MCS3 and MCS6 Series
3G Modular DC-DC Converter Systems

Installation and Operation Guide

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About This Guide

Purpose

This guide provides instructions to correctly configure and install the Eaton MCS3 and MCS6 3G Modular DC-DC Converter subracks.

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

Scope

This guide covers installation, commissioning, operation and maintenance of the Eaton MCS3 and MCS6 3G Modular DC-DC Converter subracks. It does not cover details of the many and varied power systems into which it is installed.

Features of the MCS3 & MCS6 3G Modular Converter 3 Way and 6 Way Subracks

Based on APS3 and APS6 3G Modular Rectifier systems:-

- Using same general mechanical arrangement with same sized converter modules plugging into same arrangement of subracks
- Using same SC200 monitor, I/O board and voltage feed board (except 12V output version). Configured to suit the DC-DC converter application.
- Have input isolator and output distribution circuit breakers

Related Information

- SC200 System Controller Operation Handbook - IPN 997-00012-50F

For Further Information and Technical Assistance

For further information and technical assistance contact Australia 1300 877 359

Table of Contents

1.1 DC Installation Practices

Before connecting incoming and outgoing cables to this module, please read the following DC Installation Practices:

- To avoid excessive voltage drop and overheating, ensure that the dc input cables are appropriately sized to handle the maximum dc input current into the sub-rack. Refer table in section 3.4 for maximum input currents and recommended cable sizes.
- Before energizing the subrack ensure DC input voltage polarity is correct.
- Check output circuit breakers have required output polarity (+ve earth, -ve earth)
- With cable installation provide firm strain relief and adequate anchorage.
- To reduce electromagnetic interference, separate dc input cables from DC output cables.
- Ensure that circuit breakers in the MCS3/MCS6 subrack are clearly labeled.

1.2 Connecting the Input Supply Cables and Output Load Cables

- Ensure input cables are not live. Isolate upstream before connecting.
- Use correct insulated bootlace and crimp lugs, fitted to cables using correct crimping tools.
- Before switching on circuit breakers ensure the circuit polarity is correct.
- Before switching on input supply ensure all DC-DC converter modules have the same input and output voltages (same front coloured dots).
- Refer to the installation section for details of connections.

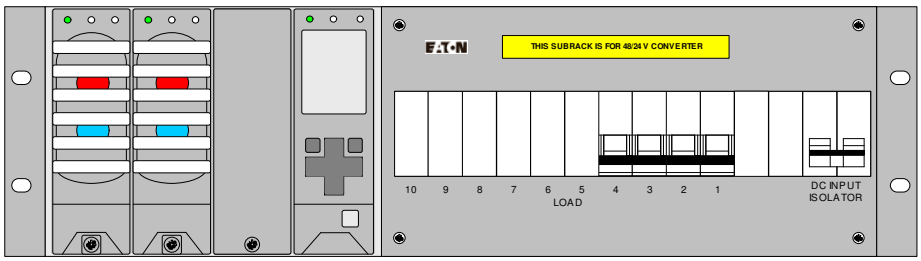
1.3 General OH&S Issues

- Be aware that hazardous voltages will be present if DC input voltage is 110Vdc.
- Be aware that hazardous energy levels may be present on the DC input if connected to an upstream battery circuit which can provide high current until disconnected by protection circuits.
- As a general rule, use insulated tools and do not wear rings, watches and jewelry when connecting cables to this equipment.

2.1 MCS Subrack Versions Overview

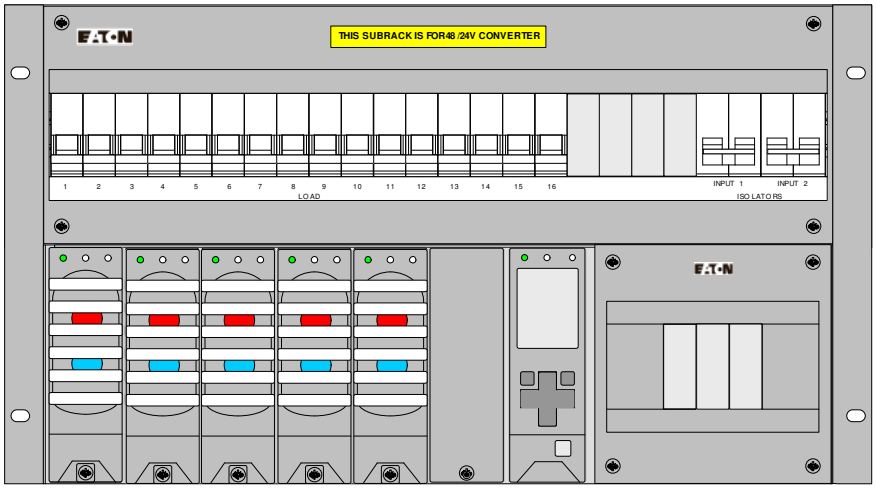
There are two basic models of the MCS subrack:-

6 MCS3, as shown in figure 1 below, is a 3RU high 19" rack mounting subrack which houses 3 x DC-DC converter modules, an SC200 monitor and a circuit breaker mounting area for input isolator and output circuit breakers.



MCS3-320
FRONT VIEW

7 MCS6, as shown in figure 2 below, is a 6RU high 19" rack mounting subrack which houses 6 x DC-DC converter modules, an SC200 monitor and an input isolator in the lower section and output circuit breakers in the upper section.



MCS6-320
FRONT VIEW

8 Each basic model (MCS3 or MCS6) come with different polarities as listed below.

2.2 MCU 3G DC-DC Converter Versions Overview

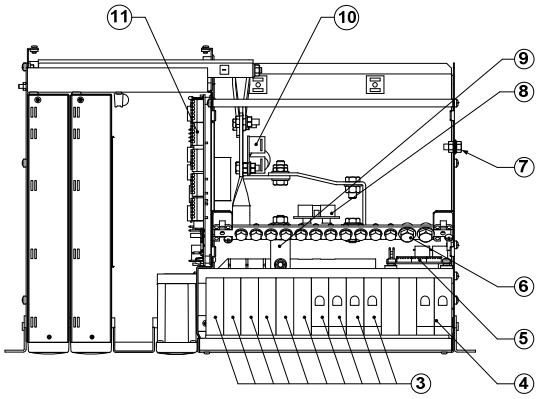
The 12 versions of the MCU DC-DC converters are listed below:-

Item Model (Eaton part number)	Input Vdc	FL Effic %	Output Vdc	Output Amp	Output Watts	Colours Input/output Bottom/Top
MCU**12120**-3G	**12**	80	**12.0**	22.5	300	green/green
MCU**12240**-3G	**12**	80	**24.0**	12.5	300	green/red
MCU**12480**-3G	**12**	80	**48.0**	6.3	300	green/blue
MCU**24120**-3G	**24**	85	**12.0**	30.0	400	red/green
MCU**24240**-3G	**24**	90	**24.0**	21.0	500	red/red
MCU**24480**-3G	**24**	90	**48.0**	10.5	500	red/blue
MCU**48120**-3G	**48**	85	**12.0**	30.0	400	blue/green
MCU**48240**-3G	**48**	90	**24.0**	21.0	500	blue/red
MCU**48480**-3G	**48**	90	**48.0**	10.5	500	blue/blue
MCU**110120**-3G	**110**	85	**12.0**	30.0	400	yellow/green
MCU**110240**-3G	**110**	90	**24.0**	21.0	500	yellow/red
MCU**110480**-3G	**110**	90	**48.0**	10.5	500	yellow/blue

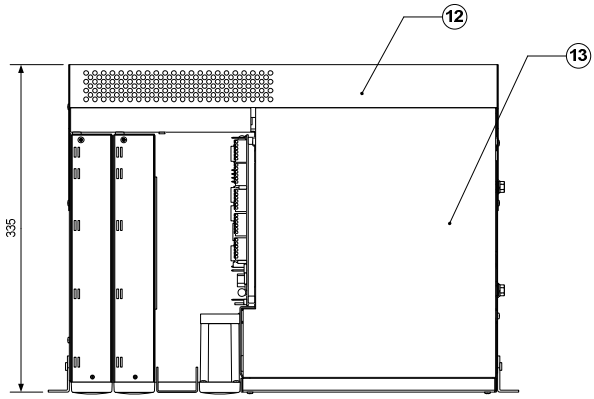
MCU48240-3G DC-DC Converter module

2.3 MCS3 Subrack Details

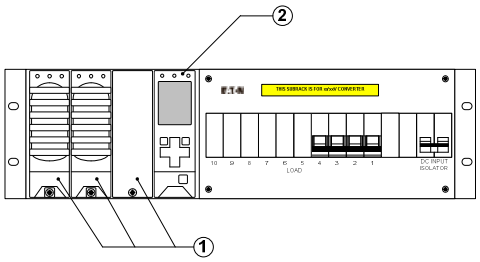
Typical MCS3 details are shown below:-



MCS3-320
TOP VIEW
(WITHOUT REAR COVER)



MCS3-320
TOP VIEW
(WITH TOP AND REAR COVER)



MCS3-320
FRONT VIEW

NOTES:

THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS3-320 DC-DC CONVERTER SUBRACK.

1. UP TO THREE (3) MCU-3G SERIES CONVERTER MODULES.
2. SC200 SUPERVISORY MODULE.
3. UP TO TEN (10) OFF LOAD CIRCUIT BREAKERS, 18mm WIDTH (QTY. SPECIFIED ON SALES ORDER).
4. INPUT 2P ISOLATOR.
5. ELECTRONIC FUSE FAIL BOARD.
6. DC COMMON (-VE).
7. EARTHING BOLT (M6).
8. LOAD CURRENT SHUNT.
9. LOAD LIVE BUS (+VE).
10. VOLTAGE FEED BOARD.
11. I/O INTERFACE BOARD WITH ALARM RELAY OUTPUT AND DIGITAL INPUT TERMINALS.
12. REAR COVER.
13. TOP COVER.

More details of each item numbered are as follows:-

1. Up to Three (3) x MCU-3G Series DC-DC Converter Modules

Hot swappable screw inserted fan cooled DC-DC converter modules with combinations of input and output voltage to suit particular system. Sizes 300W, 400W and 500W, depending on model. Colour dots at front of each converter indicate input voltage and output voltage. Refer section 2.2 for further details.

2. SC200 Supervisory Module

With LCD display and touch pads, displaying output voltage, output current and active alarms. Special configuration file downloaded to suit system. Ethernet connectivity.

3. Up to Ten (10) off Load (output) Circuit Breakers 18mm Width.

Normal system 4 off. Supplied with electronic fuse fail alarms with small wire connections to outputs (refer 5 below).

4. Input 2 Pole Isolator

Provides isolation of input positive and negative cables.

5. Electronic Fuse Fail Board

Sensor wires connect to the outputs of the load circuit breakers, giving an alarm if the breaker is off when there is a load connected (<4K7 ohms)

6. DC Common (busbar)

This has bolted connections (10 x M6 & 2 x M8) for load common output cables

7. Earthing Bolt M6

Earth connection to metal chassis

8. Load Current Shunt

Current shunt in load output for analogue input to SC200.

9. Load Live Bus

Connects from current shunt to busbar comb, teeth on which connect to bottom of circuit breakers

10. Voltage Feed Board

Output voltage from converters connects to this board to supply power to IOB and SC200.

