infoSTS

Static Transfer Switch

50 – 100 – 150 – 200 – 300 – 400A

USER MANUAL

inform

CONTENTS

InfoSTS

Thank you for choosing *InfoSTS* as your equipment protector.
It includes many features to protect your critical equipments.

Power ranges according to models

4 pole model	3 pole model	Output current per phase
STS450	STS350	50 amperes
STS4100	STS3100	100 amperes
STS4150	STS3150	150 amperes
STS4200	STS3200	200 amperes
STS4300	STS3300	300 amperes
STS4400	STS3400	400 amperes

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 main functions of the STS unit 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
- 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.

DESCRIPTION OF THE FUNCTIONS OF THE InfoSTS

InfoSTS 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 (six pairs for 6 pole models ,eight pairs for 4 pole models) . Three or four 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 (of four) 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 behavior of STS, alarm hold time, nonsynchronized 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.

Basic Features:

- Easy monitoring all parameters on LCD display
- Fast microcontroller (32 mips)
- Advanced RS232 communication features ,optional TCP/IP connection
- 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 and phase sequence fault detect circuit
- Output alternance balance sense circuit
- Adjustable Input source frequency lower/upper limits
- Additional analog synchronous sense circuit

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.

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, it 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.

Cooling

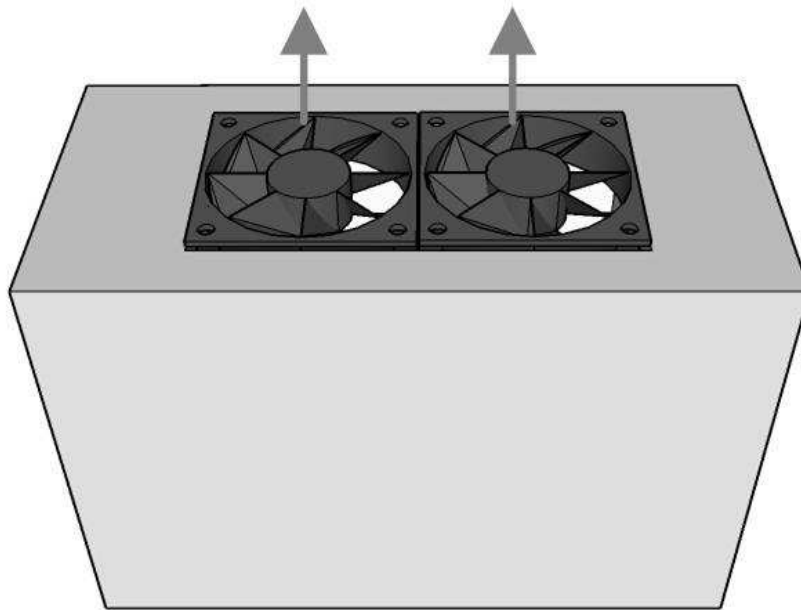The cooling fans (2 cooling fans) are installed on to the top side of STS .

Figure – 1   *Cooling outlets of the STS*
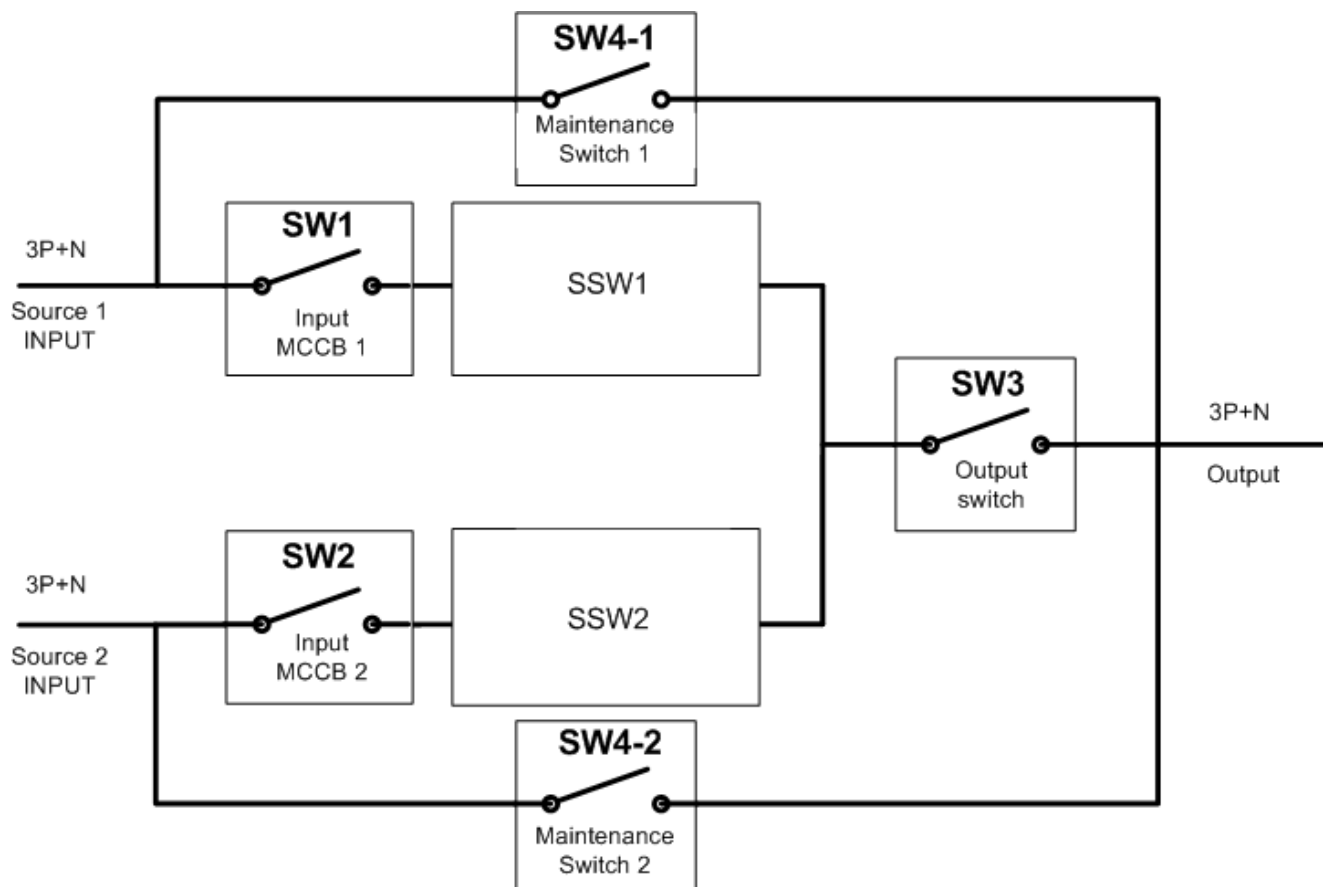
BLOCK DIAGRAM OF THE STS

Figure – 2   *STS Block diagram*

S1	Source 1 input circuit breaker (MCCB)	This switch is thermal and magnetic protected type and shutdowns source 1 input
S2	Source 2 input circuit breaker (MCCB)	This switch is thermal and magnetic protected type and shutdowns source 1 input
S4-1	Mechanical bypass switch to source 1	During maintenance these contacts connect Source 1 input to STS output directly
S4-2	Mechanical bypass switch to source 2	During maintenance these contacts connect Source 2 input to STS output directly
S3	Output switch	This switch shutdowns the output voltage of STS . During maintenance the position of this switch must be OFF.
SS1	Static transfer SCR circuit to source 1	This static switch contains SCRS and snubber components and driven by a driver circuit which is controlled by the microprocessor.
SS2	Static transfer SCR circuit to source 2	This static switch contains SCRS and snubber components and driven by a driver circuit which is controlled by the microprocessor.

NOTE   :   Figure 2 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.

MANUAL TRANSFER SWITCH

Manual transfer switch is located on back front panel and user transfers the load to input source1 or source2 rapidly. During normal operation this switch must be at **AUTO** position.

Figure – 3   *Manuel transfer switch location*

SAFETY WARNINGS

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.

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.   - Adequate protection against input over currents must be provided, considering the nominal current rating of the STS.   - 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.   - The unit have two power inputs ,if one of the supplies is connected risk of electric shock is valid.   - 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

WARNING !!!
Since it is a high voltage equipment, INFOSTS 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.**   *InfoSTS* **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 PERSONNAL MUST INSULATE THE STS (BY TURNING OF ITS INPUT SWITCHES S1 AND S2) BEFORE WORKING ON THESE EQUIPMENT.**

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 .**

FRONT VIEWS OF THE STS

Interior front view

S6
Manual
transfer
Switch

Dry contact outputs

EPO Input

RS232
Port

S3
Output
Switch

S1
Source 1
I/P SW

S2
Source 2
I/P SW

S4
Maintenance
Bypass
SW

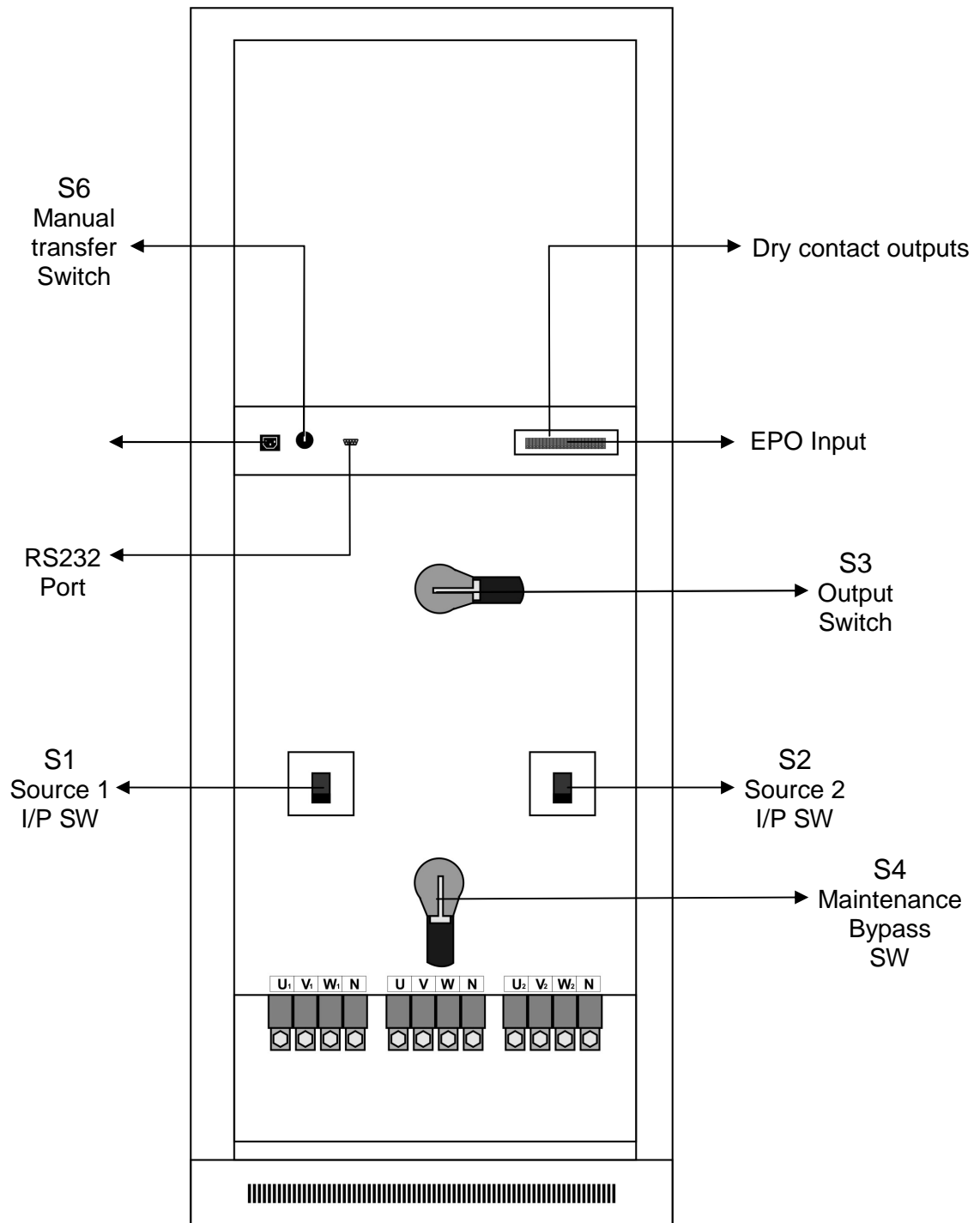| U₁ | V₁ | W₁ | N | U | V | W | N | U₂ | V₂ | W₂ | N |

figure - 4

VIEW OF THE CONTROL 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.
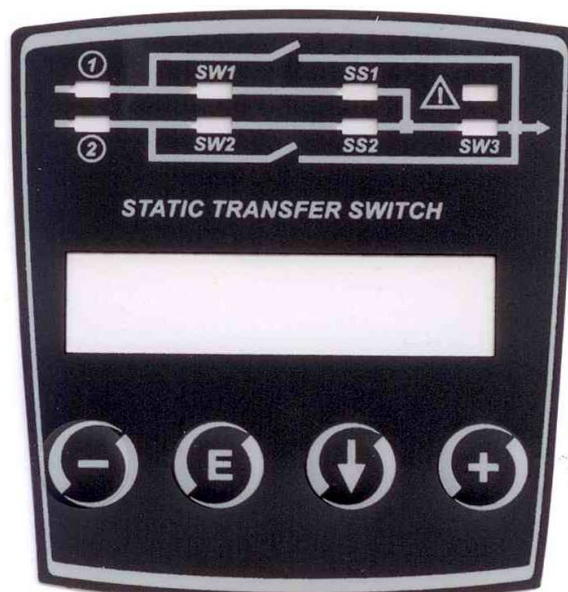

figure – 5   *STS front panel*

1	Source 1 priority lamp	**On : source 1 is preferred source**
		Off : source 1 is alternate source
2	Source 2 priority lamp	**On : source 2 is preferred source**
		Off : source 2 is alternate source
SW1	Source 1 input monitor lamp	**On: source 1 input is OK**
		Off : source 1 input failed
SW2	Source 2 input monitor lamp	**On: source 2 input is OK**
		Off : source 2 input failed
SS1	Source 1 static switch on lamp S1 static switch on	**On: SS1 SCR group fired**
		Off : SS1 SCR group open
SS2	Source 2 static switch on lamp S6 static switch on	**On: SS2 SCR group fired**
		Off : SS2 SCR group open
SW3	Output monitor lamp	**On : output normal**
		Off : output switch off
		Flash : output voltage inhibit
⚠	Alarm monitoring lamp	**Flash : previously an alarm occurred**
		Off : there is no alarm on STS
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	

INSTALLATION

ALL THE OPERATIONS DESCRIBED IN THIS SECTION MUST BE CARRIED OUT EXCLUSIVELY BY QUALIFIED STAFF.
The company may no be held liable for any damage caused by incorrect connections or by operations that are not described in this manual.

