



# **STATIC TRANSFER SWITCH**

**50 – 100 – 200A**

# **USER MANUAL**



This document contains user guide information for 3 phase INFORM STS350 , STS3100 and STS3200 static switches.

## **SAFETY**

### **IMPORTANT NOTICES**

1. This Manual must be carefully read before applying any power to the STS unit.
2. All warnings in the manual should be adhered to.
3. All operating instructions should be followed.
4. The unit should be supplied by a grounded outlet. Do not operate the unit without ground source.
5. Power input cords of the STS should be routed carefully so that they are not to be walked on.
6. Please save this manual.
7. Please save or recycle the packaging materials.

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### **WARNING !!!**

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- INFORM STS is designed for Commercial/ Industrial applications.
  - Do not insert any object into ventilation holes or other openings.
  - To reduce the risk of fire or electric shock, install the unit in temperature and humidity controlled indoor area free of flammable and corrosive substances.
  - To reduce the risk of fire, replace fuses with the same type and rating when necessary.
  - The unit have two power inputs ,if one of the supplies is connected risk of electric shock is valid.
  - The unit may contain a dangerous level of voltage, even when it is in "MAINTENANCE BYPASS" status.
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### **CAUTION !!!**

- **Installation and commissioning of this device must be performed by qualified service personnel trained and authorized by the manufacturer (or distributor)**
- **Risk of electric shock, do not remove cover. No user serviceable parts inside, refer servicing to qualified service personnel.**
- **Risk of electric shock, hazardous live parts inside .**

## INTRODUCTION

Thank you for selecting Inform static switch. To choose the STS as your equipment protector was a wise investment. It includes many features to protect your critical equipments.

Power ranges according to models

<b>Model</b>	<b>Output current per phase</b>
STS350	50 amps
STS3100	100 amps
STS3200	200 amps

This unit supplies continuous power to critical loads from 2 separate AC supplies. It monitors 2 input sources, if one of the input sources fails, it transfers the load to the other input source automatically. The user can also perform transfer from one source to another using the manual transfer switch.

The spot lines of this unit's main functions are as follows :

- Increased power quality
- Increased noise reduction
- Power blackout protection
- Power redundancy
- Automatic static switching
- Remote monitoring of input power sources
- Easy static and mechanical transfer between separate input sources
- Remote management of power events
- Power event logging
- UPS redundancy

Therefore inclusion of INFORM Static Transfer Switches (STS) in an energy distribution system provides secure protection against any possible faults in the AC power system. STS permits switching between two independent AC power supplies (SOURCE 1 and SOURCE 2) without shutting down the critical load connected to its output.

## INSTALLATION INFORMATION AND PROCEDURE

### **WARNING!!!**

- **Do not apply electrical power to the STS equipment before arrival of authorized service personnel.**
- **Installation and commissioning of STS must be performed by a qualified technician.**
- **INFORM Static Transfer Switches run only on 3-Phase AC power supplies with a NEUTRAL line**
- **The STS unit must be grounded in accordance with electrical regulations.**
- **Adequate protection against input over currents must be provided, considering the nominal current rating of the STS.**

- **Before making power connections to the unit, ensure that all the incoming power sources are de-energized and insulated.**
- **The unit is powered by more than one power mains. When one of the incoming power sources is active, the unit contains a dangerous level of voltage, even when it is in “MAINTENANCE BYPASS” position.**

### **UNPACKING**

The STS is packed and enclosed in a structural cardboard carton to protect it from damage.

1. Inspect for damage that may have occurred during the shipment. If any damage is noted, call the shipper immediately and retain the shipping carton and the STS.
2. Carefully open the carton and take the STS out.
3. Retain the carton and packing material for possible future use.

#### Unit package contents :

- User Manual
- Guarantee Certificate
- STS

### **Equipment Positioning**

1. The equipment's installation place must be an easy serving place.
2. Install the STS in a protected area with adequate air flow and free of excessive dust.
3. Cooling air enters the unit through the ventilation holes on the front cover of the cabinet and is released through the grids on the roof. Therefore the STS cabinet does not require clearances at either side or at the rear. It is important to leave a distance of at least 80cm between the top of the STS and the ceiling of the room in which it is installed to permit adequate circulation of air coming out of the unit.
4. Select a suitable place (temperature is between 0°C and 40°C) and the relative humidity (%90 max)
5. In case of an operating the STS in a dusty place, clean the air with a suitable air filtration system.
6. Keep out of your equipment from the explosive and flammable items.
7. Avoid direct sunlight, rain, and high humidity.

### **WARNING !!!**

- **Since it is a high voltage equipment, INFORM STS contains dangerously high voltages. The risk of contact with these voltages is minimized using a lockable hinged door and internal safety shields in accordance with IP20 standards.**
- **All maintenance and installation procedures requiring access to the inside of the device must be exclusively performed by a trained personnel.**
- **INFORM STS DOES NOT HAVE AUTOMATIC PROTECTION AGAINST VOLTAGE RETURNING TO THE INPUT. POWER SWITCHES OR FUSES OUTSIDE THE STS MAY HAVE VOLTAGES ON THEIR CONNECTION TERMINALS EVEN WHEN THEY ARE TURNED OFF.**
- **SERVICE PERSONNEL MUST INSULATE THE STS (BY TURNING OF ITS INPUT SWITCHES S1 AND S2) BEFORE WORKING ON THESE EQUIPMENT.**

### CONNECTING THE STS POWER CABLES

Cables can enter the INFORM STS from below, through the base panel of the cabinet. Top entry is also possible by removing the cover panel on the top of the STS revealing the cables entry hole. The connections of the STS should be supplied by grounded outlets. Cables enter the STS modules via entry panels in the base of cabinet. All control cables should be screened and run in a separate trunking to the power cables.

The input/output cables can be sized to suit the STS rating according to the table below

Model	Input and output cables
STS350	16 mm <sup>2</sup>
STS3100	35 mm <sup>2</sup>
STS3200	50 mm <sup>2</sup>

**NOTES:** The neutral conductor should be sized for 1,5 times the output phase current. The Earth conductor should be sized as 2 times the output conductor (this is dependent on the fault rating, cable lengths, type of protection etc.) These recommendations are for guideline purposes only and are superceded by local regulations and codes in practice.

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### IMPORTANT !!!

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INFORM STS will work only with an AC power source with a Permanent NEUTRAL. Failure in providing NEUTRAL connection may result in damage to the unit.

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### Safety Earth

The safety earth cable must be connected to the earth BUS BAR and bonded to each cabinets in the system and also the earthing and neutral bonding arrangements must be in accordance with the local laws. Proper grounding considerably reduces problems in systems caused by electromagnetic interference.

