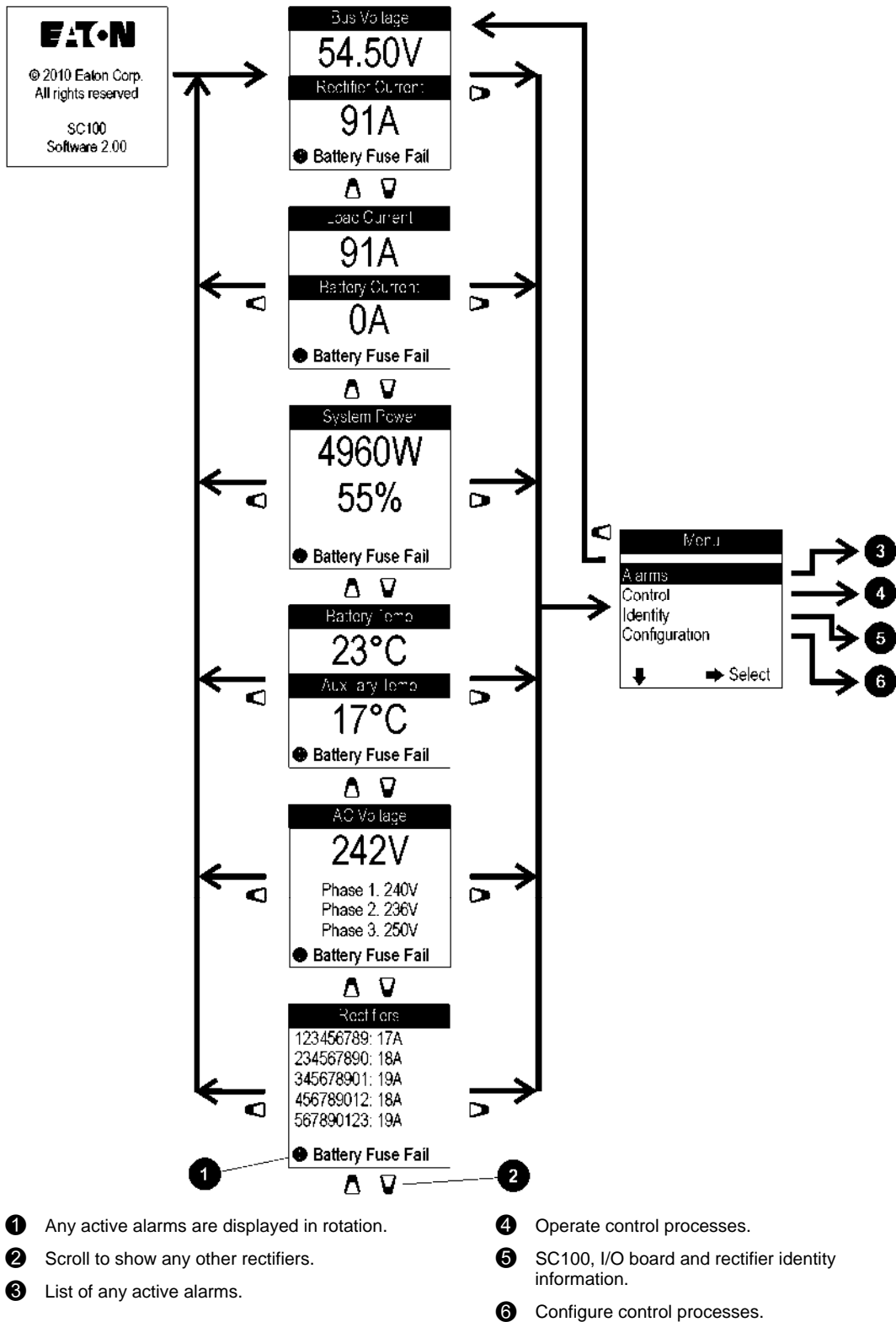
System Controller Connector Pin-outs

Connector	Type	Purpose	Pin	Description
XS1	DB9M	RS232 Serial Interface	1	-
			2	RD (Receive Data)
			3	TD (Transmit Data)
			4	DTR (Data Terminal Ready)
			5	Common (Ground)
			6	-
			7	RTS (Request to Send)
			8	-
			9	-
XS31 (SC200 only)	RJ45	Ethernet Interface	1	Rx
			2	Rx
			3	Tx
			4	-
			5	-
			6	Tx
			7	-
			8	-
YS11	RJ45	RXP System Communications	1	+24/48V (System bus voltage)
			2	+24/48V (System bus voltage)
			3	-
			4	RS485-A
			5	RS485-B
			6	-
			7	0V
			8	0V
USB (SC200 only)	USB B	USB Serial Interface	1	VCC (+5 V dc)
			2	Data -
			3	Data +
			4	Ground
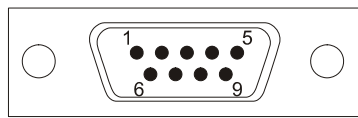
RS232 D9M and RJ45 connector pin-outs
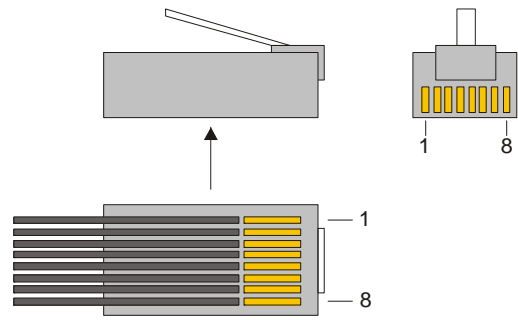
RJ45 plug pin-outs

I/O Board (IOBGP-00, -01) Connector Pin-outs

See input and output specifications on page .

Connector	Type	Purpose	Pin	Description
XH4	MTA 156	LVD 1 Interface	1	Coil -
			2	Coil +
			3	LVD 1 auxiliary switch
			4	Auxiliary switch common
XH5	MTA 156	LVD 2 Interface	1	Coil -
			2	Coil +
			3	LVD 2 auxiliary switch
			4	Auxiliary switch common
XH6	RJ45	Current Sense Inputs	1	Current Input 1 Common
			2	Current Input 1
			3	+12V out
			4	Current Input 2 Common
			5	Current Input 2
			6	0V out
			7	Current Input 3 Common
			8	Current Input 3
XH7	RJ45	Temperature Sense Inputs	1	-
			2	-
			3	-
			4	Temp Sense 1+
			5	Temp Sense 1-
			6	-
			7	Temp Sense 2+
			8	Temp Sense 2-
XH8	MTA 156	LVD Power	1	Bus live
