HELIOS
POWER SOLUTIONS

HPS-iSTS-B4

User Manual

19-inch Rack Mount Static Transfer Switch

Last Updated
16/11/18

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1 Safety Instructions

1.1 Introduction

Some aspects of this manuals contents may differ to the equipment as supplied due to technical improvements, specific model variations etc. If in any doubt in respect to the procedures and safety issues consult the manufacturer and do not proceed until clarification is received.

This manual contains important instructions that should be followed and fully understood before proceeding and commissioning and operation to prevent harm to personnel and equipment.

Installation and commissioning should be carried out only by qualified and experienced electricians. The STS should be operated by technically qualified personnel that are authorized, experienced and have knowledge and understanding of the equipment and the critical loads, using the documented procedures.

Read this whole document thoroughly. Understand every aspect before proceeding. Request further assistance if you do not understand any aspect of the operation of the STS. Support and contact numbers are at the end of the manual.

These instructions cover normal operation in the automatic as well as in manual modes. Special operating conditions, such as short circuit tests, input supplies, etc., are not covered in this document. These operations require comprehensive knowledge of the overall system and should be carried out by properly qualified, skilled and competent service personnel only.

1.2 Transport, Storage, Unpacking

The STS has been fitted with Shockwatch ship drop sensor in an effort to reduce transit damage and safeguard our shipments.

Procedure for Receiving Shipment:

- Please do not refuse to accept shipment. An activated (RED) indicator on the label does not mean that damage has occurred. It only indicates that the carton received an impact or movement above a normal anticipated level. Only an inspection can determine if any damage has occurred. If the indicator on the label is RED, please make a notation to that effect on the bill of lading or delivery receipt or document. Examine contents immediately for possible damage. If damage is discovered, inform carrier immediately and follow normal procedure for a carrier inspection and filing of a concealed damage claim.

- Take a picture of the carton and contents as a record.

- If the packaging is OK then please keep the packaging in a secure place in case the unit needs to be returned for repair.

1.3 Installation

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.

- Observe the prescribed accident prevention and safety rules for the specific application.
- When installing the STS strictly observe all information on technical data and operating conditions. Comply with all warnings, and strictly follow the procedures and practices as described in this manual.

- This STS is intended to be used in a controlled indoor environment and free of conductive contaminants and protected against animal intrusion.

- It is important that the unit has adequate ventilation. Maintain air movement around and through the unit. Do not block the air vents or restrict airflow over the heatsinks on the side of the STS.

- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C (104°F).

- Do not install the STS in an excessively humid environment or near water, relative humidity should not exceed 90% at 20°C (680F).

- Avoid spilling liquids or dropping any foreign object into the STS.

- The electrical connections must be covered.

- Connecting cables must be supported.

- Earth connection must be checked for safe function after assembly.

1.4 Maintenance Bypass

WARNING: REFER TO THE MAINTENANCE BYPASS SECTION BEFORE ATTEMPTING TO PUT THE UNIT INTO MAINTENANCE BYPASS MODE.

THE MAINTENANCE BYPASS SWITCH UTILISES MAKE-BEFORE-BREAK SWITCHING, INCORRECT OPERATION OF THE MAINTENANCE BYPASS FEATURES COULD RESULT IN DANGEROUS VOLTAGES OCCURING AND SHORT CIRCUITS AND/OR DAMAGE TO THE EQUIPMENT.

1.5 Electrical Connection

- Cable & lug size recommended is 35/50 mm^2 or 70 mm^2 using narrow palm lugs and 160 Amps per terminal.

- All cables connecting to the STS should be supported and not weigh the rear of the STS and strain the point of connection at the front of the STS.

- All electrical connections are to be realized by properly qualified, skilled and competent service personnel only.

- Consider electrical distribution discrimination carefully. The STS has two incoming AC power sources; your upstream protective devices must discriminate with downstream protective devices. The upstream STS supply breaker /fuse should only open if the downstream device protection is unable to trip or there is a fault within the STS.

1.6 Synchronism

The smoothest change-overs occur when the two incoming supplies are in synchronism. If an asynchronous transfer occurs, large currents may flow into the load which can damage trip protective devices, blow fuses, saturate and cause damage to transformers and motors. If possible it is best to make sure the supplies are in synchronism. If in doubt contact Static Power for advice on the best asynchronous transfer scheme for your loads.

1.7 Fire Regulations

Should a fire break out inside the system a fire extinguisher with CO2 or Halon must be used. Do not inhale vapours.

1.8 Standards Applied & Conformity

This equipment conforms to the following standards and EC Directives:

Standards to which conformity declared:

EN 60950-1	Information technology equipment Safety - General requirements
EN/AS 62310.1	Static transfer systems (STS) - General and safety requirements
EN/AS 62310.2	Static transfer systems (STS) - Electromagnetic compatibility (EMC) requirements
EN/AS 62310.3	Static transfer systems (STS) - Part 3: Method for specifying performance and test requirements
EN/AS 55024	Information technology equipment, Immunity characteristics, Limits and methods of measurement
EN 60950-1-2006	Information technology equipment safety: General requirements

Application of Council Directives:

2006/95/EC	Low Voltage Directive
73/23/EEC	Low Voltage Directive
89/336/EEC	EMC Directive, in version 92/31/EU
93/68/EEC	EMC Directive Amendments
2011/65/EU	EMC Directive
204/108/EEC	EMC Directive
2014/35/EC	EMC Directive

The product mentioned in this manual conforms to the relevant requirements to the appropriate EU Directive, i.e. that this product meets all relevant EU Directives and that it can be sold inside the European Union without national commercial hindrances.

Relevant EU Directives: EMC- and Low Voltage Directives:

- EU Directive on Electromagnetic Compatibility 89/336/EU, in version 92/31/EU, 93/68/EU
- EU Directive on Electrical Equipment designed for use within certain Voltage Limits (Low Voltage Directive) 73/23/EU, in version 93/68/EU

The directives themselves define only on a modest scale what to do and refer to the harmonised standards. One of the EU harmonised product standards is applicable for rectifier systems.

CE

The standards mentioned above fulfil the requirements for CE marking.

Year of CE Marking 2015/2016/2017/2018

1.9 Warranty

Static Power operating through its authorized agents warrants that the standard products will be free of defects in materials and workmanship for a period of 24 months after dispatch or such other period as may be specified or agreed under contract. This warranty does not cover failures of the product which result from incorrect installation, misuse, alterations by persons other than authorized agents or abnormal operating conditions. This includes internal fuses or damages resulting from incorrect installation, commissioning and loading.

PRODUCT RETURN/REPAIR INSTRUCTIONS - INTERNATIONAL

Please follow these steps... These are in addition to any Export requirements that there may be in your country of goods departure (these are not known by us).

1. Provide a detailed fault report (even if you've discussed it previously, the person attending to your repair will not be the person you spoke to and the passage of time alters the perception if just left verbal).
2. Pack the goods in their original packaging (as long as not extensively damaged prior).
3. Prepare the Invoice for customs:

E.g. **HS Code 8536.50.92** (So that import duties are not applicable)
Original Invoice Value of the goods
Date of original Invoice (only applicable within 24 months of receipt of goods)
On the Invoice and on the packaging the following (Including shipping docket...)
420A GST Exemption Code ITEM 20A
And HS Code 8536.50.92
Goods Returned to OEM for Repair Under Warranty
Otherwise GST/VAT taxes and duties will be payable

Send to:
Static Power Pty Ltd
5 Candlebark Court
Research Victoria 3095
Attent: Robert Heezeman
Ph: +61 3 94370494
(collection from Depot / Freight Forwarder or airport will not be undertaken)

4. Send the goods back using your standard courier or freight forwarder. Use your own account including insurances. Irrespective if the goods are under warranty or not. An assessment and determination will be made after inspection. You will be responsible for the cost of the return of goods.. If the goods are lost or damaged in transit you will be responsible for the costs of repair or replacement so we would recommend insurance. (As per our conditions of sale provided at time of quotation). e.g. **DDP – Delivered Duty Paid (named place of destination)** Shipper is responsible for delivering the goods to the named place in the country of the receiver, and pays all costs in bringing the goods to the destination including import duties and taxes. E.g. "Free In Store (FIS)". Please note that damage in transit or blown fuses and or tampering are not covered by warranty.

5. Please provide the account number and courier information for the return of the goods and a PO for the repair / inspection. This may or may not be used depending on the findings of the initial inspection. We will try to carry out the initial inspection within 2 working days of receipt of the goods. If necessary a report and quotation will be prepared and provided.

6. Upon Receipt of the goods we will acknowledge its arrival.

2 System Overview

2.1 Description

A Static Transfer Switch (STS) provides seamless switching between two power sources to provide interrupted power to a critical load.

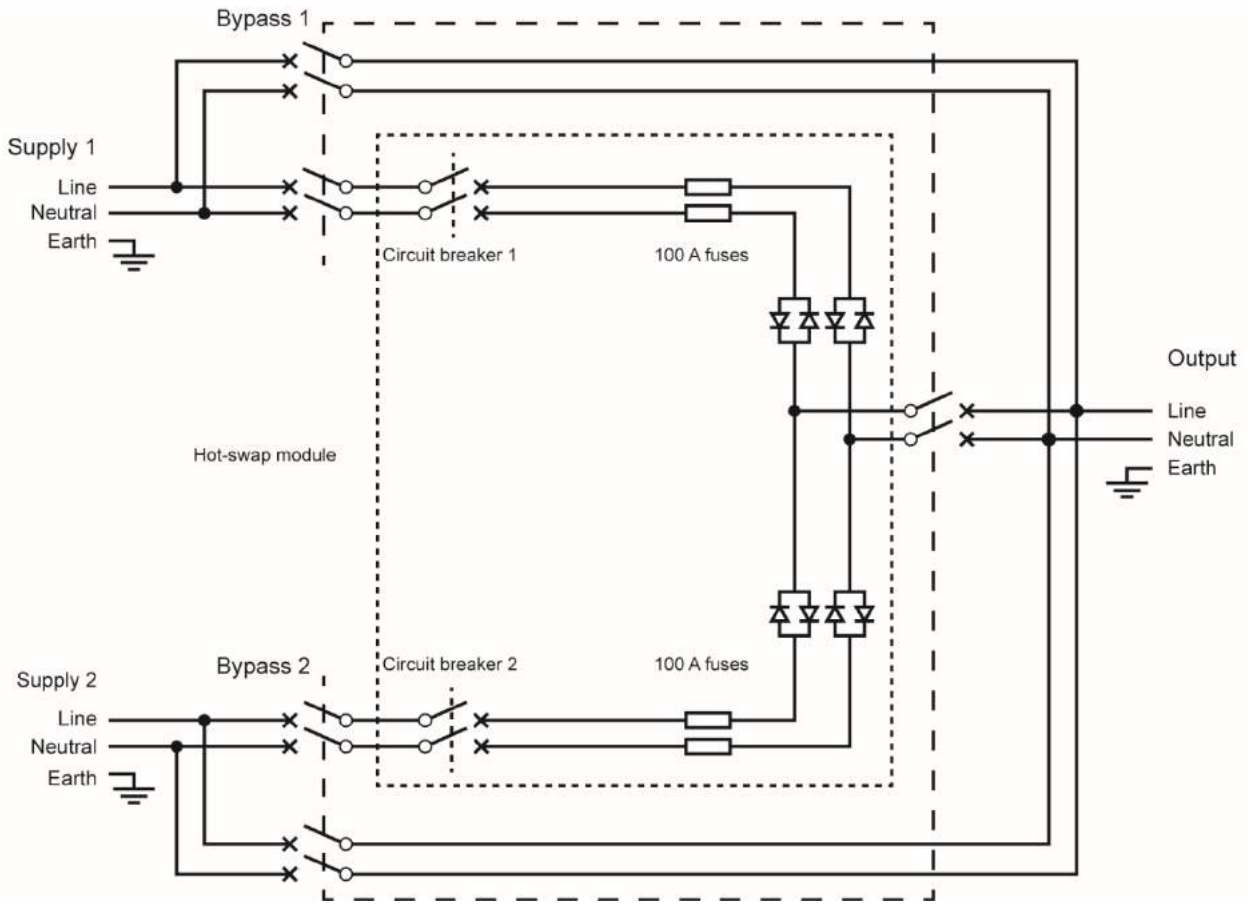
The STS continuously monitors the supply sources for failure or degeneration and switches automatically to the alternate source if the load will be affected. The break in the supply transition is so short that it is not seen by the critical load. This switching process is undertaken as a **break before make** transfer, preventing overlapping which can cause large and unpredictable currents. In 2 and 4-pole models, all the active conductors and the neutral are switched. In 3-pole models, only the active phases are switched. Thyristors are used to undertake the switching process.

In the case of downstream load fault conditions, the fault current drawn from the supply may degrade or damage the supply sources; as a consequence should a fault current exist in the load the STS will inhibit a transfer to the alternate source even if this causes source supply degradation or loss. This is to ensure that the fault will not be transferred to the alternate supply with the possibility of degrading both sources.

