

DCM2000-A21X
DC DISTRIBUTION MODULE

Installation and Operation Guide

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Purpose

This guide provides instructions to correctly configure and install the Eaton DCM2000-A21X Distribution Module.

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 DCM2000 Distribution Module. It does not cover details of the power system to which it is connected.

Related Information

- Eaton Heinemann AM/R and AM1P Series Circuit Breakers

For Further Information and Technical Assistance

For further information and technical assistance contact Australia 1300 877 359

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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 load cables are appropriately sized to handle the maximum dc output current in each cable. Multi-strand cable with insulation rating of 600V-1000V is recommended
- With cable installation provide firm strain relief and adequate anchorage.
- To minimize parasitic cable inductance and reduce electromagnetic interference, group dc cables together and avoid large current loops.
- Ensure that circuit breakers in the dc distribution unit are clearly labeled.

Connecting the Load Cables

- Before connecting load cables switch off or remove load circuit breakers
- Before switching on circuit breakers ensure the circuit polarity is correct.
- Refer to the installation section for details of connections.

General OH&S Issues

- Be aware that hazardous energy levels are present on this distribution system especially when backed up by batteries. Short circuit currents of several thousand amps can occur.
- As a general rule, use insulated tools and do not wear rings, watches and jewelry.

Physical Details



Basic DC Distribution Module details are as follows:

- 4 RU DC Distribution Module (DCM) suitable for mounting in a 19" rack.
- Overall depth 290mm
- Front access to circuit breakers via hinge down front panel. Removable circuit breaker escutcheon behind (4 screws to remove) with label holder.

Front Connections – Outgoing Load Cables

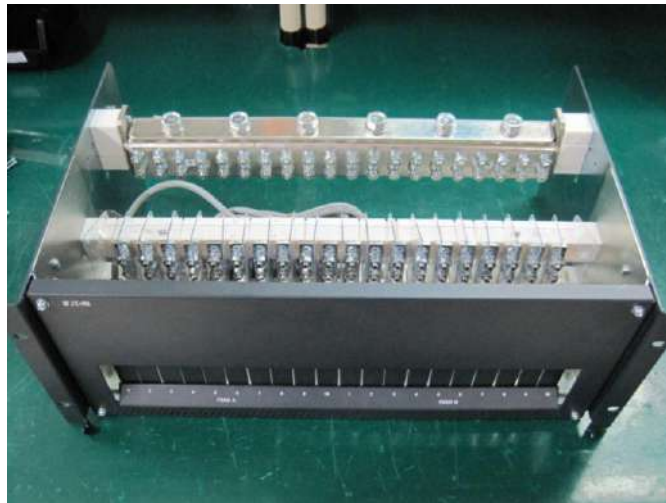
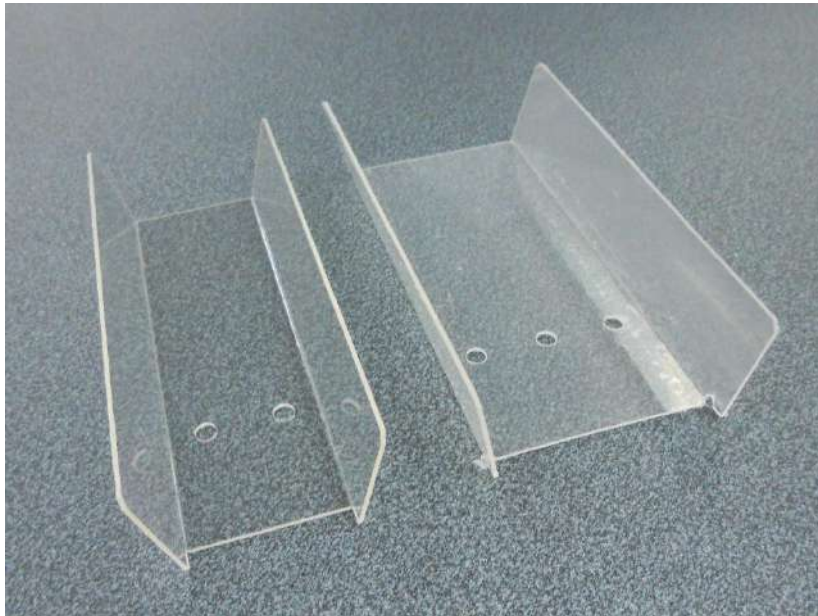


