STATIC TRANSFER SWITCH OPERATION AND INSTALLATION MANUAL

EXELTECH

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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 (800) 886-4683 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 (800)-886-4683 et demandez le service à la clientèle.

WARNING: The inverter is designed to operate from a battery. Performance cannot be guaranteed when a charger or power supply is used without a battery in the circuit. The Inverter might sustain damage with a battery in the circuit.

AVERTISSEMENT: Le variateur est conçu pour fonctionner à partir d'une batterie. Performance ne peut pas être garantie si un chargeur ou d'alimentation est utilisé sans une batterie dans le circuit. L'onduleur peut subir des dommages avec une batterie dans le circuit.

WARNING: Inverter chassis and neutral AC must be connected together with either of the battery connections and bonded to earth ground to comply with most code requirements.

ATTENTION: L'onduleur de châssis et neutre ca doit être connecté avec l'une des deux bornes de la batterie et ensuite connecté à la terre pour se conformer aux exigences du code.

WARNING: Inverter should be installed in Restricted Access Location.

ATTENTION: L'onduleur doit être installé dans un endroit à accès restreint.

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.

CAUTION: Check batteries and battery cables for correct polarity and voltage. The polarity of the leads is critical to avoid damage to the unit or the system.

ATTENTION: Vérifiez les piles et les câbles de batterie pour la polarité et la tension. La polarité de la mène est essentiel pour éviter d'endommager l'appareil ou le système.

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

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

Table of Contents

System Overview
1.0

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:

- STS Backplane & Relay Assembly
- STS Powerswitch Module(s)
- STS Controller Module
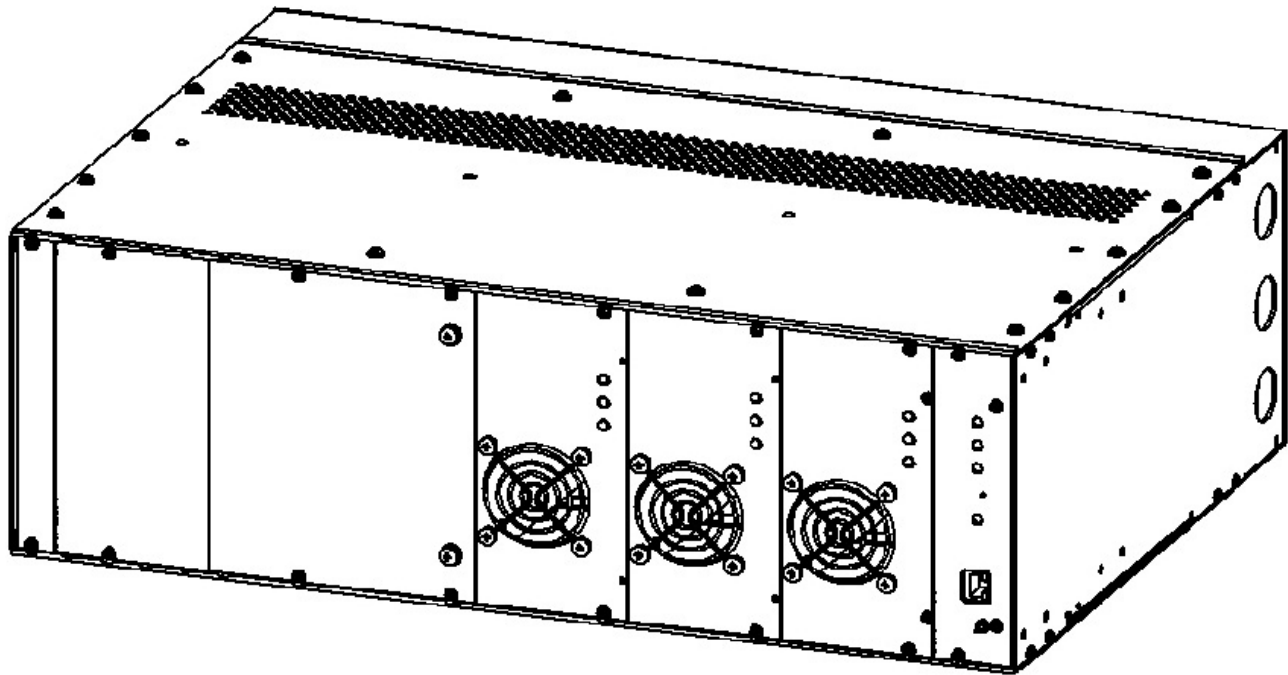
Description

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.

1.1 Modules Overview

1.1.1 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.

1.1.2 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.

1.1.3 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 STS 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 Section 4.2 of this manual. All of the system data can be accessed through the ethernet port on the STS Controller. The data is available via SNMP & Modbus.

STS BACKPLANE AND RELAY ASSEMBLY

STS CONTROLLER MODULE

STS POWERSWITCH MODULE
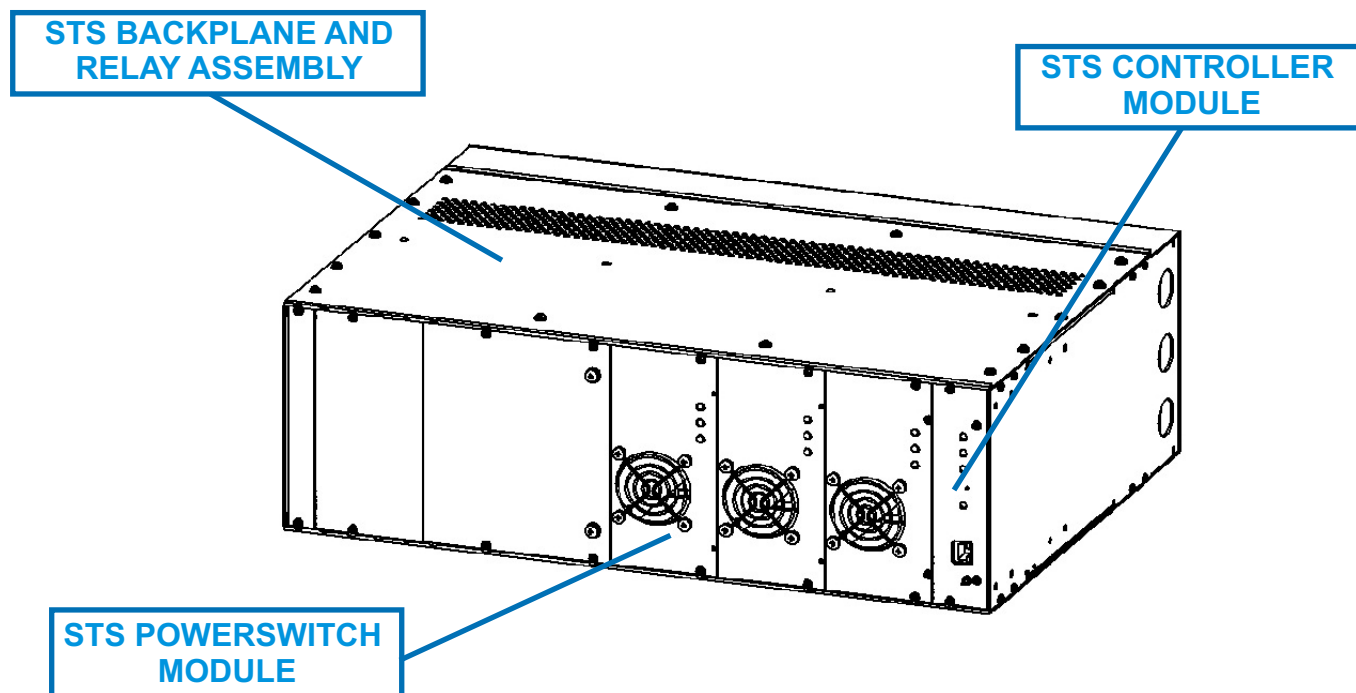
Standard Features
2.0

2.1 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 STS 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 is a light weight Java based GUI developed by Exeltech and available on Exeltech's website www.exeltech.com. 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 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 Section 4.3.4)

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 in Section 4.2.