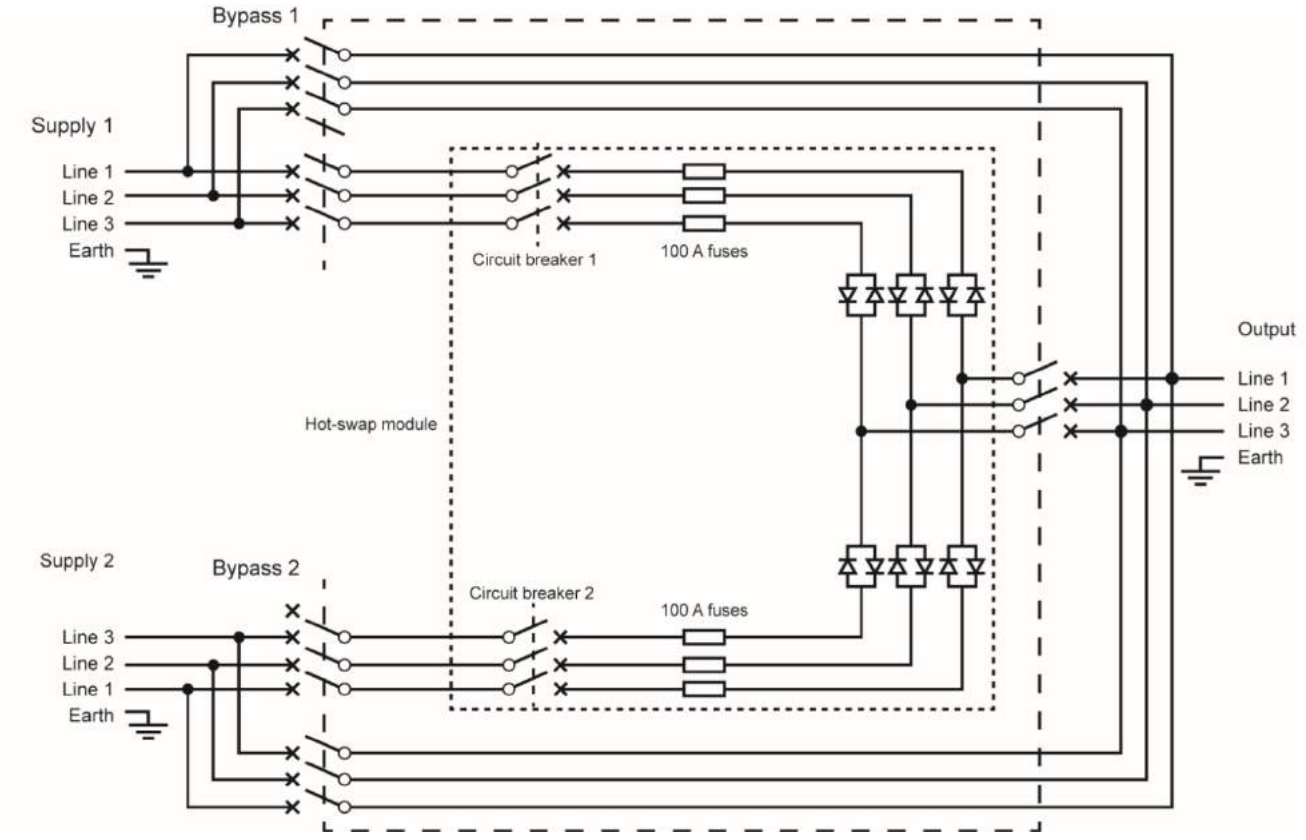
The current threshold is pre-set to approx. 300% of the rated current.

This unit contains fuses. The fuses are to provide for safe operation even in high fault capacity environments. It should be noted that the fuses are for the protection of the semiconductor switches (SCRs/ Thyristors), not the load. The STS does not have any automatic tripping devices, so load discrimination is undertaken in the primary and secondary supply networks and / or on the load equipment itself.

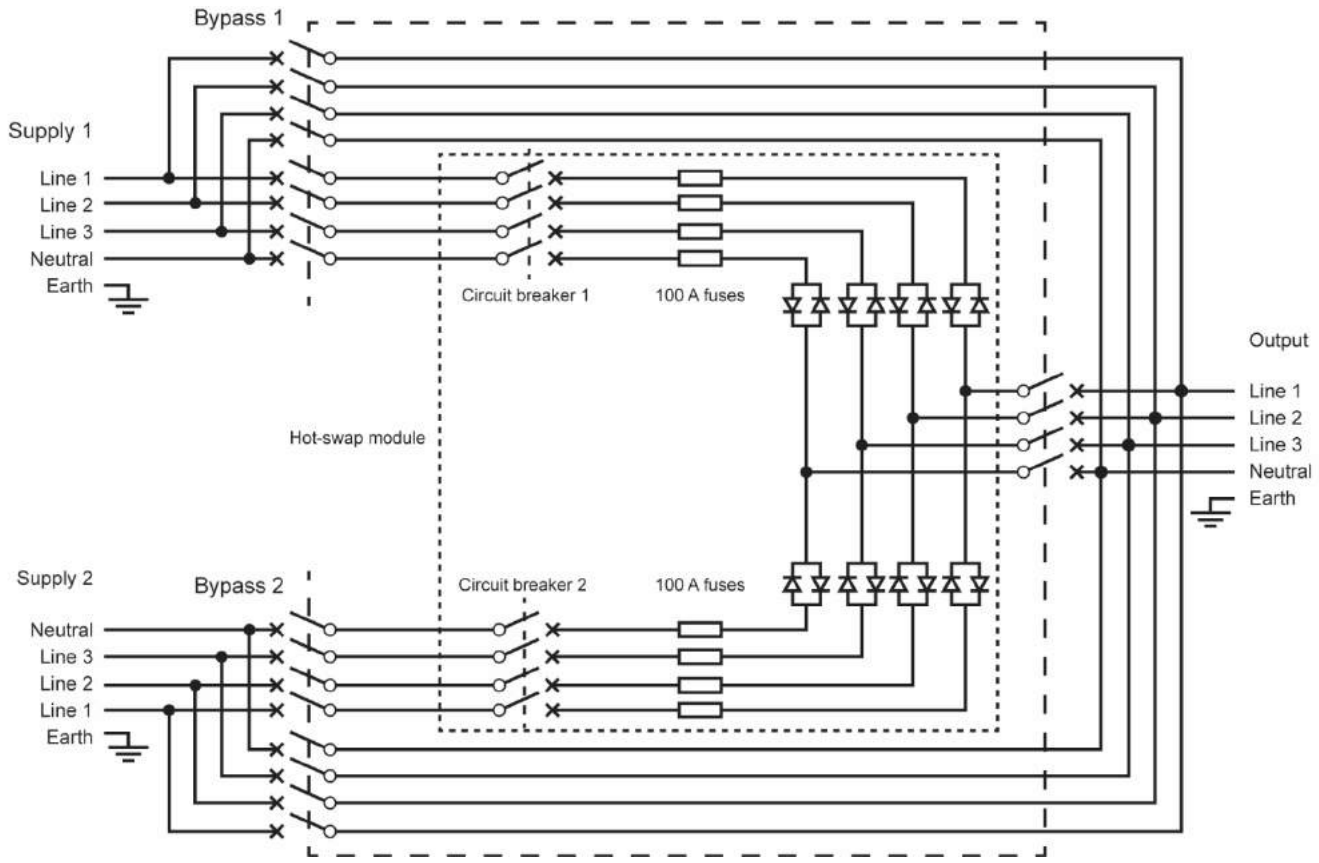
2.2 Single Line Diagram – Single-Phase 2-Pole Models



2.3 Single Line Diagram – Three-Phase 3-Pole Models



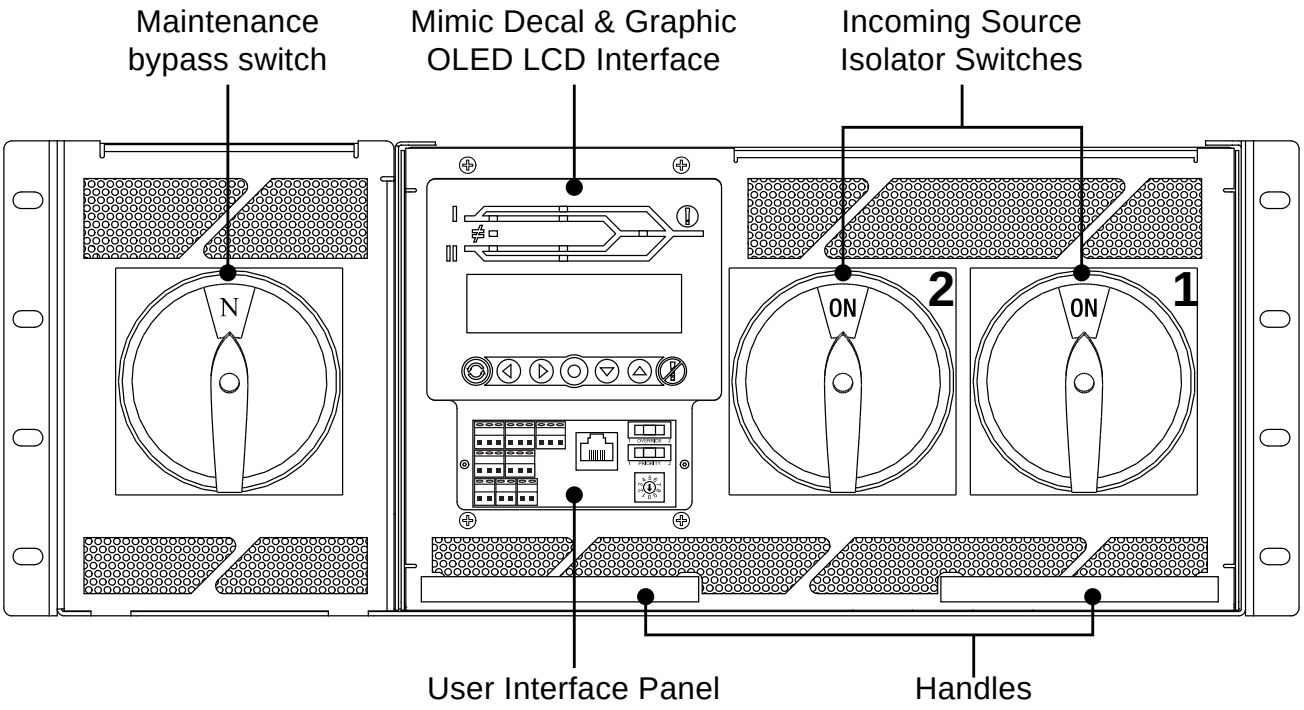
2.4 Single Line Diagram – Three-Phase 4-Pole Models

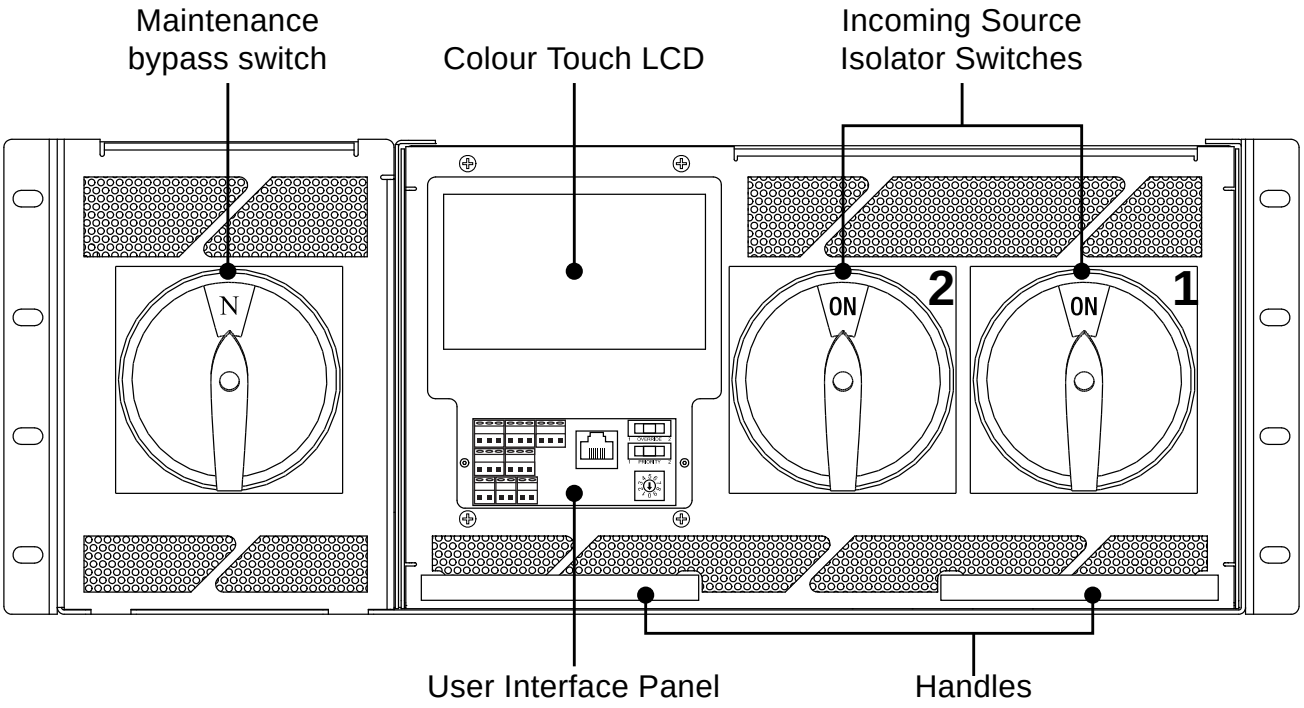


2.5 Overview

The STS comprises a hot socket removable / replaceable power module. Replacement is achieved in conjunction with the Maintenance Bypass Switch located at the front of the STS.

Front View





3 Installation

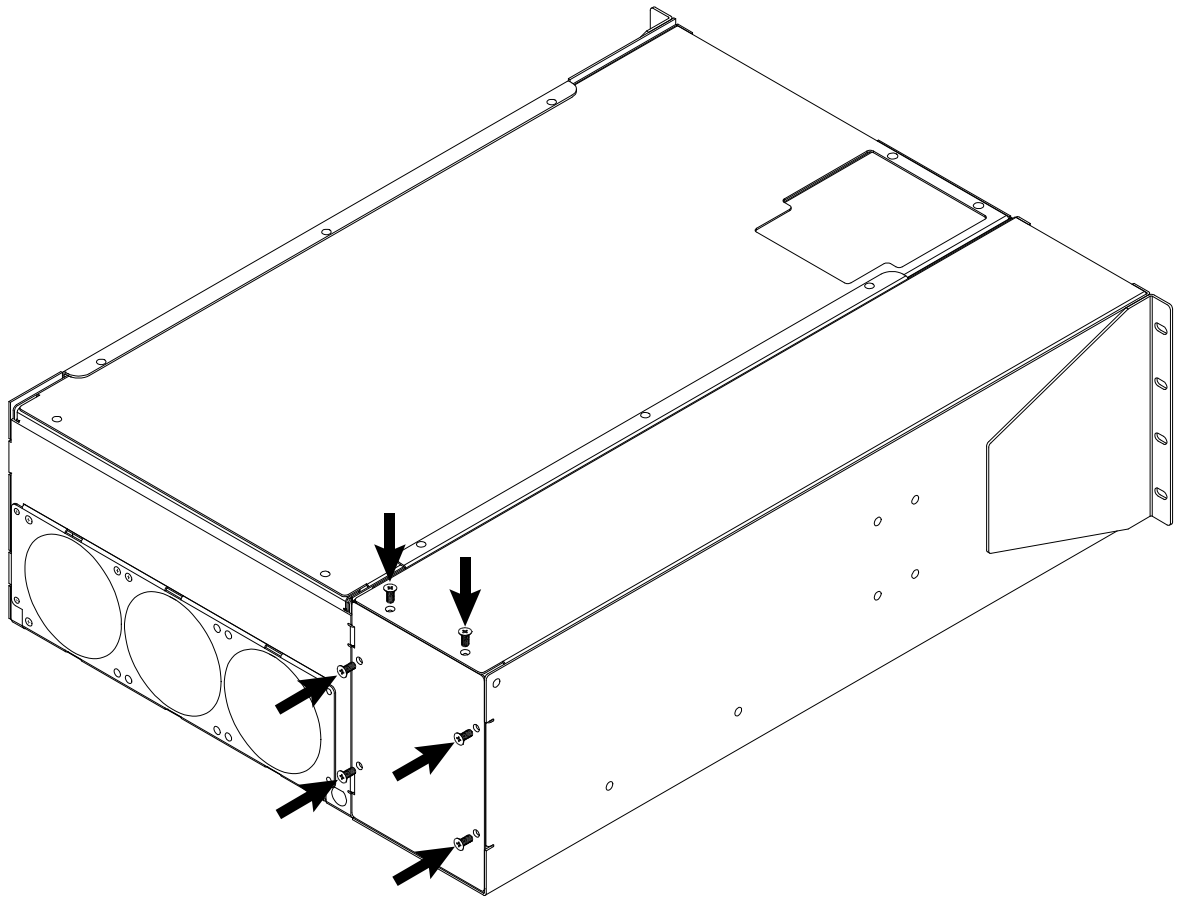
3.1 Connecting to Terminals

1. Mount the unit into a 19 inch rack. It is important because of the weight that the STS is installed on a shelf and/or that the rear section is fully supported.

