config@WEB Secure Software Users Guide

SAGE1-SFT-00S02 V2.3

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For Reference Only

Manual No. SAGE1-SFT-00S02

Rev	Date	Description	ECO #	Technical Review	Admin. Approval
1.0	2012-07-25	Initial release for secure firmware		N/A	
1.1	2013-12-10	Updates for J0 Release			
2.0	2015-10-30	Force Data K0 Release			
2.3	2017-07-25	Updates for K2 Release			
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1 Introduction

This user manual describes the software operation and features of the Schneider Electric SAGE Remote Terminal Units (RTU).

SAGE Remote Terminal Units are designed to satisfy a wide range of Supervisory Control and Data Acquisition (SCADA) application requirements in harsh environmental conditions.

The SAGE Graphical User Interface guides the user through setup and operation while expanding the rich functionality you have come to expect from Schneider Electric RTUs.

1.1 Legend

In this manual, the following designations apply:

SAGE 1X10 refers to SAGE 1210, SAGE 1310 and SAGE 1410 collectively.

SAGE 1X30 refers to SAGE 1230, SAGE 1330 and SAGE 1430 collectively.

SAGE 1X50 refers to SAGE 1250, SAGE 1350 and SAGE 1450 collectively.

SAGE 2X00 refers to SAGE 2200, SAGE 2300 and SAGE 2400 collectively.

SAGE 3030X refers to SAGE 3030 and SAGE 3030 Magnum collectively.

1.2 Features

The SAGE RTU uses the latest electronic technology for reliability, speed and maintainability. It is intended for use in a variety of SCADA applications requiring maximum configuration flexibility. The design includes several state-of-the-art functional capabilities. For example, the AC Input (ACI) option provides an advanced transducer-less AC analog input capability.

The SAGE RTU has the following features:

- Encrypted account file
- Secure Console
- Secure Protocols - SSH/HTTPS/IPsec
- Easy-to-use Graphical User Interface (GUI) via Microsoft Internet Explorer or Chrome
- Embedded web server
- Built-in Ethernet with TCP/IP
- May be configured either locally or remotely
- Point naming (no more counting point numbers to find your point of interest!)
- Point mapping with simple click and drop
- Data concentration – adds data from multiple IEDs to one database for fast polling
- Protocol conversion – convert multiple protocols to a standard protocol
- Built on a widely adopted Real-Time Operating system (RTOS)
- Employs standard PC/104 bus interface for CPU and Communication upgrades
- Relay Ladder Logic capability that supports all five IEC 61131-3 Languages

1.3 RTU Security Features

As shown below, the security features of the SAGE RTUs can be classified into two methods, both of which should be performed for full security. In the following discussions, server means the RTU; client means the computer communicating with the RTU.

	Security Method	
	SSH (see Note 1)	SSL (see Note 2)
Key or Certificate Generation Method	PuTTY Key Generator program – free SSH client for Windows – many sources	See Open SSL organization on internet
Key or Certificate Generation Documentation	"**Config@WEB Key & Certificate Generation**.PDF"	"**Config@WEB Key & Certificate Generation**.PDF"
Program for Loading Keys/Certificates into RTU (see Note 3)	User_Manager_YZ.exe	Config_Converter_YZ.exe
Documentation for Loading Keys/Certificates into RTU	"Secure Administration" chapter of the "**config@WEB Secure Software Users Guide**.PDF"	"Config Converter" chapter" of the "**config@WEB Secure Software Users Guide**.PDF"

Note 1: SSH - Secure Shell - A method to obtain secure data communication using public/private RSA or DSA keys. **The private key for the server (the RTU) must be the OpenSSH format**.

Note 2: SSL - Secure Socket Layer - The standard security technology for establishing an encrypted link between a web server and a browser; when installed in conjunction with a certificate displays HTTPS connection; a lock symbol is displayed for valid certificate, red for invalid certificate.

Note 3: These programs are part of the Firmware Upgrade zip package.

1.4 Graphical User Interface (GUI)

The SAGE RTU is easily configured using the standard web browser, Internet Explorer version 7.0 or later. The physical connection may be made in one of four ways:

- Ethernet connection using an Ethernet crossover cable directly to the RTU
- Ethernet connection to a network , locally or remotely
- PPP connection using a null-modem cable to the UIF port
- Console – this method commonly used to read and/or change IP address

The GUI is designed around the classical client/server model. A web browser is all you need for your client (PC) and you can browse any RTU product or any version of that product that supports our web interface. All configuration data is stored on the RTU in the form of Extensible Markup Language (XML). XML data is served up to the browser within HTML pages or transformed into HTML via Extensible Stylesheet Language (XSL). In either case data is presented to the user in an intuitive format using common design elements like forms, Radio Buttons, Spin Boxes, Alert Boxes, etc. for much of the data entry.

Note: See the Secure Administration chapter for initial user name and password.

Note: With the release of C3414-500-S02XY firmware, the initial TCP/IP address is 192.168.1.1.

Note: For the latest manual, please contact RTU Customer Service.

Point Mapping

The RTUs of today must interface to a wide Varity of I/O and industry standard IEDs. This creates within the RTU a large database of points that have been acquired by the RTU that must be transferred to one or more master stations.

The GUI supports an intuitive drag and drop point mapping scheme. Each point within the RTU is named
1.5 and scaled with user definable names and values. Scaling is used for local data display as well as protocol count scaling for conversion of data from one protocol to another.

Communications

The SAGE RTU supports a large suite of communication protocols over many different types of communications media. Ethernet and RS-232 come as standard hardware. However, installation of media converters allow for just about any physical communications media to be supported.

1.6

The UIF is a dedicated RS-232 port that supports a connection to the operating system using a terminal emulation program. It is used to configure the customer RTU IP and to change to safe mode operation. Diagnostic functions may also be performed using this port.

A second RS-232 port is available that supports the Point to Point Protocol (PPP). This port can perform all GUI functions, but at a 38.4kb.

Both ports can be used concurrently with the other serial and Ethernet ports.

All Schneider Electric RTU products support multiple RTU and IED protocols. This allows for data to be mapped from IEDs to multiple masters via different RTU protocols. Example: If you were replacing your current master station software that talks Series V protocol with a system that supports DNP your RTU could talk to both the old master and the new master at the same time. This provides an excellent means of replacing legacy RTU/MTU equipment without interruption to data acquisition.

An emerging need for RTU products is SCADA protocols to communicate over Ethernet all the way down to the RTU. The SAGE RTU supports DNP over Ethernet.

1.7

Relay Ladder Logic (RLL)

The SAGE RTU supports a RLL Runtime Target that accepts applications that can be developed using any one of the five IEC 61131-3 languages plus flow Charting. Programs are developed on an application workbench that runs only on the client. Fully developed/debugged programs can be downloaded into the SAGE RTU and activated for execution.

RLL applications have access to all the data within the RTU and make use of the powerful mapping capabilities of the GUI. Output data from RLL applications can be viewed in real time data displays

2 Configuration

This chapter tells you how to configure the RTU. Other chapters cover Data Display, Command, Upload/Download, and Administration. See the appendices for hardware User Interface connections.

A good user interface should be intuitive and easy to learn. This does not mean that no instruction is required, but that it is minimal and that users can "pick it up" quickly and easily. First-time users might not understand how to operate a scroll bar, or our drag and drop point mapping, but once it is explained they generally find it easy.

2.1 Client Server Application Principles

The client (your PC) can run many different types of applications. Usually the application program and all its data reside on your PC. In a Client Server application the relationship is somewhat different. All the unique features and specialized data can be stored on the remote system allowing the user to browse that data in a manner specific to that system. The GUI Interface is a Client Server application.

A thin client and a client server system avoid the version problems encountered when you have a thick Windows based application. Your browser will be able to talk to RTUs shipped today and years from now because most of the content and configuration data will be stored on the RTU.

2.1.1 Client's Web Browser

The GUI Interface was designed to function with Microsoft Internet Explorer or Google Chrome (starting with C3414-500-S02K0 firmware).

2.1.2 GUI Connection via Ethernet

In this case, your PC would use its network card to connect to RTUs that are connected either to your local Intranet or your PC could connect to your RTU via a crossover cable connected directly to your RTU. The latter would be the typical means of connection to field devices for installations without Ethernet all the way down to the RTU.

Please refer to the appendices for GUI Connection via Ethernet port.

2.1.3 GUI Connection via PPP

The RS232 User interface port is connected to the CPU card with one of two pigtail serial lines; either the Console connection or the PPP connection may be used. The Console pigtail is typically used only to view and modify the IP address of the Ethernet port. Once modified, the Ethernet port can be used for local and remote interfacing. If the PPP pigtail is used, the RTUs GUI is available at 38,400 baud.

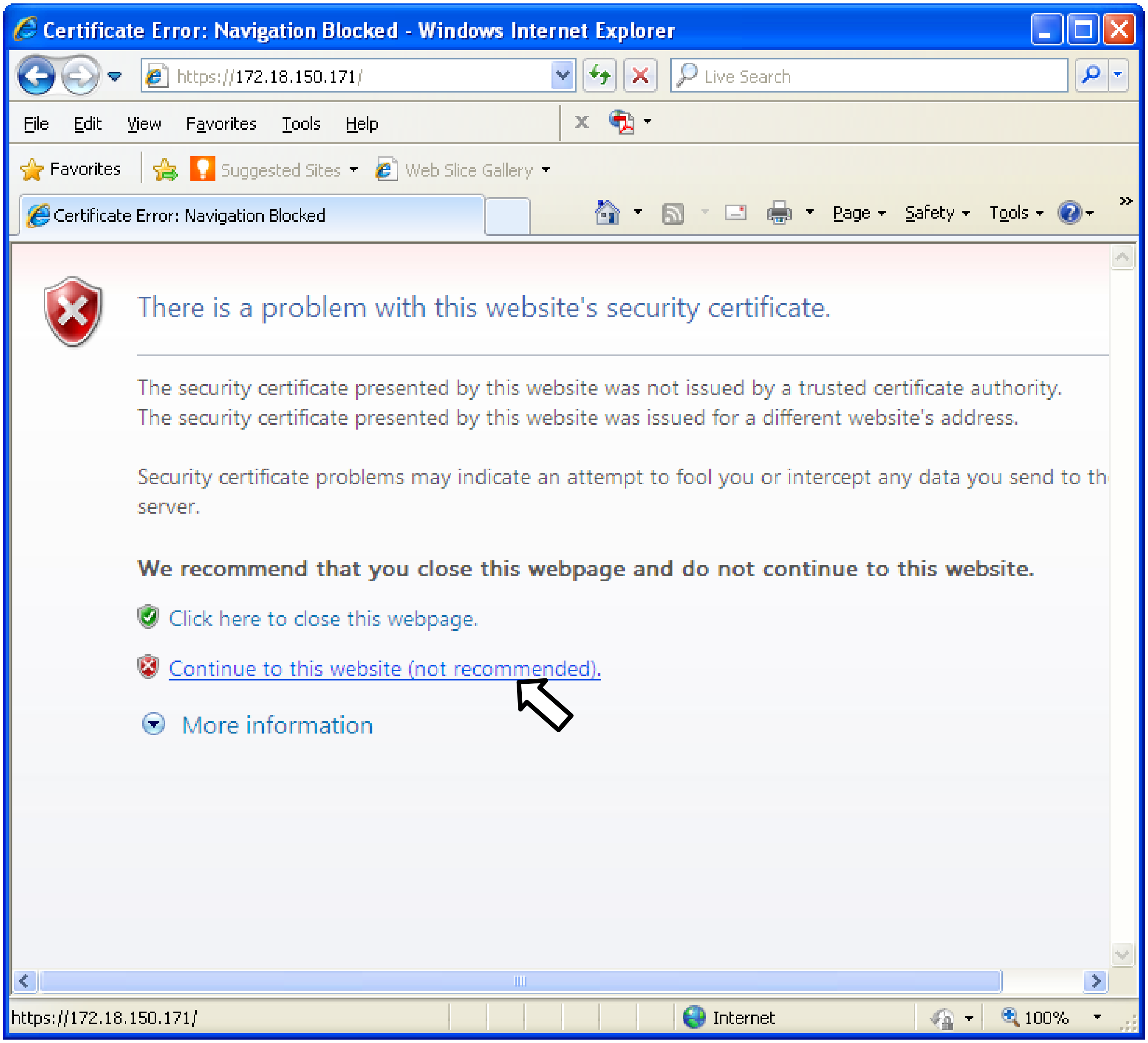
Please refer to the appendices for GUI Connection via PPP ports.

2.2 Login

2.2.1 GUI Navigation Concepts

Launch Internet Explorer and type in the IP address of your RTU. If your system does not have a valid certificate, IE will display the web page shown below. Click in the legend shown below.

Figure 2-1 IE Security Screen



The first screen that you encounter is the Login screen (see Figure 2-2). Enter your Username and Password.

Note: Username and Password and all security issues are explained in other parts of this Manual.

This screen has a Home Screen Message. For security, this message may be modified only from the CPU page.

Note: The Home Screen Message is an effective method of posting NERC CIP warning messages.

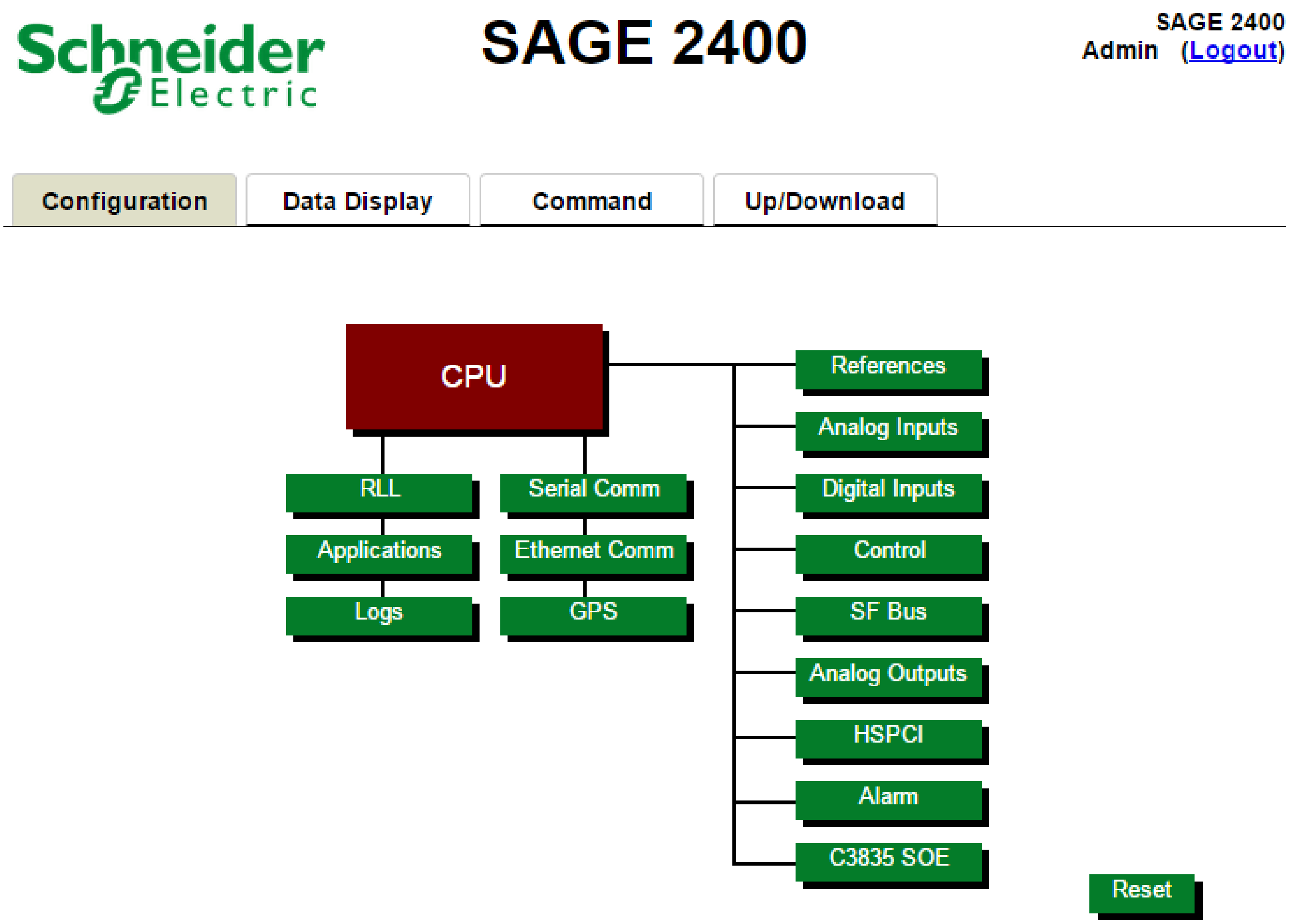
Figure 2-2 Login Screen

Once you continue beyond the login screen, the next screen to appear depends upon your login privileges. In the example below, the configuration screen is shown. At the top of the configuration diagram you will find four tabs that allow you to jump between the Configuration page, Data Display page, Command page and Up/Download page. Grayed-out tabs indicate "no privilege" for that particular function. The example shown is for Admin privileges (meaning, no restrictions). In the event that some restrictions are in effect, the screen will default to the next unrestricted tab that is allowed, working from left to right.

The block diagrams as shown on the Configuration, Data Display, and Command pages are almost the same. However, the navigation will differ depending on which diagram you are on. Example: You can configure cards on the SF Bus from the Configuration diagram but to display live data you would navigate to the Data Display tab and then to the SF Bus tab to view live data from cards on the SF Bus.

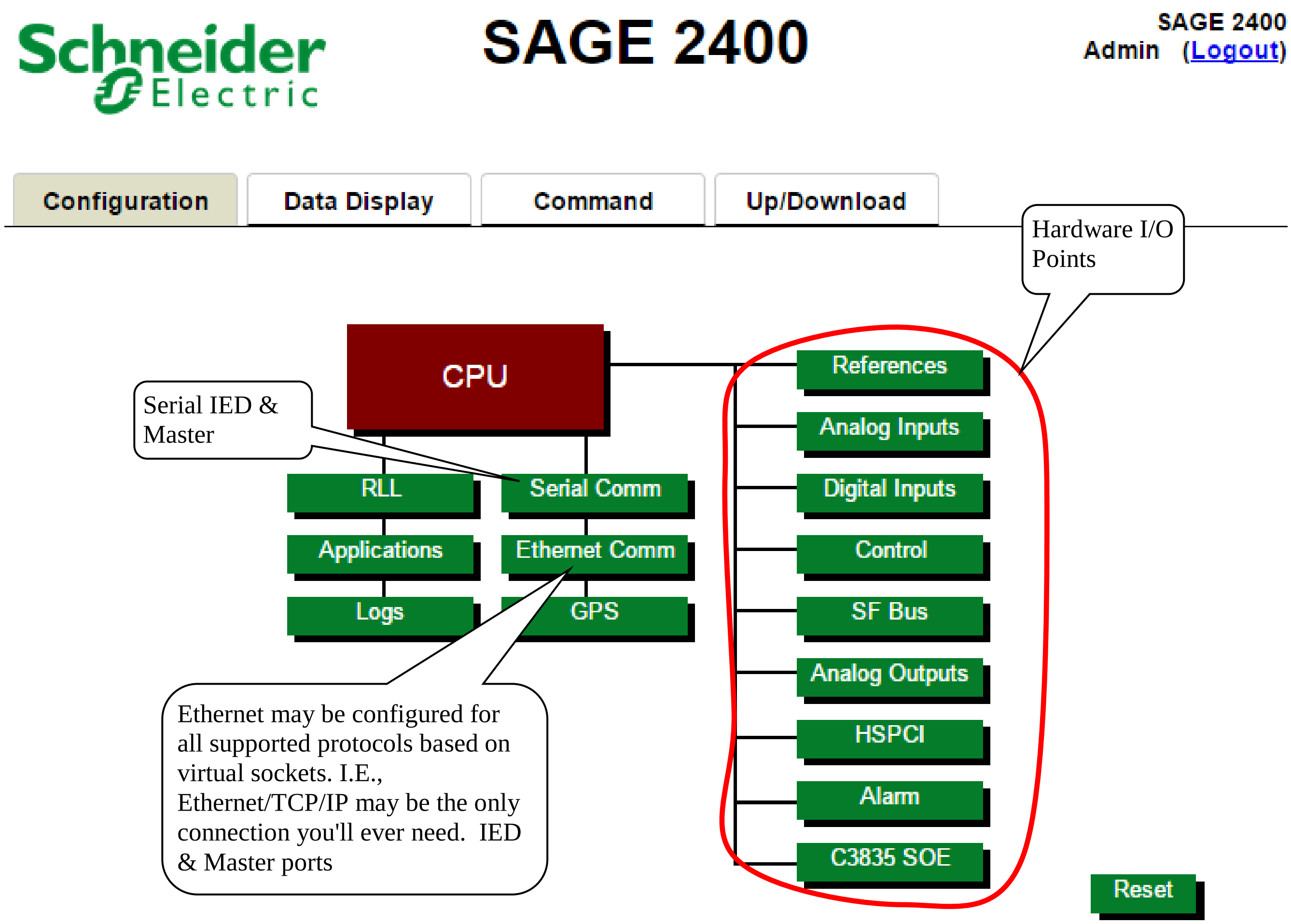
In this and the following chapters you will find specific information devoted to each tab.

Figure 2-3 Typical SAGE 2X00 First Page



Immediately after a successful login, you will see the Configuration screen (if the login is an unrestricted Admin login) as shown in Figure 2-4. On certain Configuration screens, you will see Hardware I/O Points to configure to the right of the CPU Block. Note that IED points are part of the Serial Comm and/or Ethernet Comm configuration. Master ports are also part of the Serial Comm and/or Ethernet Comm configuration. Configure all points, hardware & IED, then configure the Master ports. Simply place your cursor over the desired block and left-click to activate the function.

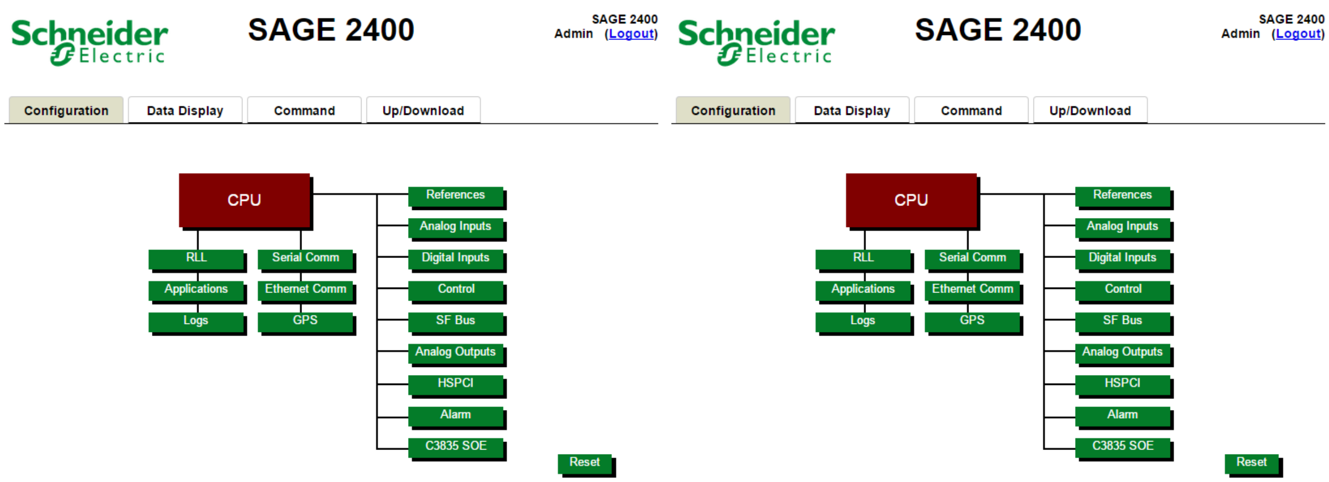
Figure 2-4 Configuration Screen



2.3 Multiple Window Technique

As you investigate the other tabs (Display, for instance, explained in the next chapter), you will find that having simultaneous multiple views into Config@WEB is very useful. This is easy to do, no matter which version of IE you are using. Simply press Control N (New Window command) to bring up multiple instances of your session. Each window is separately navigable. See the following example.

Figure 2-5 Multiple Views with Control N



Notice that this technique does not require multiple logins, which can present other issues. Multiple logins are limited to five, after which another login is impossible. If the windows opened with multiple logins are simply dismissed, the five logins will tie up the RTU until the sessions time out, so make sure to log out for each session created with a new login.

Multiple views using Control N (as shown above), rather than multiple logins, is a much better technique. If you reset or log out from one of the views, the other windows will be inactive and should be dismissed.

2.4 Navigation Shortcuts

Navigation shortcuts are now included on all screens below the tab level. No matter how far down you drill, you can always return to the top level, or any intermediate level. An example is shown below.

RTU Configuration > Communication Port Configuration > DNPM IED Configuration > DNPM IED Configuration

2.5 CPU Configuration

From the Configuration screen, click the CPU block. You will get a screen similar to that shown in Figure 2-6. This figure highlights Home Screen Message, RTU Time and Date settings, and Time Services.