Figure above shows view from above the front of the unit, showing connections as follows:

- Outgoing live connections from 1P, 2P or 3P bars at the tops of the circuit breakers (remove inner front panel for access to connections) – M6 (1/4") threads
- Outgoing common cabling from rear common bar, single screw, 2P bar or 3P bar (remove front panel and blank panel above for access).- M6 (1/4") threads

- The DCM2000-21X unit is supplied set up for 20 x single pole breakers to be plugged in, for circuit breaker ratings up to 100A. For higher current circuits, double pole breakers (up to 200A) and triple pole breakers (250A) are required.
- For the double pole and triple pole breakers, paralleling busbars are required for both the common bar and the breaker output cable connections. The single pole insulators need to be removed from the DCM and be replaced by a wider insulator to fit the 2 pole or 3 pole paralleling busbar.
- Paralleling busbars and insulators are shown below.



- Circuit breaker kits for double pole or triple pole breakers can be supplied by Eaton. Each kit contains the actual circuit breaker, the associated paralleling busbar and the associated insulator.

Circuit Breaker Plug-in Positions

The photograph below shows the 20 x single pole circuit breaker positions, each with an insulation barrier around the top cable connection.

The breaker plugs into the lower two brass cylinders above and below the auxiliary contact connection printed circuit board.



Picture below shows breaker plug-in power and auxiliary contact connections.

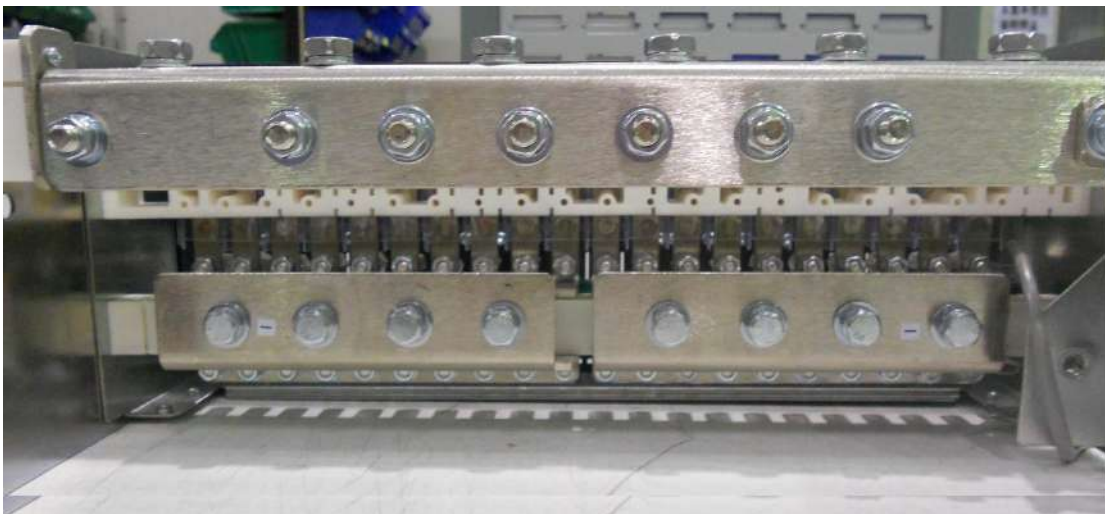


Rear Connections – Incoming Common and Live Cabling

Rear Common Positive incoming M10 bolt connections are on top surface of busbar and M10 stud connections at rear of bar, as shown below.



Rear Live A and B negative incoming M10 bolt connections shown in the lower area below

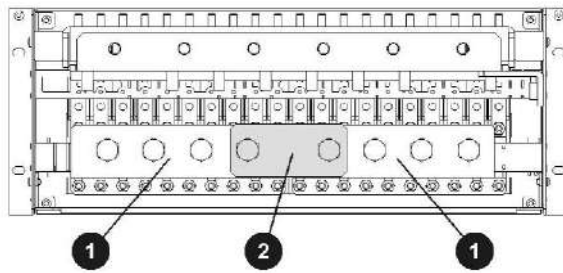


- **Important Note**

Incoming cable connections should be spread across busbar connections to achieve optimum busbar current rating