2. Where the requirement is for seismic rating the front power module retaining strap is required to be installed across the front of the unit to prevent the power module from falling out.

3. In addition for Seismic rating requirements it is necessary to strap the whole of the module onto the shelf (to prevent vertical displacement. We recommend that a metal strap be screwed/ bolted (not supplied)

4. Remove screws on the back and top of the cradle to gain access to the terminals.



5. Cut holes in the rears cover plate and feed cables through the rear cover before attaching lugs.

6. Where possible use Nylon Glands to retain the cables and replace / screw down the Gland Plate into its original position.

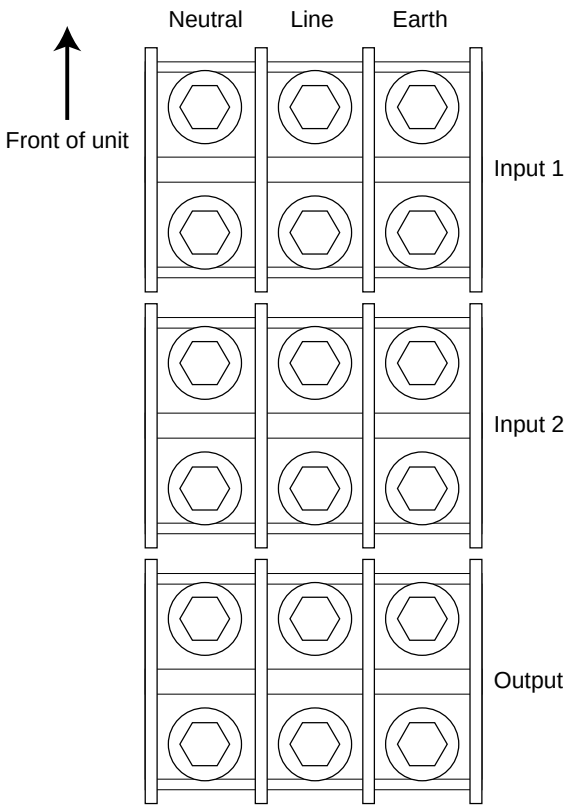
7. In addition we recommend that a cable retention system be used on the exterior of the unit to take the strain off the Glands and mounting plate. This is especially important for seismic consideration.

8**.** Attach lugs to cables. The terminals will accommodate a standard 35mm cable lug or up to a 70 mm narrow palm cable lug.

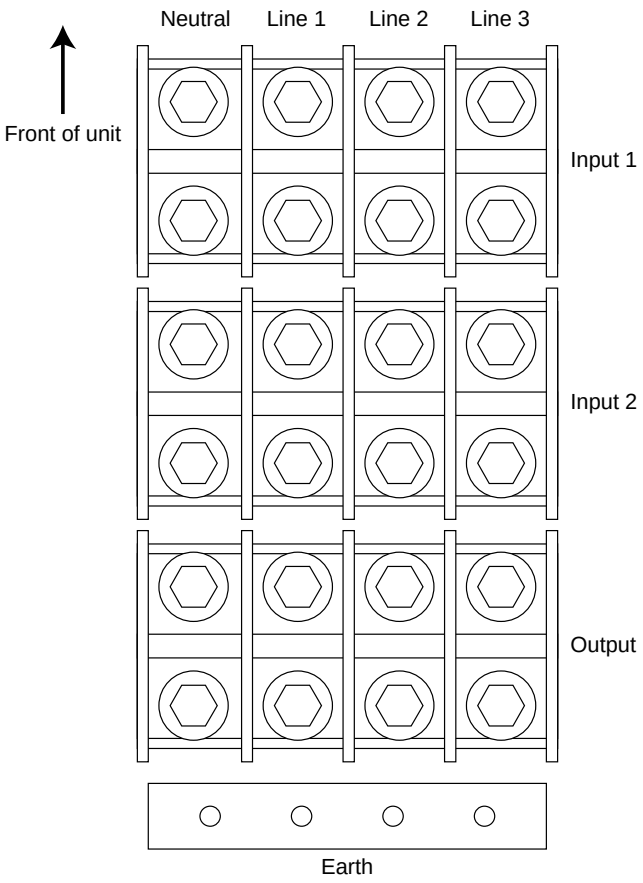
9. Attach lugged cables to terminals. Ensure that the cables are supported to prevent putting strain on the terminals, and that the weight of the cradle is supported. Check that the connections are tight before replacing the covers.

Terminal Configuration

Single-Phase Models



Three-Phase Models



3.2 Commissioning

NOTE: Before initial power up, make sure the Voltage Selector Switch is set to match your nominal voltage.

Once the unit is installed, power can be applied and the unit will turn on automatically.

After initial power up:

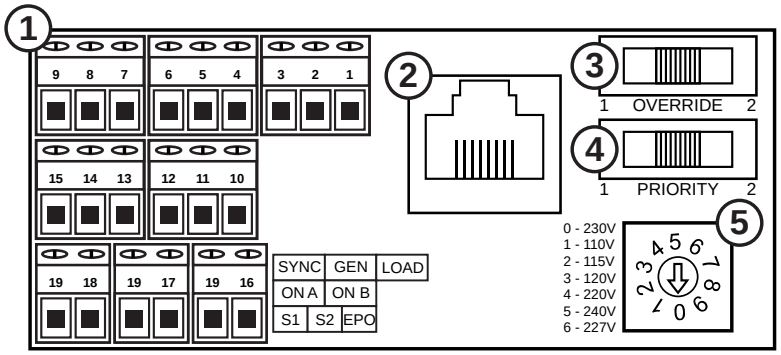
- After a few seconds the display screen will power up and you will be prompted to enter the date and time. We strongly encourage the setting of the date and time so that real time event correlation can be undertaken. The Real Time Clock is backed up by a battery clock.

Please note that the date and time are backed up using a small rechargeable lithium battery. It may have been discharged during transit or storage. The battery will re-charge, however, will take some weeks to gain full charge after power has been restored.

- The ALARM should not be active. If it is check the following states:
    - ON Supply 1 when priority is Supply 2
    - On Supply 2 when priority is Supply 1
    - Supply 1 or Supply 2 are not in spec.
    - Override Switch is in position 1 or 2
    - Supply 1 & 2 are not in synchronism
    - The unit is too hot (thermal bi-metal switch on H.S. activated)
    - There is / was an overcurrent/ overload / load fault condition

4 User Interface Panel

4.1 Overview



	NAME
1	USER INTERFACE BREAKOUT TERMINALS
2	ETHERNET PORT
3	OVERRIDE SWITCH (Operate with caution)
4	PRIORITY SWITCH
5	VOLTAGE SELECTION ROTARY SWITCH

4.2 User Interface Breakout Terminals

The relays can switch up to 220 DC, 250 AC.
Remote contacts are wet contacts and do not require external voltage to be applied.

PINS	CONNECTION	FUNCTION
1 to 2	N/O	Load Fault
3 to 2	N/C	Load Fault
4 to 5	N/O	General Alarm
6 to 5	N/C	General Alarm
7 to 8	N/O	Not in Sync
9 to 8	N/C	Not in Sync
10 to 11	N/O	ON A (Supply 1)
12 to 11	N/C	ON A (Supply 1)
13 to 14	N/O	ON B (Supply 2)
15 to 14	N/C	ON B (Supply 2)
16 to 19	REMOTE CONTACT	Emergency power off
17 to 19	REMOTE CONTACT	Transfer to Supply 1

4.3 Ethernet Connector

Use the Ethernet connector to the STS in two different ways with a RJ45 Cat5/6 Ethernet cable:

- To a Network hub/switch using a straight-through cable.
- To a PC using a cross-over cable (most PCs can now work with a straight-though cable).

Once connected the Web Browser Interface can be used.

4.4 Preferred Switch

This switch allows the preferred source to be set to Supply 1, Supply 2 or None (0), which will take affect **only** when the preferred source is set to None (0) on the STS software. Refer to the Web Interface section for instructions on changing the preferred source through LAN connectivity.

If the STS is forced to automatically transfer the critical load to the alternate source the STS will automatically transfer back to the preferred again when the preferred source is within tolerance and after a pre-set settling delay.

4.5 Override Switch

Setting the override switch to 1 or 2 will force the STS to stay on that supply even if faults are detected on that source.

This switch overrides all other settings. It should not be used to transfer the critical load between sources (a break may result).

NOTE: The override provides control logic bypass only, it does not provide an alternative path for the load power.

WARNING! The override switch initiates instantaneous transfers and may transfer faults to the load.

WARNING! Never attempt to operate the OVERRIDE switch if the supplies are not in synchronism. There is no interlock to prevent the switch from being operated when the supplies are not available or not in synchronism. Refer to the LCD variables display and mimic diagram to check the synchronism state, (SYNC LED will be RED, variables display will show degrees out of synchronism. Only operate when less than 10 degrees). If the control is not operating you may need to use other means to determine that the supplies are in synchronism. Do not operate the OVERRIDE switch onto an absent supply.

4.6 Voltage Selector Rotary Switch

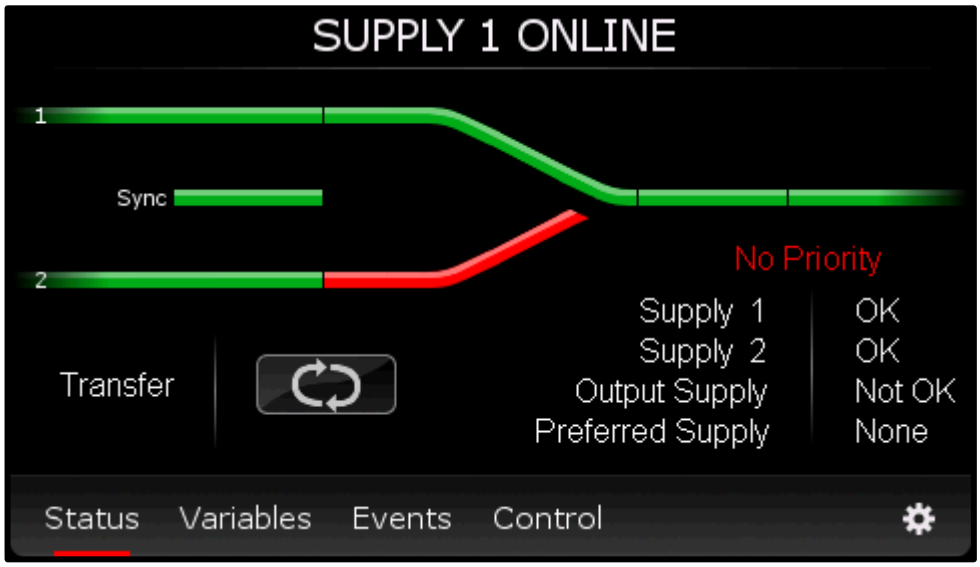
Use the rotatory switch to select your nominal voltage. This will ensure that all readings of voltage are scaled according to the operating voltage.

5 Colour Touch LCD Interface

5.1 Home / Status Screen

A colour touch-screen LCD provides the user with an easy to navigate real-time information and control interface.

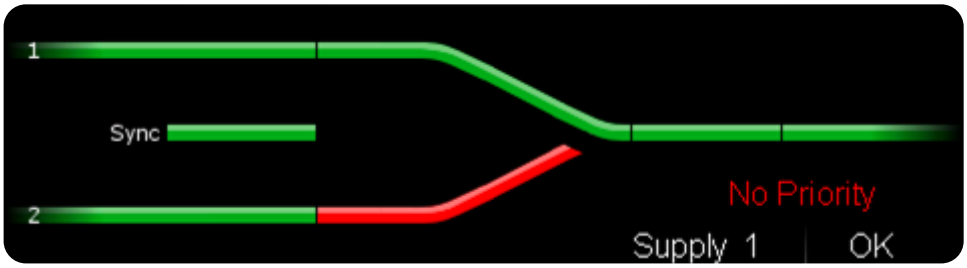
Touch feedback is indicated by an audible ‘beep’.



5.2 Status & Alarms

The Home/Status screen shows a mimic diagram and status indication as text. This is the default screen and a period of inactivity will result in the LCD returning to this location.
The mimic diagram allows easy identification of state changes, showing system status. All states are bi-colour where green indicates the normal, or ‘on’ state.

5.3 Mimic Display

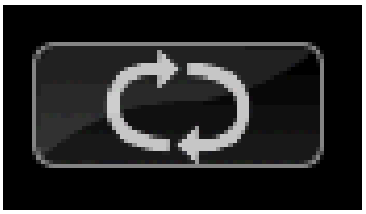


The availability of supply 1 and 2 is indicated by their respective bar on the mimic diagram.

The synchronization hold-off bar between the two sources on the mimic diagram is located between the two supply bars. Green is in synchronism.