			2	Common
XH9	MTA 156	Bus Voltage Sense Input	1	Controller reference (Live)
			2	Controller sense (Com)
XH12A	MTA 156	Battery Mid-point Monitoring sense inputs (SC200 only)	1	String 1 Mid-point
			2	String 2 Mid-point
			3	String 3 Mid-point
			4	String 4 Mid-point
XH15A		Digital inputs D1-D3	1	D1 input
			2	0V
			3	D2 input

Connector	Type	Purpose	Pin	Description
			4	0V
			5	D3 input
			6	0V
XH15B		Digital inputs D4-D6	1	D4 input
			2	0V
			3	D5 input
			4	0V
			5	D6 input
			6	0V
XH16/XH17		Digital relay outputs 1-2	1	Relay 1 normally closed (NC)
			2	Relay 1 normally open (NO)
			3	Relay 1 Common (COM)
			4	Relay 2 normally closed (NC)
			5	Relay 2 normally open (NO)
			6	Relay 2 Common (COM)
XH18/XH19		Digital relay outputs 3-4	1	Relay 3 normally closed (NC)
			2	Relay 3 normally open (NO)
			3	Relay 3 Common (COM)
			4	Relay 4 normally closed (NC)
			5	Relay 4 normally open (NO)
			6	Relay 4 Common (COM)
XH20/XH21		Digital relay outputs 5-6	1	Relay 5 normally closed (NC)
			2	Relay 5 normally open (NO)
			3	Relay 5 Common (COM)
			4	Relay 6 normally closed (NC)
			5	Relay 6 normally open (NO)
			6	Relay 6 Common (COM)
YH3	RJ45	DC power system digital inputs	1	Load Fuse Fail
			2	Battery Fuse Fail
			3	+12V out
			4	AC Distribution Fan Fail
			5	AC Distribution MOV Fail
			6	0V out (system live - protected)
			7	-
			8	System common - protected
YH11	RJ45	RXP System Communications	1	+24/48V (System bus voltage)
			2	+24/48V (System bus voltage)

