



inform

**Operating and Installation
manual for**

STATIC TRANSFER SWITCH

IMPORTANT

This users manual contains setup, operation and maintenance information for STS1 Series Static Transfer Switch.

Before starting setup and operation of the equipment, complete users manual should be read carefully.

Before operation, the Static Transfer Switch should be prepared by an authorized technical personnel approved by Inform. The warranty will be void, if this direction is not followed.

Please contact Inform customer service, if you see any problem about any process described in this users manual.

The manufacturer reserves the right to change the design of the equipment without notice.

HIGH LEAKAGE CURRENT

Because of the high leakage current, this equipment should be operated only after it is earthed.

ELECTROMAGNETIC COMPABILITY

This equipment if compatable to EMC directive 89/336/EEC and to conditions in released technical specifications. The compability remains only if related directions are followed and only if the equipment is used with accessories approved by the manufacturer.

IMPORTANT

In custom designs, there can be minor differences between this manual and the equipment.

CAUTION

1. There are no user servicable parts inside.
2. Even after the equipment is disconnected from input and output connections, a intervention to the interior of the equipment contains risk of electric shock.
3. Ventilation holes should be kept open and no objects should be inserted.
4. In the environment where the equipment will be operated, the temperature and humidity should be relevant.
5. The equipment can not be operated in an environment having flammable and explosive devices.
6. Setup, maintenance and repair of the equipment should be performed only by trained, experienced and authorised technical personnel.
7. When working on live equipment a second person who is aware of all safety precautions and emergency actions should be present at all times.
8. It is the responsibility of each individual to be aware of national legislation, local legislation and site rules governing safety and working practices.
9. Use only good quality insulated tools and accessories, properly maintained and calibrated instruments, and suitable and adequate supports and lifting equipment.
10. Electrical energy can be supplied from the AC supply or the external alarm or auxiliary control terminals.

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1. GENERAL INTRODUCTION

1.1 SYSTEM DESCRIPTION

Static Transfer Switch is a single phase, two pole semiconductor power switch, which can switch between to synchronous AC sources without interrupting the output power less than $\frac{1}{4}$ cycle. Because it is fully static, it doesn't have any moving parts like fans and relays, and can transfer the power via thyristors.

1.2 OPERATION THEORY

The primary task of a Static Transfer switch is to continuously supply the output with uninterrupted energy, even when one of the feeding input sources fails. One source of the Static Transfer Switch is called as preferred source, where the other source is called as alternate. Supplying the output through the preferred source has the priority, it means, if both sources are available and within acceptable limits, preferred source will be chosen. If any problem is detected on the preferred source, the load is transferred to the alternate source within less than $\frac{1}{4}$ cycle. It is adjustable, which source is designated as preferred and which is alternate.

There should be no back-feed during the supply of the load, it means, in any transfer, sources should not be allowed to clash. Otherwise, it is possible that both sources will be unavailable. (example, shorting outputs of two independent operating UPS's)

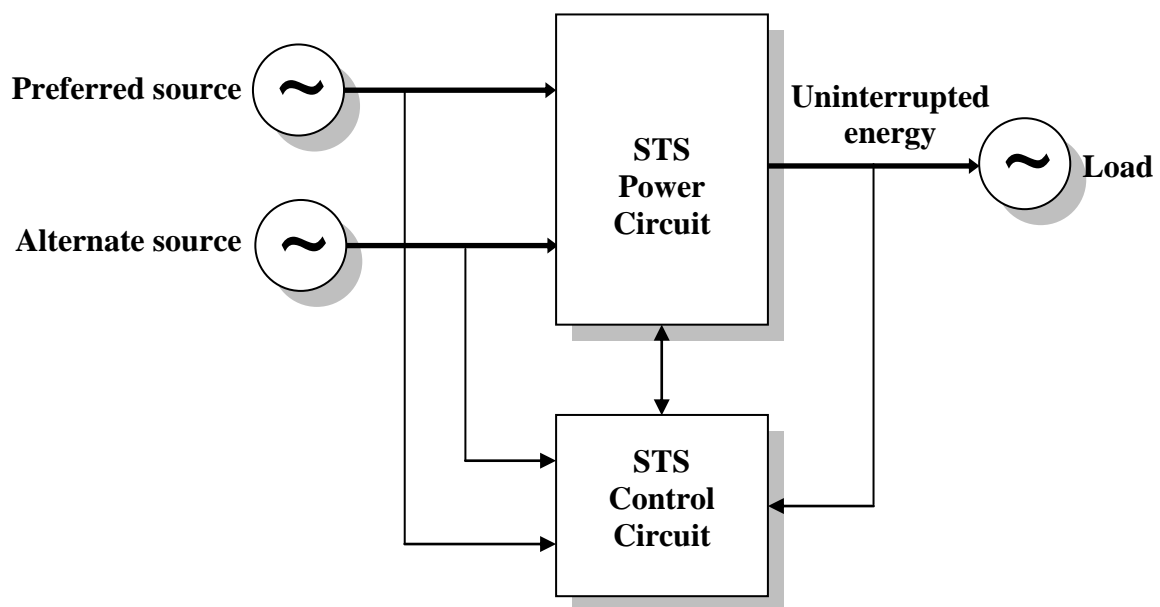


Figure 1-1 Static Transfer Switch Basic Block Diagram

Operation and transfer modes of the Static Transfer Switch can be summarised as follows :

Normal mode : During this mode, load is feeded through the preferred source.