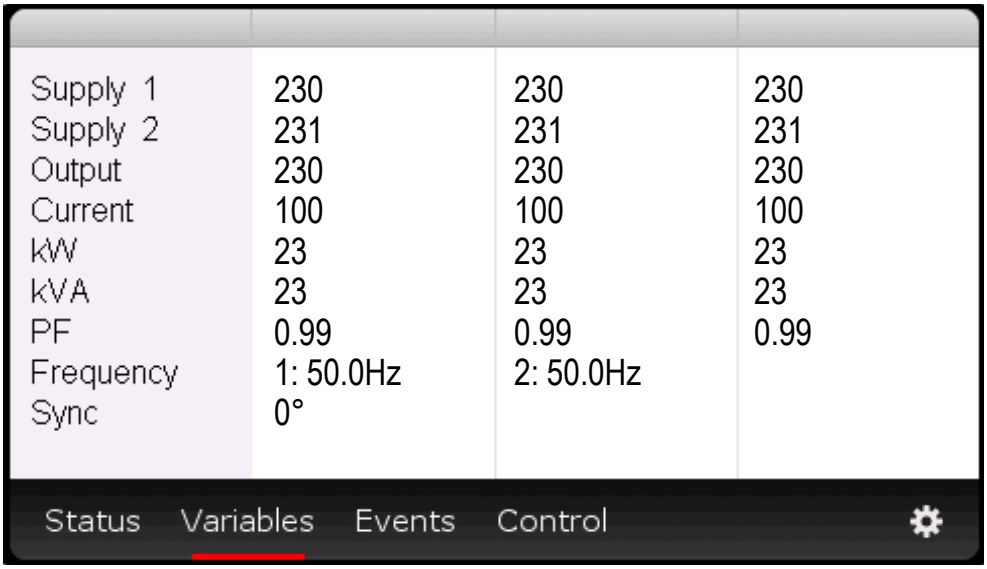
The area directly before the two bars converge shows which supply is online.

5.4 Manual Transfers



Press and hold the transfer button for 3 seconds to affect a transfer. This transfer touch zone can be removed if desired (to make the install more secure) via the “Control” menu and selecting the “Allow Transfer”, “OFF” option. The unit can still be transferred using the priority switch at the rear of the STS.

5.5 Variables

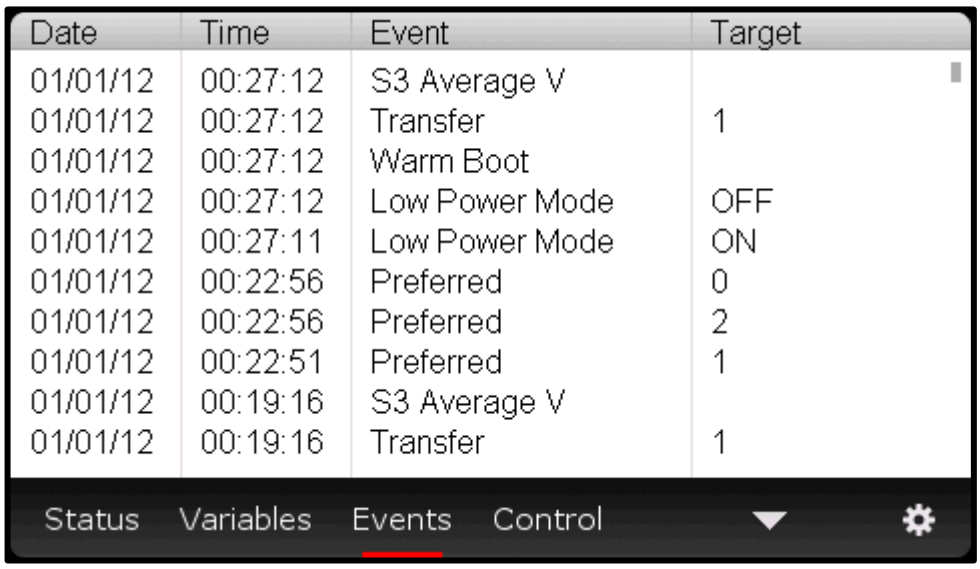


The Variables screen shows the following:

- Output Voltage (phase to neutral / phase)
- Output Current
- Output Power Factor.
- Output Power (kWatts).
- Output Power (kVA)
- Frequency for each source
- 1 Source Input Voltage
- 2 Source Input Voltage
- Phase Angle between Sources 1 & 2

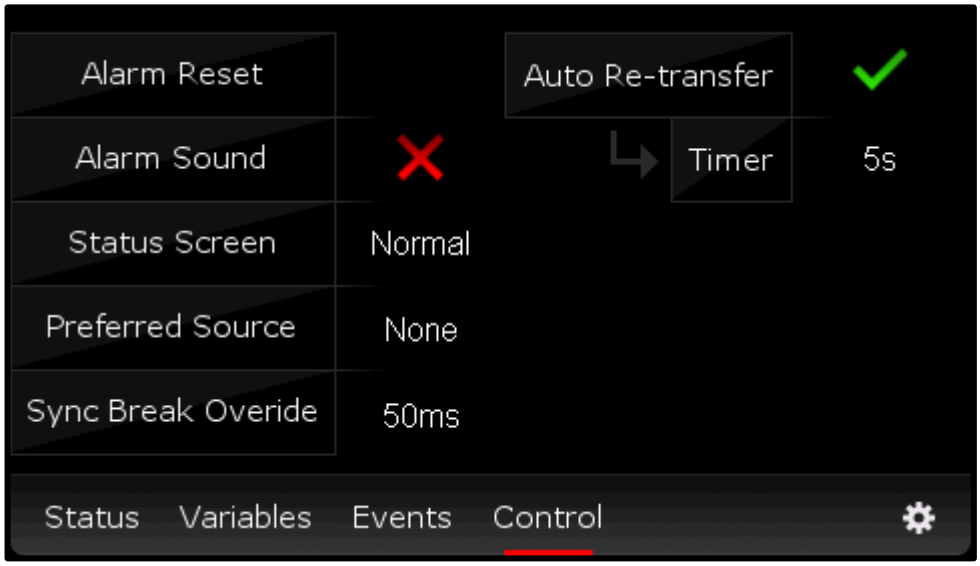
These variables refresh approximately every three seconds.

5.6 Events



Up to 200 events can be stored. Once the list is full, the oldest events are pushed from the bottom of the list and are replaced by any new events. See the Fault Codes section for more information.

5.7 Control Screen



The control interface provides access to essential parameters and set-up information:

- **Alarm Reset:** Clears persistent alarms (such as SCR Short or SCR Open).
- **Alarm Sound:** Enables/Disables the alarm sound.
- **Status Screen:** Normal/Safe. Enables/Disables the transfer touch zone on the status screen.
- **Preferred Source:** Sets the preferred source supply (supply 1, supply 2 or none). This will only make changes when the hardware preferred switch (at the rear of the unit) is set to '0' (middle position)
- **Sync Break Override**: Sets the break time (in ms) for an out of sync transfer
- **Auto Re-Transfer:** Sets the STS to transfer back to the preferred supply automatically after a self-initiated (non-manual) transfer.
- **Timer:** Sets the delay (in seconds) between the preferred supply being recognized as OK, and the transfer attempt back to that supply.

Sync Break & Mode Angle Detection Setting

Provides access to adjust the allowable not in synchronism transfer. (Default is 30^{o} and is adjustable between 5^{o} – 180^{o}), Manual transfers are inhibited when supplies are outside this range, however, automatic transfers will experience a 50 msec break, settable (0 or 50 msec).

Alternative settings for break time may be available from the DIP switch settings (consult Static Power).

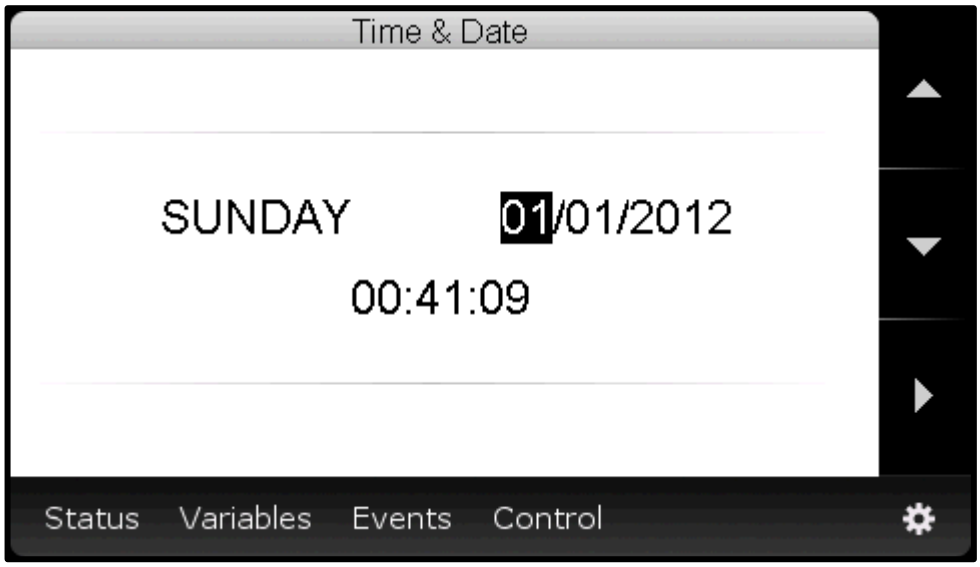
5.8 Settings

This menu item provides a facility for adjusting STS settings and calibrations.

Passcode
Enter the passcode (1234) and press return.

CAUTION! The STS has been shipped with factory defaults. These are the most reliable settings for correct stable operation. The settings should not be changed unless the user has a full understanding of the consequences. Consult Static Power prior to changing any settings. All STS settings always must be wider than the source that is supplying the STS otherwise the STS will become unstable and the load could be compromised.

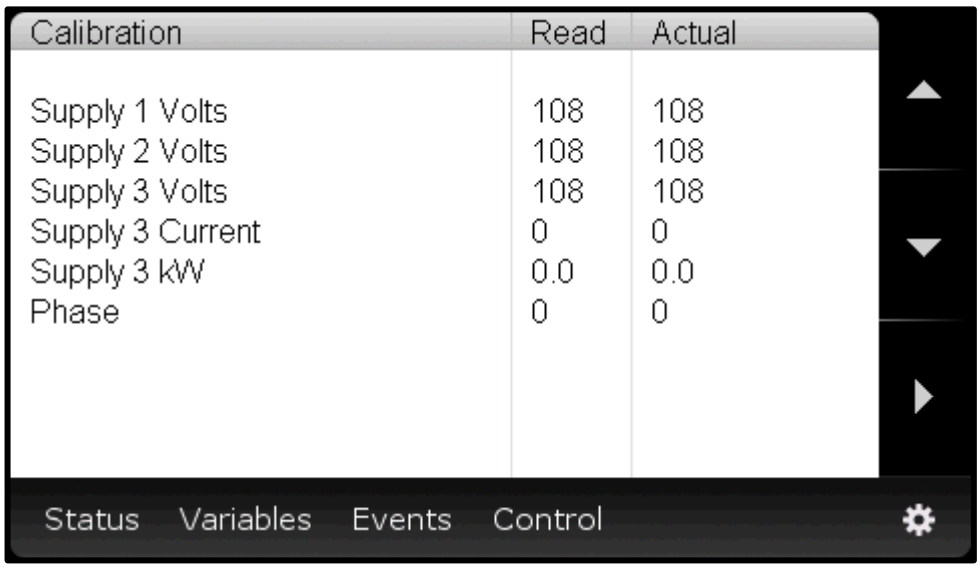
5.9 Time & Date



Use the scroll key → to access the parameter then the up & down keys to set the desired parameter values. Parameters are set as soon as they are entered.

Real time clock is battery backed up using re-chargeable Lithium battery. If left for more than 48 hours the battery will fully discharge & stored display information will be lost. Battery re-charge time can be up to 100 hours.

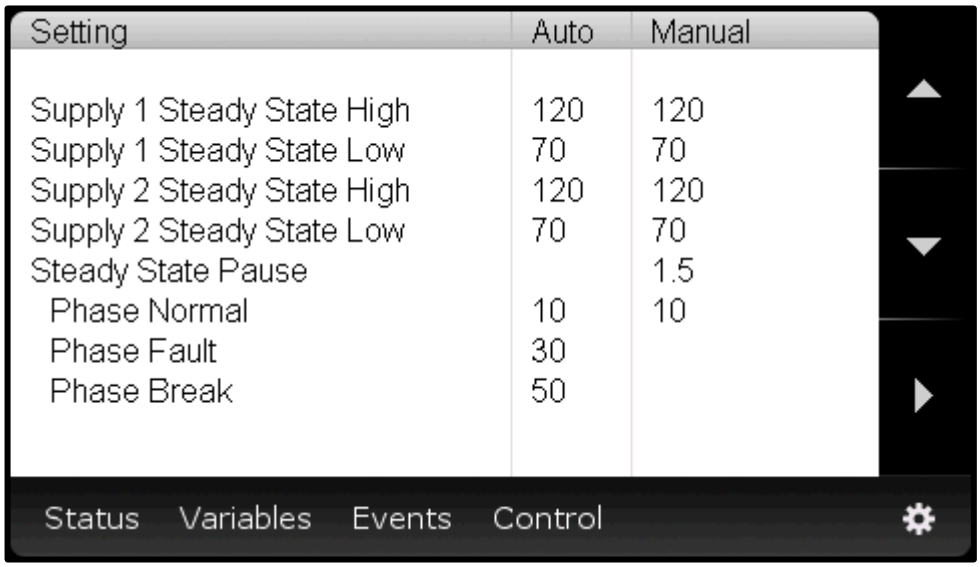
5.10 Calibration



This sub-menu is used to adjust accuracy of displayed variables (only +/- 3 volts). Follow the prompts, read the value with properly calibrated meters and enter them into the Actual column. Parameters are set as soon as they are entered.

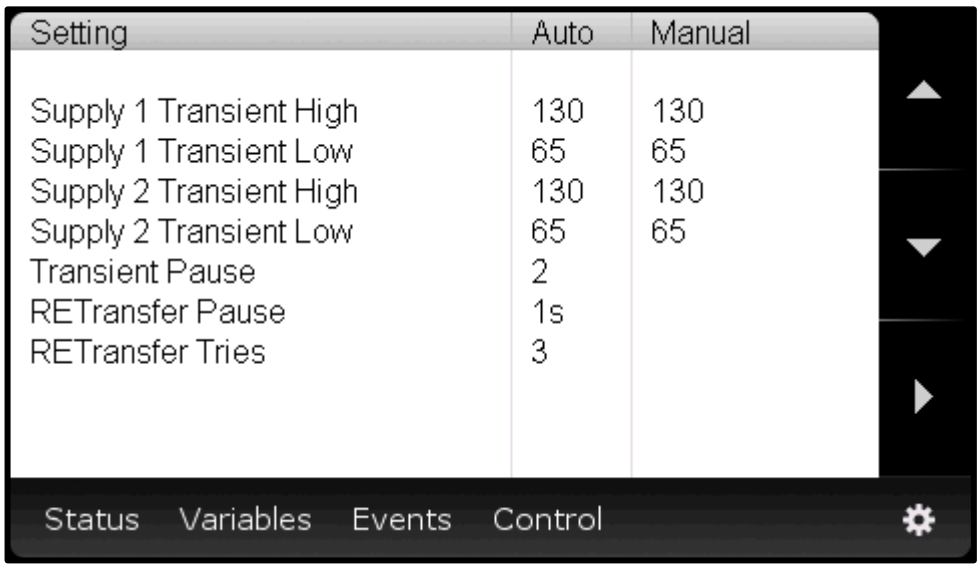
5.11 Steady State

The following screens show the available options. The Auto settings apply to normal STS operation (unattended). The Manual setting are referenced when the STS is manually operated (Manual user transfer requests).



