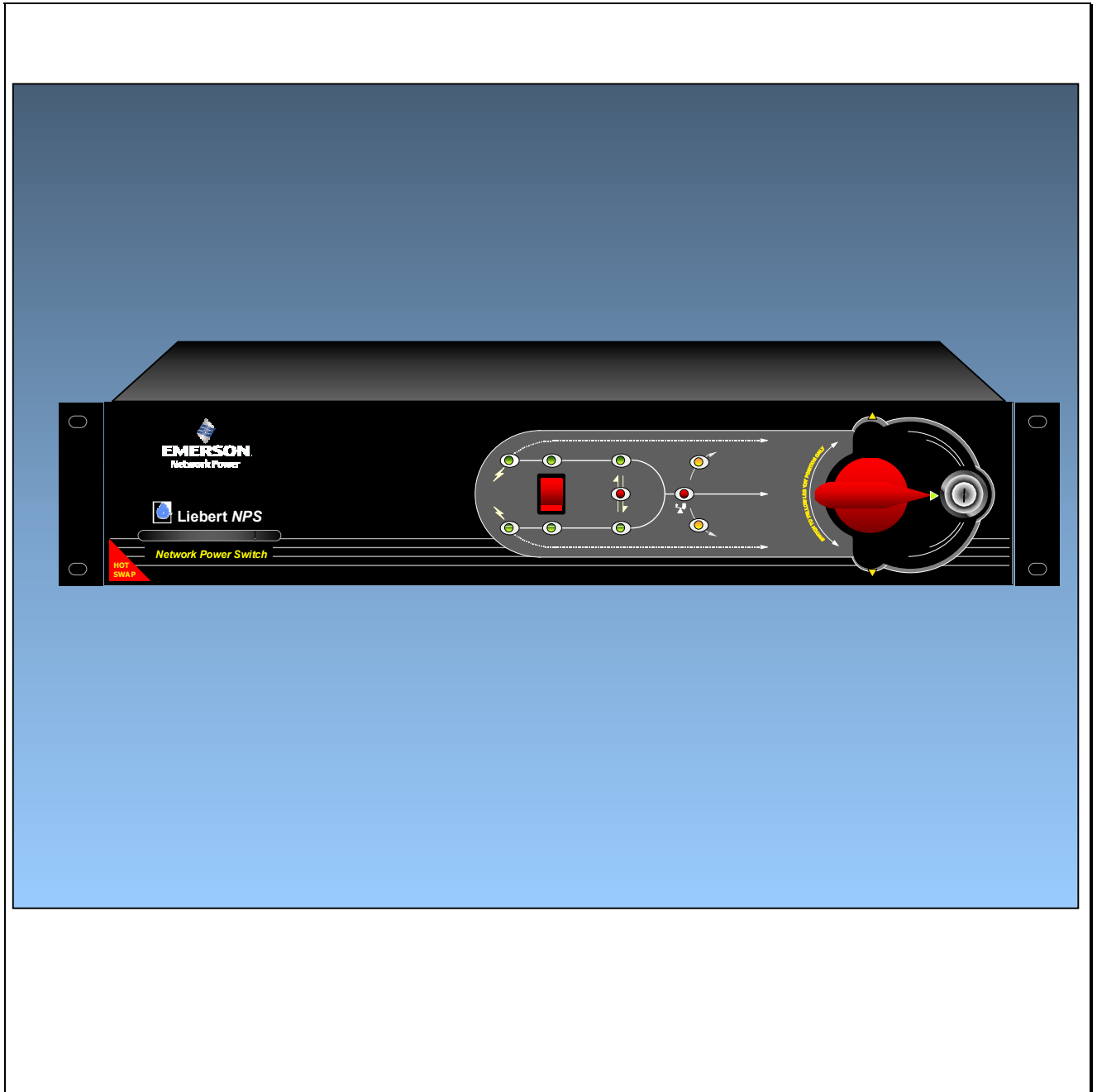

Liebert®

Network Power Switch



Installation and User Manual



Dear Customer,

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If this is your first Liebert product, we hope it is the beginning of a long relationship which delivers value to your organisation. If you already own and use a Liebert product, we are doubly honoured by your decision of continuing this relationship.

*It is our constant endeavour to partner you for the growth and success of your business. This philosophy is reflected in our Mission statement **"To deliver value through Air & Power Quality solutions to achieve customer delight"**. Please do give us feedback to help us realize our Mission.*

EMERSON NETWORK POWER

ENGLISH

This manual describes installation and operation procedures for the
Network Power Switch.

All relevant parts of the manual should be read **prior** to commencing installation.

If you encounter any problems with the procedures contained in this manual
you should seek immediate assistance from the Liebert Sales Office
from whom the equipment was purchased.
Alternatively, contact the Liebert's Customer Service & Support department
at the address shown below:

Emerson Network Power Ltd - United Kingdom

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Safety Precautions



CONFORMITY AND STANDARDS

This equipment complies with the following requirements:

Normative references:

Safety:

* EN 50178

EMC:

* EN61000-6-2 (2001-10;immunity)

* EN61100-6-3(emission)

The equipment must be installed in accordance with these instructions and used only with accessories approved by the manufacturer to maintain conformity with the standards.