Connector	Type	Purpose	Pin	Description
			3	-
			4	RS485-A
			5	RS485-B
			6	-
			7	0V
			8	0V
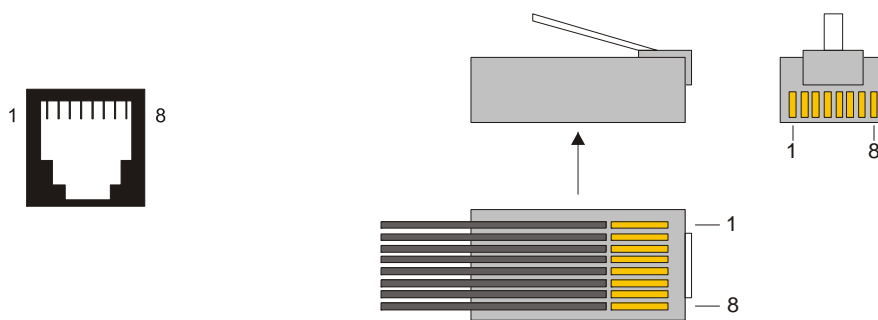
RJ45 connector pin-outs   **RJ45 plug pin-outs**

Input/Output Board (some models only)

The optional input/output (I/O) board provides the I/O interfaces and connections for the SC200 or SC100 system controller.

The I/O board allows real time data collection from building services and other external devices, and relay outputs for alarm signals or control of external devices.

The I/O functions are:

Sensors: DC Current - 3, dc voltage - 1, Temperature - 2, Battery Mid-point - 4 (SC200 only)

Input/Output: Digital inputs: 6
                  Relay outputs: 6 (one also used as Monitor OK alarm)

❶ Bus voltage sense input - XH9

❷ Power/Comms OK LED (green)

❸ Digital inputs D1-D6 (6 user defined) - XH15A, XH15B

❹ Digital (relay) outputs RY1-RY6 (6) - XH16-XH21

❺ Not used

❻ Not used

❼ Not used

❽ Not used

❾ Not used

❿ Power and RXP comms input - YH11

⓫ Not used

⓬ Not used

⓭ Battery Mid-point Monitoring sense inputs (SC200 only)

⓮ Not used

Connections

The following diagram shows the connections between the system controller, the I/O board, the other dc power system components and external devices.

❶ SC200 or SC100 system controller

❷ I/O board (optional)

❸ Voltage feed module

❹ USB communications (SC200 only)

❺ Ethernet communications (SC200 only)

❻ RS232 communications

❼ Digital relay outputs (6) to external devices and/or alarm indication system

❽ Digital inputs (6) from external voltage-free switches or relay contacts

❾ Connection to optional SiteSure-3G I/O module(s) (SC200 only). Connect to S1/S2 via RJ45 splitter if I/O board fitted.
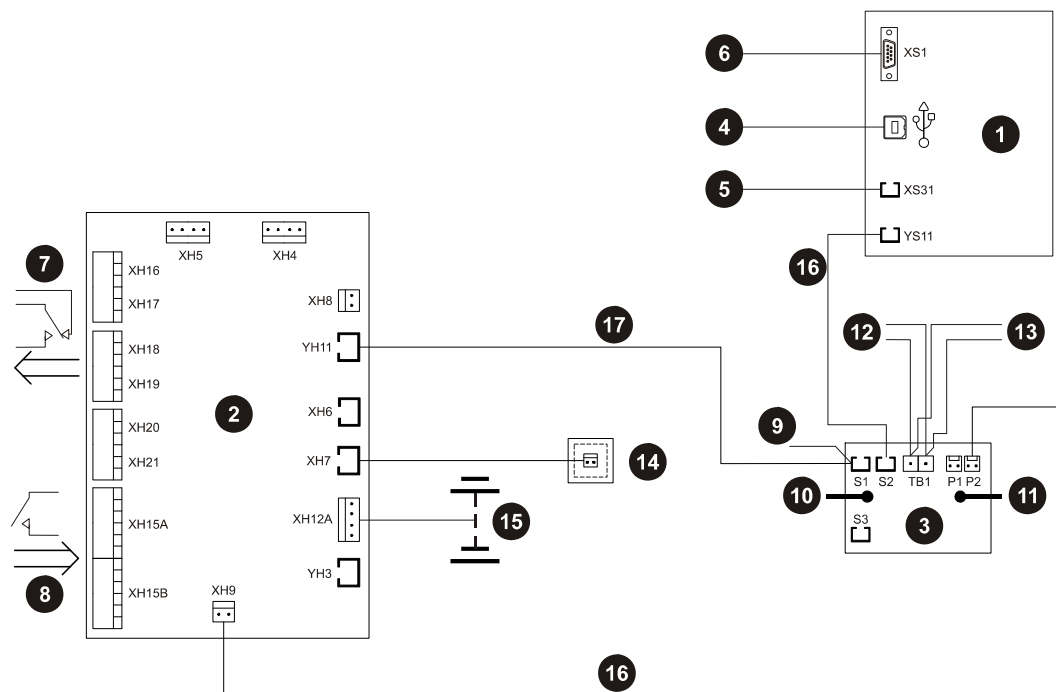
❿ Connection to dc common bus