11. I/O Board

Provides interconnection between SC200 monitor, shunt inputs, fuse fail inputs and converter fail inputs.

12. Rear Cover

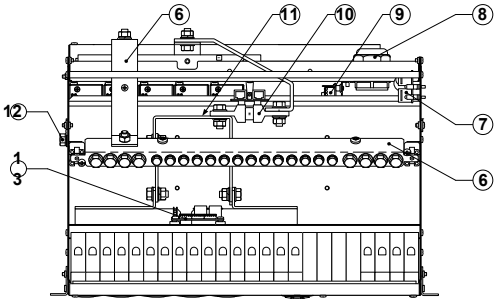
Additional cover when fitted covers rear bars

13. Top Cover

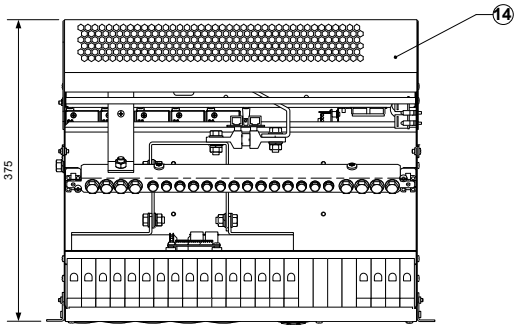
Additional cover when fitted provides protection for right hand compartment of sub-rack.

2.4 MCS6 Subrack Details

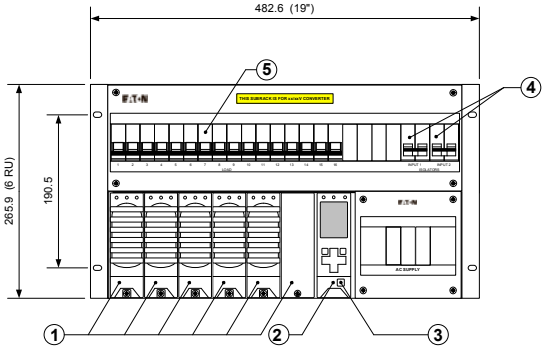
Typical MCS6 details are shown below:-



MCS6-320
TOP VIEW
(WITHOUT REAR COVER)



MCS6-320
TOP VIEW
(WITH REAR COVER)



MCS6-320
FRONT VIEW

NOTES:

THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS6-320 CONVERTER SUBRACK.

1. UP TO SIX (6) OFF MCU-3G SERIES CONVERTER MODULES.
2. SC200 SUPERVISORY MODULE.
3. USB COMMUNICATION PORT WITH ETHERNET AND RS232 PORTS ON THE BACK.
4. INPUT 2P ISOLATORS.
5. UP TO SIXTEEN (16) OFF (18mm MODULE) LOAD CIRCUIT BREAKERS (QTY. SPECIFIED ON SALES ORDER).
6. DC COMMON (-VE).
7. VOLTAGE FEED BOARD.
8. M32 INPUT CABLE GLAND (NOM CABLE OD 15-23mm).
9. I/O INTERFACE BOARD (DIGITAL INPUTS AND ALARM RELAYS).
10. LOAD CURRENT SHUNT.
11. LIVE BUS (+VE).
12. CHASSIS EARTH CONNECTION BOLT (M8).
13. ELECTRONIC FUSE FAIL BOARD.
14. REAR COVER.

More details of each item numbered are as follows:-

1. Up to Six (6) x MCU-3G Series DC-DC Converter Modules

Hot swappable screw inserted fan cooled DC-DC converter modules with combinations of input and output voltage to suit particular system. Sizes 300W, 400W and 500W. Colour dots at front of each converter indicate input voltage and output voltage. Refer section 2.2 for further details.

2. SC200 Supervisory Module

With LCD display and touch pads, displaying output voltage, output current and active alarms. Special configuration file downloaded to suit system.

3. USB Communication Port with Ethernet Port at rear of SC200

Connect PC with DCTools software to USB port.

4. Input 2 Pole Isolators

MCS6 has two input isolators for A and B feeds.

5. Load Circuit Breakers

Up to16 off 18mm load circuit breakers

6. DC Common (busbar)

This has bolted connections (18 x M6 & 4 x M8) for load common output cables

7. Voltage Feed Board

Output voltage from converters connects to this board to supply power to IOB and SC200.

8. Input Cable Gland

M32 input cable gland

9. I/O Board

Provides interconnection between SC200 monitor, shunt inputs, fuse fail inputs and converter fail inputs. Additional digital inputs and relay outputs also provided.

10. Load Current Shunt

Current shunt in load output for analogue input to SC200.

11. Load Live Bus

Connects from current shunt to busbar comb, teeth on which connect to bottom of circuit breakers

12. Earthing Bolt M8

Earth connection to metal chassis

13. Electronic Fuse Fail Board

Sensor wires connect to the outputs of the load circuit breakers, giving an alarm if the breaker is off when there is a load connected (<4K7 ohms)

14. Rear Cover

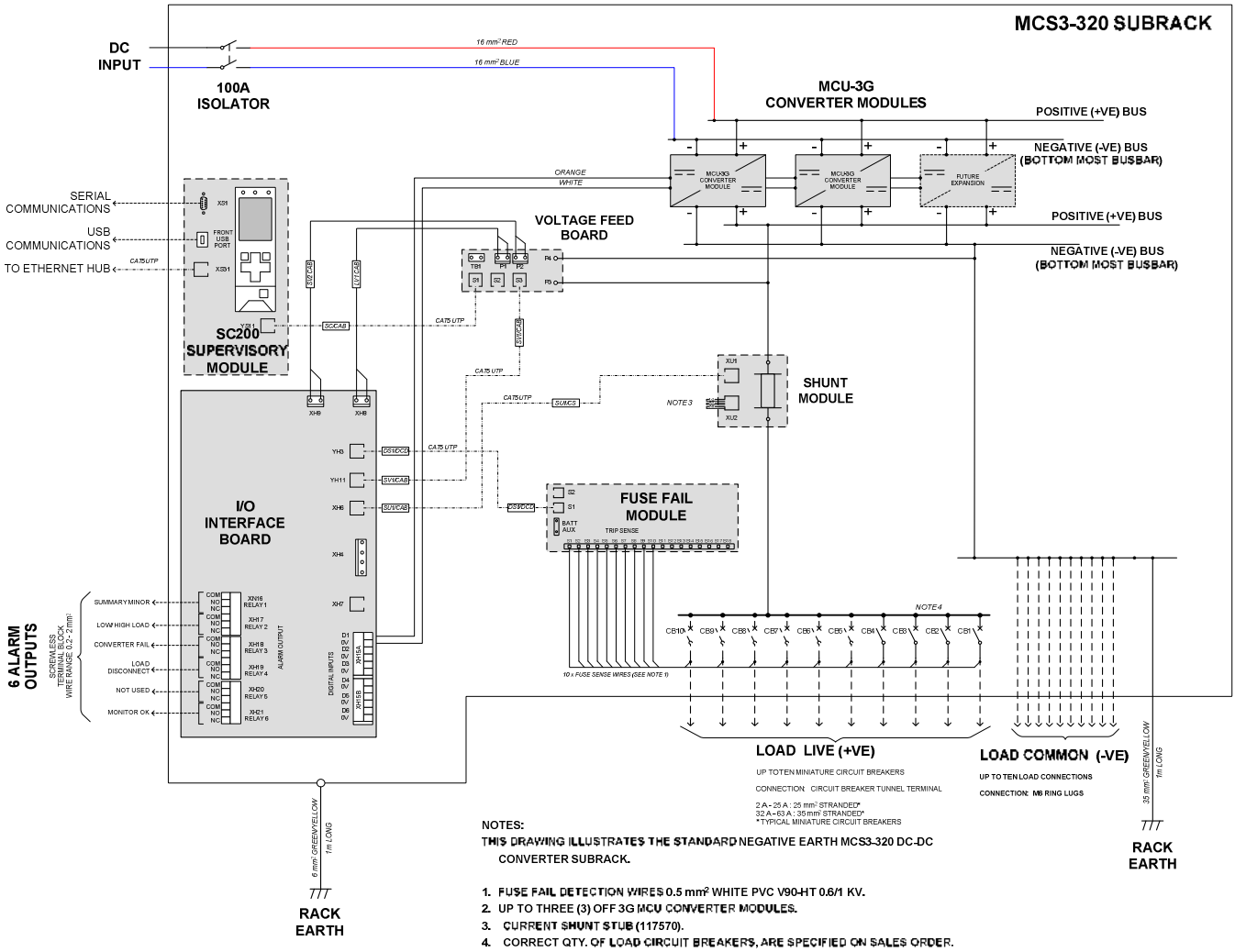
Additional cover when fitted covers rear bars

2.5 Typical MCS3-3G Wiring Diagram

Typical wiring diagram of the MCS3-3G Subrack below shows:-

- 100A DP input isolator
- SC200 Supervisory Module
- I/O Interface Board
- Voltage Feed Board
- Current Shunt Module
- Fuse Fail Module
- MCU-3G Converter Modules (3 positions)
- Load circuit breakers and common bar

Refer option specific or job specific wiring diagram (refer section 2.8 for options)