WARNING

Follow these instructions scrupulously:

The NPS is designed exclusively for indoor use. Protect the unit from excessive condensation and install it in a place free of flammable liquids, gases and corrosive substances.

The Network Power Switch must be commissioned and serviced by an engineer approved by the manufacturer (or his agent). Failure to do so could result in personnel safety risk, equipment malfunction and invalidation of warranty.

Personnel working with the equipment described in this manual must be thoroughly familiar with the product. Obtain appropriate protection against input overcurrents on the basis of the unit's nominal power.

Before making connections rear the unit, make sure that all incoming power sources are de-energised and insulated.

The unit is powered by more than one power mains.

As with other types of power equipment, dangerous voltages are present within the Network Power Switch enclosure.

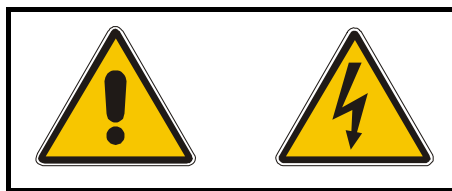
No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures.



General

The unit must be grounded in accordance with current electrical regulations.

Guide to the Instructions



The warning triangle indicates all the personal safety instructions.

Follow these instructions carefully to avoid injury.

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This manual describes the following equipment:

<i>EQUIPMENT</i>	<i>PART NUMBER</i>
6 kVA Pole Network Power Switch	SSWITCH-25A



Important

Support Information:

If you require assistance for any reason, please have the following information available:

Model and size	
Serial number	
Date installed	
Location	
Voltage & Frequency	

1 Chapter 1 – General description

1.1 Introduction

The Network Power Switch is an automatic static transfer switch designed to provide fast automatic transfers between two independent, synchronous AC power sources to provide continuity of AC power to critical equipment, such as information technology equipment.

One of the two AC inputs is designed as the “preferred” source to which the Network Power Switch will connect the load as long as the designated input source is within the acceptable limits, the Network Power Switch is designed to transfer the output load to the “alternate” input source, as long as the alternate source is within the acceptable voltage limits.

The Network Power Switch provides fast, break-before-make transfers to prevent interconnection of the two sources, even under faulted source conditions.

The maximum sense and transfer times are within the tolerance of IEEE Standard 446 susceptibility curve for information technology equipment to allow uninterrupted load equipment operation.

In case of overload, Network Power Switch gives the alarm. Under Short-circuit condition a fast acting semi conductor fuse protects condition of the load.

Manual Bypass Switch

The entire power static switch module is hot swappable. Before removing this module the load is transferred, without break to any one of the source directly by using the Manual bypass switch. After replacing the static switch module, the load is restored on static switch module, using the Manual bypass switch.

Block Diagram

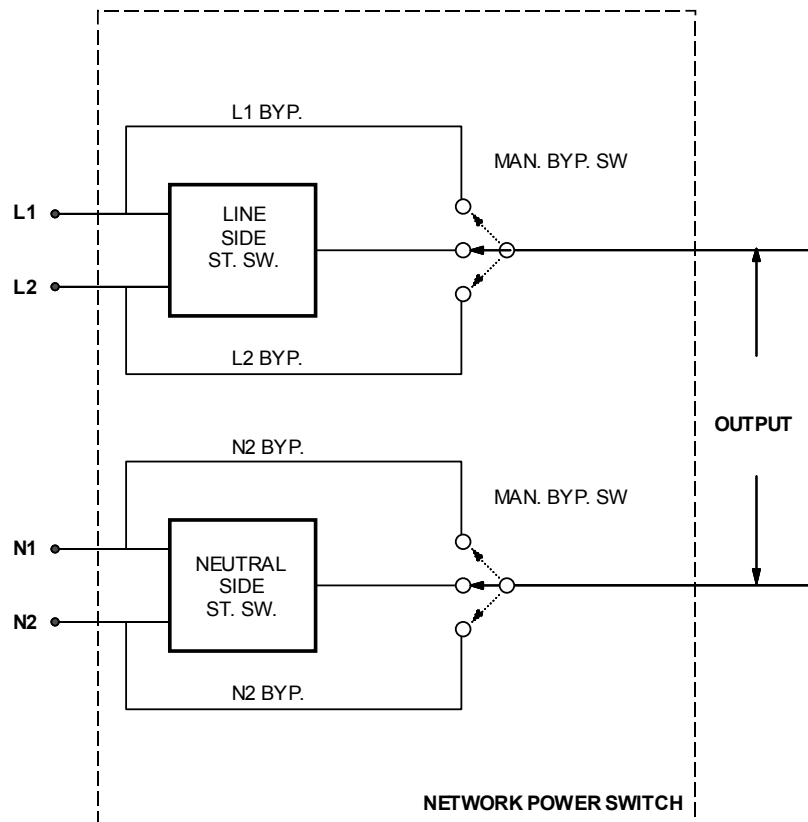


Fig 1.1 – Block Diagram of Network Power Switch

1.2 Design Concept

Figure 5.1.1 in Chapter 5 shows the Power circuit diagram for Network Power Switch. Source 1 & Source 2 are the two synchronized power sources with fuse switches FS1 & FS2 & pair of SCR's TA1 & TB1 in series with each path & TA2 and TB2 in the neutral path

Logic dictates that at any time only one pair of back-to-back connected SCR's in the line and neutral should conduct. This routes the input power to the output load. Should the load feeding source fail due to any reason; the other source takes over automatically in less than 6 ms.