**ATTENTION!!!** Failure to follow adequate earthing procedures can result in electric shock hazard to personnel, or the risk of fire

Input and output terminals of the STS are shown in the following figure

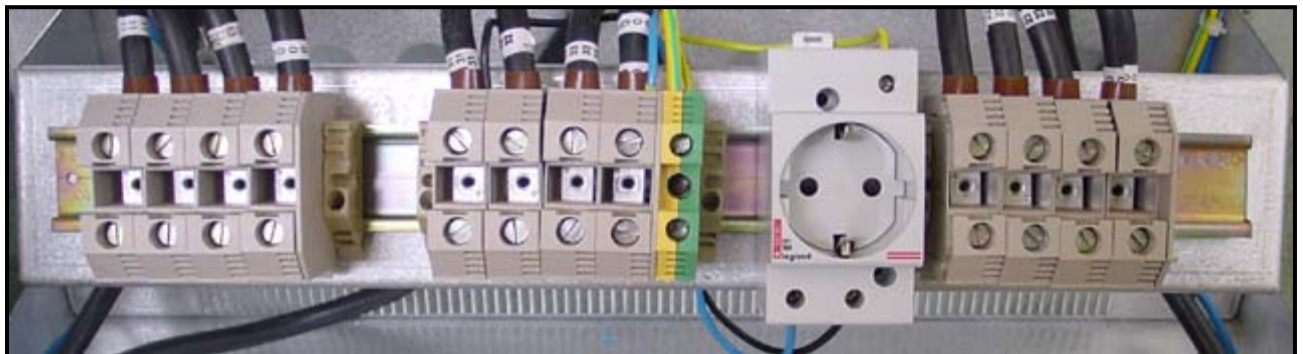
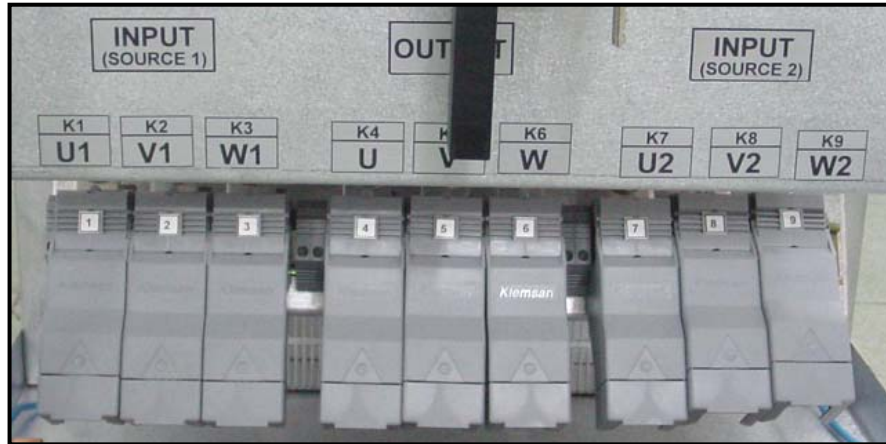
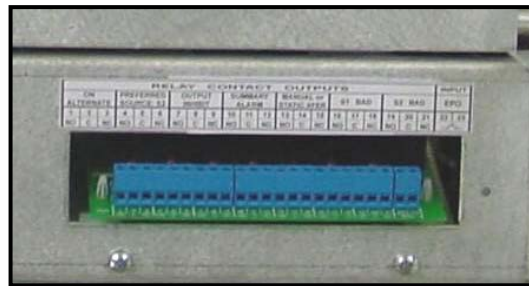


Figure 3-1 Connection terminals of STS (100A)



**Figure 3-2 Connection terminals of STS (150A and 200A)**



**Figure 3-3 Alarm Relay Contacts and EPO Input Terminals**

Source 1 input terminals (3phase)	Left side
Output terminals	center
Source 2 input terminals (3 phase)	Right side
Neutral connection	At the bottom side of terminals (bare)
Earth connection	At the bottom side of terminals (bare)
Utility outlet	For service purposes 1 phase output

### **WIRING PROCEDURE**

1. Open the STS cabinet front door and remove the metal guard on the lower side to permit access to the connection terminals and bus bars (neutral and earth). Before connecting any power cables, please ensure that all the circuit breakers on the STS are in "OFF" position. (S1, S2, S3 and S4)

#### SOURCE 1 Input Power Connections

2. Connect the SOURCE 1 AC power cables to the terminals U1-V1-W1 of the STS (Figure 3-1 or 3-2) and tighten the connections properly.  
The neutral cable must be connected to the copper bus-bar identified as "NEUTRAL".

#### **CHECK FOR CORRECT PHASE ROTATION**

#### SOURCE 2 Input Power Connections

3. Connect the SOURCE 2 AC power cables to the terminals U2-V2-W2 of the STS (Figure 3-1 or 3-2) and tighten the connections properly.

The neutral cable must be connected to the copper bus-bar identified as "NEUTRAL".

**CHECK FOR CORRECT PHASE ROTATION**

Output Connections
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4. Connect the output cables to the terminals (U-V-W) of the STS (Figure 3-1 or 3-2) and tighten the connections properly.  
The output neutral cable must also be connected to the copper bus-bar identified as "NEUTRAL".

**CHECK THAT PHASES ARE CONNECTED IN THE RIGHT ORDER.**

CHECK AGAIN ! that U1-U2, V1-V2 and W1-W2 are the corresponding phases of the two separate AC input sources respectively.

5. Also proper control and signal wire connections (Alarm relays, EPO etc.) should be made through the screw terminal block shown in figure 3-3.

**Note :** These auxiliary cables must be shielded and double insulated.  
(Recommended cross-section 1mm<sup>2</sup>)

6. Reassemble the metal guard removed previously.

**SYSTEM DESCRIPTION**

**4.1 Description Of The Functioning Of The INFORM STS**

INFORM STS is a microprocessor controlled transfer switch, designed for automatic and manual switching between two AC power sources, with interruption to the load of less than 2 msecs with synchronized sources and of less than 12 msecs for unsynchronized sources.

STS utilizes SCRs connected in opposite parallel pairs (6 pairs) . Three pairs of SCRs are used to connect the AC load to the power supply input referred to as "PREFERRED", under normal conditions. The other three pairs of SCRs are on standby to transfer the load to the other power supply input referred to as "ALTERNATE" in case of a failure of the "PREFERRED" input supply.

Source 1 and Source 2 supply inputs should come from two different AC sources with nominally identical voltages, phases and frequencies. The aim of the STS is uninterrupted transfer from one AC power supply to the other, in case of a fault in the "PREFERRED" supply.

Before and during transfer from one source to the other, the operating conditions of the SCRs are carefully monitored to prevent crosscurrents between two sources. The break-before-make technique makes healthy and uninterrupted transfers possible.

During normal operation, "PREFERRED" network supplies the load when both inputs are available. Selection of the "PREFERRED" network, automatic re-transfer, retransfer delay, overload behaviour of STS, alarm hold time, non-synchronized transfer behavior, overload and transfer inhibit reset modes may be set by the user on the control panel of the unit.

Permitted voltage, phase difference and frequency tolerance are also adjustable by the service personnel on the control panel.

## 4.2 Basic Features:

- Easy monitoring all parameters on LCD display
- Fast microcontroller (32 mips)
- Advanced RS232 communication features
- DRY contact alarm interface
- Password protected login system from remote site (timed Access)
- 2 redundant power supplies for electronic boards (hot swappable)
- Easy front access to all components inside of the STS
- Second protection cover on live circuits which prevents electrical shock
- Input sources protected by fuses
- 3 positioned Maintenance bypass switch which prevents cross currents between input sources
- User adjustable parameters by entering a password.
- Built in real time clock.
- Alarm history (with their date and time)
- Automatic transfer test from a remote site or using front panel
- Front panel Lamp test
- External emergency shutdown (EPO) input
- All boards are supplied by two separate power supplies.
- Hot plug construction during maintenance bypass
- High current output tolerant up to 1000%
- Adjustable long dead time during non synchron transfer up to 3 seconds
- SCR fault sense circuit
- Cabinet inside temperature sensor
- Fast voltage black-out circuit
- Input phase balance circuit
- Output alternance balance circuit
- Adjustable Input source frequency lower/upper limits