Single Plane System with Rear Link Bar Fitted

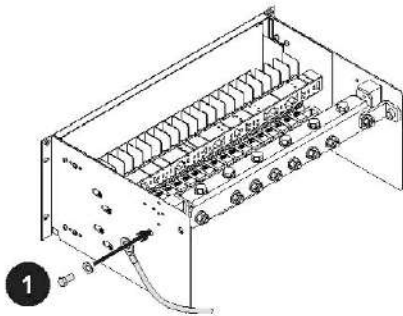
- Remove the bus link 2 to split the Live bus



- 1 Live bus bars (rear view).
- 2 Remove the bus link to split the Live bus.

DCM Chassis Earth Connection

An M10 clearance hole is provided in the rear area of the side panel for connecting the chassis earth cable, as shown below.



- 1 Use M10 nut and bolt to bond ground cable to chassis. Tighten to the correct torque.

Circuit Breaker Options

The plug-in circuit breaker positions accept Eaton Heinemann Hydraulic-Magnetic breakers type AM/R and AM1P with the following ranges:-

- **Single Pole Breakers**

These plug into a single position and have an outgoing cable connection to the bar above the breaker. Typical sizes supplied are 15A, 30A, 60A, 80A and 100A. These breakers use the single pole insulators supplied fitted to the DCM.

The common positive cable connection to the same load connects to a single bolt position on the front of the rear common bar.

There are up to 20 off single pole positions, 10 connected to live input A and 10 connected to live input B.

- **Two Pole Breakers**

These plug into a two pole position and have an outgoing cable connection to a two pole paralleling bar above the two breaker positions (which has larger stud size M10 for a larger cable). Typical sizes supplied are 125A, 160A, 175A and 200A. These two pole positions require a 2 pole insulator.

The common positive cable connection to the same load connects to an identical two pole paralleling bar bolted to the common busbar (for connection of larger cable).

There are up to 10 off two pole positions, 5 connected to live input A and 5 connected to live input B.

- **Three Pole Breakers**

These plug into a three pole position and have an outgoing cable connection to a three pole paralleling bar above the three breaker positions (which has larger stud size M10 for a larger cable 150mm²). This is to be used for a 250A 3 pole circuit breaker. These three pole positions require a 3 pole insulator.

The common positive cable connection to the same load connects to an identical three pole paralleling bar bolted to the common busbar (for connection of larger cable).

There are up to 6 off three pole positions, 3 connected to live input A and 3 connected to live input B.

Please Note: Thermal testing of DCM modules fitted with 6 off 3 pole circuit breakers concluded that there must a 1 pole gap between pairs of 250A 3 pole breakers when circuits are expected to supply loads approaching the breaker current rating. Refer Chapter 4 Selection of Circuit Breakers.

- **Mix of Breaker Sizes**

It is possible to fit a mixture of single pole, two pole and three pole breakers in the same DCM. Refer to note in Three Pole Breakers above regarding a 1 pole space between pairs of 250A 3 pole breakers. This 1 pole space must not be filled by a single pole circuit breaker.

- **Common Input Bar Option**

The A and B input bar positions can be fitted with a common live input bar to make the DCM a single plane unit.

Auxiliary Contact Alarm Details

- **Auxiliary Contact Details**

Circuit breaker auxiliary contact is a changeover contact output.

The top pin (with breaker lever up for 'on') is the common of the changeover contact.

With the breaker off the bottom pin is the closed contact and the centre pin is the open contact.

- **Auxiliary Contact PCB Details**

The auxiliary contact pcb commons all auxiliary common positions, commons all NO contact positions and commons all NC contact positions. The pcb is fitted with an RJ45 socket each end and a 3 pin header with a 2 position bridging link for setting alarm options. Refer to the Circuit Diagram DRG 3700166 for details of this link.

For this application the link will be set so that, when any circuit breaker is switched off, the auxiliary contact of that breaker links pin 1 to pin 6 of the RJ45 connector. For this to occur, the header link should be between pins 2 and 3. The pcb identifies pin 3 and the link should be in the right hand position.