This ensures that the critical load always receives the power & changeover time is less than the tolerance limit set by IEEE 446 (CBEMA curve) for information technology equipments. The change over is always with break, which ensures that in no case two sources get paralleled.

Priority source can be selected through front panel switch. The live mimic on front panel indicates which source is on priority & which is feeding the load. Figure 1.4 shows the details of live mimic panel.

1.3 Mechanical Design Description

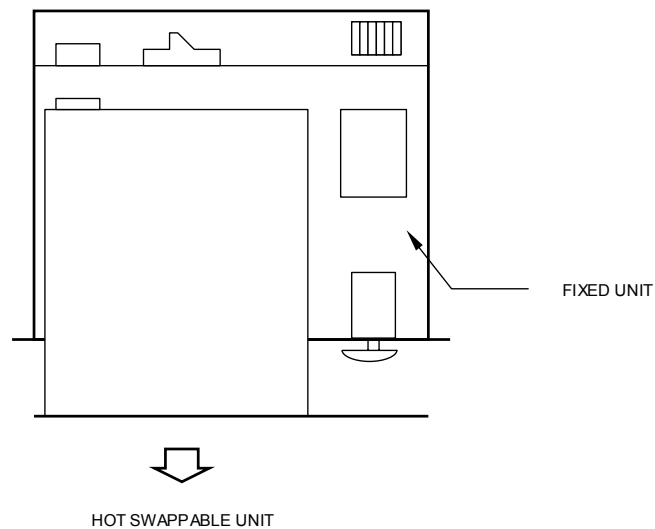


Fig 1.3 – Hot swappable and Fixed Unit

The Network Power Switch consists of two modules.

Fixed module consists of the input and output connections and manual bypass transfer control switch.

Second module is hot swappable plug-in type with removable electronics & static switching module.

The bypass / transfer control switch is located on right side of the cabinet with a key lock to restrict access to qualified or designated operators. The plug in module likewise contains locked latches to prevent unauthorized removal of the module. The Network Power Switch is designed to allow replacement of the removable electronics /switching module without having to de-energize the load equipment.

Entire power static switch module is hot swappable. Before removing this module the load is transferred without break to any one of the source directly. After replacing the static switch module, the load is again transferred back to Network Power Switch without break.

1.4 Mimic Indications

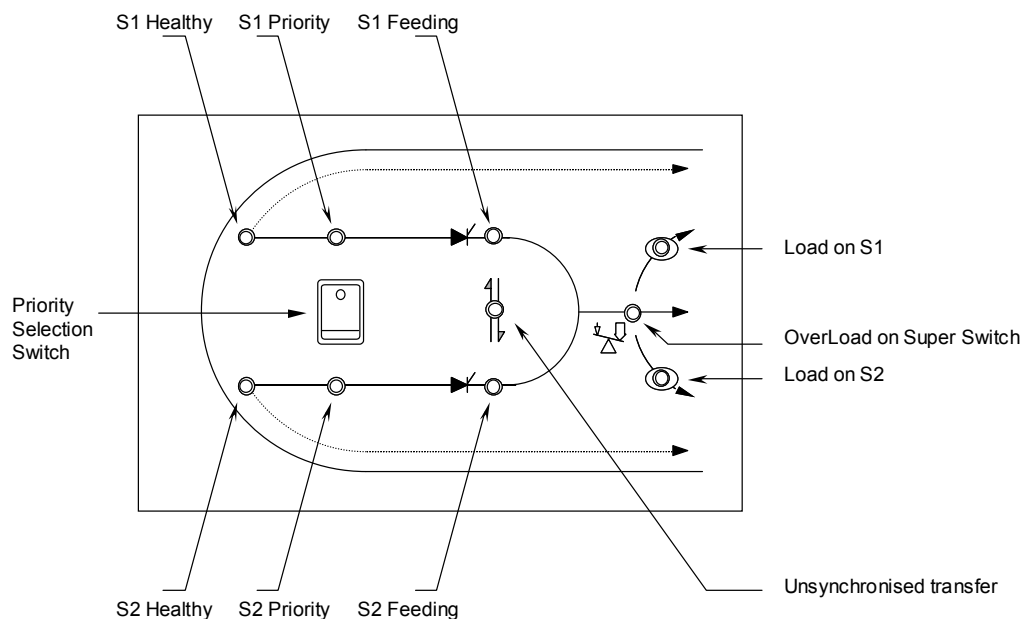


Fig 1.4 – Mimic and LED Indications

LED INDICATION

Mimic indications: Ten LEDs are mounted on the mimic plate;
Glowing LED's indicate the status of the Network Power Switch.

- S1 Healthy:** Source –1 is a healthy source and is well above the 10% under voltage setting.
- S2 Healthy:** Source –2 is a healthy source and is well above the 10% under voltage setting.
- S1 Priority:** The priority selector switch is on S1 priority position.
- S2 Priority:** The priority selector switch is on S2 priority position.
- S1 Feeding:** The load is fed through source –1.
- S2 Feeding:** The load is fed through source -2.
- Overload:** Overload has occurred i.e. current level crossed 110% of full load.
- Unsynchronized:** The sources are out of phase-synchronized window.
- Load on S1:** Source –1 is feeding the load.
- Load on S2:** Source –2 is feeding the load.

