STATIC TRANSFER SWITCH
SYSTEM

Installation & Operating Manual

SAVE THESE INSTRUCTIONS – This manual contains important instructions for Exeltech Static Transfer Switch System that should be followed during installation and maintenance.

CONSERVER CES INSTRUCTIONS — Cette notice contient d’importantes instructions visant les modèles Exeltech Static Transfer Switch System lesquelles doivent être suivies au moment de l’entretien de l’appareil.
CAUTIONS AND WARNINGS

CAUTION: It is essential to read and understand all Warnings, Cautions, and Notes before any connections are made to the unit or system. If further assistance is needed call (817) 595-4969 and ask for Customer Service.

ATTENTION: Il est essentiel de lire et de comprendre tous les avertissements, précautions et notes avant connexions sont faites à l'unité ou du système. Si une assistance supplémentaire est nécessaire appelez (817) 595-4969 et demandez le service à la clientèle.

WARNING: Intended for a CONTROLLED ENVIRONMENT

ATTENTION: Destiné à un ENVIRONNEMENT CONTRÔLE

WARNING: A means of disconnect shall be provided external to the inverter in the installation process.

AVERTISSEMENT: Un moyen de déconnexion doit être fournie externes à l'onduleur dans le processus d'installation.

WARNING: MORE THAN ONE LIVE CIRCUIT. SEE DIAGRAM.

AVERTISSEMENT : CET APPAREIL RENFERME PLUSIEURS CIRCUITS SOUS TENSION. VOIR LE SCHÉMA.

CAUTION: Observe all national and local electric codes during installation.

ATTENTION: Respectez tous les codes nationaux et locaux lors de l'installation.
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SYSTEM OVERVIEW

Preface:

This document provides system application and specification information on Exeltech's Static Transfer Switch System. This manual should be read in conjunction with the manual for the Exeltech Inverter System that accompanies the STS. The STS System is comprised of the following components:

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>800-00130-***</td>
<td>STS Backplane &amp; Relay Assembly</td>
</tr>
<tr>
<td>MX<em>1-S-1-</em>-1</td>
<td>STS Powerswitch Module(s)</td>
</tr>
<tr>
<td>MX31-C-1-6-1</td>
<td>STS Controller Module</td>
</tr>
</tbody>
</table>

Description:

The STS Backplane & Relay Assembly, STS Powerswitch Module(s), and STS Controller Module install into either a 19” or 23” Exeltech 4RU cage. This STS System is specifically designed to be installed with an Exeltech Inverter System to allow a secondary source of AC power.

The STS System will maintain continuous AC output in the event of a single AC source failure. Detecting a failure and transferring to the secondary source is typically under 4ms. Most loads will not be disturbed with a single source failure.

Components in the STS System vary with different power levels, voltage levels, and number of phases. All STS Systems are equipped with AC source monitoring via SNMP & Modbus over TCP/IP.

Exeltech is a TL9000 certified manufacturer of Telecommunication Equipment. Exeltech's Quality Management System has been demonstrated to meet the exacting standards of the Telecommunications Industry.
MODULES OVERVIEW

STS Backplane and Relay Assembly

STS Backplane & Relay Assembly is a common component among all STS Systems. The backfeed relay is a safety mechanism to prevent backfeed onto the utility AC source in the event of multiple component failures. The backplane assembly is used to complete power and signal paths between STS Controller, STS Powerswitch(s), and the backfeed relay. The backplane also provides the power output connections, alternate source input connections, and dry contact alarm connections.

STS Powerswitch Module

The STS Powerswitch module contains the SCR and cooling components required to continuously supply high current to the load from either source. Each phase requires a dedicated STS Powerswitch. So a 3 Phase system would require 3 STS Powerswitch modules. The STS Powerswitch is available in 85A and 170A models for different power needs. Each installation will require external overcurrent protection to ensure the STS Powerswitch does not operate above the rated current. Each STS Powerswitch contains LED indicators showing the status of Inverter Source, Utility Source, and Output. The STS Controller is responsible for operation of the SCR components in the STS Powerswitch.

STS Controller Module

The STS Controller module is a microprocessor based PCB that monitors the AC sources and controls the operation and automatic transfer of the SCR Powerswitch modules. A toggle switch on the STS Controller is used to set the primary source for the output power. The STS Controller determines the state of each source as good, bad, or failed and will automatically switch from a bad or failed source to a good source. Total detect and transfer time for a failed source is typically 4ms.

