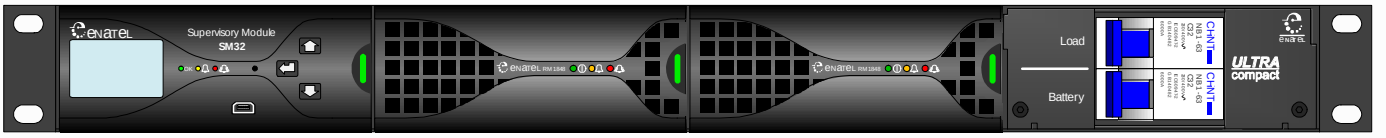

1U *ULTRA* Compact System

Installation Manual
V1.2

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SMART
power design

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Receiving Instructions

CAUTION: 

For your protection, the following information and the product manual should be read and thoroughly understood before unpacking, installing and using the equipment.

We present all equipment to the delivering carrier securely packed and in perfect condition. Upon acceptance of the package from us, the delivering carrier assumes responsibility for its safe arrival to you. Once you receive the equipment, it is your responsibility to document any damage the carrier may have inflicted, and to file your claim promptly and accurately.

Package Inspection

- Examine the shipping crate or carton for any visible damage: punctures, dents and any other signs of possible internal damage.
- Describe any damage or shortage on the receiving documents and have the carrier sign their full name.

Equipment Inspection

- Within fifteen days, open crate or carton and inspect the contents for damages. While unpacking, be careful not to discard any equipment, parts or manuals. If any damage is detected, call the delivering carrier to determine the appropriate action. They may require an inspection.
  Save all the shipping materials for the inspector to see!
- After the inspection has been made and you have found damage, call us. We will determine if the equipment should be returned to our plant for repair or if some other method would be more expeditious. If it is determined that the equipment should be returned to us, ask the delivering carrier to send the packages back at the delivering carrier's expense.
- If repair is necessary, we will invoice you for the repair so that you may submit the bill to the delivering carrier with your claim forms.
- It is your responsibility to file a claim with the delivering carrier. Failure to properly file a claim for shipping damages may void warranty service for any physical damages later reported for repair.

Handling

Handle the equipment with care. Do not drop or lean on front panel or connectors. Keep away from moisture.

Identification Labels

Model numbers are clearly marked on all equipment. Please refer to these numbers in all correspondence with Enatel.

SCOPE

This manual covers essential information for the installation and commissioning of the 1U *ULTRA* Compact Enatel Compact DC Power System (see Appendix for individual model specifications).

System set-up for the rectifiers, alarms etc., are provided in separate manuals for the SM3x supervisory module and RM2048 rectifier.

All installation and maintenance must be carried out by suitably qualified personnel.

Note: The 1U ULTRA Compact system is available with positive earthing (-48VDC, -60VDC) or negative earthing (+24VDC). The installation manual covers both earthing varieties, the standard system is assumed to be positive earthing. Where parameters and settings differ between systems, the negative earthed system parameters will be specified within parenthesis i.e.( ).

SYSTEM OVERVIEW

The 1U *ULTRA* Compact DC Power System has a maximum power output of 4.0kW (+24V rated to 2.0kW), producing a maximum current output of 83A at -54Vdc (83A at +27Vdc).