Emergency transfer : When the preferred source voltage value falls beyond acceptable limits, the Static Transfer Switch switches the output to the alternate source within less than $\frac{1}{4}$ cycle. In emergency transfer, the synchronism of two sources are not observed, because the main and critical goal is not to interrupt the load energy. But even though, if sources are not in synchronism, special transfer and timing algorithms are used to avoid any damage to the load, sources and Static Transfer Switch itself.. After the emergency

transfer, a reverse transfer to the preferred source takes place, when the preferred source is again available and within acceptable limits. The retransfer itself (automatic or manual) and retransfer delay are adjustable..

Manual transfer : The chosen source is switched to the output, after the preferred source is changed by the user. If two sources are not in synchronism, (like case between utility and standby generator), the manual transfer is delayed unless sources are not in a synchronisation window.

Detail diagram of the Static Transfer Switch is given below.

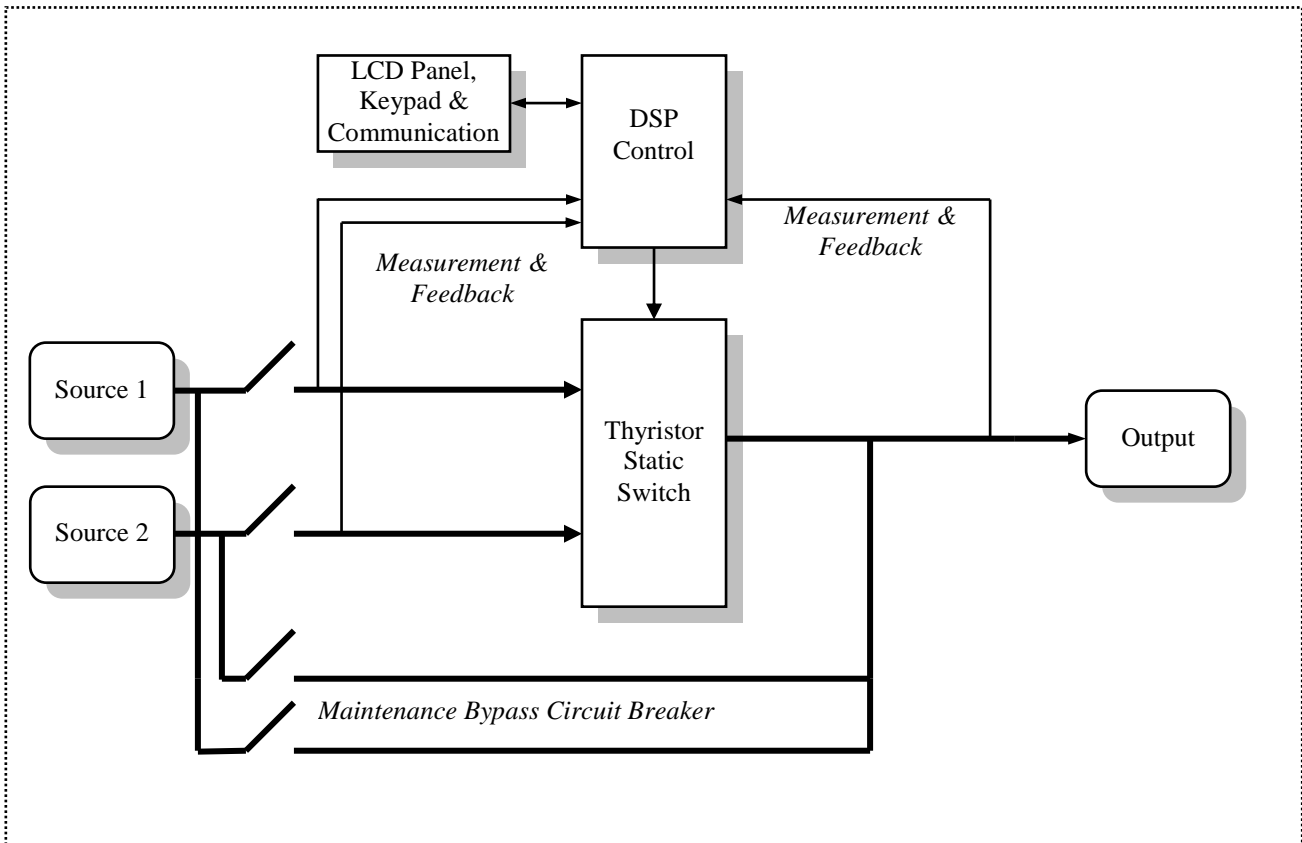


Figure 1-2 Static Transfer Switch detail diagram

1.3 GENERAL FEATURES

DISPLAYS & INDICATIONS		
LCD Displayed Values	Output Voltage Output Current Source1 Voltage Source2 Voltage Difference Voltage Active Source Operation Period	[V] [A] [V] [V] [V] [-] [hours]
Alarm & Warning Messages	Output Fail Source1 Fail (Fast and Slow) Source2 Fail (Fast and Slow) Alternate Source Active Retransfer Inhibit Over Current Sources Not Sync Thyristor Fail Over Temperature Memory Error Maintenance CB1 Closed Maintenance CB2 Closed	
Led Indications	Source1 OK / Fail Source2 OK / Fail Output OK / Fail Synchronisation Source1 Active Source2 Active Manual Bypass CB1 Closed Manual Bypass CB2 Closed Common Alarm	
COMMUNICATION and REMOTE MONITORING		
Serial Communication	Modbus Communication over RS232 Serial Port	
Dry Contact	1 Dry contact output dedicated for common alarm	
PHYSICAL FEATURES		
Dimensions – 50A	19 inch rack cabinet, Height : 2U, Depth : 360mm	
