HPS-iSTS-B1

User Manual

19-inch Rack Mount Static Transfer Switch

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HELIOS POWER SOLUTIONS

CONTENTS

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 iSTS 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 iSTS. 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

Procedure for Receiving Shipment:

- If the packaging is damaged unpack carefully and inspect the unit. We recommend that if there is any sign of mechanical damage that the unit not be powered up; but, returned for re-processing
- If damage is discovered, inform carrier immediately and follow normal procedure for a carrier inspection and filing of a concealed damage claim to the courier or your insurance company.
- 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 iSTS 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 iSTS 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.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C (104°F).
- Do not install the iSTS in an excessively humid environment or near water, relative humidity should not exceed 90% at 20°C (68°F).
- Avoid spilling liquids or dropping any foreign object into the iSTS.
- Once the connections have been made on the terminals, all terminal covers must be replaced before operation.
- Connecting cables must be supported.
- Earth connection must be checked for safe function after assembly.

1.4 Fire Regulations

Should a fire break out inside the system a fire extinguisher with CO^2 or Halon must be used. Do not inhale vapours.

1.5 Standards Applied & Conformity

The iSTS R conforms to the following standards and European Council Directives:

Standards to which conformity declared:

- IEC 60950-1 Information technology equipment Safety - General requirements
- IEC 62310-1 Static transfer systems (STS) - General and safety requirements
- IEC 62310-2 Static transfer systems (STS) - Electromagnetic compatibility (EMC) requirements
- IEC 62310-3 Static transfer systems (STS) - Part 3: Method for specifying performance and test requirements

Application of Council Directives:

- 2006/95/EC Low Voltage Directive
- 1992/31/EEC EMC Directive
- 1993/68/EEC EMC Directive amendments
- 2011/65/EU Hazardous substances in electrical and electronic equipment - RoHS

Year of CE marking: 2015-2016

CE

The Standards mentioned above fulfil the requirements for CE marking

1.6 Warranty

SP operating through its authorised agents warrants that the standard products will be free of defects in materials and workmanship for a period of 24 months after the date of invoice, or such other period as may be specified.

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.

2. SYSTEM OVERVIEW & OPERATION

2.1 Description

A Static Transfer Switch (STS) provides your critical load or single cord (single supply), equipment with an alternative supply source, thus increasing and improving power reliability and availability.

The iSTS B1 is a 2 pole, single phase 1RU 19-inch rack mount iSTS with a maintenance bypass feature. Both the active conductor and the neutral are switched. Thyristors are used to undertake the switching process. These are many times faster and more reliable than their electromechanical equivalents.

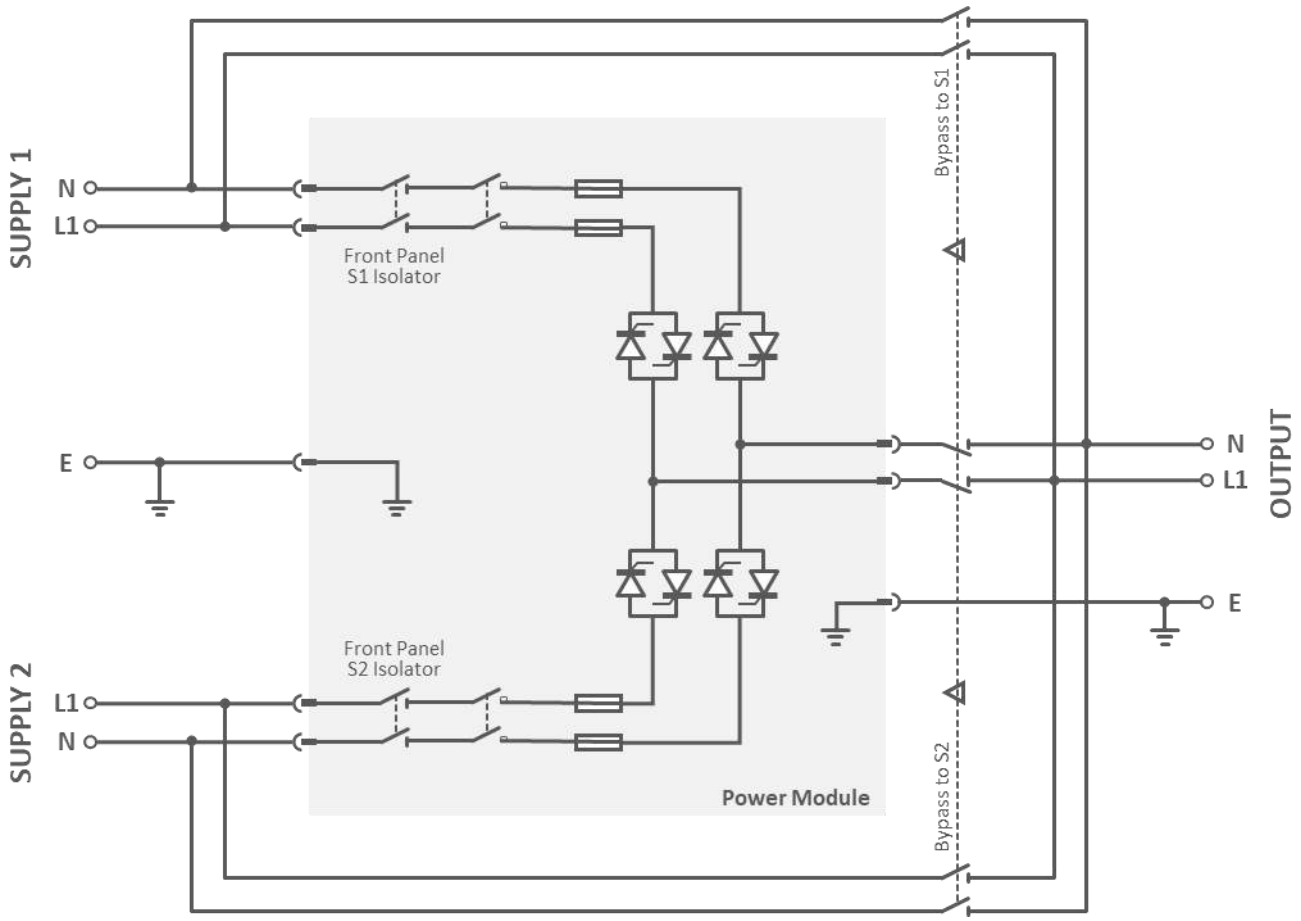
The STS continuously monitors the supply sources and should the presently connected supply fail or degenerate to not be useable, the critical load is automatically and transparently transferred to the alternate source.

This switching process is undertaken as a break before make transfer. The break in the supply transition is so short that it is not seen by the critical load.

