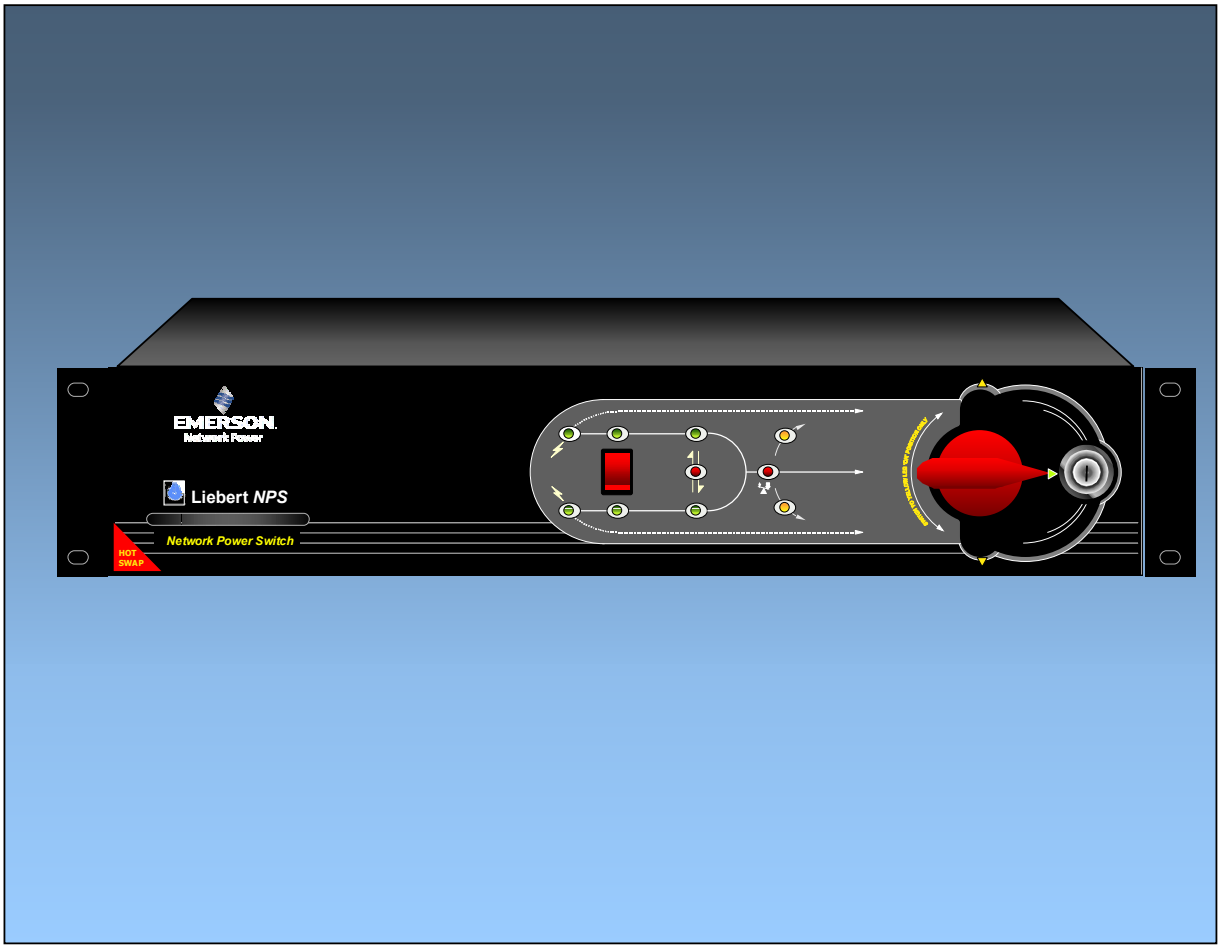
Liebert®

Network Power Switch

Single Pole 110V



User Manual

EMERSON
Network Power

Dear Customer,

Please accept our thanks for giving us the privilege to serve you by choosing a Liebert make product.

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.

Liebert Corporation pursues a policy of continual product development and reserves the right to change the equipment design without notice.

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Safety Precautions

WARNING

Personnel operating on any apparatus referred in this manual must know extensively the product.

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.