Dimensions – 100A	19 inch rack cabinet, Height : 4U, Depth : 360mm	
Weight – 50A	9 kg	
Weight – 100A	17 kg	
Operation Temperature	-0°C to + 40°C	
Storage Temperature	-20°C to + 50°C	
Relative Humidity	%0 - %90 (non condensing)	
Operation Altitude	2000 meter maximum	
ELECTRICAL FEATURES		
Source Voltages	110V / 120V / 220V / 230V / 240V	
Output Voltage	110V / 120V / 220V / 230V / 240V	
Current	50A / 100A	
Frequency	50 / 60 Hz ± %10	
Power Factor	0.7 to 1.0 (leading or lagging)	
Acceptable Source Voltage Distortion	10 % Maximum	
Crest Factor	3 : 1	
Transfer Time	< 5ms @ 50 Hz	
Efficiency	> %98	
Overload Capability	150 % continuous	

2. SETUP

2.1 OPENING PACKAGE

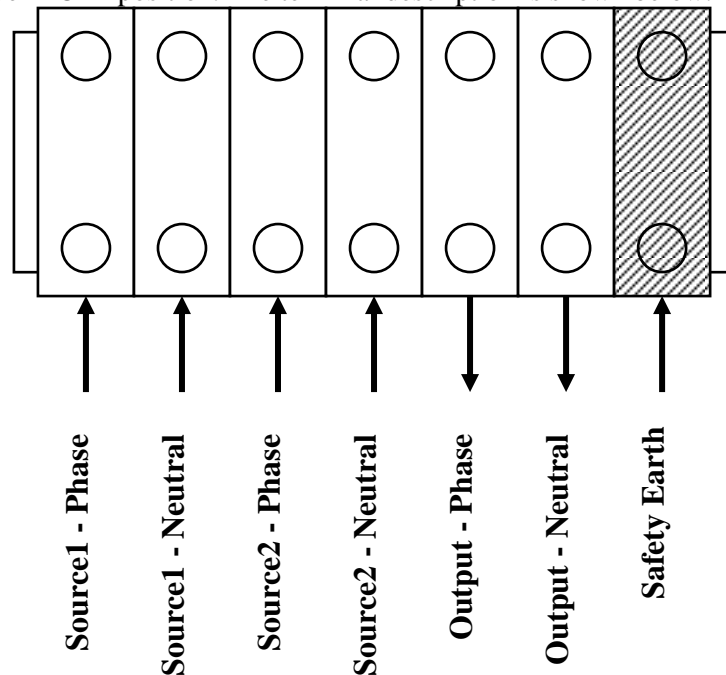
When the equipment is delivered to you, first to be examined is a possible damage during transport. Therefore, examine the equipment carefully.

2.2 CHOOSING PROPER PLACE

1. Place you equipment to your rack cabinet and tighten it to your rack cabinet via screws placed at the front plate.
2. Choose a place with proper temperature and humidity.
3. Do not choose any place which can cause dust and corrosion.
4. The place chosen should not have direct sunshine and shouldnt be near any heating source.
5. Operating the equipment in proper conditions will increase it lifetime.

2.3 ELECTRICAL CONNECTION

All electrical connections of the Static Transfer Switch are placed on the rear of the equipment. All required connections to connection panel of Static Transfer Switch should be made by Inform service personnel or by the approval of Inform service personnel. Before making the connections all power switches, isolators and circuit breakers must be in OFF position. The terminal description is shown below.



CAUTION

Connect and control ground (PE) connection. Definitely, the equipment should not be operated without ground connection.

CAUTION

Source1, Source2 and Output neutrals are shorted inside the equipment. This equipment does NOT switch the neutral connection.

3. OPERATION

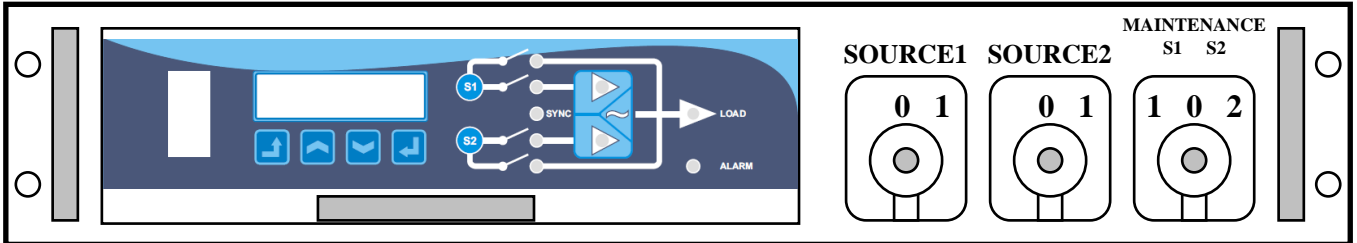
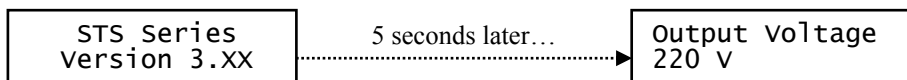