The STS Controller has three LEDs to indicate the status of each phase and one to indicate the overall status of the STS System. LED indicator descriptions can be found in the Module Details section of this manual. All of the system information can be accessed through the Ethernet port on the STS Controller. The information is available via SNMP & Modbus.
## OVERVIEW OF SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>90 to 135 Volts AC</td>
</tr>
</tbody>
</table>
| Input Frequency             | Utility: 58 to 61 Hz
                               | Inverter: 54 to 66 Hz                                       |
| Backfeed Protection         | Backfeed relay included                                     |
| Output Voltage              | Same as utility input voltage or inverter voltage            |
| Output Capacity (per phase) | STS Powerswitch 10kW: 85 Amps at 117 Volts, 10kW (maximum) @ 40°C |
|                             | STS Powerswitch 20kW: 170 Amps at 117 Volts, 20kW (maximum) @ 40°C |
| Transfer Time               | 4ms typical (Total detect and transfer)                     |
| Agency Approval             | UL 1778, CSA 107.1, CSA 107.3                               |
| Framework Type              | Exeltech 4RU Cage                                            |
| Mounting Width              | 19 or 23 Inch (Relay Rack Mounting)                         |
| Mounting Depth              | 15 Inches                                                   |
| Mounting Height             | 7 Inches (4U)                                               |
| Access                      | Rear for Installation and Maintenance
                               | Front for Operation                                         |
| Control                     | Microprocessor                                              |
| Color                       | Black Text LC 20008 Powder Coat                              |
| Options                     | Maintenance Bypass Switch (Recommended)                     |
| Environment                 | Protected environment -25°C to 40°C                         |
DETAILED DESCRIPTION AND SPECIFICATIONS:
STATIC TRANSFER SWITCH SYSTEM

Detailed Description:

System Configuration:

The system can be configured for 1, 2, or 3 phases with each phase capable of either 85 or 170 Amps. The STS System is available in 19 inch and 23 inch 4RU cages. Exeltech recommends a maintenance bypass switch (MBS) be installed with all STS Systems.

MBS Lockout:

A set of terminals are provided to connect the auxiliary signal wires from an Exeltech MBS to the STS System. This signal alerts the STS Controller that the MBS is about to activate. The STS Controller then forces the SCR Powerswitch to utility source for a safe make-before-break actuation of the MBS into the bypass position.

Dry Contact Alarms:

The STS System has 3 sets of dry contact relay alarms. The output alarm is on the STS Powerswitch and two programmable alarms are controlled by the STS Controller. Alarm connections are located on the backplane.

Remote Monitoring Software:

Product Status 2 is a light weight Java based GUI developed by Exeltech and available on Exeltech's website. The monitoring window is a simple method to view the status of various system parameters. It can also be used to change alarm configurations and for event data logging. The STS Controller communicates to Product Status 2 using Modbus over Ethernet. The IP address can be assigned by DHCP or static IP.

STS Controller can communicate with third party software through SNMP protocol or Modbus over Ethernet. The .mib file for SNMP monitoring is available on Exeltech's website. See Appendix B – Modbus Tables.

Transfer time:

All SCR based transfer switches are constrained to transfer at a current zero cross. Good to good transfers are seamless because they are timed to occur at the zero cross of the current waveform. Transfer time can vary from zero to up to 4 ms for failed source transfers depending upon where in the waveform the failure is detected. Transfer types are covered in more detail on page 19 in the Detailed Operation section of the STS Controller Module.
Physical Specifications:

Operating Environment:
- Temperature: -25°C to 40°C
- Temperature derating: 20% of full power for every 10°C over 40°C
- Humidity: 5% to 95% non-condensing
- Altitude: -60m to 1800m (-197 ft. to 5906 ft.)

Dimensions:
- 7” x 17.2” x 15” (H x W x D)
- 7” x 21.2” x 15” (H x W x D)

Weight:
- 85 Amp: 20.5 lbs, 22.5 lbs
- 170 Amp: 27 lbs, 27 lbs
- 1 Phase: 22.5 lbs
- 2 Phase: 27 lbs
- 3 Phase: 31.5 lbs

Finish: Powder Coat – Sherwin Williams Black Text LC 20008

Mounting Clearance Requirements:
- Above: 1.75” (1 U)
- Front: 12”
- Rear: 18”

AC Connection points:
- Mechanical Lugs: 1/0 – 6 awg
- Recommended Torque: 45 in-lbs.
- Customer Interface: 250MCM available in systems with AC customer interface
Front and back view: Multi-phase STS System
Back view: Single-phase STS System Backplane

Front view: Single-phase STS System with integral Maintenance Bypass Switch
Installation:

LOCATION:

The Static Transfer Switch System should be mounted in a location where only non-conductive pollution may occur. For full power capability, the temperature must be within the Operating Environment Specifications. The unit may be operated at elevated temperatures if the loading is reduced. See Physical Specifications for Operating Environment Specifications.