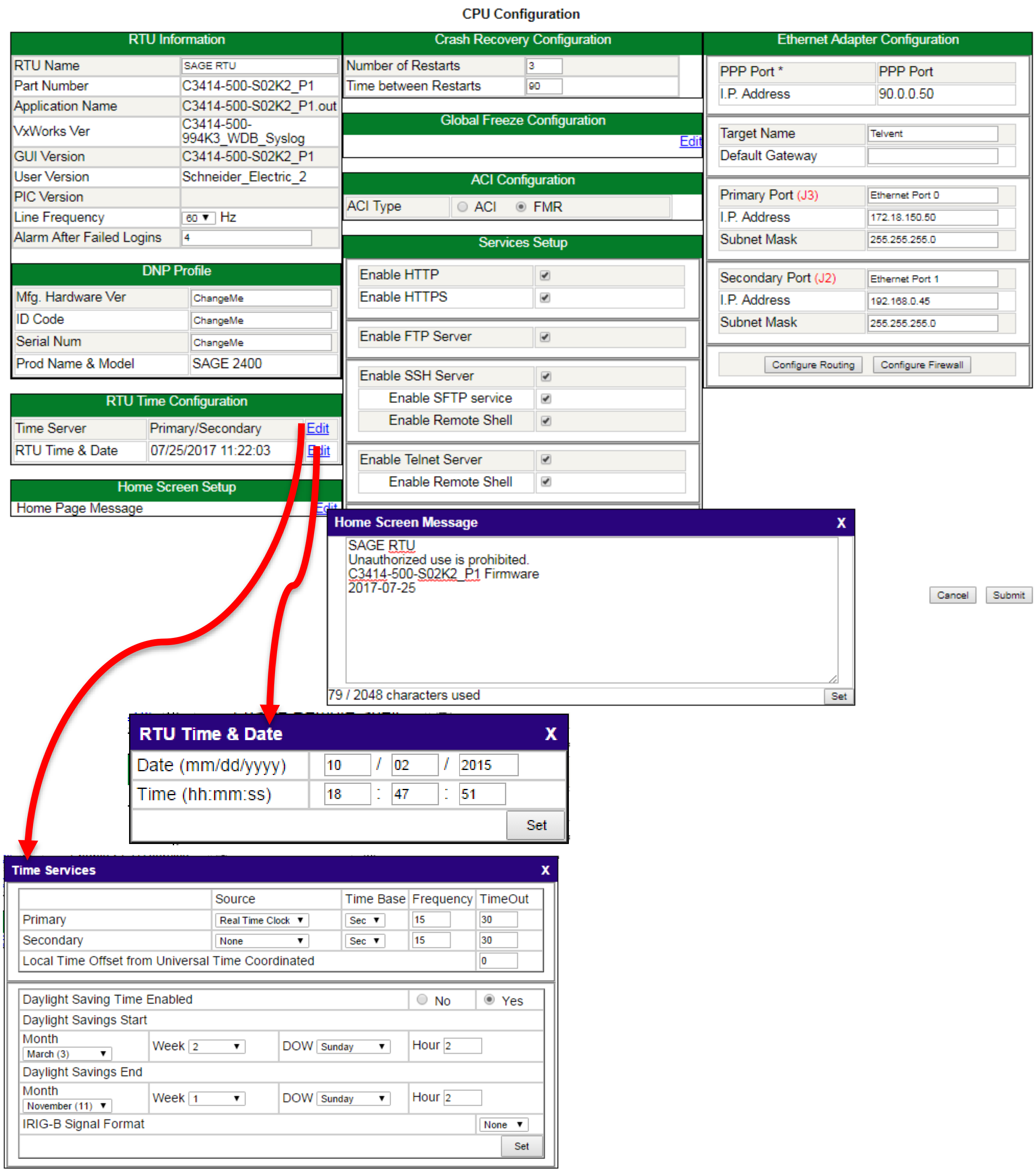


Figure 2-6 CPU Configuration

2.5.1 RTU Information

The following fields in **bold** are meant for you, the user, to fill in (or accept the default):

RTU Name	Enter the name of this RTU
Part Number	Firmware Part Number assigned by Schneider Electric (Var 242 – Device Mfg software ver – see below)

Application Name	File name of the firmware
VxWorks Ver	VxWorks Version number assigned by Schneider Electric
GUI Version	Version number assigned by Schneider Electric
User Version	Version number assigned by Schneider Electric
Line Frequency	Select the Line Frequency being monitored by a C3244 ACI SFB module or by a SAGE 1450. Selections are 50 or 60Hz..
Alarm After Failed Logins	Enter the number of failed logins allowed before the internal status point "MAX LOGIN FAILURES EXCEEDED" toggles.

2.5.1.1 DNP Profile

Mfg, Hardware Ver	User assignable
ID Code	User assignable
Serial Num	User assignable
Prod Name & Model	Assigned by Schneider Electric

2.5.2 RTU Time Configuration

Time Services

Click on the Edit link. For each *Source*, enter the *Time Base* (Sec, Min, Hrs), and the *Frequency* you want the RTU to request time syncs, and the *TimeOut* you want before the RTU stops requesting syncs from an unresponsive *Source*. After the *TimeOut*, the RTU will request time syncs from the *Secondary Source*. If the *Secondary Source* fails to provide times syncs, the RTU will not be synced.

Note: If you assign and configure both a primary and a secondary time source, the RTU will fail over to the secondary source if the primary source fails.
Note: Time sources must be configured before they become available in the drop-down list (for instance, time serve from a protocol, GPS available, IRIG-B), except for Real Time Clock, which is inherently available in the RTU.

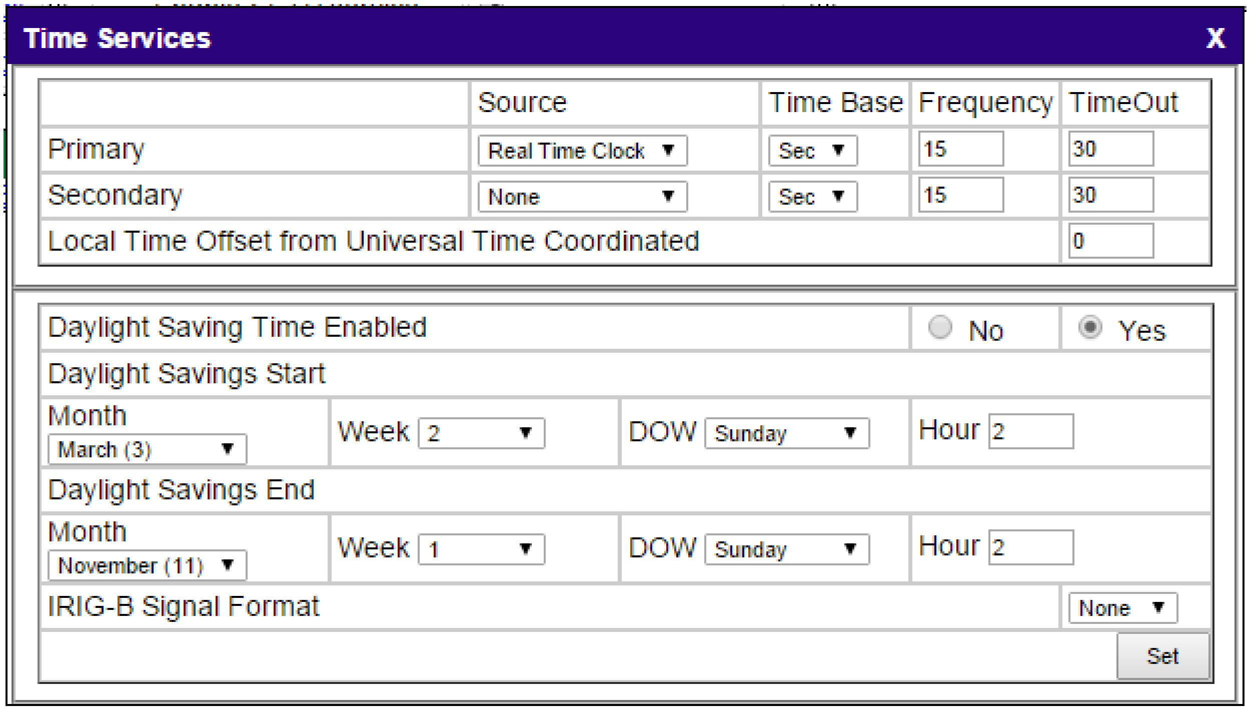


Figure 2-7 Time Services Setup

Daylight Savings Time Enabled	Default is Yes
Daylight Savings Start	Select Month, Week, Day of the Week and Hour
Daylight Savings End	Select Month, Week, Day of the Week and Hour
IRIG-B Signal Format	Select None, UTC, or Local
RTU Time & Date	Click on the Edit link. Enter time and date as indicated for the RTU real-time clock. The entered values will take effect when you click on Set. Click X to cancel.

The RTU Time and Date are always entered in local time regardless of the settings for Local and UTC time in the section following.

Note: You must set the real-time clock to the correct date for proper operation (i.e., to prevent crashes) because of protocols that don't contain the year in the sync message.

Note: The coordination between UTC and local time is a feature that may be ignored. If you want your RTU to act as it always has in regard to time syncs, set Local Time Offset from Universal Time Coordinated to 0, Daylight Saving Time Enabled to No, and IRIG-B Signal Format to None.

Local Time Offset from Universal Time Coordinated

If you use UTC for time syncs, and you want to use local time-stamps within the RTU, or to pass local time coordinated with UTC to an IED, you must enter an offset of your local time from UTC.

Values to enter for the hourly Local Time Offset follow:

- Atlantic Time zone = -4.
- Eastern Time Zone = -5
- Central Time Zone = -6
- Mountain Time Zone = -7
- Pacific Time Zone = -8
- Alaska Time Zone = -9

Other offsets can be determined by examination of the time zone settings on your PC. If the local time is correct on your PC, the UTC offset is in the configuration of the time zone.

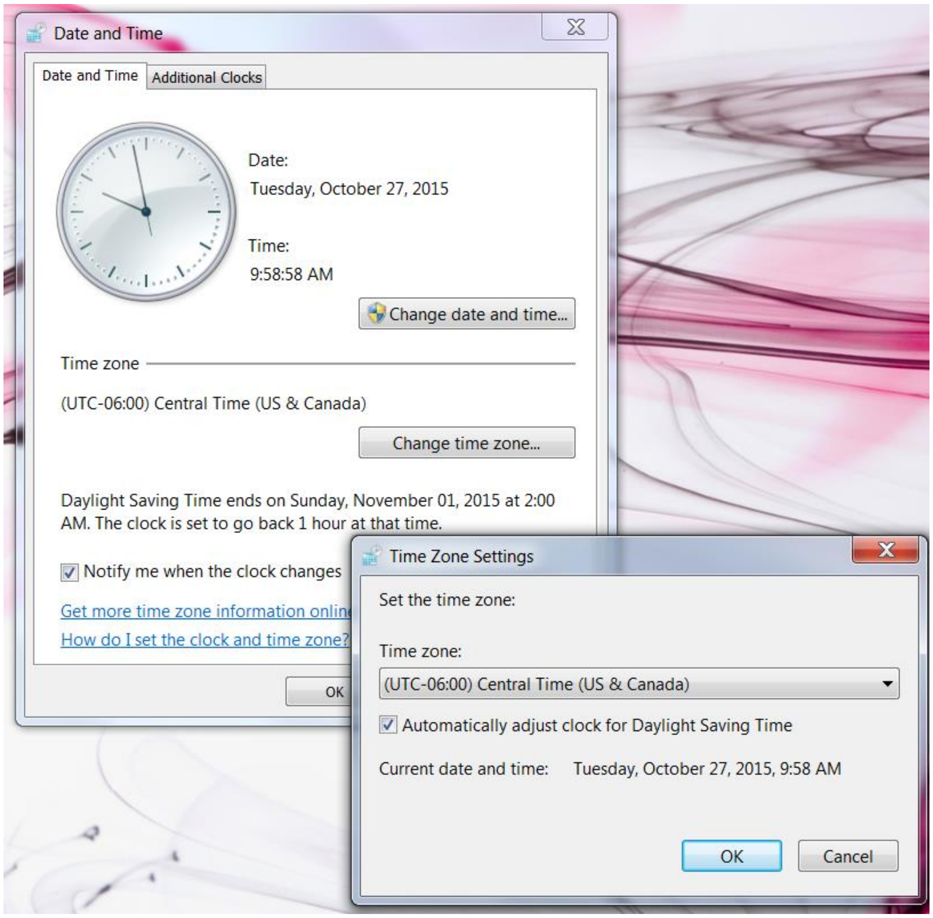


Figure 2-8 Date and Time Properties

The offset to use is the numeric part of the "(GMT-06:00)" displayed with the description of the time zone. Include the "-" (minus sign) if it is displayed.

Daylight Saving Time Enabled

Click Yes if you want your local time to account for Daylight Saving Time. If this feature is enabled, one hour will be subtracted from the local time used in the RTU.

Daylight Saving Time is defined (as this document is written) as:

Beginning on the 2nd Sunday in March at 2:00AM,

Ending on the 1st Sunday in November at 02:00AM.

Time at the beginning goes from 1:59:59:999AM Standard Time to 3:00AM Daylight Time. Time at the ending goes from 1:59:59:999AM Daylight Time to 1:00:00:000AM Standard Time. Note that the one hour of identical numeric Standard and Daylight Time at the end of Daylight Saving Time is indistinguishable in RTU communications protocols that use the Local time feature.

IRIG-B Signal Format

Note: IRIG-B function is standard on SAGE 3030X and is available as an option on the other RTU models.

Select from the drop-down list from the following:

None – no C3831 IRIG-B card attached to the PC/104 bus

Local – C3831 IRIG-B signal is Local Time

UTC – C3831 IRIG-B signal is Universal Time Coordinated

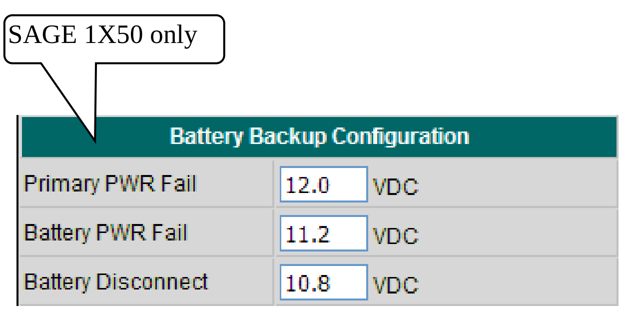
The IRIG-B signal can be provided to the RTU or driven as an output by the RTU depending on the configuration of the IRIG-B signal.

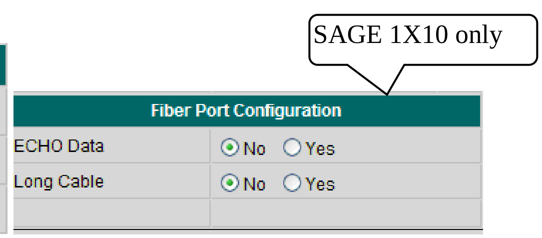
If the IRIG-B signal is used as a Time Server, the IRIG-B signal is used as an input and an IRIG-B source must be connected to the IRIG BNC connector.

Otherwise, the IRIG-B signal will be an output unless configured as none.

It is suggested that you configure the Time Services, set the RTU Time & Date and then reset the RTU and then complete the configuration of the RTU.

If you use the Local/UTC function of the RTU, the clock of the RTU is always set in UTC. Bootup/Reset times on the console and timetags on files stored on the Compact Flash will be displayed in UTC. Using only DST also offsets the time. Real Time clock will be set to Standard Time.





2.5.3 Battery Backup Configuration (SAGE 1X50 only)

Primary PWR Fail The voltage at which the Primary Power is considered to be failed (12.0 volts is the default), forcing automatic switch-over to Battery. This event is available as a status Source Point (under AC Analog Inputs), which can be mapped to the Master.

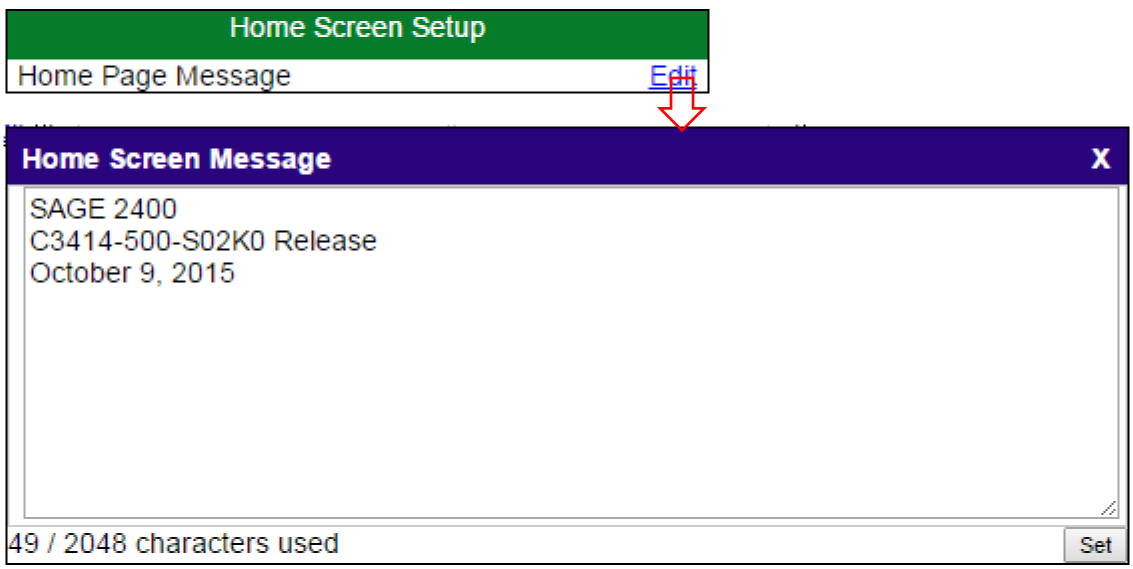
Battery PWR Fail The voltage at which the Battery will be considered failed (11.2 volts is the default). This event is available as a status Source Point (under AC Analog Inputs), which can be mapped to the Master.

Battery Disconnect The voltage at which the Battery is disconnected (10.8 volts is the default). The disconnect prevents the battery from completely discharging.

Note: Once the battery is disconnected, the Primary Power must be restored before the RTU will reconnect the battery.

2.5.4 Home Screen Setup

The Home Page Message function is used to modify the information displayed in the text box on the login page. There is a limit of 2048 characters in the display. Only a user with configuration privilege can make changes to the content of the message unlike previous versions, where all users could modify the content. This window can also be used to change the NERC CIP Unauthorized Use Warning Banner.



2.5.5 Fiber Port Configuration (SAGE 1X10 only)

ECHO Data Press No if this RTU is the master on a fiber optic loop or the only slave on a fiber optic connection. Press Yes if this RTU is a slave on a fiber optic loop. Default is No.

Long Cable Press No if this RTU is driving the fiber optic transmitter less than 1 mile. Press Yes if this RTU is transmitting to a device located more than 1 mile away. Default is No.

2.5.6 Crash Recovery Configuration

(See the appendices for detailed information)

Crash Recovery is a state of the RTU that allows you to back out of a bad configuration gracefully. The recovery process is based on the premise that you can have a way to boot VxWorks without running any applications. This allows you to reconfigure the RTU without having to run the last configuration.

Number of Restarts The number of restarts before the RTU starts VxWorks without applications (for troubleshooting purposes). Works best under normal conditions if the user accepts the default value.

Time between Restarts If crash happens in shorter time, it is logged as a restart. Works best under normal conditions if the user accepts the default value.

Example: If the RTU crashes within 90 seconds after the beginning of bootup, that counts as one restart. If this happens three times in a row, the RTU goes into Crash Recovery mode.

Notice that the default Time between Restarts is 90 seconds. Because the RTU takes about 60 seconds to reboot, 30 seconds is allowed for a crash. If you have reason to believe that the configuration problem takes longer to crash the RTU, enter a longer Time between Restarts.

2.5.7 Global Freeze Configuration

The Global Freeze application gives every port (meaning every master) the ability to read the exact same accumulator values as every other port for any given instant of time. Additionally, the ports may be set so that any master can initiate the freeze. There is a configurable lockout period whenever a freeze is initiated. The driving idea behind the Global Freeze function is synchronization of power data between ports.

Lockout Period (1–3600)

After any freeze that takes place which is triggered by any one of the options mentioned below there will be a period where any other freeze that is sent to the remote during this period will be ignored. This time period is in seconds and is entered by the user and is known as a 'lock-out period'. This value should not be greater than the freeze interval if the RTU clock is enabled. The default is 60 seconds.

Freeze triggers

Any combination of the five options listed can be selected:
Enable Freeze on Startup
Enable Freeze by Port
Enable Freeze by Status point
Enable Freeze by RTU clock
Enable Freeze After the Hour

The freeze triggers are further explained below.

Enable Freeze on Startup –

Upon a RTU startup the Global Freeze task will immediately send a freeze.

Enable Freeze by Port

Select the port(s) that can read and initiate the Global Freeze. Ports may be selected to participate in the Global Freeze but not initiate a freeze by simply selecting 'Read' for the particular port. If you want the port to be a freeze initiator, the 'Trigger' option should be selected. Only those ports that are configured which have protocols that are capable of sending a freeze will be in the choice list.

Enable Freeze by Status Point –

Select a status point (hardware or software) that can initiate the freeze. The global freeze occurs on a 'CLOSE' on the selected point.

Enable Freeze by RTU clock –

By enabling this option the user must enter the freeze interval and the freeze delay in seconds.

Freeze Interval (1 – 3600)

The user has the option to do freezes based on an interval by setting the number of seconds between freezes. For example, 900 to freeze every 15 minutes based on top of the hour; 3600 to freeze every hour on the hour. Default is 3600.

Freeze Delay (0 – [1 minus the Freeze Interval])

The freeze delay can be used as an alternative or 'backup' freeze in the case where the master station or status point fails to send the freeze. The delay time must be less than the freeze interval. Based on the delay, the RTU clock freeze initiates at the specified time but will execute only after the delay period has expired. If another freeze trigger is sent by a port or by the COS point during the delay period, it will cancel the RTU clock freeze and immediately execute the global freeze. Default is 0.

Enable Freeze After the Hour

By enabling this option the user must enter the seconds after the hour and the interval within the hour when the freeze is to occur.

Seconds After Hour (0 – 3599)

The user has the option to cause a global accumulator freeze a specified number of seconds after the hour. Default is 0.

Interval Within Hour (sec) (0 – 3600)

The user has the option to freeze at subsequent intervals, in seconds, afterwards Default is 0.

Global Freeze Notes:

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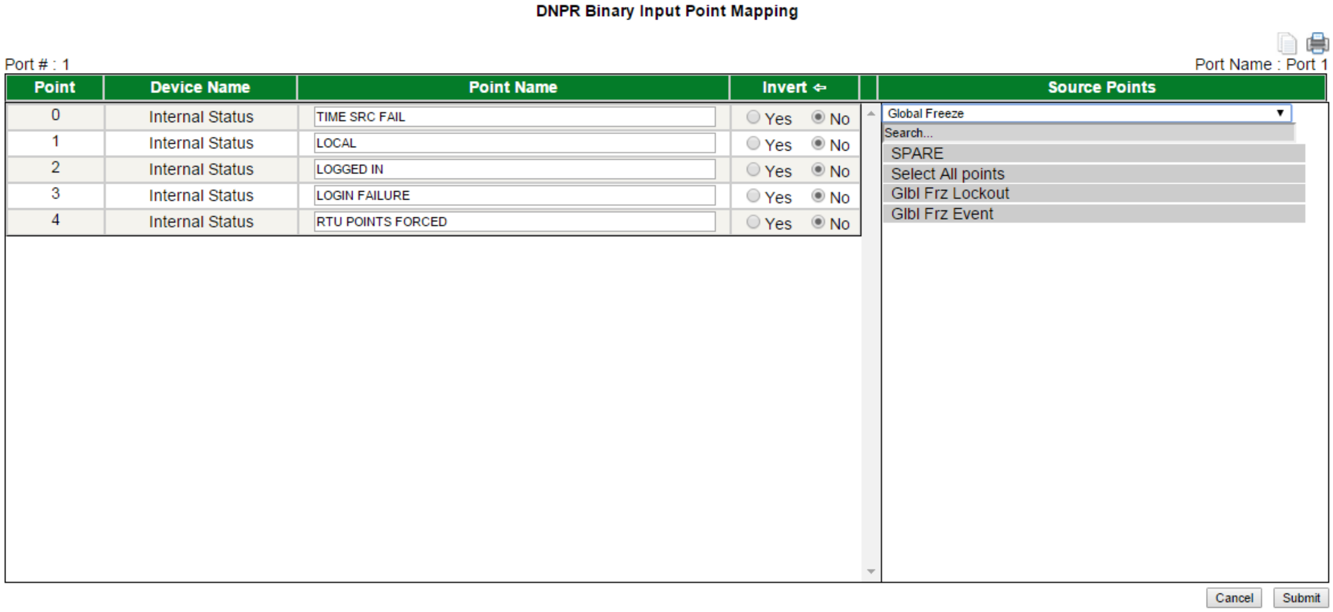
1. If the RTU clock is enabled then the Freeze Delay plus the Lockout Period must be less than the freeze interval (Freeze Delay + Lockout Period < Freeze Interval).
2. If none of the options are selected the Global Freeze task will suspend.

General Note: No configuration changes take effect until the RTU is reset.

2.5.7.1 Global Freeze Status Points

There are two internal status points associated with Global Freeze. They exist only if Global Freeze has been configured. The example below shows how the points might be mapped to a Master.