CONFORMITY AND STANDARDS

The optional device complies with the requirements of the standards identified at the beginning of the User's Manual supplied with the Network Power Switch

Continued compliance requires installation in accordance with these instructions and the use of manufacturer approved accessories only.

General

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

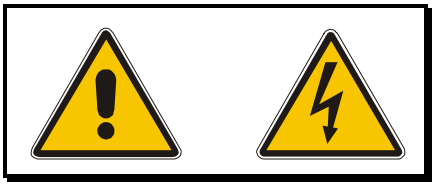
General

As with other types of power equipment, dangerous voltages are present within the Network Power Switch enclosure. The risk of contact with these voltages is minimized as the live component parts are housed behind a hinged, lockable door.

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

All equipment maintenance and servicing procedures involve internal access and should be carried out only by trained personnel.

Guide to the Instructions



The warning triangle indicates all the personal safety instructions.

Follow these instructions carefully to avoid injury.

Table of Contents

This manual describes the following equipment:

EQUIPMENT	*PART NUMBER*
3kVA, 110V, 25A, 1 Pole Network Power Switch (Rev00)	**492100399001**

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

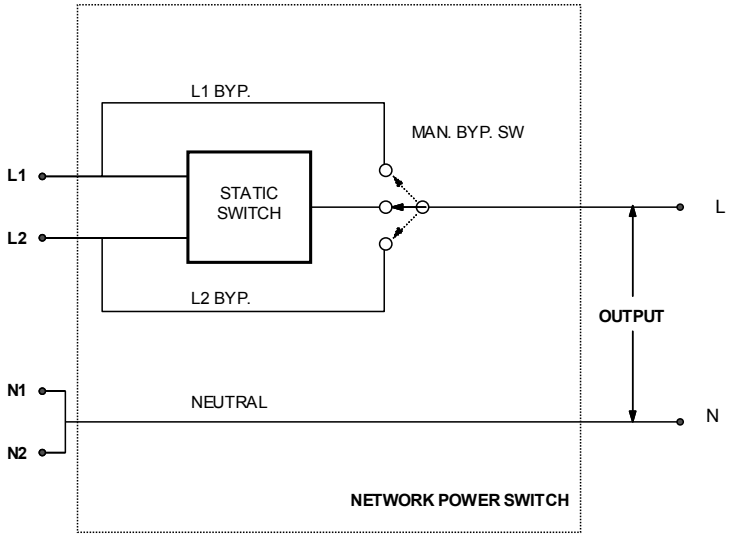


Fig 1.1 – Block Diagram of Network Power Switch

1.2 Design Concept

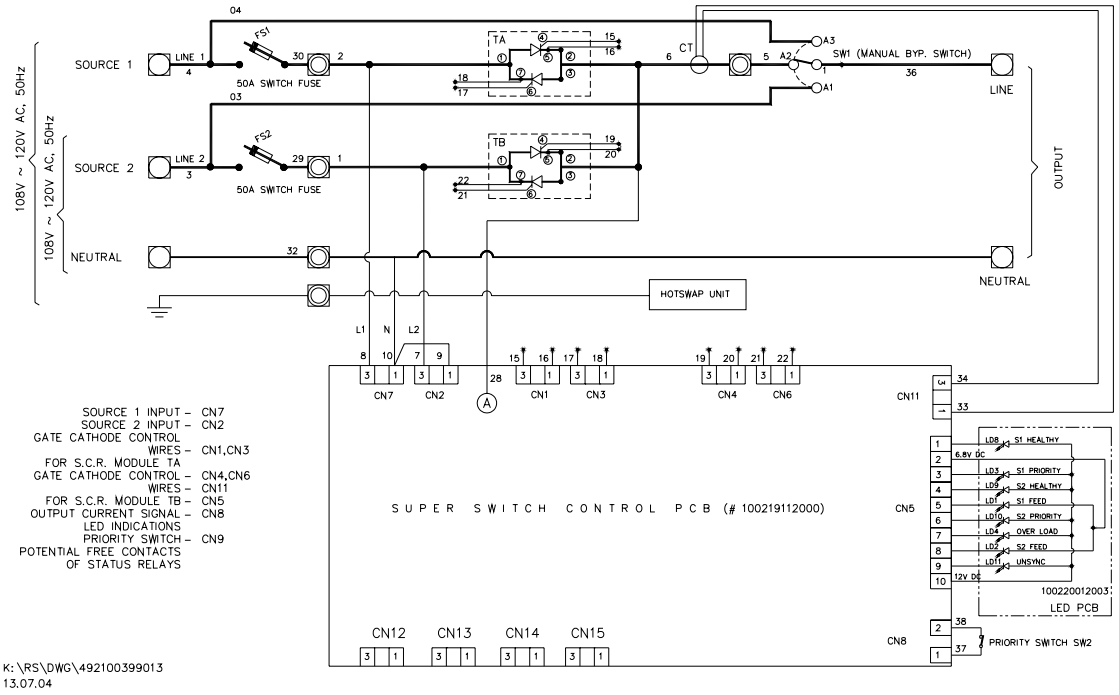


Fig 1.2 - Power Circuit Diagram for Network Power Switch

Figure 1.2 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 TA & TB in series with each path.

Logic dictates that at any time only one pair of back-to-back connected SCR's in the line path 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