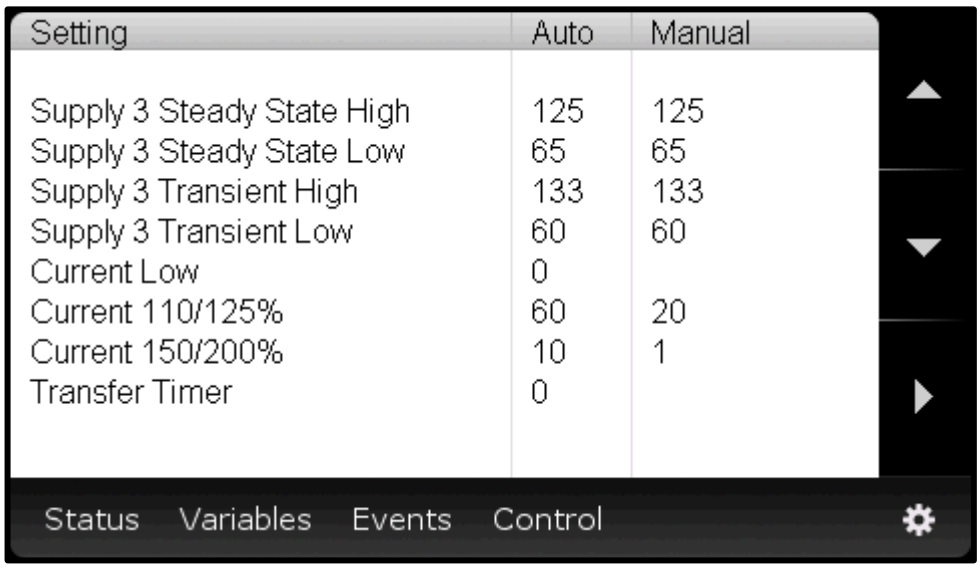
Steady State settings changes:	**Which:**
Supply 1/2 Steady State High	Sets the tolerance of steady state over-voltage conditions, as a percentage of rated voltage.
Supply 1/2 Steady State Low	Sets the tolerance of steady state under-voltage conditions, as a percentage of rated voltage.
Steady State Pause	Sets the time for what is considered steady state, in seconds
Phase Normal	Sets the phase difference of the two supplies, in degrees, of what is considered a 'warning' condition.
Phase Fault	Sets the phase difference of the two supplies, in degrees, of what is considered a 'fault' condition.
Phase Break	Sets the break time, in ms, that the STS will observe during a transfer while the Phase Fault condition is active.

5.12 Transient State



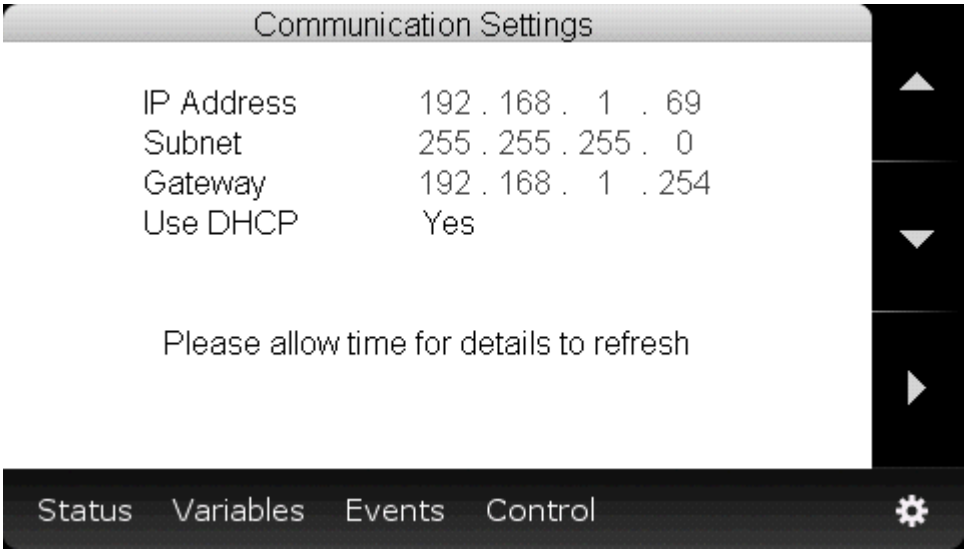
Transient settings makes changes to:	**Which:**
Supply 1/2 Transient High	Sets the tolerance of transient (sub cycle) voltage spike fault tolerance, as a percentage of rated voltage.
Supply 1/2 Transient Low	Sets the transient (sub cycle) voltage dip fault tolerance, as a percentage of rated voltage.
Transient Pause	Sets the number of consecutive samples that must be out of tolerance before a transient fault is flagged. (1 sample = 1/64th of a second)
RETransfer Pause'	Sets the pause, in seconds, that will be observed between re-transfer attempts
RETransfer Tries	Sets the number of fast, consecutive re-transfers that will be tolerated before a re-transfer lockout will be activated.

5.13 Output



Output settings makes changes to:	**Which:**
Supply 3 Steady State High/Low	Sets the tolerance of steady state over-voltage and under-voltage conditions, as a percentage of rated voltage.
Supply 3 Transient High/Low	Sets the transient (sub cycle) voltage spike/dip fault tolerance, as a percentage of rated voltage.
Current Low	Sets the tolerance for a low current alarm, in Amperes.
Current 110/125/150/200%	STS withstand time, in seconds. **Ignore Auto/Manual columns*
Transfer Timer	Sets the period for automatic 'self diagnosis' transfers, in minutes. 0 = disabled.

5.14 Communication Settings

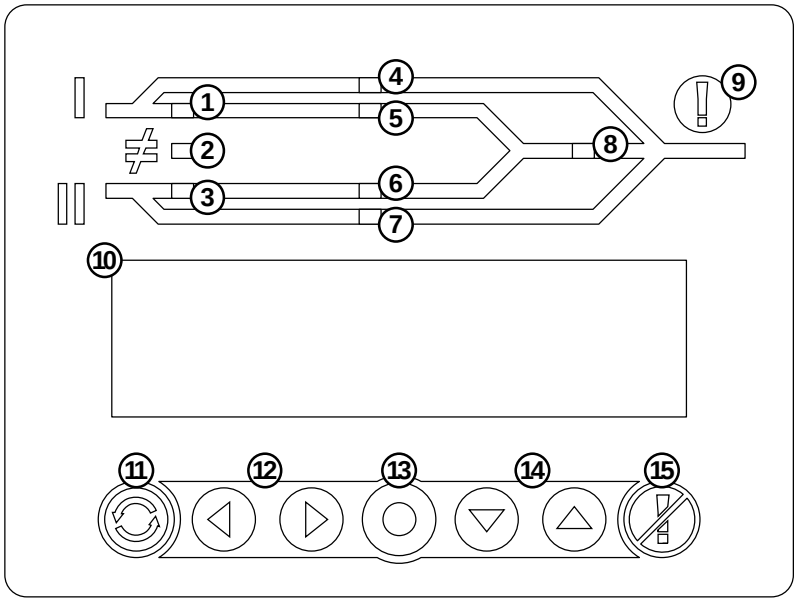


LAN Web Server and SNMP TCP / network address configuration.

For further help see section 3.4.1 Communication Settings

6 Mimic Decal & OLED LCD Interface

6.1 Overview



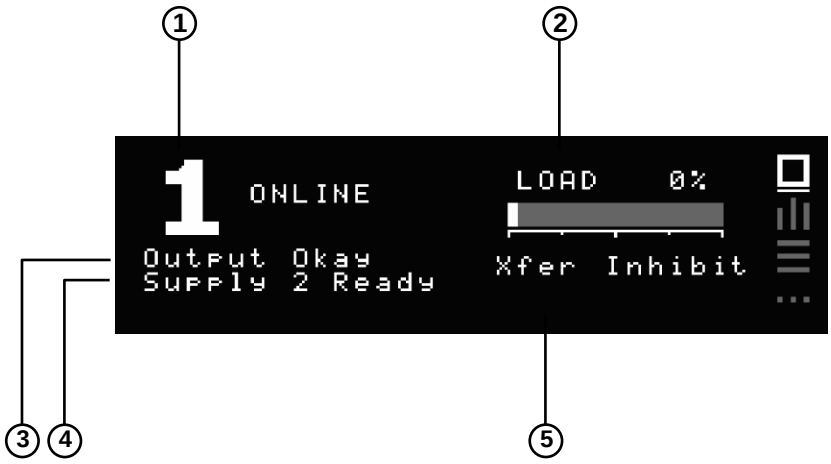
MIMIC				
	NAME	**GREEN**	**RED**	**NORMAL STATE**
1	SUPPLY 1 OK LED	Supply 1 is within tolerance.	Supply 1 is out of tolerance.	GREEN if Supply 1 is ON.
2	SYNC OK LED	Supply 1 and Supply 2 are within synchronisation range to perform a transparent transfer.	Supply 1 and Supply 2 are not within synchronisation range to perform a transparent transfer.	GREEN when Supply 1 and Supply 2 are both ON.
3	SUPPLY 2 OK LED	Supply 2 is within tolerance.	Supply 2 is out of tolerance.	GREEN if Supply 2 is ON.
4	SUPPLY 1 BYPASS LED	STS is bypassed to Supply 1.	No RED LED.	OFF unless Supply 1 bypass is active.
5	ON SUPPLY 1 LED	Load is on Supply 1.	Load is not on Supply 1.	GREEN if load is Supply 1.
6	ON SUPPLY 2 LED	Load is on Supply 2.	Load is not on Supply 2.	GREEN if load is Supply 2.
7	SUPPLY 2 BYPASS LED	STS is bypassed to Supply 2.	No RED LED.	OFF unless Supply 2 bypass is active.
8	STS OUTPUT LED	Output is OK.	Output is faulty.	GREEN.

	NAME	**DESCRIPTION**
9	ALARM LED	RED light and audible alarm indicates a fault. Pressing the Alarm Cancel button will silence the alarm and the light will stay on until the fault is cleared. The fault will be recorded in the Events List.
10	LCD DISPLAY	Shows Supply Status, Alarms, Settings, Events List and Settings.
11	PREFERRED SUPPLY BUTTON	Press to cycle the preferred source as 1, 2 or none. The STS will default to the preferred supply when it becomes available.
12	LEFT / RIGHT NAVIGATION BUTTONS	Use to scroll through menu items and enter input fields.
13	ENTER BUTTON	Enter / OK button.
14	UP / DOWN NAVIGATION BUTTONS	Use to scroll through menu items and enter input fields.
15	ALARM CANCEL BUTTON	When a fault occurs, press to acknowledge alarm and turn off the audible alarm while. The Alarm LED will remain on until the fault

		is cleared.

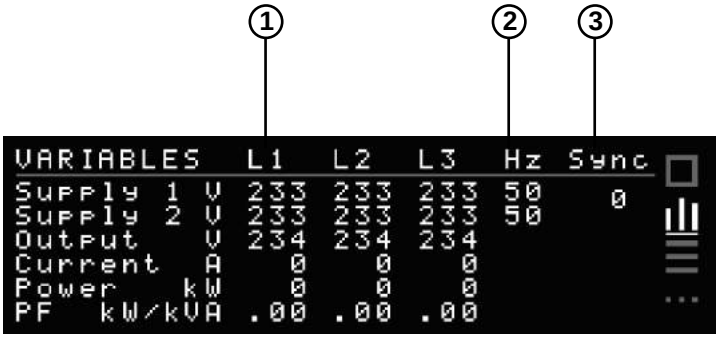
6.2 Display Screens

Home Screen



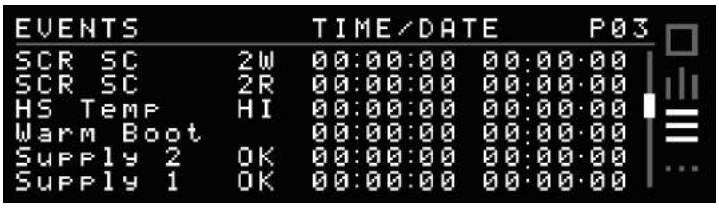
	Name	Description
1	Preferred Supply Status	Shows the preferred supply and the status of the source connected to the load
2	Load Indicator	Bar and percentage represent the current capacity of the STS that is being used
3	Output Status	Indicates the status of the output
4	Inactive Supply Status	Indicates the status of the supply that is not connected to the load
5	Priority Alarm	The message displayed will be the most important alarm (refer to Event Codes in the Fault Diagnosis section)

Variables Screen



	Name	Description
1	Line Stats	Lists the Voltage, Current, Power and Power Factor for Supply 1, Supply 2 and Output across each phase line (Single phase units will only show L1)
2	Frequency	Shows the frequency of the input supplies
3	Sync	This is the difference between the frequencies of Supply 1 and 2 in degrees

Events Screen

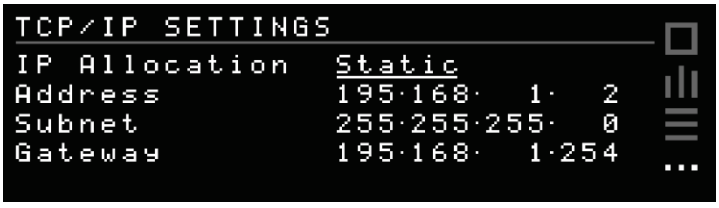


Use Up and Down to scroll through 200 logged events. Once the buffer is full, the oldest events will fall from the buffer and get replaced by any new events. Refer to Event Codes section under Fault Diagnosis for code descriptions.

Settings Screen

To enter a passcode, use the navigation buttons left and right to change digits and up and down to change the value.

Entering the default passcode **0 0 0** gives access to the Time & Date settings screen.
Entering the default passcode **1 2 3** gives access to the TCP/IP settings screen.



