STATIC POWER
SMART | SOLID | SAFE

iSTS

Model A1

User Manual

19” Rack Mount Static Transfer Switch

AUSTRALIAN MADE

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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.
- Keep the heatsinks on the sides of the iSTS uncovered for correct cooling. Note that they may be hot.
- Earth connection must be checked for safe function after assembly.

1.4 Electrical Connection

- For 32A models the cable size is limited to 6 mm².
- All cables connecting to the iSTS should be supported and must not put any strain on the point of connection within the iSTS.
- All electrical connections are to be realized by properly qualified, skilled and competent service / installation personnel only.
- Consider electrical distribution discrimination carefully. The iSTS has two incoming AC power sources and has fuses fitted inside, however, these are for safety and not for protection against faults in the load. The fuses should discriminate with downstream protective devices. The upstream iSTS supply breaker/fuse if used should only open if the downstream device protection is unable to trip or there is a fault within the iSTS or the load.

1.5 Synchronism

The smoothest change-over occurs when the 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. If possible, it is best to make sure the supplies are in synchronism.

1.6 Fire Regulations

Should a fire break out inside the system a fire extinguisher with CO2 or similar non-conductive, non-corrosive and inert gas must be used. Do not inhale vapours.

1.7 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

1.8 Warranty

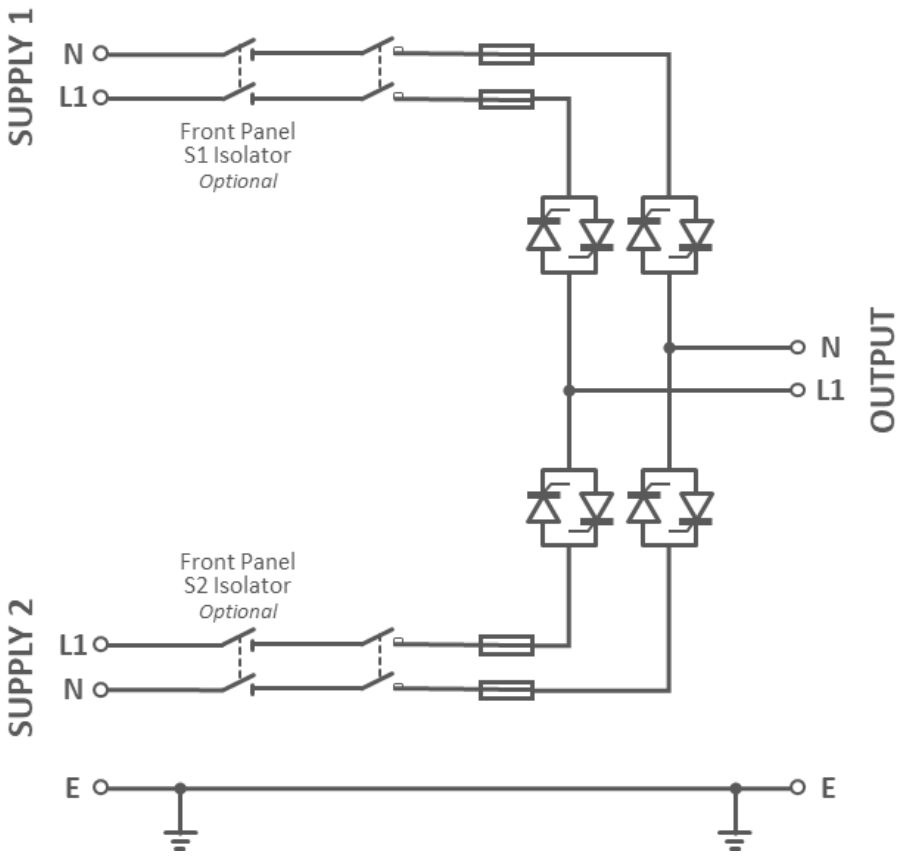
Static Power operating through its authorised agents warrants that the standard products will be free of defects in materials and workmanship for a period of 24 months after the date of invoice, or such other period as may be specified.
This warranty does not cover failures of the product which result from incorrect installation, misuse, alterations by persons other than authorized agents or abnormal operating conditions.
More about warranty: staticpower.com.au/wp-content/uploads/2019/11/Warranty-Statement.pdf