Air is drawn into the Static Transfer Switch System through the front panel mounted fans, and exits through vent holes in the top and rear. Adequate clearance is required in the front, rear, and top for both cooling and to provide access space for maintenance. See Physical Specifications, Mounting Clearance Requirements, for details.

AC WIRING:

Wiring should be of a gauge as large or larger than that called for in the chart. Insulation on all conductors must be rated for the highest voltage required by any field installed wire. Overcurrent protection must be provided at the time of installation.

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>Recommended Circuit Protection</th>
<th>(4,5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 deg C</td>
<td>85 Amps</td>
<td>3 AWG</td>
</tr>
<tr>
<td>40 deg C</td>
<td>170 Amps</td>
<td>3/0 AWG (90 deg C 1/0 AWG for 170Amps)</td>
</tr>
</tbody>
</table>

1) CAUTION: To reduce the risk of fire, connect only to a circuit provided with the appropriate maximum branch circuit overcurrent protection recommended above in accordance with the NEC, ANSI/NFPA 70 and the CEC, Part I, C22.1.

2) Wire sizes based on recommendations in the NEC, Table 310.16 for Insulated Conductors in a Raceway, Cable, or Earth, adjusted for an Operating Ambient Temperature of 40 deg. C. For operating in other ambients, apply the derating factors listed in the NEC. For operation in countries where the NEC is not recognized, follow applicable codes.

3) Wire sizes based on a maximum power of 10,000 watts, resulting in a current of 85.4 Amps AC and 20,000 watts, resulting in a current of 170.9 Amps AC.

GROUNDING:

The input and output of the inverter are isolated with a minimum of 1500 Vac. This isolation guarantees hazardous voltage from the output will not reach the input. The inverter is designed to have both the input and output grounded. The inverter is compatible with negative or positive ground battery systems.
Operation and Start Up:

STS System is intended to be installed with an Exeltech inverter. See appropriate Inverter Installation and Operation Manual for complete installation instructions.

**Installation:**

**STEP 1:** Make sure the Inverter System is mounted securely.
**STEP 2:** Check all input circuits that there is no voltage on any connection.
**STEP 3:** Check Inverter input power and signal connections made in the factory.
**STEP 4:** Connect all lines and neutral of the utility circuit to U1, U2, U3, and Neutral. Warning: Requires correct phase rotation of utility input
**STEP 5:** Connect all lines and neutral of the output circuit to L1, L2, L3, and Neutral.
**STEP 6:** Ground the chassis of the STS System to the facility central earth ground.
**STEP 7:** Neutral to chassis jumper should be removed from the STS System if there exists a neutral to ground connection anywhere else in the installation. This connection often already exists in the electrical panel for the utility source connection.
**STEP 8:** Torque all power wire connections. 45in-lb at terminals on STS backplane or 200in-lb at terminals in the customer interface cage.
**STEP 9:** Connect relay alarm for major and minor STS Controller alarms at P110.
  Wire size: 12-26awg Torque: 4in-lb
**STEP 10:** Connect relay alarm for STS Powerswitch output alarm.
  Single phase: use P108 pins 4-6
  Multi-phase: use combined output alarm P109 pins 4-6
  Wire size: 12-26awg Torque: 4in-lb
**STEP 11:** If MBS is remotely mounted, connect MBS lockout signal wires from the MBS to P114 Pins 5,6. Wire size: 12-26awg Torque: 4in-lb
**STEP 12:** Double check that all connections are correct and match the installation instructions.