Installation
3.0

3.1 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 Section 6.0).

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 Section 6.0).

3.2 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.

WIRING SIZE FOR 75 or 90 deg C RATED COPPER CONDUCTOR		
Operating Temperature	Recommended Circuit Protection	(2,3)
40 deg C	85 Amps	3 AWG
40 deg C	170 Amps	3/0 AWG (90 deg C 1/0 AWG for 170Amps)

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.

3.3 Start Up Procedure

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 alarm1/minor & alarm2/major 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 Section 4.2)

Operation
4.0

4.1 STS Powerswitch Module

Components:

The STS 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 STS controller.
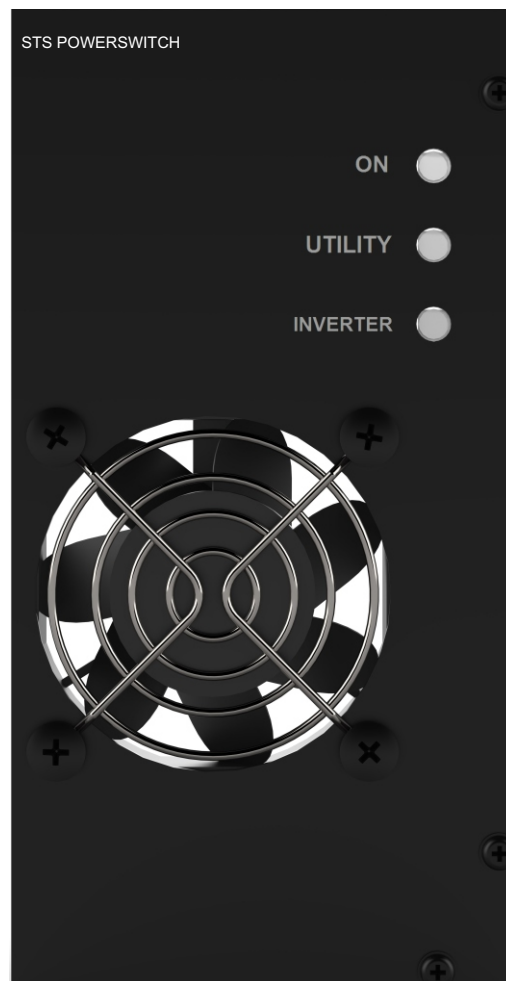
LED Indicators:

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

Cooling:

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

Over Temperature Protection:

Each STS 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 STS powerswitch will shut down and the alarm condition will persist. The module will automatically restart when it has sufficiently cooled.

4.2 STS Controller Module

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:
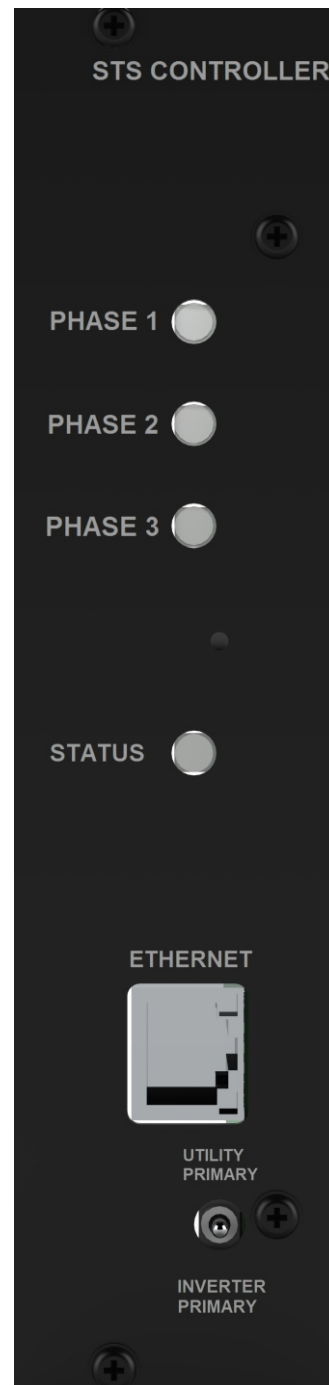Two programmable dry contact relays are available on the backplane.

Monitoring:
Modbus TCP/ IP and SNMP over Ethernet included to monitor all system
information and provides traps to indicate service requests.
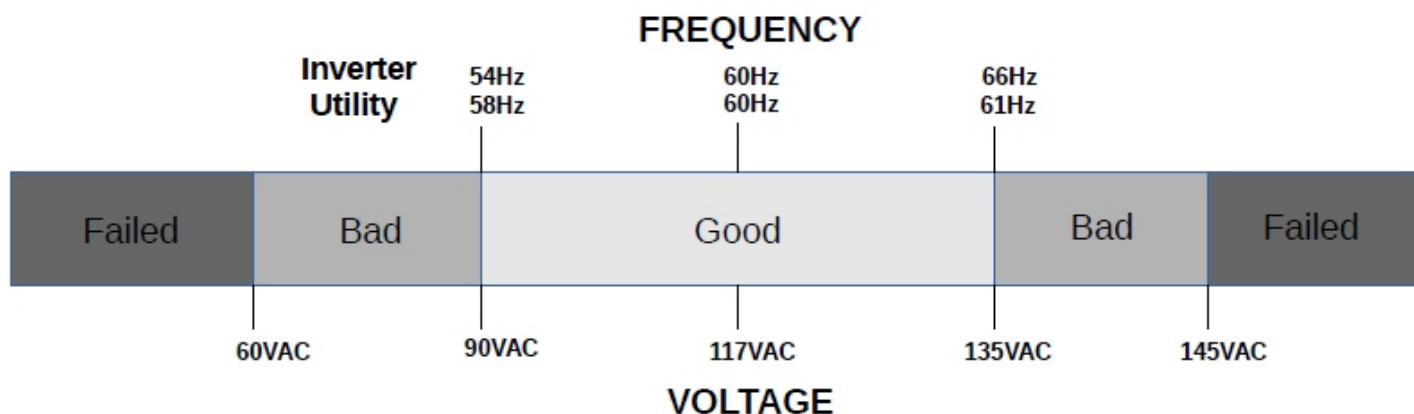(See Section 4.3.4)

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

Operation:

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

FREQUENCY

	Inverter	54Hz	60Hz	66Hz
	Utility	58Hz	60Hz	61Hz

Failed	Bad	Good	Bad	Failed

60VAC 90VAC 117VAC 135VAC 145VAC

VOLTAGE

Phase Sync:

Upon startup, the STS 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 STS 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 STS 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 STS 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 STS 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 STS 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 STS 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 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 STS 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 STS 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 STS 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 STS Controller. Under normal conditions the STS 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 STS 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 STS 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 Section 4.3.4.

Product Status 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 using Modbus over Ethernet. The IP address can be assigned by DHCP or static IP. See Section 4.3 for information on using Product Status.

4.3 Product Status Operation
* To begin Product Satus installation you will need an Ethernet cord, router and computer.

This section will cover the operation of Product Status software available on the Exeltech website (www.exeltech.com). 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 section.

Setting up Product Status to communicate with your STS Controller:

Step 1: Download the appropriate copy of Product Status from the Exeltech website.