⓫ Connection to dc live bus

⓬ Communications to rectifiers in RM3-410 or RM3-420

⓭ Communications to rectifiers in RM3-400 extension power shelf (if fitted)

⓮ Connection to optional temperature sensors (2)

⓯ Battery Mid-point Monitoring sense inputs (SC200 only)

⓰ Bus voltage sense connection

⓱ I/O power and RXP comms connection

⧠ *For connector pin-outs see details on page 65. For input and output specifications see details on page 57.*

70

Powering Business Worldwide

Safety Equipment

Use approved safety equipment as required by local health and safety regulations including (but not restricted to):

- Safety glasses
- Safety gloves
- Safety footwear
- Appropriate platform(s) and access for working at height (if required)

Essential Tools

Standard electrical toolkit with insulated tools, plus:

- Cable crimping tool and crimp lugs suitable for all cable sizes and connectors used
- Torque wrench with pivot head and insulated handle
- Digital multimeter
- Insulation tester
- Non-static clothing

Recommended Tools

- Laptop with:
  - USB port (for SC200) or RS232 port (for SC100)
  - USB A/B cable (for SC200) or RS232 null-modem cable (for SC100) - see Spare Parts on page 72.
  - DCTools software (download from www.powerquality.eaton.com/downloads).
- Test load (to suit maximum output of dc power system)
- Labeling tool and labels
- Clamp-on ammeter

Spare Parts

Item	Description	Part Number or Specification
1	Rectifier modules. See replacement procedure on page **51**.	24V, 1440W: Eaton APR24-3G 48V, 2000W: Eaton APR48-ES 48V, 1800W: Eaton APR48-3G 48V, 900W: Eaton EPR48-3G
2	Rectifier blank panel. (to cover un-used rectifier positions)	Eaton RM3B-A01
3	System controller. See replacement procedure on page **53**.	Eaton SC100-00 or SC200-00
4	Input/Output Board. See replacement procedure on page **54**.	Eaton IOBGP-00
5	AC cord sets, 120V supply	Conductors: 16 AWG x 3 Rated: 13A minimum, 125V, 90°C Jacket type: SJT Connector 1: North America: NEMA 5-15P or L5-15P Other countries: 12A min. rating Connector 2: IEC 60320-C15
6	AC cord sets, 208 - 240V supply	Conductors: 16 AWG x 3 Rated: 13A minimum, 250V, 90°C Jacket type: SJT Connector 1: North America: NEMA 6-15P or L6-15P Other countries: 12A min. rating Connector 2: IEC 60320-C15
7	Crimp lugs for dc output cables	See details on page **24**.
8	Crimp lug for protective earthing conductor	See details on page **17**.
9	USB A/B cable (for SC200 only)	RadioShack 55010997, Jaycar WC7700, or equivalent.
10	RS232 DB9 F/F null-modem cable (for SC100 only)	RadioShack 55010600, Jaycar WC7513, or equivalent. (Cross-over connections: 5-5, 2-3, 3-2)
11	SiteSure-3G Input/Output Module (optional with SC200)	Eaton IOBSS-00. See details on page **21**.
12	23" rack mounting bracket (two required)	Eaton 621-04998-29
13	Dual temperature sensors (2m leads)	Eaton TS2-200
14	Battery Mid-point Monitoring connection kit for use with SC200 (for two battery strings)	Eaton MPTLOOM-3300 (2 x 3m sense wires), or Eaton MPTLOOM-7600 (1 x 7m, 1 x 6m sense wires)

Purchasing Information

Eaton   See contact details on page **79**.