2. SYSTEM OVERVIEW & OPERATION

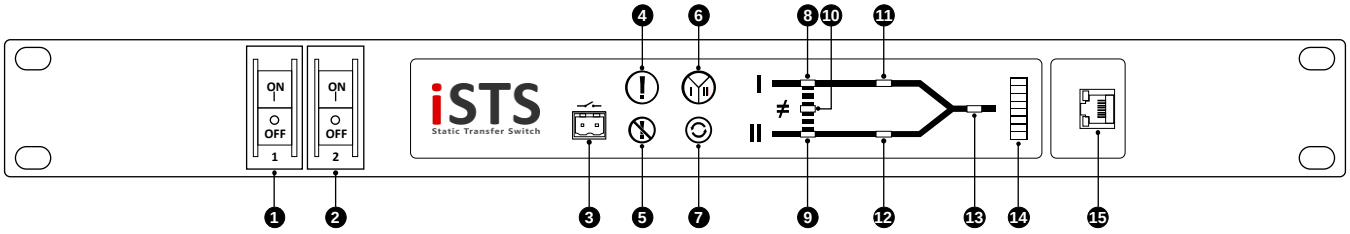
2.1 Description

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 A1 is a 2 pole, single phase 1RU 19-inch rack mount STS. 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 iSTS continuously monitors the supply sources and should the presently connected supply fail or degenerate or become 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, (90 second settling time).

2.2 Line Diagram



2.3 Front Panel

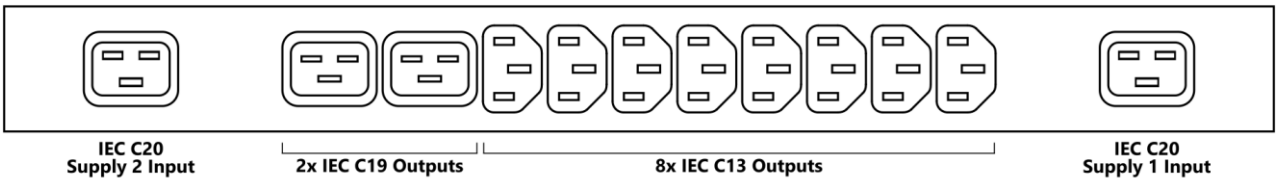


1	**Supply 1 Isolator Switch***	Turns incoming Supply 1 ON or OFF. When switched OFF, power will not go through the STS circuit and Supply 1 Okay LED will show RED.
2	**Supply 2 Isolator Switch***	Turns incoming Supply 2 ON or OFF. When switched OFF, power will not go through the STS circuit and Supply 1 Okay LED will show RED.
3	**Remote Contact**	Voltage free alarm for integration into BMS. Do not connect any more than 50VAC/DC - 0.5A, not suitable for 230VAC. 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	**Alarm LED**	When there is an alarm that has not been acknowledged this LEDs will flash. If the alarm has been acknowledged but the condition still exists, the LEDs will remain on. The Alarm LED and the Remote Contact will be triggered when: ▪ On Supply 1 when priority is Supply 2 ▪ On Supply 2 when priority is Supply 1 ▪ Not in Synchronism ▪ Supply 1 or Supply 2 are not in spec. ▪ There is/was an overcurrent/overload/load fault condition or Overtemperature condition ▪ There has been a thyristor/SCR Fault ▪ The Auto retransfer to preferred source has locked out & max number of automatic re-transfers has been exceeded.
5	**Alarm Cancellation Button**	Pressing this button acknowledges new alarms, causing the audible alarm to turn off and the LEDs to go from flashing to solid.
6	**Preferred Indicator**	These three LEDs indicate which supply is selected as the preferred supply. Supply 1 '**I**', Supply 2 '**II**' or neither may be selected.
7	**Preferred Button**	Pressing this button repeatedly will scroll through which supply is selected as the preferred supply.
8	**Supply 1 Okay LED**	Green/Red indicated that Supply 1 is within/out of tolerance. If fuse is open or blown or there is no power present the power available LED will be Red.
9	**Supply 2 Okay LED**	Green/Red indicated that Supply 2 is within/out of tolerance. If fuse is open or blown or there is no power present the power available LED will be Red.
10	**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.
11	**On Supply 1 LED**	Green/Red indicates the load is on/not on Supply 1.
12	**On Supply 2 LED**	Green/Red indicates the load is on/not on Supply 2.
13	**Output Okay LED**	Green/Red indicated the output is OK/faulty.
14	**Load LEDs**	There are eight LEDs, the bottom six are Green and indicate roughly 10% - 90% loaded. The seventh LED is orange and indicates 100% loaded. The eighth LED is Red and indicates that the iSTS is over loaded.
15	**Ethernet Connector***	Use this port to connect the iSTS 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