- Additional analog synchron sense circuit

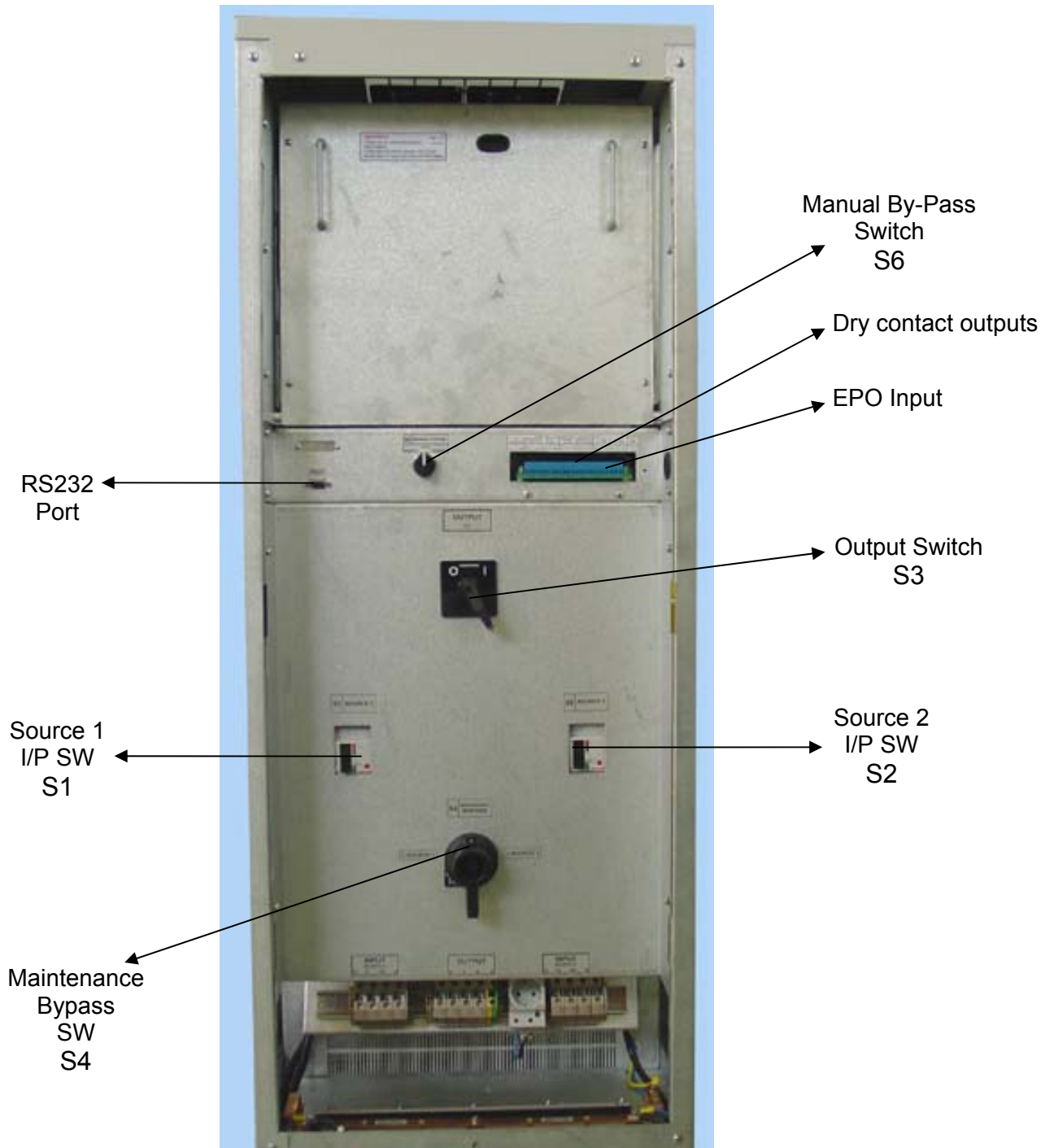


Figure 4-1

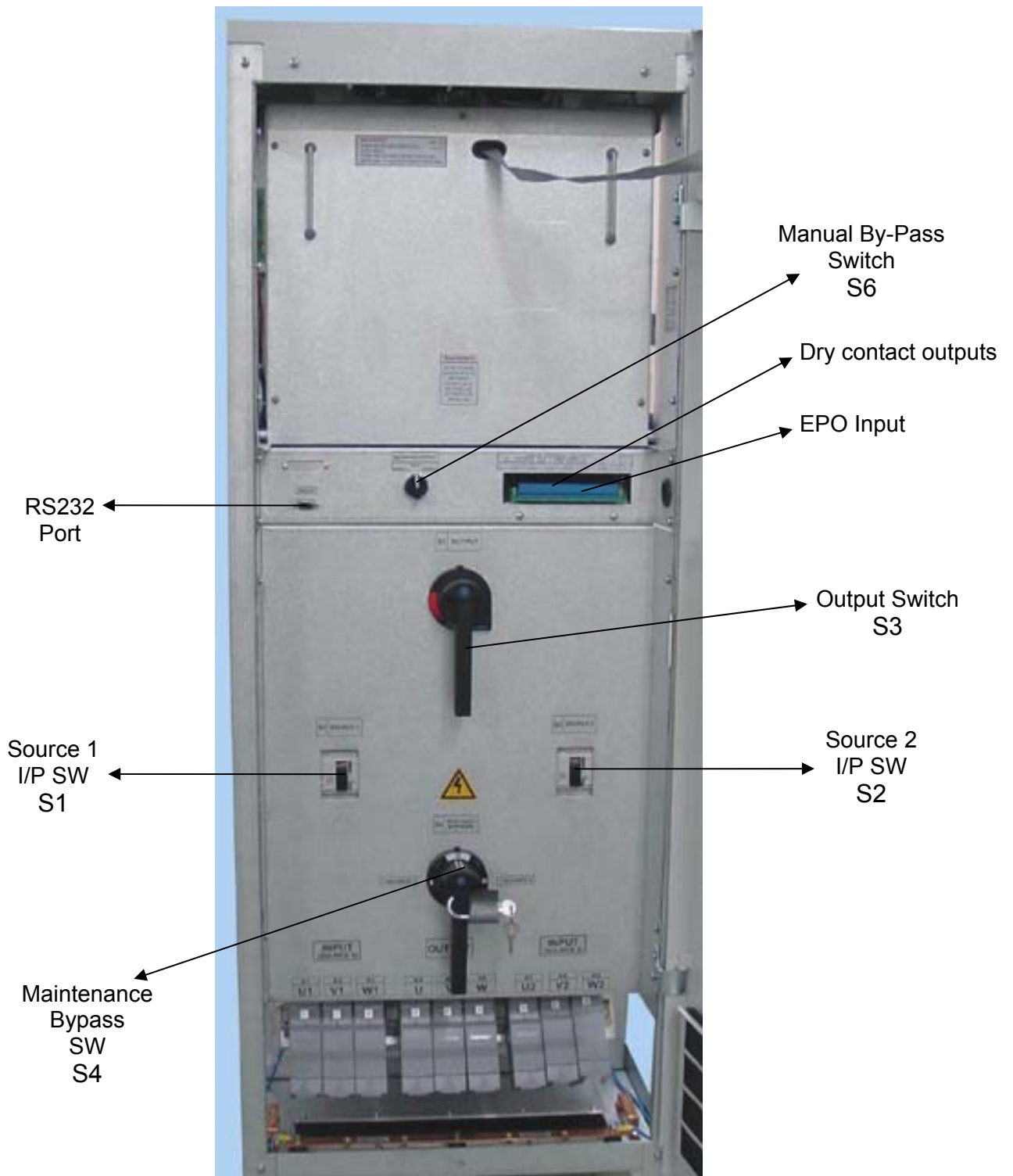
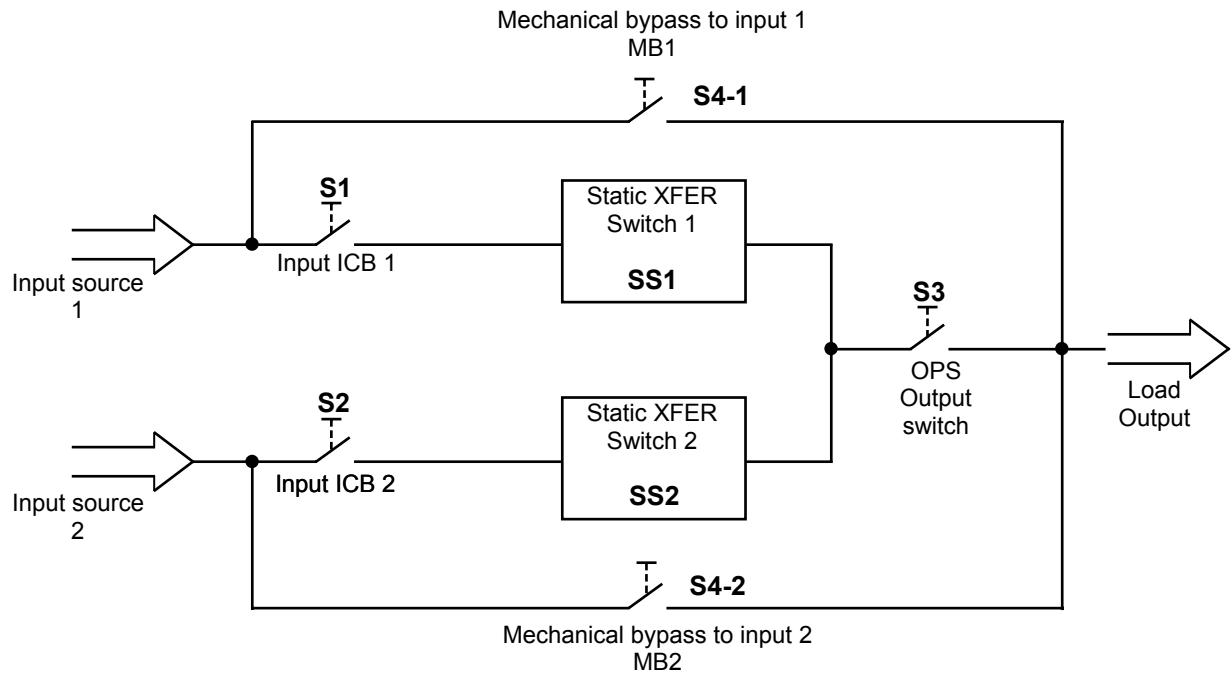