Figure 2-9 Global Freeze Status Points Mapping



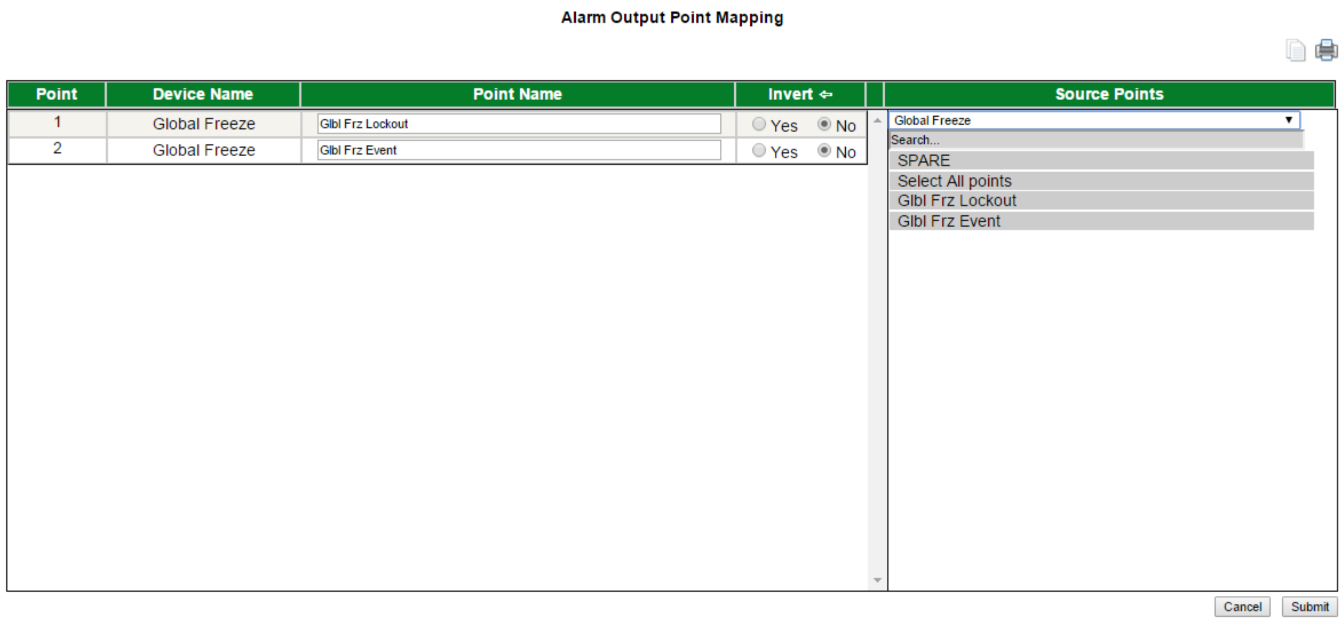
Glbl Frz Lockout

The "Glbl Frz Lockout" closes when the freeze occurs and opens when the defined lockout period expires.

Glbl Frz Event

The "Glbl Frz Event" closes when the freeze occurs and opens approximately 500 milliseconds later. This point can be mapped to an alarm point to provide a contact closure at the RTU to enable other substation devices to receive a pulse when the freeze occurs. The closure time is fixed.

Figure 2-10 Mapping Global Freeze Status Points to Alarms



2.5.8 Services Setup

The Services Setup configuration allows the user to select different protocols as required. There are no restrictions on the protocols selected.

To run the RTU in the **most secure mode**, select from the following options:

- **HTTPS** – Hypertext Transfer Protocol Secure (Port 443) used by the GUI
- **SSH** – Secure Shell (Port 22)
- **SFTP** – Secure Shell File Transfer Protocol (service inside of SSH)
- **Enable Remote Shell** – Allow VxWorks Shell access
- **IPsec** –VPN connection to ensure secure network traffic

In the most secure mode, one protocol is required and a second is optional. The GUI uses HTTPS. The tunnel functions use SSH.

To run the RTU in the **least secure mode**, select from the following options:

- **HTTP** – Hypertext Transfer Protocol (Port 80) used by the GUI
- **Telnet -** Network Virtual Terminal protocol (Port 23)
- **FTP** – File Transfer Protocol (Port 21)
- **Enable Remote Shell** – Allow VxWorks Shell access
- **PPP** – Alternate serial connection to GUI

In the least secure mode, two protocols are required and one protocol is optional. The GUI uses HTTP for the web browser and FTP to transfer configuration files. The tunnel functions use Telnet.

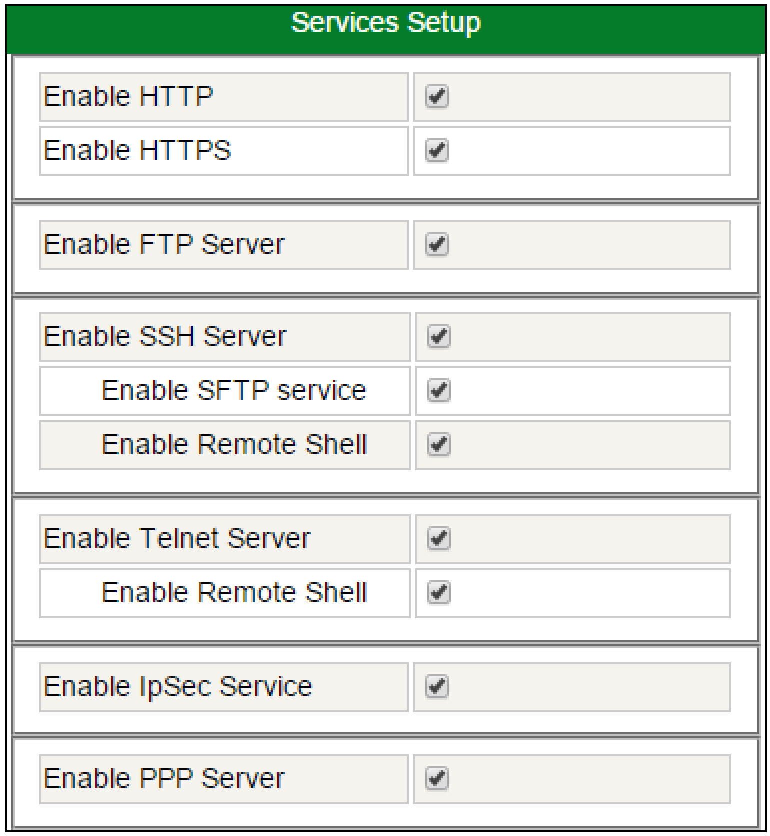


Figure 2-11- CPU Page Services Setup

2.5.9 Ethernet Adapter Configuration

PPP Port Address assigned by Schneider Electric. See Appendix E.

IP Address IP Address of this RTU

Target Name Network server name of the RTU (the network server that resolves this name to the IP address is the DNS server)

Default Gateway IP Address of the device connected to multiple physical TCP/IP networks capable of routing or delivering IP packets between them. A gateway translates between different transport protocols or data formats (for example, IPX and IP) and is generally added to a network primarily for its translation ability.

Primary Port (J3) Name of the primary Ethernet port

IP Address IP Address of the Primary port

Subnet Mask Primary Subnet Mask for the RTU on the Primary Network

Secondary Port (J2) Name of the secondary Ethernet port

IP Address IP Address of the Secondary Port

Subnet Mask Secondary Subnet Mask for the RTU on the Secondary Network

Configure Routing Clicking the Configure Routing button will display the following screen

2.5.9.1 Ethernet Routing Table Configuration

The Ethernet Routing Configuration is used to route a network or host to a specific Ethernet on the RTU. Information about the networks for the Primary and Secondary Ethernets is displayed on the page. Up to 10 routes may be entered for each network available.

The Gateway, IP Address and Subnet Mask are entered and displayed in the dotted decimal format.

Ethernet Routing Configuration

Primary Port (J3) Routing Information

Port Name:	Ethernet Port 0
I.P. Address	172.18.150.51
Subnet Mask	255.255.255.0

Route #	Type	Gateway	IP Address	Subnet Mask
1	None			
2	None			
3	None			
4	None			
5	None			
6	None			
7	None			
8	None			
9	None			
10	None			

Secondary Port (J2) Routing Information

Port Name:	Ethernet Port 1
I.P. Address	192.168.1.100
Subnet Mask	255.255.255.0

Route #	Type	Gateway	IP Address	Subnet Mask
1	None			
2	None			
3	None			
4	None			
5	None			
6	None			
7	None			
8	None			
9	None			
10	None			

Cancel Submit

Figure 2-12 - Ethernet Routing Configuration

Route # – This column shows the rows associated with each network. Each row use must contain the Route Type and the necessary data to create a route.

Route Type – Select “Network” or "Host".

Gateway – Specify the IP of the gateway host to the network

IP Address – Specify the IP Address of the network or host

Subnet Mask – Specify the network subnet mask

To add a route, do the following:

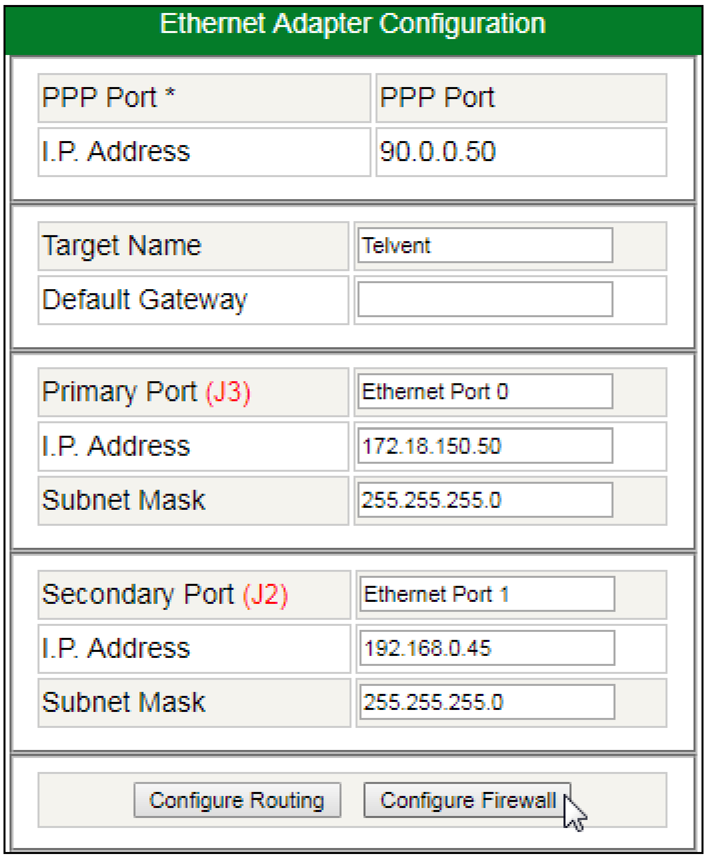
For the Network type, you must enter a Gateway, IP Address and Subnet Mask. The Gateway is the IPv4 host serving as the gateway, the IP Address is the IPv4/IPv6 destination host or network address and the Subnet Mask is .

For the Host type, you must enter a Gateway, and IP Address. The Gateway is the IPv4 host serving as the gateway and the IP Address is the IPv4 destination host to add the route for.

2.5.10 Firewall Setup

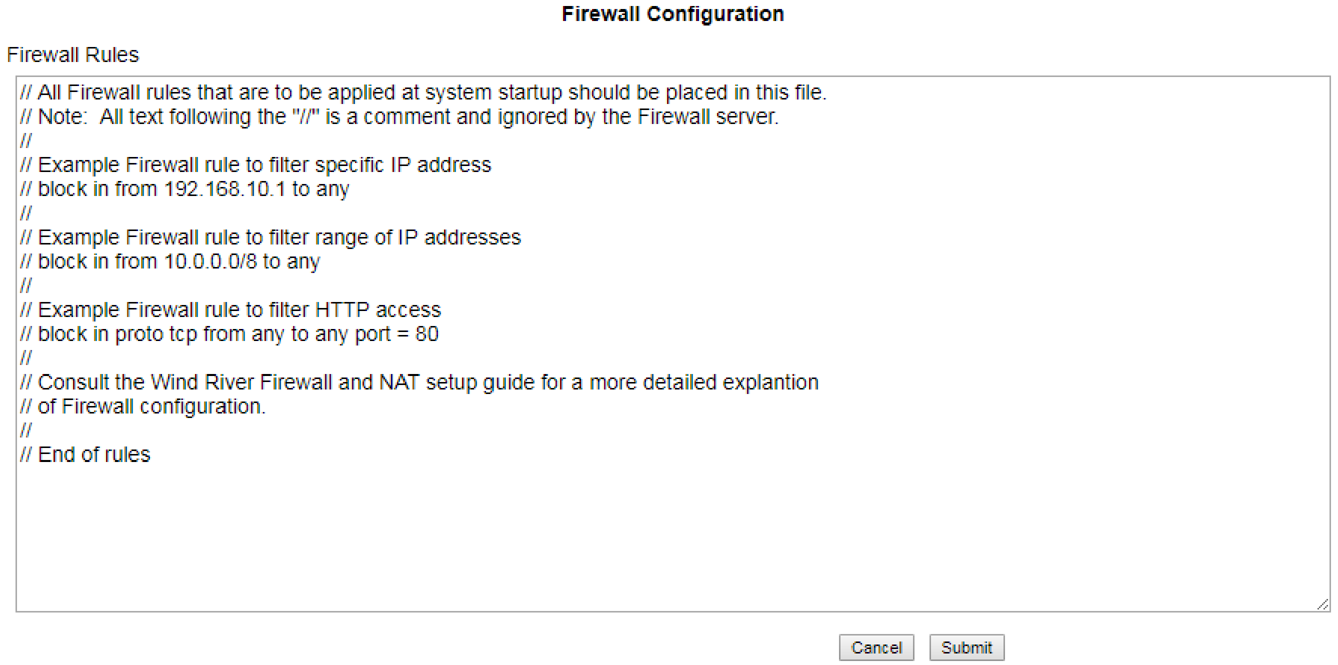
From the CPU Config page, click the Configure Firewall Button.

Figure 2-13: Configure Firewall Button



Carefully configure the needed firewall rules for your RTU. See the Firewall Configuration Manual for help with the syntax for this file (Chapter 4). It is located here. SAGE Firewall Configuration Guide

Figure 2-14: Firewall Configuration



2.5.11 ACI Type

Use the radio button to choose either ACI or FMR. Please see section "2.12.1 ACI Type" on page 48 for further information.

Navigation

Click the Submit button to accept the changes or the Cancel button to cancel changes.

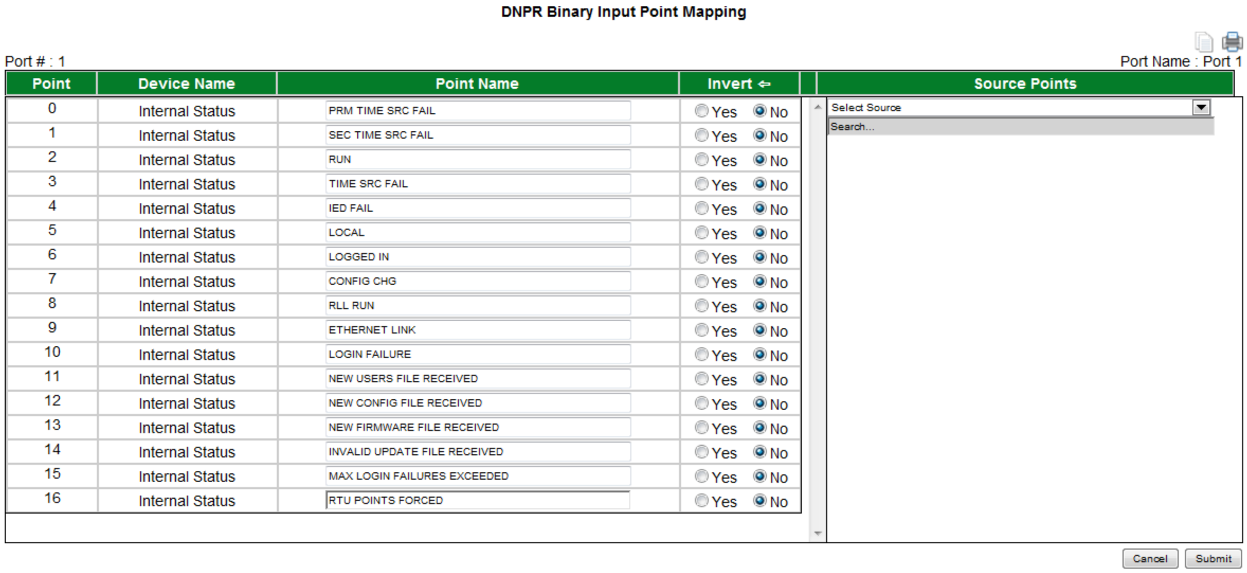
Please note: No configuration changes take effect until the RTU is reset.

2.5.12 Internal Status Points

The firmware automatically generates internal status points that are useful for monitoring important functions within the RTU. The Internal Status Points appear as source points for mapping, as shown in the example below.

Note: Internal status points are visible only when mapped to a master or any other function that is capable of mapping points. The example below happens to be a slave protocol.

Figure 2-15 Mapping Internal Status Points



DNPR Binary Input Point Mapping

Port # : 1 Port Name : Port 1

Point	Device Name	Point Name	Invert ⇦	Source Points
0	Internal Status	PRM TIME SRC FAIL	Yes / No	Select Source
1	Internal Status	SEC TIME SRC FAIL	Yes / No	Search...
2	Internal Status	RUN	Yes / No	
3	Internal Status	TIME SRC FAIL	Yes / No	
4	Internal Status	IED FAIL	Yes / No	
5	Internal Status	LOCAL	Yes / No	
6	Internal Status	LOGGED IN	Yes / No	
7	Internal Status	CONFIG CHG	Yes / No	
8	Internal Status	RLL RUN	Yes / No	
9	Internal Status	ETHERNET LINK	Yes / No	
10	Internal Status	LOGIN FAILURE	Yes / No	
11	Internal Status	NEW USERS FILE RECEIVED	Yes / No	
12	Internal Status	NEW CONFIG FILE RECEIVED	Yes / No	
13	Internal Status	NEW FIRMWARE FILE RECEIVED	Yes / No	
14	Internal Status	INVALID UPDATE FILE RECEIVED	Yes / No	
15	Internal Status	MAX LOGIN FAILURES EXCEEDED	Yes / No	
16	Internal Status	RTU POINTS FORCED	Yes / No	

Cancel Submit

Note: See the Data Display chapter for the results of this configuration.

PRM TIME SRC FAIL

Indicates the health of the Primary Time Source. Close means the primary time source has failed. Open means the primary time source is operational.

SEC TIME SRC FAIL

Indicates the health of the Secondary Time Source. Close means the secondary time source has failed. Open means the secondary time source is operational.

RUN

Indicates whether or not the CPU is running. In Display mode, look for the signature "heartbeat"; that is, a one-second change of status (similar to the blink-rate of the Run LED on the SAGE 3030 and 3030M). Normally changing status every second.

TIME SRC FAIL

Indicates the health of either Time Source. If two time sources are configured (primary and secondary), Close means one of the time sources has failed. Open means both sources are operational.

IED FAIL

Indicates the status of all of the IED(s) connected to the RTU. Close means the communications to at least one IED(s) has failed. Open means that all IED(s) communication is normal. Normally Open.

LOCAL

Indicates the status of the Remote/Local switch. Close means the switch is in the Local position (no power to controls). Open means the switch is in the Remote position (controls have power). Normally Open. Starting with C3414-500-S02K2 firmware, commands sent when the RTU is in Local Mode will generate a System Log entry.

LOGGED IN

Indicates whether or not someone is logged into the device. Close means that one or more persons are logged in. Open means that no one is logged in.

CONFIG CHG

Indicates whether or not the configuration has been changed since the last reset. Closed means there has been a configuration change since the last reset. Open means there has been no configuration change since the last reset. Normally Open.

RLL RUN

Indicates whether or not an RLL program is running. Closed means there is an RLL (ISaGRAF) program running in the RTU. Open means there is no RLL program running.

ETHERNET LINK

Indicates whether or not there is a valid Ethernet link circuit connected to the Ethernet connector. Closed means there is a valid Ethernet connection to the RTU. Open means there is not.

MAX LOGIN FAILURES EXCEEDED

When the number of failed login attempts exceeds the configured “Alarm After Failed Logins” from the CPU Page.

INVALID UPDATE FILE RECEIVED

When an update file is received that fails the security test of the gzip file or tar file. For the user account file, if the encryption of the file is bad, this point will toggle.

NEW USERS FILE RECEIVED

When a new user account file is successfully received and put into use.

NEW CONFIG FILE RECEIVED

When a new configuration package is received and successfully stored.

NEW FIRMWARE FILE RECEIVED

When a new firmware package is received and successfully stored.

Note: If the optional C3463 Switched Ethernet PC/104 card is installed, the Ethernet Link indication will always show a valid Ethernet connection.

LOGIN FAILURE

Indicates whether a failed login has occurred. This point is changed from open to closed to open when a failed login occurs, so it will be most rare to see a state other than open.

NEW CONFIG FILE RECEIVED

When a new configuration package is received and successfully stored.

RTU POINTS FORCED

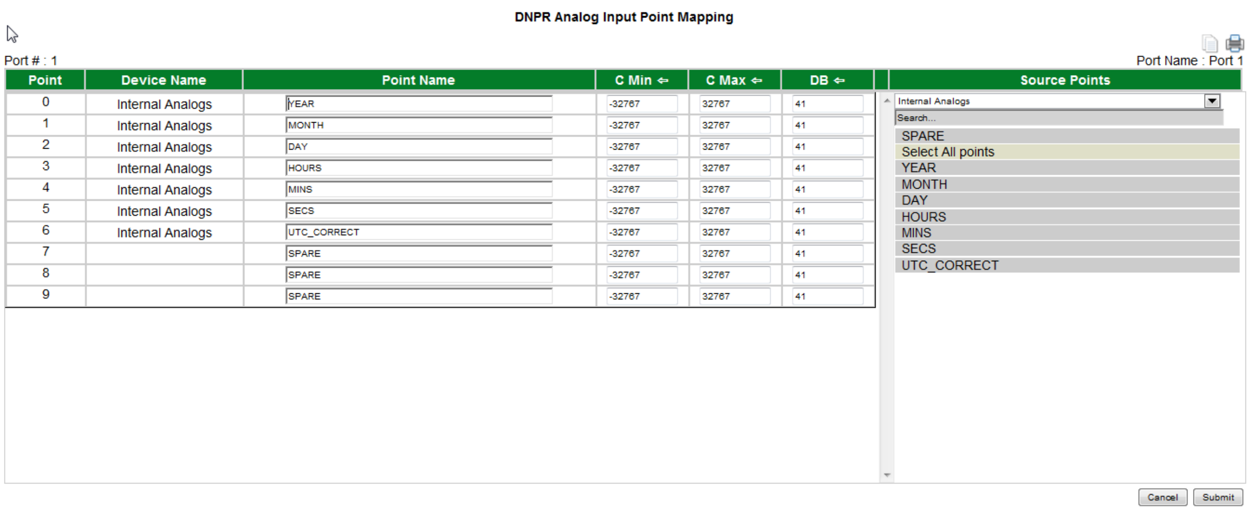
Indicates I/O point(s) on the RTU are currently forced.

2.5.13 Internal Analog Points

The firmware automatically generates internal analog points that are essentially system time and date values. The Internal Analog Points appear as source points for mapping, as shown in the example below.

Note: Internal analog points are visible only when mapped to a master or any other function that is capable of mapping points. The example below happens to be a slave protocol.

Figure 2-16 Mapping Internal Analog Points



Note: See the Data Display chapter for the results of this configuration.

YEAR

Scales the analog to the year set in the RTU Time Configuration.

MONTH

Scales the analog to the month set in the RTU Time Configuration.

DAY

Scales the analog to the day set in the RTU Time Configuration.

HOURS

Scales the analog to the hour set in the RTU Time Configuration.

MINS

Scales the analog to the minute set in the RTU Time Configuration.

SECONDS

Scales the analog to the second set in the RTU Time Configuration.

UTC_CORRECT

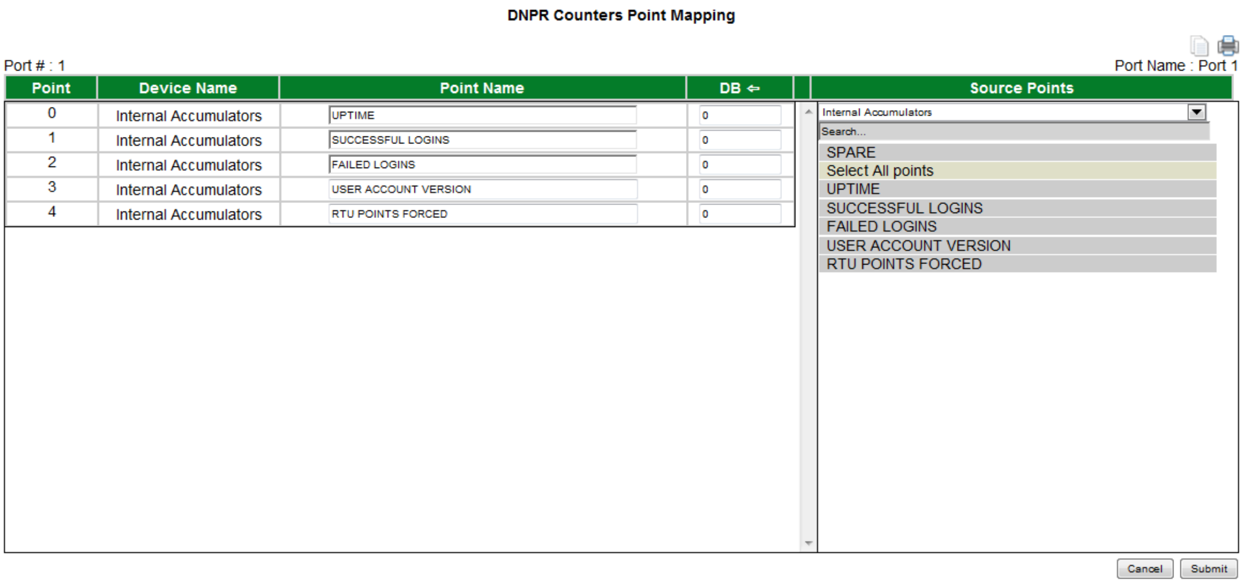
Scales the analog to the UTC Correction, if any, set in the RTU Time Configuration.

2.5.14 Internal Accumulator Points

The firmware automatically generates internal accumulator points. The Internal Accumulator Points appear as source points for mapping, as shown in the example below.

Note: Internal accumulator points are visible only when mapped to a master or any other function that is capable of mapping points. The example below happens to be a slave protocol.

Figure 2-17 Mapping Internal Accumulator Points



Note: See the Data Display chapter for the results of this configuration.

UPTIME

Generates tick marks for every second of UPTIME since last reset.