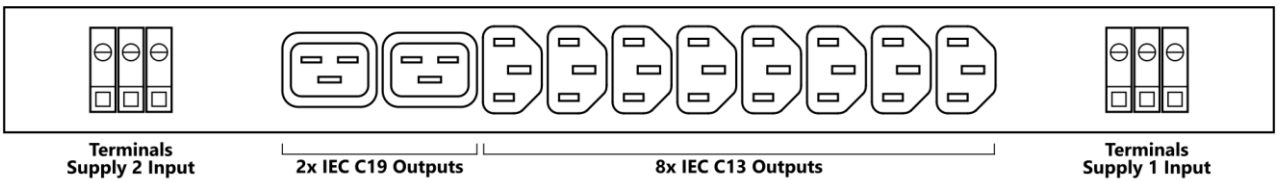
**Optional features*

2.4 Inputs & Outputs

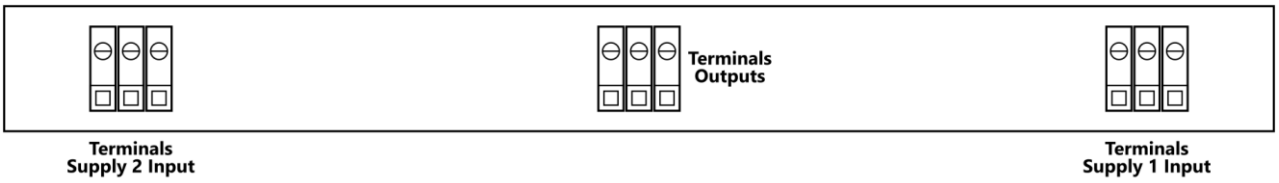
16A Model - IEC Inlets & Outlets



32A Model - Terminals & IEC Outlets



32A Model - Terminals & IEC Outlets



When using IEC Connectors

- Each of the IEC C13 outlets is rated for 10A; however, the load of the sum of each block of 4 must not exceed 16A in total.
- Each IEC C19 outlet sockets rated for up to 16A.
- Ensure that the total loading does not exceed the incoming supply capacity and the capacity of the IEC connectors.

When connecting to 6mm² Terminals

- The order of Line, Neutral and Earth is not identical for each terminal.
- Remove screws to gland plates to gain access to terminals.
- When connecting to terminals, lightly torque between 0.5 – 0.6Nm.

2.5 Operation Settings

Operation settings can be configured using the rotary switch located on top of the unit. Described below are the three independent settings that be configured

SYNC MODE	
Default	When supplies are more than 67º out of phase, a 50ms break will be inserted during a fault condition.
Short	When supplies are more than 67º out of phase, a 10ms break will be inserted during a fault condition.
Dynamic	An intelligent phase dependent break is inserted.
Ignore	Ignores phase difference.
ECO MODE	
Off	Normal fault detection.
On	Breaks less than 5ms will not cause a transfer.
ALARM MODE	
On	General alarm will generate a sound.
Off	General alarm will not generate a sound.