STORAGE OF THE STS

The storage area must have the following characteristics
Temperature : -10 to +50 C
Relative humidity : 95% max.

PREPARATION FOR INSTALLATION

PRELIMINARY INFORMATION

Model	STS450	STS4100	STS4150	STS4200	STS4300	STS4400
Nominal current	50	100	150	200	300	400
Operating temperature	0 – 40 C					
Non operating temper.	-10 to + 50 C					
Max. relative humidity	90% (non-condensing) during operation					
Max. installation height	1000 m at nominal current rating					
Dimensions WxDxH	685x530x1500 mm			685x580x1770 mm		
Weight	175 Kg			205 Kg	220 Kg	240 Kg
Protection level	IP20					
Cable input	From base / on front					
Communication	RS232 standard - TCP/IP option					
Flying transfer	Available - Standard					
LCD panel and mimic	Available - Standard					
Backfeed protection	Available - Standard					
Software management	Available - Standard					
DRY contact outputs	Available - Standard					
EPO input	Available – Standard (NO)					

<X> letter on table shows 3 pole or 4 pole model options (3 = 3 pole , 4 = 4 pole)

ELECTROMAGNETIC COMPATIBILITY

This static transfer switch (STS) conforms to the class C2 specifications (in accordance with the provisions laid down by the EN62040-2 standard: STS – EMC requirement). In the home environment ,it may cause radio interference. The user may have to take supplementary measures.
This product is designed for professional use in industrial and commercial environments . Connections to the RS232 connectors should be made with the cables provided or ,in any case, with shielded cables less than 3 meters long.

INSTALLATION ENVIRONMENT

When choosing the site in which to install the STS , the following points should be taken into consideration :
* Avoid dusty environments
* Check that the floor is level and capable of withstanding the weight of the STS
* Avoid cramped environments that could impede the normal maintenance activities
* The relative humidity should not exceed 90%, non-condensing.
* Check that the ambient temperature, with the STS running, remains between 0 and 40 C
* Avoid installing the equipment in places exposed to the direct sunlight and hot air.

REMOVING THE STS FROM PALLET

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.
Retain the carton and packing material for possible future use

PRELIMINARY CHECK OF CONTENTS

Having opened the package ,start by checking the contents
-User manual
-serial RS232 connection cable
-STS control software and user manual CD
-Guarantee document

INSTALLING THE STS

When installing the equipment the following points should be considered:

- The air outlets of the STS is on the top ,cause of this do not prevent air ventilation from the top side.
- No objects should be left on its top surface
- Sufficient space should be left in front of the equipment for it to be turned on/off and maintenance operations to be performed on it (>1.5 m)
- Keep out of your equipment from the explosive and flammable items

ELECTRICAL CONNECTIONS

DIAGRAMS OF CONNECTION TO THE ELECTRICAL SYSTEM

WARNING: a 4-wire three-phase distribution system is required for three-phase input and output connections. The standard version of the STS (3 pole) switches only 3 phases neutral is connected to the output directly. 3-phase power line + neutral + protective earth (PE), in compliance with the IEC 60364-3 specifications.
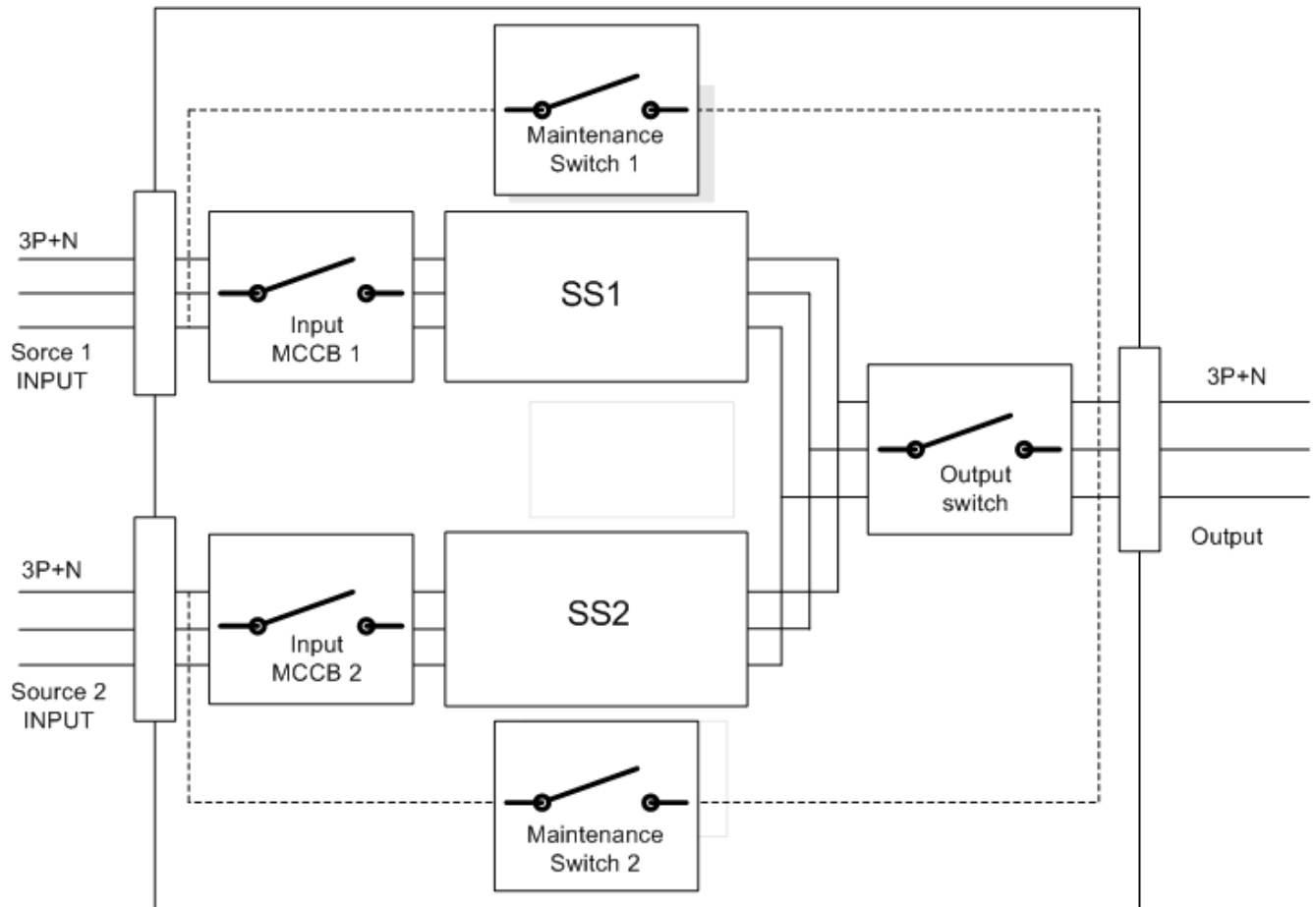

Figure – 6   3 pole standard STS input and output block diagram

PROTECTIONS INSIDE THE STS

SHORT CIRCUIT
In the event of a fault on the load , in order to protect itself and the alternate source the STS inhibits the output voltage. During short circuit event on the load, the connected source to load will be overloaded and the voltage of this input source will be go down, at this point STS monitors the output current and if current is 200% of nominal output current , if the input source phase voltages is lower than allowed limit at the same time it decides that short circuit event occurred at the output of the STS.

At the other hand during over current status , if the input MCCB trips STS decides that short circuit event occurred at the output of the STS.

OVERLOAD
Electronic overload protection system is used inside of the STS ,this protection system can be enabled or disable by the user as an option.

BACKFEED
The STS have electronic protection system against backfeed from any input source ,if any backfeed current is sensed the related input source input MCCB trips.

FUSES
There is no any replacable fuses inside of the STS ,only input MCCB's protect against overcurrents.

CABLE SIZES

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

4 pole model	3 pole model	Input and output cables	Cable type
STS450	STS350	25 mm^2	3 phase+1 neutral +earth
STS4100	STS3100	35 mm^2	3 phase+1 neutral +earth
STS4150	STS3150	50 mm^2	3 phase+1 neutral +earth
STS4200	STS3200	70 mm^2	3 phase+1 neutral +earth
STS4300	STS3300	95 mm^2	3 phase+1 neutral +earth
STS4400	STS3400	120 mm^2	3 phase+1 neutral +earth

<u>NOTE:</u>   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.

CONNECTIONS

InfoSTS Series 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

Before making power connections to the unit, ensure that all the incoming power sources are de-energized and insulated

Cables can enter the *InfoSTS* 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.

3 POLE STS POWER CONNECTIONS

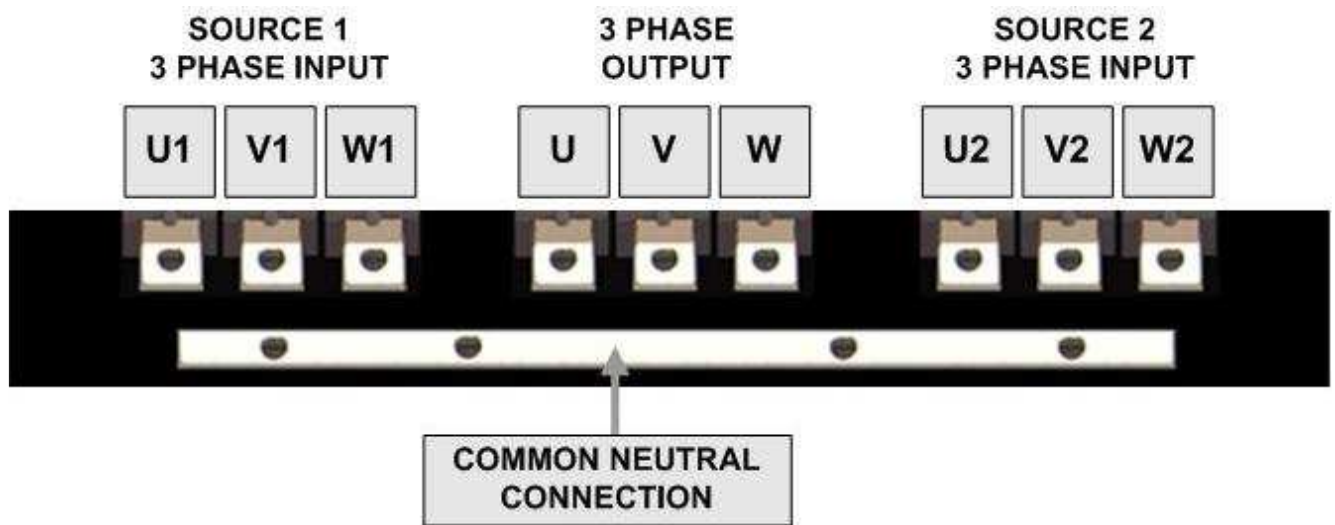Input and output terminals of the 3 pole STS are shown in the following figure