**Start Up:**

**STEP 1:** With the MBS set to Bypass, energize the utility source.
**STEP 2:** Verify that voltage is available at the output for the loads.
**STEP 3:** Turn on the inverter source.
**STEP 4:** Verify that the inverter voltage powers up the STS System, that no Output LEDs are on and the phase indicators are blinking green. This indicates MBS active. Verify all inverter LEDs are green. See Inverter manual for more information on inverter LED's.
**STEP 5:** Move MBS from Bypass to “pause 1 sec” and listen for the backfeed relay to close.
  After pausing for at least 1 second, move the MBS to the Normal position.
**STEP 6:** As MBS is moved to normal, the STS Powerswitch output LED should show green.
**STEP 7:** After 30 seconds, verify the phase indicator LEDs are solid green.
**STEP 8:** STS Controller status LED will blink orange until communication is established for remote monitoring. See STS Controller section for more information.
Maintenance:

See the MX Series manual for total system maintenance procedures.
SCR POWERSWITCH MODULE

Detailed Description:

Components:

The SCR Powerswitch design contains minimal components thus reducing the opportunity for component defects and failures. This minimal approach is achieved by locating the controls and microprocessors on the SCR Controller.

LED Indicators:

On – Output energized
Utility – Utility energized
Inverter – Inverter energized

Cooling:

A controlled variable speed fan is located on the face plate of the SCR Powerswitch. The fan will operate when the module senses an appropriate temperature. Fan speed and SCR temperature are monitored, and reported to the SCR Controller.

Over Temperature Protection:

Each SCR Powerswitch will go into thermal shutdown when the heatsink temperature exceeds the maximum set point. Approximately 5C prior to thermal shutdown, a warning alarm will be sent from the STS Controller Module. Ambient temperatures in excess of the maximum specification could result in thermal shutdown unless the load is reduced appropriately. During thermal overload, the SCR Powerswitch will shut down and the alarm condition will persist. The module will automatically restart when it has sufficiently cooled.

Physical Specifications:

Dimensions: 6.8” x 3.2” x 12.3” (H x W x D)
Weight: 2.5 lbs (85A) / 4.5 lbs (170A)
Electrical Specifications:

SCR Voltage Drop: 1.3V typical
Fan Turn On: 45°C heatsink temperature (50°C for 85A)
Fan Full Speed: 60°C heatsink temperature (65°C for 85A)
Thermal Shutdown: 70°C heatsink temperature (75°C for 85A)
Thermal Recovery: 65°C heatsink temperature (70°C for 85A)
Continuous Current Rating: 85 Amps, 170 Amps
Form C Relay Alarm: 250VAC/VDC 1.5A
Efficiency, Heat Dissipation: See Table Below:

<table>
<thead>
<tr>
<th>Output Current Amps AC</th>
<th>Output Power @ 117 VAC</th>
<th>V drop Across SCR</th>
<th>Power Loss Watts</th>
<th>Input Power Watts AC</th>
<th>Efficiency (%)</th>
<th>Heat Dissipation BTU/Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>170 Amp</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5850</td>
<td>1.3</td>
<td>65.0</td>
<td>5915</td>
<td>98.90</td>
<td>222</td>
</tr>
<tr>
<td>100</td>
<td>11700</td>
<td>1.3</td>
<td>130.0</td>
<td>11830</td>
<td>98.90</td>
<td>444</td>
</tr>
<tr>
<td>150</td>
<td>17550</td>
<td>1.3</td>
<td>195.0</td>
<td>17745</td>
<td>98.90</td>
<td>666</td>
</tr>
<tr>
<td>170</td>
<td>19890</td>
<td>1.3</td>
<td>221.0</td>
<td>20111</td>
<td>98.90</td>
<td>755</td>
</tr>
<tr>
<td><strong>85 Amp</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>2925</td>
<td>1.3</td>
<td>32.5</td>
<td>2958</td>
<td>98.90</td>
<td>111</td>
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<tr>
<td>50</td>
<td>5850</td>
<td>1.3</td>
<td>65.0</td>
<td>5915</td>
<td>98.90</td>
<td>222</td>
</tr>
<tr>
<td>75</td>
<td>8775</td>
<td>1.3</td>
<td>97.5</td>
<td>8873</td>
<td>98.90</td>
<td>333</td>
</tr>
<tr>
<td>85</td>
<td>9945</td>
<td>1.3</td>
<td>110.5</td>
<td>10056</td>
<td>98.90</td>
<td>377</td>
</tr>
</tbody>
</table>
STS CONTROLLER MODULE

Detailed Description:

LED Phase Indicators:
- Blinking Green - MBS Active
- Solid Green - Both sources good
- Solid Orange - Secondary source bad or failed
- Blinking Orange - Primary Source bad or failed
- (Primary/Secondary sources are indicated by the primary select switch)

LED Status Indicator:
- Blinking Orange - Startup, acquiring Address/TCP connection
- Blinking Green - Startup complete, Modbus communication underway.
- Blinking Red/Green – Backfeed prevention active
- Solid Red – System Fault

Relay Contacts for Alarms: Two programmable dry contact relays are available on the backplane.