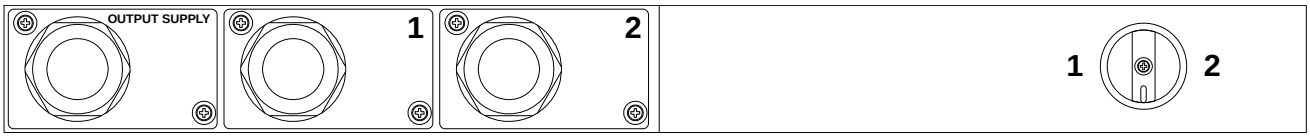
This is preferable to a make before break (or overlapping) changeover because when the two supplies are different and connected together large and unpredictable currents would flow between the sources degenerating both supplies and therefore the supply to the critical load.

In case of downstream fault the iSTS will not transfer the fault to the alternate supply even if the voltage is adversely affected. Once the fault current has cleared the iSTS will resume normal operation protecting the critical loads from voltage disturbances, (10 second settling time).

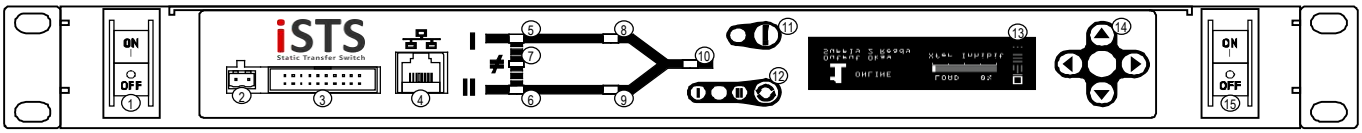
2.2 Line Diagram



2.3 Inputs & Output



2.4 Front Panel Overview & Operations



	Name	Description
1	Supply 1 Isolator Switch*	Turns incoming Supply 1 ON or OFF. When switched OFF, power will not go through the STS circuit and Supply 1 Okay LED will show red.
2	Dedicated General Alarm Contact	
3	Remote Contact	Voltage free alarm for integration into BMS. **Do not connect any more than 50 V DC 0.5 Amps, not suitable for 230 V AC.** Contacts are Normally Closed. Contact is held Open when there is no alarm. When power fails the relay contact closes (fail safe). The Remote Contact and the red Alarm LED are driven by the same logic.
4	Ethernet Connector*	Use this port to connect the STS to a LAN or directly to a PC using either a straight-through or crossover CAT5 cable with RJ45 8P8C plug 10/100 MB per second.
5	Supply 1 Okay LED	Green/red indicated that Supply 1 is within/out of tolerance.
6	Supply 2 Okay LED	Green/red indicated that Supply 2 is within/out of tolerance.
7	Sync Okay LED	Green/red indicated whether Supply 1 and Supply 2 are within/not within enough degrees of synchronisation of each other to perform a transparent transfer.
8	On Supply 1 LED	Green/red indicates the load is on/not on Supply 1.
9	On Supply 2 LED	Green/red indicates the load is on/not on Supply 2.
10	Output Okay LED	Green/red indicated the output is OK/faulty.
11	Alarm Cancel/Acknowledge button	Pressing this button acknowledges new alarms, causing the audible alarm to turn off and the LEDs to go from flashing to solid.
12	Preferred Source Indicator & Transfer Button	These three LEDs indicate which supply is selected as the preferred supply. Supply 1 (I), Supply 2 (II) or either (none) may be selected. Pressing this button repeatedly will scroll through which supply is selected as the preferred supply.
13	Graphic OLED LCD Interface	Displays Warnings, Load, Variables, Events and Settings (Refer to Display Screens section).
14	Navigation Buttons	Use to navigate through menus on the OLED display.
15	Supply 2 Isolator Switch*	Turns incoming Supply 2 ON or OFF. When switched OFF, power will not go through the STS circuit and Supply 1 Okay LED will show red.

**Optional features*

3. OPERATION

3.1 Safety

The iSTS is powered from two separate sources. It is important that you install correct signage with procedures within the enclosure and the immediate vicinity to warn personnel of this aspect and what isolation, checking and precautionary processes, and procedures need to be adopted to make the iSTS and equipment connected to the iSTS safe to work on.

This equipment receives power from more than one source.
Disconnect output and all input sources of power from this equipment before servicing.

This equipment receives power from more than one source. Disconnect output and all input sources of power from this equipment before servicing.
Do not proceed with the installation or operation of the iSTS if it has been damaged. Carefully inspect the iSTS for any damage that may have occurred during shipping, unpacking or during and after any installation process.

Take care when handling the iSTS and ensure that it is physically supported during the installation process. At the end of the installation process the iSTS should be firmly and securely bolted within the rack.
Ensure the cables are securely connected and supported and all covers plates are replaces. There should be NO live exposed or accessible contacts that could cause electrical shock if contact is able to be made. This is especially important when plugging and unplugging the input (Supply 1 or Supply 2) plugs as leakage currents could cause dangerous voltages to appear on the incoming leads which can be a shock hazard and cause equipment damage if contact with other equipment is inadvertently made.

This equipment is not recommended for installation into environments that utilise RCD earth leakage detectors on the inputs of the static transfer switch.
Where it is being installed with RCDs care should be taken to select a noise immune type; this will improve overall system reliability.
The standard iSTS B1 will contribute a maximum of 5mA to earth leakage (transiently & during switching between sources), this will itself not cause any tripping of the RCDs.
The iSTS B1 has backfeed contactors to ensure that there is no or negligible earth leakage currents if a supply source is removed.

Earth connection is essential before working on circuits or connecting / disconnecting supplies.
Treat AC incoming leads as live if disconnecting from source.

3.2 Installation

1. Secure the iSTS into your rack by the four holes on the front of the cradle portion.
2. Ensure that the power module portion of the STS is securely mated with the cradle.

3.3 Cable Termination to the iSTS

1. To access the input and output terminals at the rear of the cradle, remove the 2 screws on each of the gland plates and then remove the plate.
2. Cable size is limited to 6mm² (#10). The terminals are suitable for tin-plated stranded cables from 2.5mm² to 6mm² (nominal current is 41 Amps). Strip cables to a length of 10mm.
3. Connect Active, Neutral and Earth cables to the respective spring cage terminals as marked on the board. Note that the order is not identical for each terminal block. Secure the connections on the terminal blocks, torque the screw between 0.5 – 0.6Nm. All cables connecting to the iSTS should be supported and not weigh the rear of the iSTS or strain the point of connection.
4. All electrical connections are to be realized by properly qualified, skilled and competent service personnel only.
5. Before applying power to the iSTS, make sure that the rated voltage for the unit corresponds to the ratings plate and the local supply voltage.