Step 2: Start the Product Status 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.
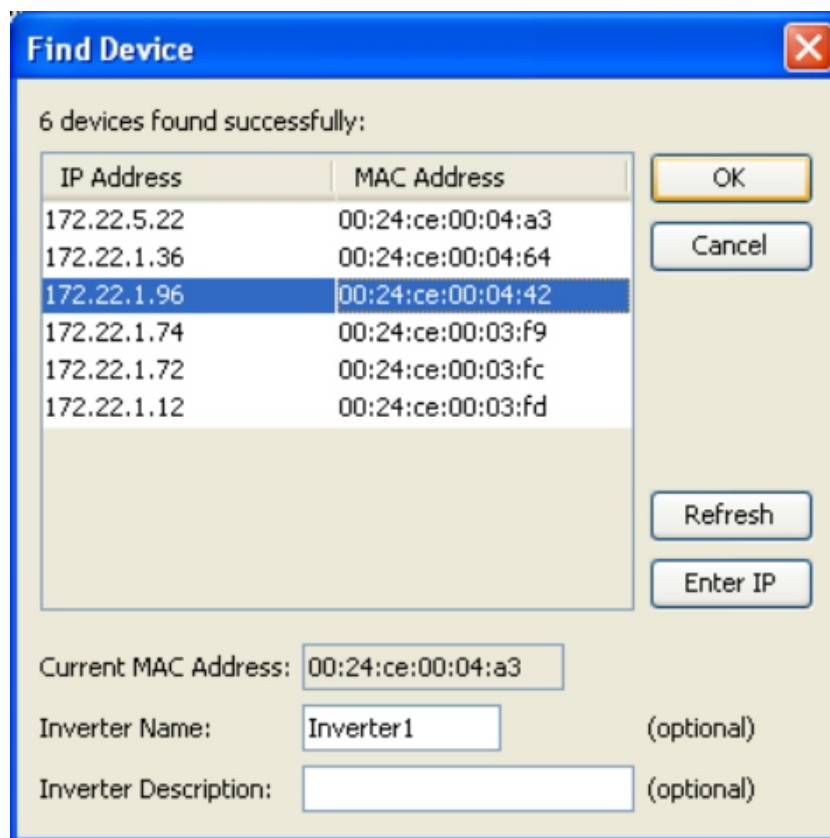
Step 5: Select the IP address with the MAC address matching the label on the front plate of the STS Controller then "OK".

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

Step 7: At this point the Product Status 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.

DESCRIPTION OF PRODUCT STATUS LABELS:

Overall System

00:00:00:00:00:00 Top Left Tab: Displays the MAC Address of the device that Product Status is connected to.

Alarm: Displays if any of the chosen alarms are currently active.

Prim: Displays if the Primary Source is active.[1]

Src: Displays if the Secondary Source is active.[1]

AB Bus: Displays if one of the two redundant battery banks are too low.[2]

Minor/Alarm1: Displays if any Minor/Alarm 1 alarm is currently triggered .

Major/Alarm2: Displays if any Major/Alarm 2 alarm is currently triggered.

Maint BP: Displays the status of the Maintenance Bypass Switch if one is installed.[1]

Modbus Update: The update number increases every time Product Status receives new data from Modbus.

Readings General

Data Column Box: This output displays the value associated with the label to the left of it. The boxes background color indicates further information about the value.

Yellow: Not/Applicable means no data is available.
Red: The value has exceeded the High or Low Limit.
Green: The value is within the set data range.

Low Limit: This box allows the user to input a lower limit on the expected value of the data field.

High Limit: This box allows the user to input an upper limit on the expected value of the data field.

Battery Voltage (V dc): This displays the voltage of the DC input to the inverter.

Battery Current (I dc): This displays the current of the DC input to the inverter.

Line 1: The information inside the Line 1 section is related to the Phase 1 power modules. In single phase mode, this is the only section that will be displayed

Line 2: The information inside the Line 2 section is related to the Phase 2 power modules.

Line 3: The information inside the Line 3 section is related to the Phase 3 power modules.

Line to Line: Displays the voltage difference between two AC lines.

Inverter Voltage (V ac): Displays the AC voltage of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Inverter Current (I ac): Displays the AC current of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Inverter Frequency (Hz): Displays the AC frequency of the Phase 1 inverter output. (Displays true RMS readings when connected to the Monitor Card).

Utility Voltage (V ac): Displays the AC voltage of the Utility Source.

Utility Current (I ac): Displays the AC current of the Utility Source.

Utility Frequency (Hz): Displays the AC frequency of the Utility Source.

Output (V ac): Displays the AC voltage output of the system

Output VA (V ac * I ac): This displays the output power in Watts.

Power Switch Temp (C): This displays the temperature of the STS Powerswitch in degrees Celsius if one is installed.[1]

Minor Alarms

Power Module: This alarm indicates that there is a problem with the power module.

Power Module Temp: This alarm indicates that the power module is running at too high of a temperature.

Inverter Reference: This alarm indicates that the system switched from the primary to the secondary control card(MX), master module(LC).

Control Card Temp: This alarm indicates that the control card is running at too high of a temperature.(MX systems only)

Phase 1 Sync: This alarm indicates that Phase 1 is out of sync with the Utility input signal.[1]

Low Voltage: This alarm indicates that the DC input voltage to the inverter is too low.

Power Switch Temp: This alarm indicates that the STS Powerswitch module is running at too high of a temperature.

Controls

Data State: This displays the state of the connection of Product Status with the monitor card.

-Inconsistent: Indicates that the connection is bad.

-Live: Indicates that the connection is good.

Mode: This button changes how Product Status is getting information from Modbus.

-The Poll setting will read in new information once every few seconds.

-The Receive is supported with Legacy MX products only.

Run: This button will attempt to connect Product Status to the monitor card with the MAC Address matching the tab in the upper left hand corner of the product status window. To change the MAC Address, see the" QUICK START" section of this manual. If Product Status successfully connects to the monitor card, the Data State box will display "Live".

Stop: This button will disconnect Product Status from the monitor card.

[1] If equipped with STS Transfer Switch

[2] If equipped with A/B Buss option

4.3.1 Configuring Programmable Alarms on the STS Controller:

The STS Controller will ship with default alarm settings that will activate the Minor/Alarm 1 if the load is not being powered from the utility source. The Major/Alarm 2 will activate if either the utility source or the inverter source fail or if the MBS goes into bypass. Follow these instructions to change the programmable alarm configuration.

Step 1: Open the Product Status 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.
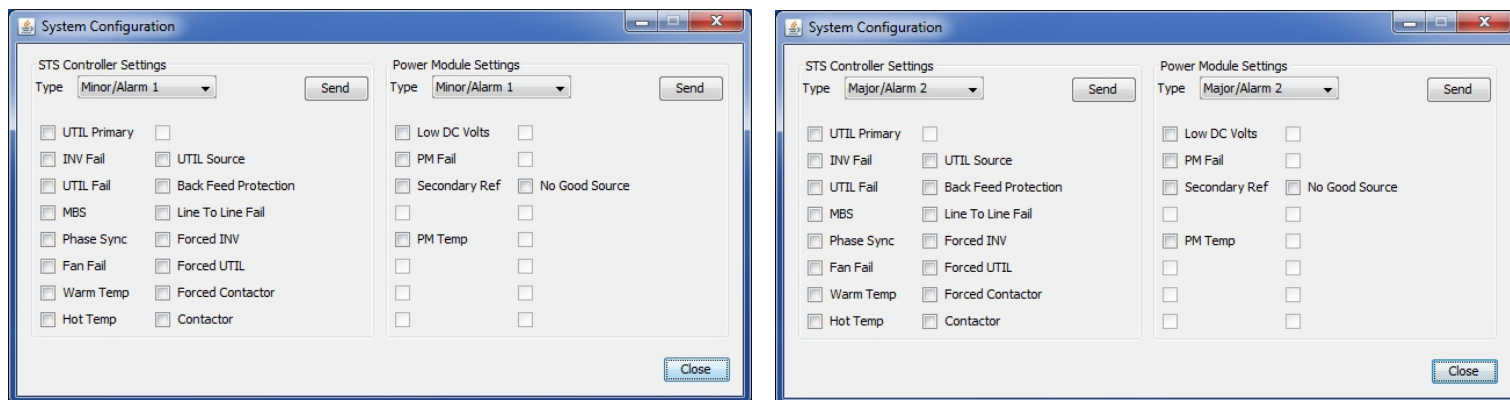
Step 4: Use the drop down box to select Minor/Alarm 1 or Major/Alarm 2.