Monitoring: Modbus TCP/ IP and SNMP over Ethernet included to monitor all system information and provides traps to indicate service requests. See Appendix B – Modbus Tables

Primary select: A toggle switch on the face plate sets the STS System to run from either inverter primary or utility primary.

Detailed Operation:

The STS Controller monitors the AC sources and controls the operation and automatic transfer of the SCR Powerswitch modules. The foundation for decisions made by the SCR Controller starts with it's ability to determine the state of each source as good, bad, or failed. With the source information, the SCR Controller makes automatic decisions about aspects such as phase sync and automatic transfer between sources. See below for state descriptions.
Phase sync:

Upon startup, the SCR Controller will individually monitor the waveforms of both sources for frequency and voltage. This individual monitoring will result in a source achieving the "good" state if that source is determined to be within range for a continuous ___10s____. Both sources must be good for ___20s____ before the phase sync will occur.

The phase sync between the inverter and utility source will continue as long as both sources are good. The SCR Controller will unlatch the inverter phase sync from the utility waveform if either source goes bad. To restore the state of a source from "bad" to "good" requires continuous ___10s____ monitoring within range. Once both sources are good for ___20s____, the SCR Controller reasserts the phase sync between inverter and utility source.

Transfer types:

**Good - Good: Transfer between two good sources.**

Good - good transfers typically result from a toggle of the primary select switch. They can also occur when returning to the primary source after a bad - good or failed - good transfer or after MBS operation. Good - good transfers involve no detect time since there is no source to detect as bad or failed. The transfer occurs at zero cross of the current waveform and happens seamlessly with zero transfer time.

**Bad - Good: Transfer from a bad source to a good source.**

Bad - good transfers will automatically occur when the SCR Controller detects voltage or frequency of the active source that has fallen outside of the range of a good source. Detection of a bad source can take up to ___1sec____. A bad-good transfer has zero transfer time and will transfer at zero cross of the current waveform.

**Failed - Good: Transfer from a failed source to a good source.**

Failed - good transfers will automatically occur when the SCR Controller detects voltage or frequency from the active source has fallen into the failed range. Detection of a failed source occurs in ___2ms____ or less. Failed - good transfers can take up to ___4ms____ depending upon the position of the failure.
within the current waveform. Note that all SCR based transfer switches are limited to transfer at current zero cross.

**Bad - Bad: Transfer from one bad source to another bad source.**

In the event of two bad sources, the SCR Controller will follow the state of the primary select switch to determine which source will power the output.

**Fail - Bad: Transfer from a failed source to a bad source.**

Given a choice of failed source or bad source, the SCR Controller will act in a similar manner to the failed - good transfer. Detection of the failed source occurs in **2ms** or less and automatic transfer from the failed source to the bad source should take **4ms** or less.

**MBS operation:**

Before operation of the MBS switch, Exeltech recommends the STS System be set to utility primary and to confirm the utility source is supplying the power to the loads.

Every Exeltech MBS is equipped with an auxiliary output that provides a signal before the closing of power contacts. During MBS operation from Normal to Bypass, the SCR Controller will react to the MBS signal and immediately switch to the utility SCR. Without this signal, the closing of contacts inside the MBS will act to short the utility source to the output of the inverter which can result in failure of inverter power modules.

Upon returning the MBS from Bypass to Normal, the SCR Controller will force the output to continue to run from the utility SCR until both sources are good and phase synchronous. This process will take a minimum of **30s**. Once phase locked, the SCR Controller will follow the primary select switch.

**Backfeed Relay:**

The backfeed relay is used to prevent backfeed onto the utility source in the event of catastrophic failure. The coil for this normally open relay is powered by the phase 1 utility voltage via a control relay on the SCR Controller. Under normal conditions the SCR controller allows the backfeed relay to close automatically when utility is present. When utility is not present the backfeed relay coil cannot be energized so the relay will open automatically.