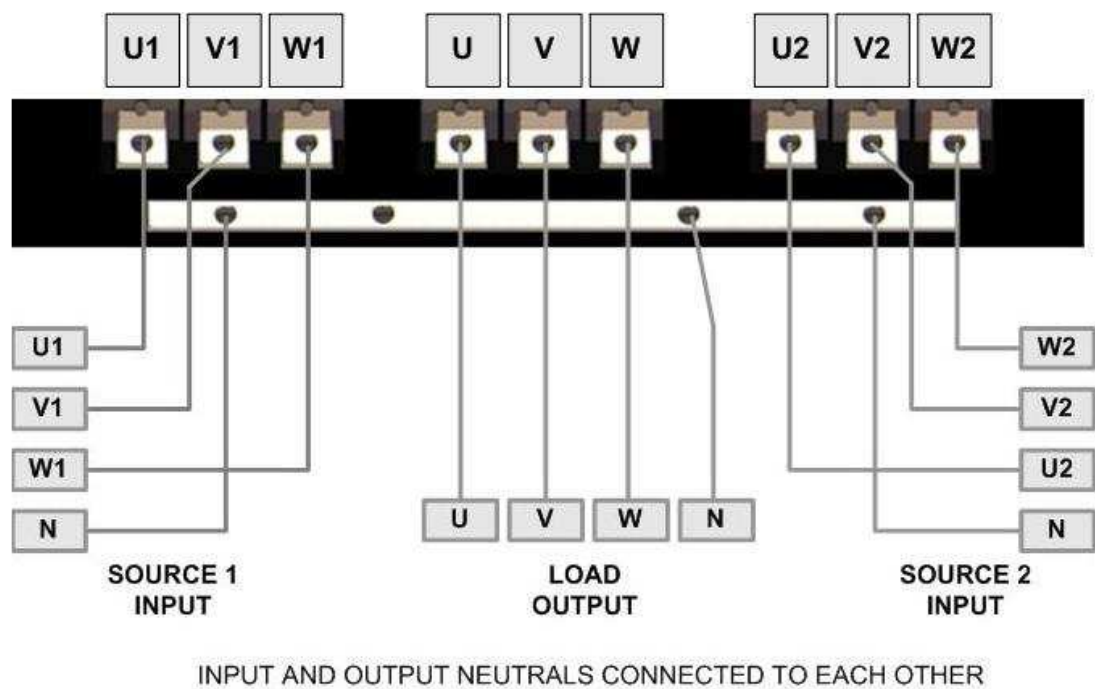**figure - 7** *Connection terminals of 3 pole STS*

figure – 8 *3 Pole STS cable connections*

4 POLE STS POWER CONNECTIONS

4 pole type STS units connects load output neutral to the current used source's neutral ,the neutral of the other source is isolated from output neutral.
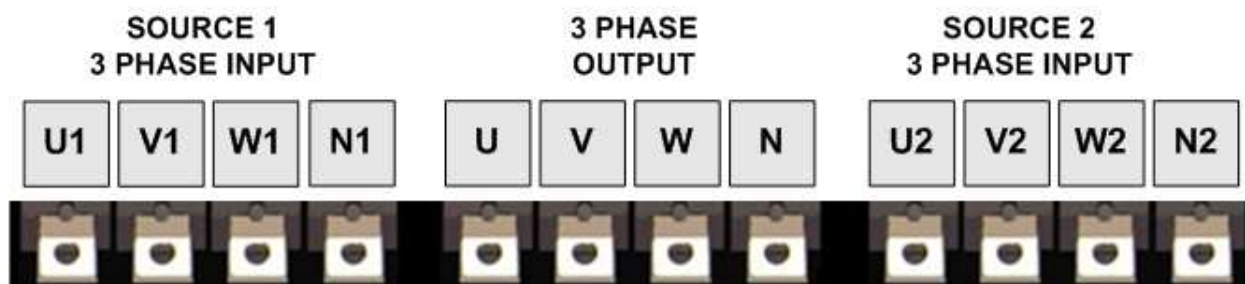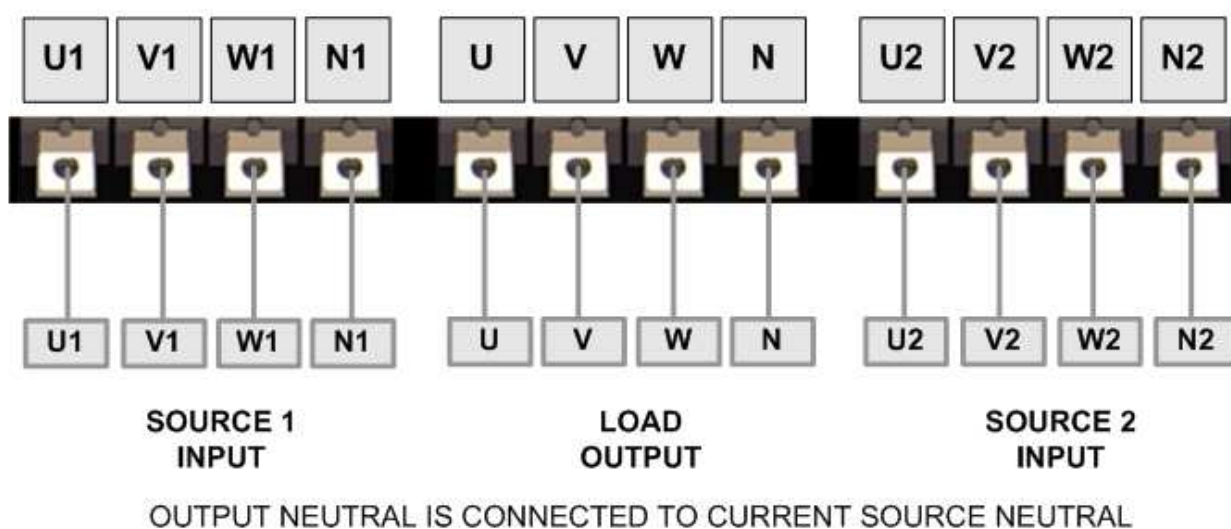
Figure - 9 *Connection terminals of 4 pole STS*

OUTPUT NEUTRAL IS CONNECTED TO CURRENT SOURCE NEUTRAL

Figure – 10 *Input and output cable connections of 4 pole STS*

ALARM RELAY CONNECTIONS
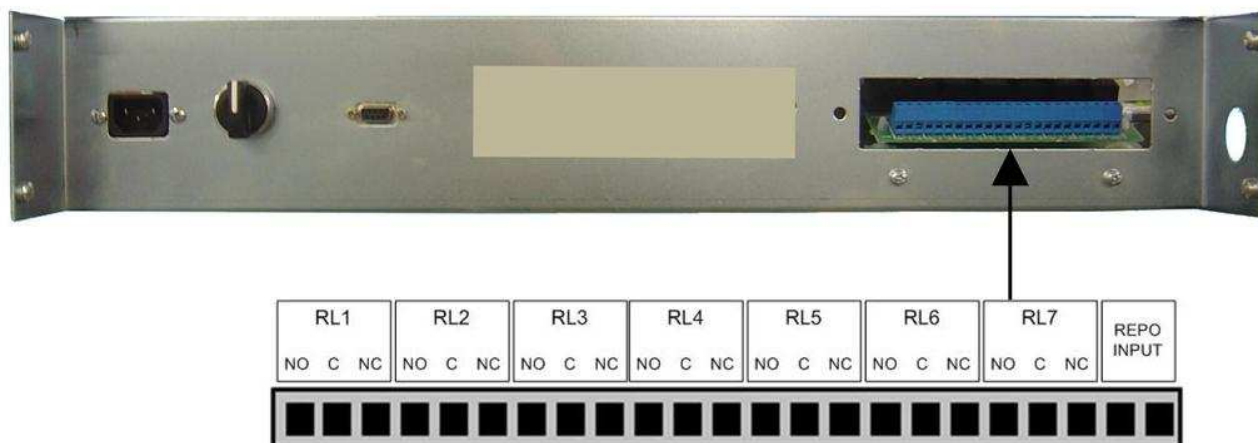
Figure - 11 *Alarm Relay Contacts and EPO Input Terminals*

Relay	Function
RL1	Load is connected to alternate input source
RL2	Preferred source indicator relay
RL3	Output Inhibit relay
RL4	Summary alarm relay
RL5	Manual or static transfer relay
RL6	S1 backfeed trip (1 second active)
RL7	S2 backfeed trip (1 second active)

EPO input is NO type interface (normally open) ,if EPO input terminals shorted to each other STS applies EPO shutdown procedure.
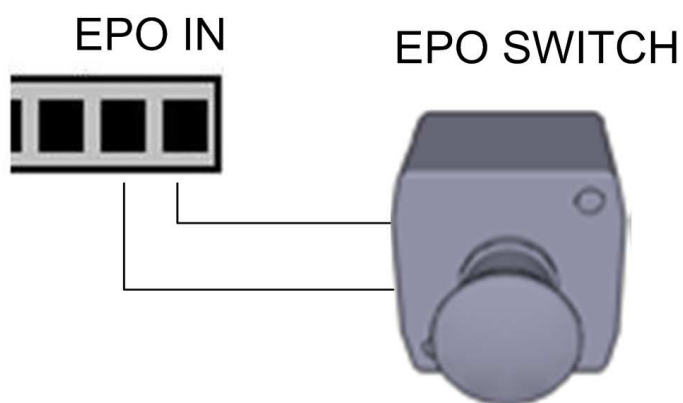
EXTERNAL EPO BUTTON

figure – 12 *Epo input connection*

Epo input trips short circuit there is no need to lock EPO signal externally.

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 busbars (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 7,8,9,10) 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 7,8,9,10) 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

4. Connect the output cables to the terminals (U-V-W) of the STS (Figure 7,8,9,10) 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 11.

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

6. Reassemble the metal guard removed previously.

PROTECTIVE EARTH

The protective 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

EMERGENCY POWER OFF

This isolated input is used to turn off the STS remotely in case of emergency.
The STS is supplied from the factory with the "Emergency Power Off " (E.P.O.) terminals open-circuited (see "View of the STS connections") if two (NO) terminals are shorted to each other STS shutdown the output voltage.

In case of emergency ,by activating the stop device STS enters to stand-by mode and powers off the load completely.

The E.P.O. circuit is self-powered ,no external power supply voltage is therefore required. If E.P.0. switch pressed (at least 1 second) STS trips the signal.

USE

DESCRIPTION

The purpose of the STS is to select one of two input power lines which is in tolerant with predefined limits. Users must decide that one of the input sources must have priority (preferred source) the other source is alternate source. So the STS tries to stay at priority (preferred) source if this source in tolerant with predefined values, if this source out of tolerant and the alternate source is in tolerant STS transfers the load to alternate source. Always STS checks priority (preferred) source if it is in tolerant retransfers the load to priority (preferred) source.

So before use the STS we must decide that which source is main (preferred) and which source is spare (alternate).

IMPORTANT : Our STS are designed and produced for long life even under severest conditions. Remember however that they are electrical power equipment items and as such are in need of periodic checks. Besides, some components have a life cycle of their own and must therefore be checked at regular intervals and may need to be replaced, where due to the conditions: in particular fans and some electrolytic capacitors.
It is recommended to implement a preventive maintenance program, using manufacturer authorized and trained service personnel.
Our Technical Servicing department is at your disposal to discuss the different personalized preventive maintenance options with you.
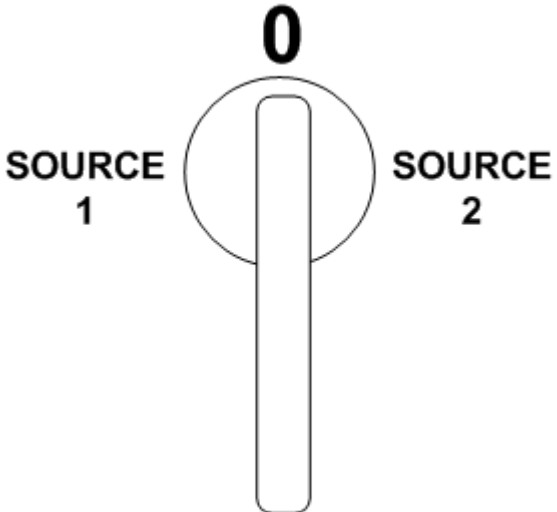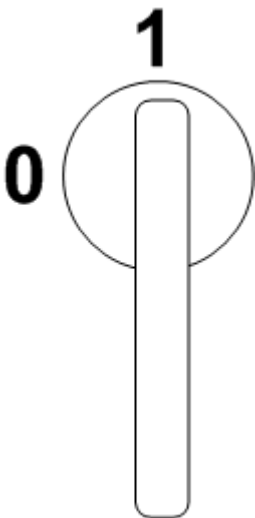
PRELIMINARY OPERATIONS

- Visual check of the connections
  Check that all the connections have been made strictly following the indications given in the "Connections" paragraph.

- Check that the following switch positions
  S1 – input 1 MCCB 0 position (off)
  S2 – input 2 MCCB 0 position (off)
  S3 – output switch 0 position (off)
  S4 – maintenance bypass switch 0 position (center)
  Manual transfer switch auto position (center)
  At this point there is no output voltage at the STS output terminals

POWERING ON FOR THE FIRST TIME

- Turn on input 1 power at external input power distribution box (apply power to input 1 terminals) . Measure the voltages on terminals. (according to your local electricity nominals)
  Phase to phase 400 volts AC ,Phase to neutral 230 volts AC.
- Turn on input 2 power at external input power distribution box (apply power to input 2 terminals) . Measure the voltages on terminals. (according to your local electricity nominals)
  Phase to phase 400 volts AC ,Phase to neutral 230 volts AC.
- Optional : If sources are synchronous to each other, Check that the phase sequency is matched between two input sources (method: measure L1 phase to phase voltage between two sources, repeat this measurement for L2 and L3 phases if the measured AC voltages is minimum the phases of two input sources are matched.)
- Turn on S1 (1 position) wait and see the STS control panel activated and shows some messages (source 2 BAD ,output switch off messages are normal)
- Turn on S2 (1 position) wait and see only output switch off message is showed on the control panel.
- At this point according to your application you must select some user options from OPTIONS MENU of the control panel. You need password to change options. The factory default password is "0000" 4 zeros ,you can change the factory password after you logged in.(STS front panel functions)
- After you setup some options you can turn on S3 output switch (1 position)
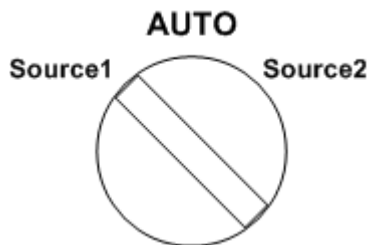- See that there is no alarm message or alarm sound on the STS

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.