IP Allocation can be set to Static and entered manually, or set to Dynamic (DHCP) where the device will be assigned an IP address automatically. Refer to the Web Interface section for instructions on accessing advance settings.

5 Web Browser Interface

Connecting to the LAN interface can be done two different ways with a RJ45 Cat5 Ethernet cable:

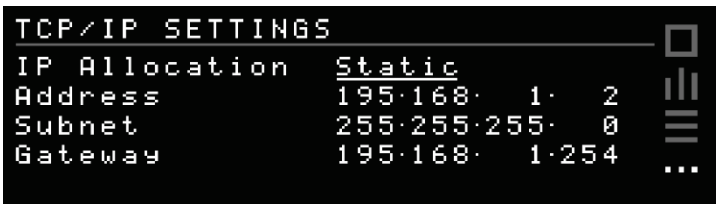
• To a Network hub/switch using a straight-through cable.

• To a PC using a cross-over cable (most PCs can now work with a straight-though cable).

5.1 Connection to a Network

By default the STS uses DHCP to have the IP information assigned automatically after the Ethernet cable is plugged in at both ends, this process can take up to several seconds to complete. If your network does not have a DHCP server or if you wish to use a static IP, you can change the IP Allocation on the Communications Settings screen shown below (or the Control Panel page on the Web server).

Use navigation buttons on the unit and move to the Settings menu, enter the passcode 1 2 3 to access TCP/IP settings. Setting IP Allocation to Static allows for manual input of IP address, subnet and gateway.

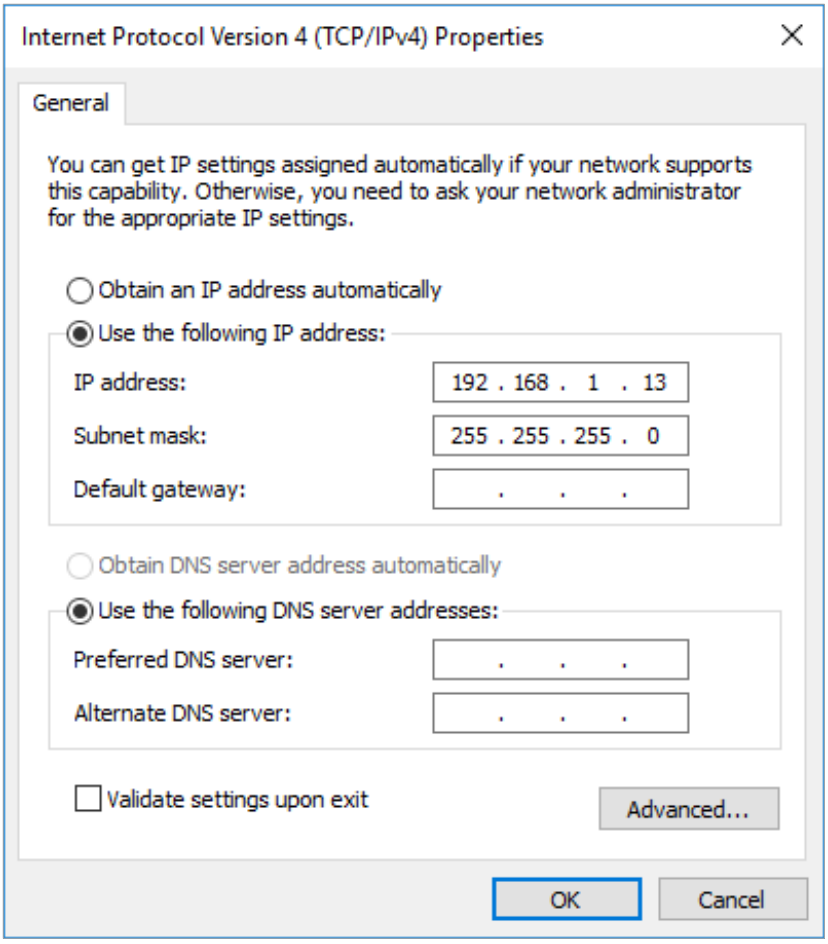


Communication Settings

5.2 Connecting to a PC

When connecting directly to a PC, both the STS and PC must have statically assigned IP addresses on the same subnet. Set the IP address of the STS in the Communications screen described earlier. By default this is IP: 192.168.1.2 with Mask: 255.255.255.0

To set the IP address of your computer in Windows 7 go to: Network and Sharing Centre → Change adapter settings, right-click the network interface → Properties. Select TCP/IPv4→Properties. Change the values to match as shown below and click OK, you soon should be connected to your device.



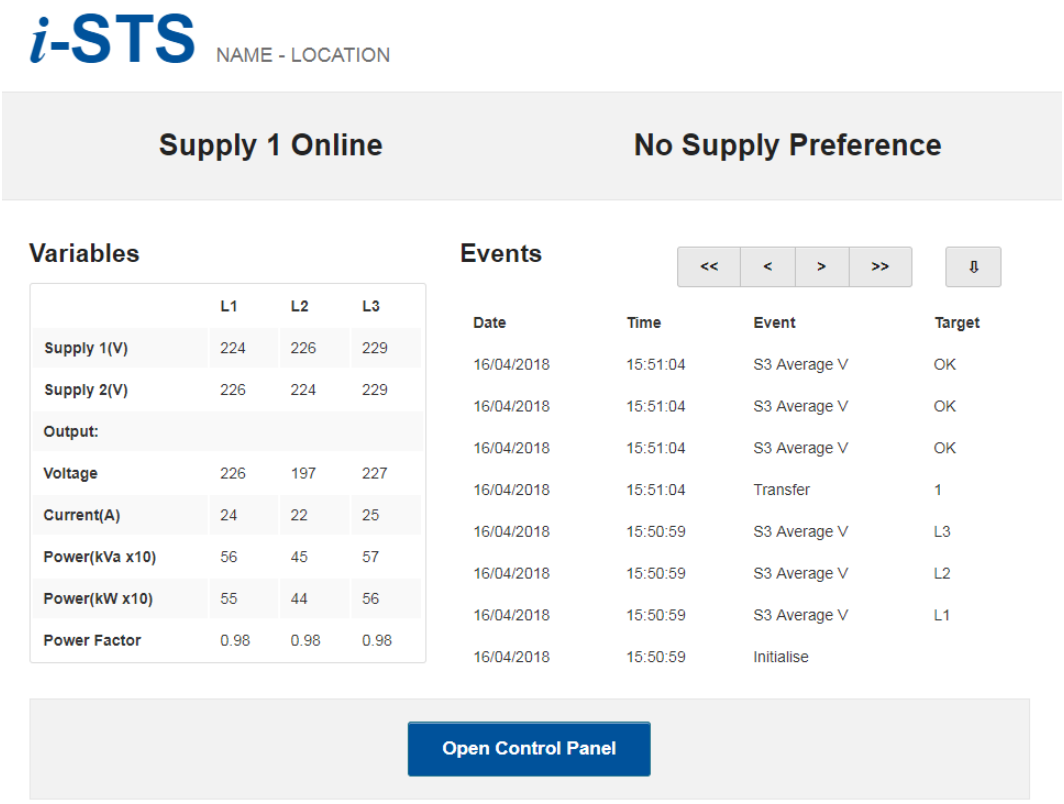
TCP/IPv4 Properties

For other operating systems, please refer to the OS networking manual.

5.3 Connecting to the Web Server

To use a ping test to confirm the connection on a PC, run command prompt (CMD) and type ping (space) then the IP address of the device then press enter.

Entering the IP address into the web browser address bar brings up the web server home page. If the DHCP / address have not yet been registered on your network you may need to remove the cable for 5 to 10 seconds and reconnect the cable, this in turn should re-register the device on the network.



Web Server Home Page

The home page displays the connected supply, supply preference, variables and events list that can be scrolled through using the arrows provided. From the home page, gain access to the Control panel by clicking Open Control Panel and enter following username and password:

Username: *admin*

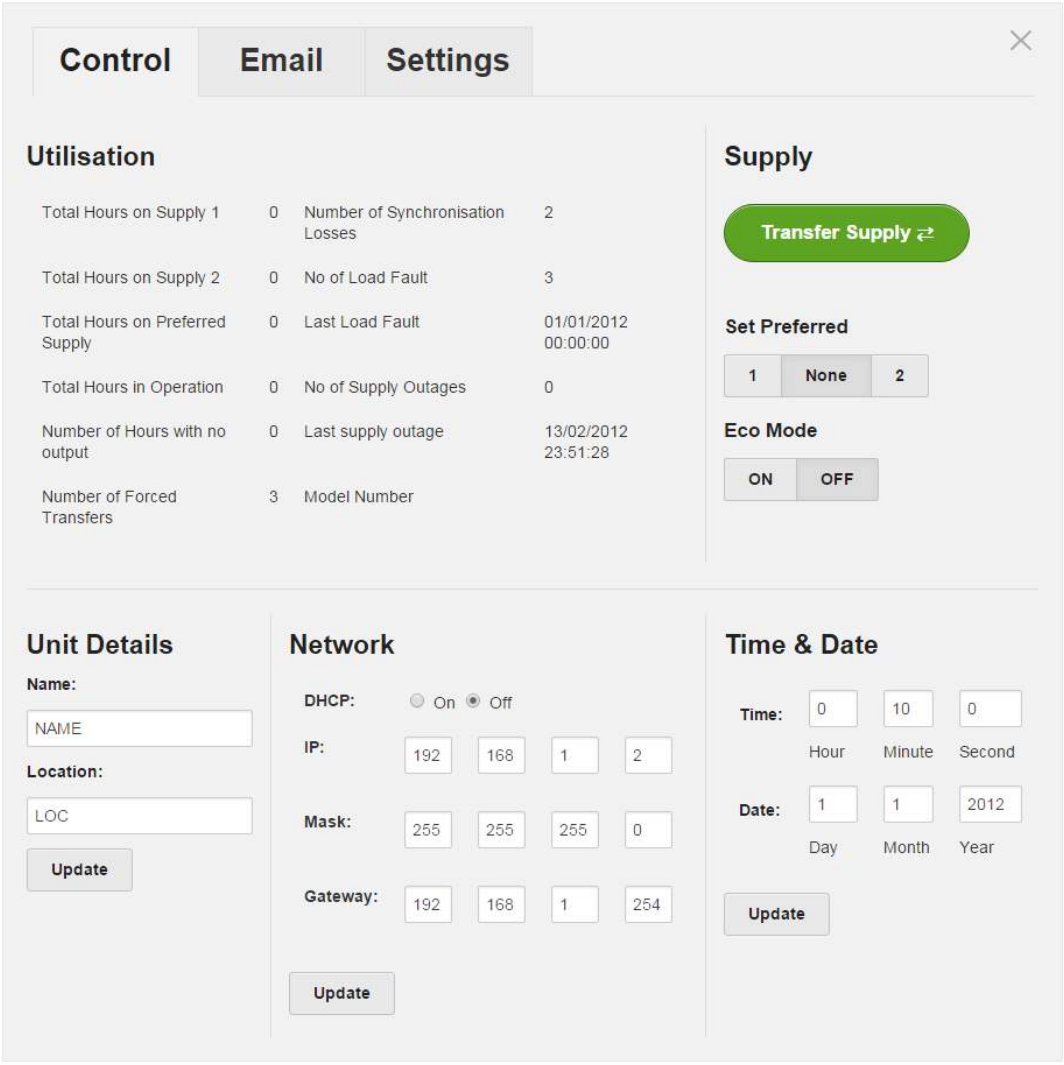
Password: *1234*

5.4 Control Panel

On the Control Panel page, many more options become available:

- Viewing utilisation
- Ability to transfer supply
- Setting the preferred supply
- Setting the name and location information
- Adjusting the time and date
- Setting the IP address

NOTE: You must press update for the information to be saved on the device



Control Panel screen

Transferring the Supply

Clicking on the “Transfer Supply” will change to the alternate supply. If that supply is faulty the transfer will not occur.

Set Preferred

The STS will stay connected to the preferred supply until there is a failure. In the case of the supply failing, the STS will switch to the alternate supply and then switch back to the preferred after the fault is cleared. When None is selected, the STS will not revert back to the other supply after switching.

Unit Details

Enter a name for the device under “Name:” and the location it is stored at under “location:” this should be done so you can differentiate between different static transfer switches.

Date and Time Settings

Enter the date and time, this should only be required once. We strongly encourage setting the correct time and date so that the real time event correlation can be undertaken. After pressing update the details will be stored into the unit. The real time clock is thereafter backed up by a battery cell.

IP Address Settings

The default settings is set to DHCP mode “On”, when this is set to “Off” then a Static IP address can be entered. From here you can change the IP, Mask and the Gateway. After pressing update these details will be saved on the unit.

5.5 Email

The Email tab allows you to turn on the email notification service. When a certain event occurs the unit will send an email to notify the user. The email takes the following format:

STS01 – LVL5

Supply 1 Fault - 05/05/2014 13:01:42

Server Settings

This is the SMTP server that the unit will use to send the email. You need to provide the Server Address, Server Port, User name or email, and a password.