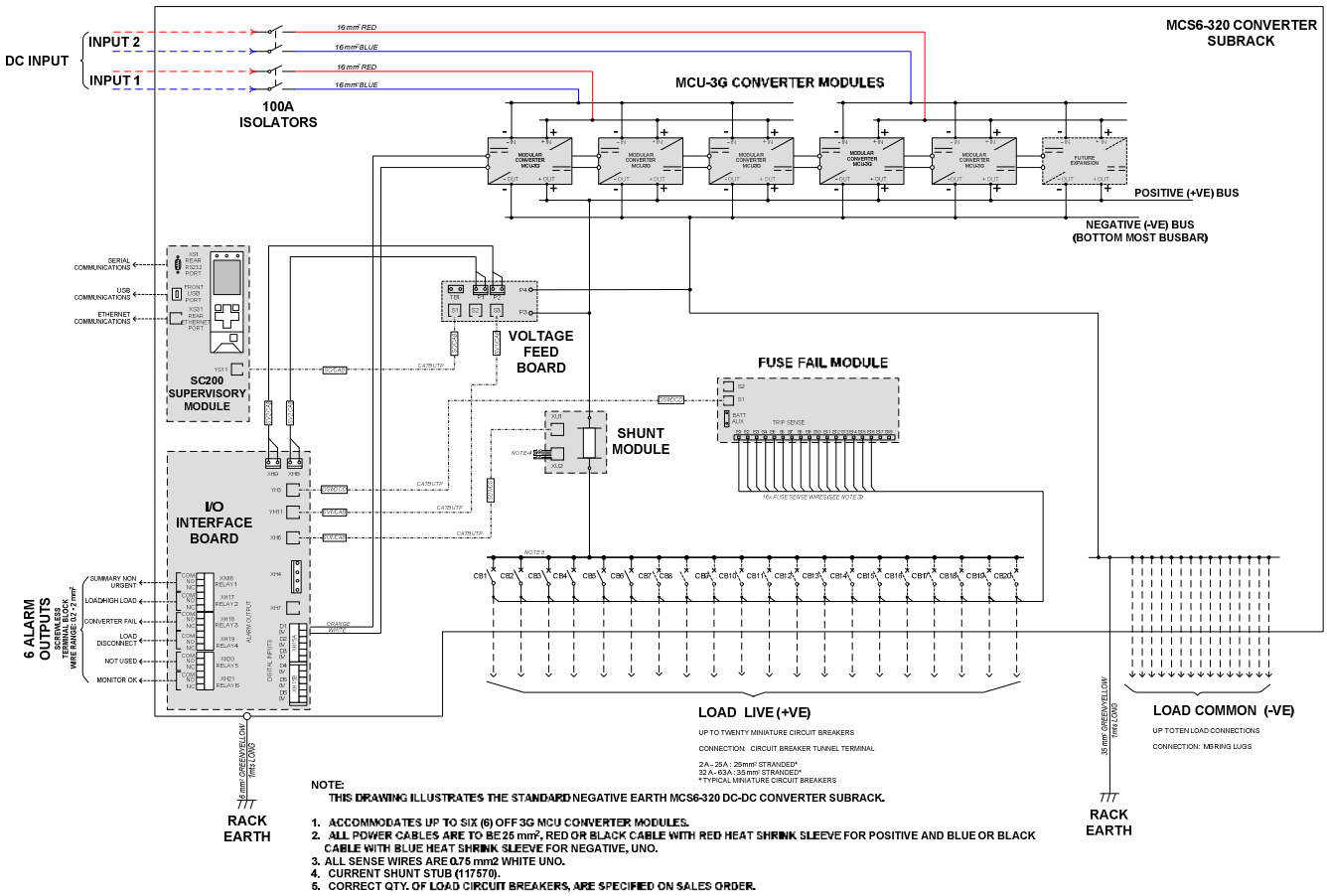


2.6 Typical MCS6-3G Wiring Diagram

Typical wiring diagram of the MCS6-3G Subrack below shows:-

- 100A DP input isolator
- SC200 Supervisory Module
- I/O Interface Board
- Voltage Feed Board
- Current Shunt Module
- Fuse Fail Module
- MCU-3G Converter Modules (6 positions)
- Load circuit breakers and common bar

Refer option specific or job specific wiring diagram (refer section 2.9 for options)



2.7 12V OUTPUT SYSTEMS

The SC200 Supervisory Module and IOB Module are powered from the DC-DC converter output busbars.

On the 12V systems this voltage is 12.0V, which is too low for the SC200 and IOB modules which require >18Vdc for operation.

The 12V option systems are therefore fitted with a DC-DC converter unit that converts the 12Vdc to 24Vdc, to power the SC200 and IOB.

Early 12V DC-DC converter systems used a separate 12/24V converter module. Ongoing 12V DC-DC converter systems now incorporate the small 12/24Vdc converter on the Voltage Feed Board.

2.8 List of MCS3 3G Options and Drawings

The following table gives sub-rack options available (xx indicates ongoing drawing revision numbers).

Option	Description	Drawing No	Drawing type
1	MCS3-320-12V +12V (-VE) earth output	IEE0964-1-001-xx	GA
		IEE0964-1-002-xx	WD
2	MCS3-320-12V -12V (+VE) earth output	IEE0964-1-011-xx	GA
		IEE0964-1-012-xx	WD
3	MCS3-320 (-VE) earth output (all other voltages except 12V output)	IEE0964-1-021-xx	GA
		IEE0964-1-022-xx	WD
4	MCS3-320 (+VE) earth output (all other voltages except 12V output)	IEE0964-1-031-xx	GA
		IEE0964-1-032-xx	WD
5	MCS3-320 Common (+VE) floating output	IEE0964-1-041-xx	GA
		IEE0964-1-042-xx	WD

2.9 List of MCS6 3G Options and Drawings

The following table gives sub-rack options available (xx indicates ongoing drawing revision numbers).

Option	Description	Drawing No	Drawing type
1	MCS6-320-12V +12V (-VE) earth output	IEE0964-2-001-xx	GA
		IEE0964-2-002-xx	WD
2	MCS6-320-12V -12V (+VE) earth output	IEE0964-2-011-xx	GA
		IEE0964-2-012-xx	WD
3	MCS6-320 (-VE) earth output (all other voltages except 12V output)	IEE0964-2-021-xx	GA
		IEE0964-2-022-xx	WD
4	MCS6-320 (+VE) earth output (all other voltages except 12V output)	IEE0964-2-031-xx	GA
		IEE0964-2-032-xx	WD
5	MCS6-320 Common (+VE) floating output	IEE0964-2-041-xx	GA
		IEE0964-2-042-xx	WD

2.10 SC200 Monitor Module

The photo below is an example of an operating MCS3-3G system, showing 2 x MCU48240-3G converter modules, a spare converter position (with blank panel fitted) and the SC200 monitor.

The DC-DC converter modules have green leds on, indicating that the converters are switched on.

The SC200 Monitor Module provides the following functionality in the MCS3-3G and MCS6-3G subracks:-

- The top three leds, left to right, are green (power on), yellow (minor alarm) and red (critical/major alarm)
- On start up the LCD display is blank except for an EATON icon at the top of the display.
- The SC200 goes through an initialization process for about 2 minutes. During that start up time there is voltage on the output circuits.
- Once initialization is complete, a default display of output (bus voltage) and output current comes up and remains on until the SC200 is powered off. The SC200 is powered from the DC output, so removal of all DC-Dc converters will shut it down.
- The LCD display in the photo shows output voltage and input voltage as another option if preferred.
- If an alarm occurs it will be displayed in smaller text at the bottom of the LCD display. If it is a minor alarm, the second yellow LED will come on also. If it is a major alarm, the third red LED will come on.
- Audible alarms are also initiated with the minor and major alarms and can be cancelled by selecting any key on the SC200. This option can also be disabled.

- The LCD display in the photo also shows an illuminated "MENU" area at bottom RH corner. By operating the soft key below this display a menu of icons comes up.

In the image above the information icon is selected. Operating the RH soft key will allow the "Info" display to be viewed. By using the navigation keys (up-down, left-right) all nine icons can be selected.

- The SC200 is designed for monitoring and control of our Eaton rectifiers. With the DC- DC converters some of the functionality is not used.
- The SC200 monitors output voltage provides DC voltage high and DC voltage low.
- The SC200 also monitors converter fail alarms
- On particular systems additional digital inputs and digital (relay) outputs can be connected to the IOB Module.

2.11 IOB Module Details

In the MCS-3G subracks the IOB Module has following functions:-

- Current Shunt Module feeds the analogue current signal back to the IOB for the SC200 current display.
- Monitors MCU-3G output voltages for high voltage and low voltage alarms to SC200
- Digital input from converter fail alarm contacts initiate alarm on the SC200
- Digital inputs from the fuse fail module gives a fuse fail alarm on the SC200
- Additional digital inputs (up to 6 in total) can be used.
- Relay outputs can be configured to provide clean contact change over contact alarms for local applications if required.

The wiring diagrams show the basic connections to the IOB module

The SC200 System Controller Operation Handbook gives more details of the IOB operation and connections.

2.12 Current Shunt Module

The current shunt module consists of a shunt 300A 55mV which mounts in the load output busbars.

The shunt output voltage feeds back to the IOB module via a cat5 cable that plugs into the current shunt RJ45 socket on the connection pcb.. The current shunt has a trim potentiometer fitted to the pcb which is trimmed in the factory for accuracy.

A gain factor of 6000 is used in the SC200 current analogue input configuration.

2.13 Fuse Fail Module

This module connects back to the IOB Module using a cat5 cable (RJ45-RJ45 cable). It has 18 white flying lead conductors which some of which are fitted to the outputs of load breakers (with load cable) to provide electronic fuse fail sensing.

This circuit sends a digital output back to the IOB when any load breaker (with sensing lead fitted) is switched off, provided that a load is also connected to that breaker.

2.14 Voltage Feed Module

This module connects to the output of the converters and provides a polyswitch protected supply for the SC200 and IOB module.

It is also a connection point for the communications bus between the SC200 and the IOB module.

On the 12V output DC-DC converter systems it is also fitted with a step up 12V/24V converter (refer section 2.7 above).

3.1 Check DC-DC Converters Are Correct Model

Check system requirements and check colour coding on front of converter units supplied (refer 2.2 above).

3.2 Check Output Polarity Required

Circuit breakers are single pole in the live side. Should this be positive or negative?

Should common DC output busbar be positive or negative?

3.3 Fit MCS-3G subrack to 19" mounting rails in cabinet

Leave at least 2 RU blank space above the sub-rack to allow hand access for connecting cables to breakers and giving some front access to some internal components.

In the particular cabinet used, check the front and rear clearances for ventilation of the dc-dc converter modules. Recommended clearances are 600mm in front, 50mm at rear and at least 1RU (44.45mm) above.

Before screwing the sub-rack to the 19" rails it will be necessary to connect the chassis earth cable to the M6 / M8 side bolt (refer 2.3 / 7 and 2.4 /12). Earth cable should be 6mm^2, from the earth bolt on the chassis back to the main rack/cabinet earth stud.

3.4 Connect DC input cables to DP input isolator

MCS-3G has a single DC input feed feeding three converter positions

MCS6-3G has dual feeds, each again feeding three converter modules.

So cable size for a single MC3-3G subrack feed will be the same size as the two feeds to the MCS6-3G sub-rack

Check maximum input current from table below and select cable size to suit system details. If input cables are long, consider voltage drop with the size chosen and increase the cable size if necessary.

- Check breakers and isolators are off (lever down).
- Remove cover over front of circuit breakers and isolators by removing four corner screws to give access to circuit breaker clamp screws.

- Connect incoming cables to top of input isolator, checking cable polarities top and bottom are the same. Use insulated sleeve bootlace crimp lugs on the cables that are fitted into the isolator. At same time check bottom connections to circuit breakers for tightness.

Minimum Input Cable Sizing Table

Converter Type (x3 for MCS3)	Vin	Vout	W out	FL Effic	Win total	Vin Min	Input Imax	Min cable size mm^2
MCU**1212**0-3G	**12**	**12.0**	300	80	1125	10	112.5	16 (X-HF-110)
MCU**1224**0-3G	**12**	**24.0**	300	80	1125	10	112.5	16 (X-HF-110)
MCU**1248**0-3G	**12**	**48.0**	300	80	1125	10	112.5	16(X-HF-110)
MCU**2412**0-3G	**24**	**12.0**	400	85	1412	20	70.6	16 (V75)
MCU**2424**0-3G	**24**	**24.0**	500	90	1667	20	83.4	16 (V75)
MCU**2448**0-3G	**24**	**48.0**	500	90	1667	20	83.4	16 (V75)
MCU**4812**0-3G	**48**	**12.0**	400	85	1412	40	35.3	6 (V75)
MCU**4824**0-3G	**48**	**24.0**	500	90	1667	40	41.7	6 (V75)
MCU**4848**0-3G	**48**	**48.0**	500	90	1667	40	41.7	6 (V75)
MCU**11012**0-3G	**110**	**12.0**	400	85	1412	80	17.7	4 (V75)
MCU**11024**0-3G	**110**	**24.0**	500	90	1667	80	20.8	4 (V75)
MCU**11048**0-3G	**110**	**48.0**	500	90	1667	80	20.8	4 (V75)

3.5 Connect Load Cables

- Check load circuit breakers are off.
- Connect load live cables to the top connections of the load circuit breakers. At the same time fit the small white fuse fail sensing wires into the tops of the circuit breakers.
- Connect the load commons to the common link bar.
- Also connect the main DC earth from the common earth bar to the rack/cabinet earth stud using 35sqmm green/yellow cable
- Provide support (cable tie where possible) for incoming and outgoing cables

3.6 Additional Small Wiring

- Connect any additional digital inputs to IOB module (top rear clamp terminals)
- Connect any digital outputs from IOB module to outging systems if required.