Fig 1



Figure 2

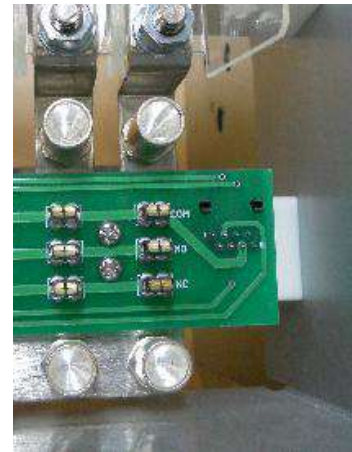


Figure 3

Figure 1 – shows the left hand end of the auxiliary contact pcb, viewed from the front of the unit (with front panels removed). This shows the 3 way header with 2 way link fitted on pins 2 and 3.

Figure 2 – also shows the left hand end of the auxiliary contact pcb, viewed down at angle from above the front to show the RJ45 connection socket for extending alarm wiring.

Figure 3 – shows the right hand end of the same pcb, indicating that there is a second RJ45 socket fitted at that end. This allows daisy-chaining DCM alarms if required.

- **Load Alarm Board Circuit Diagram DRG 3700166**

A copy of the auxiliary alarm board circuit diagram is included in the Drawings section at the rear of this manual. This shows a diode in series with the common alarm output, indicating that this circuit will pull down on a high digital input to give an alarm.

Circuit Breaker Details

Eaton Heinemann Catalogue

Refer to the Eaton Heinemann catalogue for Heinemann AM/R and AM1 P breaker details.

Selected Circuit Breaker Options

The following breaker kits and separate breakers have been selected as preferred options.

Each breaker kit includes the breaker, 2 x paralleling busbars and insulator

Other relevant part numbers are included in the following:

#	Eaton P/N	Eaton/Heinemann Description	Current Rating	No of Poles	Telstra Serial Item No.
1	61236678	DCM2000-21X, +E, 4U, SUIT BULLET BREAKERS			27400994
2	61239510	Breaker AM1R-Y222-1 50KA HIC LABEL 15A Curve 3	15A	1	27400995
3	61239511	Breaker AM1R- Y222-2 50KA HIC LABEL 30A Curve 3	30A	1	27400996
4	61239512	Breaker AM1R- Y222-3 50KA HIC LABEL 60A Curve 3	60A	1	27400997
5	61239513	Breaker AM1R- Y222-4 50KA HIC LABEL 80A Curve 3	80A	1	27400998
6	61239514	Breaker AM1R- Y222-5 50KA HIC LABEL 100A Curve 3	100A	1	27400999
7	61239515	Kit Breaker AM1P-Y34-1 50KA HIC LABEL 125A Curve 3	125A	2	27401000
8	61239532	Kit Breaker AM1P-Y34-2 50KA HIC LABEL 160A Curve 3	160A	2	27401001
9	61239533	Kit Breaker AM1P- Y34-3 50KA HIC LABEL 175A Curve 3	175A	2	27401002
10	61239534	Kit Breaker AM1P-Y34-4 50KA HIC LABEL 200A Curve 3	200A	2	27401003
11	61239535	Kit Breaker AM2P-Y34-5 50KA HIC LABEL 250A Curve 3	250A	3	27401004
12	61239597	Breaker AM1P-Y34-1 50KA HIC LABEL 125A Curve 3	125A	2	27401005
13	61239600	Breaker AM1P-Y34-2 50KA HIC LABEL 160A Curve 3	160A	2	27401006

14	61239601	Breaker AM1P-Y34-3 50KA HIC LABEL 175A Curve 3	175A	2	27401007
15	61239602	Breaker AM1P-Y34-4 50KA HIC LABEL 200A Curve 3	200A	2	27401008
16	61239603	Breaker AM2P-Y34-1 50KA HIC LABEL 250A Curve 3	250A	3	27401009
17	61236682	Busbar 2P Parallel, suit AM/P CB, DCM2000			27401010
18	61239604	Busbar 3P Parallel, suit AM/P CB, DCM2000			27401011
19	61240013	Insulator for 2P Eaton Heinemann breaker			27401012
20	61240014	Insulator for 3P Eaton Heinemann breaker			27401013
21	61240009	System, Telstra LOD Rack, 2 LODS fitted			27401014
22	61240011	System, Telstra LOD Rack, 4 LODS fitted			27401015