SUCCESSFUL LOGGINS

Generates tick marks for every successful loggin since last reset.

FAILED LOGGINS

Generates tick marks for every failed loggin since last reset.

USER ACCOUNT VERSION

Contains the version number of the user account file currently being used.

RTU POINTS FORCED

Indicates the number of I/O points on the RTU that are currently forced.

Naming Points

As mentioned previously, and as described throughout this manual, you may name source points as you configure them. There is a forty five character limit to the name of a point. The interface will not allow you to input more than forty five characters. However, some customers have created macros of various types in which the macro automatically reads a column of a spreadsheet and places those names into the appropriate XML file. The problem with this technique is that the XML file doesn't have a character limit
2.6 on the name or a filter for the type of character. The problem will show up when the RTU tries to run a long character-count name, or an inappropriate special character.

The following characters (shown below) may be used when typing into the GUI, but will present problems when placed directly into the XML file. When the character is typed into the GUI, it is replaced by the string on the right in the table. The string is retranslated into the original character for display. If any of these special characters are entered directly into the XML file, the program will use them just as they are and will cause problems.

Figure 2-18 Special Characters

Special Character	Name	Replaced by
&	Ampersand	&
<	Less Than	<
>	Greater Than	>
“	Double Quote	"
‘	Apostrophe	'

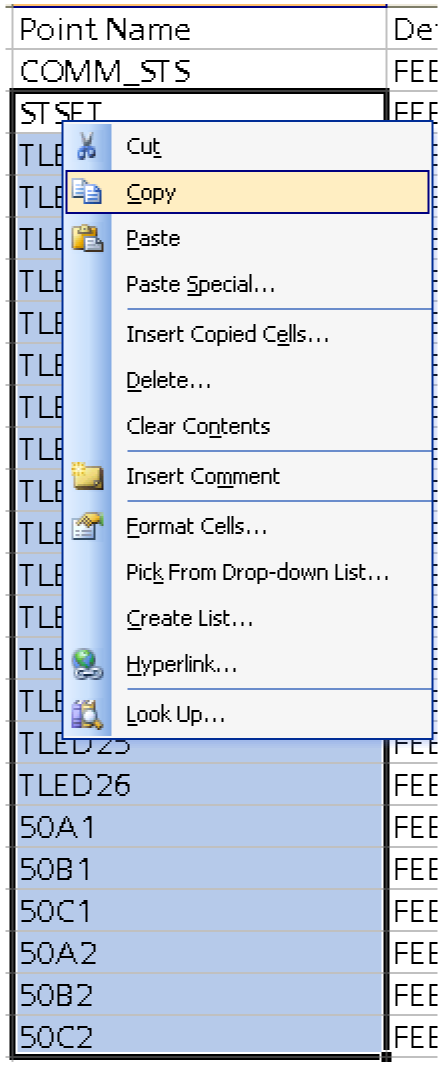
Warning: The lesson is that, if you write a macro to place point names in an XML file, be sure you limit names to forty five characters and that you replace special characters with the "Replaced
2.7 by" string listed above.

Copying Multiple Point Names from a Spreadsheet

Point names may be copied from an Excel column of names as shown below. Select and copy the range to your clipboard.

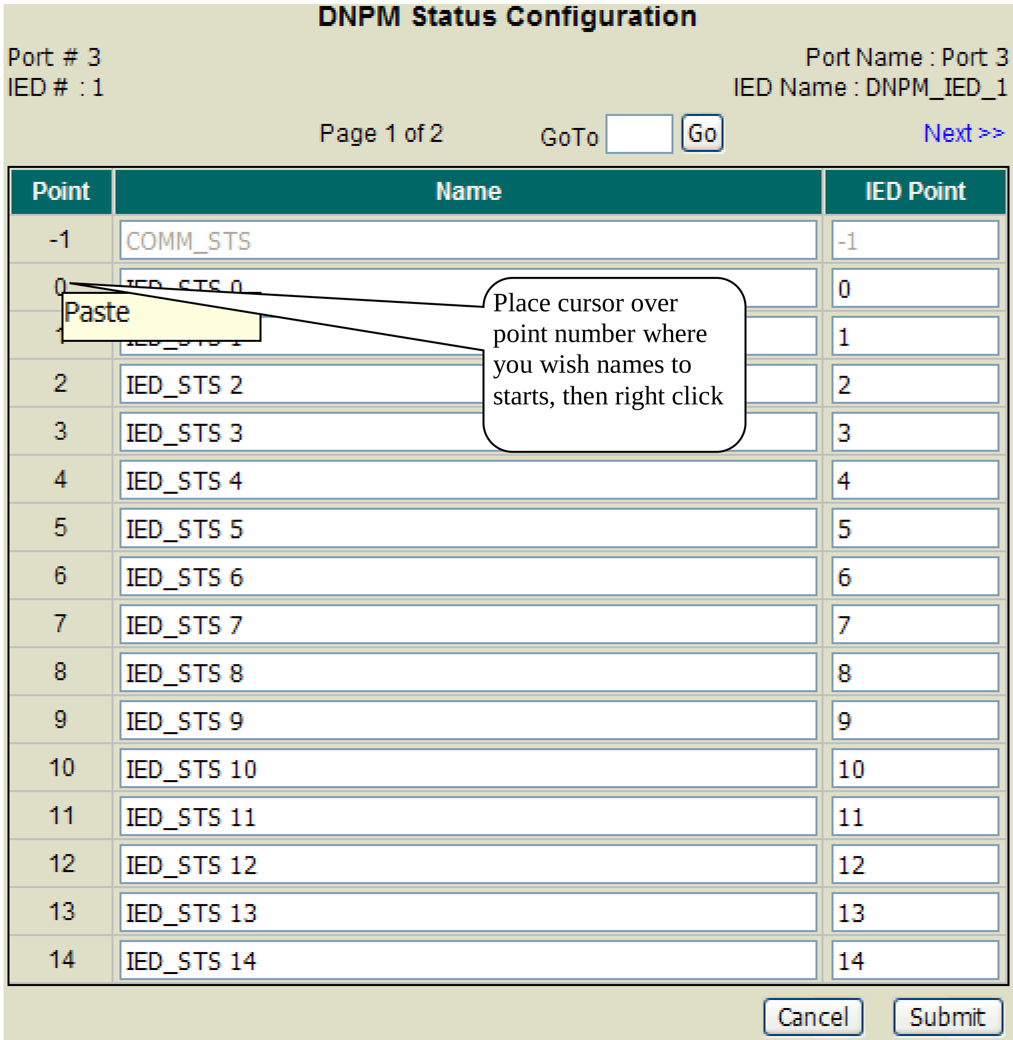
Note: Not all configurations or protocols support this feature.

Figure 2-19 Spreadsheet Column of Point Names



Then paste into the point name source (such as IED point names) as shown below.

Figure 2-20 Pasting Point Names Into Hardware Status Source Names



Click on Allow Access to paste the names into the Configuration.

Note 2: This feature is not widely implemented. If you don't see the "Paste" message as shown above, then the particular screen has not been upgraded yet.

Figure 2-21 Dialog Message

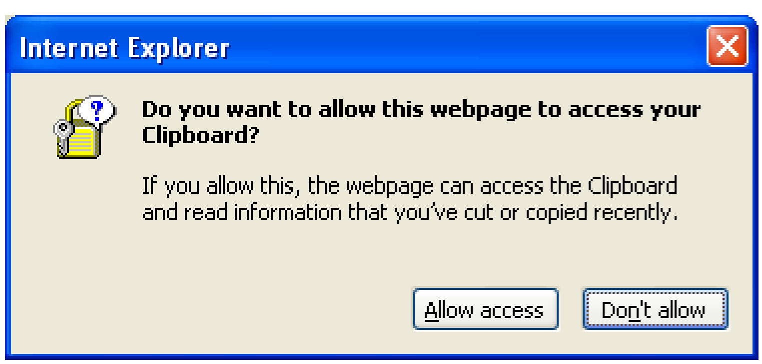
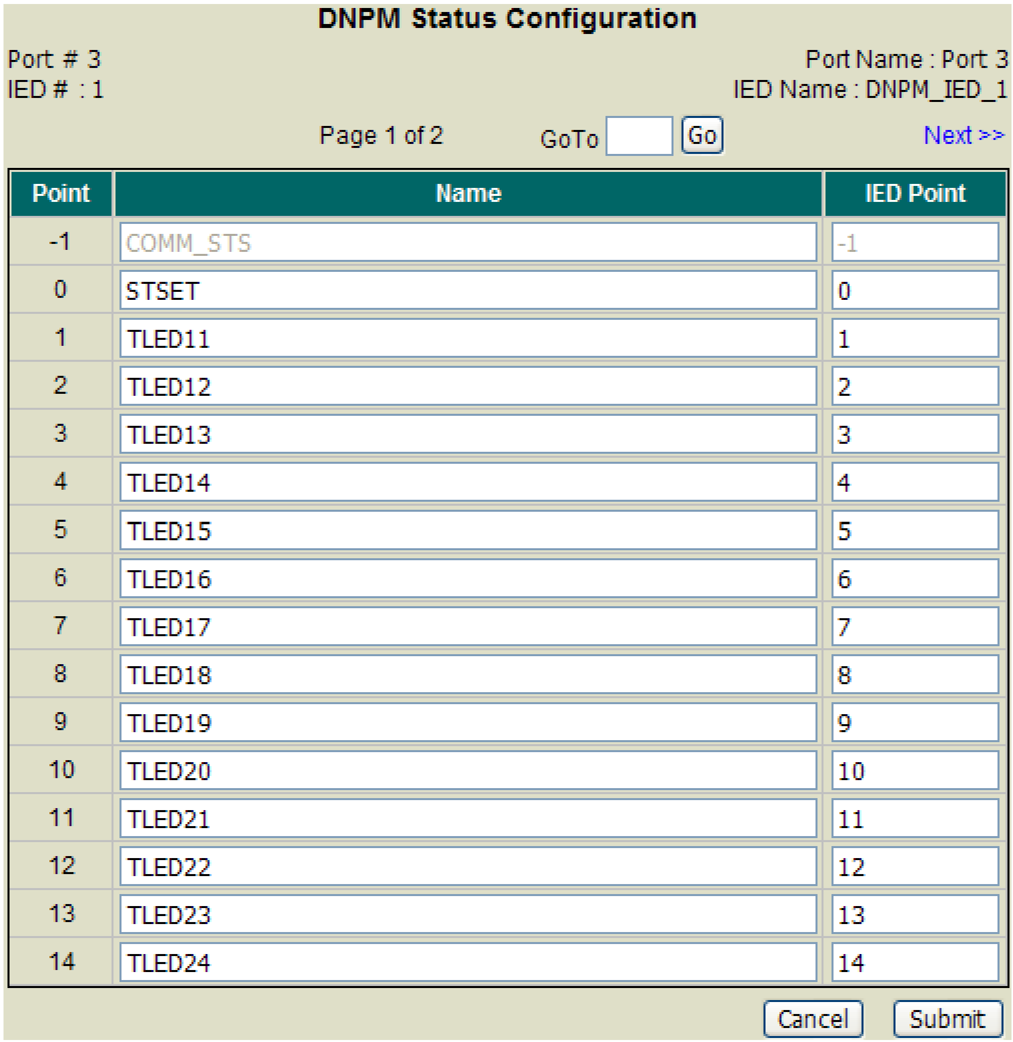


Figure 2-22 Results of Paste


DNPM Status Configuration

Port # 3 Port Name : Port 3
IED # : 1 IED Name : DNPM_IED_1

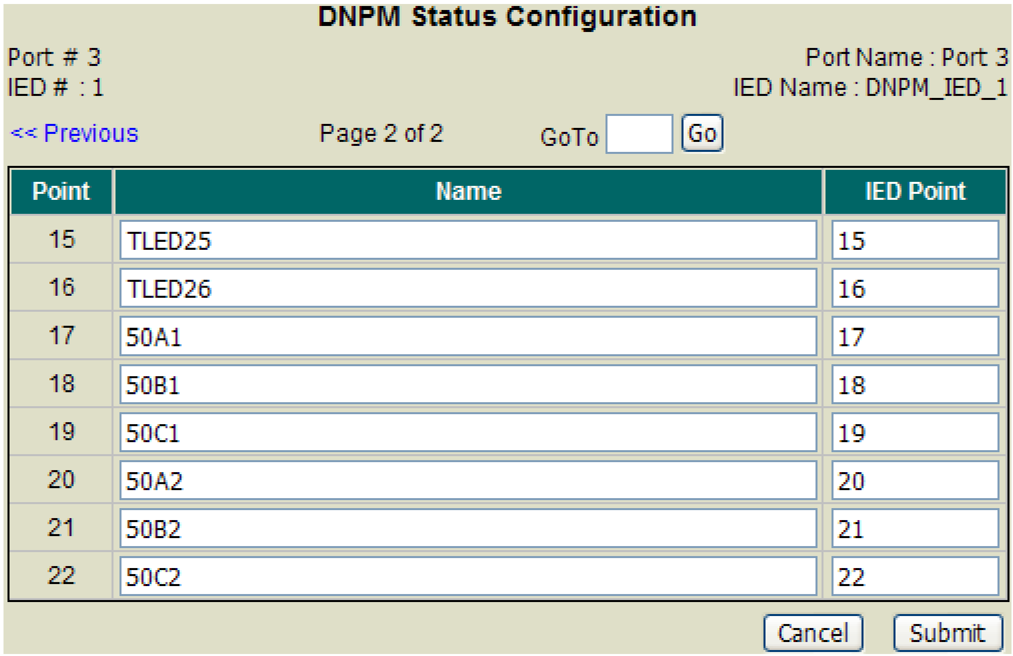
Page 1 of 2 GoTo Go Next >>

Point	Name	IED Point
-1	COMM_STS	-1
0	STSET	0
1	TLED11	1
2	TLED12	2
3	TLED13	3
4	TLED14	4
5	TLED15	5
6	TLED16	6
7	TLED17	7
8	TLED18	8
9	TLED19	9
10	TLED20	10
11	TLED21	11
12	TLED22	12
13	TLED23	13
14	TLED24	14

Cancel Submit

Notice that the Paste operation will encompass as many pages as required to accommodate the number of names you have selected, as long as you've assigned enough point names.

Figure 2-23 Second Page

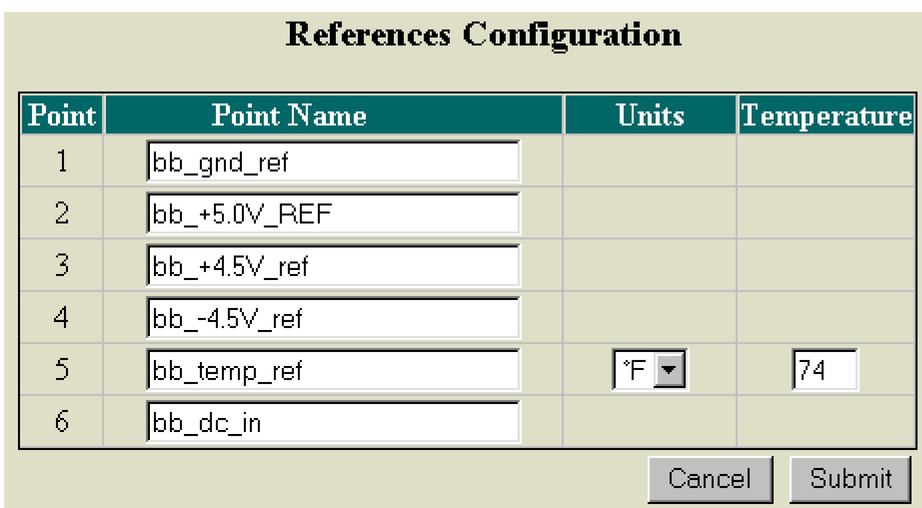


Note 1: This technique for pasting names works with columns of names from other application sources besides a spreadsheet, such as Notepad.

2.8 References Configuration

The References Configuration screen allows you to name the references or accept the default names. You may also set the temperature units (°F or °C) and correct the temperature reading (enter the current correct temperature at the RTU). See Figure 2-24. Click Submit when you are satisfied with the configuration, or Cancel to back out of the function without saving.

Figure 2-24 References Configuration



The following table defines the EGU Min and EGU Max values for the references.

Note: The SAGE 2000 baseboard sets the type for the bb_+5.0V_REF, temperature reference, and DC Input voltage to be unipolar. However, for flexibility, the default for the points when mapping to a master is bipolar. There are two ways to handle this: 1) Change the C Min and C

Max in the RTU to be unipolar for those references (for instance, for Series V protocol, 0 to 2000 counts instead of -2000 to 2000 counts. 2) Change the master station analog scaling for these two points to use the -2000 to 2000 count range.

Table 2-1 SAGE 2X00 Reference Points

Ref #	Reference	Reference Name	Type	EGU Min	EGU Max	EGU
1	Ground	bb_gnd_ref	Bipolar	-5	+5	VDC
2	Full Scale	bb_+5.0V_REF	Unipolar	0	+5	VDC
3	Positive	bb_+4.5V_ref	Bipolar	-5	+5	VDC
4	Negative	bb_-4.5V_ref	Bipolar	-5	+5	VDC
5	Temperature	bb_temp_ref	Unipolar	-58	+842	DEG F
5	Temperature	bb_temp_ref	Unipolar	-50	+450	DEG C
6	DC Input	bb_dc_in	Unipolar	0	+39	VDC

Table 2-2 SAGE 1X50 Reference Points

Ref #	Reference	Reference Name	Type	EGU Min	EGU Max	EGU
1	Ground	bb_gnd_ref	Bipolar	-3	+3	VDC
2	Positive 2.5	bb_+2.5V_ref	Bipolar	-3	+3	VDC
3	Negative 2.5	bb_-2.5V_ref	Bipolar	-3	+3	VDC
4	Temperature	bb_temp_ref	Bipolar	-58	+185	DEG F
4	Temperature	bb_temp_ref	Bipolar	-50	+85	DEG C
5	Battery Power	bb_bat_in_ref	Bipolar	-33	+33	VDC
6	Primary Power	bb_pwr_in_ref	Bipolar	-33	+33	VDC

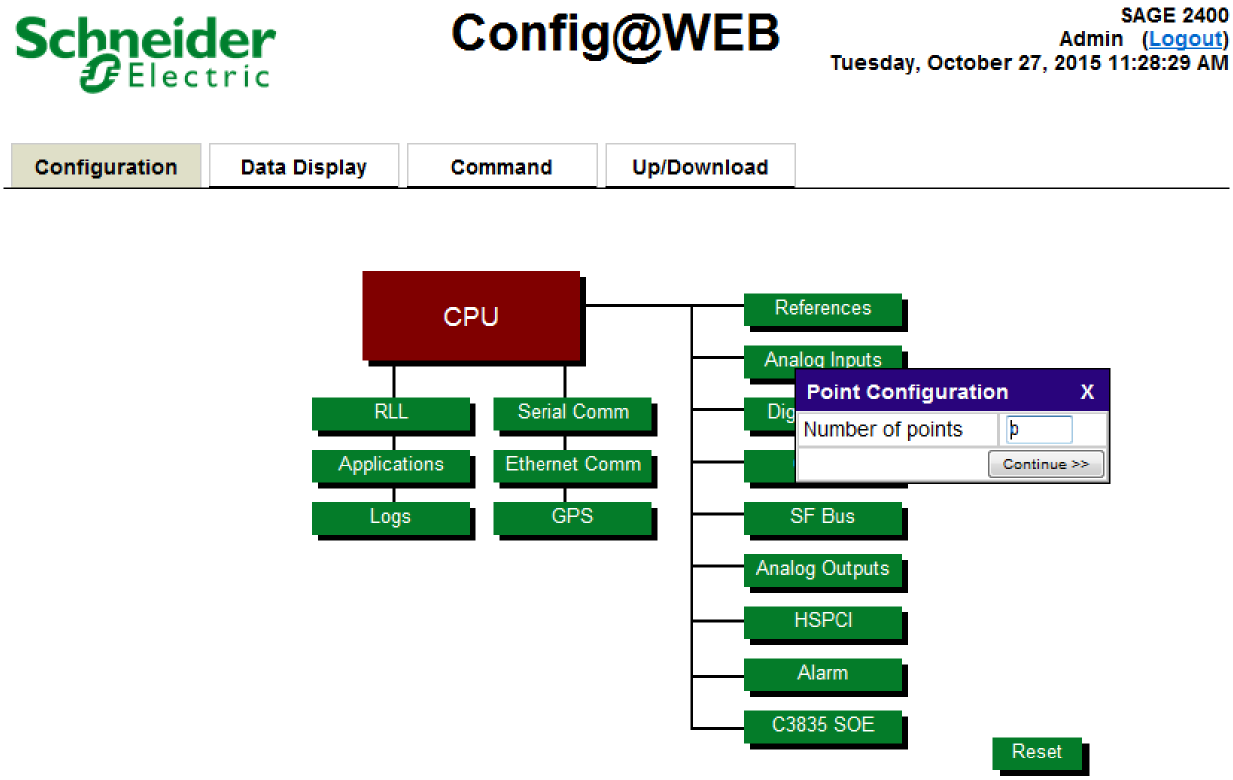
Table 2-3 C3830 Reference Points

Ref #	Reference	Reference Name	Type	EGU Min	EGU Max	EGU
1	Ground	bb_gnd_ref	Bipolar	-5	+5	VDC
2	Full Scale	bb_+5.0V_ref	Unipolar	-5	+5	VDC
3	Positive	bb_+4.5V_ref	Bipolar	-5	+5	VDC
4	Negative	bb_-4.5V_ref	Bipolar	-5	+5	VDC
5	Temperature	bb_temp_ref	Bipolar	-58	+185	DEG F
5	Temperature	bb_temp_ref	Bipolar	-50	+85	DEG C
6	C3830 Ground	C3830_gnd_ref	Bipolar	-5	+5	VDC
7	C3830 Ground	C3830_gnd_ref	Bipolar	-5	+5	VDC
8	C3830 Aux	C3830_aux_in	Bipolar	-5	+5	VDC

2.9 Analog Inputs Configuration

Click on the Analog Inputs button to enter the total number of DC hardware analog points. See Figure 2-25. Click Continue to configure the points, or Cancel to back out of the function without saving.

Figure 2-25 Analog Inputs Configuration

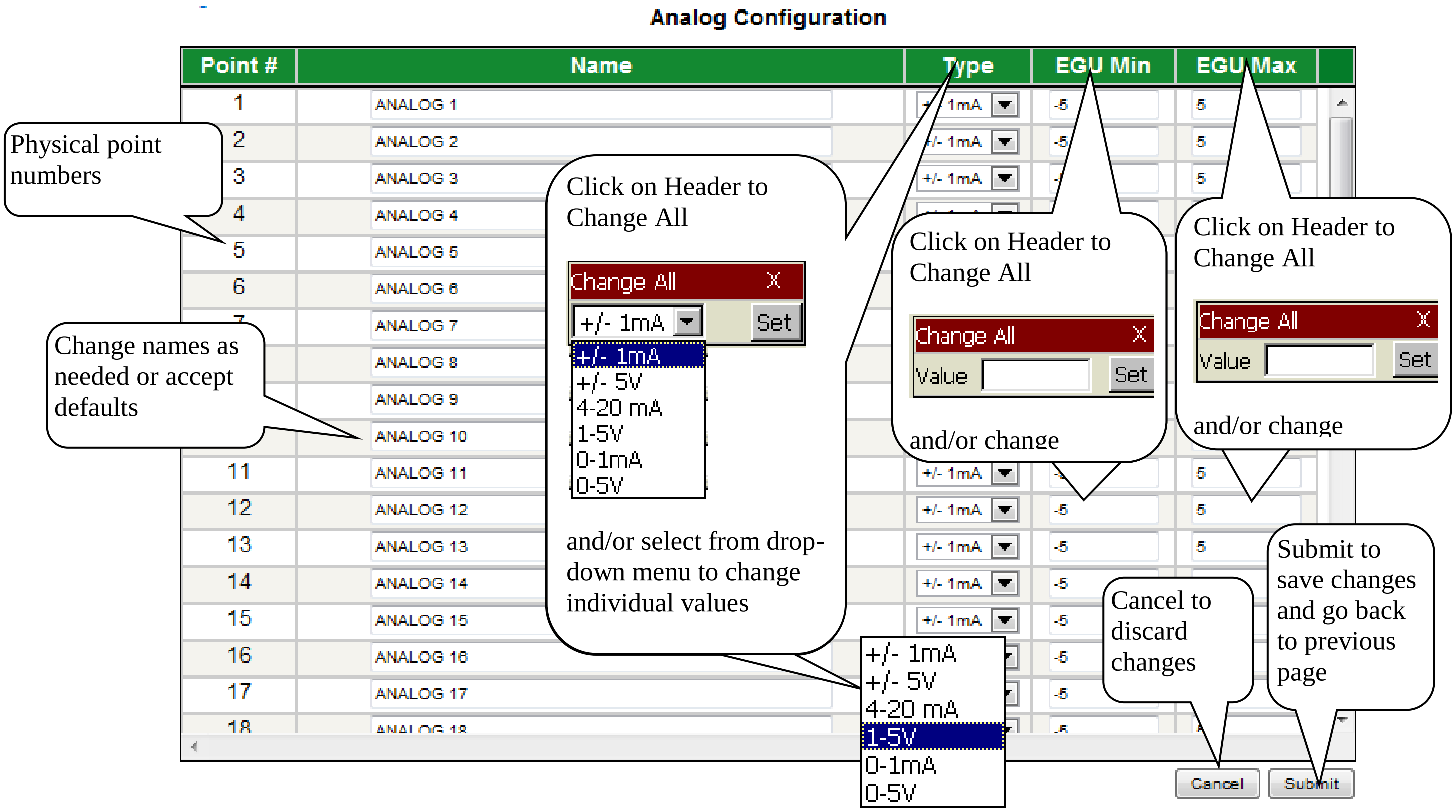


The Analog Configuration screen (Figure 2-26) allows you to name each analog point, select the type of input from a drop-down menu, and set the engineering scaling.