1) Ensure that maintenance bypass switch (S4) is in 0 position (center)	2) Turn on input switches (1 position) S1 and S2. The STS control circuits will be energized and will start functioning.
3) Select your "PREFERRED" source. (Default factory setting is 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	

Switching To Maintenance Bypass Position From Normal (automatic) 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) **AUTO** Source1 ⟋ Source2	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 **0** **SOURCE 1**	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 **1** **0**
5) Turn off the input switches S1 and S2	6) Now, the unit is ready for maintenance
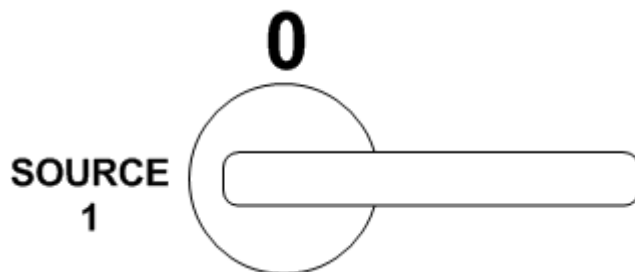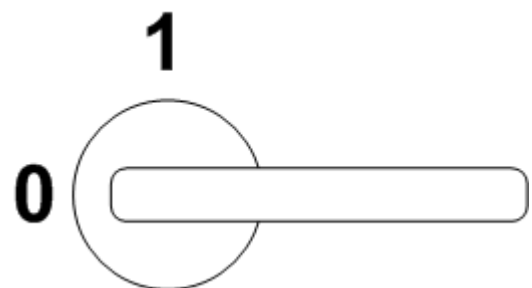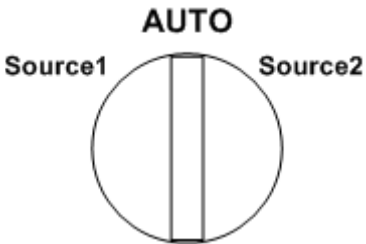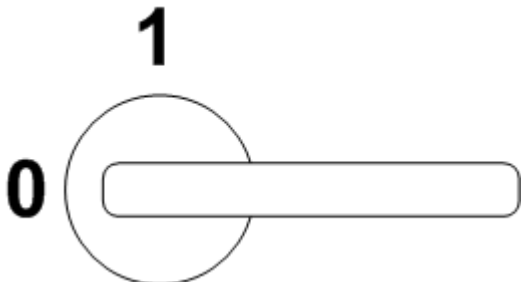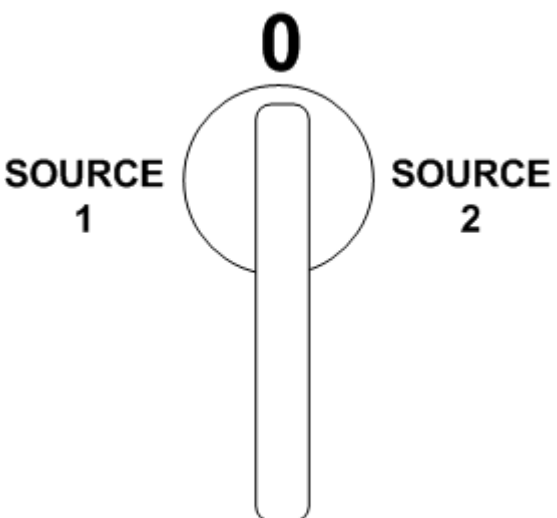
Switching From Maintenance Bypass To Normal Operation

1) Turn on input switches S1 and S2	6) 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 if there is no alarm unit is in normal operation mode again

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 **1** **0**
3) Turn off input switches S1 and S2	4) Check that the Maintenance Bypass Switch S4 is in "0" position **0** **SOURCE 1** **SOURCE 2**
5) Unit is completely turned off	

DISPLAY

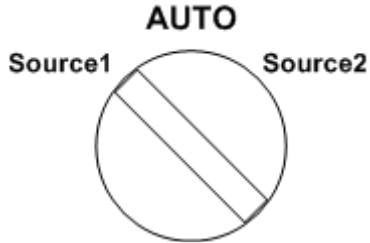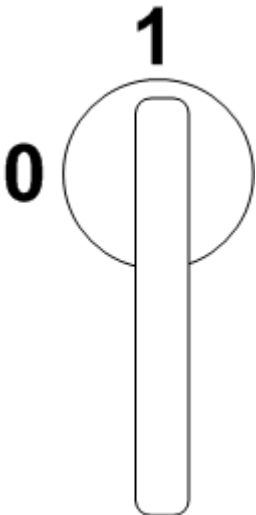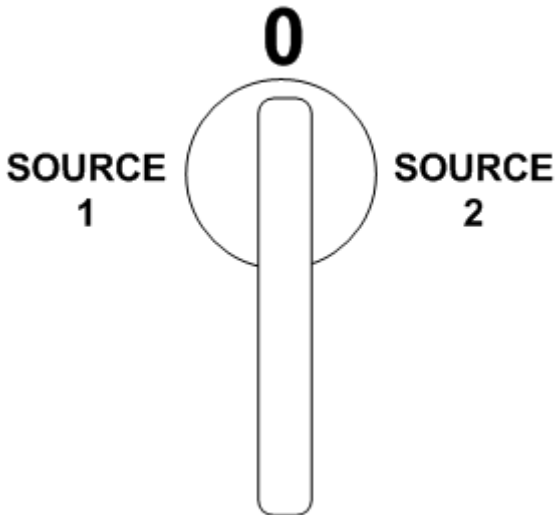At the center of the control panel there is 2 lines ,per lines 16 alphanumeric characters display, which provides, in the foreground and in real time, a detailed overview of the current status of the STS. Directly from front panel you can control the STS ,view of the electrical values of the input, outputs etc..and make the main machine settings.

The display is 2 lines and the role of lines are as follows:

First line status, menu items and measured parameters
Second line time shared for alarms
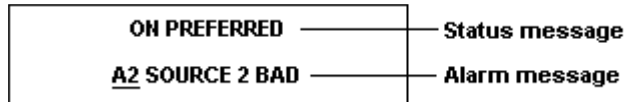
The A2 at the beginning of the alarm message on the second line shows the standard alarm code the remaining message part can be different at each language, but the alarm code is standard for all languages.

MIMIC DIAGRAM

There is a led lamp group which they are located on a block diagram of the STS

KEY SYMBOLS

↓ Move 1 step down on menu

E ENTER button to enter menu or to confirm a selection

▬ Move on options or move cursor to left 1 step

✚ Move on options or move cursor to right 1 step

Figure – 13   *STS front panel*

DISPLAY MENUS

The function of LCD panel is arranged as a 2 level menu structure.
-Main menu
-Sub menus

MAIN MENU **STATUS MESSAGES LEVEL** **MEASURES MENU** **COMMAND MENU** **ALARMS MENU** **OPTIONS MENU** **TIME MENU** **INFORMATION MENU** **ADJUST MENU** **SERVICE PASSWORD** **USER PASSWORD**	**Use down button to move on menu** **Use <E> enter button to go in submenu**

If the user press up and down buttons, main menu items come to screen by order. In main menu the left and right buttons does not function. ENTER button goes to submenus

STATUS MESSAGES LEVEL

This is the first item of the main menu and messages gives a general status information about STS to users. The possible messages according to events 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.

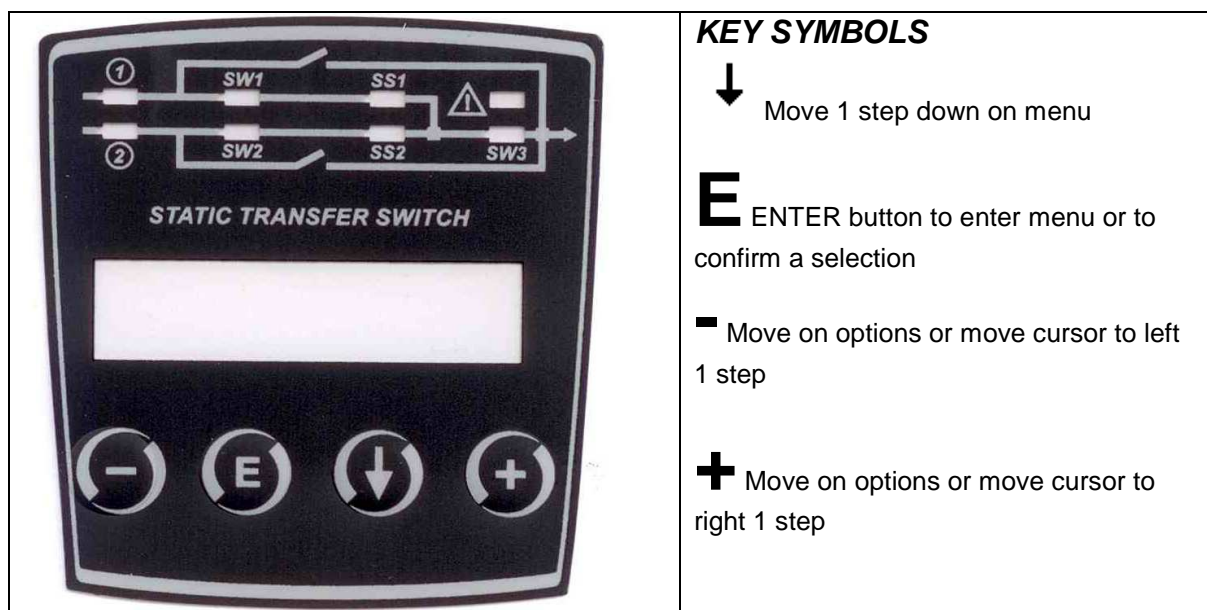**MANUAL TRANSFER :** Load is transferred to one of the input sources statically. This transfer can be performed from COMMAND MENU of LCD Panel or using the static transfer switch.

MAINT.BYPASS S1 : Load is connected directly to the Source 1 input (the S4 maintenance switch is in 1 position)

MAINT.BYPASS S2 : Load is connected directly to the Source 2 input (the S4 maintenance switch is in 2 position)

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.
Restore options : see options menu (Automatic and manual)

EMERGENCY STOP : This message shows that the external emergency stop signal sensed and the output is shutdown. To reset STS turn off Source 1 and Source 2 input switches and turn on again.

OVERLOAD INHIBIT: Overload sensing is enabled and the overcurrent occurred at the output longer than allowed overload timing. Currently the output of the STS is shutdown.

Restore options :see options menu (Automatic and manual)

MEASURES MENU

SP1:230 240 235V	**Use down button to move on submenu**
SP2:240 220 215V	
LD%:045 060 015%	
OPI:025 120 080A	
TEMP:26C	
S1-FREQ:50.2 Hz	
S2-FREQ:50.1 Hz	
SYNC.ANG:001 Deg	
PSP1:16.1 2:16.3	
<ENT>EXIT	

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

SP1:220 230 235V
This menu item shows Source 1 input voltages, 3 numbers shows 3 phase voltages from line to neutral as AC volts

SP2:220 230 235V
This menu item shows Source 2 input voltages, 3 numbers shows 3 phase voltages from line to neutral as AC volts.

LD%:045 050 060%
This menu item 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 menu item shows the output currents of STS for each of the three output phases.

TEMPER : 030 C
This menu item shows the cabinet inside temperature of the STS.

S1-FRQ : 50.1 Hz
This menu item shows the Source 1 input frequency in Hertz

S2-FRQ : 50.1 Hz
This menu item shows the Source 2 input frequency in Hertz

SYNC.ANG: 001 Deg
This menu item shows the phase difference between the two input sources in terms of angular degrees. Zero value shows that two input sources are fully synchronized to each other.

PSP1=16.2 2=16.1
This menu item shows the two redundant DC power supply output voltages of the STS separately as DC volts.

<ENTER> EXIT If the user press ENTER button exits from measures menu to upper menu.

COMMAND MENU_____

From this menu user can give immediate commands to STS.

S1=< 045 AUTO >=S2
from this option user can XFER the load to S1 or S2 directly. The message means that:

Left button	manual transfer to source 1
Enter button	automatic transfer (STS tries to stay on preferred source)
Right button	manual transfer to source 1

Notes:
In case of maintenance bypass to any source this function is disabled
In case of any alarm this function is disabled
In case of XFER switch is on S1 or S2 position this function is disabled
In case of disable **S1=< 045 AUTO >=S2** message will be replaced with **STATIC XFER OFF**

If flying transfer is selected and if the user pressed to left or right button ,STS waits for zero cross match of two input sources during this time 045 number shows the synchron angle difference of two sources ,this number blinks and sound alert beeps ,if transfer failed in 30 seconds STS cancels transfer.
In this case re press to S1 or S2 button.

XF.TEST :<ENTER>
from this menu item user can perform transfer test. If the user press "enter" button and if the load is on preferred source, load is transferred to alternate source, stays on alternate source for a pre-adjusted time (retransfer delay), and is transferred to preferred source back again.
transfer test is disabled in the following cases:

If test is performing **XF:TEST:PERFORM** message will be showned

If any alarm occurs
If manual XFER is active from panel or manual transfer switch
If maintenance bypass is applied
If test is disabled from any reason **XF.TEST:DISABLED** will be showned

ENTR-INHIBIT RST
If the STS output is shutdown from any reason ENTER button restores the STS output voltage
This function resets all current alarms

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

RELAY TEST:0 From this submenu 5 dry contact relay outputs can be tested by the user. If the user presses the left button the numbers will change from 5 to 0 ,if the user presses the right button the numbers will change from 0 to 5.
The following table gives the functions of the numbers:

RELAY TEST:0	Relay test disabled; relays will function normally
RELAY TEST:1	Relay 1 is activated
RELAY TEST:2	Relay 2 is activated
RELAY TEST:3	Relay 3 is activated
RELAY TEST:4	Relay 4 is activated
RELAY TEST:5	Relay 5 is activated

Note: If the user exits from this menu item , STS exits from relay test mode.

<ENTER>LAMP TEST
User can check all front panel lamps and sound alert by pressing enter button. All LEDs are lit during user press ENTER button and return back to their normal functions again.

<ENTER>:LOGOUT
In user or service login status ,if the user press ENTER button logout procedure will be applied ,all logins will be cancelled.Every password login is live for 3 minutes at the end of this time logout will be applied automatically.

<ENTER> EXIT If the user press ENTER button exits from command menu to upper menu

ALARMS MENU

The most important function of the STS is alarms menu. There is a real time clock in the STS and STS records all events by their date and time. And the user can see all previous events and alarms, by order. Every log record contains 24 alarms and 10 status messages.

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 time shared 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 127, 000 is the last event and the 127 is the first (oldest).

<ENTER> CLEAR LOG: If the user press enter key during this message, STS will clear all recorded events from memory.
Note : For log table delete service login is required otherwise the user can not clear log events.