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.

Programmable Alarm Descriptions:

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

UTIL 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 5C before going into thermal over temperature protection

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

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

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

Line to Line Fail - Activates when a polyphase loses one or more lines

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/Secondary Ref* – Activates if any phase is running from the secondary control card(MX), master module(LC)

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

No Good Source* - Activates if both sources are bad or failed

*Indicates programmable alarm only available with MX System Monitor II cards or LC Monitor cards.

Note: On MX systems additional inverter information and features are available when used with System Monitor II modules. The STS Controller will receive and report information about inverter components. The System Monitor 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 System Monitor II determines the inverter source to be bad.

4.3.2 Using the Event History Data Logs on Product Status:

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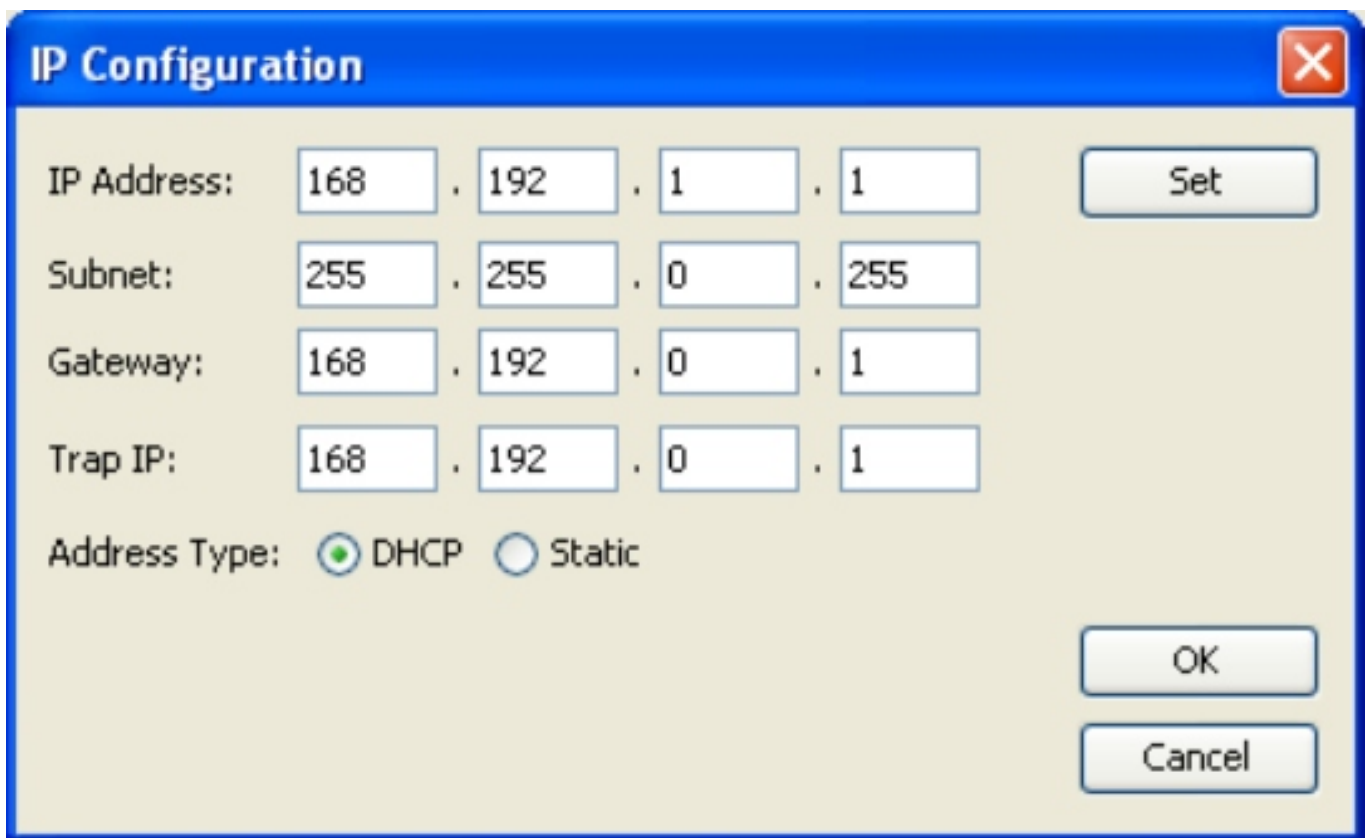
To change the location of the log text files, left click on "Tools" then "Advanced Settings". On the left bar of the Advanced Settings window select Data Logging. Now browse to the folder where you want the logs to be stored. The folder must be an existing folder since Product Status will not create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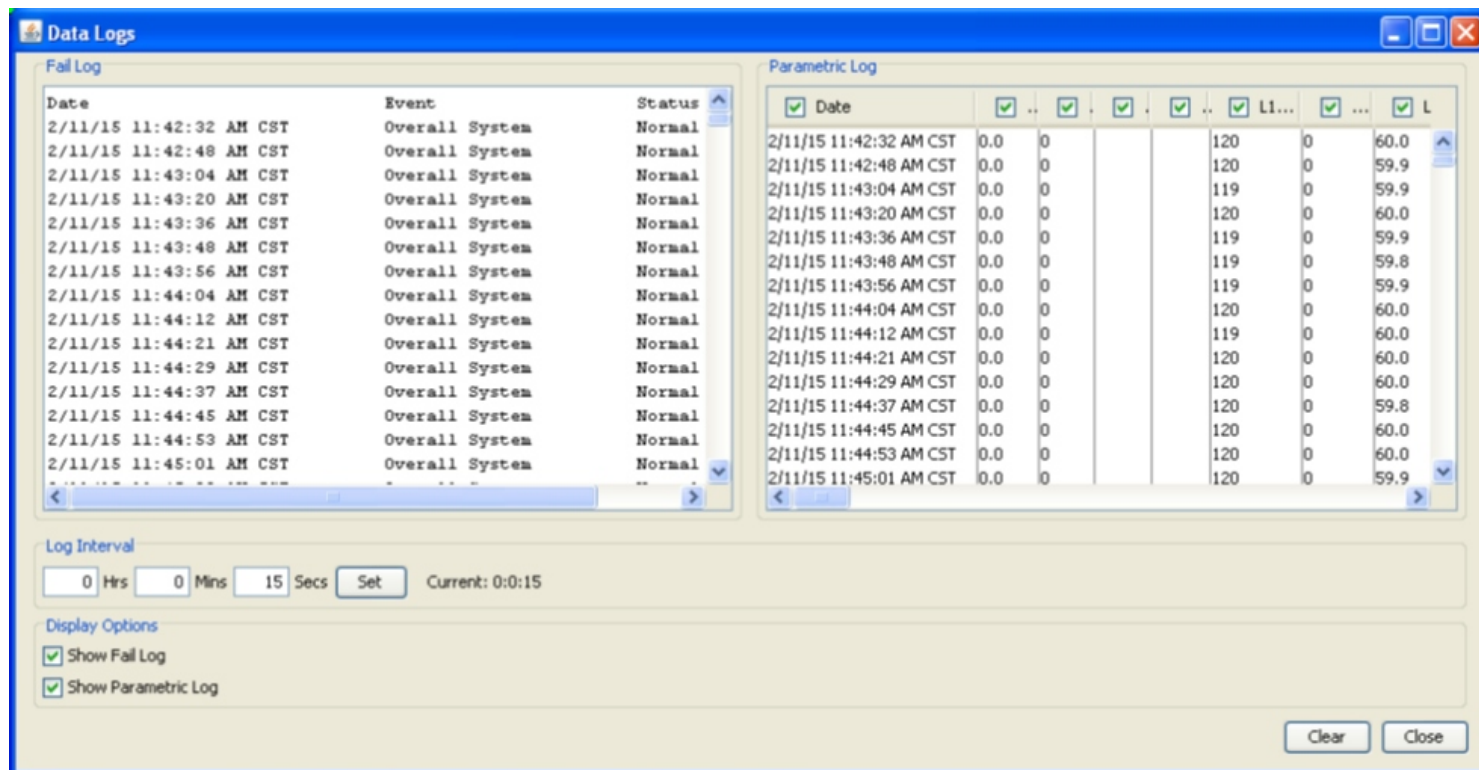
4.3.3 Configuring the Static IP Address of the STS Controller:

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.