Rotary Position	Alarm Mode	Eco Mode	Sync Mode
0	ON	OFF	Default
1	ON	OFF	Short
2	ON	OFF	Dynamic
3	ON	OFF	Ignore
4	ON	ON	Default
5	ON	ON	Short
6	ON	ON	Dynamic
7	ON	ON	Ignore
8	OFF	OFF	Default
9	OFF	OFF	Short
A	OFF	OFF	Dynamic
B	OFF	OFF	Ignore
C	OFF	ON	Default
D	OFF	ON	Short
E	OFF	ON	Dynamic
F	OFF	ON	Ignore

2.6 Operational Parameters

Absolute Maximum Values

	Min	Max
Input Voltage	**85VAC**	**265VAC**
Load Current	**-**	**16A or 32A**
Input Synchronisation	**-180°**	**+180°**
Ambient Temperature	**0°C**	**40°C**

Recommended Values

	Min	Max
Input Voltage	**105VAC/210VAC**	**126VAC/255VAC**
Load Current	**1A***	**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 @20°C	Time
80A	**30s**
125A	**1s**
1000A	**1 cycle**

3. INSTALLATION

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.

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 replaced. 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 A1 will contribute a maximum of 6mA to earth leakage (transiently & during switching between sources), this will itself not cause any tripping of the RCDs.
The iSTS A1 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 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 a 12ms break inserted if the phase difference between the sources exceeds 30 degrees. Or you are operating in RCD mode (consult factory prior).
The break has been inserted for a safe mode on purpose when the sources are out by more than 30 degrees.

3.3 Remote Monitoring Relay

Contacts are normally closed. Contact is held open when there is no alarm. Do not connect any more than 50VACDC - 0.5A, not suitable for 110/230VAC.
Provide physical separation between control circuits and power circuits to avoid confusion, reduces interference. Make sure that all control wiring is protected and securely supported so that it is not inadvertently unplugged or removed whilst other equipment is being installed or removed within the enclosure.

3.4 Setup

a) Ensure that the two input sources are within tolerance, and that they are in synchronism (±15% of rated voltage, <10% THD, <15° phase difference).
b) Connect your critical load to the OUTPUT. *NOTE: Due to the nature of Silicone Controlled Rectifiers (SCRs), some load (~1A) is required for correct operation.*
c) Connect the sources to SUPPLY 1 and SUPPLY 2. If you wish to Confirm Operation you will need to be able to switch both sources on and off.

3.5 Start-up

a) Apply power to both input sources.
b) There will be a short (15 sec) start-up period, after which the iSTS will begin powering your load.
c) Confirm that the load is receiving power.
d) Ensure that LEDs are correctly representing the supply status and load. *NOTE: Only On Supply 1 LED or On Supply 2 LED should be red.*

3.6 Confirm Operation

a) Use the Preferred Button to highlight 'I' on the Preferred Indicator. Wait for the On Supply 1 LED to turn green (if is not already).
b) Turn OFF Supply 1, and confirm that the iSTS transfers to 'II' (On Supply 2 LED - green).
c) Turn ON Supply 1, and confirm that the iSTS auto transfers to Supply 1 after a 3 second delay (On Supply 1 LED - green).
d) Use the Preferred Button to highlight 'II'. Wait for the iSTS to transfer to Supply 2 (On Supply 2 LED - green).
e) Turn OFF Supply 2, and confirm that the iSTS transfers to Supply 1 (On Supply 1 LED - green).
f) Turn ON Supply 2, and confirm that the iSTS auto transfers to Supply 2 after a 3 second delay (On Supply 1 LED - green).
g) Select your preferred supply if any.

3.7 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.
If the unit is inoperable then it should be returned to the manufacturer for repair or replacement.

3.8 Diagnostic Guide

Before starting this guide it is important that you are familiar with the unit and have read the iSTS A1 User Manual.

Overview

The diagnostic mode is used to view important events that have occurred on the iSTS. Up to 32 previous events are recorded, once 32 events are present the oldest event is pushed out to make room for the incoming event.

Diagnostic mode entry and exit

To enter or exit diagnostic mode press and hold the Alarm button for 2 seconds. You will hear a quick double beep upon successful entry and exit.