The SCR Controller monitors backfeed sensors and will open the backfeed relay under failure scenarios where the utility source is still present and the possibility of backfeed exists. The status LED will blink red/green if the relay is opened for backfeed prevention. The backfeed prevention state will not clear automatically. See procedure for clearing backfeed prevention state.
Clearing backfeed prevention state:

WARNING: Failure to investigate the cause of backfeed before moving the MBS from normal to bypass can cause major failure of the inverter components.

The safest way to clear backfeed prevention state is shut down the loads and turn off the inverter before moving the MBS from normal to bypass. Once in bypass, the system can be diagnosed.

Backfeed prevention state is stored in RAM and can only be cleared by removing all power to the SCR Controller. The backfeed prevention state will resume upon restart if the possibility for backfeed still exists.

Thermal Protection:

Primary temperature protection is controlled by the Powerswitch, the STS Controller will also activate to protect the unit in a severe over temperature condition. At 80C heatsink temperature (85C for 85A) the STS Controller will open the backfeed relay and activate the utility SCR. This thermal protection state will automatically clear after the heatsink temperature drops to 65C.

Remote Monitoring:

Remote monitoring is performed via the Ethernet port on the front of the STS Controller. Communication data stream to third party software includes both SNMP protocol and Modbus over Ethernet. The .mib file for SNMP monitoring is available on Exeltech's website. The Modbus definition tables are found in Appendix B.

Product Status 2 is a light weight Java based GUI developed by Exeltech and available on Exeltech's website. The monitoring window is a simple method to view the status of various system parameters. It can also be used to change alarm configurations and for event data logging. The STS Controller communicates to Product Status 2 using Modbus over Ethernet. The IP address can be assigned by DHCP or static IP. See Appendix C for information on using Product Status 2.
Programmable Alarms:

The STS Controller includes two dry contact relays which can be programmed to activate for the following conditions: see Remote Monitoring section

INV Primary – Activates when the primary is NOT set to INV

INV Fail – Activates if the INV source fails

UTIL Fail – Activates when the UTIL source fails (also activates while in maintenance bypass)

MBS – Activates when the MBS is in bypass mode

Phase Sync – Activates when the UTIL source and the INV source are not phase locked (also activates when UTIL is off)

Fan Fail – Activates if a fan failure is detected on the STS Powerswitch

Warm Temp – Activates 5°C before going into thermal over temperature protection

Hot Temp – Activates if the STS System is in thermal over temperature protection

Active Source – Activates when either SCR is powering the output

INV Source – Activates when the load is NOT being powered from the INV source

Back Feed Protection – Activates when the SCR Controller is in backfeed prevention mode

Forced INV – Activates when an inverter SCR short has been detected

Forced UTIL – Activates when a utility SCR short has been detected

Forced Contactor – Activates if the STS Controller has forced the backfeed relay open

Contactor – Activates when the backfeed relay is closed

PM Temp* – Activates if a Power Module is over temperature

PM Fail* – Activates if a Power Module fails

CC Fail* – Activates if any phase is running from the secondary control card

Low DC Volts* – Activates if the control card sends a signal because of low DCV

*Indicates programmable alarm only available with Sys Mon II cards.

Additional inverter information and features are available when used with Sys Mon II modules. The STS Controller will receive and report information about inverter components. The Sys Mon II modules offer additional dry contact alarms that activate for the following conditions:

**Minor Alarm** - PM Fail, PM Temp, Low DC Volts

**Major Alarm** - Any time the Sys Mon II determines the inverter source to be bad.
Physical Specifications:

Dimensions: 6.8” x 1.6” x 12.3” (H x W x D)

Weight: 0.8 lbs

Electrical Specifications:

Redundant power supplies:
Input Voltage: 90 to 135 Volts AC
Input Frequency: Utility: 58 to 61 Hz
               Inverter: 54 to 66 Hz
Form C Relay Alarms: 250VAC/VDC 1.5A
APPENDIX A – MECHANICAL DRAWINGS