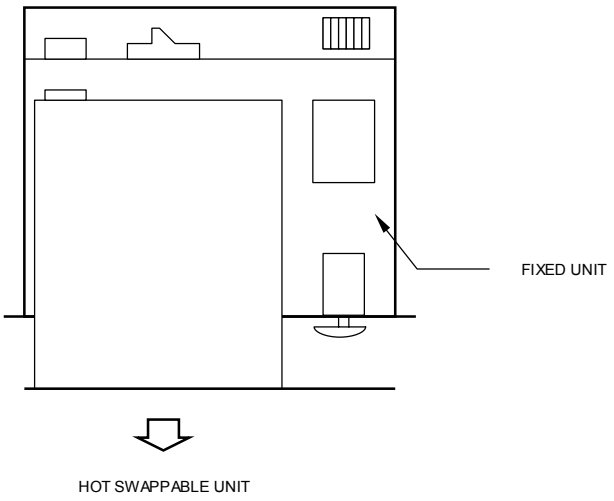


Fig 1.3 – Hot swappable and Fixed Unit

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

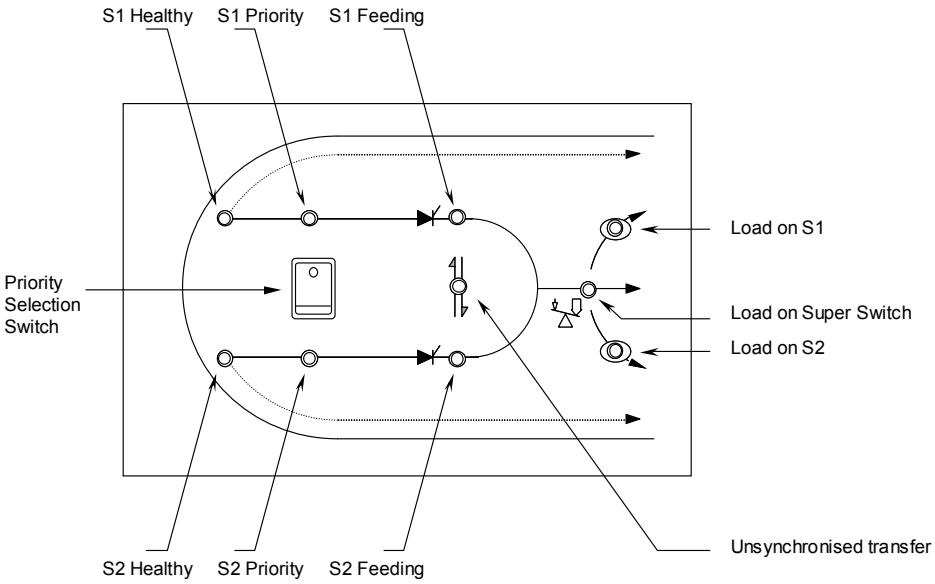


Fig 1.4 – Mimic and LED Indications

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

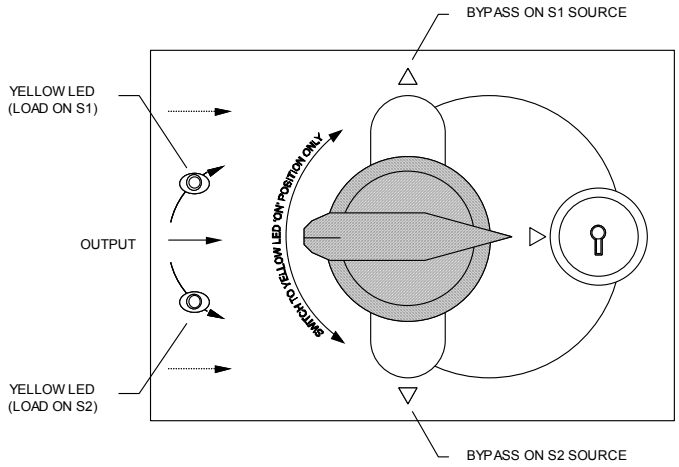


Fig 1.5 – Manual Bypass Switch Operation

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

Two potential free contacts indicating Source 1 and Source 2 Healthy conditions are taken from this 37 pin D type connector and terminated at rear terminal connectors, as shown in figure 1.7.