4.1 Pre-commissioning Checks

- Check all connections for tightness
- Re-check input cable polarity is correct.
- Re-check output circuit breakers are correct polarity

4.2 Initial start up

- Ensure all breakers are off.
- Fit a single converter module
- Energize upstream input supply, check polarity on input isolator using a DVM. Also note actual voltage reading is within the expected range.
- Close the input isolator and observe the single converter has started and the SC200 is initializing.
- After about 2 minutes observe the SC200 is now displaying a voltage and current
- Observe any alarms that may be present and take steps to understand why and clear if possible.

4.3 Restart with all Converters

- Switch off input isolator and fit additional converters if required.
- Re-start system and run system.
- If possible connect loads or fit temporary dummy load to system

5.1 Product Brochures

At this stage the product brochures are offered as performance specifications.

These are located in the Appendices.

5.2 Datasheets for SC200 and IOB modules

These are also attached to the appendices.

Attached are following:-

Brochure – 3G Modular Converter Solution MCS3 and MCS6 Series rev A
Brochure – MCU-3G DC-DC Converter Modules, rev C

SC200 Datasheet
IOB Datasheet

GA Drawing for typical system
Wiring Diagram for typical system

3G Modular Converter Solutions MCS3 and MCS6 Series

Features

- 19” sub-rack
- Modular 3U and 6U options
- Up to 6 converter modules
- N+1 redundancy options
- Pre-configured software
- High power density (110V/48V, 3kW, 6U, 19”)
- Fast on-line expansion of modules (hot-swap)
- Graphical User Interface – LCD Panel
- Priority and non-priority options for DC distribution
- Remote monitoring & control via Ethernet
- Input for 12V, 24V, 48V, and 110V
- Output for 12V, 24V and 48V
- Color Coded Modules
- Integrated DC distribution panel
- Options for external Digital and Analogue I/O

12V, 24V, 48V and 110V secure DC-DC power converter systems up to 1.5kW and 3kW respectively.

The **Eaton® 3G Module Converter Solutions** are ideal for low to medium power telecommunications and industrial applications, offering compact, efficient, flexible and reliable secure DC power supply.

These 19” rack mount systems are available with up to 3 or 6 of the Eaton 3G Modular Converter Unit modules as 12V, 24V, 48V or 110V with an output up to 180A.

With efficiency up to 90% these modular converter solutions can reduce operating costs.

The systems include an integral DC distribution panel with a range of MCB and Low Voltage Disconnect (LVD) options available.

The SC200 series of system controller offers highly advanced control and monitoring features including Smart Alarm – a configurable logic for automated site energy control.

The SC200 also offers a complete array of communications options with Ethernet, GSM cellular (including text messaging) standard modem and TCP/IP communications options. The slightly lower specification SC100 may also be available as an option.

Typical applications include providing secure power for communications equipment, data networks, and industrial signalling and control.

The 3G Modular Converter Solutions are pre-configured and most system settings are adjustable in software and stored in transferable, configuration files for repeatable and quick one-step system set-up.

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Technical Specifications

Input

Nominal Voltage (DC)	12V, 24V, 48V, 110V (Depends on MCU modules fitted)
Voltage Range (DC)	12V, (10-15V) 24V, (20-30V) 48V, (40-60V) 110V, (80-130V)
Efficiency	85-90%

Output

Nominal Voltage (DC)	12V, 24V, 48V (Depends on MCU modules fitted)	
Voltage Range (DC)	12V, (12-15V) 24V, (23-32V) 48V, (44-56V)	
Power (DC)	MCS3	12V:900W 24V:1500W 48V:1500W
	MCS6	12V:1800W 24V:3000W 48V:3000W
Load Regulation	< +/-0.5% (20-100% load)	

Environmental

Operating Temperature	-25 °C to +55 °C at rated power
Isolation	5kV DC input to output

Mechanical

Dimensions H,W,D	MCS3-3G: 3U, 19" mounting, 306mm* MCS6-3G: 6U, 19" mounting, 306mm* **Additional clear space is required for exhaust air.*

System

System Controller	SC200 or (SC100 option)	
DC Distribution Module	MCS3-3G:	12-way load circuit breakers*
	MCS6-3G:	20-way load circuit breakers* **Depends on pitch and rating of circuit breakers fitted and options fitted.*
Communications Features*	USB direct 10Base T Ethernet, TCP/IP, SNMP, Modbus-TCP, Modbus-RTU and on board web server. RS232 to external PSTN or GSM modem (modem not included) **SC200 only*	
Low Volts Disconnect (LVD)	MCS3-3G:	optional 200A load disconnect
	MCS6-3G:	optional 200A load disconnect
Blank Panels	For unused converter positions	
Top/Rear Covers	Optional	

Software

DC Tools	Configuration software. Free download from: www.powerware.com/downloads

In the interests of continual product improvement all specifications are subject to change without notice. Performance ratings are valid with all other variables at Nominal. Specifications guaranteed over rated operating range. Images are indicative views only and not guaranteed representations and will vary according to options fitted.

RoHS COMPLIANT

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MCU–3G
DC-DC Converter Modules

The **Eaton 3G Modular Converter Units** (MCUs) are designed to convert from one DC voltage to another and to be used within the Eaton Modular Converter Solutions (MCS-3G) sub-racks. Multiple parallel units allow for high power systems within compact and dense housings, and they also allow for active redundancy.

The 3G architecture is reliable, power dense and compact. The high power density allows as little as 1U of rack space to be occupied by power, therefore maximizing space available for telecom and industrial equipment.

The MCU-3G products are suitable for integration within Eaton's DC Rack Power Systems to provide multiple voltages, earth polarity and DC distribution within the same system.

The MCU-3G converter incorporates a combination of leading edge high frequency switch mode technology for a flexible and efficient DC power conversion source, with dual thermostatically controlled fans which further contributes to its high overall reliability.

The MCU-3G is designed to operate with the Eaton SC200 system controllers[2] in any of the versatile Access Power Solutions.

Item Model	Voltage Input (nom)	Efficiency @ FL	Voltage Output (nom)	Current Output	Power Watts	Voltage Designator
MCU12120-3G	12	80	12.0	22.25	300	
MCU12240-3G	12	80	24.0	12.5	300	
MCU12480-3G	12	80	48.0	6.3	300	
MCU24120-3G	24	85	12.0	30.0	400	
MCU24240-3G	24	90	24.0	21.0	500	
MCU24480-3G	24	90	48.0	10.5	500	
MCU48120-3G	48	85	12.0	30.0	400	
MCU48240-3G	48	90	24.0	21.0	500	
MCU48480-3G	48	90	48.0	10.5	500	
MCU110120-3G	110	85	12.0	30.0	400	
MCU110240-3G	110	90	24.0	21.0	500	
MCU110480-3G	110	90	48.0	10.5	500	

Features

- Intelligent microprocessor controlled
- Automatic[2] set-up from system controller
- Narrow profile
- Dual thermostatically controlled cooling fans
- Up to 10 units in a 19", 3U sub-rack
- Up to 500W[1] per module
- Fast on-line replacement of modules
- Hot swap (plug in)
- Parallel operation with active[2] load share
- Facilitates cost-effective n+1 deployment
- Colour coded
- Fully isolated input to output (5KVDC)
- Input voltages
  - 110 V, 48 V, 24 V and 12 V
- Output voltages
  - 48 V, 24 V and 12 V

1. *The maximum input current is the main limit to the converter's power performance. At lower voltages the continuous power is limited to the maximum input current rating.*
2. *Product release 2 will include active load sharing and SC200 controller communication.*

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Technical Specifications

Electrical

All Models

Nominal input voltage (V d.c.)	110 V	48 V	24 V	12 V
Input voltage range (V d.c.)	80-130V	40-60V	20-30V	10-15V

48 V Output Models

	MCU-110480	MCU-48480	MCU-24480	MCU-12480
Nominal output voltage (V d.c.)	48 V			
Output voltage range (V d.c.)	44-56 V (software adjusted[2])			
Default Factory set-point (V d.c.)	54.4 V (before output diode)			
Maximum Output current (A)	10.5 A	10.5 A	6.25 A	
Maximum Continuous Power (W)	500 W	500 W	300 W	
Over voltage alarm/shutdown (H/W)	set at approx 60 V			
Under voltage alarm (S/W)	set at approx 44 V			

24 V Output Models

	MCU-110240	MCU-48240	MCU-24240	MCU-12240
Nominal output voltage (V d.c.)	24 V			
Output voltage range (V d.c.)	23-32 V (software adjusted[2])			
Default Factory set-point (V d.c.)	28 V (before output diode)			
Maximum Output current (A)	21.0 A	21.0 A	12.5 A	
Maximum Continuous Power (W)	500 W	500 W	300 W	
Over voltage alarm/shutdown (H/W)	set at approx 32 V			
Under voltage alarm (S/W)	set at approx 22			

12 V Output Models

	MCU-110120	MCU-48120	MCU-24120	MCU-12120
Nominal output voltage (V d.c.)	12 V			
Output voltage range (V d.c.)	12-15 V (software adjusted[2])			
Default Factory set-point (V d.c.)	14 V (before output diode)			
Maximum Output current (A)	30.0 A	30.0 A	22.25 A	
Maximum Continuous Power (W)	400 W	400 W	300 W	
Over voltage alarm/shutdown (H/W)	set at approx 16 V			
Under voltage alarm (S/W)	set at approx 11 V			

All Models

Line regulation	< ±0.2%
Load regulation	< ±0.5% (20-100% load))
Output ripple	<10 mV rms
Output noise	< ±50 mV
Current limit	Software adjustable default 100%
Parallel/Redundant operation	Yes, output diode
Current Sharing	Yes, active[2]
Isolation	5 kV d.c.

Mechanical

Dimensions	133 (h) x42 (w) x266 (d) mm
Weight	1.7 kg
Construction	3RU steel case, plastic front cover
Cooling	Dual fan cooled
Connector	Custom insertion type
	output +ve, pin 5
	output -ve, pin 6
	input +ve, pins 1
	input -ve, pins 2
	Communications[2], pins 3 & 4

Indicators

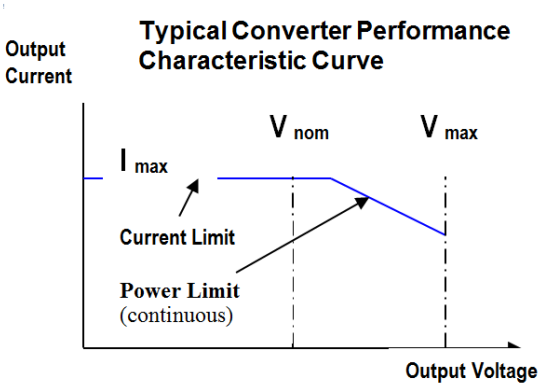
Input /Output Voltage OK	Green LED
Communications Fault	Amber LED
Critical Fault	Red LED
Alarm Contact[2]	'closed on alarm' (default),

Protection

Input Polarity	reverse voltage protection
Output over voltage	over voltage shutdown
Output short circuit	short circuit shutdown
Over temperature	over temperature shutdown

Environment

EMC	AS3548, CISPR 22 class B
Operating temp.	-25 to 55 °C at rated power
Safety	AS/NZS 60950
Certification	AUS/NZ, RCM



The power limit (maximum continuous power) is due to the converter's heat dissipation capacity

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SC200 System Controller

Contents

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Specifications apply to an SC200 installed with a single IOBGP System IO Board. Refer to the IOBGP data sheet for detailed system input and output specifications. Some features require SC200 version 4 software.