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)

4.3.4 MODBUS TABLES

Register Table			
Register	Name	Multiplier	Description
188	PHASE1_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
189	PHASE1_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
190	PHASE1_BATT_VOLT	x10	Display Battery voltage value x10
191	PHASE1_BATT_CURR	x1	Display Battery current value
192	PHASE1_UTL_VOLT	x1	Display Utility voltage value
193	PHASE1_UTL_CURR	x1	Display Utility current value
194	PHASE1_INV_VOLT	x1	Display Inverter voltage value
195	PHASE1_INV_CURR	x1	Display Inverter current value
196	PHASE1_UTL_FREQ	x10	Display Utility frequency x10
197	PHASE1_INV_FREQ	x10	Display Inverter frequency x10
198	PHASE1_OUTP_VOLT	x1	Display Output Voltage vaue
199	PHASE1_SCR_TEMP	x1	Display SCR Temperature
200	PHASE2_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
201	PHASE2_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
202	RES		
203	RES		
204	PHASE2_UTL_VOLT	x1	Display Utility voltage value
205	PHASE2_UTL_CURR	x1	Display Utility current value
206	PHASE2_INV_VOLT	x1	Display Inverter voltage value
207	PHASE2_INV_CURR	x1	Display Inverter current value
208	PHASE2_UTL_FREQ	x10	Display Utility frequency x10
209	PHASE2_INV_FREQ	x10	Display Inverter frequency x10
210	PHASE2_OUTP_VOLT	x1	Display Output Voltage vaue
211	PHASE2_SCR_TEMP	x1	Display SCR Temperature
212	PHASE3_TXFR_STATUS	Bitfields	See TXFR_STATUS bitfields
213	PHASE3_MXPM_STATUS	Bitfields	See MXPM_STATUS bitfields
214	RES		
215	RES		
216	PHASE3_UTL_VOLT	x1	Display Utility voltage value
217	PHASE3_UTL_CURR	x1	Display Utility current value
218	PHASE3_INV_VOLT	x1	Display Inverter voltage value
219	PHASE3_INV_CURR	x1	Display Inverter current value
220	PHASE3_UTL_FREQ	x10	Display Utility frequency x10
221	PHASE3_INV_FREQ	x10	Display Inverter frequency x10
222	PHASE3_OUTP_VOLT	x1	Display Output Voltage vaue
223	PHASE3_SCR_TEMP	x1	Display SCR Temperature

Bitfields Table					
TXFR_STATUS BITFIELDS			MXPM_STATUS BITFIELDS		
	bit	Set value – Alarms Indicated		bit	Set value – Alarms Indicated
_TXFR_STATUS	& 0X0001	Inverter Primary	_MXPM_STATUS	& 0X0001	Low DC Volt alarm
_TXFR_STATUS	& 0X0002	Bad Inverter Source	_MXPM_STATUS	& 0X0002	Module Fail Detected
_TXFR_STATUS	& 0X0004	Bad Utiity Source	_MXPM_STATUS	& 0X0004	Secondary Ref Detected
_TXFR_STATUS	& 0X0008	MBS Lockout Asserted	_MXPM_STATUS	& 0X0008	Module Overtemp Detected
_TXFR_STATUS	& 0X0010	2 sources not sync	_MXPM_STATUS	& 0X0010	n/a
_TXFR_STATUS	& 0X0020	Fan Fail Detected (SCR)	_MXPM_STATUS	& 0X0020	n/a
_TXFR_STATUS	& 0X0040	Warm Temp (SCR)	_MXPM_STATUS	& 0X0040	n/a
_TXFR_STATUS	& 0X0080	Overtemp (SCR)	_MXPM_STATUS	& 0X0080	AB Buss Fail Detected
_TXFR_STATUS	& 0X0100	SCR Active	_MXPM_STATUS	& 0X0100	n/a
_TXFR_STATUS	& 0X0200	Inverter SCR Driving	_MXPM_STATUS	& 0X0200	POPK Failure
_TXFR_STATUS	& 0X0400	Backfeed Protection Enabled	_MXPM_STATUS	& 0X0400	n/a
_TXFR_STATUS	& 0X0800	Line 2 Line fail	_MXPM_STATUS	& 0X0800	n/a
_TXFR_STATUS	& 0X1000	Forced Inverter State	_MXPM_STATUS	& 0X1000	n/a
_TXFR_STATUS	& 0X2000	Forced Utility State	_MXPM_STATUS	& 0X2000	n/a
_TXFR_STATUS	& 0X4000	Forced Contactor open	_MXPM_STATUS	& 0X4000	n/a
_TXFR_STATUS	& 0X8000	Contactor Open Detected	_MXPM_STATUS	& 0X8000	n/a

Table of Typical Values		
Description	Range	Units
PHASE_BATT_VOLT	100 – 1200	DC Volts x10
PHASE_BATT_CURR	1-1000	DC Amps
PHASE_UTL_VOLT	100-277	AC Volts
PHASE_UTL_CURR	1-200	AC Amps
PHASE_INV_VOLT	100-277	AC Volts
PHASE_INV_CURR	1-200	AC Amps
PHASE_UTL_FREQ	500-4000	Frequency x10
PHASE_INV_FREQ	500-4000	Frequency x10
PHASE_OUTP_VOLT	100-277	AC Volts
PHASE_SCR_TEMP	25-110	Celcius

Maintenance
5.0

5.1 Common Maintenance

Preventative maintenance required on Exeltech products is minimal. Under normal circumstances, the only maintenance required is a regular visual inspection of the STS system to check for signs of dirt, dust, corrosion or other damage. STS systems that are used in harsh environments such as mining or marine, should be inspected more frequently as well as cleaned if dusty or dirty. Accumulated dust may block airflow and impede cooling which can cause overheating. The units should also be checked thoroughly for loose hardware or damaged wiring caused by excessive shock or vibration.

Note: See the specific Inverter Series (MX/LC/NC) manual for total system maintenance procedures.

Specifications
6.0

6.1 STS System Electrical Specifications

INPUT POWER

INPUT VOLTAGE	INPUT FREQUENCY
90 - 135 VAC	58 - 61 Hz

OUTPUT POWER

OUTPUT VOLTAGE	TRANSFER TIME (TYPICAL FOR DETECT AND TRANSFER)
Same as utility voltage or inverter voltage	4ms

Output Capacity (per phase)

STS POWERSWITCH MODEL	MAX WATTS	OUTPUT VOLTAGE	OUTPUT CURRENT	OPERATING TEMP. (C)
10kW	10,000W	117V	85 Amps	40C
20kW	20,000W	117V	170 Amps	40C

PROTECTION CIRCUITRY

Over Voltage: Shutoff at maximum input voltage, per input table.
Under Voltage: Shutoff at minimum input voltage, per input table.
Thermal: Shuts off due to over temperature condition.
Output Short: Unit shuts off: electronically limited. Manual reset required.