Figure 4-2

### 4.3 Block Diagram Of Static Switch



**Figure 1 – STS Block Diagram**

ICB1	(S1)	Source 1 Input circuit breaker (MCCB)
ICB2	(S2)	Source 2 input circuit breaker (MCCB)
MB1	(S4-1)	Mechanical bypass switch to source 1
MB2	(S4-2)	Mechanical bypass switch to source 2
OPS	(S3)	Output switch
XFER1	(SS1)	Static transfer SCR circuit to source 1
XFER2	(SS2)	Static transfer SCR circuit to source 2

- ICB1 : This switch is thermal and magnetic protected type and shutdowns source 1 input  
 ICB2 : This switch is thermal and magnetic protected type and shutdowns source 1 input  
 MB1 : During maintenance these contacts connect Source 1 input to STS output directly  
 MB2 : During maintenance these contacts connect Source 2 input to STS output directly  
 OPS : This switch shutdowns the output voltage of STS . During maintenance the position of this switch must be OFF.  
 XFER1 : This static switch contains SCRS and snubber components and driven by a driver circuit which is controlled by the microprocessor.  
 XFER2 : This static switch contains SCRS and snubber components and driven by a driver circuit which is controlled by the microprocessor.

**NOTE :** Figure 1 shows only 1 phase of 3 phase construction. The other phases are not shown.

The maintenance bypass switch is a 3 pole change-over switch

1	Maintenance bypass to source1
0	Automatic operation
2	Maintenance bypass to source2

Source 1 and Source 2 input circuit breakers are MCCB's with thermal overload and magnetic short circuit releases.

A Manual Static Bypass Switch is also available for easy load transfer.

### **Control Circuit locations**

The control circuits are located in a closed cabinet which is not directly accessible by the user.

### **Redundant power supply circuit**

2 power supplies are installed inside the STS. They are connected to all boards separately. So the construction is hot swappable. During operation, service personnel can replace one of the power supplies without effecting the operation of the STS.

### **Power connections and terminals**

All input and output power connections are located at the bottom of STS. At the bottom of the STS separate panels let to the cables for easy installation.

### **Cooling**

The cooling fans ( 2 cooling fans) are installed on to the top side of STS ,so the STS can stand close to the wall.

### **Easy front Access to all components**

All components are installed onto the front side of STS. During servicing, there is no need to remove any side or rear panel of the STS.

### **Quick Access to static bypass switch**

User can perform static transfer from remote panel but this will take a long time to surf on menu functions. A separate static bypass switch is installed inside the STS and the priority of this switch is higher than the front panel controls. This means that, if the user uses the manual bypass switch, all panel bypass commands will be disabled.

### **Protections**

- Two input sources are connected to STS by MCCB's (S1 and S2)
- Suitable rating varistors protect the control circuits from high voltage transients.
- All power supply inputs are fuse protected

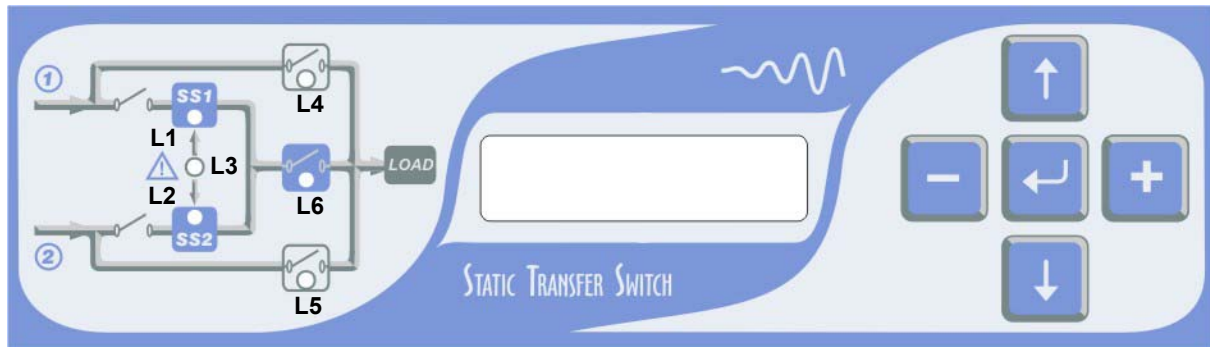
On SCR's heat-sink, there is a thermal contact to warn the user in case of excessive heat-sink temperature.

Protection shield prevents direct touch to live parts, inside the unit.

## INFORM STATIC SWITCH FRONT PANEL FUNCTIONS

### 5.1 Front panel

On the front panel of STS there are leds, control buttons and a two line alphanumeric LCD display. These components interact with each other during STS operation. Buttons change menus and submenus on LCD display. Leds show the switching position of the STS on a mimic diagram.



L1	Load on Source 1 indicator lamp
L2	Load on Source 2 indicator lamp
L3	Alarm indicator led
L4	Maintenance bypass on source 1 indicator lamp
L5	Maintenance bypass on source 2 indicator lamp
L6	Output switch on/off indicator lam
Up button	Moves menu item to 1 level up
Down button	Moves menu item to 1 level down
Enter button	Validates the adjusted data or OK confirmation
(+) button	Increases the current data
(-) button	Decreases the current data

### 5.2 MENU FUNCTIONS

The function of LCD panel is arranged as a 1 level menu structure. The main menu functions are as follows:

- a - STATUS MESSAGE
- b - MEASURES MENU
- c - COMMAND MENU
- d - ALARM MENU
- e - SETTINGS MENU
- f - TIME MENU
- g - CHANGE PASSWORD
- h - ADJUST MENU
- i - INFORMATION MENU

If the user presses up and down buttons, main menu items come to screen by the above order. In main menu the left and right buttons does not function.

## **Main menu function description:**

### **a) STATUS MESSAGE**

This message group gives a general status information to the user.