Front panel overview and navigation

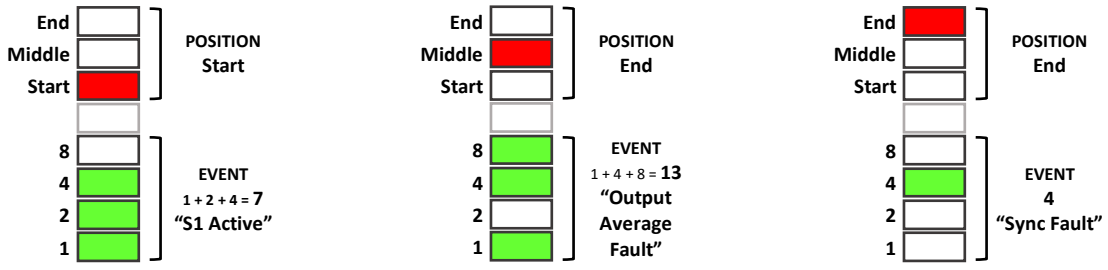
In diagnostic mode the following changes to the user interface decal apply.

Previous	Navigates to the previous event in the list
Next	Navigates to the next event in the list
Event Position	Display where you are in the list (start, middle, end)
Event Code	Represent the event code in binary, starting with bit 0 at the bottom

Event description and codes

Code	Event	Description
15	S1 Fault	Supply 1 transient or average fault detected
14	S2 Fault	Supply 2 transient or average fault detected
13	Output Average Fault	Output average voltage out of range
12	Output Transient Fault	Output voltage transient condition
11	S1 SCR OC	Supply 1 SCR open circuit detected
10	S1 SCR SC	Supply 1 SCR short circuit detected
9	S2 SCR OC	Supply 2 SCR open circuit detected
8	S2 SCR SC	Supply 2 SCR short circuit detected
7	S1 Active	Supply 1 is feeding the output
6	S2 Active	Supply 2 is feeding the output
5	Transfer Inhibit	Transfer inhibit condition caused by unstable or overloaded supply
4	Sync Fault	Supply 1 and Supply 2 out of sync
3	Overload Fault	Output load current above nominal rating
2	Preferred Change	User has changed preferred supply
1	Fire S1	Internal logic is activating Supply 1
0	Fire S2	Internal logic is activating Supply 2

Events and code examples



4. WEB BROWSER INTERFACE- LAN

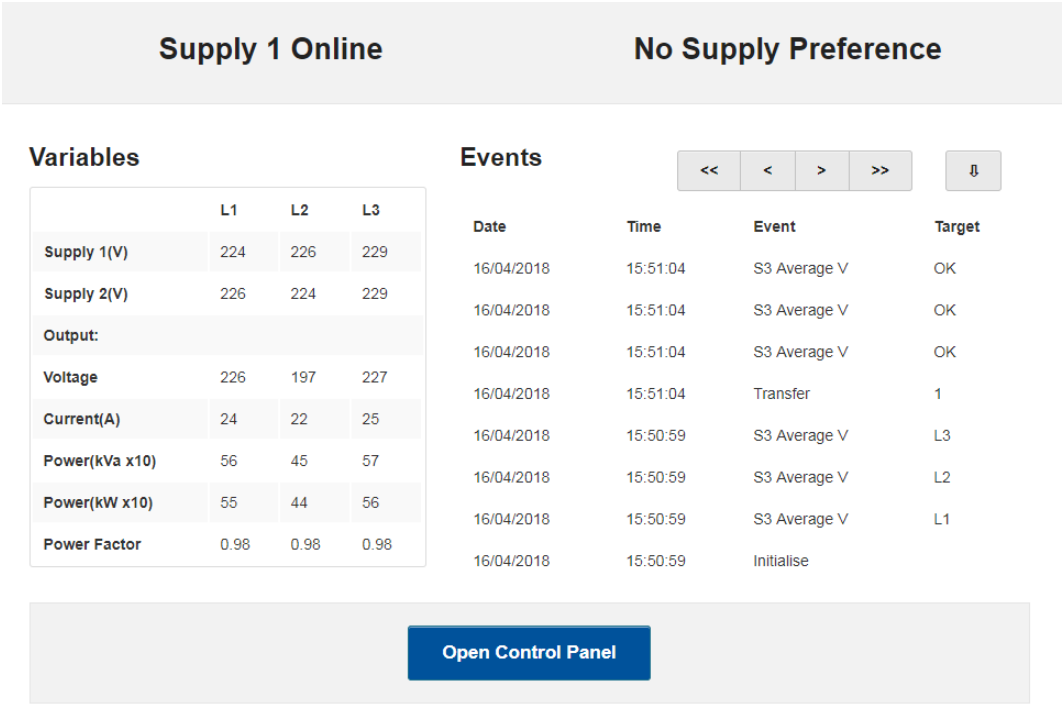
4.1 Home Page

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).