23 INCH STS SYSTEM
19 INCH STS SYSTEM
## APPENDIX B – MODBUS TABLES

### Register Table

<table>
<thead>
<tr>
<th>Register</th>
<th>Name</th>
<th>Multiplier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>188</td>
<td>PHASE1_TXFR_STATUS</td>
<td>Bitfields</td>
<td>See TXFR_STATUS bitfields</td>
</tr>
<tr>
<td>189</td>
<td>PHASE1_MXPM_STATUS</td>
<td>Bitfields</td>
<td>See MXPM_STATUS bitfields</td>
</tr>
<tr>
<td>190</td>
<td>PHASE1_BATT_VOLT</td>
<td>x10</td>
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</tr>
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<td>201</td>
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<tr>
<td>203</td>
<td>RES</td>
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<td></td>
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<td>Display Inverter current value</td>
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<td>Display Inverter frequency x10</td>
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<td>RES</td>
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<tr>
<td>215</td>
<td>RES</td>
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<td></td>
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<td>Display Utility voltage value</td>
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<td>Display Utility current value</td>
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<td>Display Inverter voltage value</td>
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<td>219</td>
<td>PHASE3_INV_CURR</td>
<td>x1</td>
<td>Display Inverter current value</td>
</tr>
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<td>220</td>
<td>PHASE3_UTL_FREQ</td>
<td>x10</td>
<td>Display Utility frequency x10</td>
</tr>
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<td>221</td>
<td>PHASE3_INV_FREQ</td>
<td>x10</td>
<td>Display Inverter frequency x10</td>
</tr>
<tr>
<td>222</td>
<td>PHASE3_OUTP_VOLT</td>
<td>x1</td>
<td>Display Output Voltage value</td>
</tr>
<tr>
<td>223</td>
<td>PHASE3_SCR_TEMP</td>
<td>x1</td>
<td>Display SCR Temperature</td>
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Bitfields Table

<table>
<thead>
<tr>
<th>TXFR_STATUS BITFIELDS</th>
<th>MXPM_STATUS BITFIELDS</th>
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<tbody>
<tr>
<td>bit</td>
<td>Set value – Alarms Indicated</td>
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<tr>
<td>TXFR_STATUS &amp; 0x0001</td>
<td>Inverter Primary</td>
</tr>
<tr>
<td>TXFR_STATUS &amp; 0x0002</td>
<td>Bad Inverter Source</td>
</tr>
<tr>
<td>TXFR_STATUS &amp; 0x0004</td>
<td>Bad Utility Source</td>
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<tr>
<td>TXFR_STATUS &amp; 0x0008</td>
<td>MBS Lockout Asserted</td>
</tr>
<tr>
<td>TXFR_STATUS &amp; 0x0010</td>
<td>2 sources not sync</td>
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<tr>
<td>TXFR_STATUS &amp; 0x0020</td>
<td>Fan Fail Detected (SCR)</td>
</tr>
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<td>TXFR_STATUS &amp; 0x0040</td>
<td>Warm Temp (SCR)</td>
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<tr>
<td>TXFR_STATUS &amp; 0x0080</td>
<td>Overtemp (SCR)</td>
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<td>TXFR_STATUS &amp; 0x0100</td>
<td>SCR Active</td>
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<td>TXFR_STATUS &amp; 0x0200</td>
<td>Inverter SCR Driving</td>
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<td>TXFR_STATUS &amp; 0x0400</td>
<td>Backfeed Protection Enabled</td>
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<td>TXFR_STATUS &amp; 0x0800</td>
<td>Line 2 Line fail</td>
</tr>
<tr>
<td>TXFR_STATUS &amp; 0x1000</td>
<td>Forced Inverter State</td>
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<td>TXFR_STATUS &amp; 0x2000</td>
<td>Forced Utility State</td>
</tr>
<tr>
<td>TXFR_STATUS &amp; 0x4000</td>
<td>Forced Contactor open</td>
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<tr>
<td>TXFR_STATUS &amp; 0x8000</td>
<td>Contactor Open Detected</td>
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Table of Typical Values

<table>
<thead>
<tr>
<th>Description</th>
<th>Range</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>PHASE_BATT_VOLT</td>
<td>100 – 1200</td>
<td>DC Volts x10</td>
</tr>
<tr>
<td>PHASE_BATT_CURR</td>
<td>1-1000</td>
<td>DC Amps</td>
</tr>
<tr>
<td>PHASE_UTL_VOLT</td>
<td>100-277</td>
<td>AC Volts</td>
</tr>
<tr>
<td>PHASE_UTL_CURR</td>
<td>1-200</td>
<td>AC Amps</td>
</tr>
<tr>
<td>PHASE_INV_VOLT</td>
<td>100-277</td>
<td>AC Volts</td>
</tr>
<tr>
<td>PHASE_INV_CURR</td>
<td>1-200</td>
<td>AC Amps</td>
</tr>
<tr>
<td>PHASE_UTL_FREQ</td>
<td>500-4000</td>
<td>Frequency x10</td>
</tr>
<tr>
<td>PHASE_INV_FREQ</td>
<td>500-4000</td>
<td>Frequency x10</td>
</tr>
<tr>
<td>PHASE_OUTP_VOLT</td>
<td>100-277</td>
<td>AC Volts</td>
</tr>
<tr>
<td>PHASE_SCR_TEMP</td>
<td>25-110</td>
<td>Celcius</td>
</tr>
</tbody>
</table>
APPENDIX C – PRODUCT STATUS 2 OPERATION