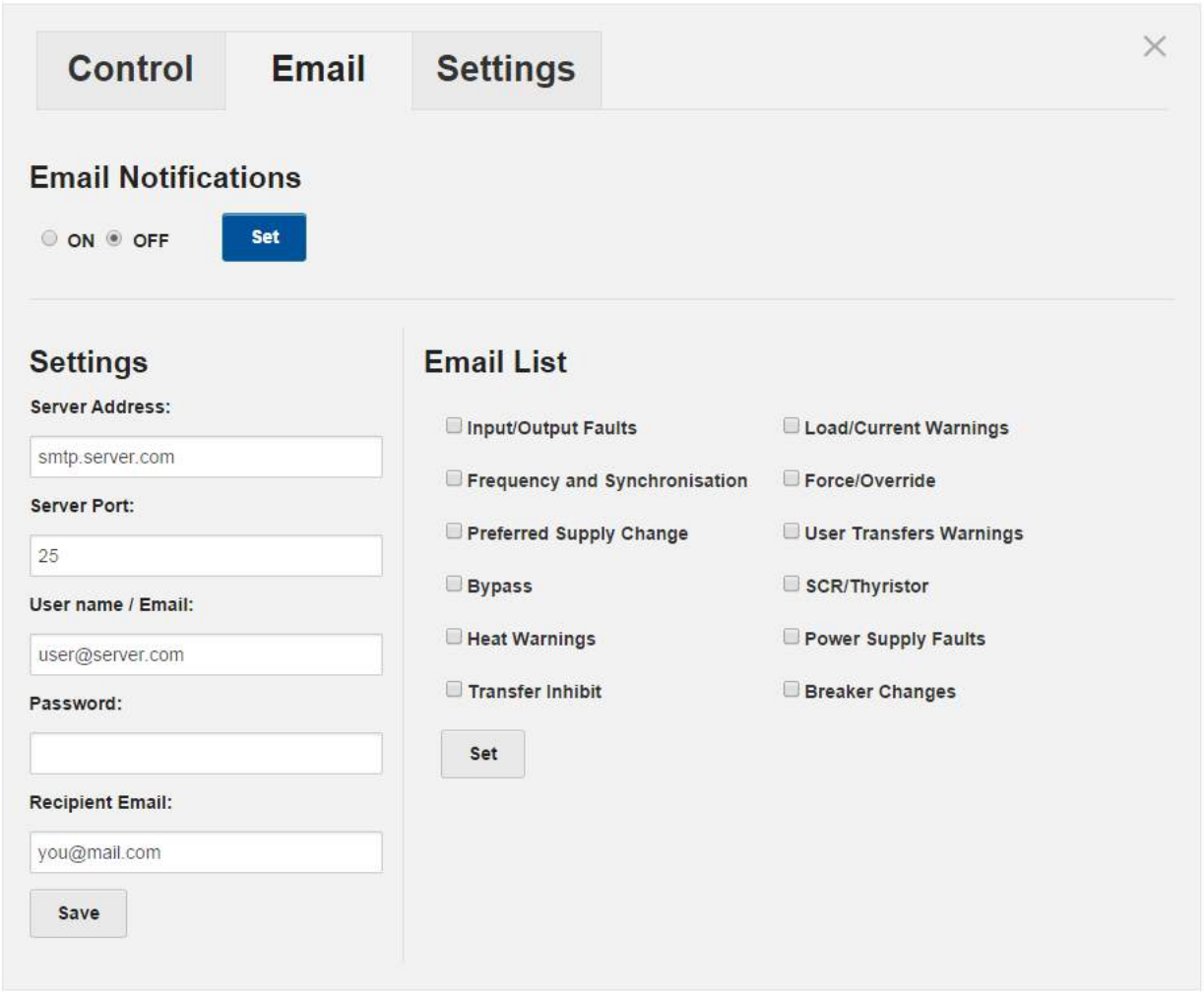
Note: this cannot be an SSL SMTP server.

Recipient Email

This is where the email notification will be sent. It can be the same as the above email.

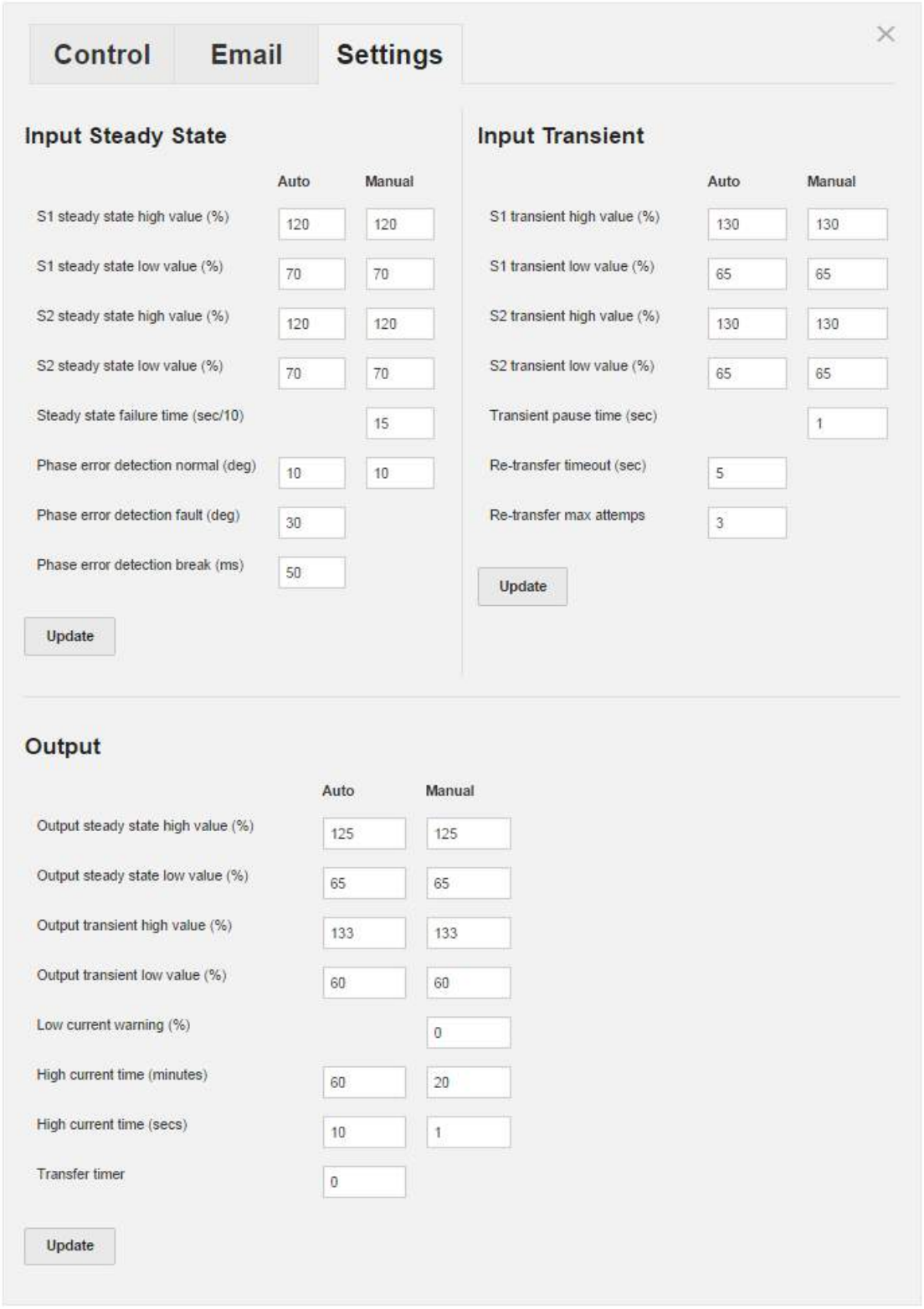
Email List

In this section you can select which event types should trigger an email notification to be sent.



Email screen

5.6 Advanced Settings



Settings screen

NOTE: The STS has been shipped with factory defaults. These are the most reliable settings for correct stable operation. These settings should only be changed under the certain operating conditions and it is advised that you consult with us before doing so, as wrong settings can make the system unstable and damage equipment.

5.7 Input Steady State Settings

These figures define the upper and lower limits of deviation from the nominal voltage and current of the input power that creates the fault condition to trigger the alarm and record the event.

S1 steady state high value (%)

Default value of 120%, can be changed from a nominal value of 105 to 125. This number will be set as percentage.

Averaging time constant for this parameter is defined by Steady state failure time typically 1.5 seconds.

S1 steady state low value (%)

Default value of 70%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Averaging time constant for this parameter is defined by Steady state failure time typically 1.5 seconds.

S2 steady state high value (%)

Default value of 120%, can be changed from a nominal value of 105 to 125. This number will be set as percentage.

Averaging time constant for this parameter is defined by Steady state failure time typically 1.5 seconds.

S2 steady state low value (%)

Default value of 70%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Averaging time constant for this parameter is defined by Steady state failure time typically 1.5 seconds.

Steady state failure time (sec/10)

Default value of 15, this value will be divided by 10 making the value of 1.5 seconds.

This is the amount of time for the input power sources being outside of the limit values in order for the fault condition to be determined as true.

If this time is set to too small of a value it can cause erratic operation.

NOTE: By default the unit operates with the intelligent out of sync delay. To turn off the intelligent sync delay DIP SW2 must be turned on. The below phase settings should only be changed when intelligent sync delay is off.

Phase error detection normal (deg)

This figure between 0 – 180 degrees, sets the maximum allowable separation between the two supplies, whereby if the supplies fall out of phase by this amount, the user will no longer be able to perform a manual transfer.

The default is 10 degrees.

Although the setting limit can be set from 0 to 180 degrees the consequence of transfer when asynchronous may result in a non-seamless transfer to the critical load. Ferromagnetic devices will saturate and draw large current when out of synchronism transfers are undertaken. The effect on some switch mode power supplies is also unknown. The user should consult with the equipment manufacturer to ensure that damage does not result from out of synchronisation transfers and what their recommended synchronisation limits are.

Setting to “0” disables the transfer pushbutton operation.

If the programmed value in the “Auto” column is exceeded no action takes place. Refer to “Phase error detection fault” below.

Phase error detection fault (deg)

This is the degree of difference between phases of the supplies that will force a break time between automatically initiated transfers due to supply source / output supply faults. This can be set from 0 to 180 degrees. The recommended default is 30 degrees. Up until this value transfers that are initiated from the system (except manually) will occur without a break. Once the displacement between the two phases is more than this value, a break is inserted as defined by “Phase error detection break”.

Phase error detection break (ms)

Setting this value to ‘0’ turns on the intelligent transfer delay mode where the device will automatically calculate a break time based on the degree of difference between the two supplies. For more information refer to ‘Prevention of Transformer Saturation’ technical report.

Otherwise this can be set from 10 – 150 msec with resolution of 10 msec. These are typical break insertion times; additional time would be added as a result of thyristor turn-off delays.

NOTE: In the scenario that two supplies are significantly out of synchronism, a break time will be insert to prevent inadvertent damage to equipment, tripping of protection devices or opening of fuses.

5.8 Input Transient Settings

These figures define the upper and lower limits of deviation from the nominal voltage and current of the input power that creates the fault condition to trigger the alarm and record the event.

S1 transient high value (%)

Default value of 130%, can be changed from a nominal value of 108 to 135. This number will be set as percentage.

Transient time constant for this parameter is defined by “transient over-sampling time constant 3 x 312 µsec”.

S1 transient low value (%)

Default value of 65%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Transient time constant for this parameter is defined by “transient over-sampling time constant 3 x 312 µsec”.

S2 transient high value (%)

Default value of 130%, can be changed from a nominal value of 108 to 135. This number will be set as percentage.

Transient time constant for this parameter is defined by “transient over-sampling time constant 3 x 312 µsec”.

S2 transient low value (%)

Default value of 65%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Transient time constant for this parameter is defined by “transient over-sampling time constant 3 x 312 µsec”.

Transient pause time (sec)

This is the times that the values need to be outside the limit values before a fault condition is determined to be true.

Re-transfer timeout (sec)

This parameter defines the delay before a re-transfer back to the original preferred source after the fault has been cleared and the source has returned to normal steady state conditions.

This parameter is usually set to 1 second. If this is set to a value too small, an unstable condition could arise from the source not having enough time to recover.

Re-transfer max attempts

This setting refers to the number of times the device will transfer back to the preferred source. A lock out results after this but is re-set on a new fault alarm condition.

A setting of “0” inhibits retries and device will not transfer back to the preferred source.

NOTE: Adjustment may be required to the Transient values if the source supply voltages are distorted or above or below nominal. Setting too close a limit to the actual operating Steady State voltage may cause erratic Static Transfer Switch operation.

5.9 Output Settings

Output steady state high value (%)

Default value of 125%, can be changed from a nominal value from 108 to 135. This number will be set as percentage.

Averaging time constant for this parameter is defined by “Steady state failure time” typically 1.5 seconds.

Set as a percentage from nominal – This parameter should always be wider than the S1 & S2 Steady state high threshold. This will ensure that when there is a problem with S1/S2 the event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault.

When the output reaches this value the alarm will be triggered and the STS will transfer to the alternative source.

Output steady state low value (%)

Default value of 65%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Averaging time constant for this parameter is defined by “Steady state failure time” typically 1.5 seconds.

Set as a percentage from nominal – This parameter should always be wider than the S1 & S2 steady state low threshold. This will ensure that when there is a problem with S1/S2 event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault.

When the output reaches this value the alarm will be triggered and the STS will transfer to the alternative source.

Output transient high value (%)

Default value of 133%, can be changed from a nominal value of 108 to 135. This number will be set as percentage.

Transient time constant for this parameter is defined by “Transient over-sampling time constant 2 x 330 Micro Sec”.

Set as a percentage from nominal – This parameter should always be wider than the S1 & S2 transient high threshold. This will ensure that when there is a problem with S1 or S2 the event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Transient limits should be set outside Steady state limits.

Output transient low value (%)

Default value of 60%, can be changed from a nominal value of 0 to 95. This number will be set as percentage.

Transient time constant for this parameter is defined by “Transient over-sampling time constant 2 x 330 Micro Sec” Set as a percentage from nominal – Default setting 60% - This parameter should always be wider than the S1 & S2 transient high threshold. This will ensure that when there is a problem with S1 or S2 the event list will report correctly. S3 sensing is provided as redundant sensing for on line source S1 or S2 and in case of internal thyristor triggering fault. Operation is to transfer to the alternative source.

Transient limits should be set outside steady state limits.

Low current warning (%)

Normally set to “0”, defines the minimum value for units load.

Setting to non-zero value will disable thyristor open circuit and short circuit detection until after the threshold has been reached. We recommend that this parameter not be altered.

High current time (minutes) at 110 & 125% Overload

Exceeding the overload limits of 110% for greater than 60 minutes OR 125% for 20 Minutes will not affect the critical load and no switching occurs. It is intended as a warning that the STS is overloaded. Failure to reduce the load will cause semiconductor failures.

Consult manufacturer before setting to higher values to ensure that the unit will operate safely without failure or overheating.

High current time (secs) at 150 & 200% Overload

Exceeding the overload limits of 150% for 10 Minutes OR 200% for 1 Minute will not affect the critical load and no switching occurs. It is intended as a warning that the STS is overloaded. Failure to reduce the load will cause semiconductor failures.

Consult manufacturer before setting to higher values to ensure that the unit will operate safely without failure or overheating.

Transfer timer

Setting of “0” disables function.

After the set period the STS will undertake a test transfer to the alternate source. After a delay the load will be returned to the original source. This function is used to test functionality and protections within the STS. The timing is in minutes per unit. We recommend that this parameter not be altered.

6 Maintenance Bypass

6.1 Overview

Maintenance Bypass mode allows the load to be connected to one supply without going through the power circuit of the STS. In this mode, transferring the load to an alternate supply is not possible.

The maintenance bypass switch is located on the front of the power module. The switch is normally in the “N” position and can be used to bypass the internals of the STS to either “Supply Source 1” or “Supply Source 2”.

A padlock can be used to stop inadvertent / unauthorized operation of the switch.