You are not required to set the EGU Min and EGU Max because these values are used only on the RTU Data Display (the Engineering Unit values are not sent to the Master). However, for troubleshooting purposes, it is good practice to set the EGU Min and EGU Max to the same values used on the Master station.

Click Submit when you are satisfied with the configuration, or Cancel to back out of the function without saving.

Figure 2-26 Analog Configuration

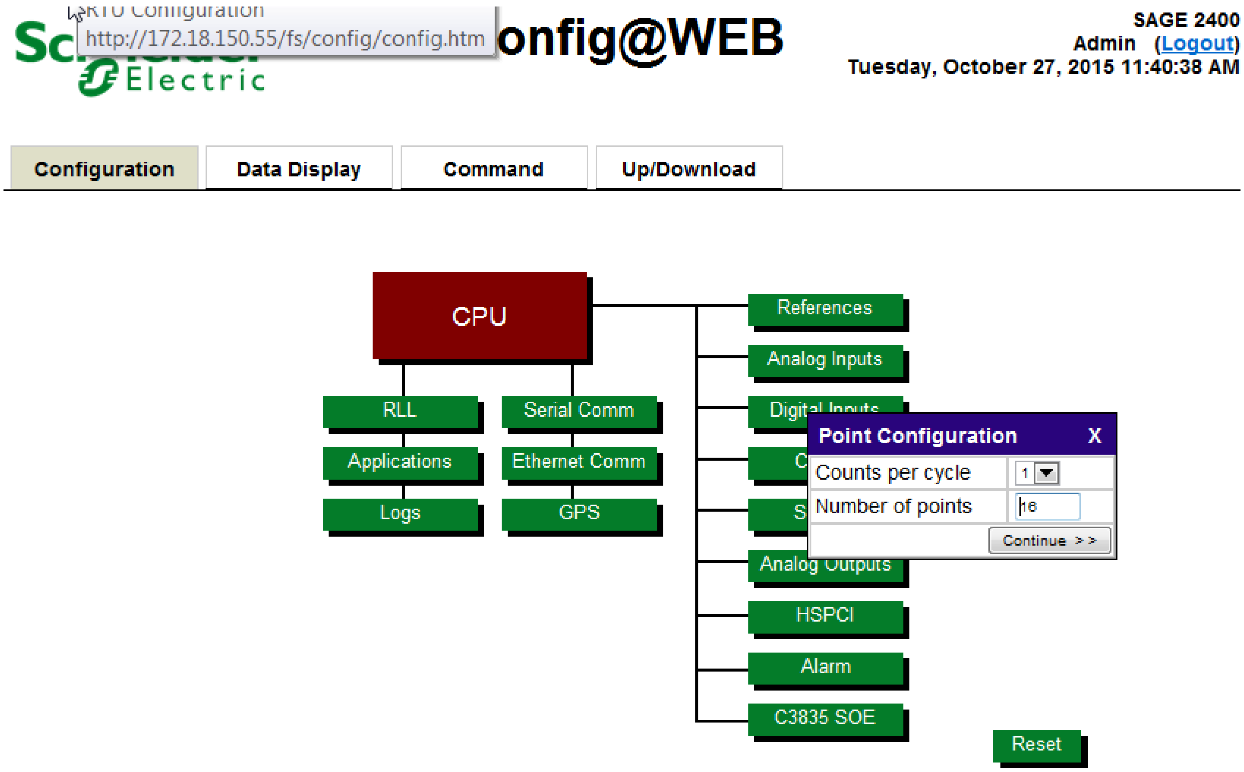


Please note: No configuration changes take effect until the RTU is reset.

2.10 Digital Inputs Configuration

Click Digital Inputs button to enter the total number of hardware digital points.

Figure 2-27 Configure Digital Inputs



2.10.1 Counts per cycle

If some DI points will be configured as accumulator points, select either 1 or 2 counts per cycle for accumulators from the dropdown menu. The number of counts is calculated by rising and falling edges as follows:

2.10.2 Counts per cycle = 1

Form A: 1 is added to the accumulator on the debounced rising edge (closed state) of the digital input point assigned to the accumulator point.

Form C: 1 is added to the accumulator when the debounced transitions on the two digital input points assigned to the accumulator point have been received and validated, 0(Open) 1(Closed) state to 10 state to 01 state adds 1 count.

2.10.3 Counts per cycle = 2

Form A: 1 is added to the accumulator for each debounced rising or falling edge of the digital input point assigned to the accumulator point.

Form C: 2 is added to the accumulator when the debounced transitions on the two digital input points assigned to the accumulator point have been received and validated, 01 state adds 1 count and 10 state adds 1 count.

2.10.4 Number of points

Enter the total number of DI points. This includes both status points and accumulator points.

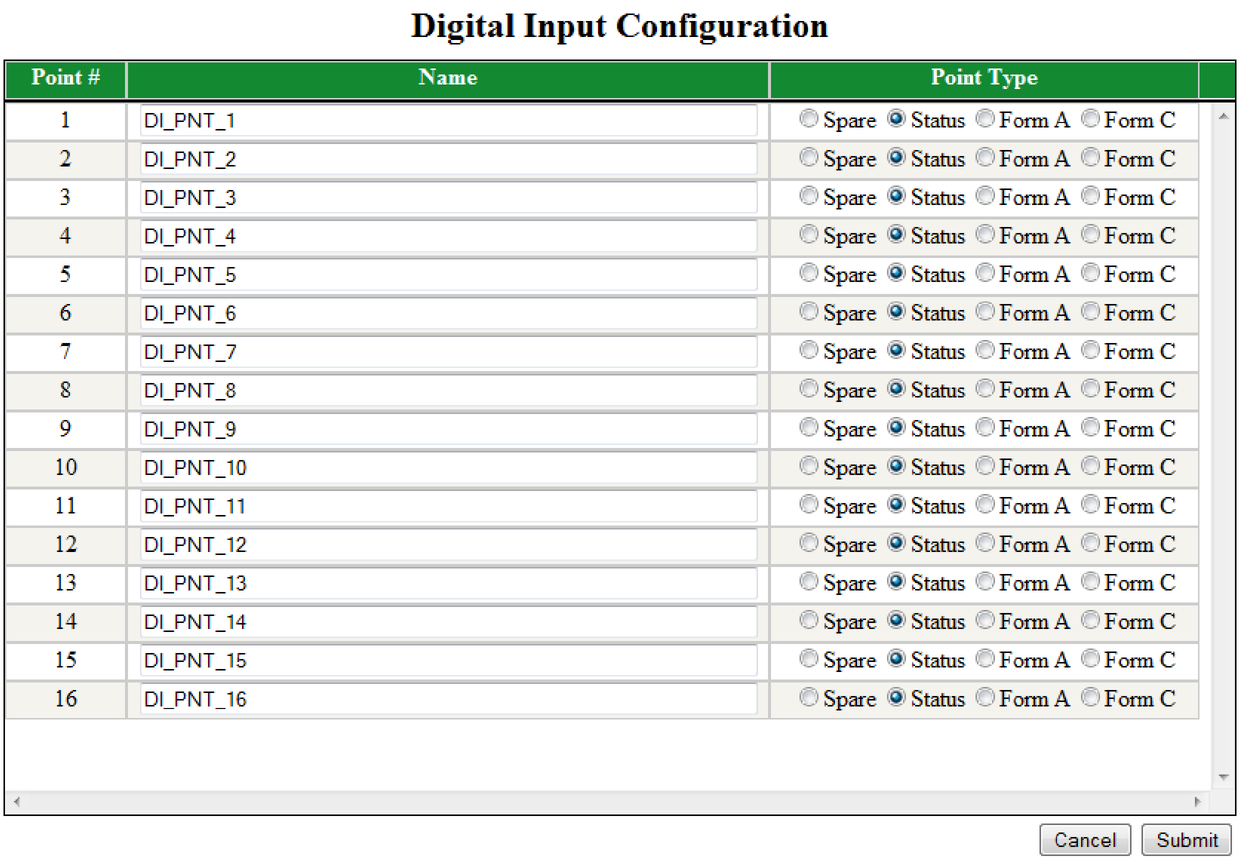
Click Continue to configure the points, or Cancel to back out of the function without saving.

On the Digital Input Configuration screen, type in a name for each point or accept the default names. Select whether the point is to be Spare, Status, Form A Accumulator, or Form C Accumulator.

Note: When selecting a digital input point to be a Form C accumulator, the digital input point immediately following must first be set to Spare. When defining a point to be Form C, the next point will be grayed out and not allow further entry.

Click Submit when you are satisfied with the configuration, or Cancel to back out of the function without saving.

Figure 2-28 Digital Input Configuration



Digital Input Configuration

Point #	Name	Point Type
1	DI_PNT_1	○ Spare ◉ Status ○ Form A ○ Form C
2	DI_PNT_2	○ Spare ◉ Status ○ Form A ○ Form C
3	DI_PNT_3	○ Spare ◉ Status ○ Form A ○ Form C
4	DI_PNT_4	○ Spare ◉ Status ○ Form A ○ Form C
5	DI_PNT_5	○ Spare ◉ Status ○ Form A ○ Form C
6	DI_PNT_6	○ Spare ◉ Status ○ Form A ○ Form C
7	DI_PNT_7	○ Spare ◉ Status ○ Form A ○ Form C
8	DI_PNT_8	○ Spare ◉ Status ○ Form A ○ Form C
9	DI_PNT_9	○ Spare ◉ Status ○ Form A ○ Form C
10	DI_PNT_10	○ Spare ◉ Status ○ Form A ○ Form C
11	DI_PNT_11	○ Spare ◉ Status ○ Form A ○ Form C
12	DI_PNT_12	○ Spare ◉ Status ○ Form A ○ Form C
13	DI_PNT_13	○ Spare ◉ Status ○ Form A ○ Form C
14	DI_PNT_14	○ Spare ◉ Status ○ Form A ○ Form C
15	DI_PNT_15	○ Spare ◉ Status ○ Form A ○ Form C
16	DI_PNT_16	○ Spare ◉ Status ○ Form A ○ Form C

Cancel Submit

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.11 Control Configuration

Click on Control button, then type in the number of control points. Select either SBO, Skip BB SBO, or BB DO (BB means baseboard). Skipping baseboard SBOs would be a good option if the baseboard SBOs were not suitable for the application. Baseboard SBOs *must* be skipped to use the full complement of 128 SBO XTs (256 relays). Only 124 SBOs (248 relays) may be configured if the baseboard SBOs are not skipped. Below is a further explanation of the radio buttons. This example is for the SAGE 2X00 only.

SBO SBO option using baseboard relays

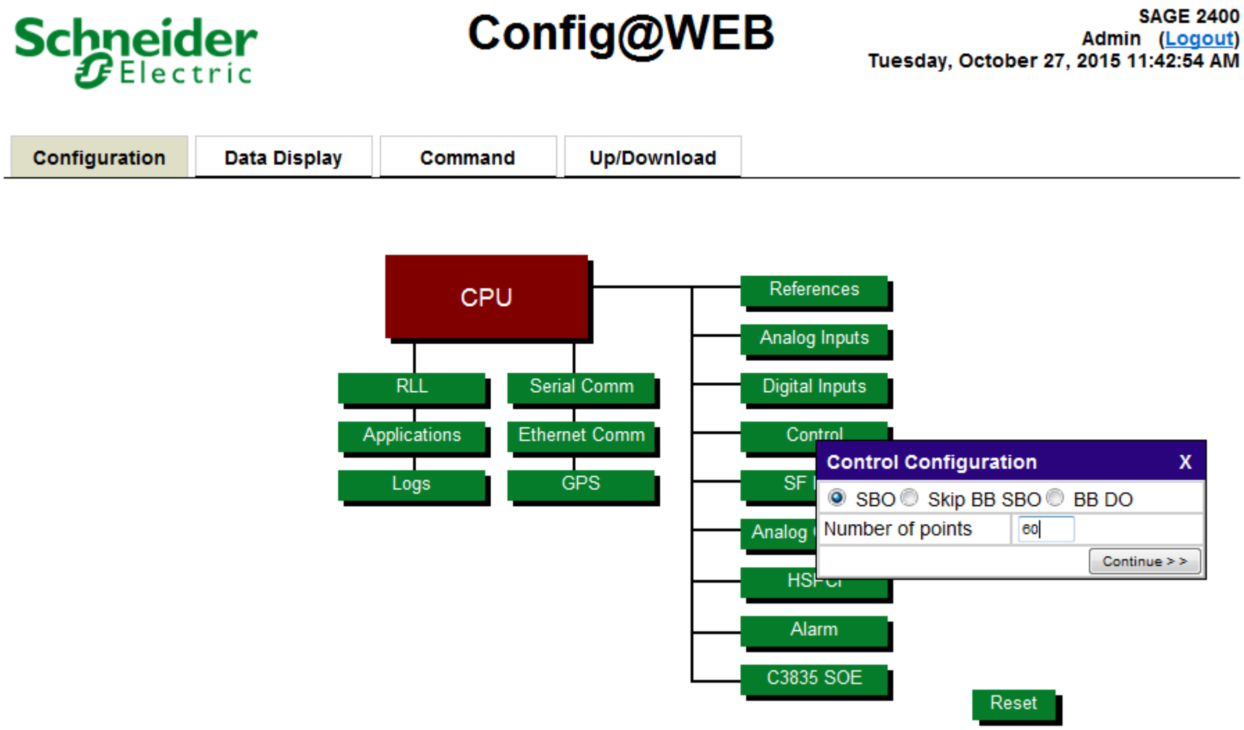
Skip BB SBO SBO option not using baseboard relays. Physical relays must be removed from the sockets if this option is selected. If you intend to use SFB DOs without using BB DOs, or BB SBOs, be sure to check this option.

BB DO No SBO points configured in RTU, only DO points.

Refer to the appropriate hardware manual for correct jumpering of baseboard.

Click Continue to configure the points or Cancel to back out of the function without saving.

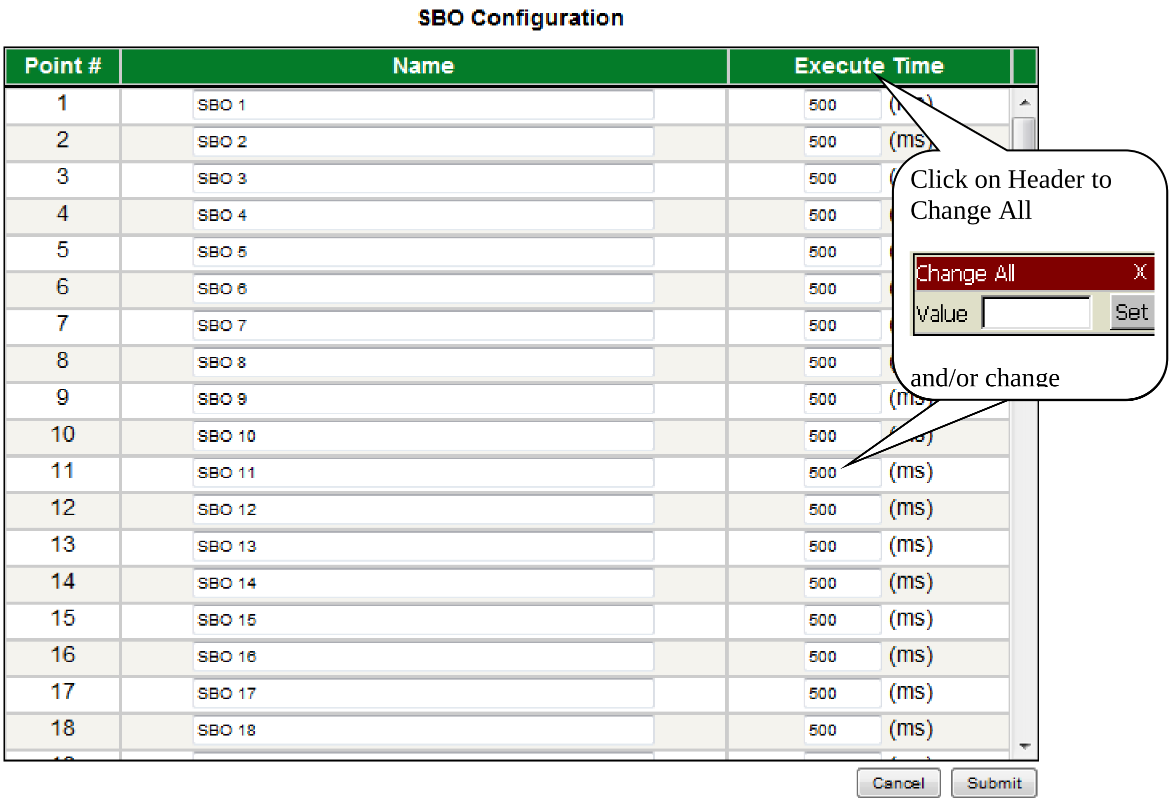
Figure 2-29 Control Configuration



Enter the name of the SBO point and the Execute Time for each SBO, or accept the defaults. You may click on the header Execute Time to set a time for all SBOs. You may also change the individual Execute Time for selected SBOs. The Execute Time entered will be used as the default when operating controls through the UIF and also for protocols that do not have the ability to send the control execute time in an MTU-to-RTU message.

Click Submit when you are satisfied with the configuration, or Cancel to back out of the function without saving.

Figure 2-30 SBO Configuration



Point #	Name	Execute Time
1	SBO 1	500
2	SBO 2	500 (ms)
3	SBO 3	500
4	SBO 4	500
5	SBO 5	500
6	SBO 6	500
7	SBO 7	500
8	SBO 8	500
9	SBO 9	500
10	SBO 10	500
11	SBO 11	500 (ms)
12	SBO 12	500 (ms)
13	SBO 13	500 (ms)
14	SBO 14	500 (ms)
15	SBO 15	500 (ms)
16	SBO 16	500 (ms)
17	SBO 17	500 (ms)
18	SBO 18	500 (ms)

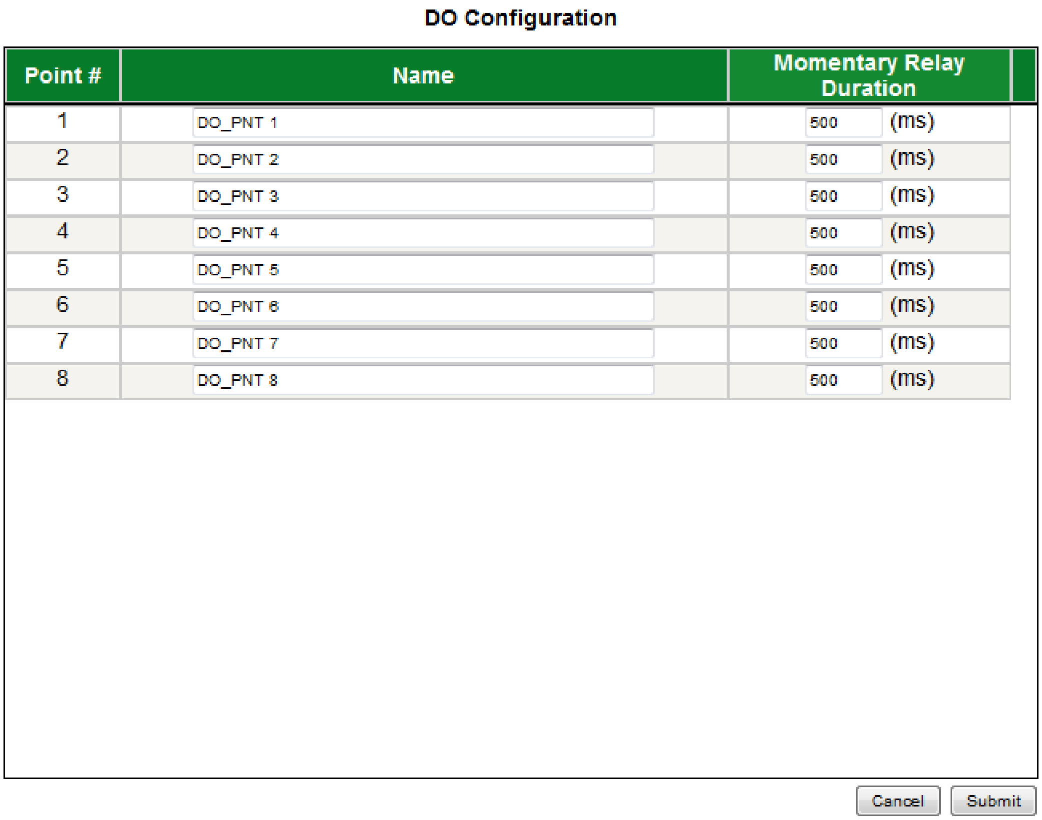
Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

If the BB DO radio button selection is made, the relays on the baseboard will operate as general purpose digital outputs and the screen shown in Figure 2-31 will come up when the continue button is depressed.

Figure 2-31 DO BB Configuration



DO Configuration

Point #	Name	Momentary Relay Duration
1	DO_PNT 1	500 (ms)
2	DO_PNT 2	500 (ms)
3	DO_PNT 3	500 (ms)
4	DO_PNT 4	500 (ms)
5	DO_PNT 5	500 (ms)
6	DO_PNT 6	500 (ms)
7	DO_PNT 7	500 (ms)
8	DO_PNT 8	500 (ms)

Cancel Submit

Navigation

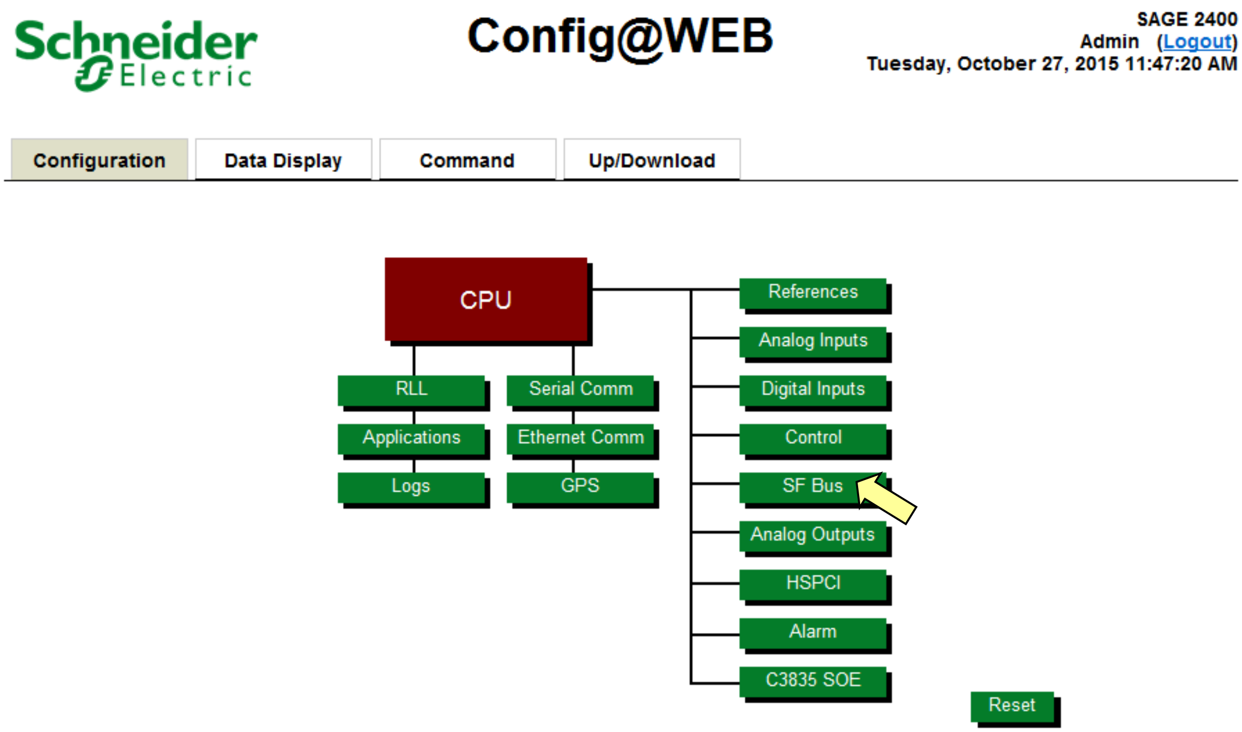
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.12 SF Bus Configuration (SAGE 2X00 Only)

Click on SF Bus button to configure the Special Function Bus (SFB), as shown in Figure 2-32. Configuring the SFB is required for ACI cards, 1MSSOE cards, some Analog Output cards, High Speed Pulse Counter Input cards, and Digital Output cards.

Figure 2-32 Configuring Special Function Bus



Select from the drop-down menu the SFB Card Types cabled to the SFB. Start at the RTU and follow the ribbon cable to the last XT on the cable chain. See Figure 2-33.

This data is required for correct operation of the RTU because the XTs placed on the SFB are position dependent. If a designated SFB XT fails, operation of that type of data is disabled, rather than operating the wrong digital output or reporting the status of an input incorrectly.

Note: The ACI notation for the SFB refers to the AC Analog inputs. Additional ACI theory information is to be found in the manual:
C3244 AC Analog Input Option, Manual Number C3244-AAA-00011.

As an example of how the SFB might be configured with two 1MSSOE cards and two ACI cards, begin with Figure 2-33.

Figure 2-33 Example SFB Configuration

Special Function Bus Card Configuration

SFB Card Location	SFB Card type	Configure each XT	Copy to Card
Select 1	1MSSOE	Configure SFB XT# 1	Copy
Select 2	1MSSOE	Configure SFB XT# 2	Copy
Select 3	ACI	Configure SFB XT# 3	Copy
Select 4	ACI	Configure SFB XT# 4	Copy
Select 5	None	-	Copy
Select 6	None	-	Copy
Select 7	None	-	Copy
Select 8	None	-	Copy

Back

Navigation

Click the Back button to go back to the Configuration screen.

Please note: No configuration changes take effect until the RTU is reset.