The possible messages are:

**ON PREFERRED** this message shows that the selected preferred source is switched directly to the output of STS (i.e. the load is on the preferred source)

**ON ALTERNATE** this message shows that the alternate source is switched directly to the output. The possible causes of this message are : preferred source is bad and load transferred to alternate source or transfer test is being performed.

**MANUAL TRANSFER** load is transferred to one of the input sources statically. This transfer can be performed from COMMAND MENU of LCD Panel or using the static transfer switch.

**MAINT.BYPASS S1** Load is connected directly to the Source 1 input (the maintenance switch1 is on)

**MAINT.BYPASS S2** Load is connected directly to the Source 2 input (the maintenance switch2 is on)

**OUTPUT INHIBIT** this message shows the voltage at the output of STS is shut down. Possible causes of this message are: Source1 and Source2 are bad, and there is no good source for transfer or non synchron transfer is disabled.

### **b) MEASURES MENU**

From this menu user can see all measured parameters on STS ,the submenu items are shown as follows by order of appearance.

**SP1:220 230 235V** This message shows Source1 input voltages, 3 numbers shows 3 phase voltages from line to neutral.

**SP2:220 230 235V** This message shows Source2 input voltages, 3 numbers shows 3 phase voltages from line to neutral.

**LD%:045 050 060%** This message shows the output load percentage of STS for each output phase. 100% is maximum capacity of STS. If the load is above 100% the STS gives overload message.

**OPI : 090 100 120A** : This message shows the output currents of STS for each of the three output phases.

**TEMPER : 030 C** This message shows the cabinet inside temperature of the STS.

**S1-FRQ : 50.1 Hz** This message shows the Source1 frequency

**S2-FRQ : 50.1 Hz** This message shows the Source2 frequency

**SYNC.ANG: 001 Deg** This message shows the phase difference between the two input sources in terms of angular degrees.

**PSP1=16.2 2=16.1** This message shows the two redundant DC power supply voltages of the STS.

### **c) COMMAND MENU**

From this menu user can give immediate commands to STS.

**S1=< AUTO >=S2** from this option user can XFER the load to S1 or S2 directly. The message means that:

Left button	XFERS the load to source1
Enter button	STS manages the XFER in automatic mode (normal operation)
Right button	XFERS the load to source2

Notes:

In case of maintenance bypass this function is disabled

In case of any alarm this function is disabled

In case of XFER switch activation this function is disabled

In case of disable **S1=< AUTO >=S2** message will be replaced with **STATIC XFER OFF**

**<ENTER>XFER TEST** from this menu user can perform XFER test. If the user presses “enter” button and if the load is on preferred source, load is transferred to alternate source, stays on alternate source for a preadjusted time (retransfer delay), and is transferred to preferred source again. Xfer test is disabled in the following cases:

If any alarm occurs

If manual XFER is active

If maintenance bypass is active

If test is disabled the **<ENTER>XFER TEST** message will be replaced by **TEST DISABLED**

**ENTR-INHIBIT RST** This message means that if the STS output is inhibited from any reason User can restart the STS by pressing the enter button.

**ENTER-SOUND ON/OFF** This message means that if the user presses enter button and if the audible alarm sounds ,alarm sound will be disabled. The next click will enable the sound alarm again.

**RELAY TEST:0** From this submenu 7 dry contact relay outputs can be tested by the user. If the user presses the left button the numbers will change from 7 to 0 ,if the user presses the right button the numbers will change from 0 to 7.

The following table gives the functions of the numbers:

<b>RELAY TEST:0</b>	Relay test disabled; relays will function normaly
<b>RELAY TEST:1</b>	Relay 1 is activated
<b>RELAY TEST:2</b>	Relay 2 is activated
<b>RELAY TEST:3</b>	Relay 3 is activated
<b>RELAY TEST:4</b>	Relay 4 is activated
<b>RELAY TEST:5</b>	Relay 5 is activated
<b>RELAY TEST:6</b>	Relay 6 is activated
<b>RELAY TEST:7</b>	Relay 7 is activated

Note: If the user exits from this menu, relay test will be disabled.

### **<ENTER>LAMP TEST**

User can check all front panel lamps by pressing enter button. All LEDs are lit for 2 seconds and return back to their normal functions again.

#### **d) ALARM MENU**

The most important function of the STS is alarm menu. There is a real time clock in the STS and it records all events by their date and time. And the user can see all previous events and alarms, by order.

**STS STATUS:** This menu shows the present alarm position of STS on the second line of LCD panel. All alarms will be shown on the second line by order of occurrence. Each alarm is displayed for 3 seconds and at the end of this time, if there is one more alarm it comes to screen for another 3 seconds.

**000>101003 10:30** This is the last recorded alarm on 10-10-2003 date, at 10:30 and the event number is 000.

The second line shows alarm or alarms by order which were recorded at that time.

If the user presses the left or right buttons, the event numbers will change from 000 to 063, 000 is the last event and the 063 is the first.

**ENTER CLEAR LOG:** If the user presses enter key during this message, STS will clear all recorded events from memory.

**S1 CODE: 000** This message shows the detailed alarm codes for Source1. The numbers are arranged as Bitmap and the meanings are as follows:

Code:0	No alarm on Source 1, Source normal
Code:1	Source1 L1 is out of tolerance
Code:2	Source1 L2 is out of tolerance
Code:4	Source1 L3 is out of tolerance
Code:8	Source1 black-out sense
Code:16	Source1 phase balance bad
Code:32	Source1 frequency is out of tolerance
Code:64	Source1 input switch is off

At some cases numbers can be shown as total (contains more than 1 alarm)

**S2 CODE: 000** This message shows the detailed alarm codes for Source2. The numbers are arranged as Bitmap and the meanings are as follows.

Code:0	No alarm on Source 2, source normal
Code:1	Source2 L1 is out of tolerance
Code:2	Source2 L2 is out of tolerance
Code:4	Source2 L3 is out of tolerance
Code:8	Source2 black-out sense
Code:16	Source2 phase balance bad
Code:32	Source2 frequency is out of tolerance
Code:64	Source2 input switch is off

At some cases numbers can be shown as total (contains more than 1 alarm)

## **e) SETTINGS MENU**

This menu contains user adjustable operating modes, options and parameters. These are as follows.

**PREFERED : SourceX** User can give priority to one of the input sources

OPTION	DESCRIPTION
Source1	Source1 has higher priority. STS tries to transfer to Source1 under normal operating conditions.
Source2	Source2 has higher priority. STS tries to transfer to Source2 under normal operating conditions.

Press (+ or -) keys for selection and press enter key to apply the new preferred source selection.

If the preferred source fails, STS transfers the load to the alternate source.

**RE-TRANSFER : On (or Off)**

OPTION	DESCRIPTION
On	Load goes to alternate and retransfers to preferred source after a delay
Off	Load stays permanently on alternate source after transfer from the preferred source

Press (+ or -) keys for selection and press enter key to apply the new selection

**RET-DELAY : 008sec** user can adjust re-transfer delay (how long the STS stays on alternate source). The range of applicable delay is 1-60 secs.

Press (+ or -) keys for adjustment and press enter key to apply the new value

**OVLOAD : ENABLE (OR DISABLE)** user can select the overload behavior of the STS.

OPTION	DESCRIPTION
DISABLE	Electronic Overload protection feature is disabled, STS continues to supply the load. The supply current is limited only by the input MCCB ratings.
ENABLE	Electronic Overload protection is enabled, i.e. STS continues to supply the load with a certain overload current for a certain period of time determined by the control software.

Press (+ or -) keys for selection and press enter key to apply new selection

**ALR.HOLD: 010 sec** user can adjust the alarm hold time from this submenu. The adjustment range is 5 to 60 seconds.

Press (+ or -) keys for adjustment and press enter key to apply the new value

**NSYNC.TR: (disable, delay, 0-curr)** User can select non synchronous transfer behavior of STS. The unit decides which kind of transfer protocol is applied when there is no synchronization between the two input sources, Source 1 and Source 2.