ENVIRONMENTAL

Temperature: $-25^{\circ}C$ to $+40^{\circ}C$ full power, derated -20% per $10^{\circ}C$ above $40^{\circ}C$.
Humidity: 5 to 95% non-condensing
Altitude: -60m to 1800m (-197ft. To 5906ft.)
Cooling: Thermostatically controlled variable speed forced air.
Warranty: Full year parts and labor.

PHYSICAL SPECIFICATIONS

Framework Type: Exeltech 4RU Cage

Dimensions: 7" x 17.2" x 15" (H x W x D) for 19'' Relay Rack
    7" x 21.2" x 15" (H x W x D) for 23'' Relay Rack

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

Weight:

Weight:	85 Amp	170 Amp
1 Phase	20.5 lbs	22.5 lbs
2 Phase	23.0 lbs	27.0 lbs
3 Phase	25.5 lbs	31.5 lbs

Access: Rear for Installation and Maintenance and Front for Operation

Control: Microprocessor control, Ethernet based monitoring

Options: Maintenance Bypass Switch (Recommended)

AC Connection points:
    Mechanical Lugs: 1/0 – 6 AWG

    Recommended Torque: 45 in-lbs.

    Customer Interface: 250MCM available in systems with AC customer interface

6.2 STS Powerswitch Module Electrical Specifications

OUTPUT CURRENT AMPS AC	SCR VOLTAGE DROP (TYPICAL)	FAN TURN ON TEMP C	FAN FULL SPEED TEMP C	THERMAL SHUTDOWN TEMP C	THERMAL RECOVERY TEMP C	CONTINUOUS CURRENT RATING	FORM C RELAY ALARM 250VAC/VDC
85A	1.3V	50C	65C	75C	70C	85V	1.5A
170A	1.3V	45C	60C	70C	65C	170A	1.5A

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)

STS Powerswitch Heat Dissipation Table:

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

6.3 STS Controller Module Electrical Specifications

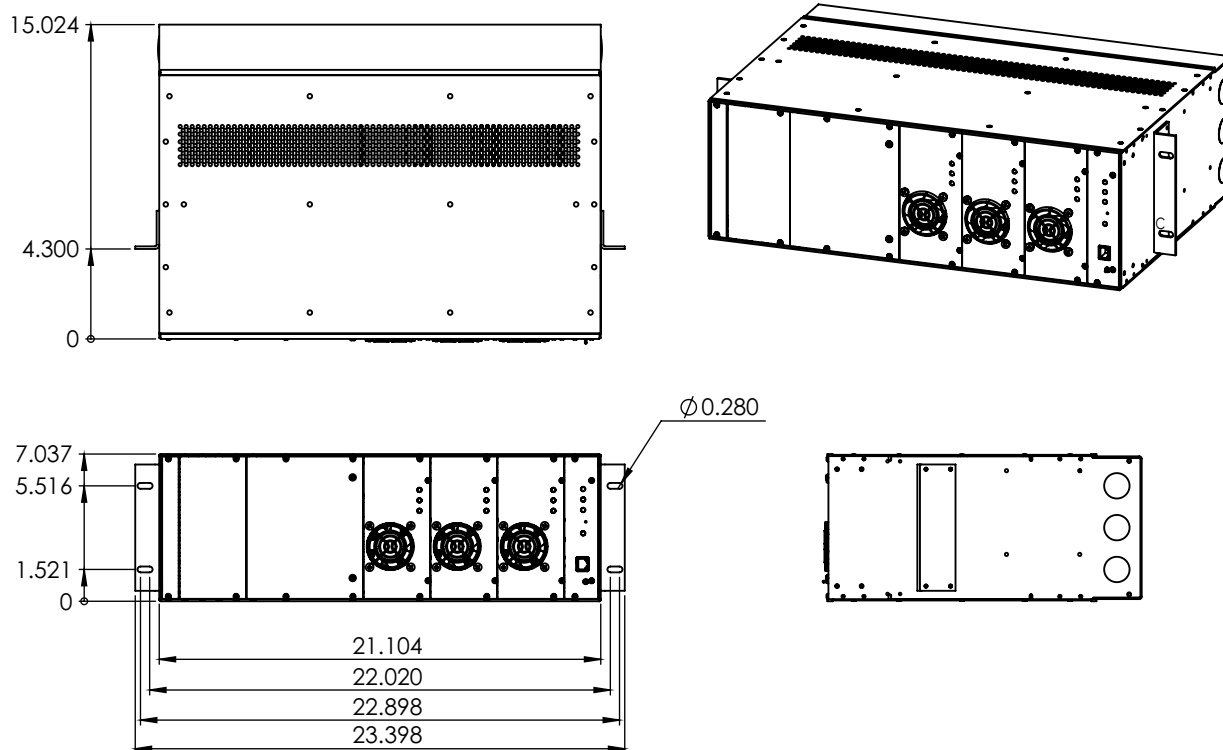| INPUT VOLTAGE	INPUT FREQUENCY
90 - 135 VAC	58 - 61 Hz

Physical Specifications

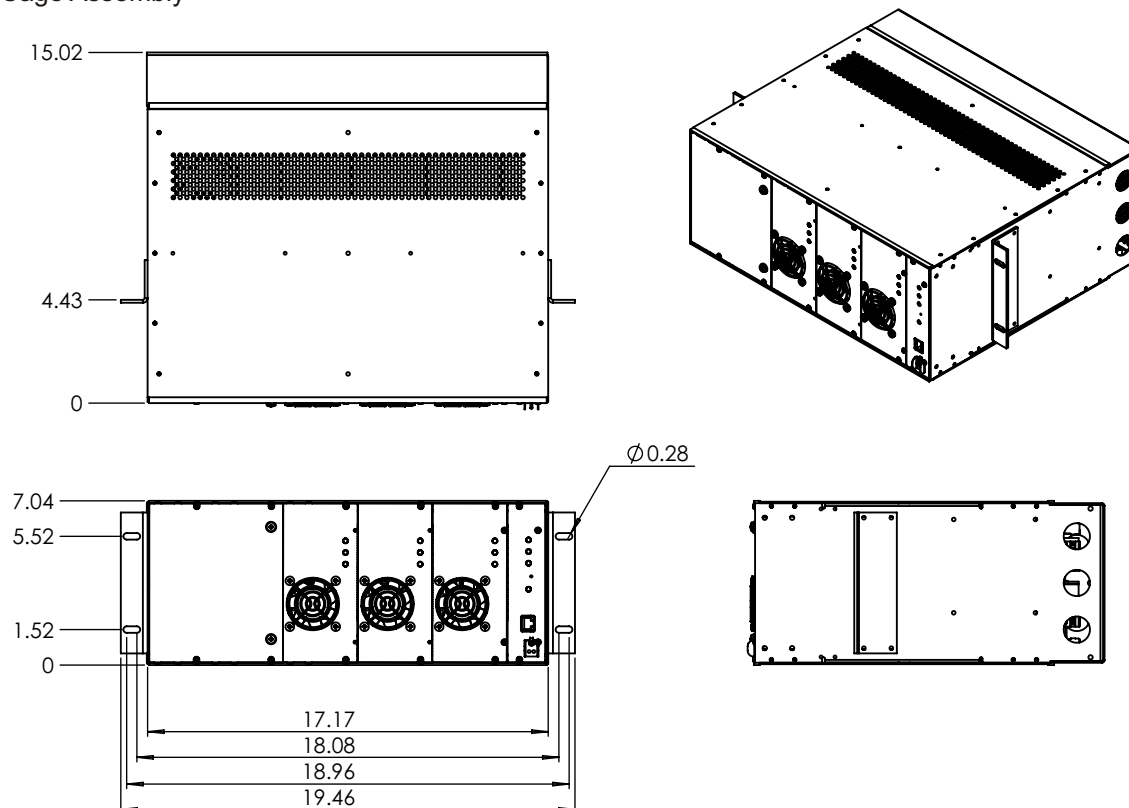**Dimensions:** 6.8" x 1.6" x 12.3" (H x W x D)