1.5 Manual Bypass Switch Operation

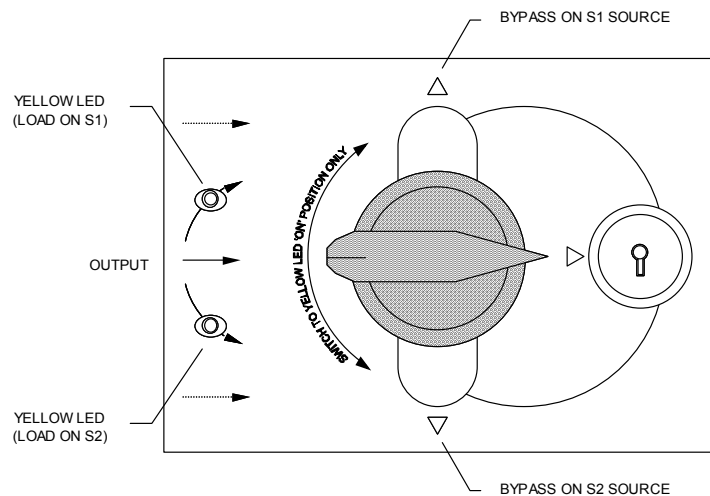


Fig 1.5 – Manual Bypass Switch Operation

Manual Bypass switch is used only when a fault occurs in the Network Power Switch and the control circuitry of the Network Power Switch is to be checked. For doing this operation the load is connected to the bypass. For Normal Operation, the position of the switch should be at Network Power Switch output position (i.e. horizontal)

If the load is to be fed through the source 1 Bypass, first it is to be unlocked and the knob should be rotated upwards. To feed through source 2 bypass the knob is to be rotated downward.

A mechanical interlocking arrangement is provided on this Bypass switch, by which the Hot swappable unit can be removed only when load is connected to bypass. In normal operation when the load is connected to Network Power Switch, the Hot swappable unit cannot be removed.

Operating Network Power Switch in Normal Mode (load connected to Network Power Switch output)

- Unlock the Manual Bypass Switch with the key provided.
- Depending upon the available healthy source (i.e. either Source-1 or Source-2) select it by changing the Manual Bypass Switch position.
- Unlock the sliding module
- Pull out the Hot swappable sliding module out of the Network Power Switch, which contains (SCR assembly, control circuitry).

Operating Network Power Switch in Bypass mode

- Insert the Hot swappable module into the Network Power Switch unit
- Lock the sliding module for preventing its accidental opening.
- Unlock the Manual Bypass Switch with the key provided
- Connect the Load output to Network Power Switch by changing the switch position to Network Power Switch output.
- Depending on the priority switch, Load will get transferred to source-1, if the priority switch is on source1.
- The Static Switch output position LED will glow

1.6 Potential free contacts

The Network Power Switch status can be checked with the 37 pin D-type connector, located on the rear end. This is a potential free contact, and gives following indications as shown in Table 1-1 –

Table 1-1

Status	Termination available of 37 pin D-type connector					
	NC	NO	Common	NC	NO	Common
Overload	20	1	2	3	21	19
Priority	23	4	5	6	24	19
S1 Feed	7	25	26	27	8	19
S1 Healthy	28	9	10	11	29	19
S2 Healthy	12	30	31	32	13	19
S2 Feed	33	14	15	16	34	19
Unsynch	17	35	36	37	18	19

The pin details for this connector is shown in fig 1.6

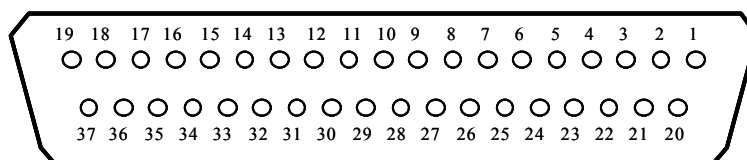


Fig 1.6 – Pin details for 37 pin D-type Connector

2 Chapter 2 – Operating Instructions

2.1 Introduction

The Network Power Switch can be considered to be in one of the three operating conditions:

- Normal Operation - All relevant power switches and fuses closed and the Load is connected to Network Power Switch output
- Manual Bypass – The load is connected to the input supply directly.
- Shut down - All power switches are off and load is not operational.

2.2 General Notes

NOTE: All users controls and indicators mentioned in these procedures are identified in chapter1

For power connection details, refer to figure in Chapter 5.

2.3 Procedure for Switching the Network Power Switch to power the load from a Power Off condition

This procedure should be followed when turning on the Network Power Switch from a fully powered down condition -i.e. When the load is not being initially supplied at all. It is assumed that the installation is complete; the authorized personnel have commissioned the system.

1. Select the priority to source1. Close the fuse FS1.
2. Check for the LED S1 healthy, S1 priority, S1 feed and LED load on source1 to glow.
3. Close the fuse FS2.
4. Check for the LED S2 healthy to glow.
5. Using priority switch transfer the load to source2, check this transfer does not affect the load.
6. Transfer the load to source 1 again and check this transfer does not affect the load.