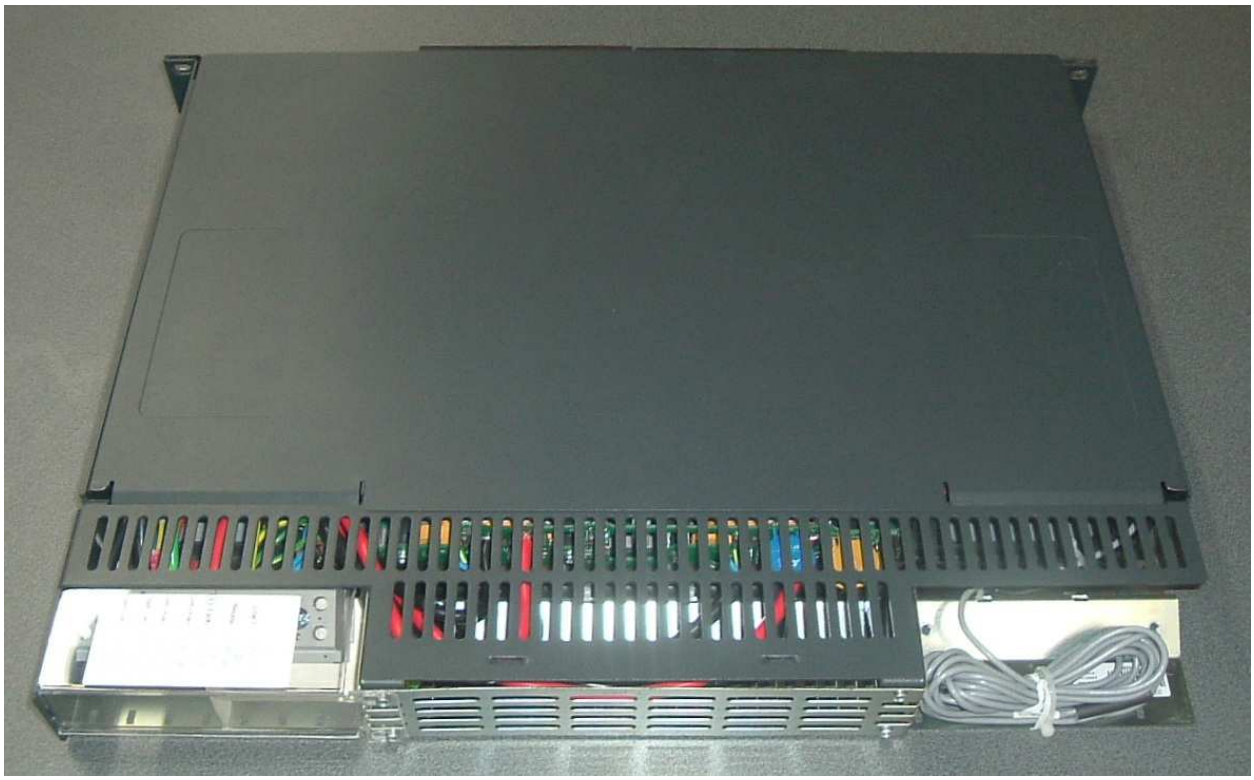
The system is intended to be a complete power system in a box, so no connections need to be made internally. All the AC, DC (Load and Battery) connections are made at the rear of the unit. Alarm connections are assessable from the front.

The system is designed to be extremely simple to install and set up.

The following is a summary of the system:

- Overall size is 483mm wide (19" standard mounting) x 44.5mm high (1U) x 350mm deep
- Up to 2 RM18xx series rectifiers or 2 RM20xx rectifiers - may be packaged separately
- SM31 or SM32 supervisory module (fully integrated in the system)
- Battery Low Voltage Disconnect fitted as standard (80A rating).
- 1x 63A Battery Circuit Breaker, this may be specified as different values (from 2A to 63A) at time of order.
- 1x 63A Load Circuit Breaker, this may be specified as different values (from 2A to 63A) at time of order.

- System weight is approximately 5kg without rectifiers, and 7.6kg with two rectifiers fitted.
- Single set of 1-phase input terminals (phase, neutral and earth)



Note: This system is supplied with the AC and DC earths connected. The standard system (+ve earth system) output has the DC Common in the positive side of the circuit (-ve earth system output has the DC Common in the negative side of the circuit).

The earth link can be removed from the system to isolate earths. Please see the relevant section.

INSTALLATION

Unpacking & Installing in Frame

Upon unpacking, check that the unit is not damaged, and that you have the required number of rectifiers.

The unit fits into a standard 19" mounting frame. The mounting screws should be M6, however M5 may be used with washers. Be sure to mount the unit in the 19" frame squarely if M5 screws are used.

To fit the cover, remove the screws securing the top of the system and place on. Secure the cover to the chassis by replacing the screws. The rack will be able to securely hold the 1U system with just the bottom two screws fitted. Brace cabinet mounting if necessary.

Please note the complete system weight is 7.6Kg. Ensure the 19" mounting rails are able to withstand mounting of the system.

AC & DC Cabling

The AC terminals are clearly marked at the rear of the system (see Fig 1). The terminals can accept up to 10mm^2 cables.