Weight: 0.8 lbs
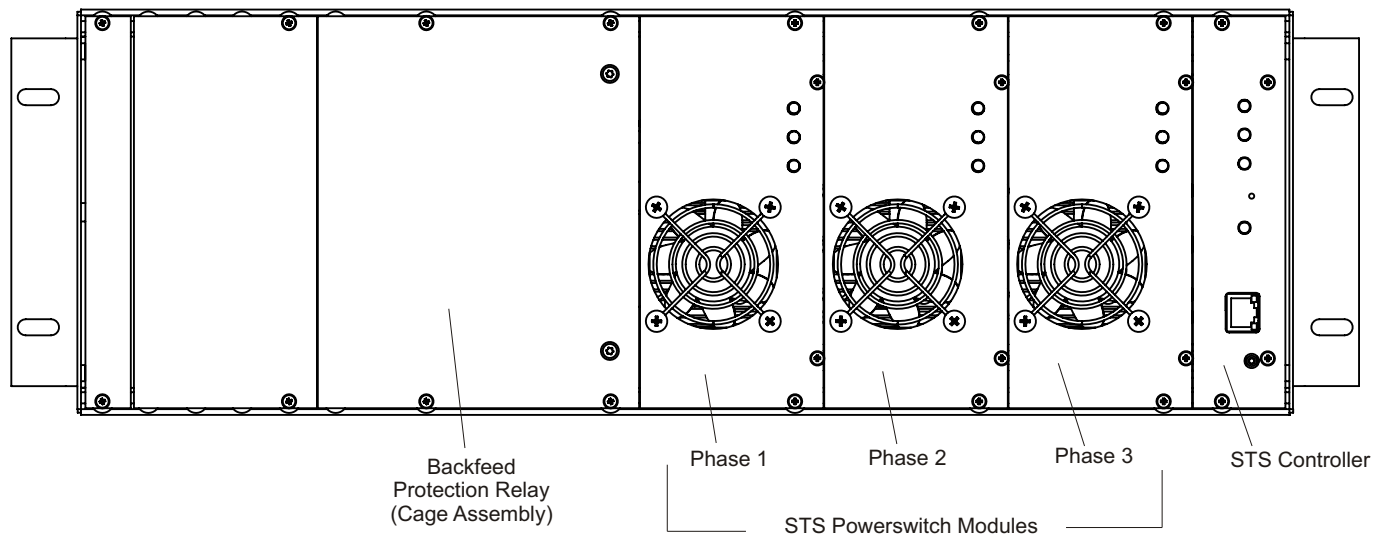
6.4 Mechanical Drawings
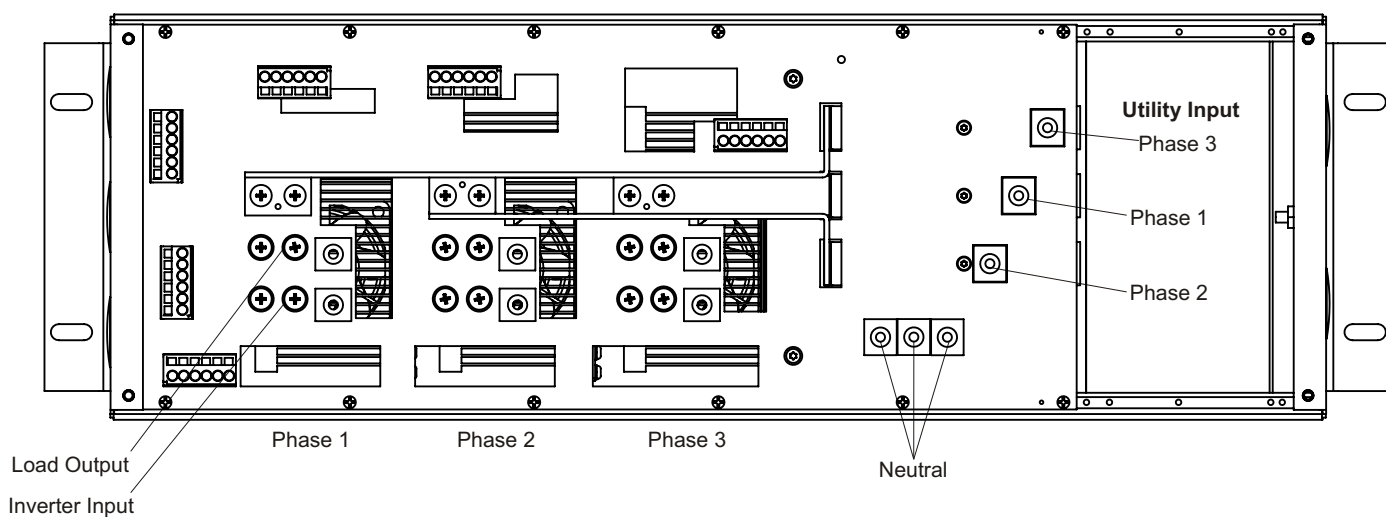
23'' STS Cage Assembly

19'' STS Cage Assembly

6.5 Backplane Connections

Front View

Backfeed
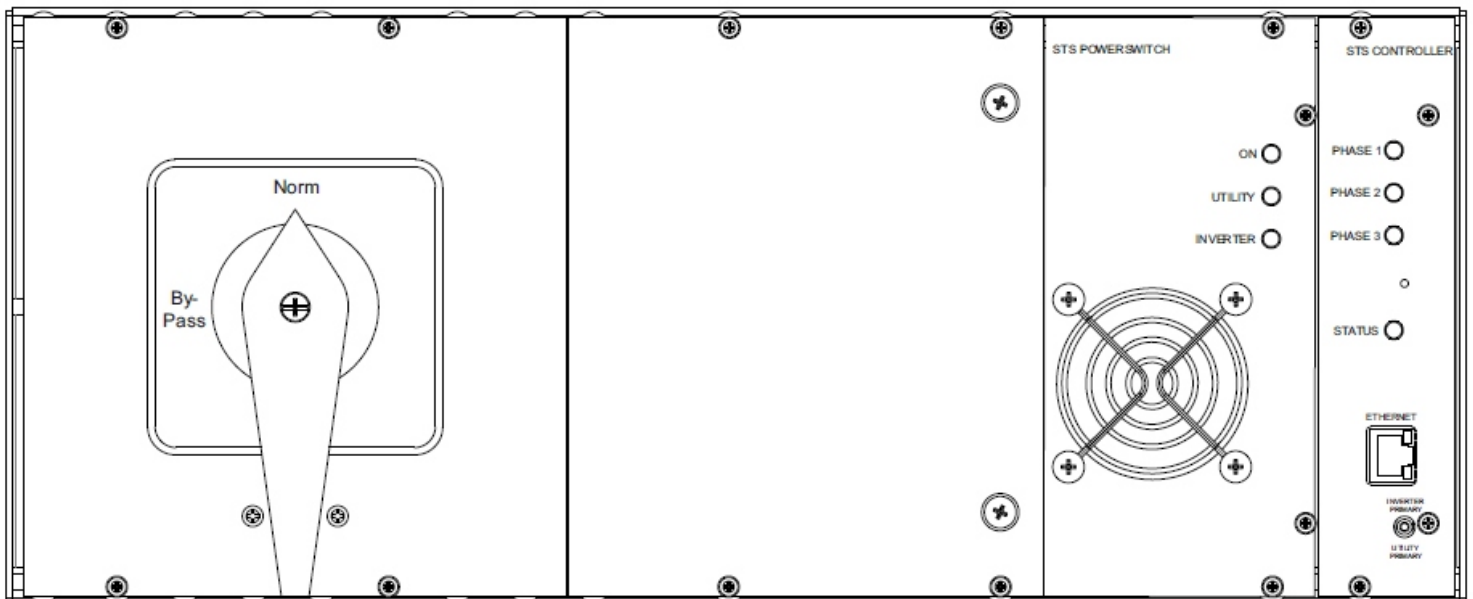Protection Relay
(Cage Assembly)