When working on live STS, be sure to comply with the applicable standards and national accident prevention rules.

3.4 Synchronism

The smoothest change-over occurs when the supplies are in synchronism, so it is best to make sure the input supplies are in synchronism. Some equipment (like transformers) may saturate when a transfer occurs when not in synchronism. This causes large currents to flow into the load which could cause damage to the transformer, trip protective devices or blow fuses.
The iSTS is configured by default to have up to 12ms break inserted if the phase difference between the sources exceeds 30 degrees.
The break has been inserted for a safe mode on purpose when the sources are out by more than 30 degrees.

3.5 Start-up

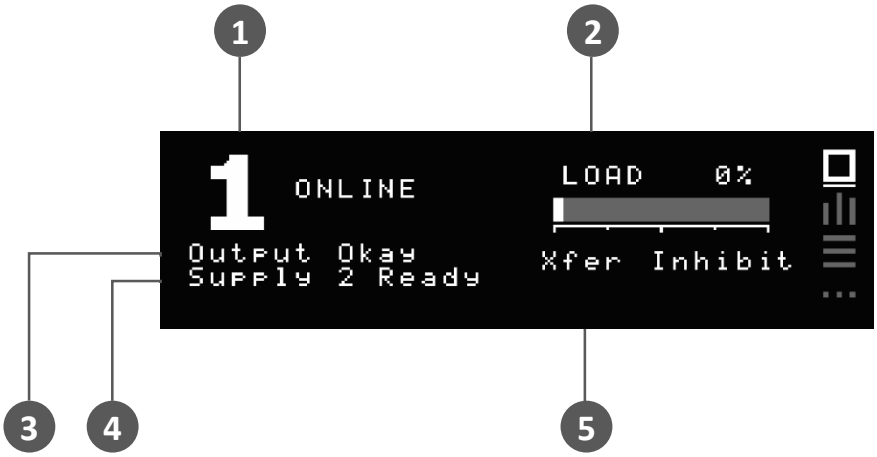
NOTE: Due to the nature of SCRs (silicon controlled rectifiers) some load of around 0.5A is required for correct operation. Before testing the operation of this iSTS, make sure this load is applied to the output.

1. Ensure that your two input sources are within the tolerances.
2. Apply power to both input sources. There will be a short 15 second start-up period, after which the iSTS will begin powering your load.
3. Confirm that the load is receiving power. Check that LEDs on the mimic are correctly representing the supply status and load.

NOTE: Only the On Supply 1 LED or On Supply 2 LED should be red, not both.

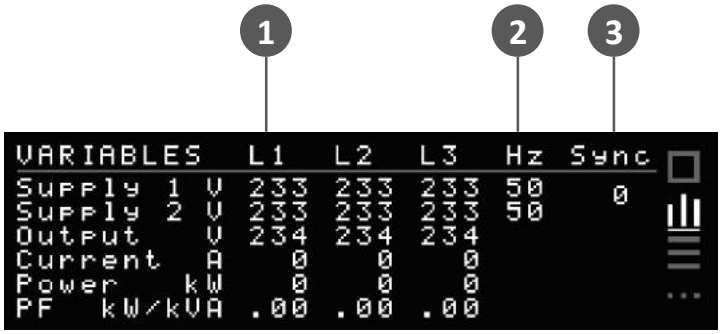
3.6 Display Screen

HOME SCREEN



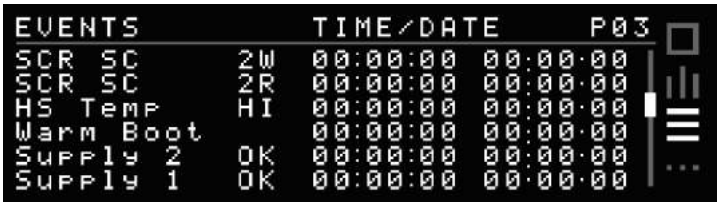
	Name	Description
1	Preferred Supply Status	Shows the preferred supply and the status of the source connected to the load
2	Load Indicator	Bar and percentage represent the current capacity of the STS that is being used
3	Output Status	Indicates the status of the output
4	Inactive Supply Status	Indicates 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)

VARIABLE 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



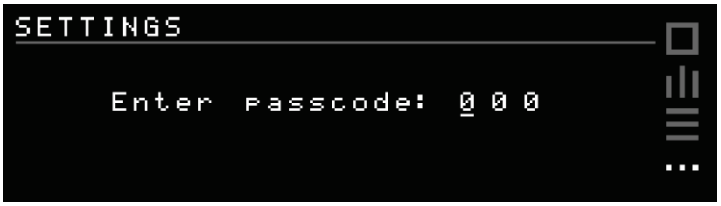
Use Up and Down to scroll through 200 logged events. Once the buffer is full, the oldest events will fall from the buffer and get replaced by any new events. Refer to Event Codes section under Fault Diagnosis for code descriptions.

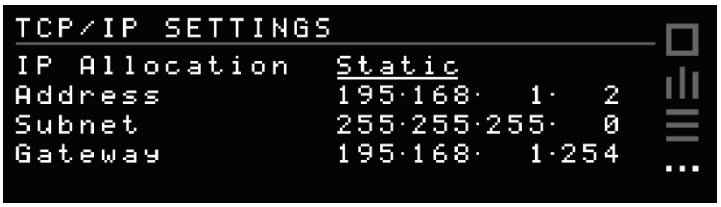
SETTING SCREEN

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.



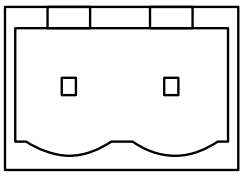


IP Allocation can be set to Static and entered manually, or set to Dynamic (DHCP) where the device will be assigned an IP address automatically. Refer to the Web Interface section for instructions on accessing advance settings.

3.7 Remote Contacts

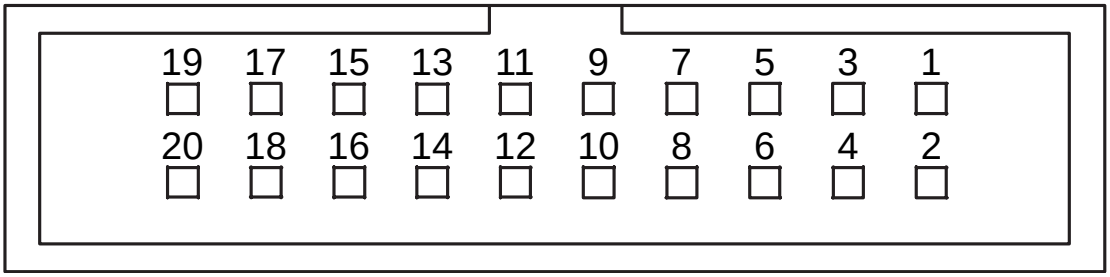
Provide physical separation between control circuits and power circuits to avoid confusion and reduce interference. Ensure all control wiring is protected and securely supported to avoid inadvertent removed whilst other equipment is being installed or removed within the enclosure.