RadioShack   www.radioshack.com

Jaycar   www.jaycar.com

Drawing Number	Issue	Title
3692996	B	WIRING DIAGRAM RM3-X00 (applies to RM3-400 models)
3692979	C	WIRING DIAGRAM RM3-X2X (applies to RM3-410/420 models)

WIRING DIAGRAM
RM3-X00

ISSUE	AMENDMENT	DRAWN	CHKD	APP'VD	DATE
A	ORIGINAL	MB			23.3.07
B	EARTHING CHANGED	SAV			16.08.07

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E·T·N
Powerware
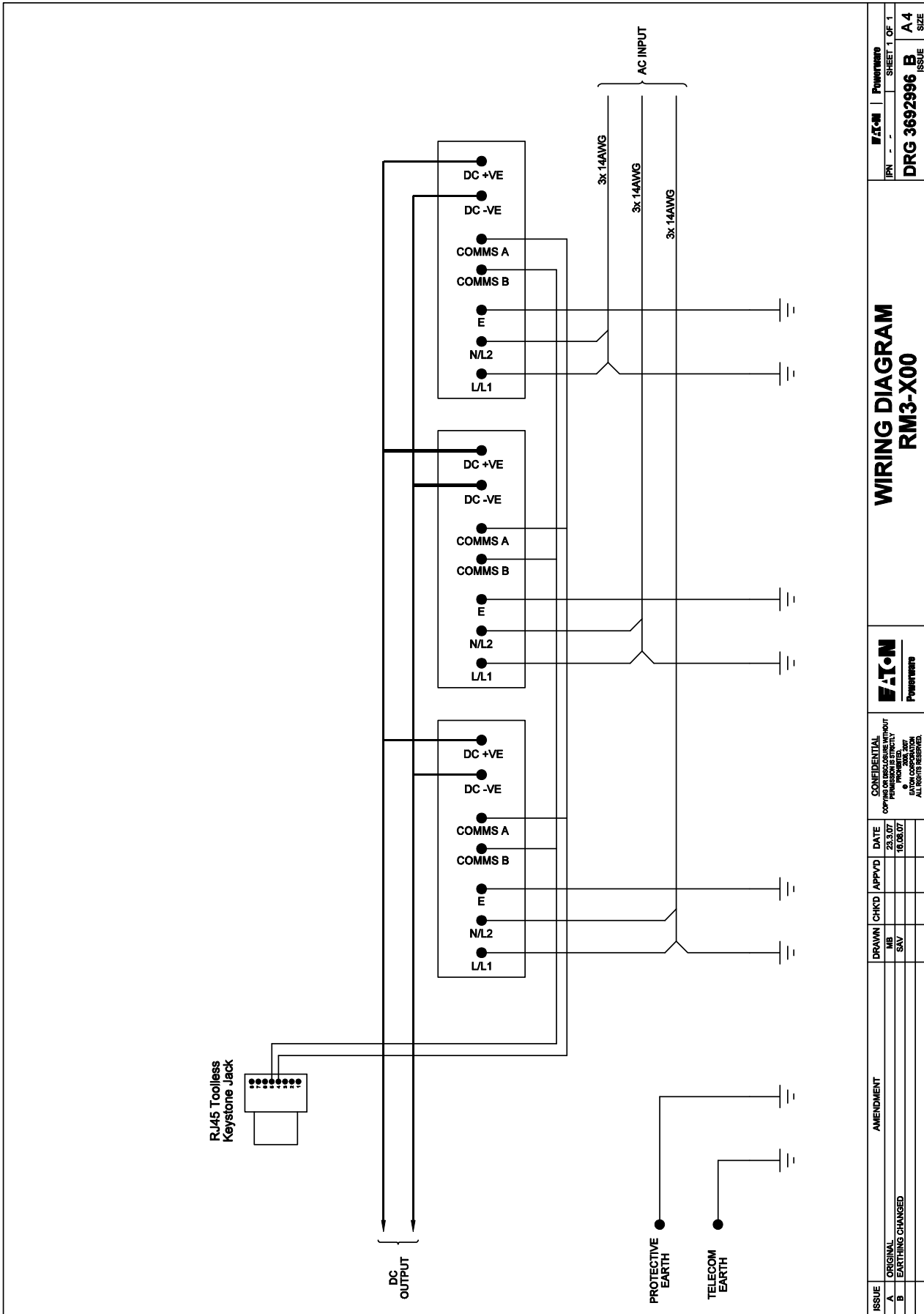
IPN - -	SHEET 1 OF 1
DRG 3692996	B
	ISSUE
	A4 SIZE