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	Description
Code:0	No alarm on Source 1, Source normal
Code:1	Source 1 input voltage out of tolerant
Code:2	Source 1 phase sequency bad
Code:4	Source 1 backfeed tripped
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
Code:128	phase or alternance loss on S1

At some cases numbers can be shown as total (contains more then 1 alarm at the same time)

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	Description
Code:0	No alarm on Source 2, source normal
Code:1	Source 2 input voltage out of tolerant
Code:2	Source 2 phase sequency bad
Code:4	Source 2 bacfeed tripped
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
Code:128	phase or alternance loss on S2

At some cases numbers can be shown as total (contains more then 1 alarm at the same time)

<ENTER> EXIT If the user press ENTER button exits from alarms menu to upper menu

OPTIONS 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 the load to Source1 under normal operating conditions.
Source2	Source2 has higher priority. STS tries to transfer the load 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	If preferred source failed by any reason load transfers to alternate source and retransfers to preferred source after a delay (RET-DELAY)
Off	If preferred source failed load transfers to preferred source and load stays permanently on alternate source after transfer from the preferred source (until alternate source fails ,if alternate source fails STS retransfers the load to preferred source again)

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 seconds.
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 during overcurrents. The supply current is limited only by the input MCCBs 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. The current alarm stays on LCD panel as given time then if the alarm condition is normal STS clears the alarm message from LCD panel.
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 method of the STS. The unit decides which kind of transfer method is applied when there is no synchronization between the two input sources, Source 1 and Source 2. ,during transfer from preferred source to alternate source.

OPTION	DESCRIPTION
Disable **WARNING**	Transfer is disabled when there is no synchronization. If preferred source failed during non synchronous status output will be shutdown.
Delay	Non synchronous transfer is allowed only after a security delay. Delay time can be adjusted by the service personnal from the ADJUST MENU.
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 shutdown the output voltage from non synchronous transfer disabled option, at the end of alarm hold time it begins to supply the load again.
MANUAL	If the STS shutdown the output voltage from non synchronous transfer disabled option, 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

RET.MODE: (WAIT SYN ,DELAY ,0-CURRENT,FLYING)
This option determines non synchronous retransfer from alternate to preferred source

OPTION	DESCRIPTION
WAIT SYNC	During retransfer from alternate to preferred source wait until two input sources for synchron otherwise stay on alternate source.
DELAY	After a certain delay retransfer the load from alternate to preferred source. Delay time can be adjusted by the service personnel from the ADJUST MENU.
0-CURRENT	If this mode is selected, during non synchronous retransfer, STS waits for the output currents to be zero and transfers to the alternate source.
FLYING	During retransfer from alternate to preferred on non synchronous status STS waits for zero cross match of two input sources ,if they are matched retransfers the load

PHASE ERROR : (ON,OFF)
This option enables or disables the phase sequence sense circuit of the STS

OPTION	DESCRIPTION
ON	Enables source input phase sequency error
OFF	Disables source input phase sequency error

SCR ALARM : (ON,OFF)
This option enables or disables the phase or alternance loss sense circuit of the STS

OPTION	DESCRIPTION
ON	Enables phase or alternance loss sense on the STS output
OFF	Disables phase or alternance loss sense on the STS output

MAN.XFER: (0-curr / Flying)
Determines manual transfer switch or front panel manual transfer operating mode

OPTION	DESCRIPTION
0-Current	Apply 0-current transfer method during manual transfer
Flying	Apply flying transfer method during manual transfer

<ENTER> EXIT If the user press ENTER button exits from options menu to upper menu

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:10-01-2007	Current date of RTC clock
SET HOURS: 13	press left and right buttons to change the current hours (0 to 23)
SET MINS: 15	press left and right buttons to change the current minutes (1 to 59)
SET DAY: 10	press left and right buttons to change the current day of the month (1 to 31)
SET MONTH: 01	press left and right buttons to change the current month of the year (1 to 12)
SET YEAR:2007	press left and right buttons to change the current year (2000 to 2099)
<ENTER> :UPDATE	press enter to update the last date and time settings on STS RTC clock
<ENTER> EXIT	If the user press ENTER button exits from time menu to upper menu

INFORMATION MENU

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

RS232 receive: OK there is RS232 receive action
RS232 receive: --   there is no RS232 receive action
 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-X The firmware version of the STS control software.

<ENTER> EXIT If the user press ENTER button exits from information menu to upper menu

ADJUST MENU

This menu is for service personnel only there is no user defined parameter or option on this menu please refer to service manual of STS unit for detailed information.

SERVICE PASSWORD

Adjust menu functions requires service password. The service personnel of the STS unit knows the service password.
Service password is 4 characters length ,these are numeric characters .
At first entry to this menu **SER.PASS: 0000** message is showned ,one of characters is replaced with blinking cursor ,this character can be change by pressing up and down buttons.

Left and right buttons changes the cursor position.

After you typed the service password press **ENTER** button ,if the password is correct at the second line of LCD panel **SERVICE LOGIN** message will be showned.
The usage of this menu is as follows :

If service personnel is in **LOGGED OUT** status:
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 service personnel is in **LOGGED ON** status:
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 forgot the service password, connect the jumper JP2 on the main board this will activate the service login mode you can access to ADJUST MENU.

USER PASSWORD

User password is 4 characters length ,these are numeric characters .
At first entry to this menu **USR.PASS: 0000** message is showned ,one of characters is replaced with blinking cursor ,this character can be change by pressing up and down buttons.

Left and right buttons changes the cursor position.

After you typed the user password press **ENTER** button ,if the password is correct at the second line of LCD panel **USER LOGIN** message will be showned.

User password can be change by the users during login status.

ALARM MESSAGES

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

2. LINE MESSAGES *(these messages are shown on the second line of LCD panel)*	
A1 SOURCE 1 BAD	If input source 1 is out of tolerance this alarm occurs
A2 SOURCE 2 BAD	If input source 2 is out of tolerance this alarm occurs
A3 SYNCHRON BAD	Shows that 2 input sources are not synchronized
A4 OVERLOAD	Output current of the STS is too high
A5 NSYNC.INHIBIT	Non synchronous transfer is disabled by the user, and during non sync status transfer process started ,currently output shutdowns
A6 XFER INHIBIT	During transfer the STS can not find a good source and the output shutdowns
A7 OUT.BAD ON S1	
A8 OUT.BAD ON S2	
A9 PSP FAILURE 1	Redundant power supply 1 is bad
A10PSP FAILURE 2	Redundant power supply 2 is bad
A11 OVERTEMP	SCR heatsink temperature is too high
A12 MAN.XFER S1	Load is transferred to Source 1 by the user
A13 MAN.XFER S2	Load is transferred to Source 2 by the user
A14 BYPASS TO S1	Load is directly transferred to Source 1 by maintenance bypass
A15 BYPASS TO S2	Load is directly transferred to Source 2 by maintenance bypass
A16 OUTP.SW.OFF	The output switch of the STS is off
A17 INP.SW.1 OFF	The Source 1 input switch is off
A18 INP.SW.2 OFF	The Source 2 input switch is off
A19 S1 BLACKOUT	On Source 1 input black out sensed
A20 S2 BLACKOUT	On Source 2 input black out sensed
A21 S1 FRE.FAULT	Source 1 input frequency out of tolerant
A22 S2 FRE.FAULT	Source 2 input frequency out of tolerant
A23 S1 BAL.BAD	Source 1 input phase balance bad
A24 S2 BAL.BAD	Source 2 input phase balance bad
A25 ROTATE S1 Ph	Source 1 input phase sequence is BAD
A26 ROTATE S2 Ph	Source 2 input phase sequence is BAD
A27 SHORT CIRCUIT	Short circuit status fixed on the output of the STS
A28 MISFUNCTION	Faulty usage of manual transfer switch
A29 BACKFD.TRIP1	Backfeed protection activated for source 1
A30 BACKFD.TRIP2	Backfeed protection activated for source 2

STATUS MESSAGES	
SERVICE LOGIN	Service personnel is logged on from panel or RS232 for adjustment
EMERGENCY STOP	External emergency stop signal is detected and the output shutdown
ON SOURCE 1	Load is on source 1
ON SOURCE 2	Load is on source 2
STS RESET	STS is started (power on)
EMPTY LOG	The current log record is empty
OUTPUT SHUTDOWN	Output of the STS is shutdown currently
USER LOGIN	User is logged on from panel or RS232 for adjustment
MANUAL TRANSFER	Manual transfer is activated by the user
MAINT-BYPASS S1	Maintenance bypass switch is on S1 position
MAINT-BYPASS S2	Maintenance bypass switch is on S2 position
OUTPUT INHIBIT	The output of the STS is shutdown

INPUT SOURCE ALARM DESCRIPTIONS

INPUT SOURCE VOLTAGE OUT OF TOLERANT

If the input source voltage is less then minimum adjusted value or higher then maximum adjusted value STS decides the related source is BAD.

BLACKOUT SENSING

Programmable black out sense provides flexible operation according to conditions and applications.
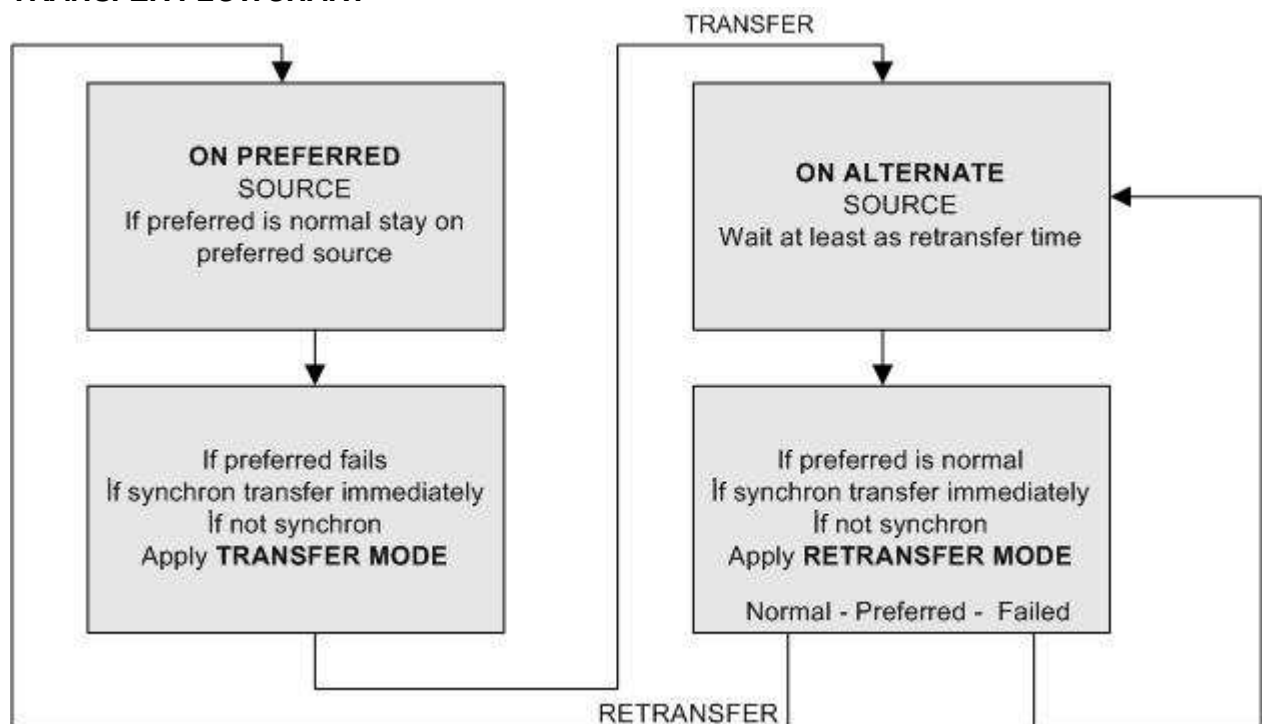
TRANSFER FLOWCHART

figure - 14

OPTIONAL EXTERNAL POWER INPUT

Optional external power supply input provides event logging during power loss on all inputs . If external power supplied from a small UPS ,all control circuits of the STS continues to function and records power events for troubleshooting.