OPTION	DESCRIPTION
Disable	Transfer is disabled when there is no synchronization.
Delay	Non synchronous transfer is allowed only after a security delay. Delay time can be adjusted using the item "NSY.LONG" in the ADJUST MENU which will be described later.
0-curr.	If this mode is selected, during non-synchronous transfer, STS waits for the output currents to be zero and transfers to the alternate source.

Press (+ or -) keys for selection and press enter key to apply the new selection

**OVL.RESET: (AUTO or MANUAL)** This option determines overload reset type of the STS.

OPTION	DESCRIPTION
AUTO	If overload alarm occurs, STS shuts down the output voltage and at the end of alarm hold time begins to supply the load again.
MANUAL	If overload alarm occurs, STS shuts down the output voltage and stays in this position until the user resets the STS using the COMMAND MENU.

Press (+ or -) keys for selection and press enter key to apply the new selection

**INH.RESET:AUTO** This option determines the output inhibit reset type of STS

OPTION	DESCRIPTION
AUTO	If the STS shuts down the output voltage for any reason, at the end of alarm hold time it begins to supply the load again.
MANUAL	If the STS shuts down the output voltage, it stays in this position until the user resets the STS using the COMMAND MENU.

Press (+ or -) keys for selection and press enter key to apply the new selection

**REMOTE:ON** This option enables or disables the remote control of STS from its serial port.

OPTION	DESCRIPTION
ON	The control options of STS is enabled from serial port (Login requires)
OFF	The control options of STS is disabled from serial port (read only)

Press (+ or -) keys for selection and press enter key to apply the new selection

#### **f) TIME MENU**

From this menu user can see and set the time and date settings of RTC of the STS.

**TIME: 13:15** Current time of the RTC clock  
**DATE:10-01-2003** Current date of RTC clock  
**SET HOURS: 13** press left and right buttons to change the current hours  
**SET MINS: 15** press left and right buttons to change the current minutes  
**SET DAY: 10** press left and right buttons to change the current day of the month  
**SET MONTH: 01** press left and right buttons to change the current month of the year  
**SET YEAR:2003** press left and right buttons to change the current year  
**ENTER <UPDATE>** pres enter to update the last date and time settings on STS

#### **g) CHANGE PASSWORD**

The adjust menu and serial port remote commands require a password. This password can be typed using this menu. If the password is OK, **LOGGED ON** message will be shown on the second line of LCD panel. In the logged on position, user can stay for 3 minutes. After 3 minutes, user must type the password again.

The usage of this menu is as follows :

If the user is in **LOGGED OFF** position:

The main menu message will be "**PASSWORD INPUT**". Press enter button; the password input submenu comes to screen.

**PASSWORD:0000** left and right keys moves the blinking digit to either left or right. Use up and down keys to change the blinking number. After you typed all 4 numbers, press enter button. If the password is correct, menu returns to main menu and the LOGGED ON message will be shown on the second line of LCD Panel. If the password is incorrect, **INVALID >:EXIT** message will be shown. This means password is invalid and the right button is used to exit from this message.

If the user is in **LOGGED ON** position

If the user is logged on, this menu functions as password change menu. The main menu message will be **CHANGE PASSWORD**. Press enter button, the password input submenu comes to screen.

**NEW PASS:0000** left and right keys moves the blinking digit to either left or right. Use up and down keys to change the blinking number. After you typed all 4 numbers press enter button.

**ENTER:OK >:EXIT** this message means that if the user presses enter button the new password is valid from now on. The user can exit from this message by pressing the right button.

**In case of forgetting the password, connect the jumper JP1 on the main board and type a new password.**

#### h) ADJUST MENU

This menu is used for service purposes. This menu is available only if the password (which is a 4 digit number) is typed correctly, or by inserting the jumper J1 on the main control board of the STS. Please see the service manuals of STS for menu description.

#### i) INFORMATION MENU

This menu contains some useful information about the STS operation...

**RS232 receive: OK** this message shows that the STS is receiving the serial communication data from the PC. If a PC is connected to STS through its RS232 serial port, this menu helps the user about communication failures.

**VERSION:STA10** The firmware version of the STS control software.

## ALARM MESSAGES

Following table shows all the alarm messages which are used in STS and these messages will be recorded in events log.

<b>2. LINE MESSAGES</b> (these messages are shown on the second line of LCD panel)	
<b>SOURCE 1 BAD</b>	If input source 1 is out of tolerance this alarm occurs
<b>SOURCE 2 BAD</b>	If input source 2 is out of tolerance this alarm occurs
<b>SYNCHRON BAD</b>	Shows that 2 input sources are not synchronized
<b>OVERLOAD</b>	Output current of the STS is too high
<b>NONSYNC.INHIBIT</b>	Non synchron xfer is disabled by the user, output shutdowns
<b>TRANSFER INHIBIT</b>	During transfer the STS can not find a good source and the output shutdowns
<b>OVERTEMPERATURE</b>	SCR heat sink temperature is too high
<b>XFER TEST</b>	XFER test is performing
<b>DC PSP FAILURE 1</b>	Redundant power supply 1 is bad
<b>DC PSP FAILURE 2</b>	Redundant power supply 2 is bad
<b>OUTPUT BAD</b>	Alternance or phase loss at the output of the STS
<b>MAN.XFER TO S1</b>	Load is transferred to Source 1 by the user
<b>MAN.XFER TO S2</b>	Load is transferred to Source 2 by the user
<b>BYPASS TO S1</b>	Load is directly transferred to S1 by maintenance bypass
<b>BYPASS TO S2</b>	Load is directly transferred to S2 by maintenance bypass
<b>OUTPUT SW.OFF</b>	The output switch of the STS is off
<b>INP.SW 1 OFF</b>	The Source 1 input switch is off
<b>INP.SW 2 OFF</b>	The Source 2 input switch is off
<b>LOGGED ON</b>	User is logged on from panel or RS232 for adjustment
<b>EMERGENCY STOP</b>	External emergency stop signal is detected and the output shutdown
<b>ON SOURCE 1</b>	Load is on source 1
<b>ON SOURCE 2</b>	Load is on source 2
<b>STS RESET</b>	STS is started (power on)
<b>EMPTY LOG</b>	At this location there is no log record
<b>OUTPUT SHUTDOWN</b>	The output voltage of the STS is shutdown

**The following messages are not recorded to events log**

<b>STATUS MESSAGES</b> (these messages are shown on the first line of LCD panel)	
<b>ON PREFERRED</b>	Load is on preferred source
<b>ON ALTERNATE</b>	Load is on alternate source
<b>MANUAL TRANSFER</b>	Manual transfer is activated by the user
<b>MAINT-BYPASS S1</b>	Maintenance bypass switch is on S1 position
<b>MAINT-BYPASS S2</b>	Maintenance bypass switch is on S2 position
<b>OUTPUT INHIBIT</b>	The output of the STS is shutdown
<b>EMERGENCY STOP</b>	External emergency stop signal is detected and the output shutdown

## COMMUNICATION INTERFACE AND REMOTE MANAGEMENT

The following information contains standard communication interface for INFORM STS. Additional RS485 communication for long distance is available as an option.

Two types of communication interfaces are available

RS232	Serial communication
DRY CONTACTS	Dry contact outputs for some major events.