To Access the Web Browser Interface

Once the iSTS is running and has been connected to your network open a browser and navigate to 192.168.1.2. If you are having trouble connecting to the STS try pinging the device. You will need to make sure that you are on the same subnet (192.168.1.XX).



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:

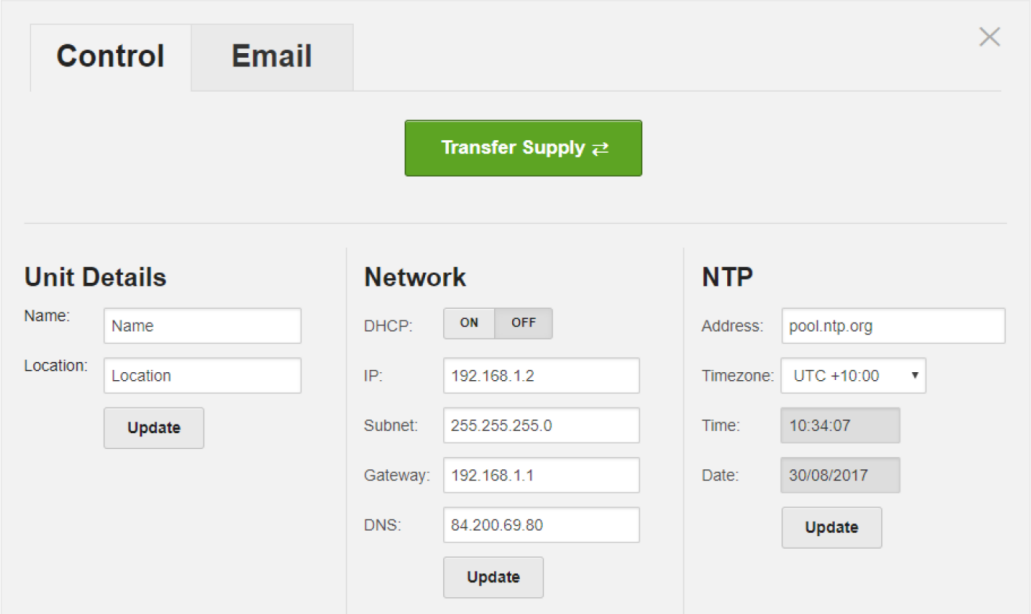
Username: **admin**
Password: **1234**

4.2 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



4.3 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:

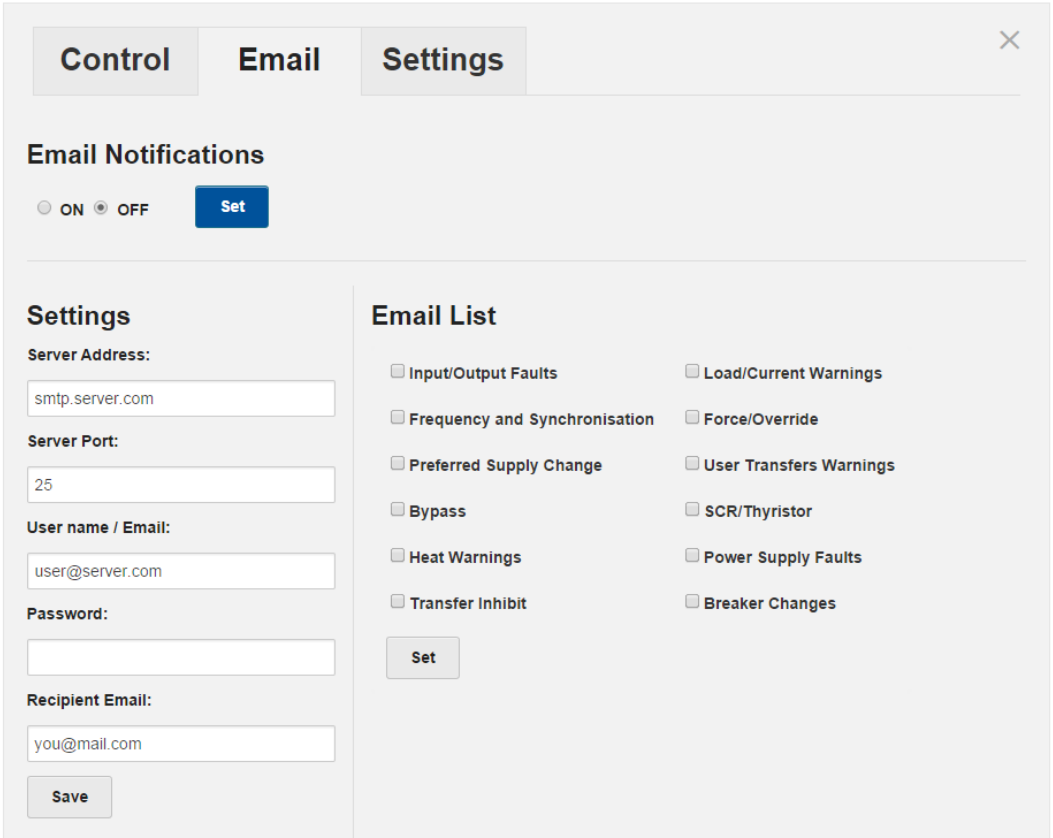
STS01 – LVL5

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.



4.4 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. RECOMMENDED MAINTENANCE SCHEDULE

- Once per month check the status of the LEDs on the front panel of the iSTS. The LEDs The LEDs showing the flow of power on the mimic should be Green. The LEDs of the load indicator at the right of the decal should all be Green. If there Orange or Red LEDs on the bar graph then the iSTS is being overloaded.
- Once every 6 months, (sooner if the environment is bad), vacuum dust from grills at side of unit.
- Inspect cable / plug connections for overheating.

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

6. SPECIFICATIONS

Current rating	16A and 32A
Voltage rating	115V or 230V, ±10%
Type	1-Phase/2-Pole
Frequency	50Hz and 60Hz, ±10% - Auto detection
Transfer type	Break-Before-Make zero current transfer by Thyristors / SCR
Synchronous break time	10ms Typical
MTBF	>1,000,000 hours
Maintenance bypass	None
Isolation	Optional incoming source isolator switches, front mounted
Display	Bi-colour LED mimic decal with load indication
Interface	Preferred supply selection, Source transfer selection and Alarm cancel button
Contact	One voltage free general alarm indicator, Form A or Form B - SPST
Ethernet	LAN optional
Input options	16A: IEC C20 sockets 32A: 6mm² terminals with glands
Output options	16A: 2 x IEC C19 + 8 x IEC C13 sockets 32A: 2 x IEC C19 + 8 x IEC C13 sockets or 6mm² terminals with glands
Dimensions H x W x D	16A: 1RU/19" - 44 x 483 x 285mm 32A: 1RU/19" - 44 x 483 x 307mm
Weight	5kg
Temperature	0 – 40°C
IP rating	IP31
Detection	Digital: <1ms
Asynchronous break time	0ms, 10ms, 50ms or Vt proportional, 0° to 180°
Loading	0 - 100% @40°C ambient
Device ratings	$80A_{RMS}$, 1400V, 1kA for 1 cycle
Overload @40°C ambient	40A for 30s 115A for 0.1s 63A for 1s 1kA for 1 cycle
Fault current setting	300% peak with load fault transfer inhibit
Safe install environment	20kA, 100A internally fused
Protection	100A fuses - BS88/FE100
Power factor	No practical limit
Max THDV	10% - Max allowable source voltage distortion
Crest factor	3 : 1
dV/dt max	800V/µs
Cooling	Passive
Humidity @40°C ambient	5 – 95% non-condensing
Regulatory approvals	IEC 62310-1,2,3 - IEC 60950 - IEC 61000-6-1,2,3,4 – CE – RCM - UL Capable - RoHS
Standard warranty	24 months offsite repair or replacement policy

Specifications are subject to change without notice

STATIC POWER

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AUSTRALIAN MADE

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