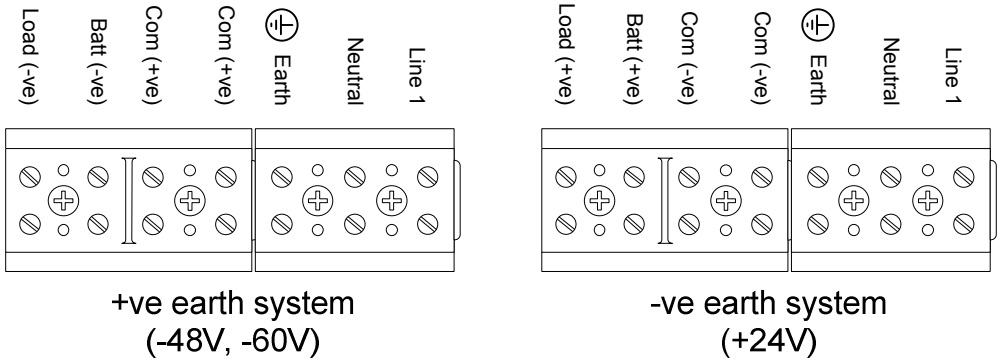


Fig. 1 System AC and DC Connection

The AC earth is internally bonded to the system chassis. DC Common (+ve or –ve depending on specification - see appendix for model numbers) is connected to the AC earth by a removable cable (green/yellow), but can be removed if DC output is required to be isolated from AC earth.

Fig. 2 System DC Earth connection

DC Cabling

CAUTION: Use extreme care when fitting batteries & their connections. Remove all jewellery and rings from oneself prior to commencing the installation. Always use insulated tools when fitting batteries and take extreme care not to short terminals when working on them.

All live DC cables terminate on the connectors at the rear of the unit as shown in Figure 1. These terminals are all 10mm^2.

The internal battery cabling goes directly to the circuit breaker, then via a Low Voltage Disconnect relay and current shunt to the internal live bus. This can be seen on the wiring diagram as the rear of this manual.

Common (+ve or –ve depending on specification) connections for both load and battery connections are made to the common connector at the rear of the system also shown in Fig 1.

Ensure cables are strain relieved by utilising the cable tie slots provided (see Fig 2).

Once cables are connected, ensure cable connector cover is fitted and secured.