After you select the SFB Card Type, "Configure SFB XT#" will appear under "Configure each XT". The underlined blue legend means it is a clickable link. Click on the link to configure the 1MSSOE card.

Note: If the configuration for a particular card is nearly the same for the next card of the same type, you can save some time by copying the configuration as shown in

Figure 2-34.

Figure 2-34 Copying an SFB Configuration

Special Function Bus Card Configuration

SFB Card Location	SFB Card type	Configure each XT	Copy to Card
Select 1	1MSSOE	Configure SFB XT# 1	2 Copy
Select 2	None	-	Copy
Select 3	None	-	Copy
Select 4	None	-	Copy
Select 5	None	-	Copy
Select 6	None	-	Copy
Select 7	None	-	Copy
Select 8	None	-	Copy

Back

Navigation

Click the Back button to go back to the Configuration screen.

Please note: No configuration changes take effect until the RTU is reset.

2.12.1 ACI Type (SAGE 2X00 and SAGE 1X50 Only)

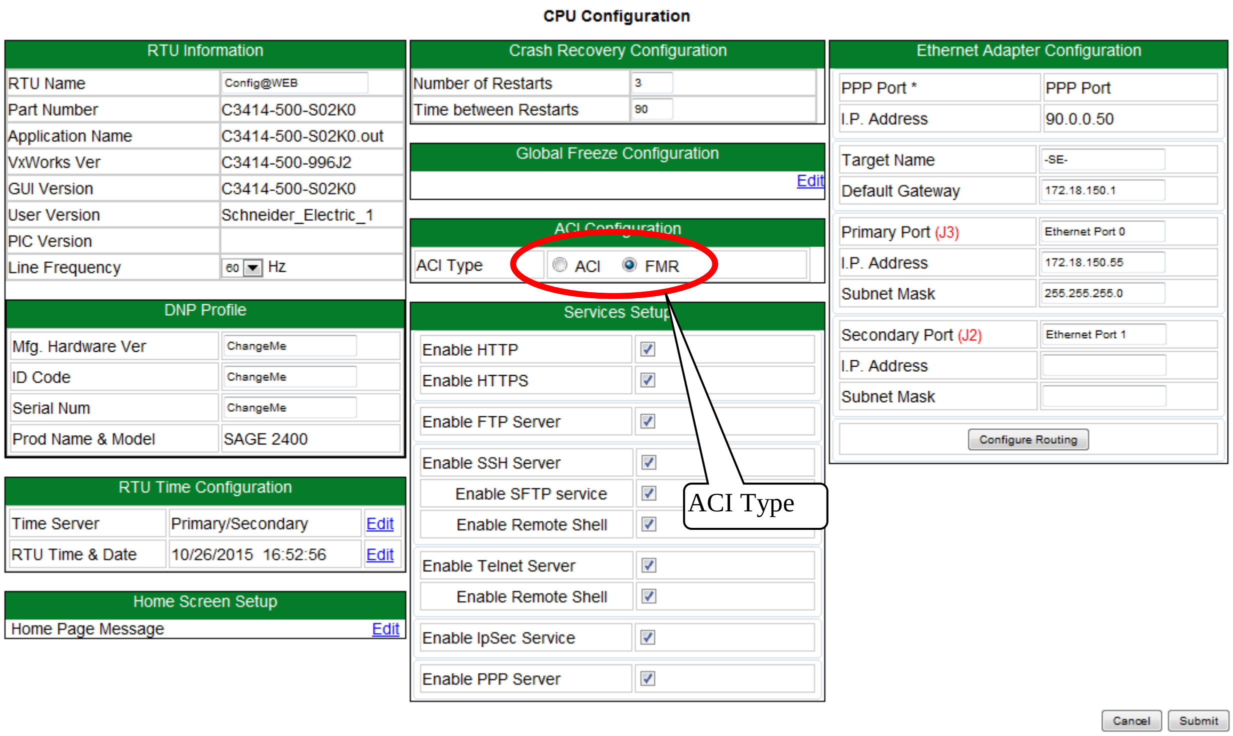
Warning: The applications Energy Calculation, Timing, and the ACI function all use the same BB ram memory space; therefore only one of these applications may be run at any given time.

From the CPU Configuration screen, you have a choice of two types of AC Analog Inputs: Either ACI or FMR. See the following sections for an explanation of each type.

2.12.2 FMR Type AC Analog Inputs Configuration

From the CPU Configuration screen, click the radio button for FMR.

Figure 2-35 Choosing Between FMR or ACI



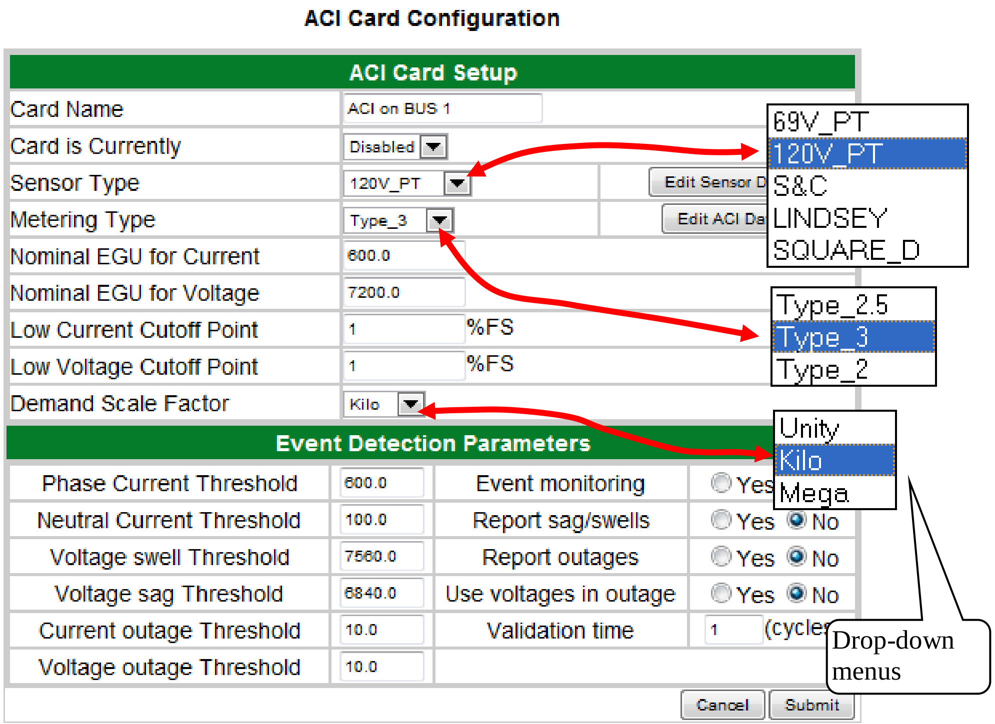
Navigation

Click the Submit button to accept the changes or the Cancel button to cancel changes.

Please note: No configuration changes take effect until the RTU is reset.

The ACI Card Configuration screen is used to configure a database record for the ACI subsystem. This menu allows you to enter information about the circuit that you are monitoring and the data to be returned via the ACI subsystem.

Figure 2-36 FMR Type ACI Card Setup



Card Name

Type in a card name or accept the default. This entry usually corresponds to the circuit or the device the ACI card is monitoring. The card name corresponds to the source point name in the data mapping routine.

Card is Currently (Enabled, Disabled)

This field must be set to Enabled before the ACI will perform any analog measurements.

Navigation

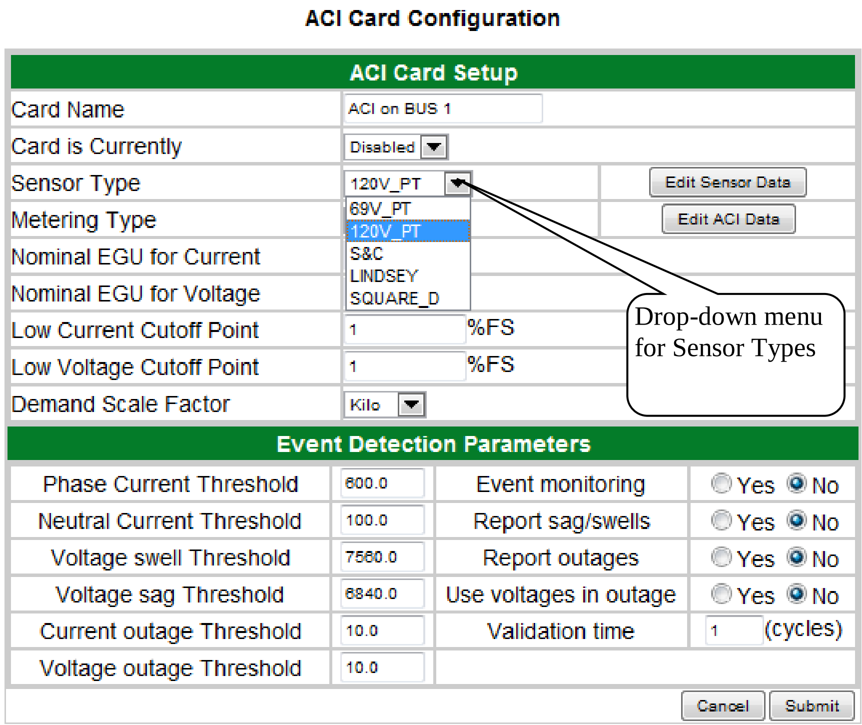
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Sensor Type

From the drop-down menu, select the Input type from 69V_PT, 120V_PT, S&C, LINDSEY, or SQUARE_D, as shown in Figure 2-37. For each sensor type you may click the Edit Sensor Data button to edit sensor data as required. The configuration required by hitting this button is further described in section 2.12.4.

Figure 2-37 FMR Type ACI Card Configuration – Sensor Type



Navigation

Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Metering Type

From the drop-down menu, select 3 for 3 element metering, 2.5 for 2 1/2 element metering, and 2 for 2 element metering. The calculated values for the different metering types are shown in Table 2-4, Table 2-5, and Table 2-6. Please refer to the C3244 ACI Analog Input Option manual (C3244-AAA-00011) for termination requirements.

Table 2-4 Calculated Values for 3-Element Metering

Phase and Total Watts
Phase and Total VARs
Phase and Total PF
Phase and Total VA
Phase frequency, voltage derived
Phase RMS Current
Phase RMS Voltage
Harmonic content (2nd through 7th) of ABC voltage and ABC current

RMS Neutral current

Table 2-5 Calculated Values for 2 1/2-Element Metering

Phase and Total Watts
Phase and Total VARs
Phase A & C and Total PF
Phase A & C and Total VA
Phase A and C frequency, voltage derived
Phase RMS current
Phase A and C RMS voltage
Harmonic Content (2nd through 7th) of A&C voltage and ABC current
RMS Neutral current

Table 2-6 Calculated Values for 2-Element Metering

Total Watts
Total VARs
Total PF
Total VA
Phase AB and BC frequency, voltage derived
Phase A and C RMS current
Harmonic Content (2nd through 7th) of AB & BC volts and A & C current

Nominal EGU for Current

Enter the 100% nominal value for the current. This value is used to scale analog data for display and calculation of other analog data. See Table 2-7. The RTU will report 150% of this parameter to the master allowing measurement and reporting of 50% over-range. For example, if it is set to 600 amps, the maximum reported value would be 900 amps.

Nominal EGU for Voltage

Enter the 100% nominal value for the voltage. For 3 and 2 1/2 element metering, this value must be line-to-neutral voltage. For 2 element metering, this value is line-to-line voltage, This value is used to scale analog data for display and calculation of other analog data. See Table 2-7. The RTU will report 125% of this parameter to the master allowing measurement and reporting of 25% over-range. For example, if it is set to 7200 volts, the maximum reportable value will be 9000 volts.

Note: Remember, the voltages you enter for 3-element and 2 1/2-element metering are measured from line to neutral. Voltages for 2-element metering are measured line to line.

Table 2-7 Current & Voltage Scaling for Page 1

Calculated	Type	Scaling Source	EGU Min	EGU Max	Multiplier	Engineering Unit (EU)
Current	Unipolar	AC Analog Configuration	0.0	X	1.50	Amps
Voltage			0.0	X	1.25	Volts

Note: X designates operator-entered values.

Low Current Cutoff Point

Enter the percentage of the full-scale value for the ACI subsystem to utilize in determining a low current. Current readings below this threshold will be treated as 0 when computing power and harmonics. For example, if it is set at 1% and nominal feeder current is 600 amps, the ACI subsystem will consider any current below 6 amps as zero and will not waste time computing power and harmonics because it may be meaningless.

Low Voltage Cutoff Point

Enter the percentage of the full-scale value for the ACI subsystem to utilize in determining a low voltage. Voltage readings below this threshold will be treated as 0 when computing power and harmonics.

Demand Scale Factor

From the drop-down menu, select Unity, Kilo or Mega for scaling Watts, VARs, VA, Watt-hours and VAR-hours. This field selects the units for scaling real and reactive power and accumulated real and reactive power.

Unity - Watts, VARs, VA, Wh, VARh

Kilo - kW, kVAR, kVA, kWh, kVARh

Mega - MW, MVAR, MVA, MWh, MVARh

Phase Current Threshold

Enter the RMS current threshold for identifying an event on a phase current.

Neutral Current Threshold

Enter the RMS current threshold for identifying an event on the neutral current. Set the threshold to a high value to disable neutral event detection.

Voltage swell Threshold

Enter the RMS voltage threshold for identifying a voltage swell event on a phase voltage.

Voltage sag Threshold

Enter the RMS voltage threshold for identifying a voltage sag event on a phase voltage.

Current outage Threshold

Enter the RMS current threshold for identifying a current outage event on a phase current.

Voltage outage Threshold

Enter the RMS voltage threshold for identifying a voltage outage event on a phase voltage.

Event monitoring

Click the radio button for "Yes" to enable event monitoring. This flag must be set to Y to enable any event monitoring (must be true for any event activity to occur).

Report sag/swells

Click the radio button for "Yes" to enable reporting of phase over and phase under voltage events.

Report outages

Click the radio button for "Yes" to enable current outage event reporting.

Use voltages in outage

Click the radio button for "Yes" to enable voltage outage monitoring.

Validation time

Enter the number of cycles that an event must be present to qualify as a valid event. A value of 1 will cause an immediate validation of the event. If some other value is entered, the trigger event must be maintained for this number of cycles before the event will be validated.

2.12.2.1 Edit FMR Type ACI Data

Press the button Edit ACI Data to go to the screen for ACI Data Configuration (see Figure 2-38). Use the scroll bar as necessary to access all functions on this screen.

Figure 2-38 FMR Type ACI Data Configuration

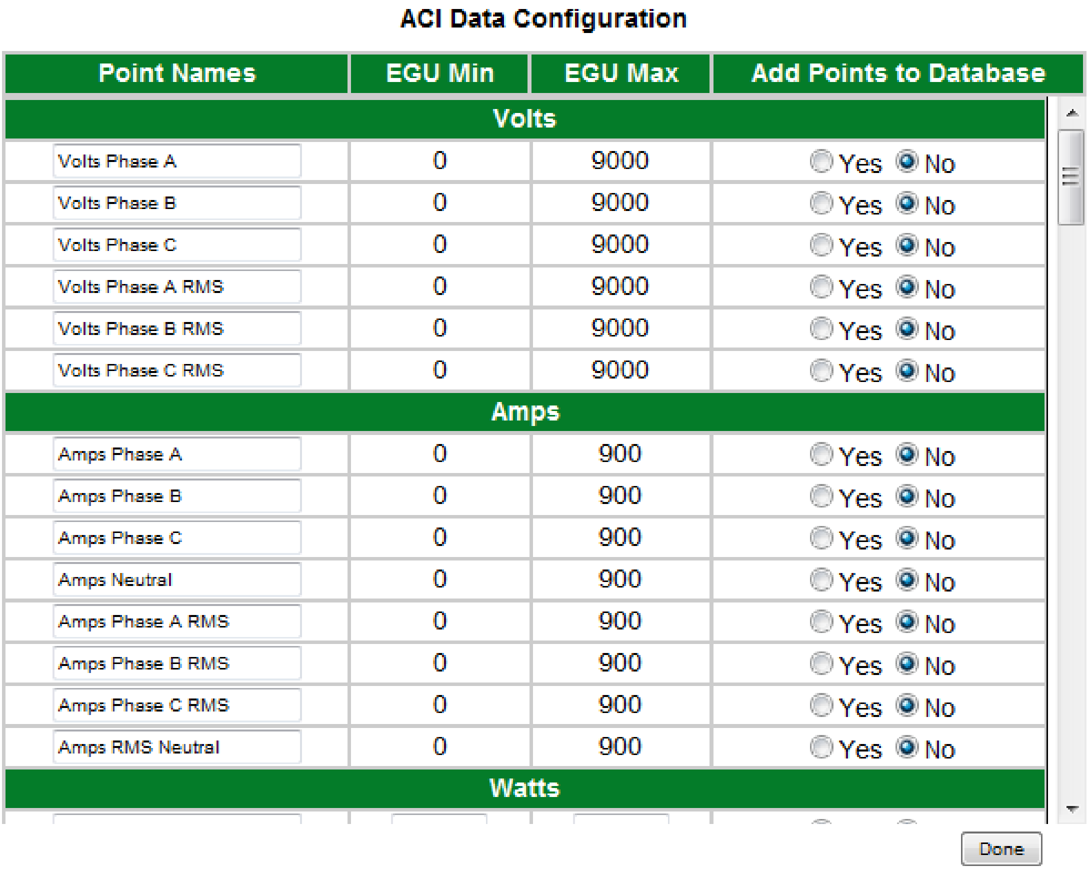


Table 2-8 explains the way EGU Min and EGU Max are determined for ACI Data Configuration screen.

Table 2-8 AC Analog EGU Min & EGU Max

	Calculated Per Phase	Type	Scaling Source	EGU Min	EGU Max	Multiplier	Engineering Unit (EU)
Calculated	Watts	Either	EGU Min & Max (Note 1)	X	X	1.00	Watts
	VARS			X	X	1.00	VARS
	VA			X	X	1.00	VA
	Frequency (60Hz)	Unipolar	RTU Configuration	55.0	65.0	1.00	Hz
	Frequency (50Hz)			45.0	55.0	1.00	Hz
	Power Factor			0.0	1.0	1.00	
	Power Factor	Bipolar		-1.0	1.0	1.00	
DC Analogs	Ground	Bipolar	Fixed	-3.0	3.0	1.00	VDC
	+ REF			-3.0	3.0	1.00	VDC

Note 1: If EGU Min & Max is 0, no value will be calculated for the field.

Note 2: X designates operator-entered values.

Note 3: The Point Names (Volts Phase A, Amps Phase A, etc.) are editable. You may change the name as needed. The following definitions use the default names for convenience.

Volts Phase (A, B, C)

Click the radio button for "Yes" to report voltage information on the indicated phase fundamental component of the voltage.

Volts Phase (A, B, C) RMS

Click the radio button for "Yes" to report RMS voltage for each phase.

Amps Phase (A, B, C)

Click the radio button for "Yes" to report information on the current of the indicated phase.

Amps Neutral

Click the radio button for "Yes" to report the neutral phasor amperage.

Amps Phase (A, B, C) RMS

Click the radio button for "Yes" to report RMS current for each phase.

Amps Neutral RMS

Click the radio button for "Yes" to report the neutral RMS amperage.

Watts Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report watts information on the indicated phase.

Watts Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total wattage information.

VAR Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report VAR information on the indicated phase.

VAR Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total VAR information.

VA Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report VA information on the indicated phase.

VA Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total VA information.

Freq Phase (A, B, C)

Click the radio button for "Yes" to report the frequency information on the indicated phase.

PF Phase (A, B, C)

Click the radio button for "Yes" to report power factor information on the indicated phase.

PF Total

Click the radio button for "Yes" to report total power factor information.

2nd Through 7th Voltage Harmonic 0 to 100%

Click the radio button for "Yes" to report voltage harmonics for three phases. Values are reported as a percentage of the fundamental frequency component.

2nd Through 7th Current Harmonic 0 to 100%

Click the radio button for "Yes" to report current harmonics for three phases. Values are reported as a percentage of the fundamental frequency component.

DC Inputs

AGND

Click the radio button for "Yes" to report the value of the analog ground reference point.

+2.500 Ref

Click the radio button for "Yes" to report the value of the +2.5 volt analog reference point.

Phase (A, B, C) Accumulators

+WH Phase A,B,C

Click the radio button for "Yes" to report the accumulated positive Watt-hours.

–WH Phase A,B,C

Click the radio button for "Yes" to report the accumulated negative Watt-hours.

+VARH Phase A,B,C

Click the radio button for "Yes" to report the accumulated positive VAR-hours.

–VARH Phase A,B,C

Click the radio button for "Yes" to report the accumulated negative VAR-hours.

Total Accumulators

+WH Total

Click the radio button for "Yes" to report the accumulated total positive Watt-hours.

–WH Total

Click the radio button for "Yes" to report the accumulated total negative Watt-hours.

+VARH Total

Click the radio button for "Yes" to report the accumulated total positive VAR-hours.

–VARH Total

Click the radio button for "Yes" to report the accumulated total negative VAR-hours.

Status Points

Fault Phase (A, B, C)

Click the radio button for "Yes" to report the fault for each phase.

Fault Neutral

Click the radio button for "Yes" to report the fault for neutral.

Navigation

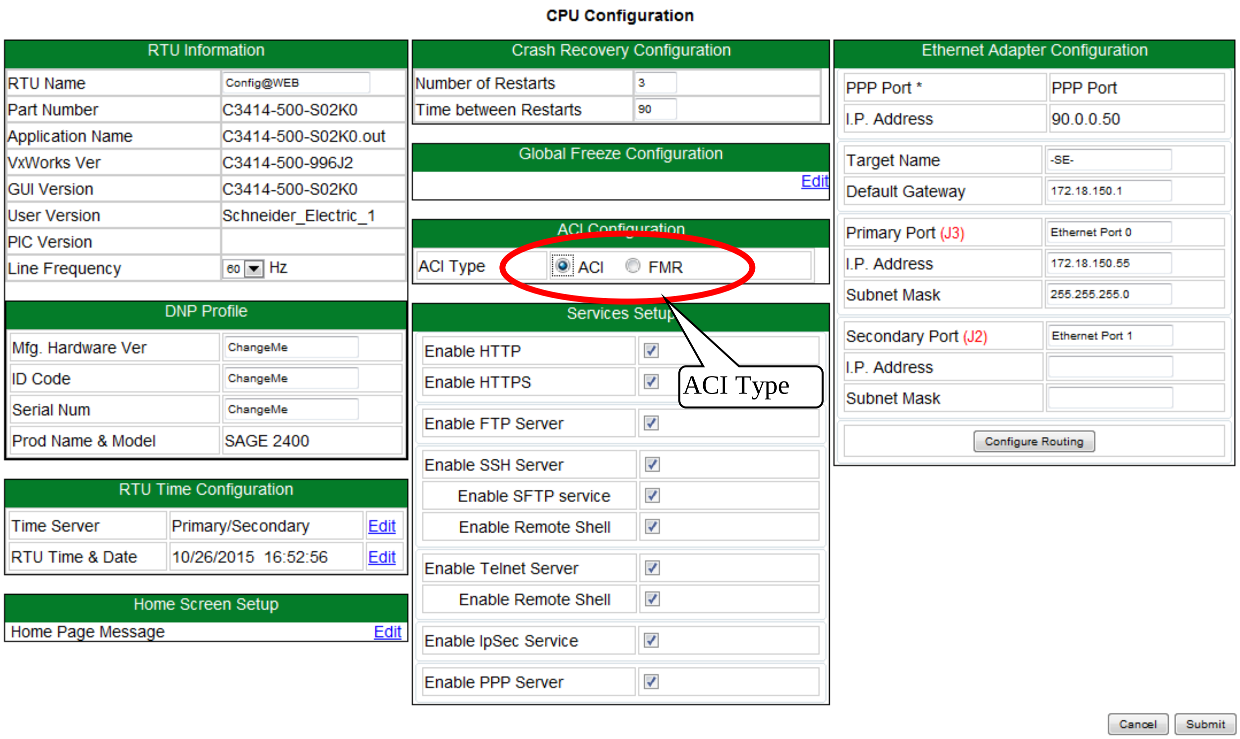
Click the Done button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.12.3 ACI Type AC Analog Inputs Configuration

From the CPU Configuration screen, click the radio button for ACI.

Figure 2-39 Choosing ACI



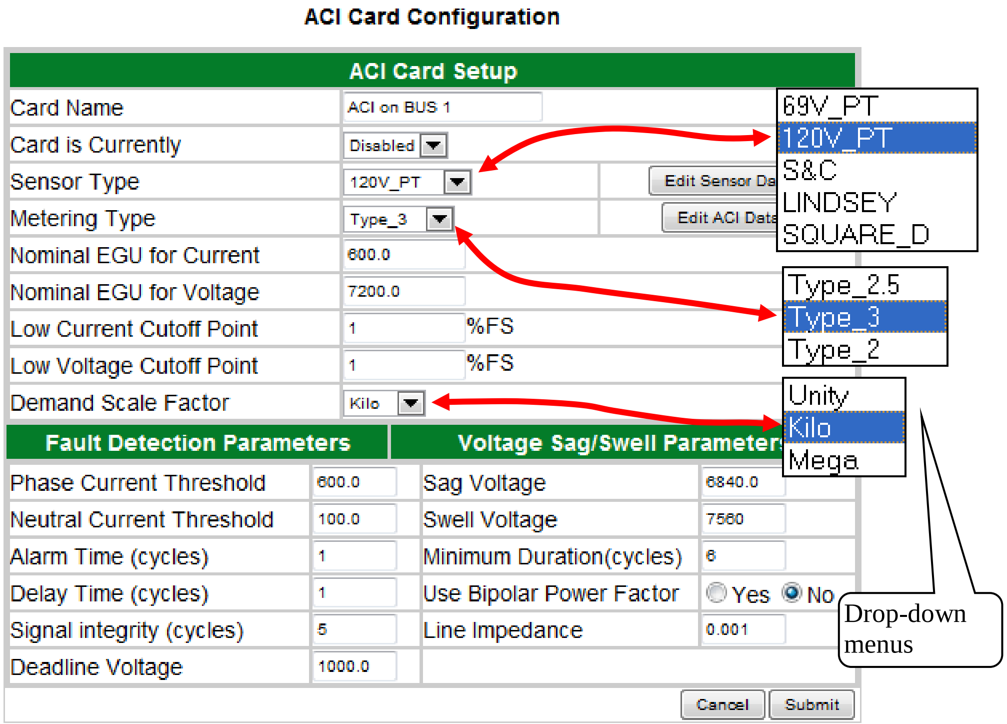
Navigation

Click the Submit button to accept the changes or the Cancel button to cancel changes.