External power input connector is located on to the back panel of the STS.

figure – 15 *External power input*

COMMUNICATION INTERFACE AND REMOTE MANAGEMENT

The following information contains standard communication interface for INFOSTS. Additional RS485 communication for long distance is available as an option.
3 types of communication interfaces are available on STS units

Possible connections to STS unit	
RS232	Serial communication
DRY CONTACTS	Dry contact outputs for some major events.
TCP/IP connection	Available (optional)

RS232 hardware	
Baud rate	2400 baud
connection	3 wire (RX,TX,GND)
Bits	8 bits
Parity	none
flow	none
Stop bit	1

RS232 CONNECTION TO PC

To connect STS to any PC from RS232 use special cable for connection. STS CONTROL software must be run on PC.
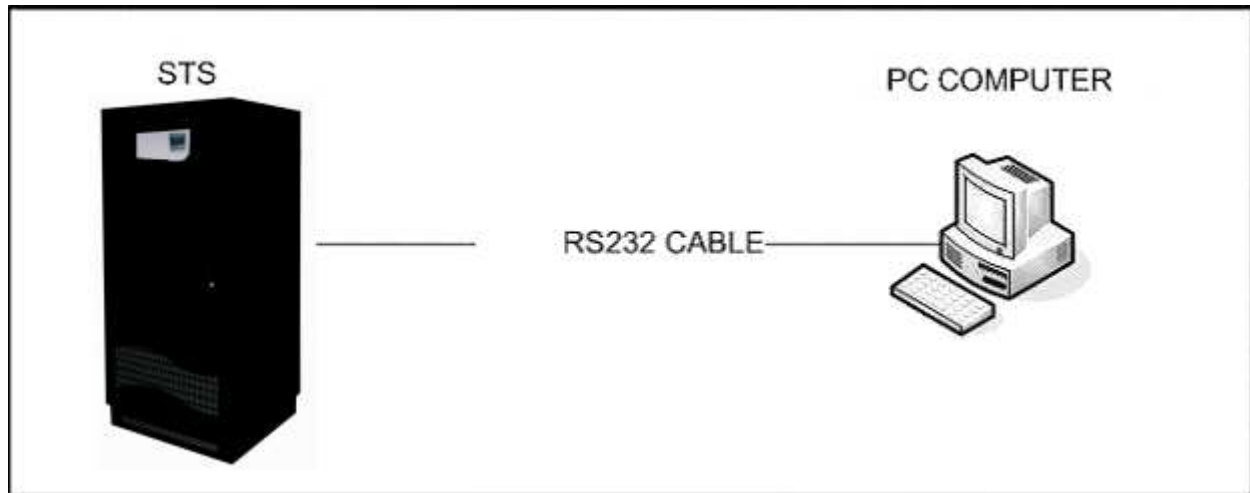

figure – 16   STS RS232 connection to PC

Notes

- special cable is not a standard RS232 cable ,PC side is standard RS232 pins but the STS side pin functions are different then a standard RS232 cable.
- Maximum cable length of the RS232 interface is 25 meters.
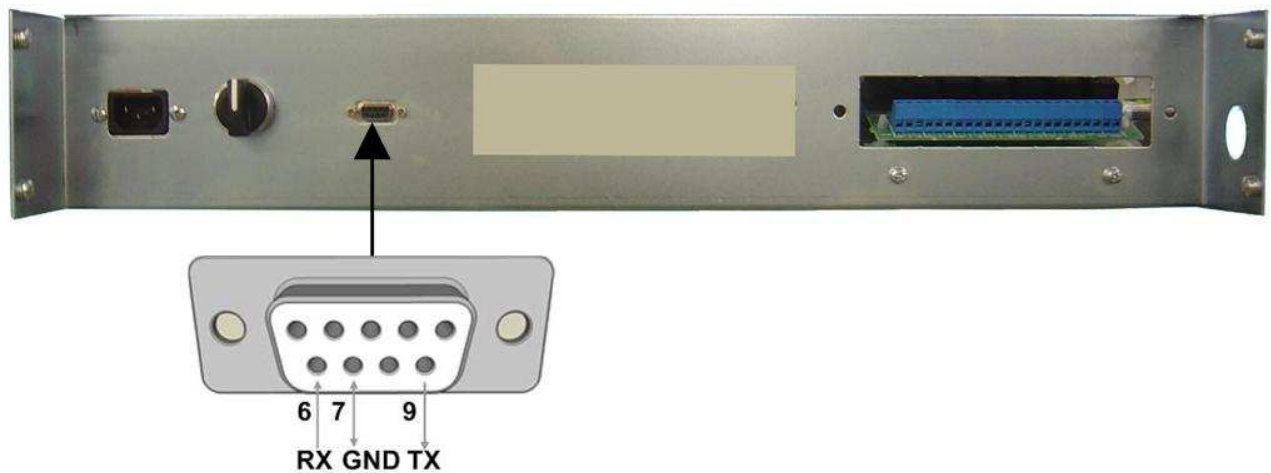

RS232 Pinouts

figure – 17   RS232 pinouts

RS232 security

The STS serial port is interactive with PC so PC can send any command to STS in this case unauthorized users can change parameters and send unwanted commands to STS. To prevent unauthorized access to STS from serial port two level security is provided.

a) User can enable or disable remote RS232 commands from options menu ,if remote is disabled(off) STS will accept only parameter sending commands. The control commands will be refused.

b) From PC user password is required (USER LOGIN). If password is sent from PC to STS ,2 minutes login status will be applied ,during this time control commands and user options will be accepted from RS232 serial port. Bu at the end of this time remote user will be logged out.

DRY CONTACT INTERFACE	
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	BACKFD.TRIP1 (2 seconds)
Relay7	BACKFD.TRIP2 (2 seconds)
Inputs	
Emergency stop	If the user presses the external emergency stop switch for more then 2 seconds STS shutdowns the output

OPTIONAL TCP/IP ADAPTOR

On standard models RS232 serial port is installed but if the user wants to use serial port and TCP/IP connection at the same time optional TCP/IP adaptor is available.
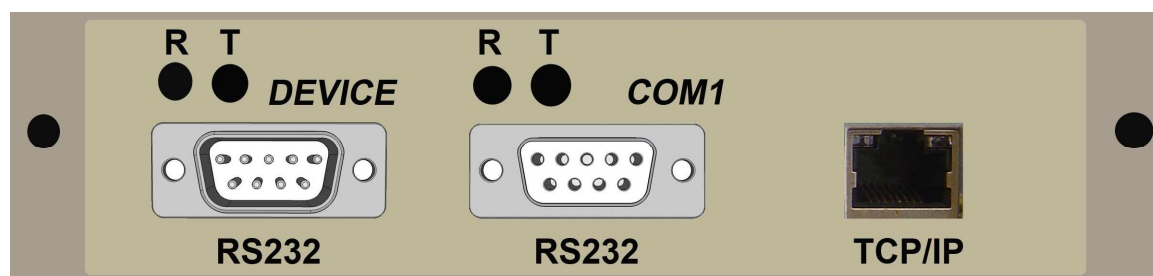

figure – 18   *Optional TCP/IP adaptor front view*

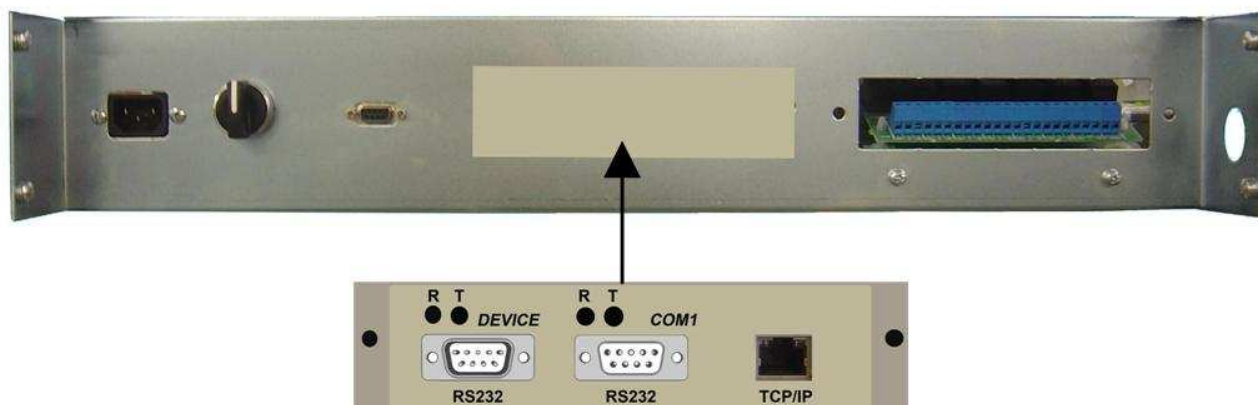The adaptor is located on to the back front panel

figure – 19   Location of TCP/IP adaptor
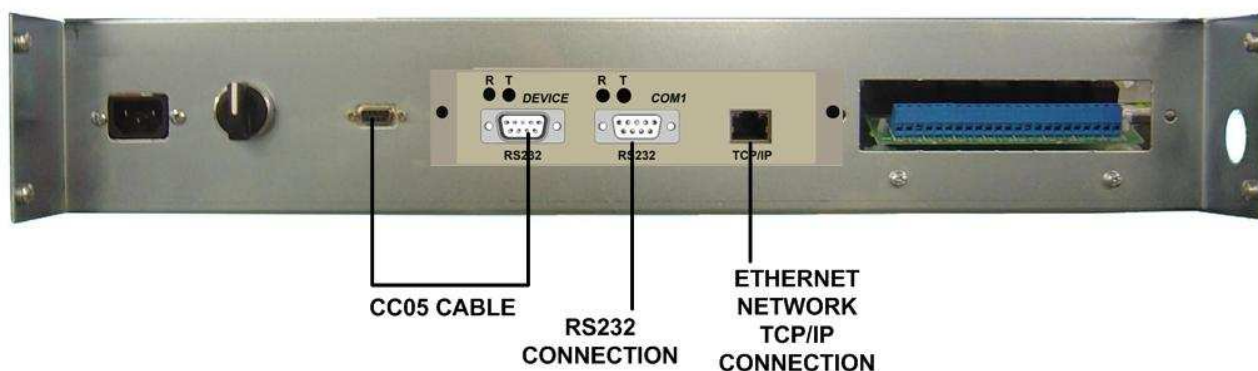
Sample TCP/IP and serial port connection

figure – 20   Connection of TCP/IP adaptor

STS CONTROL software supports RS232 and TCP/IP connection.

TECHNICAL SPECIFICATIONS

INPUT	
Input voltage	180-250 volts AC 3 phase (3 phase +neutral)
Neutral switching	Optional
Input voltage analog error window	adjustable from service menu
Input voltage distortion	Less than 10%
Input Blackout sensing	Available
Input blackout error window	Adjustable from service menu
Phase balance error sensing	Available (user can disable)
Phase balance error sense offset	adjustable
Input frequency	50Hz or 60 Hz (adjustable from service menu) +-5%
Input frequency error window	Adjustable (from service menu)
Phase sequence sense	Available
Phase sequence alarm	Enabled or disabled by the user
Input MCCB trip during short circuit	Available
Back feed protection	Available

OUTPUT	
Output voltage	Same as input
Output frequency	Same as input
Rated current	50-100-150-200-300-400 amperes per phase and neutral according to models (STS450- STS4100- STS4150- STS4200- STS4300- STS4400) respectively.
Load crest factor	Up to 3.5
Type of transfer	Break before make
Synchron Transfer time	max 1.8 msec (on 0 current mode)
Non synchron transfer time	max 10 msec in 0 current mode, 0-25 sec adjustable in delay mode and in 0 current mode.
Flying transfer	Available
Load PF range	0.6 lag to 0.9 lead

PROGRAMMING	
Transfer mode	Synchron
	Non synchron with delay
	Non synchron 0 current:Transfers each phase on 0 current
Synchron transfer delay	0-current transfers in max 1.8 miliseconds
Non synchron transfer mode	Disable Delay and transfer Wait for zero current for each phase and transfer
Non synchron transfer delay	0-25 seconds adjustable
Digital synchronization check	digital: Calculation of angle between sources
Analog synchronization check	Analog sense: Measuring voltage difference
Phase angle error	0-20 degrees adjustable
Preferred source	Selectable
Retransfer	ON : transfers to alternate source and retransfers to the preferred source OFF :transfers to alternate source and stay until it fails.
Retransfer mode	Wait synchron ,Delay ,0-current ,Flying transfer
Retransfer delay	1-60 seconds adjustable
Alarm hold time	5-60 seconds adjustable
Input blackout sense	0.1-25 miliseconds adjustable
Overload inhibit	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 msecs
Overload inhibit resetting	Manual or automatic reset
Inhibit resetting	Manual ot automatic

EVENTS DESCRIPTION	
Event	Criteria
Transfer inhibit criteria	If both preferred and alternate sources fails at the same time
	If 2 input sources are not synchronous to each other And non synchron transfer is disabled by the user
Overload inhibit	If one of the 3 phase currents is higher than a software preset value And overload inhibit is enabled by the user
Retransfer criteria	If synchron immediately transfer If the 2 input sources are not synchronous to each other ,according to selected retransfer mode by the user
Manual transfer mode	If synchron immediately transfer If not synchronous according to selected manual transfer mode by the user
Emergency stop	If external emergency stop signal is applied
Maintenance bypass	If maintenance bypass switch is on S1 or S2 position

INDICATORS AND CONTROLS	
2 lines 16 character LCD alphanumeric display	1.line for parameters 2.line for alarms
Microprocessor	32 mips, very 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 os 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
Sound test	From panel
Logon by password	From panel or RS232
Alarm logs	128 recorded alarm logs from panel or RS232
Status indication leds	7 led lamps arranged in a mimic diagram
Manual transfer switch	Available
Mechanical bypass	Available for each input
Source input switch	Available for each input (MCCB type trip type)
External EPO input	Available

MEASURED PARAMETERS	
All measured parameters can be monitored from front panel or RS232	
Source 1 voltages	230 220 215 V
Source 2 voltages	210 219 218 V
Output load percentage	015 020 040 %
Output current	020 030 045 A
STS cabinet temperature	024 deg.
Source1 input frequency	50.0 Hz
Source2 input 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)

USER OPTIONS AND SETTINGS	
All user option parameters can be selectable from front panel or RS232	
Preferred source selection	Source 1 or source 2 from panel or RS232
Retransfer mode	On/off from panel or RS232
Retransfer delay	1-60 seconds from panel or RS232
Overload inhibit	Disable or Enable
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 reset mode	Manual or automatic
Inhibit reset mode	Manual Automatic
Remote access	On : Control Access from RS232 ENABLED Off : Control Access from RS232 DISABLED
Retransfer mode	Wait synchron Delay O-current Flying transfer
Phase error	On : Phase sequence alarm enabled Off : Phase sequence alarm disabled
SCR ALARM	On : Output phase or alternance loss sense enabled Off : Output phase or alternance loss sense disabled
Manual transfer mode	0-current - Flying

COMMUNICATION INTERFACE	
Emergency stop input	2 seconds delay NO input
Dry contact outputs	5 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)
RS232 serial interface	Available ASCII characters
RS232 hardware	2400 baud ,1 stop bit ,no parity 3 wired (RX,TX,common)
TCP/IP connection	Available (optional)
2 serial ports	Available (optional)
Monitoring and control software	Available on windows

OTHER FEATURES	
Power supply	2 redundant power supplies, hot swappable 100-260 volt AC input
Cooling fan	2 cooling fans (redundant) (3 fans for STS4200)
Neutral switch	optional
Input overload and short circuit protection	available
Output switch	available
Cabinet inside temperature sensor	available

MECHANICAL CHARACTERISTICS						
Model	STS450	STS4100	STS4150	STS4200	STS4300	STS4400
Height	1500 mm			1770 mm		
Width	685 mm			685 mm		
Dept	530 mm			580 mm		
Weight	175 Kg			205 Kg	220 Kg	240 Kg
Ventilation	Forced air cooling by internal fans.					
Cooling outlet	From top					
Cable Entry	From base / on front					
Protection	IP20					
Color	RAL9011					
Service access	From front side					

<X> letter on table shows 3 pole or 4 pole model options (3 = 3 pole , 4 = 4 pole)

Note : Dimensions are given without package sizes

MAINTENANCE

WARNING !!!