DECIDATED GENERAL ALARM CONTACT



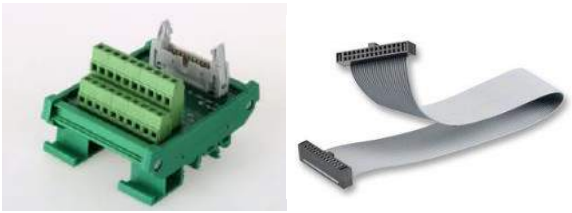
This terminal is normally closed. It will open when a fault is detected.

REMOTE BMS CONTACTS



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

If connecting to this we recommend using a 20 way ribbon cable (length suitable for application) and a ribbon cable terminal break-out connector (not supplied) similar to that shown below



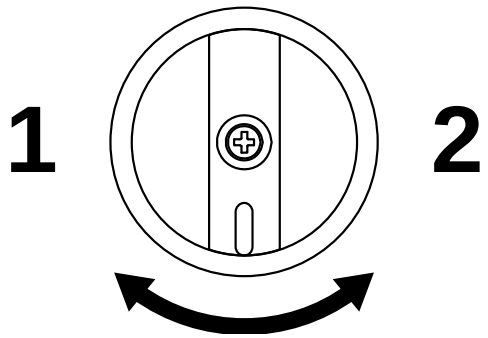
The relays can switch up to 50VDC.
Remote contacts are wet contacts and do not require external voltage to be applied.

3.8 Confirm Operation

1. Press the Preferred Button to highlight 'I' on the Preferred Indicator. Wait (aprox. 3s) or the STS to transfer to Supply 1, if is not already on Supply 1. On Supply 1 LED will turn green.
2. Turn off Supply 1. Confirm that the STS transfers to Supply 2. On Supply 2 LED will turn green.
3. Turn on Supply 1. Confirm that the STS automatically transfers to Supply 1 after a 3 second delay. On supply 1 LED will turn green.
4. Press the Preferred Button to highlight 'II' on the Preferred Indicator. Wait for the STS to transfer to Supply 2. On Supply 2 LED will turn green.
5. Turn off Supply 2. Confirm that the STS transfers to Supply 1. On Supply 1 LED will turn green.
6. Turn on Supply 2. Confirm that the STS automatically transfers to Supply 2 after a 3 second delay. On Supply 1 LED will turn green.
7. The operational test is complete. You can now select a preferred supply if any.

3.9 Maintenance Bypass Procedure

To put the STS into maintenance bypass mode requires access to the Maintenance Bypass Switch located at the rear of the unit.



Bypass Mode on Supply 1

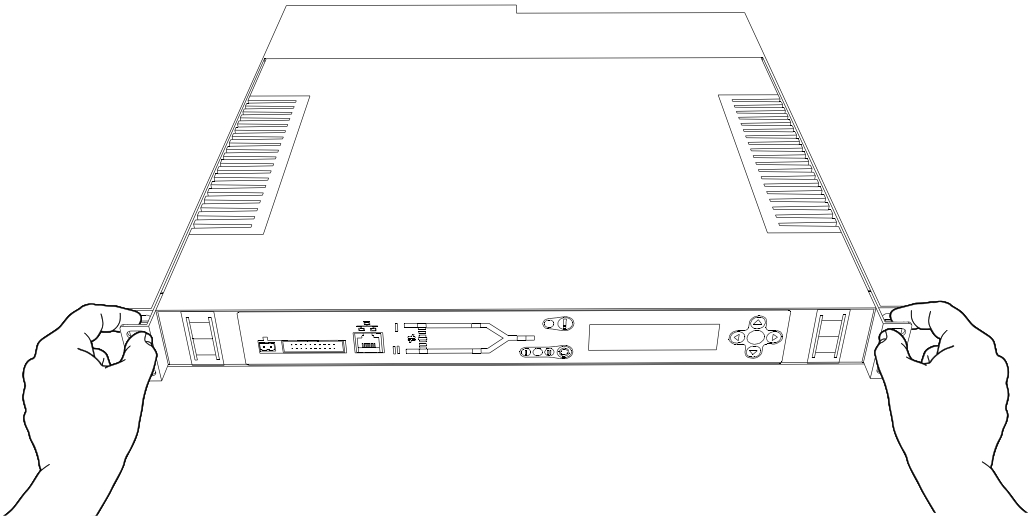
1. Use the TRANSFER pushbutton on the front of the unit to transfer the load to Supply 1.
2. TURN OFF Supply 2 using the isolator switch on the front of the unit.
3. Finally operate the Maintenance Bypass Switch at the rear by turning to position 1. The unit will now be in bypass mode on Supply 1.

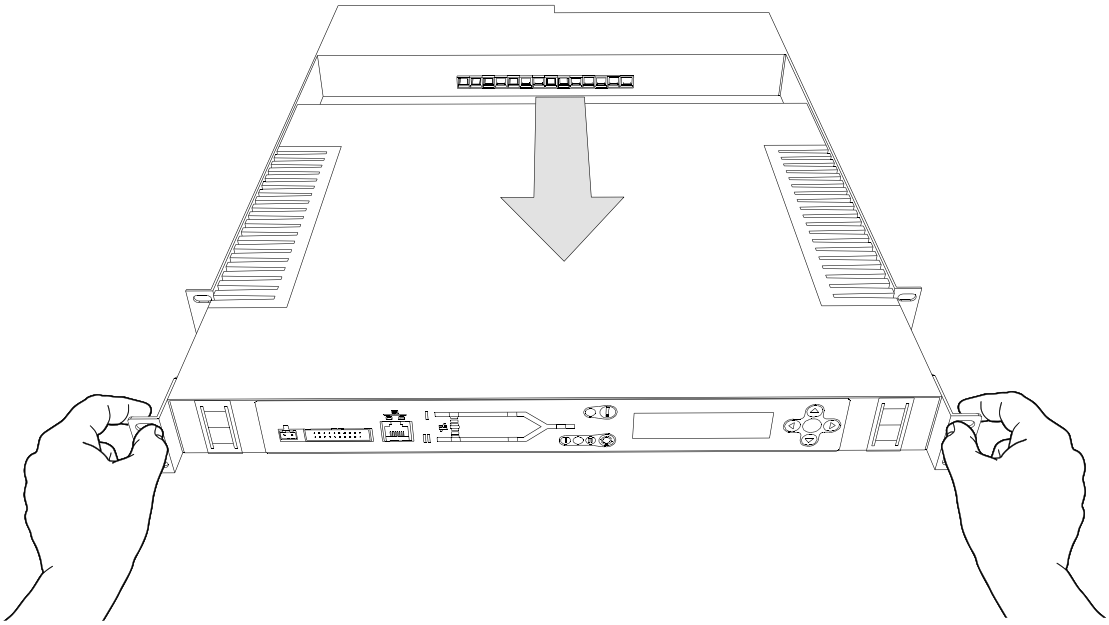
Bypass Mode on Supply 2

1. Use the TRANSFER pushbutton on the front of the unit to transfer the load to Supply 2.
2. TURN OFF Supply 1 using the isolator switch on the front of the unit.
3. Finally operate the Maintenance Bypass at the rear by turning to position 2. The unit will now be in bypass mode on Supply 2.