Please note: No configuration changes take effect until the RTU is reset.

The ACI Card Configuration screen is used to configure a database record for the ACI subsystem. This menu allows you to enter information about the circuit that you are monitoring and the data to be returned via the ACI subsystem.

Figure 2-40 ACI Type ACI Card Setup



Card Name

Type in a card name or accept the default. This entry usually corresponds to the circuit or the device the ACI card is monitoring. The card name corresponds to the source point name in the data mapping routine.

Card is Currently (Enabled, Disabled)

This field must be set to Enabled before the ACI will perform any analog measurements.

Navigation

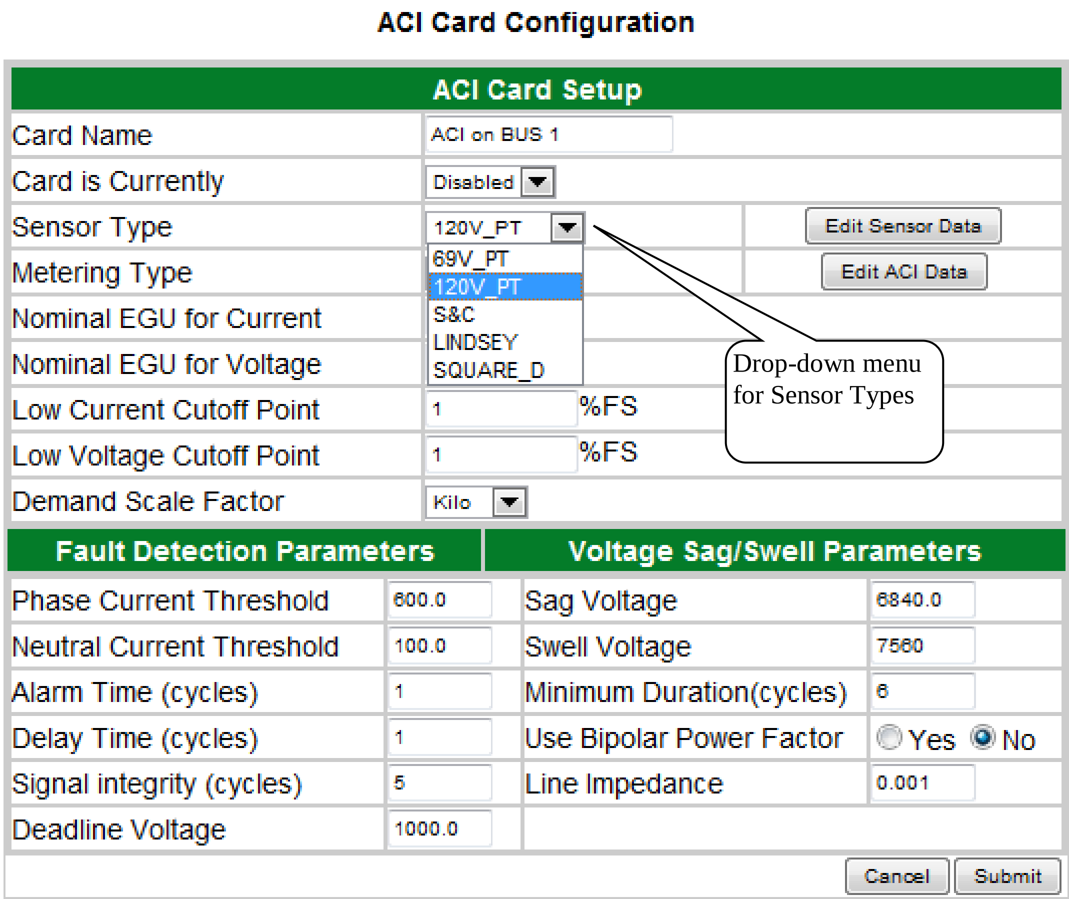
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Sensor Type

From the drop-down menu, select the Input type from 69V_PT, 120V_PT, S&C, LINDSEY, or SQUARE_D, as shown below. For each sensor type you may click the Edit Sensor Data button to edit sensor data as required. The configuration required by hitting this button is further described in section 2.12.4.

Figure 2-41 ACI Type ACI Card Configuration – Sensor Type



Navigation

Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Metering Type

From the drop-down menu, select 3 for 3 element metering, 2.5 for 2 1/2 element metering, and 2 for 2 element metering. The calculated values for the different metering types are shown in Table 2-9, Table 2-10, and Table 2-11. Please refer to the C3244 ACI Analog Input Option manual (C3244-AAA-00011) for termination requirements.

Table 2-9 Calculated Values for 3-Element Metering

Phase and Total Watts
Phase and Total VARs
Phase and Total PF
Phase and Total VA
Phase frequency, voltage derived

Phase RMS Current
Phase RMS Voltage
Harmonic content (2nd through 7th) of ABC voltage and ABC current
RMS Neutral current

Table 2-10 Calculated Values for 2 1/2-Element Metering

Phase and Total Watts
Phase and Total VARs
Phase A & C and Total PF
Phase A & C and Total VA
Phase A and C frequency, voltage derived
Phase RMS current
Phase A and C RMS voltage
Harmonic Content (2nd through 7th) of A&C voltage and ABC current
RMS Neutral current

Table 2-11 Calculated Values for 2-Element Metering

Total Watts
Total VARs
Total PF
Total VA
Phase AB and BC frequency, voltage derived
Phase A and C RMS current
Harmonic Content (2nd through 7th) of AB & BC volts and A & C current

Nominal EGU for Current

Enter the 100% nominal value for the current. This value is used to scale analog data for display and calculation of other analog data. The RTU will report 150% of this parameter to the master allowing measurement and reporting of 50% over-range. For example, if it is set to 600 amps, the maximum reported value would be 900 amps.

Nominal EGU for Voltage

Enter the 100% nominal value for the voltage. For 3 and 2 1/2 element metering, this value must be line-to-neutral voltage. For 2 element metering, this value is line-to-line voltage. This value is used to scale analog data for display and calculation of other analog data. The RTU will report 125% of this parameter to the master allowing measurement and reporting of 25% over-range. For example, if it is set to 7200 volts, the maximum reportable value will be 9000 volts.

Note: Remember, the voltages you enter for 3-element and 2 1/2-element metering are measured from line to neutral. Voltages for 2-element metering are measured line to line.

Table 2-12 Current & Voltage Scaling for Page 1

Calculated	Type	Scaling Source	EGU Min	EGU Max	Multiplier	Engineering Unit (EU)
Current	Unipolar	AC Analog Configuration	0.0	X	1.50	Amps
Voltage			0.0	X	1.25	Volts

Note: X designates operator-entered values.

Low Current Cutoff Point

Enter the percentage of the full-scale value for the ACI subsystem to utilize in determining a low current. Current readings below this threshold will be treated as 0 when computing power and harmonics. For example, if it is set at 1% and nominal feeder current is 600 amps, the ACI subsystem will consider any current below 6 amps as zero and will not waste time computing power and harmonics because it may be meaningless.

Low Voltage Cutoff Point

Enter the percentage of the full-scale value for the ACI subsystem to utilize in determining a low voltage. Voltage readings below this threshold will be treated as 0 when computing power and harmonics.

Demand Scale Factor

From the drop-down menu, select Unity, Kilo or Mega for scaling Watts, VARs, VA, Watt-hours and VAR-hours. This field selects the units for scaling real and reactive power and accumulated real and reactive power.

Unity - Watts, VARs, VA, Wh, VARh

Kilo - kW, kVAR, kVA, kWh, kVARh

Mega - MW, MVAR, MVA, MWh, MVARh

2.12.3.1 Fault Detection Parameters

Phase Current Threshold

Enter the RMS current threshold for identifying an event on a phase current.

Neutral Current Threshold

Enter the RMS current threshold for identifying an event on the neutral current. Set the threshold to a high value to disable neutral event detection.

Alarm Time (cycles)

Enter the number of cycles an over-current must persist in order for an alarm event to be validated. This debounce delay can be disabled by entering 1. For example, if it is set to 5 cycles and current goes beyond the threshold, the ACI subsystem will wait for 5 cycles after over-current before the fault will be considered.

Delay Time (cycles)

Enter the time delay to pass to allow the upstream interrupting device to detect and clear the fault. The fault detection algorithm will wait this many cycles after the current levels return to normal before computing the average voltage after the fault. The units of this parameter are cycles with a range of 0 to 65535 cycles. Set the time to 1 if the voltage monitoring is disabled.

Signal Integrity (cycles)

Enter the number of cycles over which the ACI will average the RMS voltage values to determine the validity of a detected fault. Set the number to 1 if the voltage monitoring is disabled.

Deadline Voltage

Enter the RMS phase voltage below which the voltage must drop to qualify the fault. If the average voltage calculated during the fault is not below this threshold, the event is discarded. To disable this voltage monitoring, enter 1.25 times the value used for the "AC Input Nominal EGU Range" Voltage for this parameter and 1 for Signal Integrity and Delay Times.

2.12.3.2 Voltage Sag/Swell Parameters

Sag Voltage

Enter the voltage threshold below which the phase voltage must fall to activate the sag detection subsystem. For example, if it is set to 6840 volts (5% below a nominal voltage of 7200 volts), then the sag counter will increment once for every time the voltage goes below 6840 volts and stays for the "minimum duration" defined.

Swell Voltage

Enter the voltage threshold above which the phase voltage must rise to activate the swell detection subsystem. For example, if it is set to 7560 volts (5% above a nominal voltage of 7200 volts), then the swell counter will increment once for every time the voltage goes above 7560 volts and stays for the "minimum duration" defined.

Minimum Duration (Cycles)

Enter the minimum number of cycles the phase voltage must remain below the Sag Voltage threshold or remain above Swell Voltage threshold as a requirement for incrementing the sag counter or swell counter when the phase voltage returns to a normal level.

Use bipolar power factor

Set this flag to Yes to force the sign of the power factor to follow the sign of the VARs. If set to No, the power factor will always be positive. This should be set to Yes if VARs are also bipolar.

Line Impedance

Enter the line impedance per unit of length of the line. This unit of length will be used in the display for Fault Distance.

2.12.3.3 Edit ACI Type ACI Data

Press the button Edit ACI Data to go to the screen for ACI Data Configuration. Use the scroll bar as necessary to access all functions on this screen.

Figure 2-42 ACI Type ACI Data Configuration

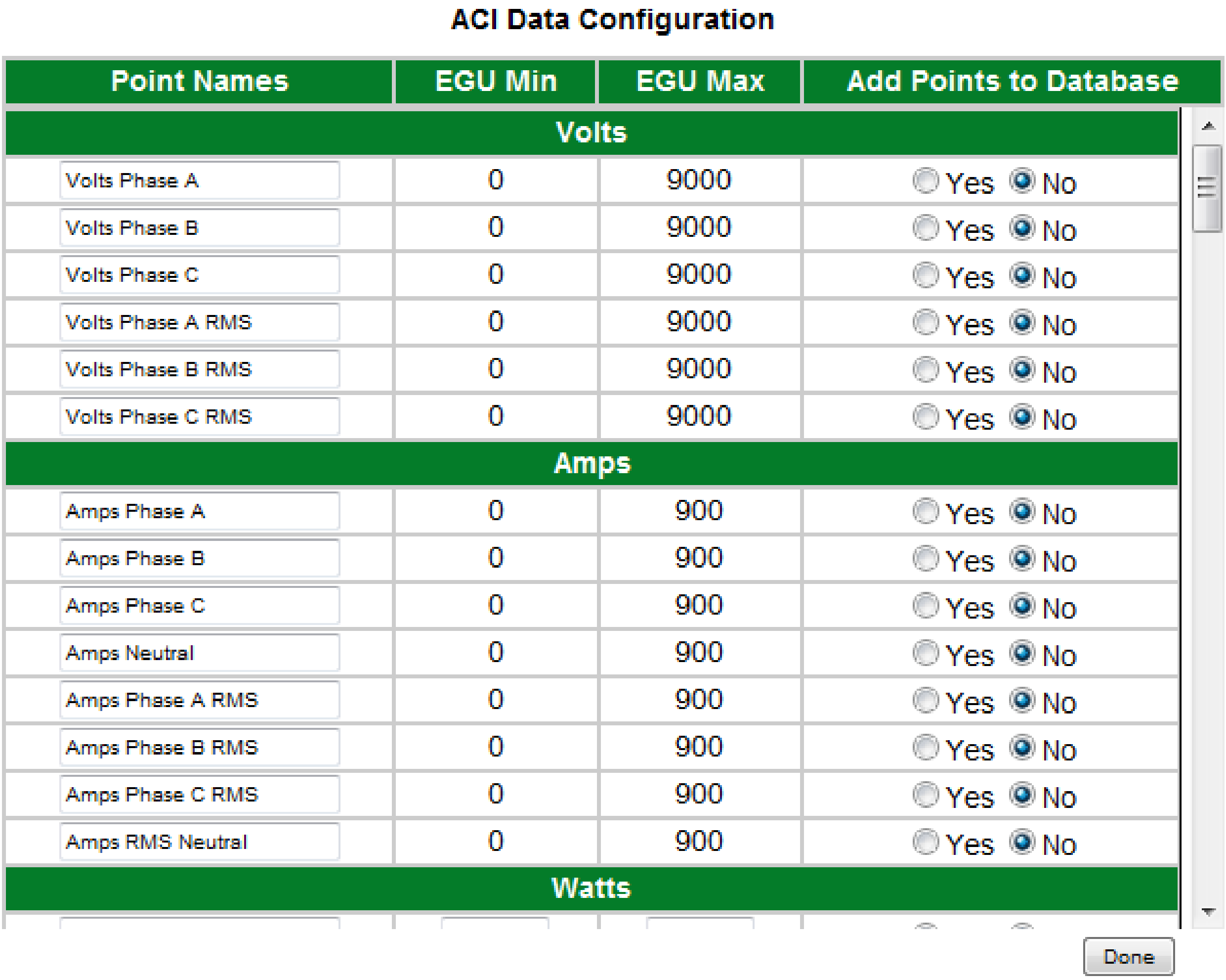


Table 2-13 explains the way EGU Min and EGU Max are determined for ACI Data Configuration screen.

Table 2-13 AC Analog EGU Min & EGU Max

	Calculated Per Phase	Type	Scaling Source	EGU Min	EGU Max	Multiplier	Engineering Unit (EU)
	Watts	Either	EGU Min & Max (Note 1)	X	X	1.00	Watts
	VARS			X	X	1.00	VARS
	VA			X	X	1.00	VA

Calculated	Frequency (60Hz)	Unipolar	RTU Configuration	55.0	65.0	1.00	Hz
	Frequency (50Hz)			45.0	55.0	1.00	Hz
	Power Factor			0.0	1.0	1.00	
	Power Factor	Bipolar		-1.0	1.0	1.00	
DC Analogs	Ground	Bipolar	Fixed	-3.0	3.0	1.00	VDC
	+ REF			-3.0	3.0	1.00	VDC

Note 1: If EGU Min & Max is 0, no value will be calculated for the field.

Note 2: X designates operator-entered values.

Note 3: The Point Names (Volts Phase A, Amps Phase A, etc.) are editable. You may change the name as needed. The following definitions use the default names for convenience.

Volts Phase (A, B, C)

Click the radio button for "Yes" to report voltage information on the indicated phase fundamental component of the voltage.

Volts Phase (A, B, C) RMS

Click the radio button for "Yes" to report RMS voltage for each phase.

Amps Phase (A, B, C)

Click the radio button for "Yes" to report information on the current of the indicated phase.

Amps Neutral

Click the radio button for "Yes" to report the neutral phasor amperage.

Amps Phase (A, B, C) RMS

Click the radio button for "Yes" to report RMS current for each phase.

Amps Neutral RMS

Click the radio button for "Yes" to report the neutral RMS amperage.

Watts Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report watts information on the indicated phase.

Watts Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total wattage information.

VAR Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report VAR information on the indicated phase.

VAR Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total VAR information.

VA Phase (A, B, C)

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report VA information on the indicated phase.

VA Total

Enter the EGU Min and EGU Max (or accept the defaults) and click the radio button for "Yes" to report total VA information.

Freq Phase (A, B, C)

Click the radio button for "Yes" to report the frequency information on the indicated phase.

PF Phase (A, B, C)

Click the radio button for "Yes" to report power factor information on the indicated phase.

PF Total

Click the radio button for "Yes" to report total power factor information.

2nd Through 7th Voltage Harmonic 0 to 100%

Click the radio button for "Yes" to report voltage harmonics for three phases. Values are reported as a percentage of the fundamental frequency component.

2nd Through 7th Current Harmonic 0 to 100%

Click the radio button for "Yes" to report current harmonics for three phases. Values are reported as a percentage of the fundamental frequency component.

DC Inputs

AGND

Click the radio button for "Yes" to report the value of the analog ground reference point.

+2.500 Ref

Click the radio button for "Yes" to report the value of the +2.5 volt analog reference point.

Fault

Fault Start Time

Click the radio button for “Yes” to report the fault start time.

Fault Duration in Cycles

Click the radio button for “Yes” to report the fault duration in cycles.

Fault RMS I, Phases A,B,C

Click the radio button for “Yes” to report the fault RMS current for phases A, B, and C.

Fault RMS I Neutral

Click the radio button for “Yes” to report the fault RMS current for Neutral.

Fault RMS V, Phases A,B,C

Click the radio button for “Yes” to report the fault RMS voltage for phases A, B, and C.

Fault MAG I, Phases A,B,C

Click the radio button for “Yes” to report the fault current magnitude for phases A, B, and C.

Fault MAG V, Phases A,B,C

Click the radio button for “Yes” to report the fault voltage magnitude for phases A, B, and C.

Fault Distance

Enter the minimum and maximum fault distance. The minimum should logically be zero.

Phase (A, B, C) Accumulators

+WH Phase A,B,C

Click the radio button for "Yes" to report the accumulated positive Watt-hours.

–WH Phase A,B,C

Click the radio button for "Yes" to report the accumulated negative Watt-hours.

+VARH Phase A,B,C

Click the radio button for "Yes" to report the accumulated positive VAR-hours.

–VARH Phase A,B,C

Click the radio button for "Yes" to report the accumulated negative VAR-hours.

Total Accumulators

+WH Total

Click the radio button for "Yes" to report the accumulated total positive Watt-hours.

–WH Total

Click the radio button for "Yes" to report the accumulated total negative Watt-hours.

+VARH Total

Click the radio button for "Yes" to report the accumulated total positive VAR-hours.

–VARH Total

Click the radio button for "Yes" to report the accumulated total negative VAR-hours.

Sag/Swell

Click the radio button for "Yes" to report the Sags and Swells for all three phases.

Status Points

Fault Phase (A, B, C)

Click the radio button for "Yes" to report the fault for each phase.

Fault Neutral, Fault Forward, Fault Reverse

Click the radio button for "Yes" to report these fault status points.

Navigation

Click the Done button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.12.4 Edit Sensor Data for FMR & ACI

69 Volt & 120 Volt PT Configuration

Figure 2-43 Edit AC Analog Setup for 69 Volt PT

69V_PT Sensor Configuration

RTU Phase A		RTU Phase B		RTU Phase C	
Current		Current		Current	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
1.000639	0.0	1.000639	0.0	1.000639	0.0
Volts		Volts		Volts	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
0.984178	0.0	0.984178	0.0	0.984178	0.0

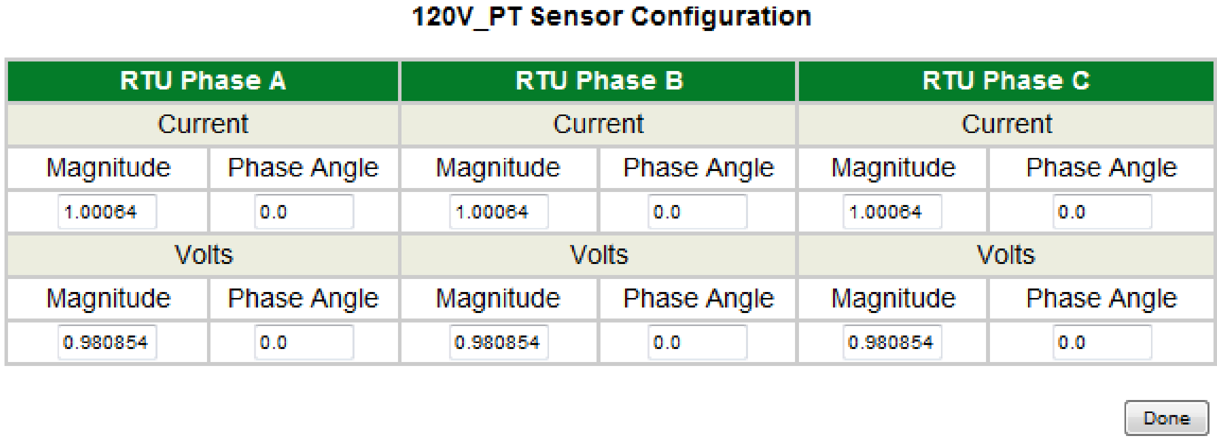
Done

Navigation

Click the Done button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Figure 2-44 Edit AC Analog Setup for 120 Volt PT



The following field descriptions apply to all phases of the 69 and 120 Volt inputs:

RTU Current Sensor Magnitude

The values entered in these fields are correction values applied to the current measured by the secondary CT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Current Sensor Phase Angle

The values entered in these fields are correction values applied to the current phase angle measured by the secondary CT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Voltage Sensor Magnitude

The values entered in these fields are correction values applied to the voltage measured by the secondary PT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Voltage Sensor Phase Angle

The values entered in these fields are correction values applied to the voltage phase angle measured by the secondary PT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

Navigation

Click the Done button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

Figure 2-45 LINDSEY Sensor Configuration

LINDSEY Sensor Configuration

1		2		3	
Current		Current		Current	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
1.0	0.0	1.0	0.0	1.0	0.0
Volts		**Volts**		**Volts**	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
1.0	0.0	1.0	0.0	1.0	0.0
RTU Phase A		**RTU Phase B**		**RTU Phase C**	
Current		Current		Current	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
0.9914	0.0	0.9914	0.0	0.9914	0.0
Volts		Volts		Volts	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
0.9908	0.0	0.9908	0.0	0.9908	0.0
Line to Line Voltage					
14.4 (kvLL)					

Done

The following entries apply to the Lindsey CVMI Input Type.

LINDSEY Current Sensor Magnitude

Enter the scaling factor as given in the accompanying documentation.

LINDSEY Current Sensor Phase Angle

Enter the scaling factor as given in the accompanying documentation.

LINDSEY Voltage Sensor Magnitude

Enter the scaling factor as given in the accompanying documentation.

LINDSEY Voltage Sensor Phase Angle

Enter the scaling factor as given in the accompanying documentation.

RTU Current Sensor Magnitude Factor

The values entered in these fields are correction values applied to the current measured by the secondary CT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Current Sensor Phase Angle

The values entered in these fields are correction values applied to the current phase angle measured by the secondary CT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Voltage Sensor Magnitude Factor

The values entered in these fields are correction values applied to the voltage measured by the secondary PT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

RTU Voltage Sensor Phase Angle

The values entered in these fields are correction values applied to the voltage phase angle measured by the secondary PT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

Line to Line Voltage (kvLL)

From the drop-down menu, enter the value 14.4, 25.0 or 34.5 in kV, of the line to line voltage.