2.4 Switching the Load to Manual Bypass condition

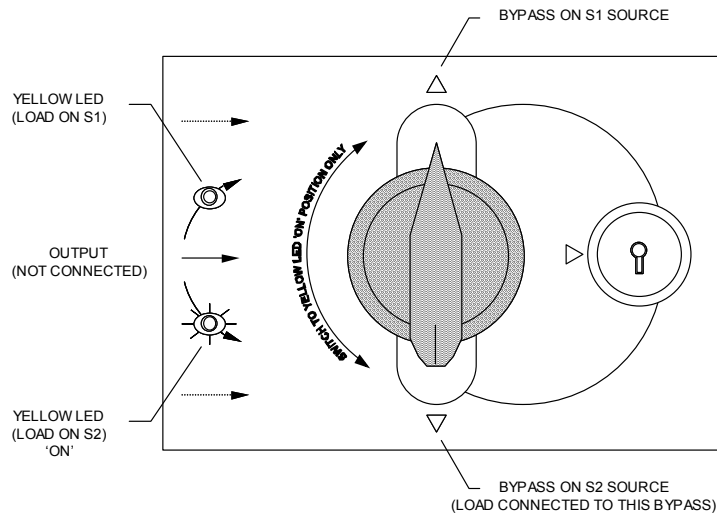


Fig 2.2 – Switching to Bypass

WARNING

This operation should be performed by Trained personnel only.

SWITCH TO YELLOW LED 'ON' POSITION ONLY.

1. By seeing the LED indication check which source is feeding.
2. Unlock the Bypass switch lock by the using the key provided.
3. Rotate the Manual Bypass switch in the direction of the source feeding the load as per the warning given on the mimic.
4. Relock the Bypass switch, remove the key and keep it in original place.



2.5 Procedure for switching the Network Power Switch from Manual Bypass condition to Normal Operation

1. Unlock the Bypass switch using the key provided.
2. Rotate the bypass switch knob to the Static switch output position, i.e. horizontal position.
3. Lock the Bypass Switch, remove the key and keep it in original place.

3 Chapter 3 – Installation Procedure

3.1 Introduction

  WARNING
<i>Do not apply electrical power to the Network Power Switch equipment before the arrival of the commissioning engineer.</i>

  WARNING
<i>The Network Power Switch equipment should be installed by a qualified engineer in accordance with the information contained in this chapter and the drawing package shipped inside UPS cabinet.</i>

This chapter contains information regarding the positioning and cabling of the Network Power Switch.

Because every site has its peculiarities, it is not the aim of this chapter to provide step-by-step installation instructions, but to act as a guide to the general procedures and practices that should be observed by the installing engineer.

3.2 Equipment positioning and environmental considerations

The Network Power Switch cabinets are designed to fit in standard 19-inch rack. In case of non-availability, it can be kept on floor or as a tabletop item, with sufficient ground clearance.

The super switch module should be located in a cool, dry, clean environment with adequate ventilation to keep the ambient temperature within the specified operating range.

  WARNING
<i>The Network Power Switch cabinet is connected with live voltages, hence it should be located at safe place.</i>

3.3 Connecting cables to Network Power Switch



WARNING

BEFORE CABLING-UP THE NETWORK POWER SWITCH, ENSURE THAT YOU ARE AWARE OF THE LOCATION AND OPERATION OF THE EXTERNAL ISOLATORS THAT CONNECT THE NETWORK POWER SWITCH INPUT SUPPLY TO THE MAINS DISTRIBUTION PANEL.

CHECK THAT THESE SUPPLIES ARE ELECTRICALLY ISOLATED, AND POST ANY NECESSARY WARNING SIGNS TO PREVENT THEIR INADVERTENT OPERATION.

3.3.1 Cable entry

Cable enter the Network Power Switch cabinet, from the rear side as shown in figure 5.1.2. The cables are terminated on the connectors and fuses.

3.3.2 Cable Rating

Following are the recommended cable size for 6kVA Network Power Switch –

Table 3-1

Description	Max. Current rating (Amp)	PVC cable (sq.mm)
Input Cables	25	4
Output Cables	25	4
Earthing	-	2.5

Note:

These recommendations are for guideline purposes only and may be superseded by local regulations and codes of practices.

3.3.3 Cable connections

Following are the set of external power cables, which are connected to the Network Power Switch equipment –

- Input source 1 – Line
- Input source 2 – Line
- Input source 1 – Neutral
- Input source 2 – Neutral
- Output – Line
- Output – Neutral
- Earthing

These cables are connected to the terminals on rear side of the equipment as shown in figure 5.1.2 in Chapter 5.

3.3.4 Safety earth

The safety earth busbar is provided on the rear side of equipment .The safety earth cable must be connected to this busbar.



WARNING

FAILURE TO FOLLOW ADEQUATE EARTHING PROCEDURES CAN RESULT IN ELECTRIC SHOCK HAZARD TO PERSONNEL, OR THE RISK OF FIRE, SHOULD AN EARTH FAULT OCCUR.