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.

The unit is designed for easy maintenance. Very little customer user 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 dump cloth.

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. First off all please note the error code AXX on the second line of the STS LCD panel

2. Did you follow the operation procedure? Did it happen on installation?

3. Did a power failure occur just after or before the malfunction noted on the STS?

4. What is the indicators status? (see alarms and alarm codes)

5. See recorded log events and their date and time

6. Were any changes made recently to unit or the critical equipment connected to the unit?

7. Did an overload condition occur? Remove load from the unit and restart it.

8. Check the two source input phase voltages and input fuses of the STS

9. Is the utility power phase sequence correct (were any changes phase sequence of the mains)?

10. If the load fails and there is no alarm on STS check the load distrubition fuses cables etc…

11. If over temperature alarm occurs please check the air outlets of the STS

OPTIONAL TCP/IP ADAPTOR SETUP

If optional TCP/IP adaptor is installed you need some network adjustments for TCP/IP connection make the network connections as displayed at the following figure:
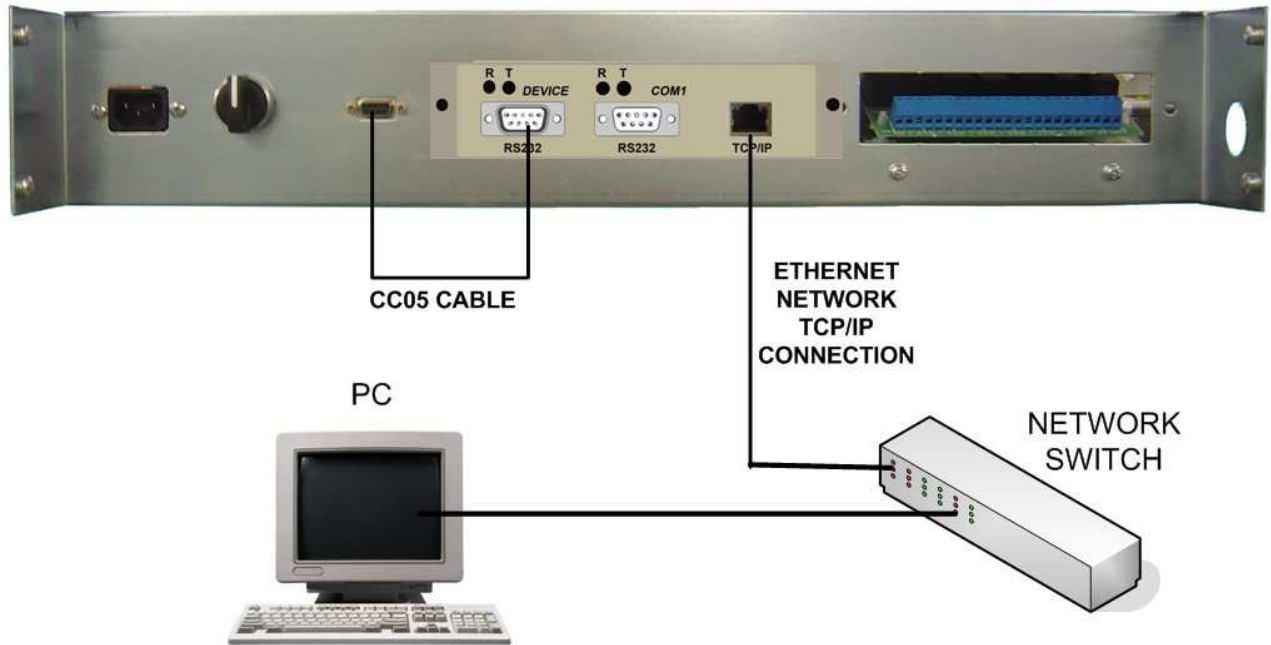

Figure 21

TCP/IP network Adjustment procedure

1) First setup Lantronix device installer software from TCP/IP adaptor CD

2) Run device installer software. (Start-Programs-Lantronix Device Installer)

This utility program finds all network connected TCP/IP adaptor devices.
If it fails please change your network settings (IP address and subnet mask) as static IP to the following values
İt is only for adjustment purpose after you adjust adaptor you can return to your old network settings.

TCP/IP Port (X-Port) factory settings:
IP: 10.0.0.xxx
Subnet Mask: 255.0.0.0
Gateway : 0.0.0.0

The startup screenshot is showed at the figure 28 The device installer program finds TCP/IP devices devices on the network automatically and lists all devices on program window.
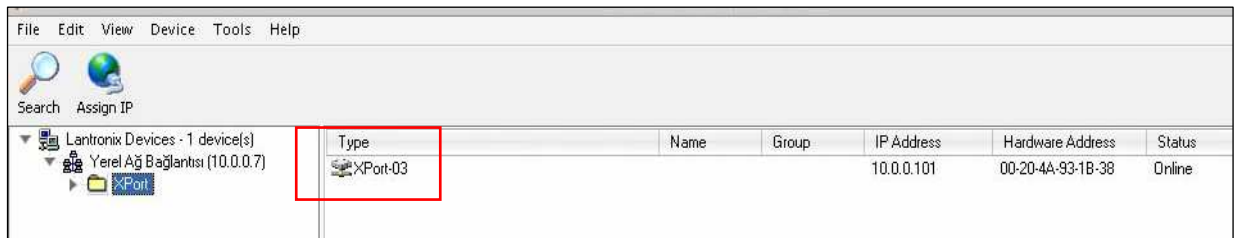
Figure 22

If the program finds TCP/IP adaptor device on the list double click on it and device details will be shown at the window. Select the related TCP/IP adaptor and click on *Assign IP* button for adjusting the adaptor to your network settings.
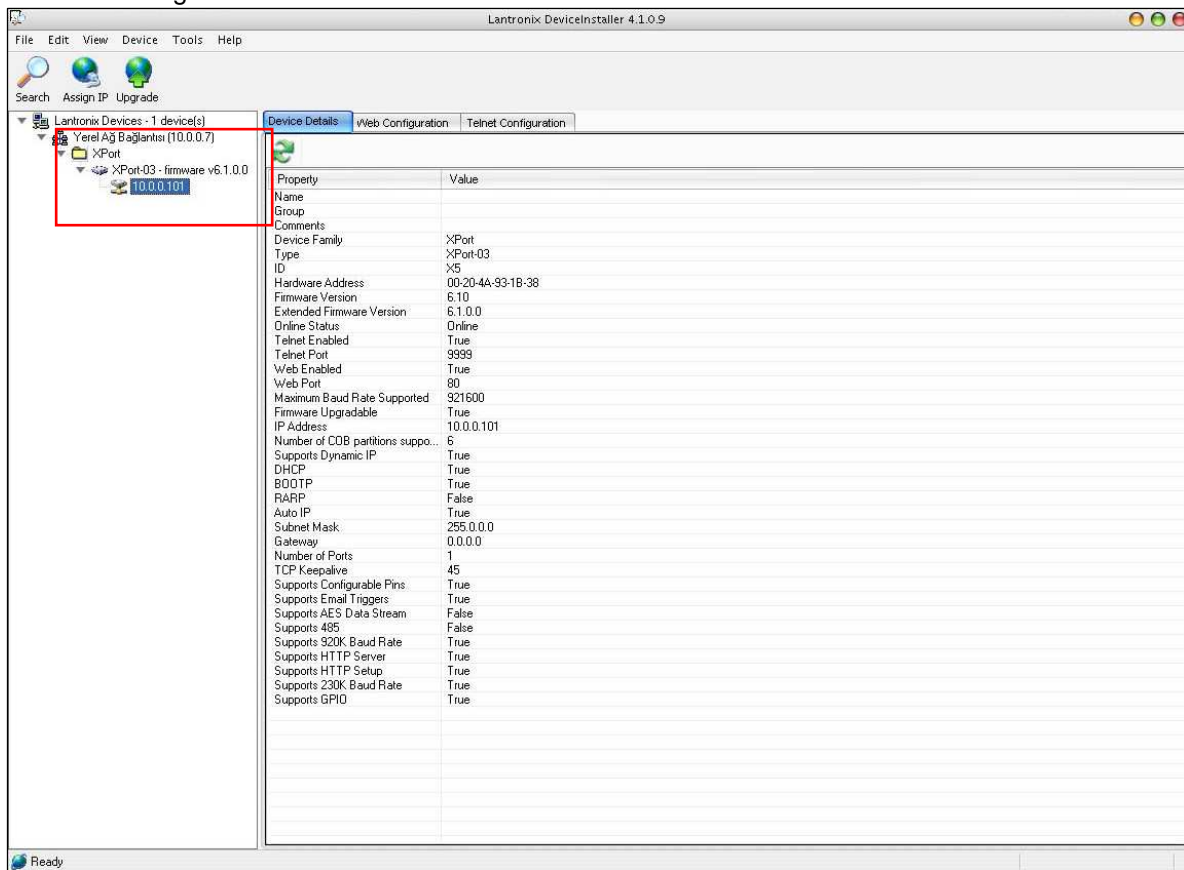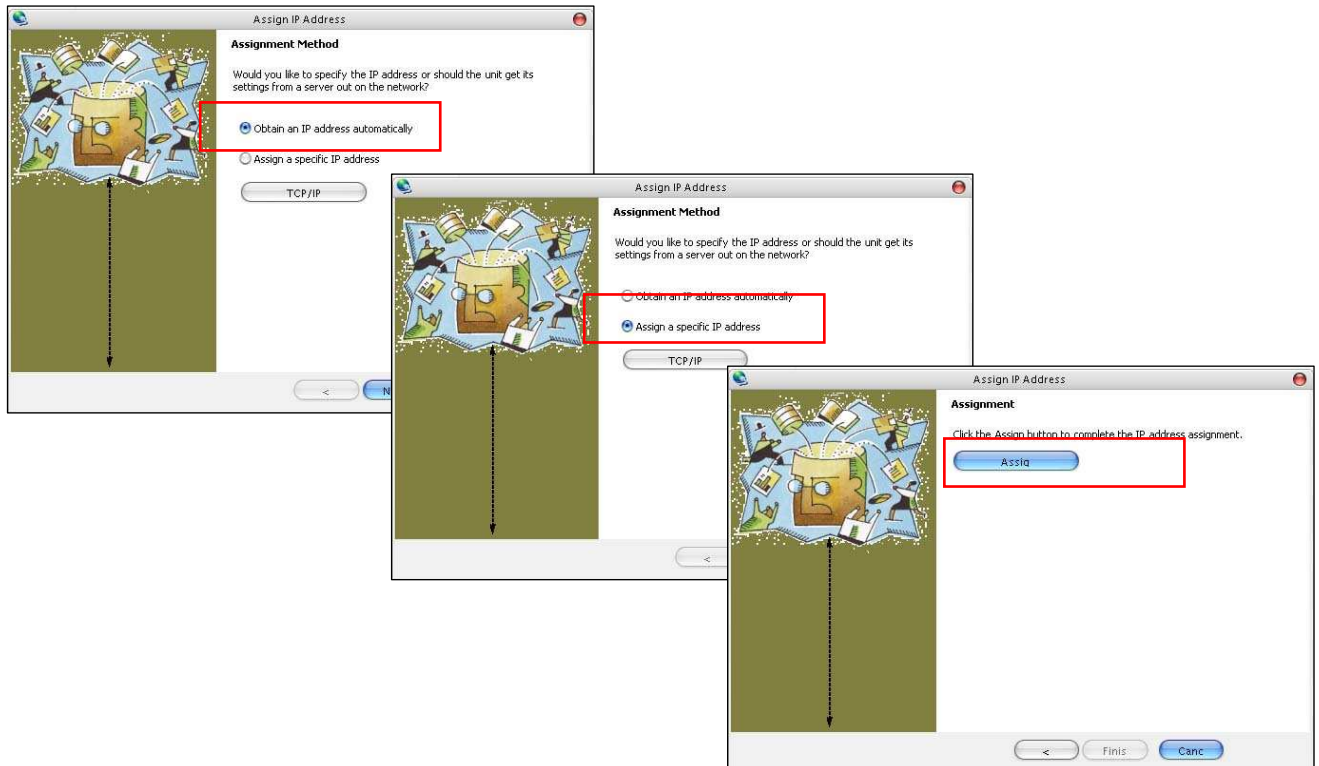

Figure 23

Figure 24

At "Assign IP" window select *Static IP* option from configuration window and click on *NEXT* button.