Figure 3-1 Static Transfer Switch front view

3.1 OPERATING WHEN BOTH SOURCES ARE AVAILABLE

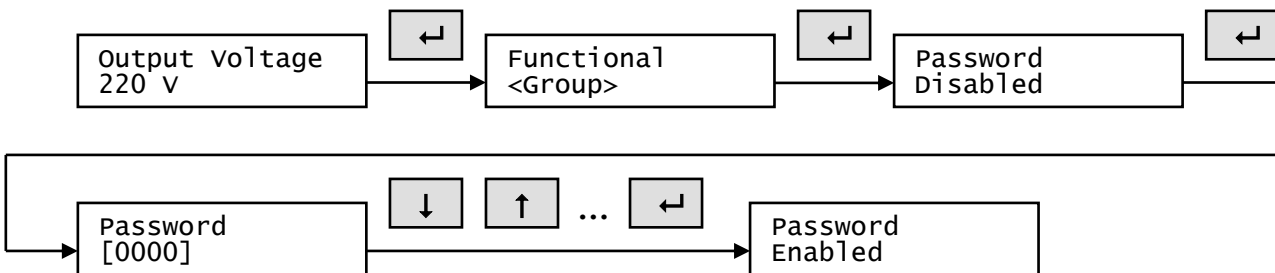
1. Switch SOURCE1 and SOURCE2 circuit breakers into 1 position.
2. Front panel and leds will be energized and the following welcome message will be displayed on the LCD screen.



3. Within 10 seconds, the source designated as preferred will be switched to the output, if the source designated as preferred source is available. If the preferred source is not available, but the alternate source is, the alternate source will be switched to the output.

3.2 CHANGING THE PREFERRED SOURCE (MANUAL TRANSFER)

1. The correct password should be entered to the Password domain inside the Functional submenu, before changing to preferred source setting. Following steps should be performed to enter the password :



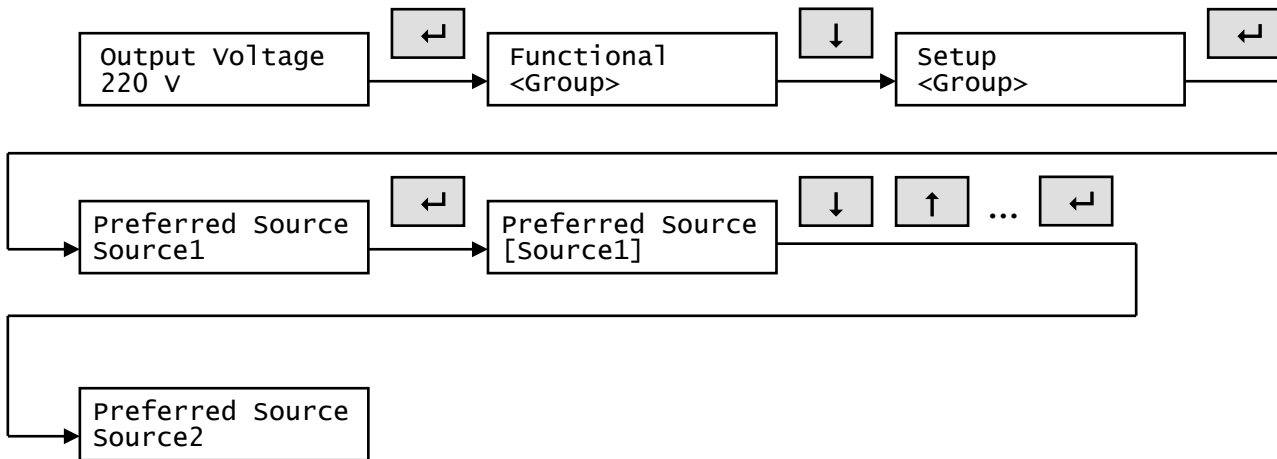
NOTE

Default (factory setting) password is 0000.

NOTE

A lock symbol in main screen on LCD display is displayed, when password is locked. (prevents unauthorised access). Lock symbol disappears after correct password is entered.

- Preferred source setting is placed inside the Setup submenu under the Main menu. Following steps should be performed to modify the preferred source setting :



The new preferred source will be switched to output, after the setting is modified.

3.3 SWITCHING THE DEVICE TO MAINTENANCE BYPASS WHEN THE LOAD IS POWERED

- Switch the maintenance bypass circuit breaker into desired source position, when the device is in operation.
- The device will display the maintenance bypass message and continue to feed output both through the chosen sources thyristor switches and maintenance bypass circuit breaker.
- Source1 and / or Source2 circuit breaker may be switched off, if desired.

3.4 SWITCHING THE DEVICE TO MAINTENANCE BYPASS, WHEN THE LOAD IS NOT POWERED

- Switch the maintenance bypass circuit breaker into desired source position.
- The device will power the load through the maintenance bypass circuit breaker.

CAUTION

The load is not protected against power failures, when maintenance bypass switch is position 1 or position 2.

CAUTION

If one source will be de-energized for an extended period (hours or days), set the unit to maintenance bypass mode for the remaining source. Without using bypass, if a failure occurs in the switch components for remaining source, the static transfer switch does not have a second source to switch to and the load would not receive power.

4. FRONT PANEL

4.1 STRUCTURE OF FRONT PANEL

The front panel of the Static Transfer Switch contains a 2x16 character LCD (Liquid Crystal Display), keypad and leds. Via LCD, measurements and status / alarm messages are displayed in a format, which can be easily understood. Parts in front panel and their functions are given below.