Hardware and Software Compatibility

Rectifiers controlled:	APR24-3G APR48-3G Energy Saver Rectifier APR48-ES EPR48-3G CR48-3G
Number of rectifiers supported:	126
Remote Control and Management Software:	PowerManagerII Any SNMP Network Management Software. *SNMP MIBs available on request.* Any Building Management System (BMS) using Modbus-RTU or Modbus-TCP. *Refer to Application Note AN0107 for full details.* Third party management software using S3P protocol. *S3P interface specifications available on request.*
Set-up / installation / service tools:	DCTools ICE Web browser (Internet Explorer, Mozilla Firefox, Google Chrome or other compatible browser)

Mechanical

Dimensions H, W, D:	133.5mm (3U), 44.5mm (1U), 70mm
Weight:	140g [5 oz]
Mounting options:	Panel mount Rectifier slot mount
Orientation:	Vertical, horizontal left, horizontal right

Environmental Requirements

Ambient Temperature Rated Operating Range: Extended Operating Range:	 -10°C to +50°C (14°F to 122°F) -25°C to +70°C (-13°F to 158°F) *May affect product lifetime, metering accuracy and display contrast.*
Altitude:	<3000m (9800 feet)
Humidity:	<95%RH (Non-condensing)
Location:	This unit must be installed in a restricted access location.

DC Input

Rated Voltage:	24V / 48V nominal *From an SELV power source, earthed or unearthed.*
Operational Range: Power input connector: Input current	18V to 60V RJ-45 (part of RXP bus) 0.18A (24V) / 0.06A (48V)
Earthing:	Class II ⧈
Fault Protection (external):	Over-current protection of the SC200 / IOBGP power supply (RXP bus) is required to prevent excessive current flow during fault conditions.
Approved over-current devices:	Powerware Voltage Feed Module (VFN), or Tyco RXEF135 or Littelfuse 60R135 polyswitch in series with LIVE input of the DC power source.

Keypad and Display

Display type:	160 x 128 back-lit color dot matrix
Viewable area:	30.5mm x 36mm
Display settings:	Contrast Adjustable Orientation Vertical, Horizontal Left or Horizontal Right
Main Screen Values	Configurable to any analog input value, or key system values
Keypad:	6 keys, elastomer type (Up / Down / Left / Right / Softkey 1 / Softkey 2)
Keypad Access Security	
Protection:	Prevents configuration changes from the keypad.
Set/cleared:	Optionally allows temporary write access using a 4 digit PIN. From DCTools or Web.
User interface functions:	View system values View and change alarms View status messages Start / stop control functions Test and characterize LVDs Test alarm relays Change operating settings Map I/O boards
Language (standard):	English
Language options:	Chinese, German, Spanish, Russian (download by web) *Other languages available on request.*

Indicators

Status LEDs	
Power On:	Green
Critical / Major Alarm:	Red
Minor Alarm:	Yellow
Audible Alarm Indicator:	Enabled/Disabled (default: Enabled)

Data Logging

Event Log:	Up to 10,000 records
Data Log	
Records:	Up to 10,000 records
Continuous Log Interval:	10s to 1 day (default: 1800s - 30 minutes)
Off-normal Log Offset:	1.0 to 8.0V (default: 4.0V)
Off-normal Log Interval:	1s to 1 day (default: 180s – 3 minutes)

Communications

Ethernet	
Interface:	10baseT
Connector:	RJ-45
Protocols:	TCP/IP, SNMP, S3P over IP, http (Web), https (secure Web), Modbus-TCP
Settings:	IP Address, Subnet mask, Gateway address
USB	
Version	1.1
Speed	Full Speed (12Mbits/s)
Function	Local viewing of values and configuration using DCTools
RS-232 Serial	
Interface:	RS-232 (DTE)
Connectors:	DB9M
Protocols:	S3P, MII (China-specific), Modbus RTU

Communications (continued)

System Communications	
Interface:	RS-485
Connector:	RJ-45 (Rear panel)
Protocols	RXP
External modem options	
GSM Modem:	SMS (TXT) system status and alarm messages (see following).
GPRS/HSUPA Router:	Ethernet over mobile network. Communications to PowerManagerII, DCTools or third-party Network management System (NMS).
SMS Messaging	Requires suitable external GSM modem
System Status Message:	Trigger: Text message to modem, starting with lower case or capital "P" Destination: number of mobile phone that sent trigger message Contents: Site name, number of alarms active, bus voltage, load current, AC voltage, battery current, temperature, battery time remaining
Alarm Message:	Trigger: Any alarm activation or de-activation, Critical, Major or Minor, as configured Destination: up to 8 mobile phone numbers Contents: Site name, triggering alarm name and status (active or inactive), bus voltage, load current, AC voltage, battery current, temperature, battery time remaining
Email alarm messages	
Communications	Requires access to external SMTP server
Number of destinations	Up to 6
When sent	An email is sent a configurable delay after a new alarm with a sufficiently high severity is activated or de-activated
Email Delay	Configurable per destination
Email subject	Triggering alarm name and severity
Alarm message contents	System Identity details Active alarms System Values System Status Recent events (all events occurring in the previous hour)
SNMP Interface	
Functions:	Get/Set/Trap
SNMP Versions:	1, 2c, 3
MIBs supported:	SC200 MIB (Eaton proprietary), MIB II
Trap format options:	Eaton (multiple trap numbers) or X.733 (single trap number)
SNMPv3 security settings:	Authentication password, privacy password (single-user only)
SNMPv3 protocols:	Authentication: HMAC-SHA Privacy: CBC-DES
Web Interface	
Functions:	Full configuration and control supported
Security:	Secure web (https), username/password access control
Software upgrades:	Via Ethernet port *Allows remote software upgrade over network.*
Remote Access Password Security	
Protection:	Prevents configuration changes and control function operations by DCTools or PowerManagerII through the serial or Ethernet port.
Set:	From web or DCTools
Cleared:	From web, DCTools or keypad

Communications (continued)

Serial Server	
Operation	Allows remote access to a device connected to the SC200's RS232 port via Ethernet.
Protocol:	Any serial protocol over IP
Port number:	15000

Alarms

Alarm severity settings:	Critical, Major, Minor, Warning, Control (does not cause remote alarm; not shown on front panel)
Standard alarm relay settings	Summary Minor, Low / High Load, Rectifier Fail, AC Fail, Load/Batt Disconnect, Monitor OK
System Alarms	Low Float, Low Load, High Float, High Load, Rectifier Fail, Multiple Rectifier Fail, Rectifier Comms Lost, Multiple Rectifier Comms Lost, Partial AC Fail, AC Fail, System Overload*, Load Fuse Fail, Battery Fuse Fail, MOV Fail, ACD Fan Fail, LVD1 Disconnected, LVD1 Fail, LVD1 Manual, LVD1 Characterization Error, LVD2 Disconnected, LVD2 Fail, LVD2 Manual, LVD2 Characterization Error, Batt Temp High, Batt Temp Low, Sensor Fail, Battery Test Fail, Equalize, Fast Charge, Battery Test, Aux Sensor Fail, In Discharge, Configuration Error, Monitor OK, Battery Current Limit, Rectifier No Load, Rectifier Current Limit, Rectifier Over Temperature, Generator Fail, Cabinet Fan Fail, IOB Comms Lost, Unmapped IOB Found, Unknown Hardware, Missing Hardware, String Fail, Standby Mode, LVD Disconnected, LVD Fail, LVD Manual, LVD Characterization Error, Wrong Battery Polarity, Characterizing Battery, DO Manual, Normal Charge, AC Phase 1 Voltage, AC Phase 1 Fail, AC Phase 2 Voltage, AC Phase 2 Fail, AC Phase 3Voltage, AC Phase 3 Fail. ** System overload alarm can be configured in System overload or N+1 Redundancy modes.* *Not all alarms are enabled by default; refer to the configuration file for alarm settings.*
Voltage Alarm settings	
Low float:	0 to 60V (default: 52.8V)
Low load:	0 to 60V (default: 47.0V)
High float:	0 to 60V (default: 55.6V)
High load:	0 to 60V (default: 57.6V)
System Overload Alarm setting	
% capacity:	0 to 100% (default: 85%)
Overload time:	0 to 10,000 min (default: 4 hours)
Overload type:	Total capacity / Redundancy (default: Total capacity)
Optional Note	Size: 60 text characters per alarm Viewing: from DCTools, Web, in SNMP trap, in email alarm message, on LCD display
User Alarms	
Digital (any DI including system inputs):	Configurable name, active state, severity, relays (up to two)
Analog (any AI including system inputs):	Configurable name, high alarm threshold, high alarm severity, high alarm relays (up to two), low alarm threshold, low alarm severity, low alarm relays (up to two), hysteresis (shared by low and high alarms)

Smart Alarms

Operation	Boolean combinations of alarm sources
Maximum Number	32
Logic Functions	AND, OR or XOR
Recognition Period	0 seconds to 20 hours
De-Recognition Period	0 seconds to 20 hours
Alarm Sources	
Maximum Number:	64
Type:	System Alarm, Analog Input High Alarm, Analog Input Low Alarm, Digital Input Alarm, Smart Alarm
Logic:	EQUAL or NOT
Scheduled Sources	
Maximum Number:	20
Functions:	First Date/Time Number of Activations (default: 0) Duration (default: 60 minutes) Interval (default: 1440 minutes = 1 day)
System Value Sources	
Maximum Number:	20
System Values:	Bus Voltage, Rectifier Current, Load Current, Battery Current, Battery Temperature, Load Power, System Power, Ah Discharged, Number Of Rectifiers Failed, Number Of Rectifiers Comms Lost, AC Voltage, Battery Time Remaining, Alternative Source Current, Highest Rectifier Heatsink Temperature, Fuel Level, Generator Backup Time, Fuel Remaining Time
Threshold Type:	High/Low

Standard Input/Output (with single IOBGP)

Digital Inputs	
System:	4 (Load Fuse Fail, Battery Fuse Fail, MOV Fail, ACD Fan Fail)
User:	6
Digital Outputs:	6 (one also used as Monitor OK relay)
Analog Inputs	
Bus Voltage:	1 (assigned to system bus voltage)
Temperature:	2 (one assigned to battery temperature, one user)
Current:	3 (assignment depends on system)
Battery Mid-point Monitoring (MPM)	
Inputs (number of strings):	Standard: 4 (single IOBGP) Maximum: 24 (requires extra IOBGP modules; 4 strings per module)
Input range	0 to 36V

Optional Input/Output with extra IOBGP or IOBSS Modules

Digital Inputs:	6 per IOBGP, 10 per IOBSS
Digital Outputs:	6 per IOBGP, 6 per IOBSS
Analog Inputs:	4 per IOBSS module (4 per IOBGP if mid point inputs are used)
Temperature sense inputs:	2 per IOBGP, 2 per IOBSS
Current sense inputs:	3 per IOBGP, 3 per IOBSS
Bus voltage sense input:	1 per IOBGP, 1 per IOBSS
Maximum number of inputs and outputs	
Analog Inputs:	48
Digital Inputs:	108
Digital Outputs:	32

Control Processes [require IOBGP]

Note: Default voltage settings are shown for 48V systems.