3.3.5 Protective devices

For safety reasons, it is necessary to install external to the Network Power Switch system, circuit breaking protective devices in the input a.c. supply and towards the output. Given that every installation has its own characteristics, this chapter provides general useful information for qualified installation engineers, with knowledge of operating practices, of regulatory standards, and of the equipment to be installed.

Rectifier and Bypass input supply of the Network Power Switch:

The input to Network Power Switch should be given through a 32 amp, 2pole ELCB for safe operation.

Protection against excessive overcurrents and short circuits in the mains supply input:

These inputs must be protected, installing suitable protective devices at the distribution panel of the incoming main supply, considering that the protection should discriminate with overload capacity of the system.

The protective devices must be selected for the nominal input current, with respect to the rating and the input a.c. supply voltage as given in table 3-1.

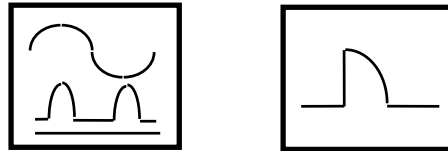
Protection against earth faults (RCD or RCCB devices):

In the event of a differential (RCD) device being installed upstream of the input supply, one must take into account the transient and steady state earth leakage currents that are produced during start-up of the Network Power Switch.

The presence of an RFI suppression filter inside the NPS, determines a residual earth current not greater than 3.5 mA.

Residual current circuit breakers (RCCB/RCD) must be sensitive to d.c. unidirectional pulses (class A) in the network and insensitive to transient current pulses.

They are identified by the symbols respectively:



These isolators must have an average sensitivity, possibly adjustable between 10mA and 0,3A.

It is recommended that the selectivity with every differential switch be verified both upstream of the input distribution board and downstream (towards the load).

Output of the System:

In the eventuality that an external distribution panel is used for load distribution, the selection of protective device must provide discrimination with those that are used at the input to the Network Power Switch module.

3.3.6 Cabling Procedure

The external power cables should be connected to the terminals as shown in figure 5.1.2 in Chapter 5. Proper termination labels are provided near each connector for ease of cabling.

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4 Chapter 4 - Specifications

4.1 Conformity and Standards

This equipment complies with the following requirements:

Normative references:

Safety:

* EN 50178

EMC:

* EN61000-6-2 (2001-10;immunity)

* EN61100-6-3(emission)

The equipment must be installed in accordance with these instructions and used only with accessories approved by the manufacturer to maintain conformity with the standards.

4.2 General Specifications

- Manual and Automatic Transfers
- Sense and transfer time – less than 6 milliseconds
- Break-Before make switching
- Selectable preferred source
- Selectable auto/manual retransfer
- In-phase transfer window – adjustable from $7.5 \pm 1^\circ$
- Convection cooling
- Hot swappable electronic static switching module
- Live mimic on Hot swappable unit for indicating load supply status & alarms
- Make before break manual bypass switch to transfer load from static switch to direct source 1 or source 2
- Isolated neutrals

4.3 Environmental specifications

ENVIRONMENTAL CHARACTERISTICS	UNITS	DESCRIPTION
Heat dissipation	W	75
Storage temp. range	°C	-40 to 60°C
Operating temp. range	°C	0 to 40°C
Relative humidity	%	0 to 95%
Operating altitude	m	Up to 1500m (5,000 ft)
Storage / Transport Altitude	m	Up to 12000m (40,000 ft)
Audible Noise	db	< 45 db at 1.5 m

Network Power Switch

4.4 Electrical Specifications

ELECTRICAL CHARACTERISTICS	UNITS	DESCRIPTION
Nominal Input Voltage	VAC	220, 230 or 240 volts
Power supply		single phase a.c., 2W+G, 50 Hz. Solidly grounded power sources
Nominal Output current	Amps	25
Frequency	Hz	50 / 60
Source unhealthy status	-	Guaranteed Transfer to alternate source –15 % of V nominal
Load Power factor range	-	0.5 to unity leading or lagging
Load Crest factor	-	Up to 3.5
In-Phase transfer window	-	Adjustable from $5 \pm 1^\circ$
Source voltage distortion	%	Up to 10% THD
Overload capability	%	125% of continuous current for 2 hrs, 1000% for two cycles minimum.
Over current Protection	-	By semi conductor fuse
Short circuit withstand capability	Amps	Up to 20,000 symmetrical amps, protected by internal fusing.
Redundant Control Power supplies	-	Taken from available source 1 and source 2
Integral Maintenance Bypass	-	Make before break operation
Alarm contacts	-	Eight Isolated Normally Open alarm & static switch Status contacts.
Unsynchroised transfer		6 millisec for synchronized transfer and 16 millisec for unsynchronized transfer.