Specifications and Selection of Breakers

DCM2000-21X SPECIFICATIONS

Dimensions (H, W, D)	4U (178mm), 19-inch mounting, 290mm
Clearances	Above: 2U required for cable access Below: 1U recommended
Maximum load currents	Single bus: 1200A at 43.2 – 59.6V Split bus: 2 x 600A at 43.2-59.6V
Maximum Ambient Temperature (operating)	45 ⁰ C
Relative Humidity (operating and storage)	<95% (non-condensing)
Circuit breaker trip alarm	RJ45 connector. Pin 1 = Live on alarm, pin 6 = common (separate circuit to power circuits – refer circuit diagram at rear of this manual).
Torque settings	M6: 3.9 – 4.5 Nm M10: 18.7 – 21 Nm

SELECTION OF CIRCUIT BREAKERS

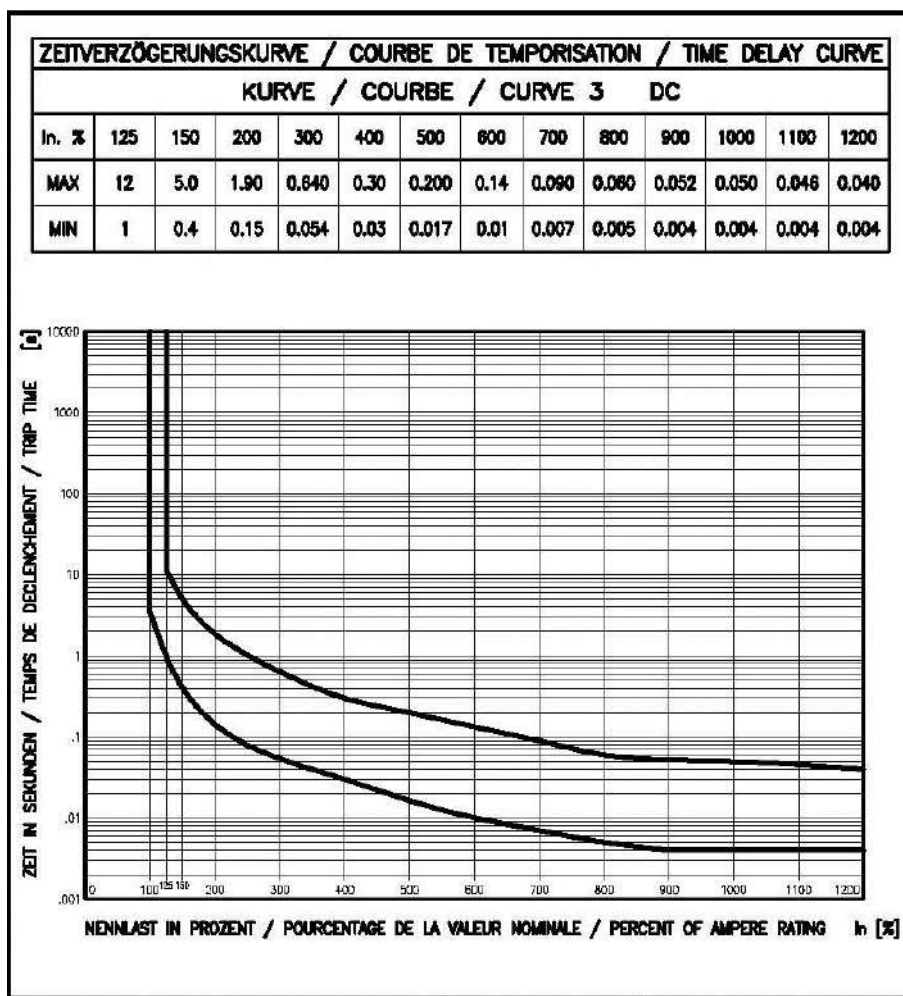
It is the responsibility of the designer/installer to select breaker sizes and layout such that actual maximum load currents do not exceed the maximum load current specifications given above (1,200A or 2 x 600A).

For maximum reliability the maximum load currents must be spread over the breaker positions. Multiple DC input cable connections are also spread over the main busbars. Some general design rules have been included in this document as a guide. These rules are based on applications where the actual load current is approaching the circuit breaker rating.