Removing the Power Module

Once the unit is in maintenance bypass mode on either Supply 1 or 2, the power module can be removed. To remove the module, make sure the bypass cradle is secure then use the tabs on the sides of the module to pull it out from the cradle.





Reinstatement from Maintenance Bypass Procedure

1. Reconnect the power module to the bypass cradle. Take care to ensure the connectors on both sections are aligned and the sections mate together securely.
2. Turn on both Supply 1 and Supply 2 isolator switches located at the front of the unit. Wait for the unit to start up. The Supply 1 and 2 OK LEDs on the mimic will be green to indicate that both supplies are active in the STS.
3. Finally operate the bypass switch, returning it to the middle position.
4. The unit will now be normal operation mode.

3.10 Operational Parameters

Absolute Maximum Values

	Min	Max
Input Voltage	**-**	**277VAC**
Load Current	**-**	**16A or 32A**
Input Synchronisation	**-180°**	**+180°**
Ambient Temperature	**-20°C**	**45°C**

Recommended Values

	Min	Max
Input Voltage	**110VAC**	**277VAC**
Load Current	**0.5A***	**16A or 32A**
Input Synchronisation	**-15°**	**+15°**
Ambient Temperature	**0°C**	**30°C**

**Due to the nature of the silicone controlled rectifiers used in all static transfer switches, some current must be applied to the iSTS to ensure a clean break during transfers.*

Overload Capacity

Load	Time
100A	**30s**
250A	**1s**
400A	**0.1s**
2000A	**1 cycle**

4. WEB BROWSER INTERFACE

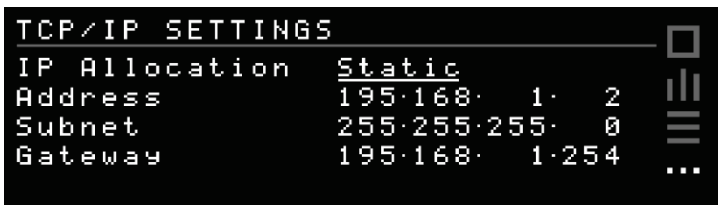
Connecting to the LAN interface can be done two different ways with a RJ45 Cat5 Ethernet cable:

- 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).

4.1 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.

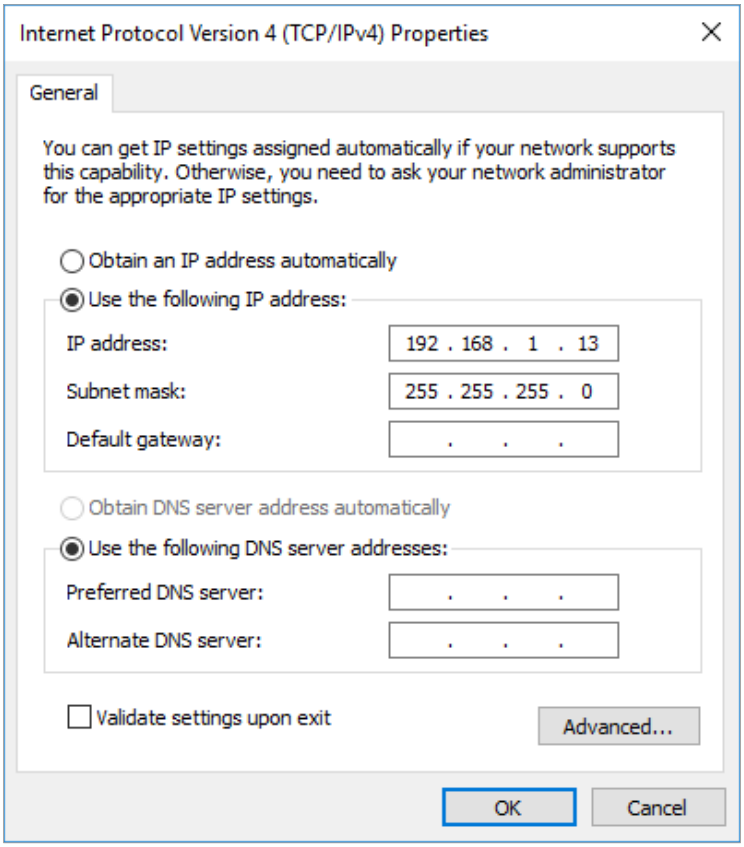
COMMUNICATION SETTINGS



4.2 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.