4.5 Mechanical specifications

MECHANICAL CHARACTERISTICS	UNITS	DESCRIPTION
Height	mm	88.0
Width		431.0
Depth		457.0
Weight	kg	8.0
Colour		Matt Black
Installation		19" Rack Mounted / floor / table top
Cable entry	-	Rear side

5 Installation Drawings

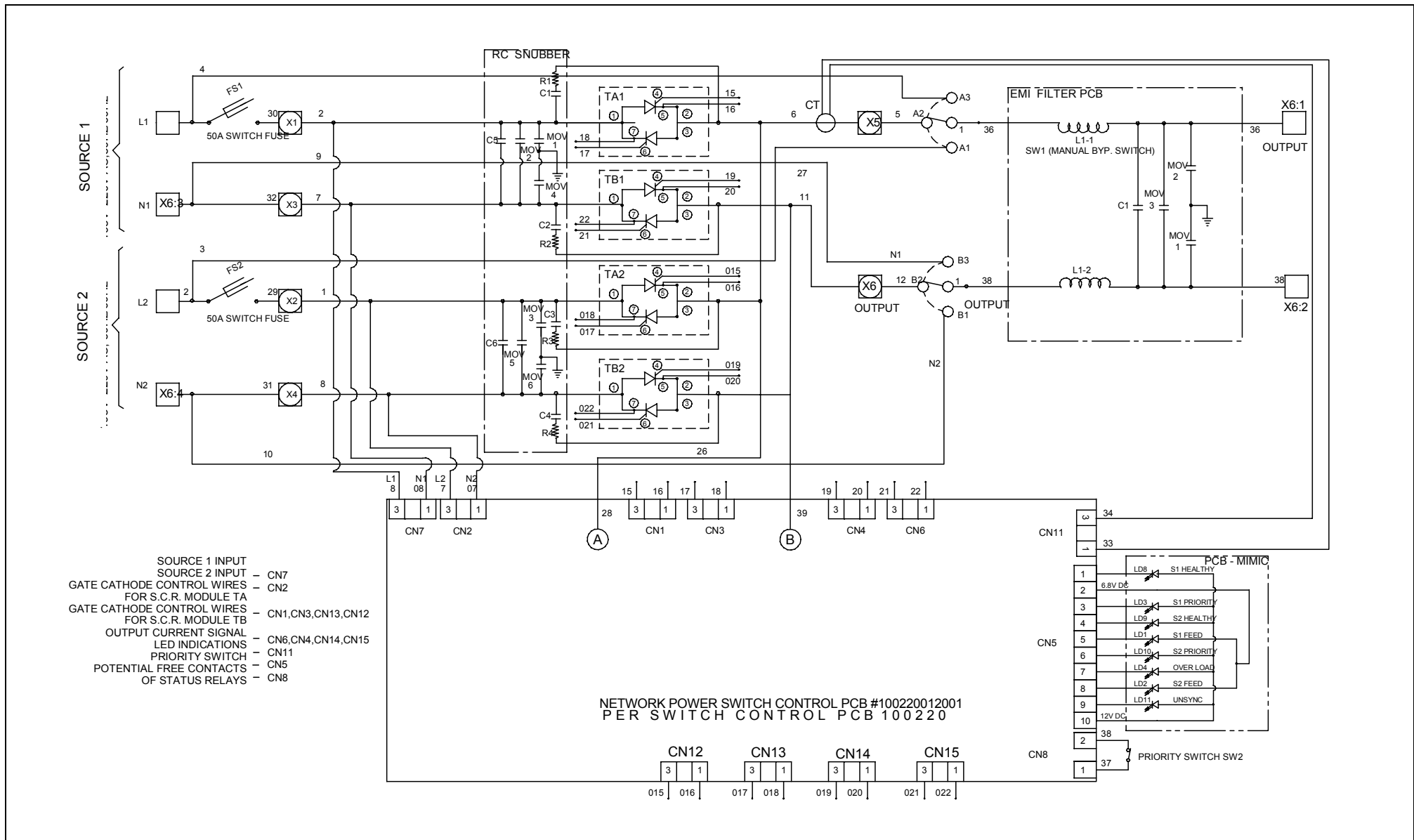
5.1.1 Power Circuit Diagram

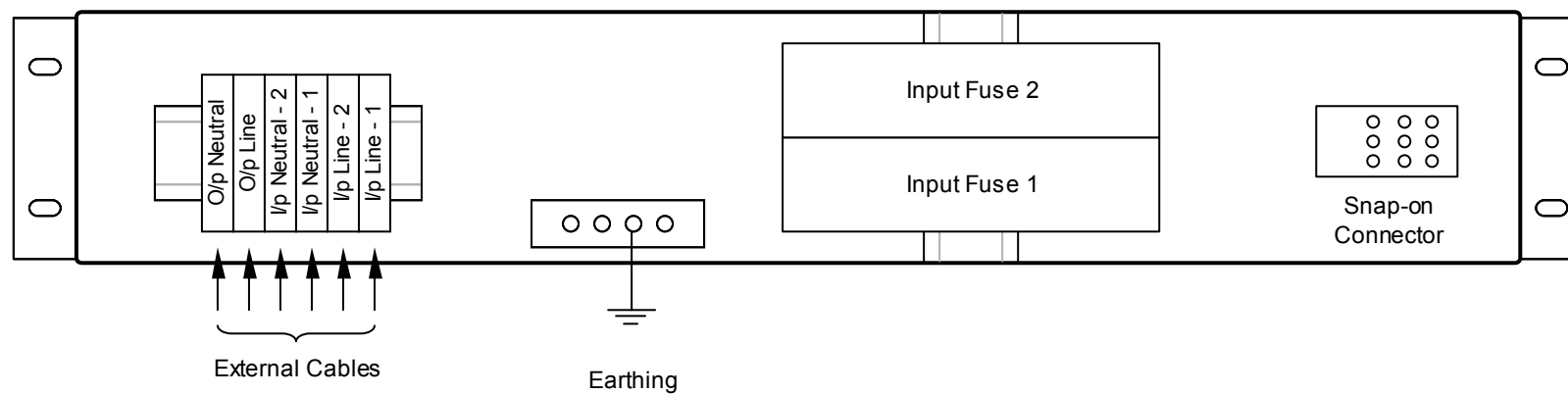
5.1.2 External Power cable connections

5.1.3 Overall general arrangement

Network Power Switch

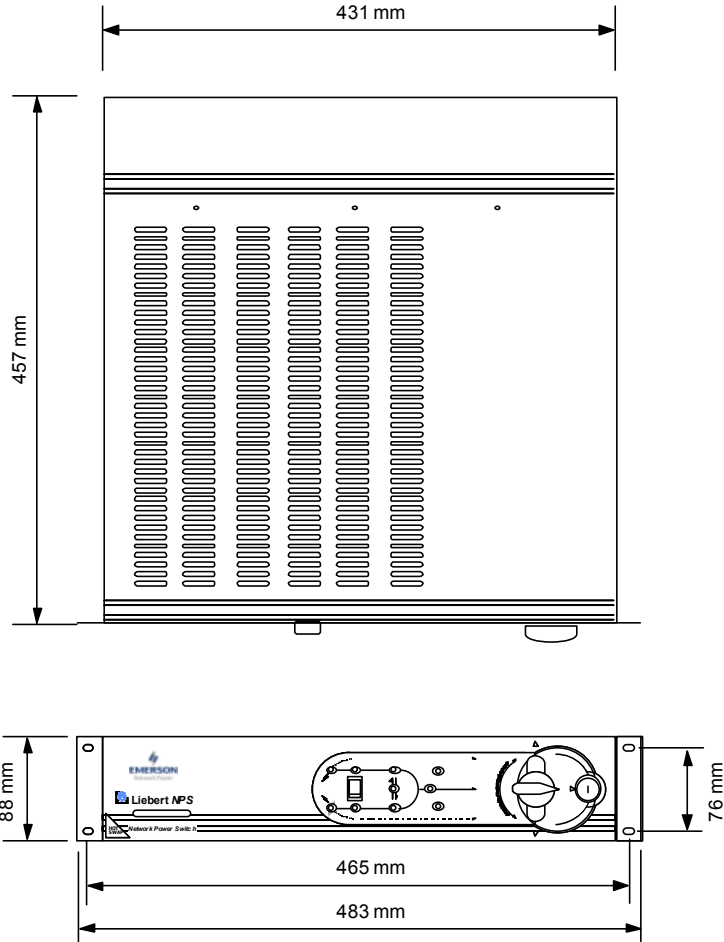
5.1.1 Power Circuit Diagram



5.1.2 External Power cable connections**Rear View****EXTERNAL POWER CABLE CONNECTIONS**
NETWORK POWER SWITCH

Network Power Switch

5.1.3 Overall general arrangement



6 LIMITED WARRANTY

Liebert Corporation extends the following LIMITED WARRANTY to the purchaser and to its customer (collectively referred to as the "Purchaser"): the enclosed Power Protection System (Liebert NPS) and components are free from defects in materials and workmanship under normal use, service, and maintenance FOR A PERIOD OF TWO YEARS FROM THE DATE OF ORIGINAL PURCHASE from Liebert or the Liebert dealer or retailer. THE FOREGOING WARRANTY IS THE ONLY WARRANTY GIVEN AND NO OTHER WARRANTY IS PROVIDED, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Certain aspects of disclaimers are not applicable to consumer products acquired by individuals and used for personal, family, or household purposes (as distinguished from industrial or other purposes). Local laws may not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary according to local law.