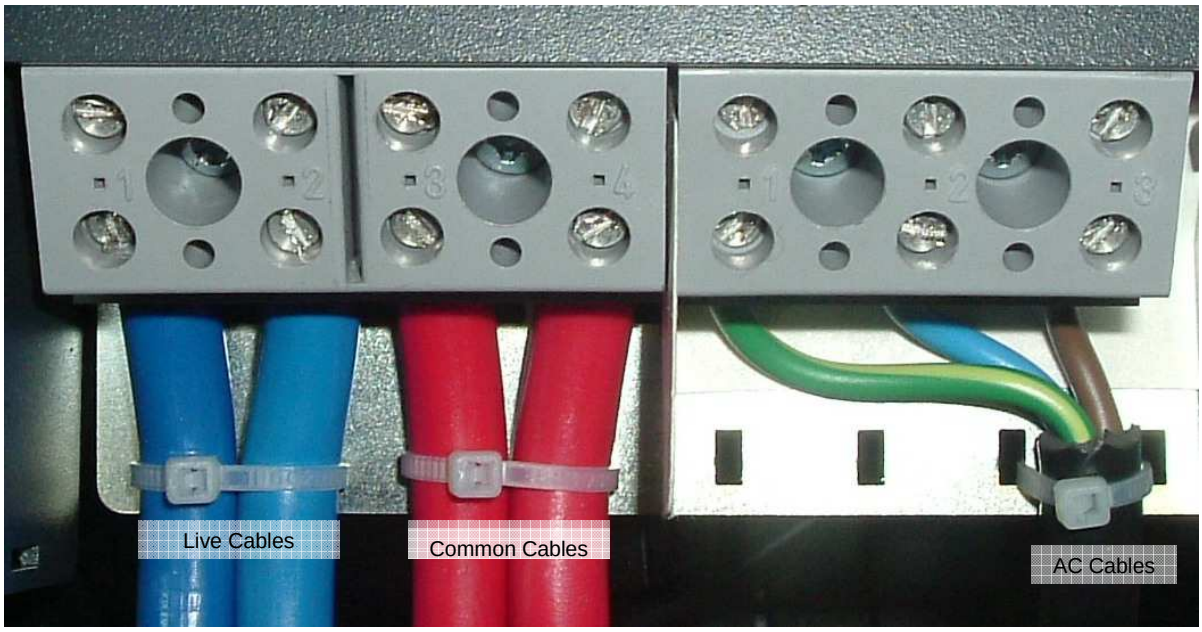


Fig 3. AC and DC cable strain relief

Alarm/Ancillary Cabling

Alarm and communication cables terminate directly into the rear of the Supervisory Module, SM31 or SM32, which terminals are assessable by pulling the monitor forward to expose connections (see Fig 3 & 4).

When routing the cables, ensure they are kept away from the AC and DC power cables when possible.

Fig 4. For removal, unlock SM3x by lifting green locking tab.

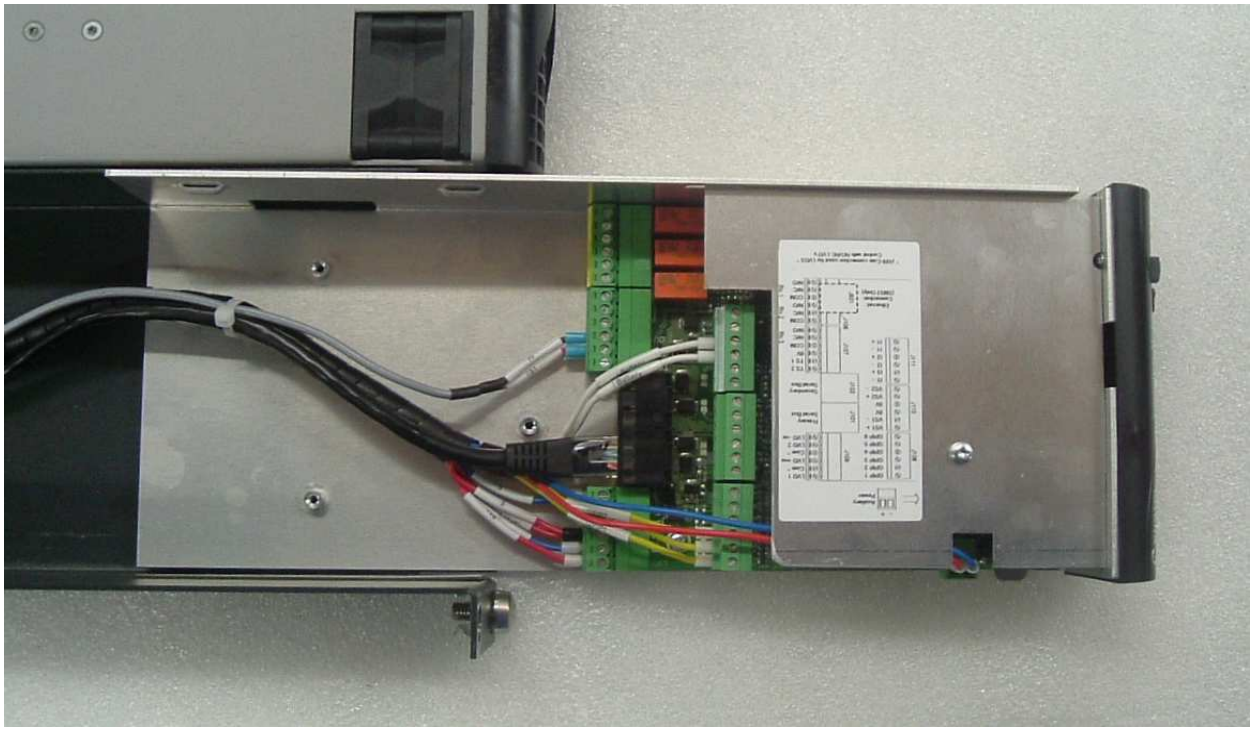


Fig 5. SM3x cable access

The relay states labelled Normally Open or Normally Closed are for their de-energised state. If an alarm is programmed for the relay to be normally energised (as may be possible in the case of a low voltage alarm where loss of power will put the alarm into its active state), then be sure to connect the remote wiring appropriately.

For full SM31/32 functionality and operation information, refer to the SM31/32 Manual.