NOTE : The new IP address is different from 10.0.0.xxx or subnet mask is different from 255.0.0.0 value the unit connection may be lost in this case please re adjust your PC network settings to these network values.
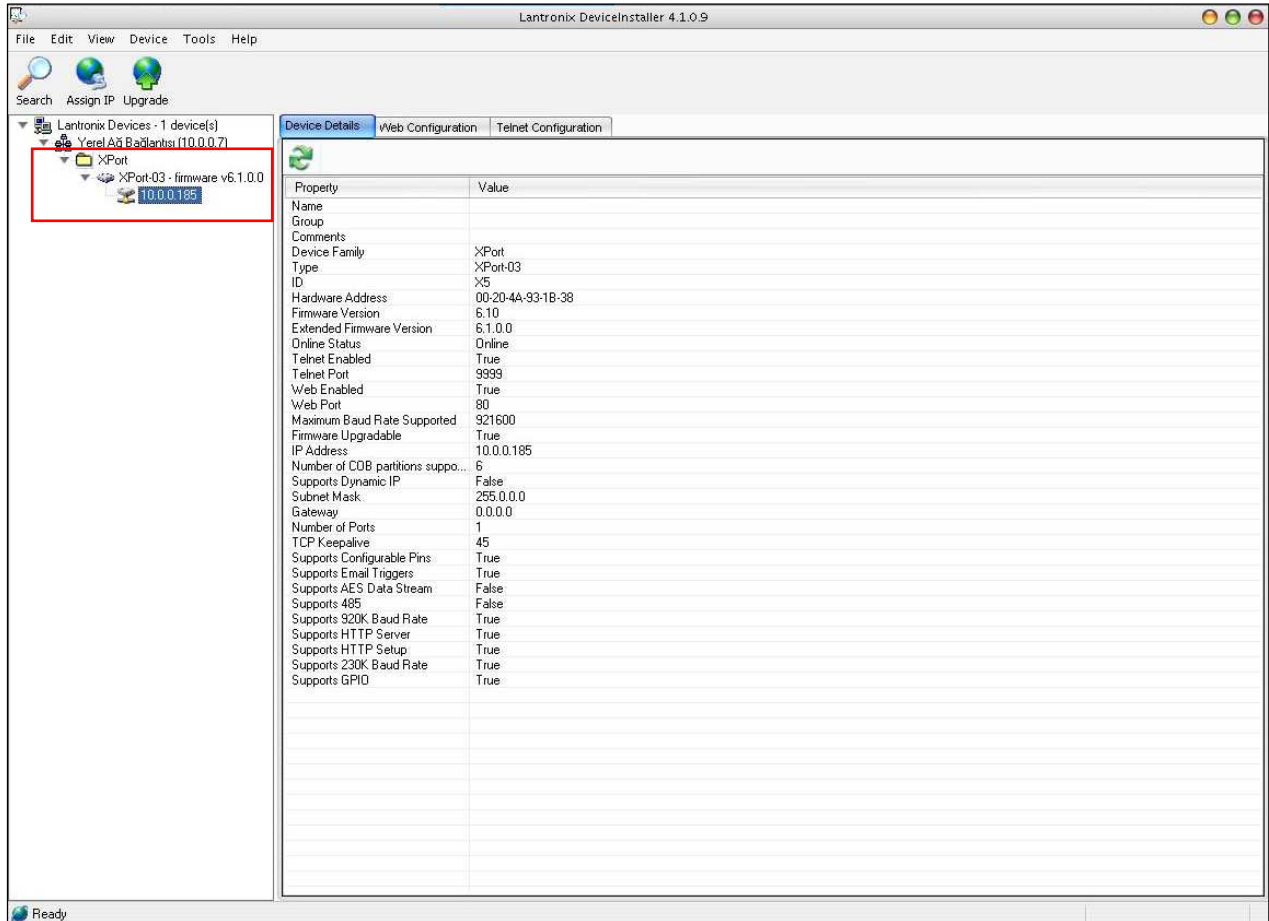
Figure 25

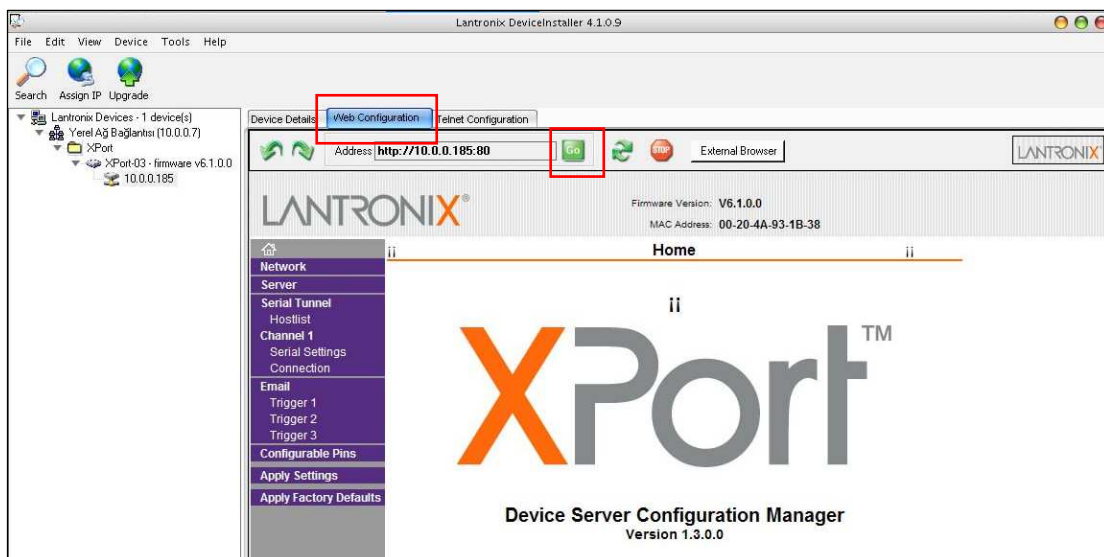After adjust TCP/IP adaptor Ethernet port IP addresses the new assigned IP address will be shown at device installer program window.

Figure 26

For detailed configuration we must connect to adaptor as WEB page to do this from device installer program click on WEB configuration. Than click on *GO* button and device main WEB PAGE comes to screen. Ignore username and password values for the first time.

For TCP/IP adaptor serial port configuration at the left side menu click on *Serial settings* serial configuration page comes to screen.

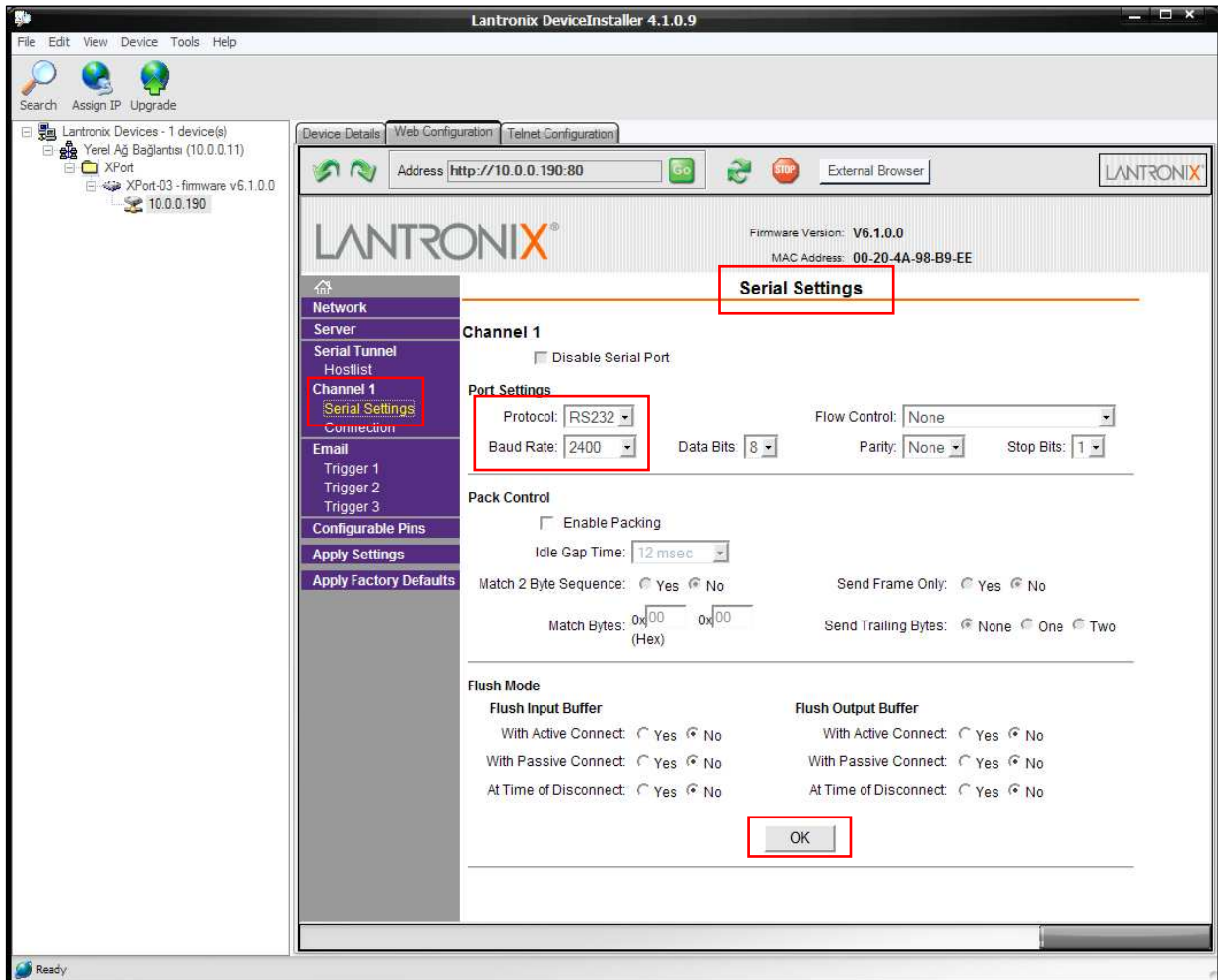| Parameter	value
Baud rate	2400
Click on *OK* button for update settings at the end of page	

Figure 27

For TCP/IP adaptor Ethernet configuration from the left side manu click on *Connection* related configuration page comes to screen.

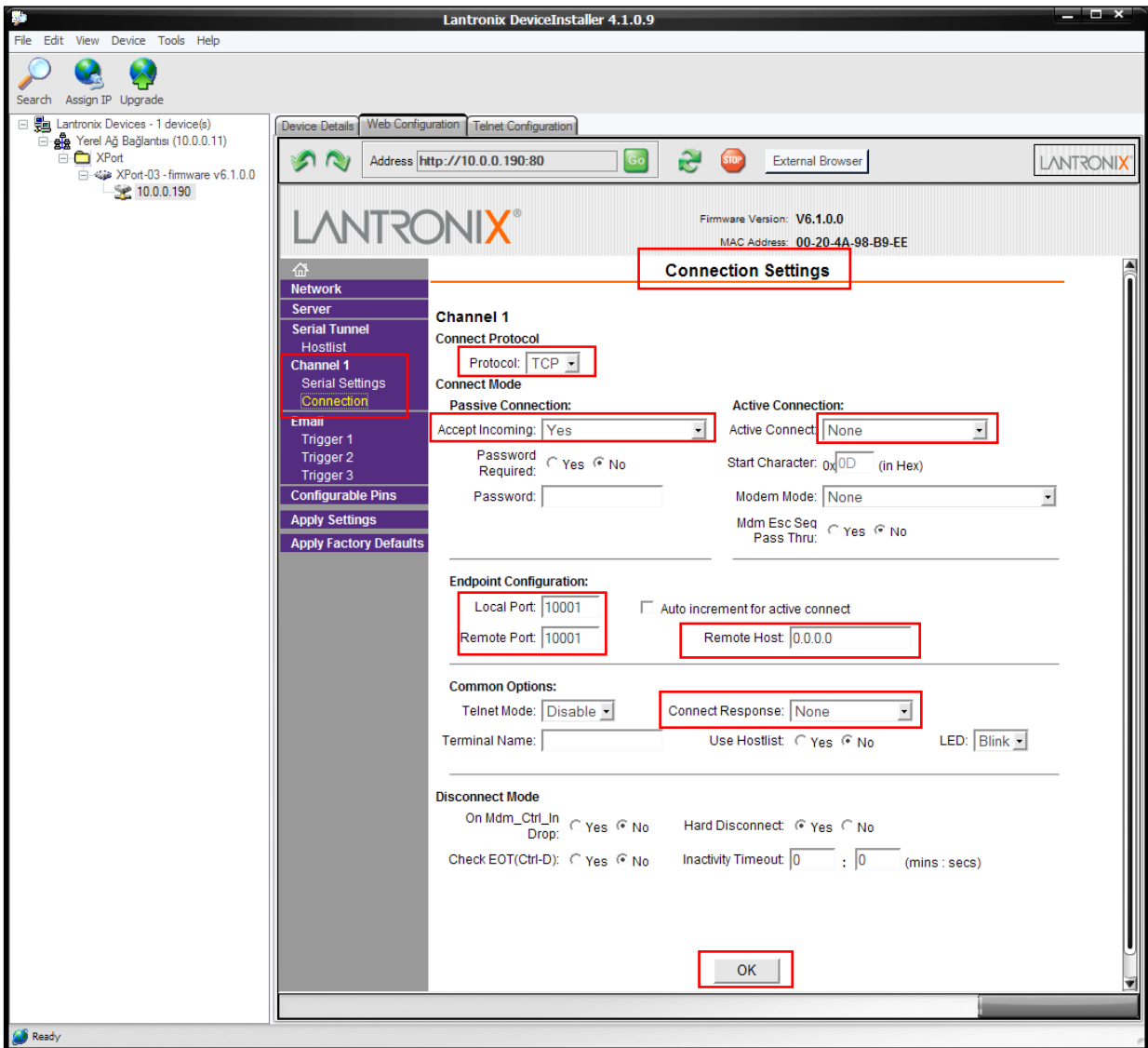| Connect Mode	Accept Incoming	YES
	Active Connect	None
	Connect Response	None
	Local port	10001
	Remote port	10001
Click on *OK* button for update settings at the end of page		

Figure 28

3) Now you are ready for connection ,run STS CONTROL software (first install it)

Figure 29

Type the given IP address (given IP at device installer) to Remote STS 1 white window check that TCP/IP port factory setting value is 10001. Click on Save button. From STS CONTROL main window select Connect to Remote STS on 10.0.0.190 (or any IP) and click on Connect button. Check that at the bottom of window Data OK message shows that the connection to remote STS is provided.

Figure 36

Figure 30

NOTES