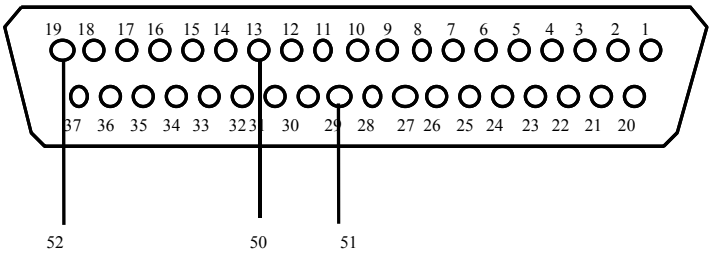


Fig 1.6 – Pin details for 37 pin D-type Connector

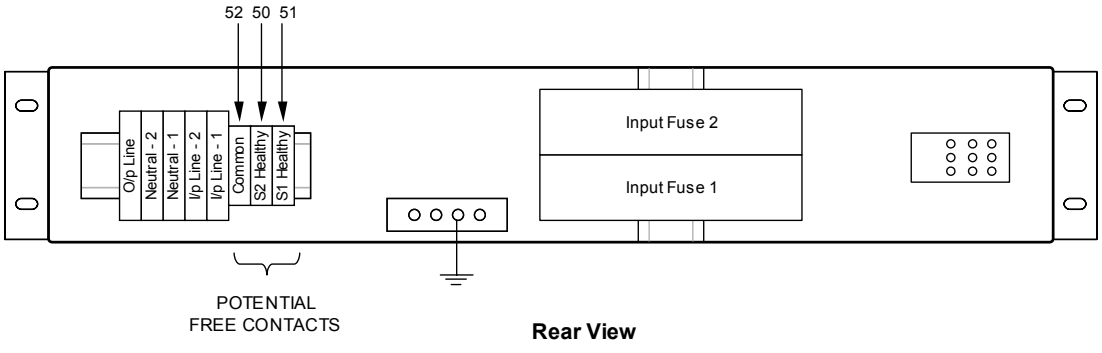


Fig 1.7 – Potential free contacts Connectors

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

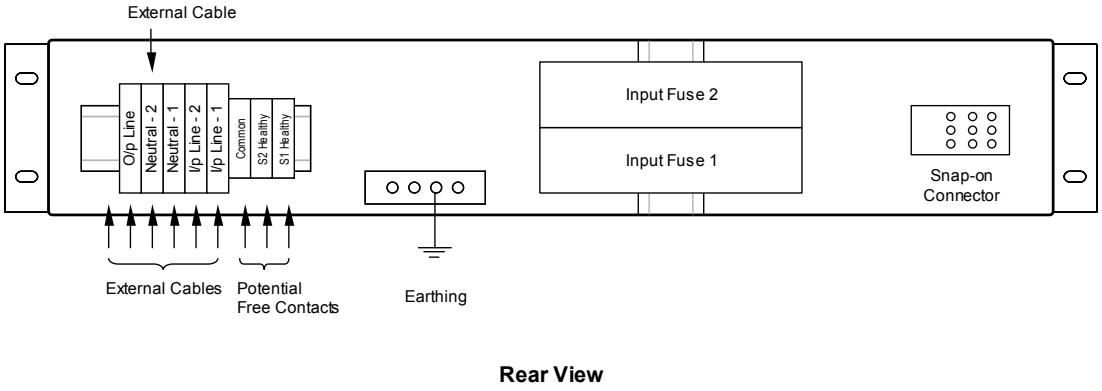


Fig 2.1 - Power Connection details for Network Power Switch

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

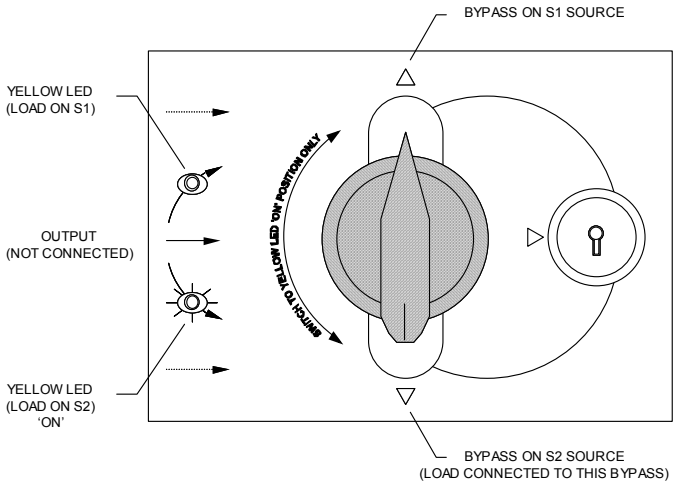


Fig 2.2 – Switching to Bypass

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

Do not apply electrical power to the Network Power Switch equipment before the arrival of the commissioning engineer.

WARNING

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.

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