Active Voltage Control	
Default status:	Enabled
Batteries	
No. of cells per string:	0 to 26 (default: 24)
Total capacity:	1 to 100,000Ah (default: 300Ah)
Battery Current Limit	
Default status:	Disabled
Battery current limit setting	0 to 100% of Battery Ah (default: 10%)
Engine run limit setting	0 to 100% of Battery Ah (default: 1%)
Engine Run operation	The current limit setting changes from *Battery Current Limit* to *Engine Run Limit*.
Activation:	The generator control process has started the generator, or a digital input with Function set to *Engine Run* is active
Battery Test	
Default status:	Disabled
Lockout period:	48 hours after an AC fail (set Interval to zero to override lockout)
Termination voltage:	18 to 60V (default: 47.5V)
Activation options:	Periodic
	Manual using web, DCTools or front panel
	Using a digital input with the function set to Start Battery Test
Duration:	1 to 1000 minutes (default: 30 minutes)
Periodic activation settings	
Start date/time:	User selectable
Interval:	0 to 366 days (default: 183 days)
Current Share	
Default status:	Enabled
Balance:	± 2% of rated rectifier current
Equalize	
Default status:	Disabled
Equalize voltage:	0 to 60.0V (default: 56V)
Activation options	Periodic
	Manual using web, DCTools or front panel
	Using a digital input with the function set to Start Equalize
Duration:	1 to 10,000 min (default: 600 minutes)
Periodic activation settings	
Start date/time:	User selectable
Periodic Equalize interval:	0 to 365 days (default: 0 days – no periodic equalize)
Fast Charge	
Default status:	Disabled
Charge voltage:	0 to 60.0V (default: 56.0V)
Start thresholds	
Ampere hour threshold:	1 to 100% (default: 25%)
Voltage threshold:	0 to 60.0 V (default: 48.0V)
Stop Thresholds	
Maximum duration	0 to 10,000min (default: 1440 minutes)
Recharge percentage	1 to 200% (default: 110%)
Ampere-hour threshold	0 to 100% (default: 0%)

Control Processes (continued)

Generator Control	
Control Relay	Any Digital Output (Default: None; generator control is disabled)
Can Run with Mains Present	Yes, No (Default: No)
Automatic Control Mode	Disabled, Fast Charge Only (default) , Fast Charge & Equalize, Every Mains Failure
Start/Stop conditions:	Refer to Fast Charge and Equalize Threshold Settings
Controls	Start / Stop Manual Generator Run
Control input:	Engine Run; a digital input active when the generator is running
Fuel Metering	
Fuel Tank Volume	0 to unlimited (Default: 0 l)
Manual Generator Run Time	0 to unlimited (Default: 0 min)
Calculated values	
Generator Refuel Date	When the generator was last refuelled
Generator Refuel Volume	How much fuel was added at the last refuel
Generator Backup Time	How long the generator can continuously run until empty
Tank Empty Date	When the tank will be empty, based on the average usage
Rectifier Shut Down	Disabled, Manual, Automatic (Default: Disabled)
Load Based Rectifier Shutdown (LBRS)[1]	
Operates	When Shutdown is set to Automatic
High Threshold	20 to 90% (Default: 60%)
Low Threshold	10 to 80% (Default: 40%)
Interval	5 min to 30 days (Default: 7 days)
System Voltages	
Float voltage:	5.0 to 60.0V (default: 54.5V)
Maximum voltage:	5.0 to 60.0V (default: 57.6V)
Minimum voltage:	5.0 to 60.0V (default: 42.6V)
Temperature Compensation	
Default status:	Enabled
Slope:	-10.00 to -0.01mV/°C/cell (default: -4.00mV/°C/cell)
Low cut-off:	-40°C to +20°C (default: 0°C)
High cut-off:	+21°C to +60°C (default: +50°C)
Reference Temperature:	0.0°C to 50.0°C (default: 20°C)
LVDs	
Number of logical LVDs supported:	16
Number of contactors supported:	16 (up to two per IOBGP)
Logical LVD settings (each of 16 LVDs)	
Voltage Based Disconnect:	Disabled/Enabled (default: Enabled)
Disconnect Voltage:	0 to 60.0V (default: 43.2V)
Reconnect Voltage:	0 to 60.0V (default: 48.0V)
Recognition Time:	10 to 600s (default: 10s)
AC Timer Based Disconnect:	Disabled/Enabled (default: Disabled)
AC Timer Delay:	0 to 6,000 minutes (default: 240 minutes)
Smart Alarm Based Disconnects:	Disabled/Enabled (default: Disabled)
Smart Alarm Index:	1 to 32 (default: 1)
Chained to Previous:	Disabled/Enabled (default: Disabled)
Physical Contactor Settings (each of 16 Contactors)	
LVD Number:	1 to 16 (default: 1 / 2)
Enable:	Disabled/Enabled (default: Disabled)
IOB Number:	1 to 16 (default: 1)
IOB LVD Number:	1 to 16 (default: 1 / 2)
Type:	Normally Open / Normally Closed (default: Normally Open)

[1] Only with rectifiers that support LBRS

Other Functions

Battery Time Remaining	
Typical accuracy at C_{10} rate:	+/-20% of time remaining (subject to battery characterization discharge completed prior)
Settings:	
End Voltage:	1.65 to 2.00V per cell (default 1.80V per cell)
Automatic Characterization:	Disabled/Enabled (default Disabled)
Automatic Characterization Delay:	0 to 7 days (default 48hours)
Battery Mid-point Monitoring	
Number of Battery Strings Supported:	Up to 24 (4 per IOBGP)
Settings	
MPM Enabled:	Disabled/Enabled (default: Disabled)
MPM lockout Period:	0 to 24 hours (default: 12 hours)
MPM Convergence Period:	0 to 24 hours (default: 24 hours)
String Fail Recognition Period:	0 to 12 hours (default: 1 hour)
MPM Start Threshold:	0.5 to 10% (default: 8.0%)
MPM Stable Threshold:	0.5 to 10% (default: 4.0%)
Reverse Battery Protection	
Operation:	Prevents LVD connection on reverse battery wiring
Wiring Requirements:	Uses one mid-point input on IOBGP per string (inputs are not available for mid-point measurement)

Compliances

Safety	EN 60950-1, UL 60950-1, AS/NZS 60950.1
EMC Product family standard	EN 300 386 (OTTC)
EMC Generic standards	
Emissions:	EN 61000-6-3
Immunity:	EN 61000-6-2
Environmental	RoHS and WEEE Directives

Certifications

China	MII
Europe	CE – mark
North America	FCC Verification, IC, UL
Australia/New Zealand	C-Tick

IOBGP System I/O Board

Contents

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These specifications apply to a single IOBGP module controlled by an SC100 or SC200 system controller, unless otherwise stated.

System Configuration

System Controller:	SC100 or SC200
Location:	Within the DC power system

Mechanical

Dimensions H, W, D:	106mm [4.17"], 175mm[6.89"], 20mm [0.79"]
Weight:	140g [5 oz]
Mounting:	Panel mount

Environmental Requirements

Ambient Temperature:	-10°C to +80°C [14°F to 176°F] *Reduced accuracy above +70°C [158°F]*
Storage Temperature:	-40°C to +85°C [-40°F to 185°F]
Humidity:	<95% RH (non-condensing)
Altitude:	<3000m (9800 feet)

DC Input ⎓

Rated Voltage:	24V - 48V nominal; 0.4A - 0.2A *From an earthed SELV non-polar power source.*
Operational Range:	19 - 60V
Power input connector:	RJ-45 (part of RXP bus)
Earthing:	Class II ⧈
Fault Protection (external):	Over-current protection of the IOBGP power supply (RXP bus) is required to prevent excessive current flow during fault conditions.
Approved over-current devices:	Eaton Voltage Feed Module (VFN), or Tyco RXEF135 or Littelfuse 60R135 polyswitch in series with LIVE input of the DC power source.

Indicators

OK LED (green):	Indicates the IOBGP's status
LVD contactor 1 indicator (green):	Indicates LVD contactor 1 status
LVD2 contactor indicator (green):	Indicates LVD contactor 2 status

Communications

RXP bus	
Interface:	RS-485
Connector:	RJ-45
Protocol:	RXP (Rack Extended Protocol)

Inputs

Bus Voltage	
Number:	1
Range:	-60V to +60V
Resolution:	30mV
Accuracy:	±0.5% at 25°C [77°F], ±1% over rated temperature range
Current Sensor/Shunt	
Number:	3
Range:	–50 to +50mV
Resolution:	<50µV
Accuracy:	±0.5% at 25°C [77°F], ±1% over rated temperature range
Temperature	
Number:	2
Range:	2.53V to 3.23V (-20 to +70°C)
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
Battery mid-point monitoring	
Number of strings:	4
Range:	–35 to +35V
Resolution:	<30mV
Accuracy:	±0.5% at 25°C [77°F], ±1% over rated temperature range
User Digital Inputs	
Number:	6
Connectors:	Screwless terminal blocks
Wire size:	0.5 - 2.0mm^2 [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
System digital inputs:	MOV Fail, Fan Fail, Load Fuse Fail, Battery Fuse Fail

Outputs

Relay Outputs	
Quantity:	6 configurable including 1 also used for Monitor OK
Type:	Voltage free, NO-C-NC, 0.3A at 60V DC/1A at 30V DC
Connections:	Screwless terminal blocks
Wire size:	0.5 - 2.0mm^2 [20 - 14 AWG]