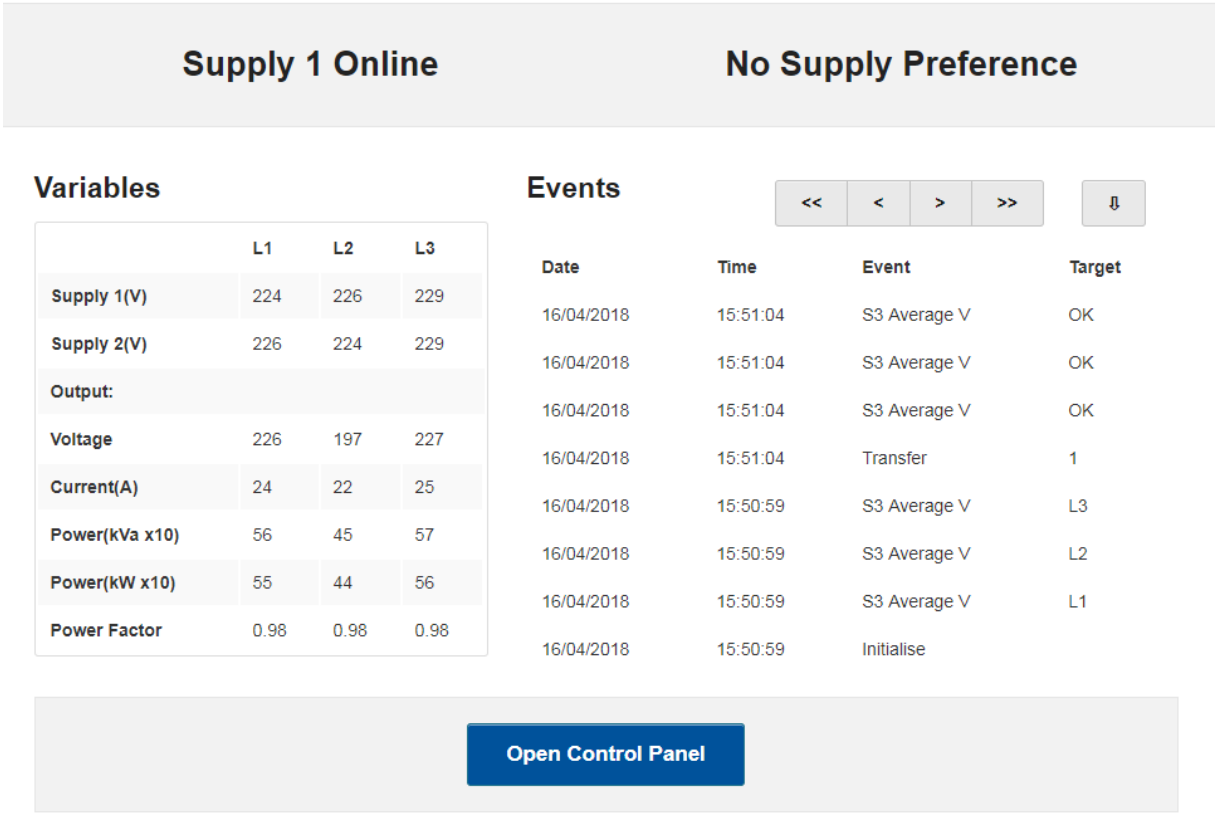


For other operating systems, please refer to the OS networking manual.

4.3 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:

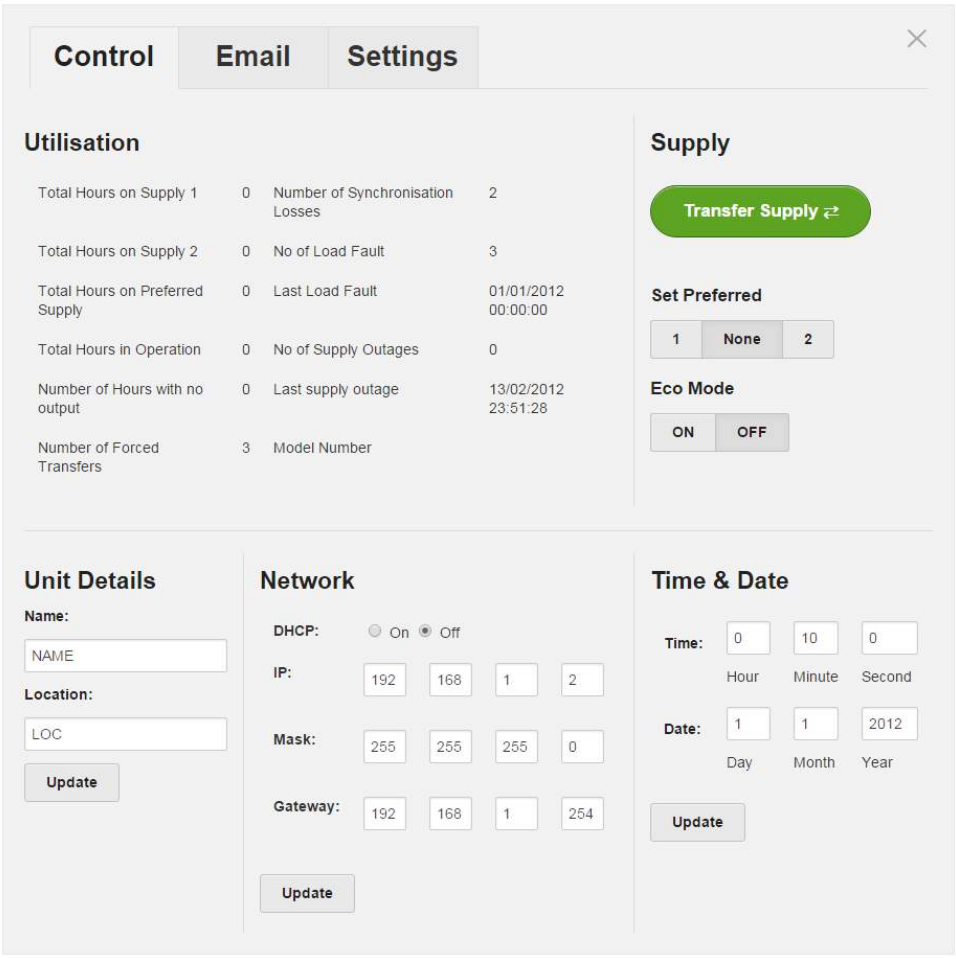
Username: **admin**
Password: **1234**

4.4 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 iSTS 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 iSTS 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 the other options become available to change. From here you can change the IP, Mask and the Gateway. After pressing update these details will be saved on the unit.