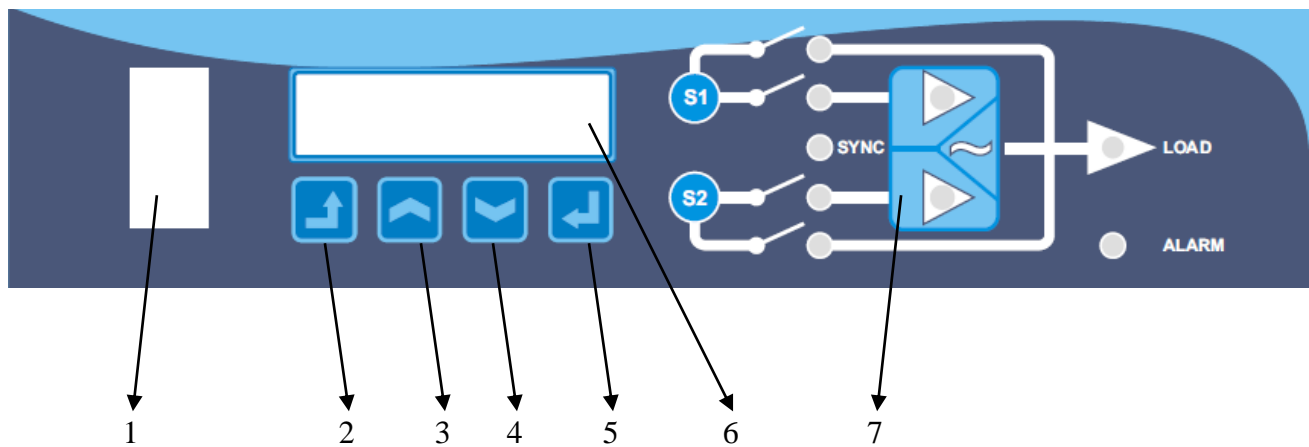


Figure 4-1 Static Transfer Switch Front Panel

1	RS232 Port	This port allows the equipment to communicate to PC via RS232 communication.
2	Esc Button	This button is used to get back from a submenu or to escape from adjustment without validating.
3	Up Button	In menus, this button is used to see the previous item (up). In adjustments, this button is used to increase the adjusted quantity.
4	Down Button	In menus, this button is used to see the next item (down). In adjustments, this button is used to decrease the adjusted quantity.
5	Enter Button	This button is used to enter a submenu or to validate a setting performed.
6	LCD Display	Measured values, status and alarm messages of the equipment are displayed in this 2x16 character LCD display.
7	Led Displays	These leds provide instantaneous information about the status of the equipment.

4.2 MEASUREMENTS MENU

LCD display remains in MEASUREMENTS MENU, after the STS has started its operation. UP and DOWN buttons can be used to move ahead this menu. Measured values of the STS are displayed on the LCD display.

Item		Description
Output Voltage	[V]	Output voltage value (RMS)
Output Current	[A]	Output current value (RMS)
Source1 Voltage	[V]	Source1 voltage value (RMS)
Source2 Voltage	[V]	Source2 voltage value (RMS)
Difference Voltage	[V]	Difference voltage between Source1 and Source2 (RMS)
Active Source	[-]	Current active source switched to output
Operation Period	[hours]	Operation period since the production of the unit. This value is resetted, when the device is switched off and again switched on.

There is password protection to avoid unauthorised access to system parameters. A LOCK sign is displayed on the right bottom of the LCD display, when the password is active (prevents unauthorised Access)

Alarm and warning messages are displayed timely on the LCD display. Audible alarm is also provided at the mean time. Possible alarm and warning messages are listed below.

Message	Message Description
OUTPUT FAIL	Output voltage is out of acceptable limits.
SOURCE1 FAIL (F)	The instantaneous value of source 1 voltage (fast measurement) if out of acceptable limits.
SOURCE2 FAIL (F)	The instantaneous value of source 2 voltage (fast measurement) if out of acceptable limits.
SOURCE1 FAIL (S)	The RMS value of source 1 voltage (slow measurement) if out of acceptable limits.
SOURCE2 FAIL (S)	The RMS value of source 1 voltage (slow measurement) if out of acceptable limits.
ALTERNATE SOURCE ACTIVE	The source set as alternate source is active and switched to output.
RETRANSFER INHIBIT	Reverse transfer from the alternate source to preferred source is disabled. In this case, after any emergency transfer, the equipment will NOT automatically transfer from alternate source to preferred source, even when the preferred source is recovered.
OVERCURRENT	The output current is above the equipment limits.
SOURCES NOT SYNC	There is a voltage difference between source1 and source2, above the limits and sources are not considered in synchronism.
THYRISTOR FAIL	Any of the static thyristor switches is failed.
OVER TEMPERATURE	The temperature of the thyristor switch heatsink is above the considered limits.
MEMORY ERROR	Indicates, that the DSP control unit can not load the saved parameters properly. In this case, the system will return to factory set values.
MAINT CB1 CLOSED	Indicates that maintenance bypass circuit breaker is switched to source1 position.
MAINT CB2 CLOSED	Indicates that maintenance bypass circuit breaker is switched to source2 position.

4.3 CONTROL ve SETTING MENUS

Adjustable items inside the control and setting menus are described below.