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

Before Installing, the 'Transit Clamps' are to be removed as shown in the figure 3.1. Without removing the clamps, the Hotswap unit cannot be opened.

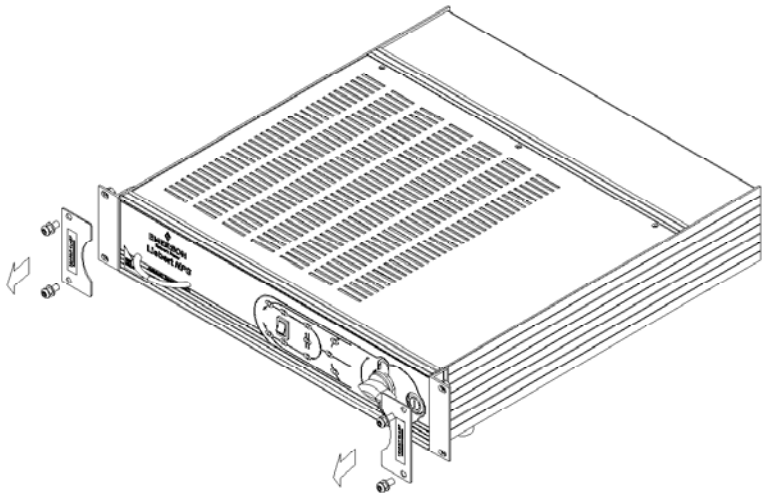


Fig 3.1 – Removal of Transit Clamps

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 3.2. 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 fig 3.2

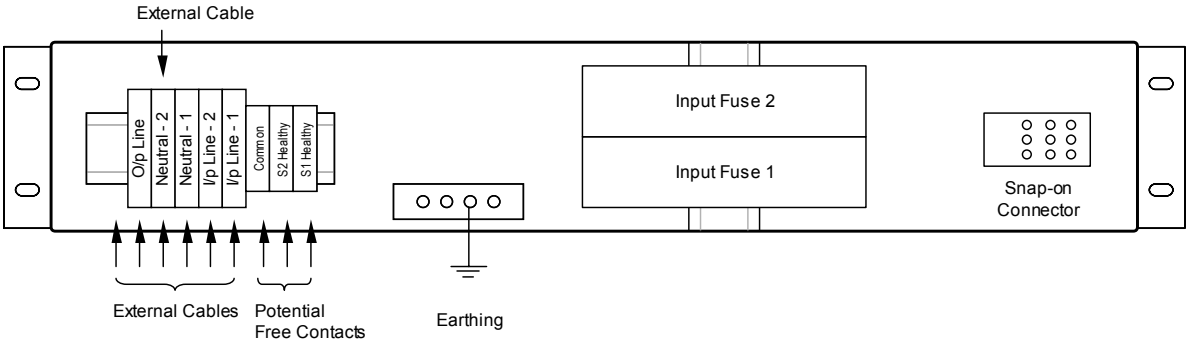


Fig 3.2 – External Power Cables

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

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

3.3.6 Cabling Procedure

The external power cables should be connected to the terminals as shown in fig 3.2. Proper termination labels are provided near each connector for ease of cabling.