Low Voltage Disconnect (LVD) Control Functions

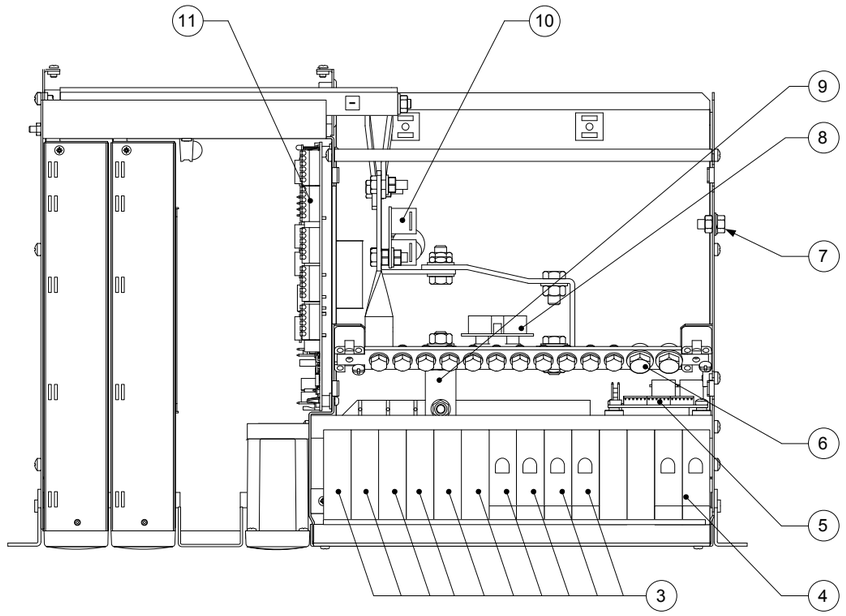
Number of LVD contactors supported:	2
LVD Contactor Type	
SC200 systems:	Normally Open (NO) with auxiliary contacts only
SC100 (Version 2.0 or later) systems:	Normally Open (NO) or Normally Closed (NC), with or without auxiliary contacts
LVD Contactor Coil Ratings	
Nominal Voltage (with auxiliary contacts fitted):	24V (nom) dc power systems: 12V / 24V* 48V (nom) dc power systems: 12V / 24V / 48V*
Nominal Voltage (without auxiliary contacts):	24V (nom) dc power systems: 24V 48V (nom) dc power systems: 48V
Maximum Hold-in Current:	1.2A
	**Applies to SC200 systems, and SC100 systems with auxiliary contacts fitted. The SC100 or SC200 uses LVD Characterization to determine the optimum LVD coil drive voltages.*
LVD power feed input:	Required only if LVDs fitted
LVD power feed type:	Live bus/Common bus connections
LVD operated input:	From contactor auxiliary switch (if fitted)

Compliances

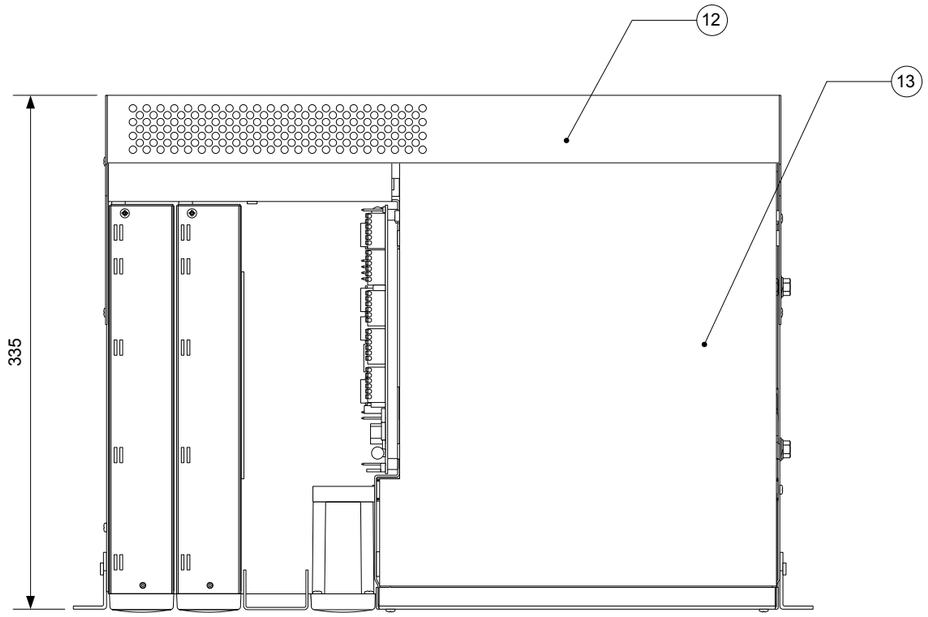
Safety:	EN 60950-1, AS/NZS 3260.1, UL 60950-1
EMC – immunity	
Electrostatic discharge:	EN 61000-4-2
Radiated radio frequency:	EN 61000-4-3
Electrical fast transients:	EN 61000-4-4
Surge:	EN 61000-4-5
Conducted radio frequency:	EN 61000-4-6
EMC – emissions	
Radiated emissions:	EN 55022, CISPR 22
Environmental:	RoHS and WEEE Directives

Certifications

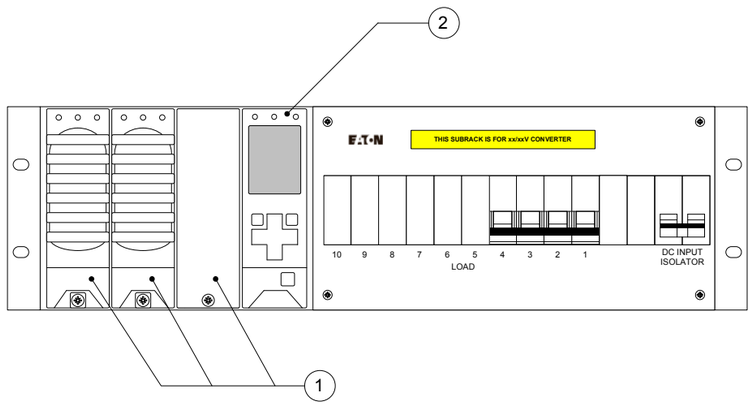
Europe:	CE-mark
North America:	FCC Verification, IC, UL (pending)
Australia/New Zealand:	C-tick



MCS3-320
TOP VIEW
(WITHOUT REAR COVER)



MCS3-320
TOP VIEW
(WITH TOP AND REAR COVER)



MCS3-320
FRONT VIEW

NOTES:

THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS3-320 DC-DC CONVERTER SUBRACK.

1. UP TO THREE (3) MCU-3G SERIES CONVERTER MODULES.
2. SC200 SUPERVISORY MODULE.
3. UP TO TEN (10) OFF LOAD CIRCUIT BREAKERS, 18mm WIDTH (QTY. SPECIFIED ON SALES ORDER).
4. INPUT 2P ISOLATOR.
5. ELECTRONIC FUSE FAIL BOARD.
6. DC COMMON (-VE).
7. EARTHING BOLT (M6).
8. LOAD CURRENT SHUNT.
9. LOAD LIVE BUS (+VE).
10. VOLTAGE FEED BOARD.
11. I/O INTERFACE BOARD WITH ALARM RELAY OUTPUT AND DIGITAL INPUT TERMINALS.
12. REAR COVER.
13. TOP COVER.

REV	CHANGE	ECO No	DATE	BY
00	FOR PRODUCTION		28/11/2013	BS

DO NOT SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

GENERAL TOLERANCE

	LINEAR	HOLE CNTR
100<	±0.25	±0.15
300<	±0.50	±0.25
300>	±1.00	±0.50

UNLESS OTHERWISE STATED

DRAWN: BS
DATE: 28/11/2013
CHECK:
APPR:

Powering Business Worldwide

ACN 66 103 014 571
10 Kent Road
Mascot NSW 2020

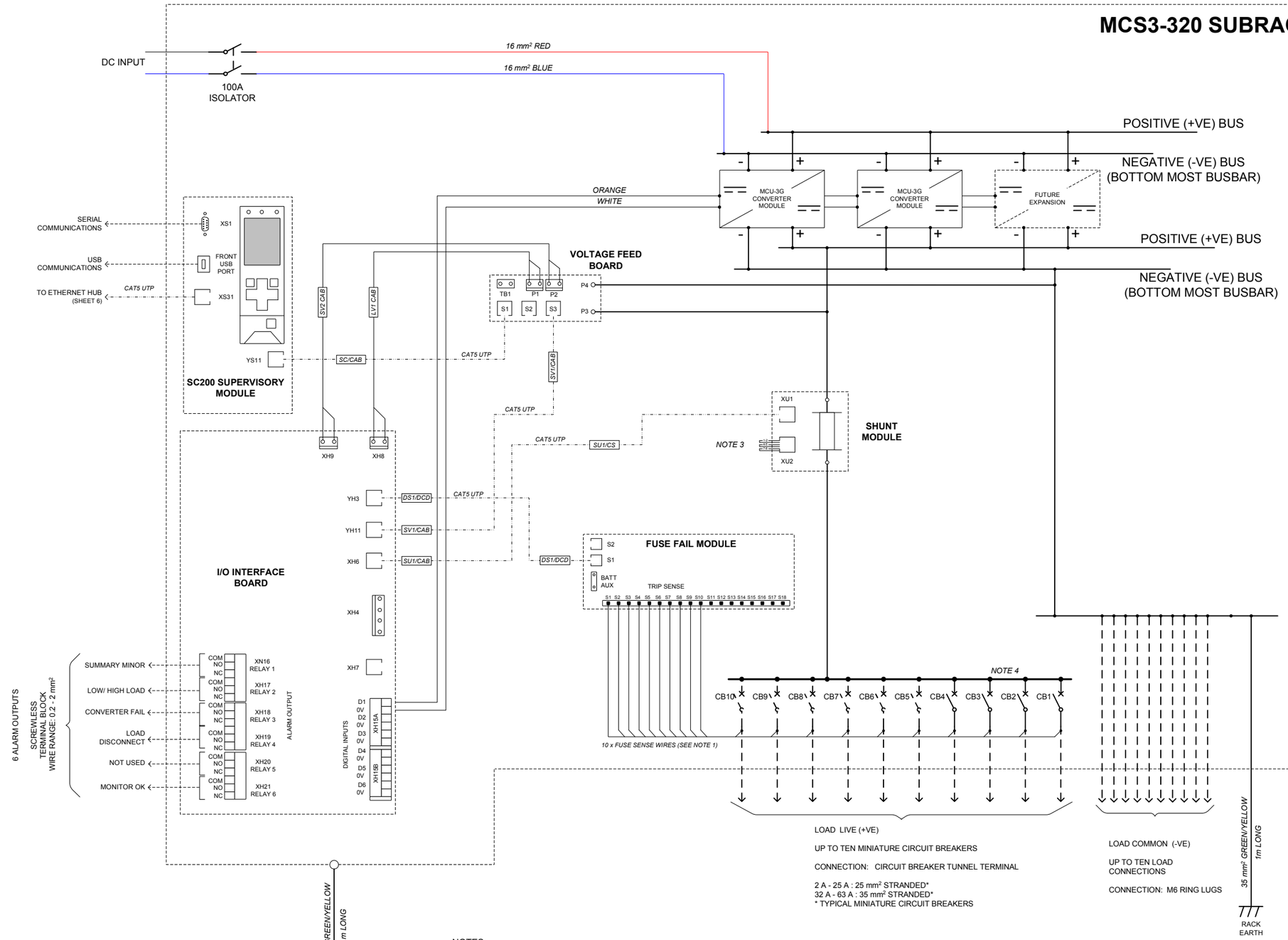
MAT: N/A FINISH: N/A SCALE: X : X

GENERAL ARRANGEMENT
MCS3-320, DC-DC CONVERTER SUBRACK

DWG No: IEE0964-1-021

EATON P/N: XXXXXXXX SHEET: 1 OF 1 A3

MCS3-320 SUBRACK



NOTES:

THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS3-320 DC-DC CONVERTER SUBRACK.

1. FUSE FAIL DETECTION WIRES 0.5 mm² WHITE PVC V90-HT 0.6/1 KV.
2. UP TO THREE (3) OFF 3G MCU CONVERTER MODULES.
3. CURRENT SHUNT STUB (117570).
4. CORRECT QTY. OF LOAD CIRCUIT BREAKERS, ARE SPECIFIED ON SALES ORDER.