4.5 Email

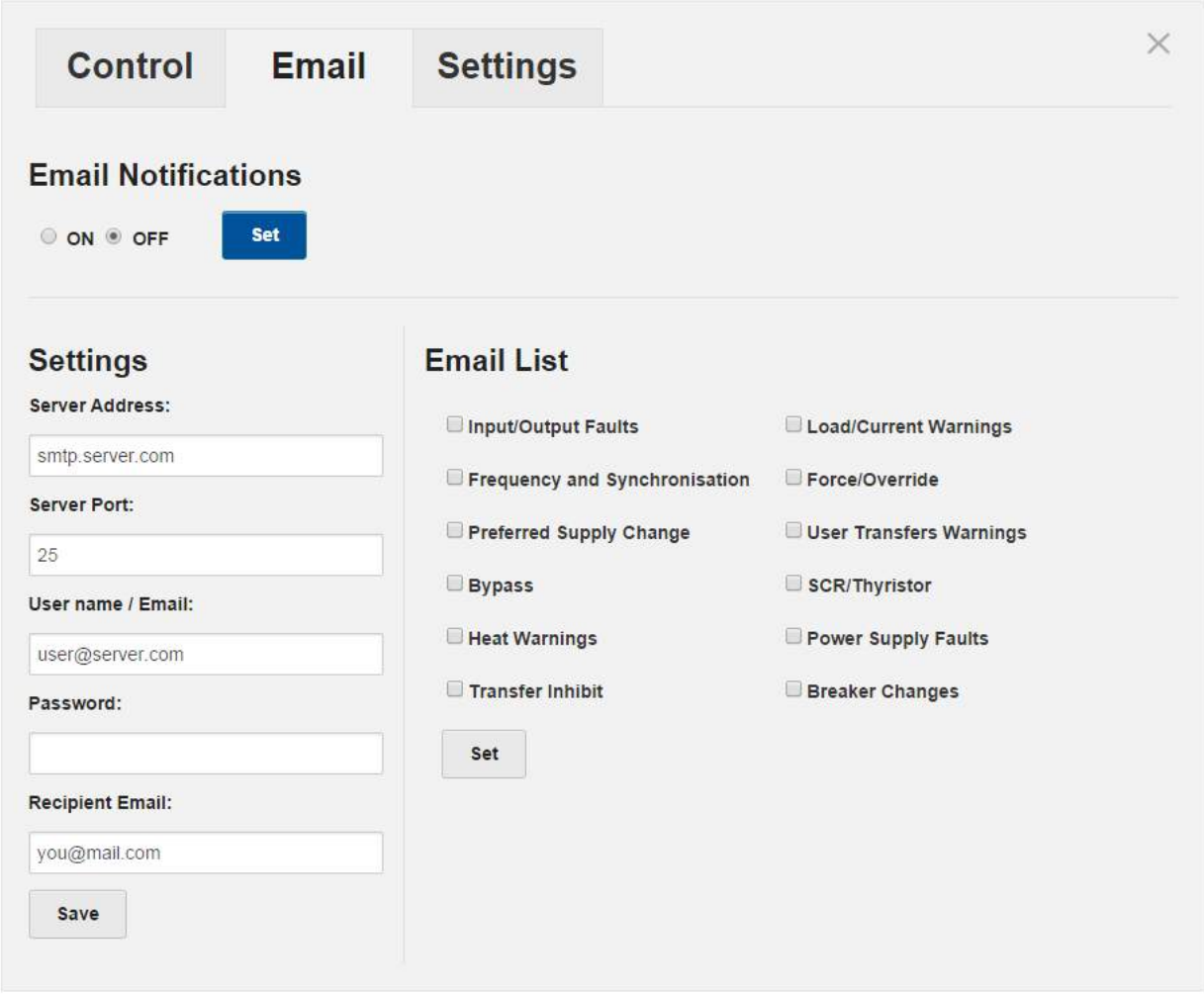
The Email tab allows you to turn on the email notification service. When a certain event occurs the unit will send an email to notify the user. The email takes the following format:

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.

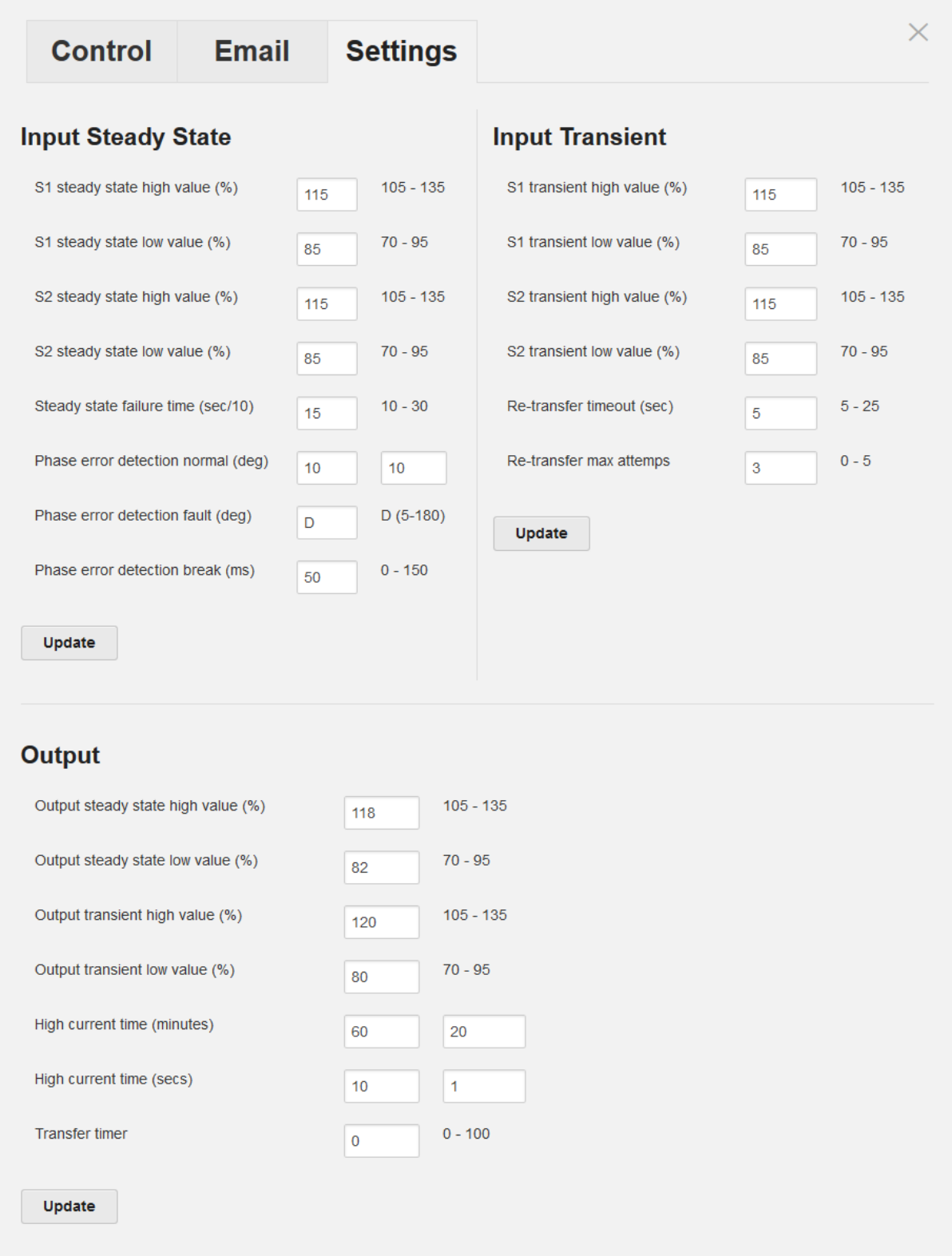
Recipient Email
This is where the email notification will be sent. It can be the same as the above email.

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



EMAIL SCREEN

4.6 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.

4.7 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 115%, 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 85%, can be changed from a nominal value of 70 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 115%, can be changed from a nominal value of 105 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.

S2 steady state low value (%)
Default value of 85%, can be changed from a nominal value of 70 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 number can be between 10-30. 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.
The default value is “D” (Dynamic) which means the STS will calculate the break to insert for the degree of asynchronisation.
This can be set from 5 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.