Uncoil the battery temperature sensor and place in the middle of the middle battery string. If the lead is not long enough, ordinary 2-core copper (approx. 0.75mm^2) wire can be used as an extension. The purpose of the battery temperature sensor is to monitor the ambient temperature of the batteries over long periods of time and adjust the rectifier output (float) voltage accordingly. As a result, it is not necessary to have the temperature sensor touching the batteries. If the Battery Temperature Sensor is removed a “battery temp fault” alarm is generated.

For remote communications and direct computer connection to the Compact System, refer to the SM31/32 Manual. These connections can be made via the mini-USB port on the front panel of the monitor (computer connection to the SM31 or SM32), and the Ethernet port (SM32 web-based communications only).

Alarm Mapping to Volts-free Relays

Note that on all systems, Relay 1 is pre-configured as the "Monitor Fail" alarm. This alarm activates is the monitor has a hardware fault or if software becomes corrupted.

All other relays can be mapped to different alarm conditions. The SM31/32 Manual details how these may be changed. On the standard Compact Systems alarms are preconfigured as follows:

Relay 2: Summary Non-urgent alarm

Relay 3: Summary Urgent alarm

As mentioned, if these mappings are not appropriate, they can be changed in the field to suit customer requirements.

Circuit Breaker Fail Monitoring

The load circuit breaker is monitored electronically by a general purpose input on the SM31/32. The digital input will trigger an alarm when it is pulled to the system common (+ve or –ve depending on specification) rail. This means that to operate the load must be connected. In this way, false alarms are avoided when no load is connected and the load circuit breaker is in the "off" position.

Note: This means that a residual voltage will be measured at the load terminal even when the circuit breaker is turned off. This is high impedance and does not present a hazard to the user

The battery circuit breakers however, use voltage sense to detect tripping or whether they are turned off. This is because when a battery breaker is tripped, there may be very little voltage difference, making electronic fail detection problematic. Hence, if no battery is connected, the breaker must be "on" to clear the Battery Breaker Fail alarm.

LVD OPERATION

This system is configured with a single Low Voltage Disconnect contactor in the battery side of the circuit (see wiring diagram at rear of this manual).

The SM31/32 supervisory and monitor unit is powered from both the rectifier side of the LVD contactor and battery source. Therefore when the low voltage threshold is reached and the LVD disconnects the battery, the SM3x will loose voltage sense (as voltage sense is measuring rectifier bus voltage) but still maintains operation for monitoring system. The LVD contactor will not re-engage until the rectifier power is restored (i.e., until the DC bus voltage is restored).

COMMISSIONING

Use the following set of instructions as a guide, unless different procedures are recommended by local authorities.

Pre-check:

1. System installation is completed.
2. Battery and load circuit breakers are turned off, and upstream AC has been turned off (i.e., system is completely de-powered).
3. Rectifier modules have been placed into their shelf positions, and pulled forward enough to disconnect them from the system.
4. Check that the protective AC Earth is connected as per local regulations, and check that the DC Earth has been strapped to the AC Earth at a point physically close to the DC Power System (unless specifically requested otherwise). There must only be one AC to DC earth strap.

Note: This system is available in either negative earthing (-48VDC, -60VDC) or positive earthing (+24VDC) configurations. Before connecting batteries or rectifiers ensure that the correct system has been specified and earthing is correct for your application.

5. Turn on AC upstream and check that voltages from phase to neutral are as expected.

Rectifier Start-up

1. Turn the upstream AC circuits on.
2. Fully insert first rectifier, wait for the rectifier to start and its power on LED to remain green.
3. Check the SM3x powers up, and indicates the system default float voltage on its display. If the audible alarm activates, press any button to silence it.
4. If a different system float voltage has been specified, set this at this time using the procedure specified in the SM3x Manual (either from the front panel or connected computer).
5. Fully insert the rest of the rectifiers ensuring they power up with only their green “power on” LED illuminated.
6. Check that the load and battery currents on the SM3x are 0 amps (+/- 1 or 2 amps).
7. Check that all SM3x configuration settings are correct (as per customer specification) with respect to:
   - Voltage levels
   - Alarm settings
   - Alarm mappings to the volts-free relays

   (refer to the SM3x manual for information on how to check these via the front panel or locally connected computer).