RS232 hardware:

Baud rate	2400 baud
connection	3 wire
flow	none
Stop bit	1
Command set	See serial communication features of STS

### DRY CONTACT INTERFACE

<b>Outputs</b>	
Relay1	Activates if the load is on alternate source
Relay2	Activates if Source2 is the preferred source
Relay3	Activates if the output is inhibited
Relay4	Activates if an alarm occurs
Relay5	Activates if a manual XFER or maintenance bypass occurs
Relay6	Activates if Source1 is bad
Relay7	Activates if Source2 is bad
<b>Inputs</b>	
Emergency stop	If the user presses the external emergency stop switch for more then 2 seconds STS shutdowns the output

### **Supported remote commands: (requires password)**

OUTPUT INHIBIT
MANUAL XFER TO S1
MANUAL XFER TO S2
CANCEL MANUAL XFER
LOGIN
LOGOUT
INHIBIT RESET (restart)
SOUND ON/OFF
ANY PARAMETER ADJUSTMENT

### **Supported remote monitoring commands: (Read only)**

Send All alarms to PC
Send synchron and phase balance information to PC
Send source voltages to PC
Send output loads to PC
Send log record to PC

## INFORM STATIC SWITCH TECHNICAL INFORMATION

<b>INPUT</b>	
Input voltage	150-250 volt AC 3 phase (3 phase +neutral)
Input Voltage analog error window	adjustable (ALVOLT LOW and ALVOLT HIGH screens in the ADJUST MENU)
Input voltage distortion	Less than 10%
Fast input voltage sense	available
Fast input voltage error window	adjustable (BLK-OUT screen in the ADJUST MENU)
Phase balance error sense	available
Phase balance error sense offset	adjustable (AL-BAL1 and AL-BAL2 screen in the ADJUST MENU)
Input frequency	50Hz or 60 Hz
Input frequency error window	Adjustable (FRQ-LOW and FRQ-HIG screens in the ADJUST MENU)

<b>OUTPUT</b>	
Output voltage	Same as input
Output frequency	Same as input
Rated current	50-100-200 amperes per phase and neutral according to models (STS350-STS3100-STS3200) respectively.
Load crest factor	Up to 3.5
Type of transfer	Break before make
Synchron Transfer time	max 2 msec (0 current mode prevent source interference)
Non synchron transfer time	max 10 msec in 0 current mode, 0-25 sec adjustable in delay mode and in 0 current mode.
Load PF range	0.6 lag to 0.9 lead

<b>PROGRAMMING</b>	
Transfer criteria	Synchron
	Non synchron with delay
	Non synchron 0 current: Transfers each phase on 0 current
synchron transfer delay programming	0-current transfers in max 2 milliseconds
Non synchronal transfer mode programming	Disable Delay and transfer Wait for zero current for each phase and transfer
Non synchron transfer delay programming	0-25 seconds adjustable from panel or RS232 (NSY.LONG screen in ADJUST MENU)
Synchronization check	digital: Calculation of angle between sources (SYNC.ANG in MEASURES MENU)
	Analog sense: Measuring voltage difference (SYN: in ADJUST MENU)
Programming of phase angle error	0-20 degrees adjustable from panel or RS232 (SYN ANGLE in ADJUST MENU) adjustable analog values from panel or RS232 (SYN HIG and SYN LOW in ADJUST MENU)
Programming of preferred source	Adjustable from panel or RS232

Programming of retransfer	ON : transfers to alternate source and retransfers to the preferred source OFF :transfers to alternate source and stay until it fails. Selectable from panel or RS232 (SETTINGS MENU)
Retransfer delay programming	1-60 seconds Adjustable from panel or RS232 (RET-DELAY in SETTINGS MENU)
Programming of alarm hold time	5-60 seconds adjustable from panel or RS232 (ALR.HOLD in SETTINGS MENU)
Fast zero input voltage sense programming	0.1-25 ms adjustable from panel and RS232 (BLK-OUT in ADJUST MENU) Maximum allowable black-out time
Overload inhibit programming (selectable from panel or RS232)	Disable : do not sense overload Enable: applies for different loads and for different times 100%-150% 1 minute 150%-200% 10 seconds >200%- 0,5 seconds 1000% 20 ms
Overload inhibit reset programming	Manual reset : reset from panel or RS232 manually Automatic reset : reset at the end of alarm hold time Selectable from panel or RS232
Inhibit reset programming	Manual reset: reset from panel or RS232 Automatic reset : reset if at least 1 source is good Selectable from panel or RS232

<b>DESCRIPTION</b>	
Transfer inhibit criteria	If both preferred and alternate sources fail.
Non synchron transfer inhibit	If the 2 sources are not synchronous to each other
Overload inhibit	If one of the 3 phase currents is higher than a software preset value
Retransfer permitted	Only if synchronized (waits until synchronization)

<b>INDICATORS AND CONTROLS</b>	
2 lines 16 character LCD alphanumeric display	1.line for parameters 2.line for alarms
Microprocessor	32 mips, fast
Control buttons	5 push buttons interactive with LCD panel
Manual transfer to S1	From panel or RS232
Manual transfer to S2	From panel or RS232
Cancel manual transfer	From panel or RS232
Transfer test	From panel or RS232
Manual inhibit reset	From panel or RS232
Sound on/off	From panel or RS232
Dry contact relay test	From panel or RS232
Lamp test	From panel
Logon by password	From panel or RS232
Alarm logs	64 recorded alarm logs from panel or RS232
Status indication leds	6 leds arranged in a mimic diagram
Manual transfer switch	Available
Mechanical bypass	Available for each input
Source input switch	Available for each input (thermal protected type)
External EPO input	Available

<b>MONITORED PARAMETERS</b>	
Source 1 voltages	230 220 215 V
Source 2 voltages	210 219 218 V
Output load	015 020 040 %
Output current	020 030 045 A
STS cabinet temperature	024 deg.
Source1 frequency	50.0 Hz
Source2 frequency	50.1 Hz
Phase angle	005 deg. (The phase difference between 2 sources in terms of angular degrees)
DC Power supply voltages	15.8 16.0 V (PS1 and PS2)

<b>USER SETTINGS</b>	
Preferred source selection	1 or 2 from panel or RS232
Retransfer mode	On/off from panel or RS232
Retransfer delay	1-60 seconds from panel or RS232
Alarm hold time	5-60 seconds from panel or RS232
Non synchron transfer mode	Disable Delay and transfer 0 current from panel or RS232
Overload inhibit	Disable Enable
Overload inhibit reset mode	Manual Automatic
Inhibit reset mode	Manual Automatic
Remote access	On : Control Access from RS232 ENABLED Off : Control Access from RS232 DISABLED

<b>COMMUNICATION INTERFACE</b>	
Emergency stop input	2 seconds delay NO input
Dry contact outputs	7 outputs available
Dry contact communication relays	Relay 1 : on alternate Relay 2 : preferred=source 2 Relay 3 : Transfer inhibit Relay 4 : Summary alarm Relay 5 : Bypass (mechanical or manual) Relay 6 : Source 1 bad Relay 7 : Source 2 bad
RS232 serial interface	Available ASCII characters
RS232 hardware	2400 baud 1 stop bit non parity 3 wired (RX,TX,common)
Monitoring and control software	Available on windows

<b>OTHER</b>	
Power supply	2 redundant power supplies, hot swappable 80-260 volt AC input
Cooling fan	2 cooling fans (redundant) (3 fans for STS 3200)
Neutral switch	optional
Input overload and short circuit protection	available
Output switch	available
Cabinet inside temperature sensor	available
Alarms list	Source1 or 2 BAD Synchron bad Overload Non synchron inhibit Output inhibit Overtemperature Output Bad Performing transfer test Manual xfer to S1 or S2 Bypass to S1 or S2 Output switch 1 or 2 off DC PSP failure 1 or 2 These messages will be shown on the second line of LCD panel time shared with status list.
Status list	Logged on Emergency stop On source 1 On source 2 STS reset Empty log These messages will be shown on the second line of LCD panel time shared with alarm list

<b>MECHANICAL CHARACTERISTICS</b>				
	STS 350	STS3100	STS3200	unit
Height	1420			mm
Width	575			mm
Depth	508			mm
Weight	110	115	125	kg
Ventilation	Forced air cooling by internal fans.			-
Cable Entry	From below or from top			-
Degree of Protection	IP20			-
Color	RAL7035			-

## **OPERATING THE INFORM STS**

**Starting with all the power switches, S1, S2, S3 and S4 in “OFF” and S6 in “AUTO” position.**

### **A) Switching On (Normal Operation) The STS From Off Position**

1. Ensure again that the Maintenance Bypass Switch (S4) is in “0” position and it is locked for safety.
2. Turn on input switches S1 and S2. The STS control circuits will be energized and will start functioning.
3. Select your “PREFERRED” source. (It is factory set to Source 1). You can change your selection using the SETTINGS MENU.
4. Check from the mimic diagram on the control panel, that the static switch of the preferred source is turned on (either SS1 or SS2).
5. Then turn on the output switch S3, to apply power to the load connected to the output of the STS.
6. See there is no alarm on LCD display.
7. STS unit is now ready to use.