E·T·N | Powerware

WIRING DIAGRAM
RM3-X2X

DRG 3692979 C

AC INPUT

DC +VE
DC -VE
COMMS A
COMMS B
E
N/L2
L/L1

3x 14AWG
3x 14AWG

DC +VE
DC -VE
COMMS A
COMMS B
E
N/L2
L/L1

SV1

XH8
XH4 LVD 2

XH8 LVD
POWER
YH11 POWER RXP
XH6 CURRENT
XH7 TEMP
XH12A BATTERY MIDPOINTS
YH3 DCDACD

IO BOARD
IOBGP-00

XH5 LVD 1

XH9 BUS VOLTAGE

SV2

P2
XH16 RY1 XH16 RY2
P3
XH16 RY3 XH16 RY4
P4
XH16 RY5 XH16 RY6
XH15A USER DIGITAL INPUT
XH15B USER DIGITAL INPUT

VFN-00

SV2

LIVE

COMMON

S3

A B
P2 P1 TB1 S2 S1

MONITOR SC200

DC OUTPUT

PROTECTIVE EARTH

TELECOM EARTH

ISSUE	AMENDMENT	DRAWN	CHK'D	APPV'D	DATE
A	ORIGINAL	MB			22.3.07
B	THIRD RECTIFIER POSITION REMOVED	MB			26.7.07
C	EARTHING CHANGED	SAV			16.08.07

IPN - -
SHEET 1 OF 1
A4 SIZE

76

EQUIPMENT INCIDENT REPORT

Please enter as much information as you can. Send the completed form, together with the item for repair to your nearest authorized service agent. NOTE: Only one fault to be recorded per form.

For further information contact your local Eaton dc product supplier or Eaton (see contact details on page). Or email: CustomerServiceNZ@eaton.com

Date: _____

Customer Information

Company: _____

Postal Address: _____

_____

Return Address: _____
(Not PO Box)

_____

Telephone: _____ Fax: _____ Email: _____

Contact Name: _____

Location of Failure

Product code: _____ Serial number: _____ Document number: _____

System type installed in: _____ Serial number: _____

Site name or location: _____

Fault discovered	☐ Delivery	☐ Unpacking	☐ Installation
	☐ Initial test	☐ Operation after _____ years	☐ Other _____

Failure source	☐ Design	☐ Manufacturing	☐ Documentation
	☐ Transportation	☐ Installation	☐ Handling
	☐ _____		

Effect on system operation ☐ None ☐ Minor ☐ Major ☐ _____

INFORMATION (fault details, circumstances, consequences, actions)

_____

_____

_____

_____

_____

Internal use only.

Reference No: _____ RMA: _____ NCR: _____ Signature: _____ Date: _____

INFORMATION continued (fault details, circumstances, consequences, actions)

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SG/03 ISS06

For product information and a complete listing of worldwide sales offices, visit Eaton's website at: **www.eaton.com/telecompower** or email: **DCinfo@eaton.com**

For technical support contact either your local Eaton dc product representative, the closest office from the following list, telephone **(+64) 3 343-7448,** or email **CustomerServiceNZ@eaton.com**
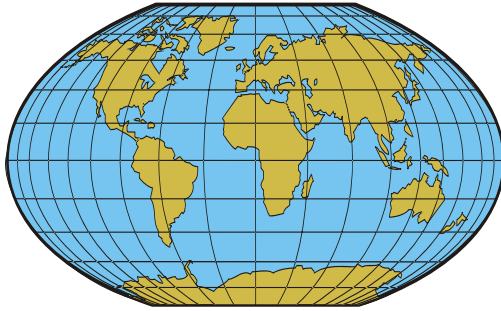
Australia:	1300 877 359
Canada:	1-800-461-9166
Central America:	+52 55 9000 5252
China:	+86-571-8848-0166
Europe / Middle East / Africa:	+44-1243-810-500
Hong Kong / Korea / Japan:	+852-2745-6682
India:	+91-11-4223-2325
New Zealand	0800 DC Power (0800 327-693)
Singapore / South East Asia:	+65 6825 1668
South America:	+54-11-4124-4000
South Pacific:	+64-3-343-7448
Taiwan:	+886-2-6600-6688 or free call 0800-038-168
United States of America (Toll Free):	1-800-843-9433 - option 2 - option 6

80