4 Chapter 4 - Specifications

4.1 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 5 ± 1°
- 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

4.2 Electrical Specifications

ELECTRICAL CHARACTERISTICS	UNITS	DESCRIPTION
Nominal Input Voltage	Volts	110, 115 or 120 volts singe phase, 3W+G, 50 Hz. Solidly grounded power sources
Nominal Output current	Amps	25
Frequency	Hz	50 / 60
Source unhealthy status	-	Guaranteed Transfer to alternate source within –15 % of Vnominal
Load Power factor range	-	0.5 to unity leading or lagging
Load Crest factor	-	upto 3.5
In-Phase transfer window	-	Adjustable from 5 ± 1º
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	upto 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.
Unsynchronised transfer		6 milllisec for synchronized transfer and 16 millisec for unsynchronized transfer.

4.3 Mechanical specifications

MECHANICAL CHARACTERISTICS	UNITS	DESCRIPTION
Height	mm	88.0
Width	mm	431.0
Depth	mm	457.0
Weight	kg	8.0
Colour		Matt Black
Installation		19” Rack Mounted / floor / table top
Cable entry	-	Rear side
Ingress Protection		IP41

4.4 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	Upto 1500m (5,000 ft)
Storage / Transport Altitude	m	Upto 12000m (40,000 ft)
Audible Noise	db	< 45 db at 1.5 m