### **B) Switching To Maintenance Bypass Position From Normal Operation**

1. Select the input source which is going to supply the load during maintenance, and turn the manual XFER switch S6 to this selected source (either Source 1 or Source 2)
2. Follow on the mimic diagram that the load is switched to the source selected by the manual XFER switch S6.
3. Then turn the Maintenance Bypass Switch (S4) to the selected source for maintenance. See the maintenance bypass message on the LCD panel.
4. Turn off the output switch S3. This switch disconnects the static transfer switches SS1 and SS2 from the STS output, but the load continues to work on maintenance bypass line.
5. Turn off the input switches S1 and S2.
6. Now, the unit is ready for maintenance.

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### **WARNING !!!**

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REMEMBER THAT, SERVICING AND MAINTENANCE MUST ONLY BE PERFORMED BY  
QUALIFIED AND AUTHORISED SERVICE PERSONNEL!

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### **C) Switching From Maintenance Bypass To Normal Operation**

1. Turn on input switches S1 and S2
2. Check that the manual XFER switch S6 is on the maintenance source side, and follow that the corresponding static switch (either SS1 or SS2) is turned on.
3. Turn on the output switch S3.
4. Change the position of the maintenance bypass switch S4 to “0”, lock it again.
5. Turn manual XFER switch to “AUTO” position.
6. See there is no alarm message on LCD display.
7. Unit is in normal operation mode again.

### **D) Switching Off The STS During Normal Operation**

1. Turn off all loads which are connected to STS output
2. Turn off the output switch S3
3. Turn off input switches S1 and S2
4. Check that the Maintenance Bypass Switch S4 is in “0” position
5. Unit is completely turned off.

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### **WARNING !!!**

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MAKE SURE THAT THE AC INPUT SUPPLY CABLES ARE DE-ENERGIZED IF THEY ARE GOING  
TO BE REMOVED FROM THE STS UNIT.

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## 1. CUSTOMER SERVICE

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### **WARNING !!!**

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There are no customer serviceable components inside. DO NOT open the cover or attempt to service the unit. Unauthorized service will void the warranty and could cause serious injury.

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#### **10.1 Maintenance**

The unit is designed for easy maintenance. Very little customer maintenance is required. The following will help to ensure trouble -free operation for many years:

1. Vacuum the dust from the ventilation intake on the front panel.
2. Wipe the cover with a damp cloth.

#### **10.2 Troubleshooting**

Due to the unique design, the unit can be serviced only by authorized people. In case of a persistent failure or problem properly turn off the unit first. Then review the following check list. Be prepared to answer the questions before calling the service.

1. Did you follow the operation procedure? Did it happen on installation?
2. Did a power failure occur just after or before the malfunction noted on the STS?
3. What is the indicators status? (see alarms)
4. Were any changes made recently to unit or the critical equipment connected to the unit?
5. Did an overload condition occur? Remove load from the unit and restart it.
6. Is the utility power phase sequence correct (were any changes phase sequence of the mains)?

#### **10.3 Storage**

1. Uninstalling operation of the unit should be performed by authorized service personnel.
2. Keep the equipment in a dry, cool place.  
Best storage temperature for the STS : Between 0°C and 50°C.

## ADJUSTMENTS

This menu is created for only service and adjustment purposes. The wrong usage of this menu can cause failures please do not change any parameter without consulting an authorized service personnel. There are 3 ways to access these parameters:

- type the password
- connect jumper 1 on the main controller board
- type the password from RS232

<b>ADJUST MENU</b>		<b>Default</b>
<b>S1-L1: 230 180</b>	(Source 1 L1 voltage and calibration multiplier)	175
<b>S1-L2: 230 180</b>	(Source 1 L2 voltage and calibration multiplier)	175
<b>S1-L3: 230 180</b>	(Source 1 L3 voltage and calibration multiplier)	175
<b>S2-L1: 230 180</b>	(Source 2 L1 voltage and calibration multiplier)	175
<b>S2-L2: 230 180</b>	(Source 2 L2 voltage and calibration multiplier)	175
<b>S2-L3: 230 180</b>	(Source 2 L3 voltage and calibration multiplier)	175
<b>PSP1: 160 185</b>	(PSP1 DC voltage and calibration multiplier)	180
<b>PSP2: 160 185</b>	(PSP2 DC voltage and calibration multiplier)	180
<b>LOAD1: 030 190</b>	(Load L1 and calibration multiplier)	200
<b>LOAD2: 030 190</b>	(Load L2 and calibration multiplier)	200
<b>LOAD3: 030 190</b>	(Load L3 and calibration multiplier)	200
<b>TEMP: 030 140</b>	(Temperature and calibration offset)(1 degree steps)	142
<b>AL-BAL1: 014</b>	Source 1 phase balance alarm level adjustment (0-255)	015
<b>AL-BAL2: 014</b>	Source 2 phase balance alarm level adjustment (0-255)	015
<b>SYN-HIG: 129</b>	Analog synchron upper limit alarm level adjustment (0-255)	135
<b>SYN-LOW: 114</b>	Analog synchron lower limit alarm level adjustment (0-255)	110
<b>SYN.ANGLE: 019</b>	Digital Synchron window adjustment (1 degree steps) 0-255	020
<b>ALVOLTLOW: 182</b>	Source voltage low alarm level adjustment (2 volts steps)	180
<b>ALVOLTHGH: 246</b>	Source voltage high alarm level adjustment (2 volts steps)	250
<b>BLK-OUT: 19</b>	Maximum allowable black-out adjustment(0.1 msecond steps) 0-255	020
<b>NSY.DEAD: 160</b>	Short non synchron dead time ( 0.1 milisecond steps ) 0-255	150 (Not valid)
<b>NSY-LONG: 30</b>	Long non synchron dead time ( 0.1 second steps )0-255	000
<b>FRQ-LOW./4: 112</b>	Source frequency low alarm (frequency-low/4 x0.1 hertz)	112
<b>FRQ-HIGH/4: 138</b>	Source frequency high alarm (frequency-high/4 x 0.1 hertz)	138
<b>SUPP.LOW: 120</b>	DC power supply bad alarm adjustment (0.1 volt steps) 0-255	100
Load factory settings		
<b>BALANCE: 006 007</b>	input source phase balance	See note 1
<b>SYN: 121 125 126</b>	input source phases analog synchron status	See note 2

### NOTE 1 :

**BALANCE: 006 007** This message shows the 3 phase balances of the two input sources. The first number is the phase balance of source1 and the second number is the phase balance of source2. These values are not voltages, these are measured ADC values.

### NOTE 2 :

**SYN: 121 125 126** This message shows the analog phase to phase differences of the two input source voltages. These values are not voltages, they are measured ADC values. User can define minimum and maximum alarm levels for these parameters. The value is centered to 120 (this means that if source1 and source2 L1 phases are equal, the first one of these three values will be 120)