Battery Start-up

Note: It is important that battery circuit breaker connections should be made when the rectifiers are turned on and the system is “live”. This is because the system voltage and battery voltages will be similar, thus minimising any arcing during connection. This also prevents high current arcing due to the charging of the rectifier output capacitors.

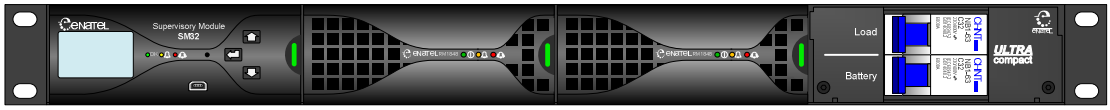
1. Power up only one rectifier initially (to limit any damage if any connections are incorrect).
2. Measure the voltage across each battery string at the terminals of the Compact System. Ensure that the reading from the DC Common bus to the Battery Live Terminals is -48V (or -60V, +24V as per system specification).
3. Turn on each battery circuit breaker in succession while measuring the battery voltage and ensure that the voltage increases slightly to the system Float Voltage (typically the voltage will increase from 2-3V below float to float voltage. At this point the batteries will be drawing some current to bring them to a full state of charge.

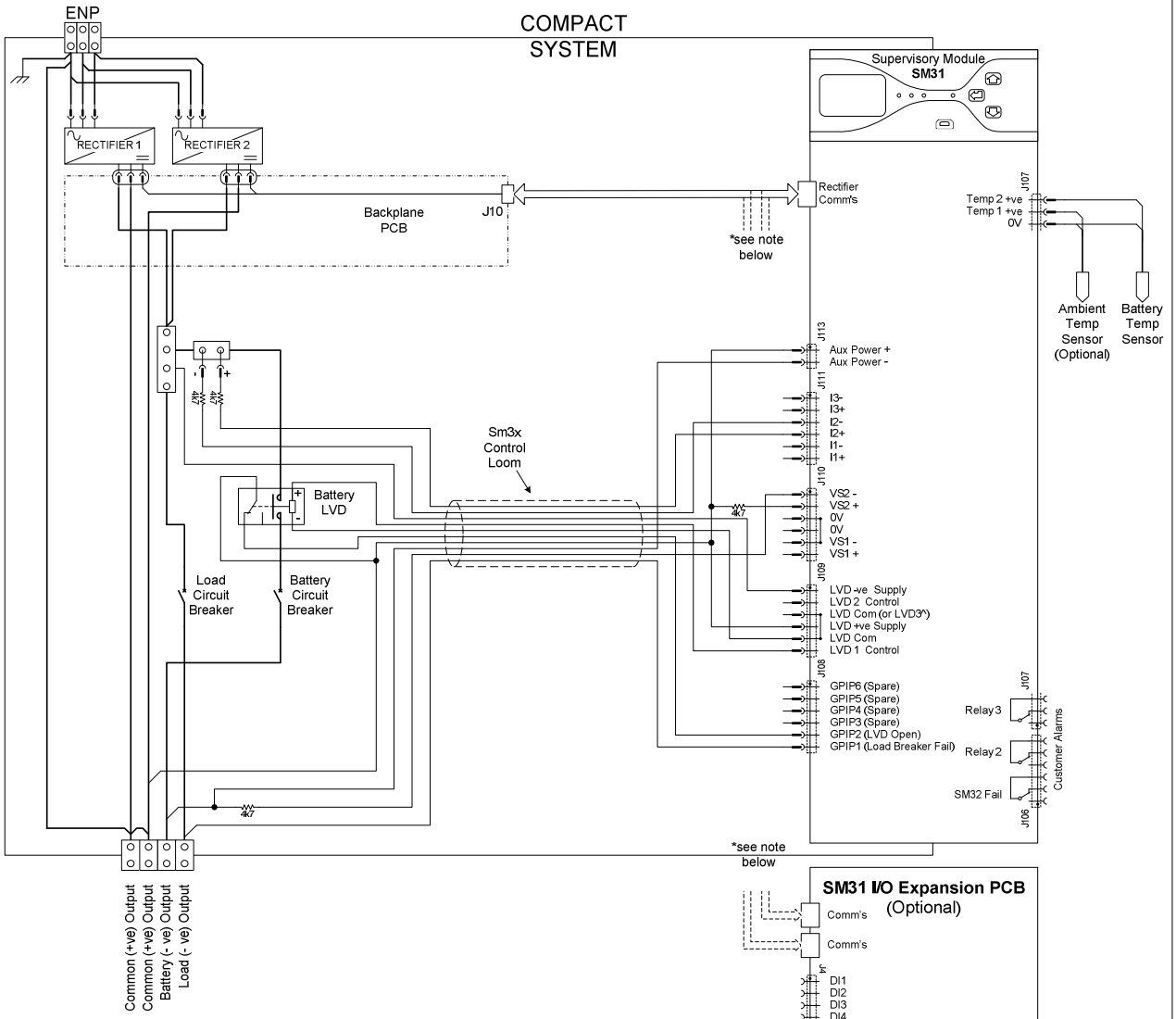
Load Start-up

1. Ensure downstream load connections have been made and there are no loose/floating cables.