REV	CHANGE	ECO No	DATE	BY
00	FOR PRODUCTION		28/11/2013	BS

DO NOT SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

GENERAL TOLERANCE

	LINEAR	HOLE CNTR
100<	±0.25	±0.15
300<	±0.50	±0.25
300>	±1.00	±0.50

UNLESS OTHERWISE STATED

DRAWN: BS
DATE: 28/11/2013
CHECK:
APPR:

EATON Powering Business Worldwide

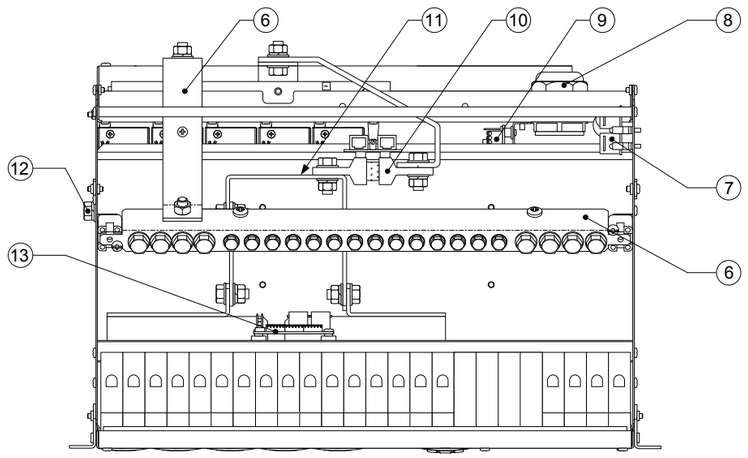
ABN 66 103 014 571
10 Kent Road
Mascot NSW 2020

WIRING DIAGRAM

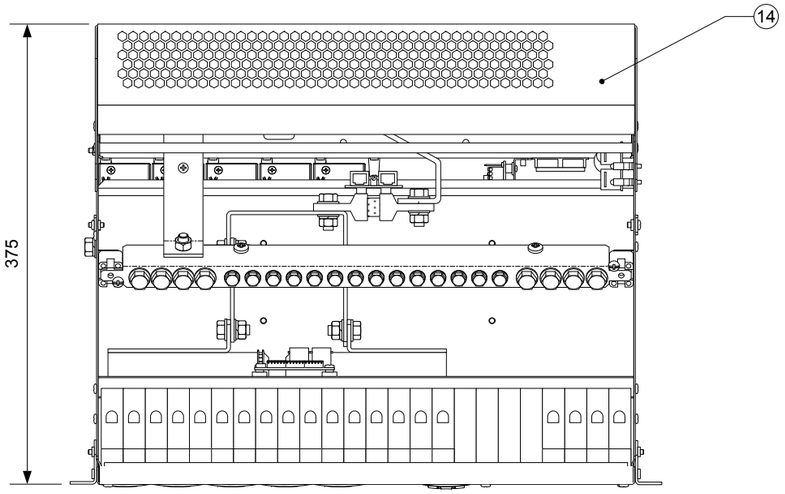
MCS3-320, DC-DC CONVERTER SUBRACK

DWG No: IEE0964-1-022

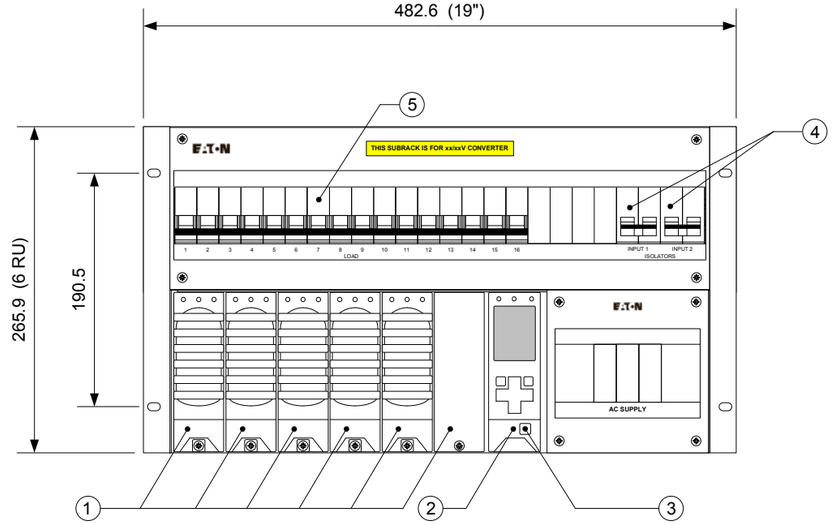
MAT: N/A FINISH: N/A SCALE: X : X EATON P/N: XXXXXXXX SHEET: 1 OF 1 A3



MCS6-320
TOP VIEW
(WITHOUT REAR COVER)



MCS6-320
TOP VIEW
(WITH REAR COVER)



MCS6-320
FRONT VIEW

NOTES:

THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS6-320 CONVERTER SUBRACK.

1. UP TO SIX (6) OFF MCU-3G SERIES CONVERTER MODULES.
2. SC200 SUPERVISORY MODULE.
3. USB COMMUNICATION PORT WITH ETHERNET AND RS232 PORTS ON THE BACK.
4. INPUT 2P ISOLATORS.
5. UP TO SIXTEEN (16) OFF (18mm MODULE) LOAD CIRCUIT BREAKERS (QTY. SPECIFIED ON SALES ORDER).
6. DC COMMON (-VE).
7. VOLTAGE FEED BOARD.
8. M32 INPUT CABLE GLAND (NOM CABLE OD 15-23mm).
9. I/O INTERFACE BOARD (DIGITAL INPUTS AND ALARM RELAYS).
10. LOAD CURRENT SHUNT.
11. LIVE BUS (+VE).
12. CHASSIS EARTH CONNECTION BOLT (M8).
13. ELECTRONIC FUSE FAIL BOARD.
14. REAR COVER.

REV	CHANGE	ECO No	DATE	BY
00	FIRST PRODUCTION ISSUE		29/11/2013	BS

DO NOT SCALE

ALL DIMENSIONS ARE IN MILLIMETERS

GENERAL TOLERANCE

	LINEAR	HOLE CNTR
100<	±0.25	±0.15
300<	±0.50	±0.25
300>	±1.00	±0.50

UNLESS OTHERWISE STATED

DRAWN: BS
DATE: 29/11/2013
CHECK:
APPR:

EATON Powering Business Worldwide

ABN 66 103 014 571
10 Kent Road
Mascot 2020

MAT: N/A
FINISH: N/A
SCALE: X : X

GENERAL ARRANGEMENT
MCS6-320, DC-DC CONVERTER SUBRACK

DWG No: IEE0964-2-021

PART No: XXXXXXXX
SHEET: 1 OF 1
A3

MCS6-320 CONVERTER SUBRACK

DC INPUT
INPUT 2
INPUT 1
16 mm² RED
16 mm² BLUE
16 mm² RED
16 mm² BLUE
100A ISOLATORS

MODULAR CONVERTER MCU-3G
FUTURE EXPANSION
POSITIVE (+VE) BUS
NEGATIVE (-VE) BUS (BOTTOM MOST BUSBAR)

SERIAL COMMUNICATIONS
USB COMMUNICATIONS
ETHERNET COMMUNICATIONS
XS1 REAR RS232 PORT
FRONT USB PORT
XS31 REAR ETHERNET PORT
YS11
SC200 SUPERVISORY MODULE

VOLTAGE FEED BOARD
TB1 P1 P2 P4 P3 S1 S2 S3
SC/CAB
SV1/CAB
SV2 CAB
CAT5 UTP

FUSE FAIL MODULE
S2 S1 BATT AUX TRIP SENSE
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18
DS1/DCD
16 x FUSE SENSE WIRES (SEE NOTE 3)

SHUNT MODULE
XU1 XU2
NOTE 4
SU1/CS

I/O INTERFACE BOARD
XH9 XH8 YH3 YH11 XH6 XH4 XH7
DS1/DCD
SV1/CAB
SU1/CAB
ORANGE WHITE
D1 0V D2 0V D3 0V D4 0V D5 0V D6 0V
XH15A XH15B
DIGITAL INPUTS
ALARM OUTPUT

6 ALARM OUTPUTS
SCREWLESS TERMINAL BLOCK WIRE RANGE: 0.2 - 2 mm²
SUMMARY NON URGENT — XN16 RELAY 1
LOAD/HIGH LOAD — XH17 RELAY 2
CONVERTER FAIL — XH18 RELAY 3
LOAD DISCONNECT — XH19 RELAY 4
NOT USED — XH20 RELAY 5
MONITOR OK — XH21 RELAY 6
COM NO NC

6 mm² GREEN/YELLOW 1mts LONG
RACK EARTH

NOTE 5
CB1 CB2 CB3 CB4 CB5 CB6 CB7 CB8 CB9 CB10 CB11 CB12 CB13 CB14 CB15 CB16 CB17 CB18 CB19 CB20

LOAD LIVE (+VE)
UP TO TWENTY MINIATURE CIRCUIT BREAKERS
CONNECTION: CIRCUIT BREAKER TUNNEL TERMINAL
2 A - 25 A : 25 mm² STRANDED*
32 A - 63 A : 35 mm² STRANDED*
* TYPICAL MINIATURE CIRCUIT BREAKERS

35 mm² GREEN/YELLOW 1mts LONG
RACK EARTH

LOAD COMMON (-VE)
UP TO TEN LOAD CONNECTIONS
CONNECTION: M6 RING LUGS

NOTE:
THIS DRAWING ILLUSTRATES THE STANDARD NEGATIVE EARTH MCS6-320 DC-DC CONVERTER SUBRACK.

1. ACCOMMODATES UP TO SIX (6) OFF 3G MCU CONVERTER MODULES.
2. ALL POWER CABLES ARE TO BE 25 mm², RED OR BLACK CABLE WITH RED HEAT SHRINK SLEEVE FOR POSITIVE AND BLUE OR BLACK CABLE WITH BLUE HEAT SHRINK SLEEVE FOR NEGATIVE, UNO.
3. ALL SENSE WIRES ARE 0.75 mm2 WHITE UNO.
4. CURRENT SHUNT STUB (117570).
5. CORRECT QTY. OF LOAD CIRCUIT BREAKERS, ARE SPECIFIED ON SALES ORDER.

REV	CHANGE	ECO No	DATE	BY
00	FOR PRODUCTION		28/11/2013	BS

DO NOT SCALE
ALL DIMENSIONS ARE IN MILLIMETERS
GENERAL TOLERANCE

	LINEAR	HOLE CNTR
100<	±0.25	±0.15
300<	±0.50	±0.25
300>	±1.00	±0.50

UNLESS OTHERWISE STATED

DRAWN: BS
DATE: 28/11/2013
CHECK:
APPR:

EATON INDUSTRIES PTY LTD

ACN 66 103 014 571
10 Kent Road
Mascot NSW 2020

MAT: N/A FINISH: N/A SCALE: X : X

WIRING DIAGRAM
MCS6-320, DC-DC CONVERTER SUBRACK

DWG No: IEE0964-2-022
EATON P/N: XXXXXXXX SHEET: 1 OF 1
A3