Functional

Password

This item is the password required to modify other adjustable parameters. The equipment is shipped with default password 0000.

New Password

After the correct password is entered, the password can be modified using this item.

Language

Defines the language selection for front panel. Front panel language can be chosen as English or Turkish. Default language after factory test is English.

Serial Link

This setting is used to select, which application will occupy the serial link of the Static Transfer Switch. FreeMaster communication for factory settings or Modbus communication for user purposes can be chosen.

Modbus

This submenu contains items to setup the Modbus communication.

Comm. Mode

Baud Rate

Slave No

Parity

Permission

Audible Alarm

This setting is used to enable or disable audible alarm in an alarm condition. In environments like hospitals, disabling the audible alarm is preferred.

Setup

Preferred Source

Determines the preferred source switched to the output. The control logic will choose this source to switch to the output, when both sources are available. The unchosen source acts as alternate source and will be switched to output only in emergency transfer.

Auto Retransfer

This setting enables / disables auto retransfer back to the preferred source, when preferred source is recovered after any emergency transfer.

Retransfer Delay

This setting determines the delay for the auto retransfer back to the preferred source, after when preferred source is recovered after any emergency transfer.

Low Voltage Limit

Acceptable low voltage limit value for sources and output. If the voltage value of a source is below this value, it will be supposed as fail.

High Voltage Limit

Acceptable high voltage limit value for sources and output. If the voltage value of a source is above this value, it will be supposed as fail.

Synch. Voltage

This setting determines the upper limit of voltage difference between sources to be assumed as synchronous. If the voltage difference between two sources are above this value, the control logic considers that sources are not synchronous. Manual transfer is inhibited when sources are not synchronous.

Peak Current Limit

Static Transfer Switch monitors the load current and if the load current exceeds an adjustable preset level deemed to represent a load inrush or fault condition, emergency transfer is disabled even if the voltage on the selected source exceeds the transfer limits. This setting enables / disables this mechanism.

Frequency Pulse Tune

When the setup is needed, the STS broadcasts a frequency pulse at the nominal frequency, to synchronise the independent and free running upstream devices to avoid alarm regarding that the sources are not sync. This way, upstream sources are synchronised to this frequency pulse and hence to each other. This setting is used to tune the frequency of the distributed pulse.

Calibration

This menu block allows the user to fine tune the measured values of the static transfer switch, without any intervention to the electronic hardware of the equipment. Using this menu only by authorized personnel is recommended.

About

Items in this submenu shows software versions and nominal values of the device.

DSP Version

DSP software version.

uC Version

Microcontroller software version.

V Nominal (V)

Nominal voltage (nameplate value) of the device.

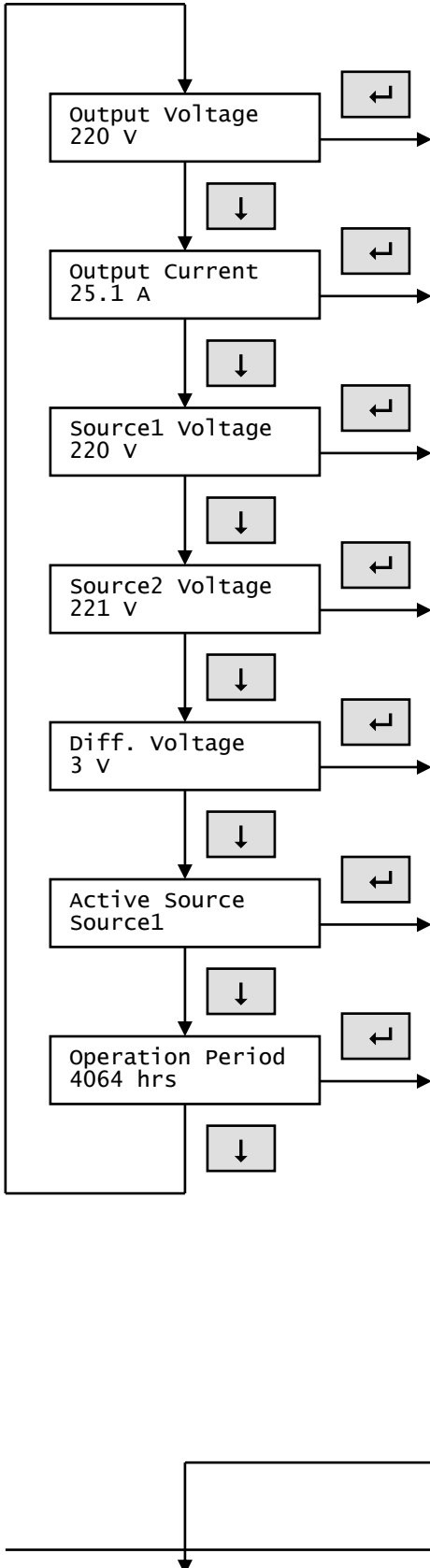
I Nominal (A)