4.8 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 115%, can be changed from a nominal value of 105 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 85%, can be changed from a nominal value of 70 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 115%, can be changed from a nominal value of 105 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 85%, can be changed from a nominal value of 70 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".

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. The default value for this parameter 5 seconds. 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. The default value is 3. 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.

4.9 Output Settings

Output steady state high value (%)

The default value of 118%, can be changed from a nominal value from 105 to 135. This number will be set as a 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 (Output) sensing is provided as redundant sensing for online source S1 or S2 and in case of internal thyristor triggering a 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 (%)

A default value of 82%, can be changed from a nominal value of 70 to 95. This number will be set as a 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 (Output) sensing is provided as redundant sensing for online source S1 or S2 and in case of internal thyristor triggering a 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 (%)

The default value of 120%, can be changed from a nominal value of 105 to 135. This number will be set as a percentage. The transient time constant for this parameter is defined by “Transient over-sampling time constant 2 x 312 µsec”. 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 (Output) sensing is provided as redundant sensing for online source S1 or S2 and in case of internal thyristor triggering a fault. The operation is to transfer to the alternative source.

Transient limits should be set outside Steady state limits.

Output transient low value (%)

The default value of 80%, can be changed from a nominal value of 70 to 95. This number will be set as a percentage. The transient time constant for this parameter is defined by “Transient over-sampling time constant 2 x 312 µsec” 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 (Output) sensing is provided as redundant sensing for online source S1 or S2 and in case of internal thyristor triggering a fault. The operation is to transfer to the alternative source.

Transient limits should be set outside steady state limits.

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

The default values for 110% (first column) is 60 minutes and for 125% (second column) is 20 minutes. 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 the 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

The default values for 150% (first column) is 10 seconds and for 200% (second column) is 1 second. Exceeding the overload limits of 150% for 10 seconds OR 200% for 1 second 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.

Transfer timer
The default setting value is “0” which disables this function.
This parameter sets a period in seconds that 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.

5 FAULT DIAGNOSIS

5.1 Fault Codes

Event	Append	Description	STS Action Resulting
INIT		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
SYNC	FLT/OK/WRN	S1 & S2 not in synchronism	Alarm No action
SUPPLY 1	FLT/OK	Supply 1 has a fault or fault has cleared	When fault is detected transfers to supply 2 if on 1
SUPPLY 1 TRANS		Supply 1 has Transient High or Low (1 sec)	Transfers to supply 2 if on 1
SUPPLY 1 AVG	LOW/HIGH/OK	Supply 1 steady state is outside tolerance limits	When fault is detected, transfers to supply 2 if on 1
SUPPLY 2	FLT/OK	Supply 2 has a fault or fault has cleared	When fault is detected transfers to supply 1 if on 2
SUPPLY 2 TRANS		Supply 2 has Transient High or Low (1 sec)	Transfers to supply 1 if on 2
SUPPLY 2 AVG	LOW/HIGH/OK	Supply 2 steady state is outside tolerance limits	When fault is detected, transfers to supply 2 if on 1
SUPPLY 3 AVG		Output steady state is outside tolerance limits	Transfers to inactive supply
SUPPLY 3 TRANS		Outside has Transient High or Low (1 sec)	Transfers to inactive supply
CURRENT	WARN/HIGH	Output is overloaded (timed shutdown)	Alarm No action starts timer
TRANSFER	1/2	Transfer to Supply 1 or 2 requested	User - Manual Action
PREF	1/2/OFF	Preferred Source Set 1, 2 or none	User - Manual Switch Only
SCR SC	1/2	SCR on S1 or S2 short circuit detected on Supply 1 or 2	Contact Static Power – Locks to safe source
SCR OC	1/2	SCR on S1 or S2 Open circuit detected on phase #	Contact Static Power – Locks to safe source

5.2 Load Fault

In case of sustained high current output load faults, the iSTS 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 iSTS output before re-instatement of power.

6. RECOMMENDED MAINTENANCE SCHEDULE

If the unit is faulty then it should be removed from service as per the accompanying procedure and a qualified experienced service agent should affect repair.

- 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.

Contact Static Power for help with troubleshooting and parts replacement.

NOTE: The user should not undertake repair procedures or gain access to the internal of the equipment.

7. SPECIFICATIONS

Power		
Type	1-phase / 2-pole (4 x AC static switches)	
Current rating	16A / 20A / 32A	
Voltage rating	All regional voltages (±10%) selectable	
Safe install environment	20kA, 100 internally fused	
Frequency	50Hz / 60Hz (auto detection)(± 10 %)	
Max THDV	10% (max allowable source voltage distortion)	
Power factor	No practical limit	
Crest factor	3.5 : 1	
Loading	0.5 Amperes – 100%	
Overload capacity	@ 45 °C: 63A for 30s 100A for 1s 225A for 0.1s	@ 20°C: 100A for 30s 150A for 1s 400A for 0.1s
Input / Output	With Maintenance Bypass: Input: 6mm² terminals with glands. Output: 6mm² terminals with glands. Without Maintenance Bypass: IEC inputs and outputs	
Maintenance bypass	Maintenance bypass cradle with 3-position switch on rear	
Isolation	Incoming source isolator switches, front mounted (removal of switches optional)	
Switching		
Transfer type	Thyristor / SCR break-before-make	
Detection	Digital: <1ms	
Break time	Normal: < 1ms Max: < ¼ cycle	
Asynchronous break time	0ms / 10ms / 50ms / Vt proportional (user settable)	
dV/dt max	800V/µs	
MTBF	800,000h @ 25ºC, recommend Routine Preventative Maintenance @ 200,000h	
Device ratings	150A RMS, 1400V, 2kA, 1 cycle	
Fault current setting	300% A peak (transfer lockout)	
Protection	100A fuses (BS88, FE100)	
Communication & control		
User interface	LED mimic decal Preferred supply and alarm cancel buttons	
Contacts	In: 2 x self-wetting transfer control inputs Out: 5 x voltage free status indicators (change-over, Form C, SPDT)	
Ethernet	HTTP - web user interface or reporting & control SNMP - 120 unique reports & transfer control Modbus TCP/IP - 120 unique reports & transfer control Email alerts Clock synchronisation with NTP	
Environmental		
Dimensions (H W D)(mm)	With Maintenance Bypass: 44 x 483 x 540 Without Maintenance Bypass: 44 x 483 x 390	
Weight	11kg	
Temperature	0 – 45°C	
Cooling	Passive	
Humidity	5 – 90% non-condensing	
IP rating	IP31	
Compliance		
Regulatory	AS/NZ3100, 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	