Appendix C will cover the operation of Product Status 2 software available on the Exeltech website. This will allow the end user to monitor system parameters, reconfigure the programmable alarms, and view event history data logs. To communicate to the STS Controller via the Ethernet port your network must be able to assign the initial IP address via DHCP.

To set the STS Controller to work in Static IP mode, press and hold the reset button for 10 to 12 seconds until the status light turns off and stays off. Once the communication port reboots, the default IP address will be (192.168.1.1/255.255.255.0/192.168.1.0). Instructions for changing the static IP address are covered later in this Appendix.

Setting up Product Status to communicate with your STS Controller:

Step 1: Download the appropriate copy of Product Status 2 from the Exeltech website.
Step 2: Start the Product Status 2 software.
Step 3: Left click on “View” and select the correct phase information for your system.
Step 4: Left click on “Tools” then “Find Device” to open the following window.

![Find Device Window]

Step 5: Select the IP address with the MAC address matching the label on the front plate of the STS Controller then “OK”.

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Step 6: Left click on “Run” and you should now be receiving data to the Product Status 2 window. The Data State box should now show the message “Live”.

Step 7: At this point the Product Status 2 GUI is active and polling data from your system. You can now change the high limit and low limit fields for each parameter to your desired settings. Once complete, left click on “File” then “Save Settings” to store your phase information and limit field settings.
Configuring the programmable alarms your STS Controller:

The STS controller will ship with default alarm settings that will activate the Minor Alarm if the load is not being powered from the inverter source. The Major Alarm will activate if either the utility source or the inverter source fail. Follow these instructions to change the programmable alarm configuration.

Step 1: Open the Product Status 2 GUI and make sure it is actively polling data from your system.
Step 2: Set the primary select switch to Utility Primary and make sure the load is powered from utility source.
Step 3: Left click on “Tools” then “System Configuration” to open the following window.

Step 4: Use the drop down box to select Minor or Major alarm.
Step 5: Check and uncheck the parameters to create your desired alarm configuration. Selecting multiple parameters means any one of the parameters selected will cause the alarm to activate.
Step 6: Click “Send”
Step 7: After the alarm settings are set. Close the System Configuration window and move the primary select switch back to your desired primary source.
Using the event history data logs on Product Status 2:

If the Product Status 2 GUI is producing live data then it is also logging event history data. This data can be used to review the status history of the system parameters. Two logs are created as text files in the folder that the Product Status 2 software is launched from.

Parametric Log – Records system parameters such as voltage, current, frequency, and PCB temperature at a set time interval. The set time interval can be changed in the Data Logs window.

Failure Log – Records system status at set time intervals and any system alarms along with the time stamp of when they occurred.

To access these logs through the Product Status 2 GUI, left click “History” then “Data Logs”. Use the Display Options at the bottom of the Data Logs window to show or hide the two logs.

To access the text files for the failure log and parametric log, navigate to the location where the software is installed and open the sub folder titled “logs”.

To change the location of the log text files, left click on “Tools” then “Advanced Settings”. On the left bar of the Advanced Settings window select Data Logging. Now browse to the folder where you want the logs to be stored. The folder must be an existing folder since Product Status 2 will not create the folder automatically.
Configuring the Static IP address of your STS Controller:

Use the following procedure to change the static IP address of your STS Controller from default static IP to the one you assign.

Step 1: Right click “Tools” then “IP Configuration” to open the following window.

![IP Configuration Window]

Step 2: Select “Static” then enter the IP address, Subnet, Gateway, and Trap IP.
Step 3: Click “Set” then “OK”
Step 4: You will now need to go back to “Tools” and then “Find Device” to reestablish connection with the STS Controller at it's new IP address.

Note: The default static IP address can be re-obtained by holding the reset button for 10 to 12 seconds until the status light turns off and stays off. Once the communication port reboots, the default IP address will be (192.168.1.1/255.255.255.0/192.168.1.0)