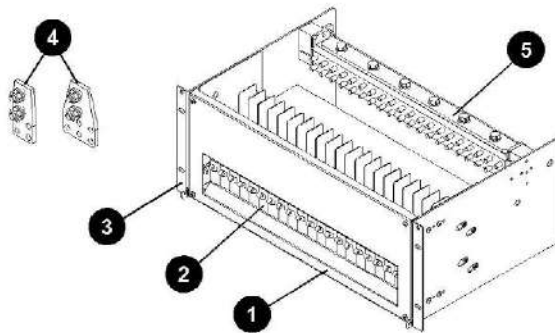
These selection guide rules include the following:-

- These Eaton Heinemann breakers are magnetic / hydraulic and not sensitive to ambient temperature variation. There is no requirement to apply temperature de-rating as for thermal breakers.
- Consideration should be given to worst case current (at low DC volts) and a safety margin may also be considered.
- Circuit breakers are not polarity sensitive but, because the breaker toggles are offset, there is only one way that breakers will fit the cut-out slot in the front panel.

- As a guide, if the DCM is to be fitted with all single pole 100A breakers, and if the circuits are running close to full rating, the number of breakers will be limited to 12 (or 6 per plane). In this situation, to spread the busbar loading, a spare breaker position should be included after every pair of 100A breakers.
- As a guide, if the DCM is to be fitted with all double pole 200A breakers, and if the circuits are running close to full rating, the number of breakers will be limited to 6 (or 3 per plane). In this situation, to spread the busbar loading, a spare breaker position should be included after every pair of 200A breakers.
- As a guide, if the DCM is to be fitted with all triple pole 250A breakers, and if the circuits are running close to full rating, the number of breakers will be limited to 4 (or 2 per plane). In this situation, to spread the busbar loading, a spare breaker position should be included after every pair of 250A breakers.
- Positioning of combinations of breakers must be based on the maximum current ratings of busbars, the actual maximum currents in the circuits and the requirement to spread the current loading over the 10 breaker positions.
- For loads with high inrush current it may be necessary to check the breaker sizing. The following diagram shows the Time Delay DC Curve 3 characteristic of the Eaton Heinemann breakers supplied.



Typical DCM2000 Distribution Module



- ① Removable front cover.
- ② Up to 20 circuit breakers (supplied separately). Number of circuit breakers depends on ratings.
- ③ 19-inch rack mount brackets (four rack mounting screws, washers and nuts are supplied).
- ④ Cable connection plates for 2-pole or 3-pole circuit breakers (supplied separately).
- ⑤ Common bar for vertical common cable access (horizontal common cable access is optional).

General Details

1. Remove two top fixing screws to drop down front panel
2. Remove four front corner fixing screws to lift off circuit breaker cover for connection of load cables. This cover is fitted with a front label holder for circuit breaker feed details.
3. Breaker positions, single pole, two pole or three pole.
4. Add on live terminal plates for two pole and three pole breaker connections.
5. Live terminal insulators. Normally fitted with single pole. Removal of single fixing screw per pole allows removal of insulator.
6. Common busbar at rear

Installation Procedure

Step 1 – Install DCM in Cabinet

- Fix to 19" mounting rail in required position
- Remove blank panels and side covers if necessary to give access to connections.
- Remove positive to chassis link on DCM, if fitted.
- Install earth cable from LOD chassis to rack earth bar.

Step 2 – Access circuit breakers

- Open the hinged front cover.
- Undo and remove the circuit breaker cover
- To remove any breakers already fitted, pull out.

Step 3 – Check Circuit Breaker Auxiliary Alarm Link

- Check 2 way link on 3 way header on auxiliary contact pcb (to the left of circuit breaker position 1) is parked linking terminals 2 and 3 (two right hand pins).
- Also check cat 5 cable is plugged into the RJ45 socket in the same area

Step 4 – Fit circuit breakers (if required)

WARNING: Circuit breakers must be fitted the right-way up so that front panel can be refitted.

Plug in circuit breakers. Exercise care to insert top and bottom breaker plugs evenly so that the rear auxiliary alarm contact lugs line up with the split in the receptor pins on the pcb behind. Damage to the pcb pins may result if breakers are not evenly inserted.