2. Turn on load circuit breaker, ensuring that the downstream equipment is being powered up as expected.
3. Ensure the system float voltage on the SM3x is at the level previously noted.
4. Ensure the load current is at a level expected (could be zero if loads downstream have not been connected).

Note: Prior to leaving the system after it has been commissioned, ensure all AC, DC *and* battery circuits are off. If it is required that the system is to be left on (to power load equipment, ensure rectifiers are left in their powered up state, and batteries are in circuit. This will prevent anyone leaving the batteries only powering the load (in which case the batteries would go flat).

APPENDIX 1 - SYSTEM WIRING DIAGRAM





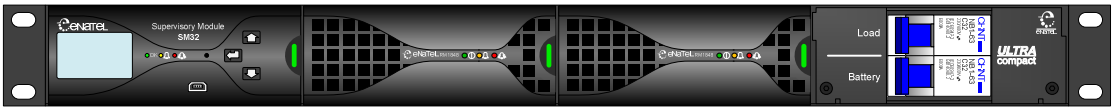
System Ratings:

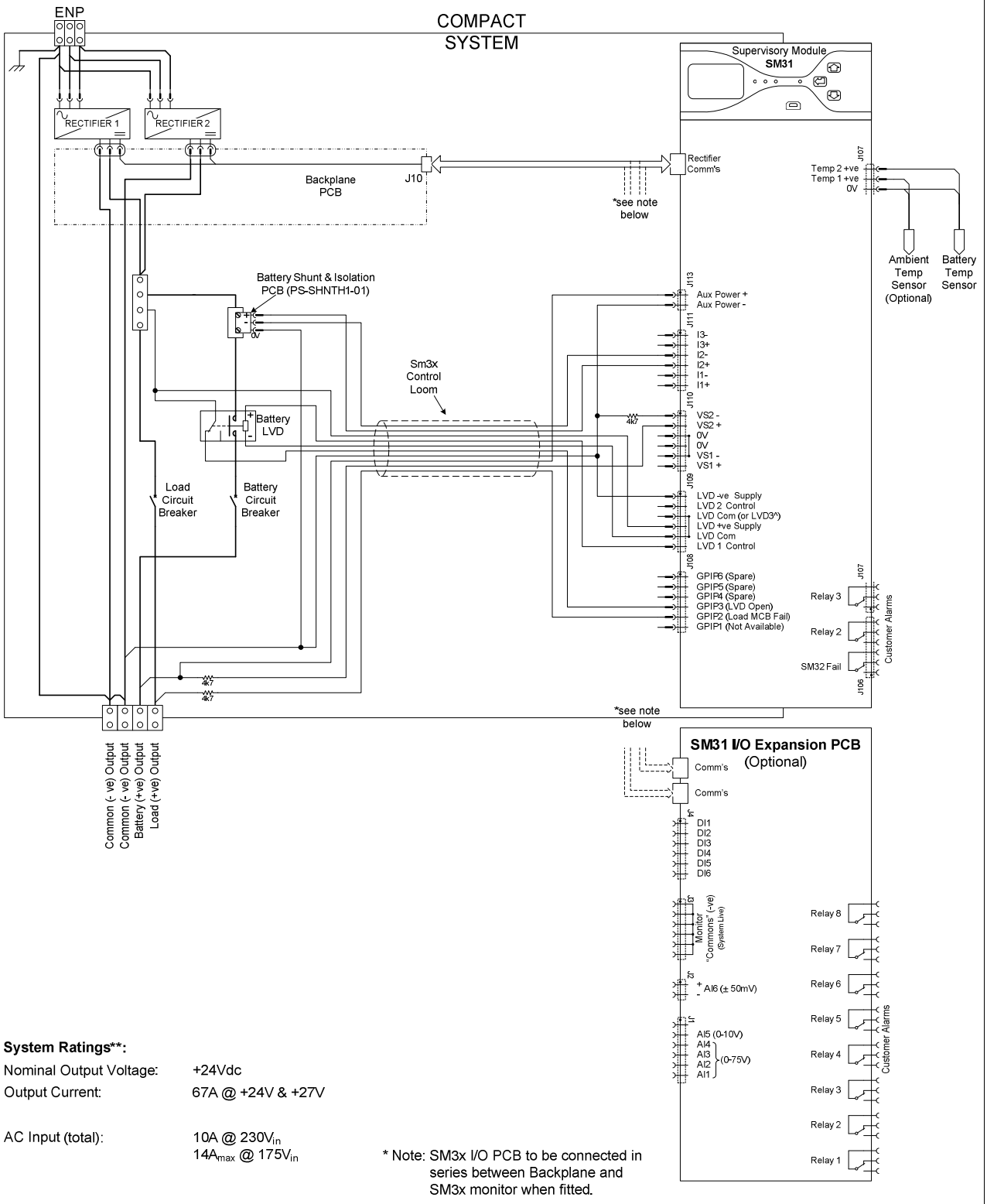
Nominal Output Voltage:	-48Vdc	-60Vdc
Max. Output Current (RM1848):	66.7A/-48V & -54V	-
Max. Output Current (RM1860/48):	60A/-48V & -54V	60A/-48V, 53A/-67.5V
Max. Output Current (RM2048):	83A/-48V, 74A/-54V	-
AC Input (total):	19A** @ $230V_{in}$ $23A_{max}$** @ $175V_{in}$	17A @ $230V_{in}$ $22.5A_{max}$ @ $175V_{in}$