Phase 1   Phase 2   Phase 3   STS Controller

STS Powerswitch Modules

Back View

Utility Input
Phase 3
Phase 1
Phase 2

Load Output

Inverter Input

Phase 1   Phase 2   Phase 3

Neutral

*All Power Connection Terminals Rated 0-6AWG

Back View: Single-Phase STS System
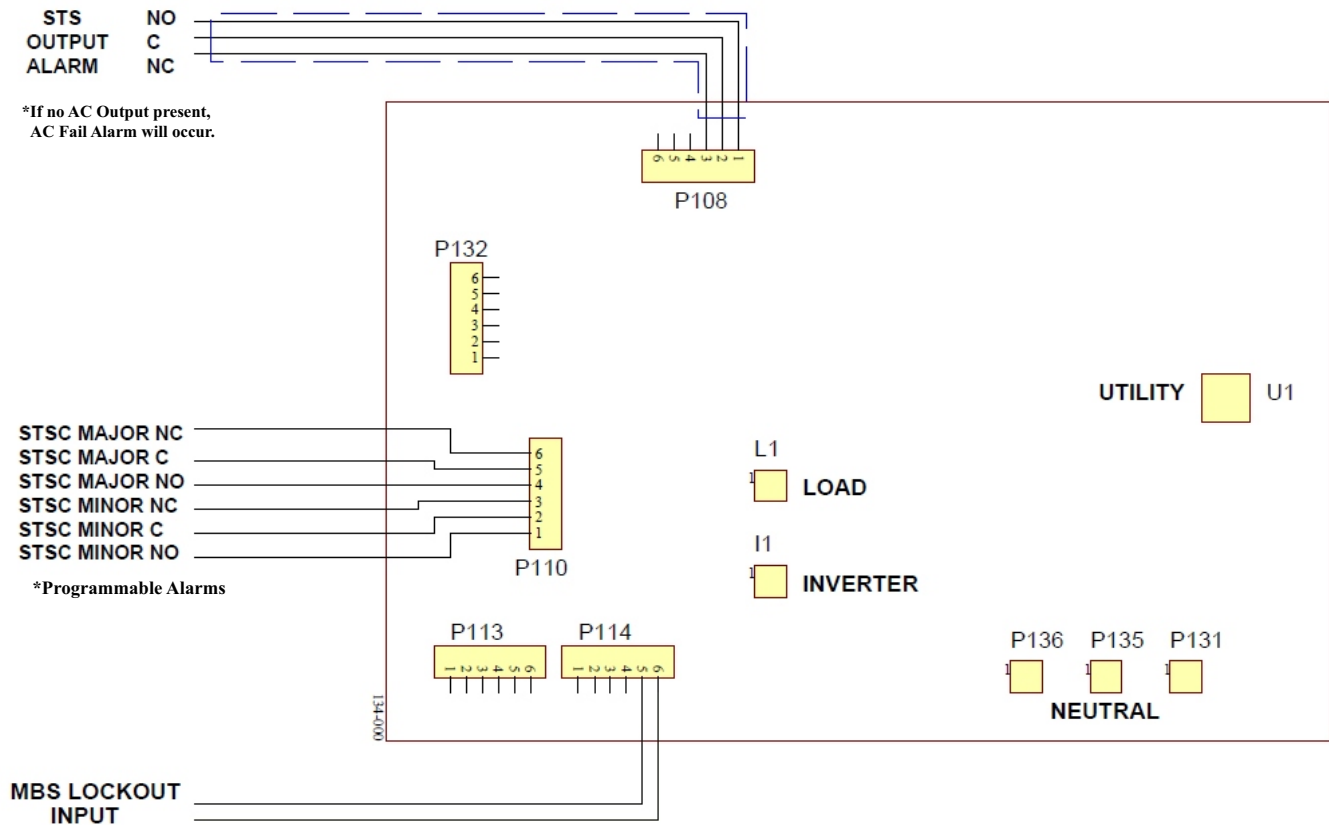
Front View: Single-Phase STS System with Integral Maintenance Bypass

Back View: Multi-Phase STS System

Front View: Multi-Phase STS System
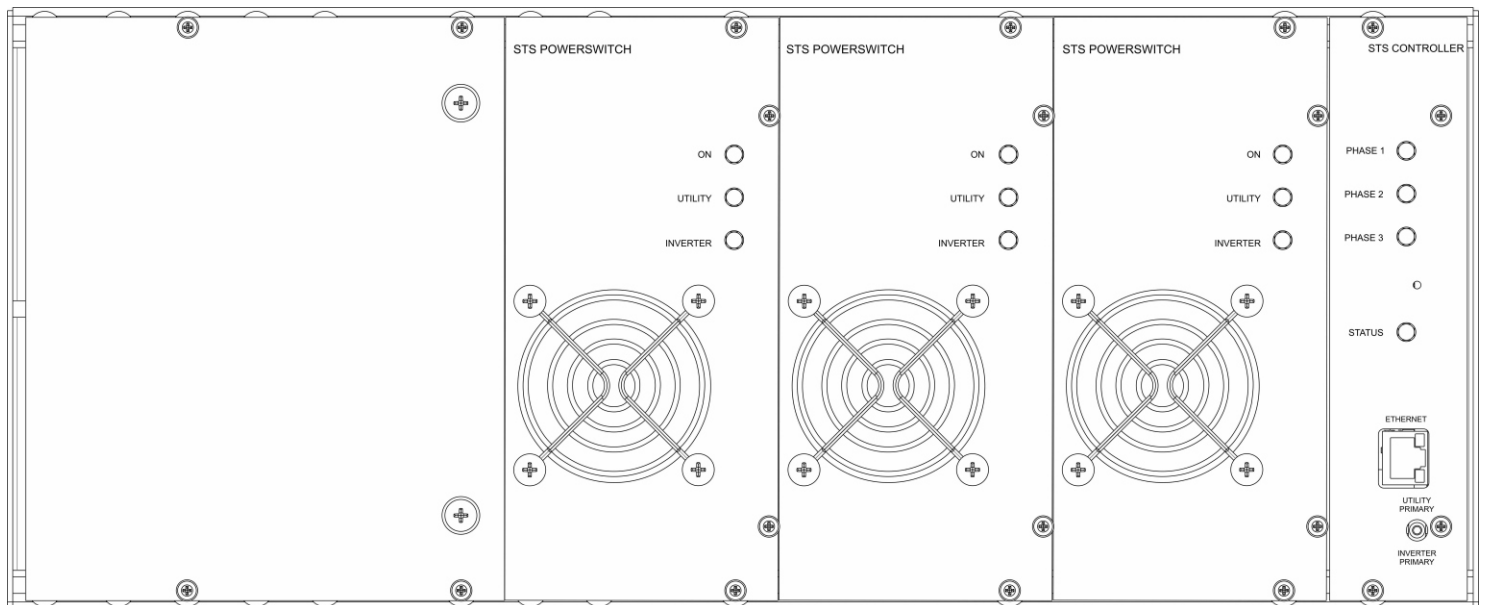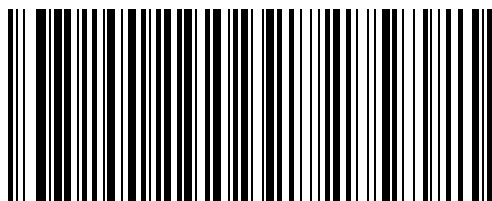
**EXEL*TECH*

931- STSM* - * 0C

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