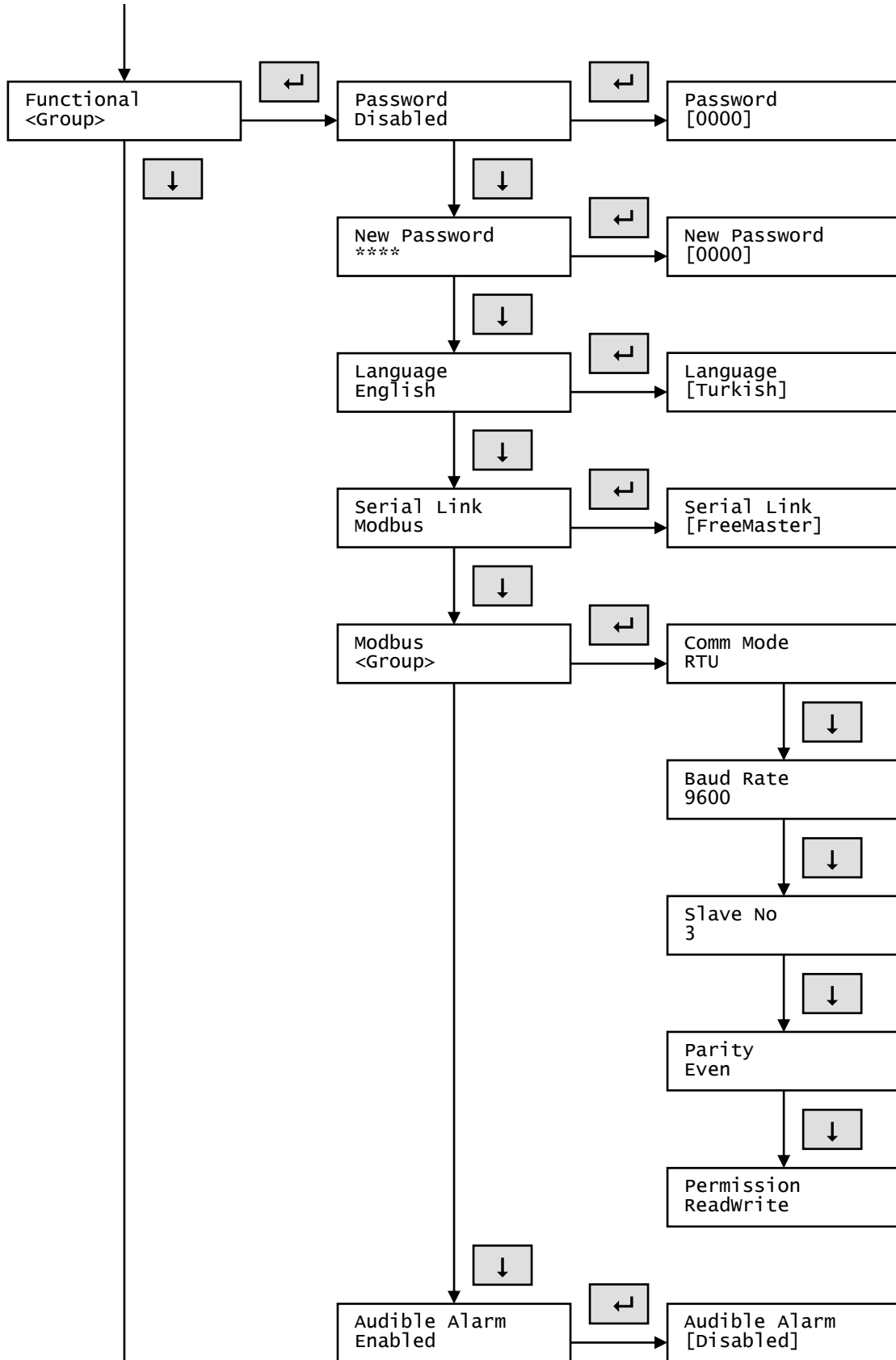
Nominal current (nameplate value) of the device.