** Based on RM2048 Rectifier (power limited <190Vin)
(RM1848 power limits <175Vin)

* Note: SM3x I/O PCB to be connected in series between Backplane and SM3x monitor when fitted.

enatel	TITLE: 4kW/-48V & -60V, 1U Compact (1 load, 1 batt)			DRAWN: LDS
	DRAWING NUMBER: 080064/1	SYSTEM NUMBER: PSC040201xx-xxx	DATE: 08Sep'08	REVISION: 3.0
			SCALE: NTS	SHEET: 1 of 2





System Ratings:**

Nominal Output Voltage:	+24Vdc
Output Current:	67A @ +24V & +27V
AC Input (total):	10A @ $230V_{in}$ $14A_{max}$ @ $175V_{in}$

* Note: SM3x I/O PCB to be connected in series between Backplane and SM3x monitor when fitted.

** Based on RM1848/24 Rectifier

enatel	TITLE: 2kW/+24V, 1U Compact (1 load, 1 batt)			DRAWN: LDS
	DRAWING NUMBER: 080064/2	SYSTEM NUMBER: PSC020201xx-xxx	DATE: 08Sep.'08	REVISION: 5.0
			SCALE: NTS	SHEET: 2 of 2

APPENDIX 2 - MODEL SPECIFICATIONS

Part number	Description	Voltage	Earth	Monitor	I/O PCB
PSC02020110-200	1U *ULTRA* Compact System	+24VDC	-ve	SM31	×
PSC02020111-200	1U *ULTRA* Compact System	+24VDC	-ve	SM31	✓
PSC02020120-200	1U *ULTRA* Compact System	+24VDC	-ve	SM32	×
PSC02020121-200	1U *ULTRA* Compact System	+24VDC	-ve	SM32	✓
PSC04020110-000	1U *ULTRA* Compact System	-48VDC	+ve	SM31	×
PSC04020111-000	1U *ULTRA* Compact System	-48VDC	+ve	SM31	✓
PSC04020120-000	1U *ULTRA* Compact System	-48VDC	+ve	SM32	×
PSC04020121-000	1U *ULTRA* Compact System	-48VDC	+ve	SM32	✓