WARNING: THE MAINTENANCE BYPASS SWITCH SHOULD ONLY BE USED TO SELECT THE PRESENTLY OPERATING SOURCE. IT CANNOT BE USED TO TRANSFER THE CRITICAL LOAD FROM ONE SOURCE TO THE OTHER.

THE MAINTENANCE BYPASS SWITCH UTILISES MAKE-BEFORE-BREAK SWITCHING, INCORRECT OPERATION OF THE MAINTENANCE BYPASS FEATURES COULD RESULT IN DANGEROUS VOLTAGES OCCURING AND SHORT CIRCUITS AND/OR DAMAGE TO THE STS.

A padlock can be used to stop inadvertent / unauthorized operation of the switch.

6.2 Maintenance Bypass Procedure

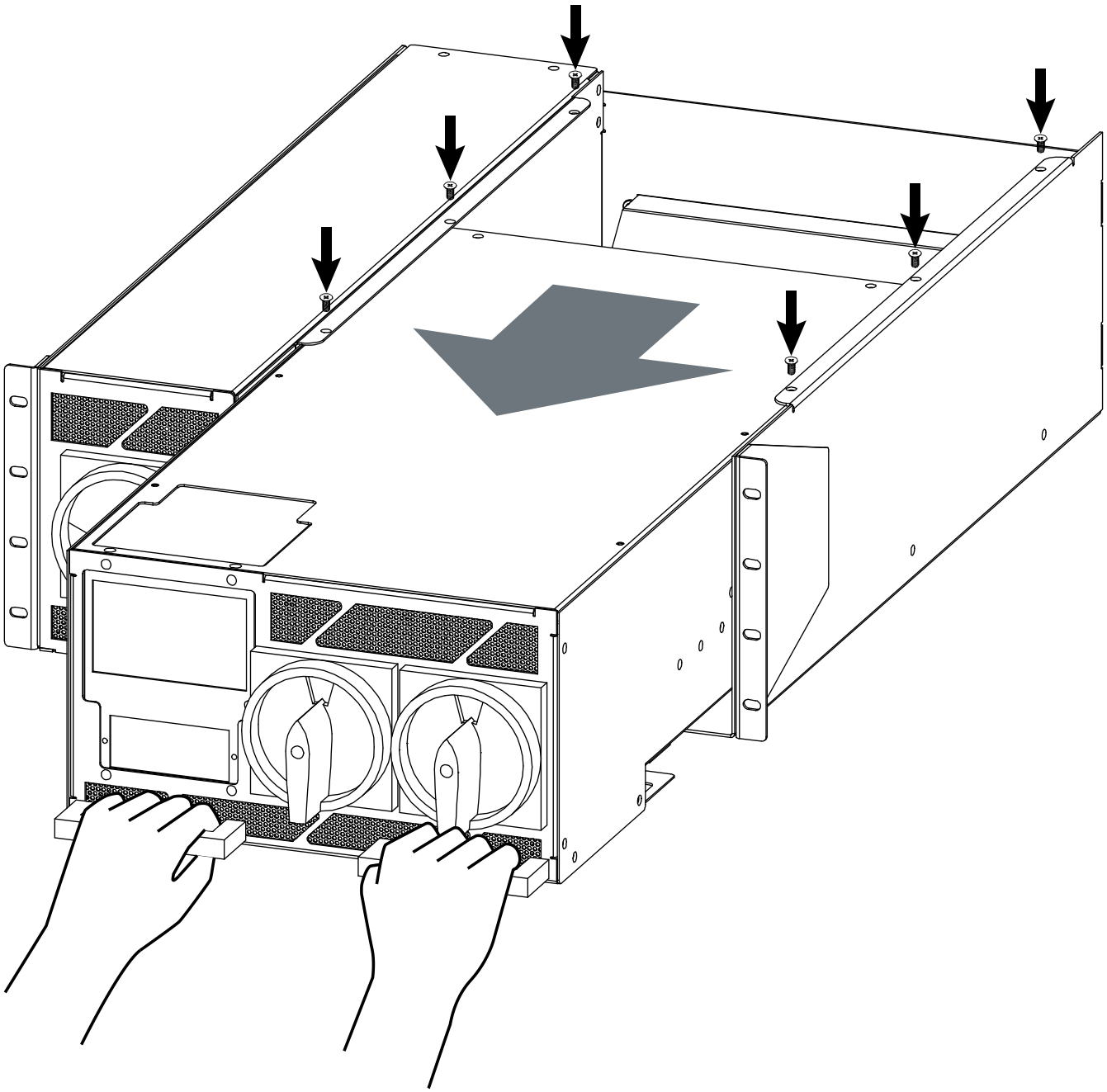
Bypass to Supply 1

1. Move the Preferred Source selection switch to 1.
2. Wait for the STS to transfer to the selected source.
3. Turn off Supply 2 using the isolator switch on the right of the front panel.
4. Turn the Maintenance Bypass Switch 90 degrees to the left for Supply 1.

Bypass to Supply 2

1. Move the Preferred Source selection switch to 2.
2. Wait for the STS to transfer to the selected source.
3. Turn off Supply 1 using the isolator switch on the right of the front panel.
4. Turn the Maintenance Bypass Switch 90 degrees to the right for Supply 2.

When the unit is in maintenance bypass mode, either on Supply 1 or 2, the power module can be removed. To separate the module, remove the screws from the top of the cradle, keep the cradle secure and pull the handles located on the front of the module.



6.3 Reinstatement from Maintenance Bypass

1. Push the power module into the cradle. Take care to ensure the connectors on both parts are aligned and the cradle and module are mated together securely.
2. Move the Preferred Source selection switch to the supply that is in bypass.
3. Turn on both Supply 1 and Supply 2 circuit breakers located at the front of the unit. Wait for the unit to start up. The mimic on the display screen should show Supply 1 and 2 as GREEN to indicate that both supplies are active in the STS.
4. Finally operate the bypass switch, returning it to the middle position.
5. The unit should now be operating as normal.

7 Fault Diagnosis

7.1 Fault Codes

Event Descriptor	Append	Description	STS Action Resulting
INITIALIZE		RAM CHKsum failed – Cold Start (RAM Corrupt) – Flash Defaults downloaded	None - Contact Static Power
WARM BOOT		Power-up, Warm Start, re-initialize all but RAM – Keeps Event List	Normal After Black Start
WATCHDOG TIMER	Diagnostic	Signals software / hardware problems	None - Contact Static Power
STACK	Diagnostic	Stack or Heap has overflowed	None - Contact Static Power
EEPROM		FLASH/ EEPROM Checksum error – cal may be damaged	None - Contact Static Power
ROM		FLASH ROM has been corrupted (Program is in error)	None - Contact Static Power
BATTERY		Battery has low power (needs replacing)	None - Contact Static Power
COMMS	1/2/3/4/5/6/7/8	Communications has failed to Dig Proc, Ana1, Ana2.	None - Contact Static Power
CALIBRATION	1/2/3	Calibration of MSP required	Contact Static Power
LOW POWER MODE	ON/ OFF	LOW POWER MODE (Power Down Modes @ loss of electronics power)	LOW POWER MODES
S1 / S2 / S3	AVERAGE V (R,W,B	Supply 1 or 2 OR 3 has Steady State High or Low or phase R, W or B	Transfers to supply 2 if on 1
S1 / S2 / S3	TRANS V (Red, White, Blue)	Supply 1 or 2 OR 3 has Transient High or Low (1 sec)	Transfers to supply 2 if on 1
S1 / S2 /S3	LOW /OK	Supply 1 or 2 OR 3 has Steady State Low (1 sec)	Transfers to supply 2 if on 1
S1 /S2 /S3	HI / OK	Supply 1 or 2 OR 3 has Steady State High (1 sec)	Transfers to supply 2 if on 1
SUPPLY 1 or 2 or 3	FAILED / OK	Supply 1 or 2 OR 3 has Steady State High (1 sec)	Transfers to supply 2 if on 1
OVERRIDE	0, 1, 2	Controls Override set to S1	User - Manual Switch Only
PREFERRED	0, 1, 2	Preferred Source Set (0 or 1)	User - Manual Switch Only
S1 / S2	FREQ LOW / HI /OK	Frequency of supply 2 is high or low	Alarm No action

Event Descriptor	Append	Description	STS Action Resulting
LOCAL XFER	1, 2	Local Transfer to Supply 1 or 2 requested	User - Manual Action
REMOTE XFER	1, 2	Remote transfer to Supply 1 or 2 requested	Via User Inputs or BMS
BACK FEED	1 or 2 on (R, W, B)	Back feed voltage too high on S1 or S2	Contact Static Power
REMOTE POWER	OFF/ON	Remote Supply off Requested (EPO)	Via User Inputs or BMS
SYNCHRONISATION	LOS / OK	S1 & S2 not in synchronism	Alarm No action
CURRENT	WARN / HIGH /FAULT/OK	Output is overloaded (timed shutdown)	Alarm No action starts timer
HEAT SINK TEMP	HI /OK	Fans Failed or Over Stressed Device Temperatures, Heat Sink is Over temperature	No Action – Check & Reduce Loading or Ambient
LOAD FAULT	FLT/ CLR	There was a fault at the load	Does not transfer (Inhibit)
FAN	FAIL / OK	Status Indication Only	No Action - Repair
THDI	HI / OK	Total harmonic Distortion of current is very high	Alarm No Action – Check Load
THDV	HI / OK	Total harmonic Distortion of Voltage is too high	Alarm No action - Check Load
BREAKER OPEN	Q1, Q2, Q3, Q4 or Q5	Status Indication Only	Response to interlocking controls
BREAKER CLOSED	Q1, Q2, Q3, Q4 or Q5	Status Indication Only	Response to interlocking controls
TRIPPED	Q1, Q2, Q3, Q4 or Q5	Status Indication Only	Response to interlocking controls
ALARM CANCEL		Alarm Cancel was pressed	Resets Audible & Latched fault
POWER SUPPLY	1,2 or 3	Status Indication Only	None -Contact Static Power / Repair
SCR SC	S1,S2 R, W, B, N	SCR on S1 or S2 short circuit detected on phase #	Contact Static Power – Locks to safe source
SCR OC	S1,S2 R, W, B, N	SCR on S1 or S2 Open circuit detected on phase #	Contact Static Power – Locks to safe source

7.2 Load Fault

In case of sustained high current output load faults, the STS will inhibit a transfer to the alternate supply even if this means degradation or loss of source supply. It is therefore imperative that you ensure that the discrimination with downstream and upstream protective devices ensures that the downstream protective device always clears the fault first.

In case that all output is lost the faulty equipment should be located and removed from the STS output before re-instatement of power.

At this point it is recommended that the UPS source (1 or 2) be transferred to bypass to allow greater capacity to isolate downstream faults without affecting UPS output voltage integrity. It will be necessary to gain access to the STS maintenance bypass switch for 1 or 2. The supply from the UPS system in bypass mode should be selected by manual operation of the corresponding maintenance bypass switch.

Application of this power should clear any downstream faults still present. The alarm pushbutton in the CONTROL menu is then pressed for 10 seconds to reset the alarm conditions, followed by the transfer switch for the desired source to reinstate the STS to normal operation.

When the LCD mimic indicates that the STS is active again (the 1 or 2 LCD bar is Green), the maintenance bypass isolator can be manually opened.

If the unit is inoperable then it should be returned to the manufacturer for repair or replacement.

8 Maintenance

Recommended Schedule

- Once per month record the operating variables and compare with the specifications and operating parameters to ensure that the unit is operating correctly.
- Check the Event History and correlate any recorded events since last observation with real occurrences. Report / investigate any suspicious entries.
- Once every 6 months, (sooner if the environment is bad), vacuum dust from grills at front of unit.
- Inspect cable / plug connections for overheating.
- Units with fans need their fans changed every 3-5 years. This may need to be sooner if the environment is bad.

Please contact Static Power for help with troubleshooting and parts replacement.

9 Specifications

Power		
Type	1-phase / 2-pole OR 3-phase / 3-pole* OR 3-phase / 4-pole*	
Current rating	63, 80, 100, 125 or 160A	
Voltage rating	All region-specific voltages selectable (± 10 %)	
Safe install environment	20kA, 300 A internally fused	
Frequency	50Hz and 60Hz ± 10 % - Auto detection	
Max THDV	15 % - Max allowable source voltage distortion	
Power factor	No practical limit	
Crest factor	3.5 : 1	
Loading	0 – 100% @45°C ambient	
Overload capacity	125% for 10min 150% for 30s 200% for 1s	300% for 0.1s 5kA for 1 cycle
Input / Output	Fixed wiring to terminals up to 70mm² cables via glands	
Maintenance bypass	Cradle with 3-position overlapping CAM switch, front mounted	
Isolation	Incoming source isolation switches, front mounted	
Switching		
Transfer type	Transfer at zero current by break-before-make by Thyristor / SCRss	
Detection	Digital: <1ms	
Break time	<1ms to <¼ cycle	
Asynchronous break time	Settable from 0ms to 150ms or VT proportional (default)	
dV/dt max	800 V/µs	
MTBF	800,000h @ 25°C ambient recommend Routine Preventative Maintenance @ 200,000h	
Device ratings	250/300A RMS, 1400V, 3.5kA/5kA, 1 cycle	
Fault current setting	>350% peak with load transfer inhibit	
Protection	300A fuses – aR-NGT00	
Communication & Control		
User interface	Colour touch LCD interface OR bi-colour LED mimic decal with graphic OLED display, Preferred supply selection, source transfer selection, Controls override & transfer inhibit switches	
Contacts	In: 2 self-wetting transfer controls inputs and emergency power off Out: 5 voltage free change-over status indicator, Form C, SPDT)	
Ethernet	HTTP - web user interface or reporting & control SNMP - 120 unique reports & transfer control Modbus TCP - 120 unique reports & transfer control Email alerts Clock synchronisation with NTP	
Environmental		
Dimensions (H W D)(mm)	177 x 483 x 650mm	
Weight	38kg	
Temperature	0 – 45°C	
Cooling	Redundant fans (field replaceable module)	
Humidity	5 – 90% non-condensing	
IP rating	IP31	
Compliance		
Regulatory	IEC 62310-1,2,3, 60950, 61000-6-1,2,3,4, CE Approval, RCM, UL Capable, RoHS	
Standard warranty	24 months off site repair or replacement policy	

*3-phase 3 and 4-pole models are 4-wire + earth unless otherwise stated.

10 Contact Information

The information contained in this user manual may be superseded at any time.

For the latest information check the website at: www.staticpower.com.au

iSTS Manufacturing is a subsidiary of

STATIC POWER PTY. LTD.

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