- Check the circuit breakers are the right-way up (refer warning above). The circuit breaker cover will not fit if circuit breakers are upside down. Breaker lever up is on.
- As a guide, for single circuit breakers rated 100A leave an empty position between pairs of circuit breakers to more evenly distribute the current loading along the bar. Refer Chapter 4.
- For 2 pole and 3 pole circuit breakers (120 – 250A):
 - o Replace the 1-pole live terminal insulators with a 2-pole or 3 pole insulator as required (refer replacing insulator instructions)
 - o Fit a 2-pole or 3-pole cable connection plate to the circuit breaker terminals and also to the common bar terminals for termination of larger cables.
 - o When fitting 6 x 3-pole breakers, allow a single pole gap between pairs of breakers (breaker1 – breaker 2 – 1 pole gap – breaker 3 - breaker 4 – 1pole gap – breaker 5- breaker 6). This provides a more even distribution of busbar loading. Refer Chapter 4.

Step 5 – Install and terminate cables

- Select cable sizes to suit the circuit breaker ratings, taking into account voltage drop for long runs (refer the following table for minimum sizes). Cable insulation must be minimum 90⁰C rated.
- Route the cables into the distribution cabinet, providing cable support and tidy cable management. Additional cable ties will probably be required after termination of the cables. Plan cable routing details.
- Terminate the load cables (live and common) with double hole crimp lugs. Hole details and hole centre dimensions are shown in the table below. Fit heatshrink to exposed crimp connections on lugs (blue for live and red for common).

Cable Termination Details

CB rating	Cable Size (min) mm ²	2-hole Crimp Lug details	Cable Lug Part Numbers
15A	2.5	To suit M6 studs on 15.9mm centres	No 2 hole lug available
30A	6		No 2 hole lug available
60A	16		CABAC p/n CAL16SPSB616
80A	25		CABAC p/n CAL25SPSB616
100A	35		CABAC p/n CAL35SPSB616
125A	50	To suit M10 studs on 25.4mm centres	CABAC p/n CAL50SPSB1025
160A	70		CABAC p/n CAL70SPSB1025
200A	95		CABAC p/n CAL95SPSB1025
250A	150	To suit M10 studs on 25.4mm centres	CABAC p/n CAL150SPSB1025

Note:

Cable sizes for larger breakers have been based on current ratings and not voltage drop. Current ratings are based on outgoing cables being grouped in double-tiered formation inside the LOD rack.

Step 6 – Check terminations, secure cables and test insulation

- Check all terminations are correct and tighten to following torque settings:
 - M6 studs – 3.9-4.5 Nm
 - M10 studs - 18-22 Nm
- Secure all cables neatly using cable ties
- Remove any earth connections temporarily and megger test insulation resistance of cables.
- Refit earth cables as required

Step 7 – Refit covers and close circuit breakers

- Refit circuit breaker cover, removing metal pole fillers from rear side of cover to suit circuit breaker positions.
- Refit cabinet blank panels

Step 8 – Switch on circuit breakers (if and when required)