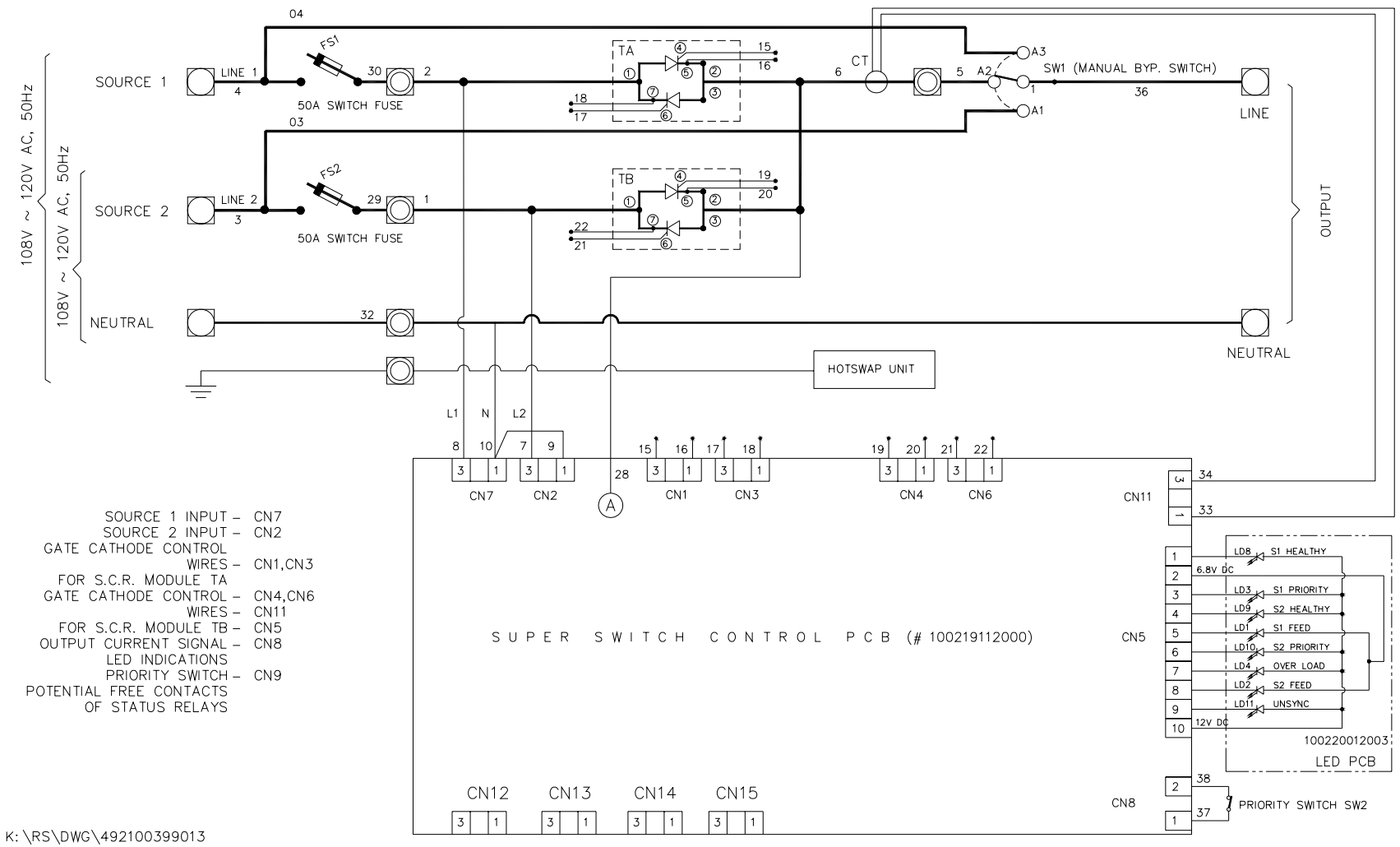
5 Installation Drawings

5.1.1 Power Circuit Diagram

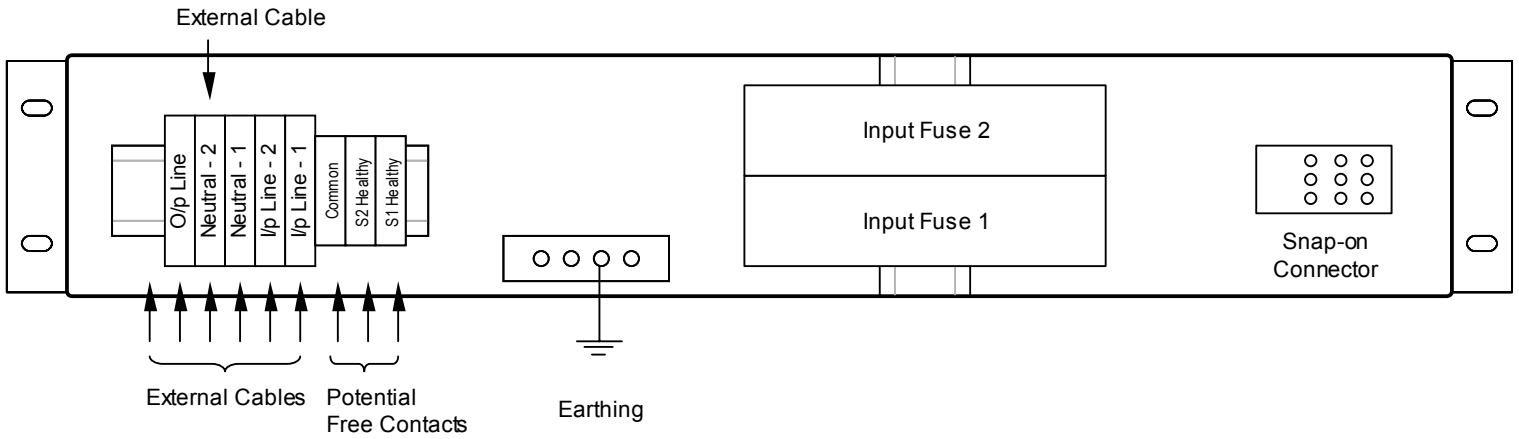
5.1.2 External Power cable connections

5.1.3 Overall general arrangement

5.1.1 Power Circuit Diagram



5.1.2 External Power cable connections



Rear View

EXTERNAL POWER CABLE CONNECTIONS

NETWORK POWER SWITCH

5.1.3 Overall general arrangement