Certain repairs or services are the responsibility of the Purchaser and the Purchaser is expected to pay for them. This warranty does not extend either to products with removed or altered serial numbers or to any losses or damages due to act of God or source external to the product, misuse, accident, abuse, neglect, negligence, unauthorized modification, alteration, or repair, use beyond rated capacity, or improper installation, maintenance, application or use, including, without limitation, use in a manner contrary to the accompanying instructions or applicable codes.

If the Liebert NPS fails to conform with the above warranty within the two year warranty period, Liebert will repair or replace the system, at Liebert's option. Repairs or replacements are warranted for the remainder of the original warranty period. To make a warranty claim, the Purchaser should call a Liebert's representative to obtain a Returned Goods Authorization number and shipping instructions. Return transportation costs to Liebert are the responsibility of the Purchaser.

"LIFE SUPPORT" POLICY

This product is not recommended, and the Company will not knowingly sell this product, for use with life support and other designated "critical" devices. ANY SUCH USE BY A USER AUTOMATICALLY VOIDS AND DISCLAIMS ANY AND ALL WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND EXPRESS WARRANTIES THAT THIS PRODUCT WILL CONFORM TO ANY AFFIRMATION OR PROMISE, FOR THIS PRODUCT AND THE USER AGREES THAT IN NO EVENT SHALL THE COMPANY BE LIABLE FOR CONSEQUENTIAL OR INDIRECT DAMAGES.