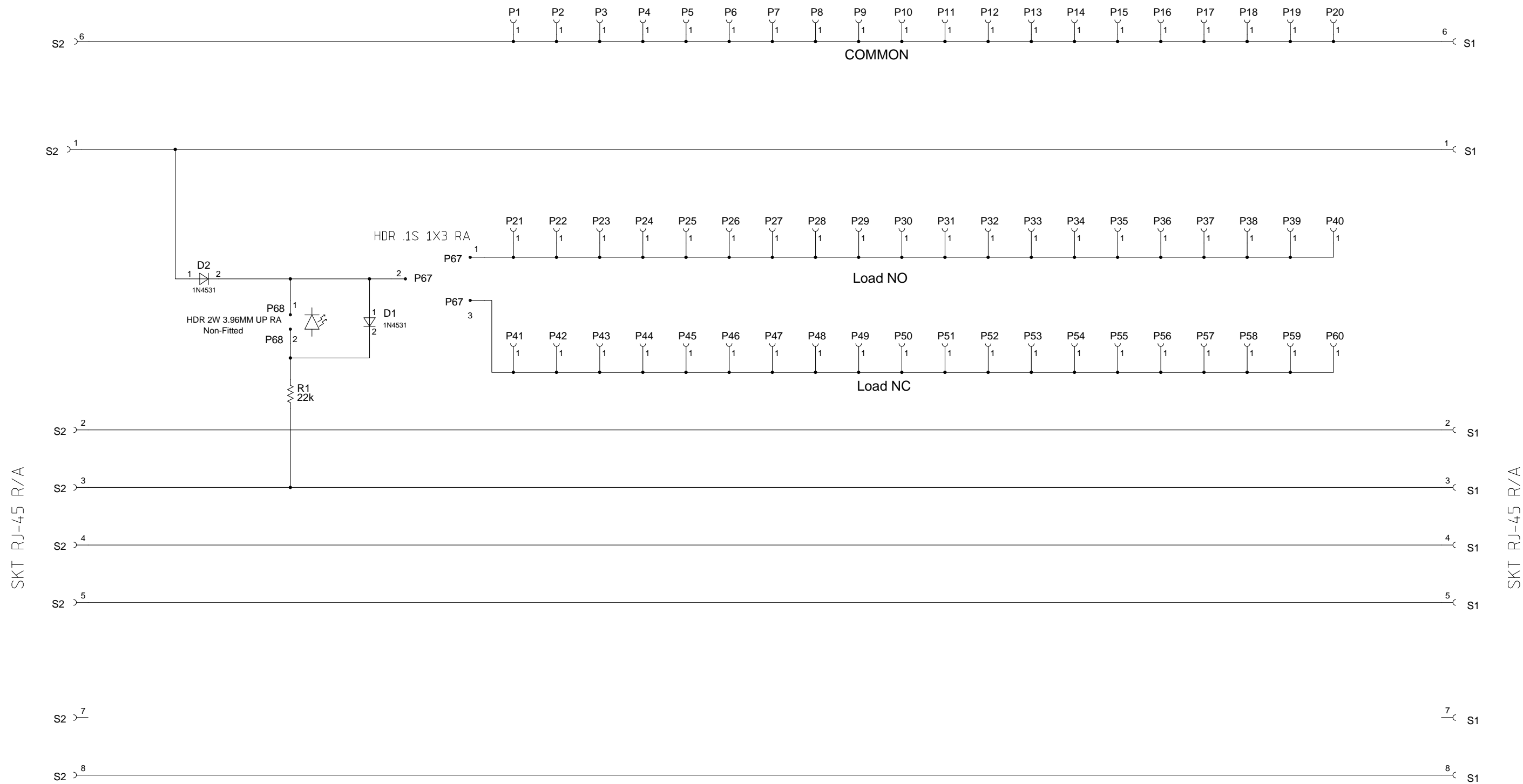
- Refer to the equipment manufacturer’s instructions before applying dc power to any equipment
- To apply dc power to the equipment, switch on the circuit breaker
- Close the hinged front cover.

Removing Insulators

- To remove an insulator remove the single countersunk screw above the crimp lug fixing studs
- Remove screw and insulator lifts out vertically.



Screwdriver removing insulator fixing screw



ISSUE	AMENDMENTS	DRAWN	CHKD	APPD	DATE
1	PROTOTYPE 1	GD	YL	YL	30.10.07
A	UPDATED WITH NEW MCB CONNECTOR REF-E35339	ANW	YL	YL	9.4.08
A1	P68 NOW NON-FITTED, R1 WAS 0.1% PART REF-E36657	ANW	YL	YL	2.7.09
B	LEAD FREE UPDATE NO CHANGE TO CIRCUIT REF-E37789	ANW	JPM	JPM	19.4.11

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**NGA APS UL Versions
LOAD ALARM BOARD**

EATON IPN: 350-00114-01B	
MFN: SK710-B0086-01P	SHEET 1 OF 1
DRG 3700166	B ISSUE

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 95). 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 _____

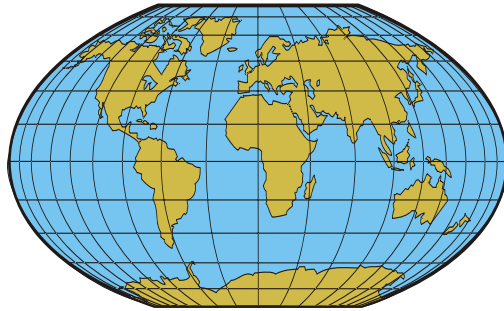
INFORMATION (fault details, circumstances, consequences, actions)

Internal use only.

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

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



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