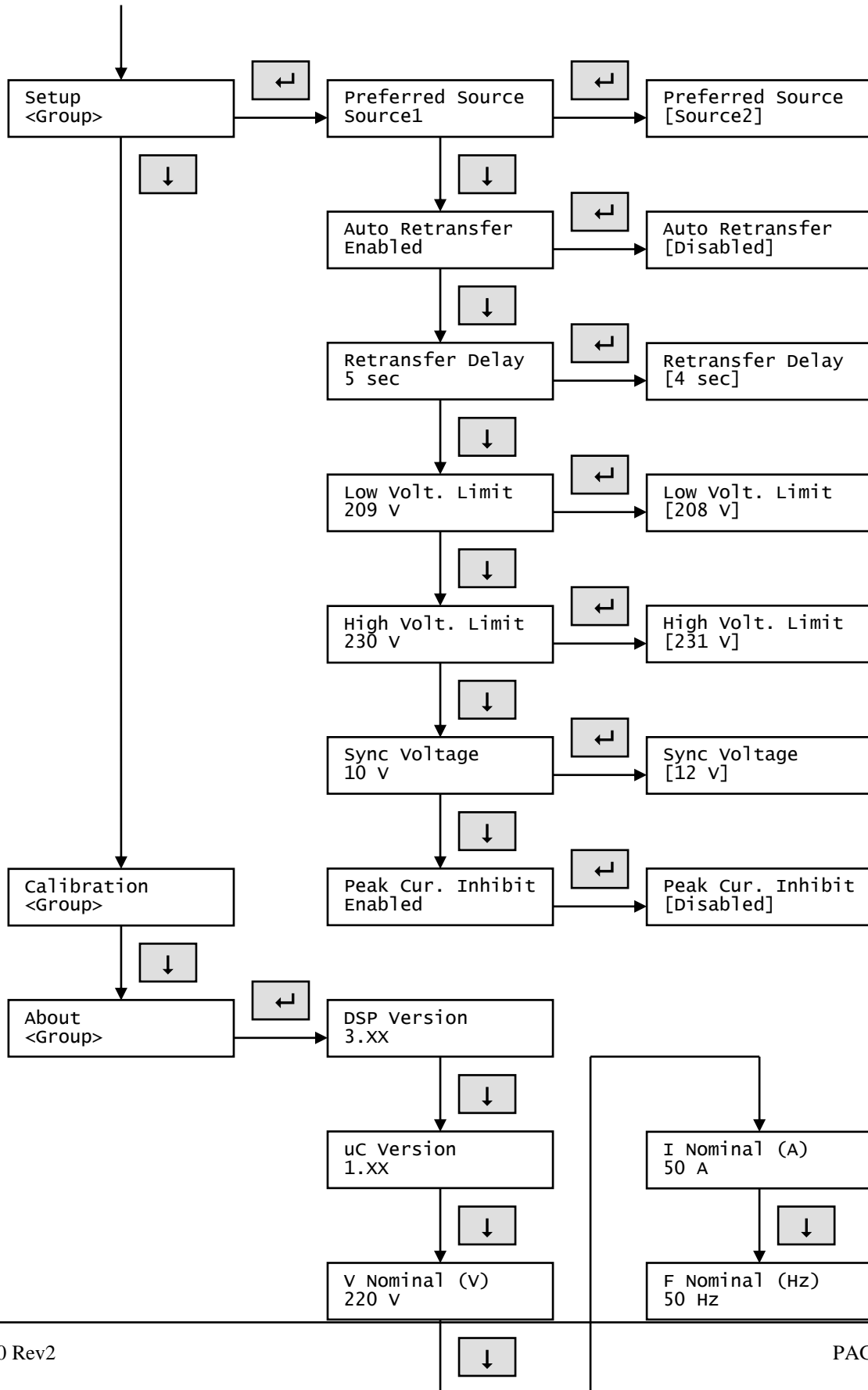
f Nominal (Hz)

Nominal frequency (nameplate value) of the device.

4.4 MENU TREE







5. ADDITIONAL FEAFURES

5.1 DRY CONTACT OUTPUT

Static Transfer Switch provides 1 dry contact dedicated to common alarm status. Dry contact remain energized, when common alarm condition is not occurred. When any common alarm is detected, dry contact is releases and switches to unenergized state. Dry contact output is provided to the user in four pole connector at the rear of the Static Transfer Switch.

NOTE

Maximum 220Vac or 24Vdc voltage should be applied to dry contacts. Dry contacts are for signaling purposes and can carry maximum 0.5A current.

5.2 RS232 COMMUNICATION

This feature provides Modbus communication over RS232 connection, for remote control and monitoring.

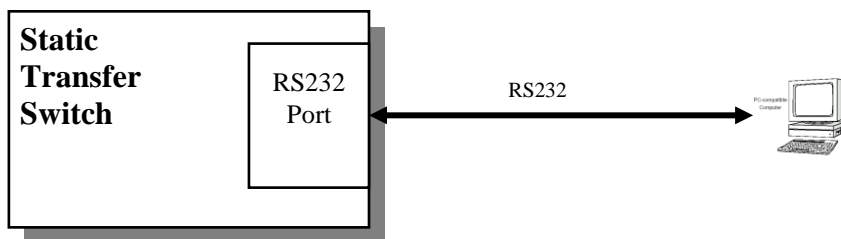


Figure 5-1 Static Transfer Switch / PC Connection

For RS232 communication, 9 pin female DSUB connector on the front panel of the Static Transfer Switch. Pin connections of the necessary cable for STS connection is given in the table below :

STS side cable (DSUB9 Male)		PC side cable (DSUB9 Female)	
Pin No	Function	Pin No	Function
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND

NOTE

Contact Inform for Modbus addresses.

6. SERVICE AND MAINTENANCE

CAUTION

There are no by the user servicable parts inside the equipment, therefore DO NOT OPEN THE COVER OF THE EQUIPMENT. Because of possible input and output connection and dry contact relay outputs, THERE MAY BE HIGH VOLTAGE INSIDE THE EQUIPMENT, EVEN WHEN THE STS IS TURNED OFF. Do not permit unauthorized persons to intervent any failure, otherwise, the warranty will be void and moreover, significant injury may occur.

Under normal operating conditions only preventative maintenance is required. The intervals between maintenance actions will vary according to the level of remote monitoring and the standard of cleanliness of the equipment room.

6.1 PERIODICAL MAINTENANCE

The Static Transfer Switch equipment is designed for a very minor maintenance requirement. It does not contain moving parts like fans and relays. Only fulfil conditions described below.

1. Clear the dust piled up in ventilation holes of the equipment.
2. You may clean the cover of the equipment with a moist cloth.
3. Record all abnormal occurrences in the service log
4. Visually check electrical connections and component for signs of overheating or corrosion. Rectify as necessary.

6.2 FAILURES

As mentioned before, only authorized personnel may perform maintenance of the equipment. In any abnormal situation, before calling service, check the points described below.

6.3 BEFORE CALLING SERVICE

1. Did you read the users manual carefully and followed all directions written ?
2. Is there energy in the distribution panel, to which the Static Transfer Switch is connected ?
3. Is any of the alarm leds on the front panel active ?
4. Is there a recent change in the load connected to the Static Transfer Switch ?
5. Was there an overload condition ?