Navigation

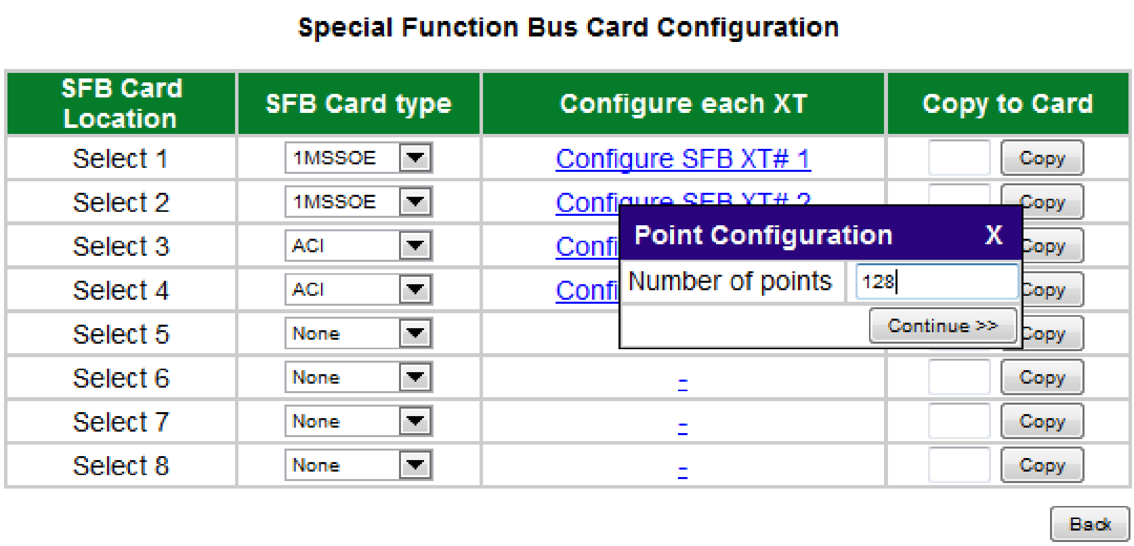
Click the Done button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset. Square D Configuration

2.12.5 SFB 1MSSOE XTs Configuration (SAGE 2X00 Only)

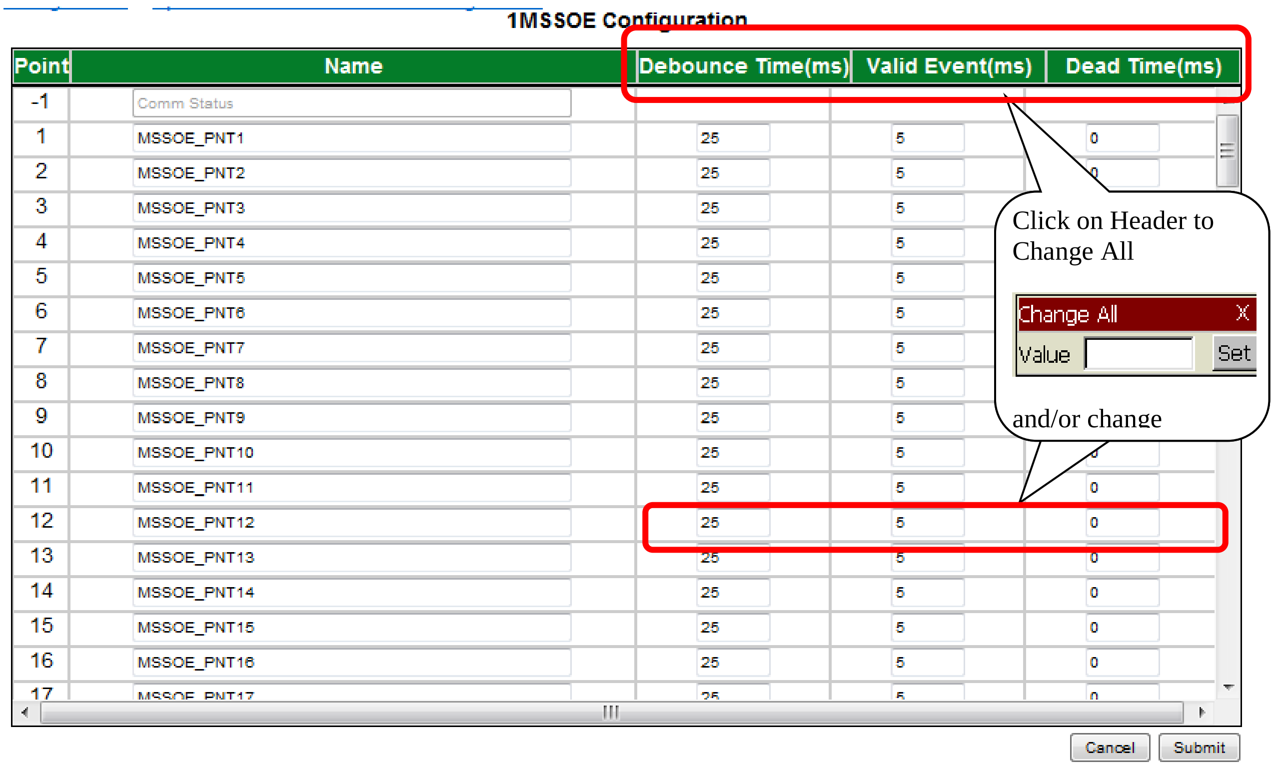
Click on "Configure SFB XT# 1" (in this example, 1MSSOE). Enter the number of points that are attached to this 1MSSOE card. Click Continue to accept your entry, or Cancel to back out without saving.

Figure 2-46 Special Function Bus Card Configuration



The 1MSSOE Configuration screen allows you to name the point, type in a Debounce Time, a Valid Event time, and a Dead Time or accept the defaults for all values.

Figure 2-47 1MSSOE Configuration



Note: Point -1 is a Comm Status point for the SOE channel.

Debounce time (ms) 1-255

Enter the debounce time in milliseconds to filter an event before it is logged as a valid event. The debounce time must be an odd number of 1/2 cycles. For 60 Hz systems, the optimum debounce time is 25 msec. The event time-tag will be that of the initial excursion that triggered the debounce timer. Default is 25 msec.

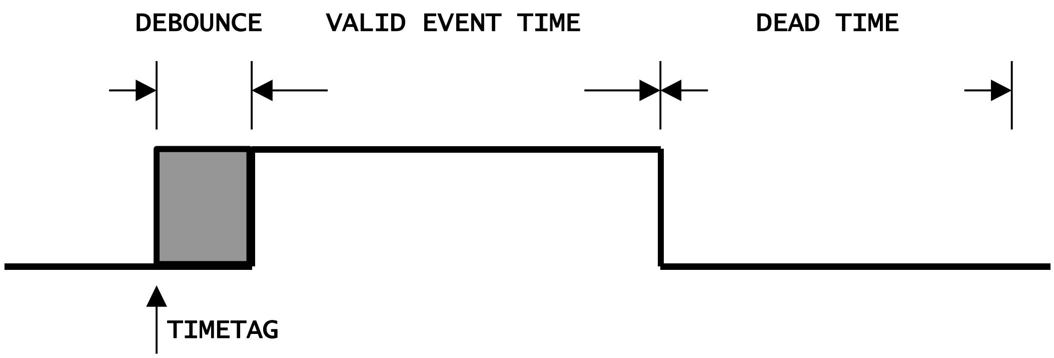
Valid event times (ms) 1-255

Enter the minimum event time required to validate an event. Default is 5 msec.

Dead time between events (ms) 0-255

Enter the minimum dead time required between events to validate that a new event has occurred. Default is 0.

Figure 2-48 1MS SOE Event Parameters



Navigation

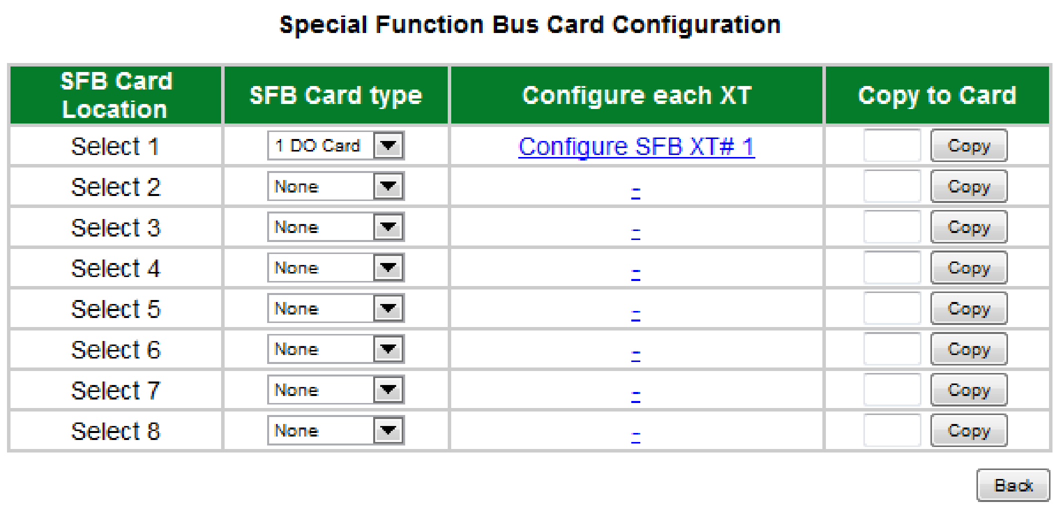
Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.12.6 SFB DO XTs Configuration (SAGE 2X00 Only)

You may select up to two DO cards, one at a time.

Figure 2-49 Selecting SFB Digital Output Configuration



Special Function Bus Card Configuration

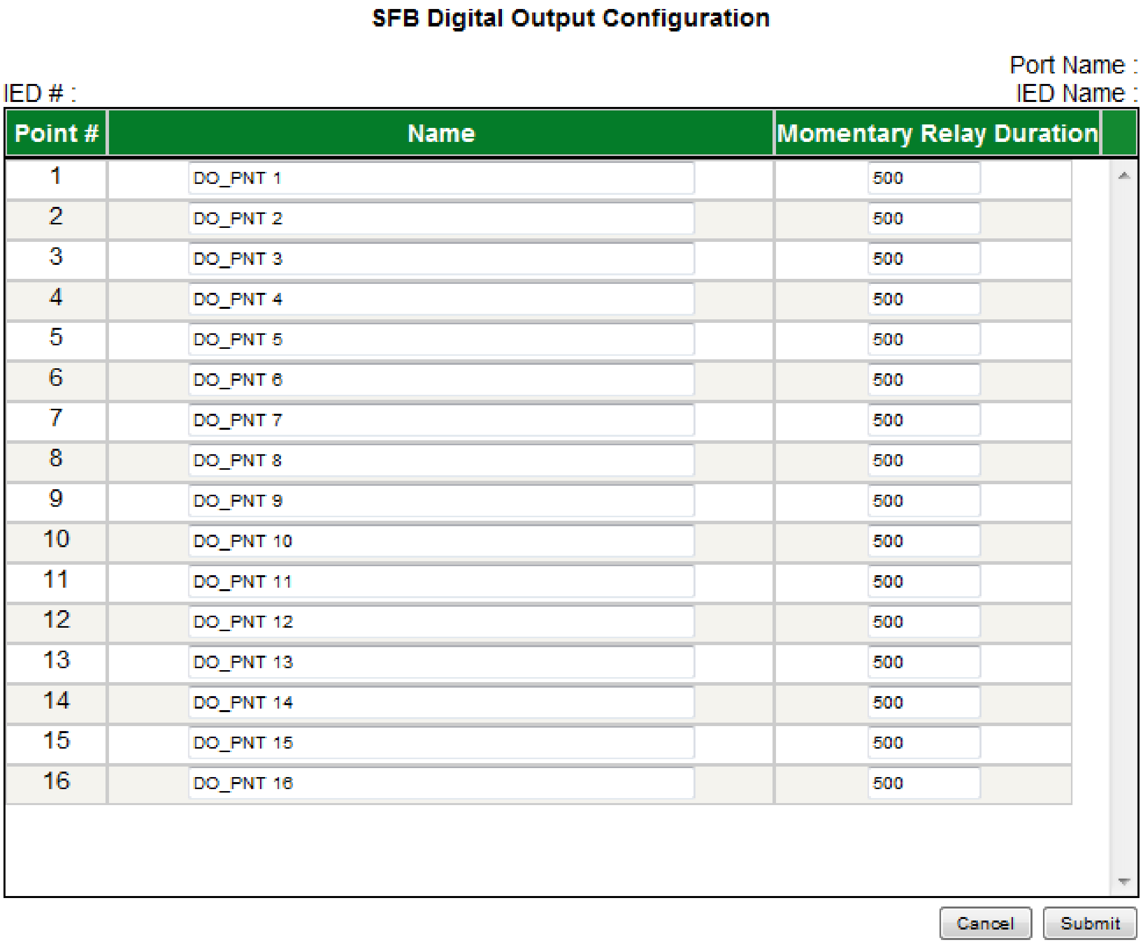
SFB Card Location	SFB Card type	Configure each XT	Copy to Card
Select 1	1 DO Card	Configure SFB XT# 1	Copy
Select 2	None	-	Copy
Select 3	None	-	Copy
Select 4	None	-	Copy
Select 5	None	-	Copy
Select 6	None	-	Copy
Select 7	None	-	Copy
Select 8	None	-	Copy

Back

When you click on Configure SFB XT# n, you will get a screen similar to the one below..

Note: If you intend to use SFB DOs without using BB DOs, or BB SBOs, be sure to check “Skip BB SBO” under Control Configuration.

Figure 2-50 SFB Digital Output Configuration



Point

This is the physical point number on the DO XT.

Name

This is the point name. You may change it, or accept the default.

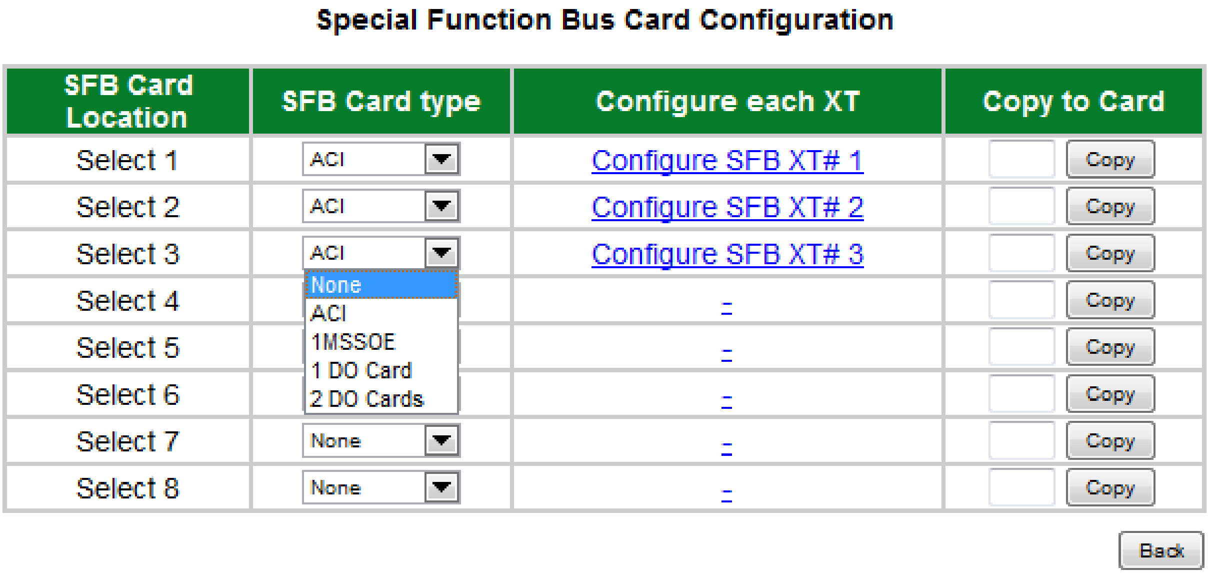
Momentary Relay Duration

You may change the momentary relay pull-in time, or accept the default.

2.12.7 Deleting SFB Cards

If the need arises to delete SFB cards, you must delete them in the reverse order of adding the cards. That is, as shown in the example of three ACI cards in Figure 2-51, delete Number 3 first, then Number 2, then Number 1. This rule applies to any SFB card.

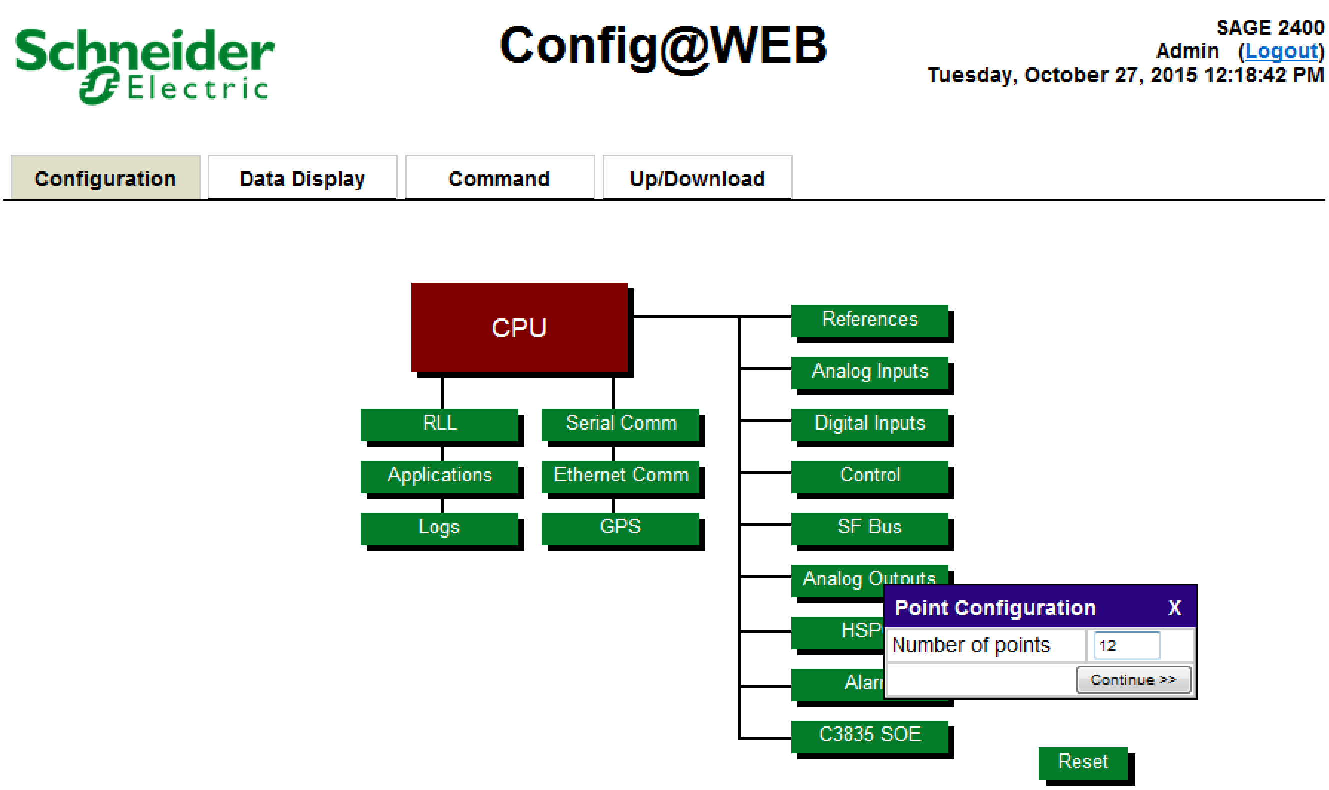
Figure 2-51 Deleting SFB Cards



2.13 Analog Outputs Configuration (SAGE 2X00 Only)

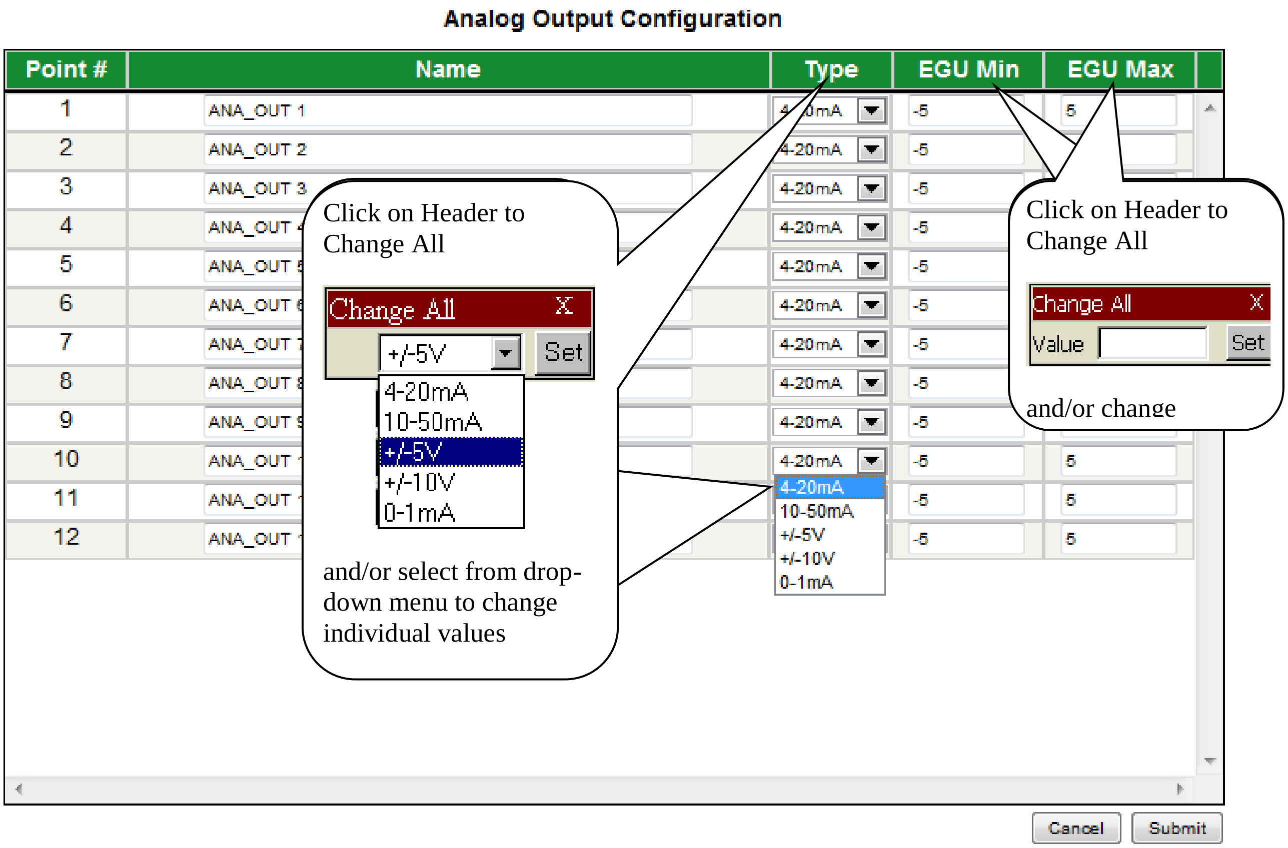
Click Analog Outputs. Type the number of points. Click Continue to configure the points.

Figure 2-52 Analog Outputs Configuration



Type a name for the point (or accept the default), select the point Type from the drop-down menu, type in the EGU Min and EGU Max (or accept the defaults).

Figure 2-53 Analog Output Configuration



Navigation

Click the Cancel button to discard changes. Click the Submit button to accept the changes.

Please note: No configuration changes take effect until the RTU is reset.

2.14 HSPCI Configuration

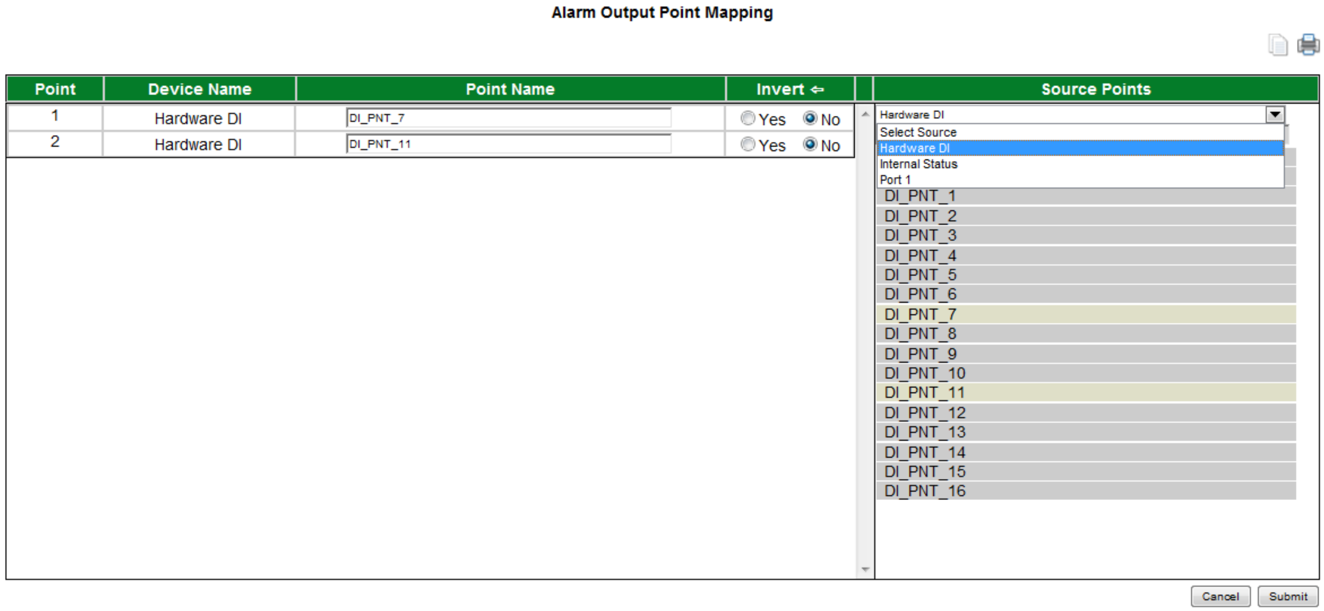
Note: This feature not implemented at this time.

Figure 2-54 Baseboard HSPCI Configuration

2.15 Alarm Configuration

The two baseboard alarms may be sourced (triggered) by any DI, as shown below.

Figure 2-55 Baseboard Alarm Output Configuration



Point

This is the physical point number of the alarm.

Device Name

This is the source of the point.

Point Name

This is the point name.

Invert

This allows you to invert the manner in which the DI triggers the alarm. The default is NO inversion.

Source Points

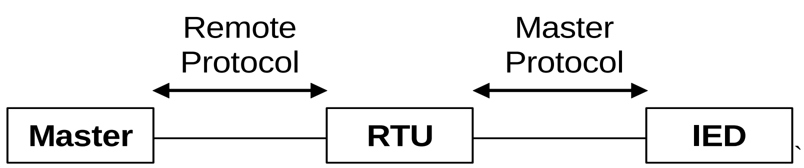
Select the DIs to trigger the alarms from the list of sources.

Please note: No configuration changes take effect until the RTU is reset.

2.16 Serial Comm Configuration

There are two types of protocols that the RTU deals with: Remote and Master. Master protocol means that the RTU is gathering data from an IED. Remote protocol means that the RTU is talking to a Master Station. Both types are shown in Figure 2-56.

Figure 2-56 Protocol Types



Note: An IED could be another RTU.

The SAGE configuration utility has built-in point mapping. Point mapping is used on the output comm. port, that is, the comm. port reporting to a Master, whether that Master is another RTU or a central Master Station.

Your configuration should follow this sequence:

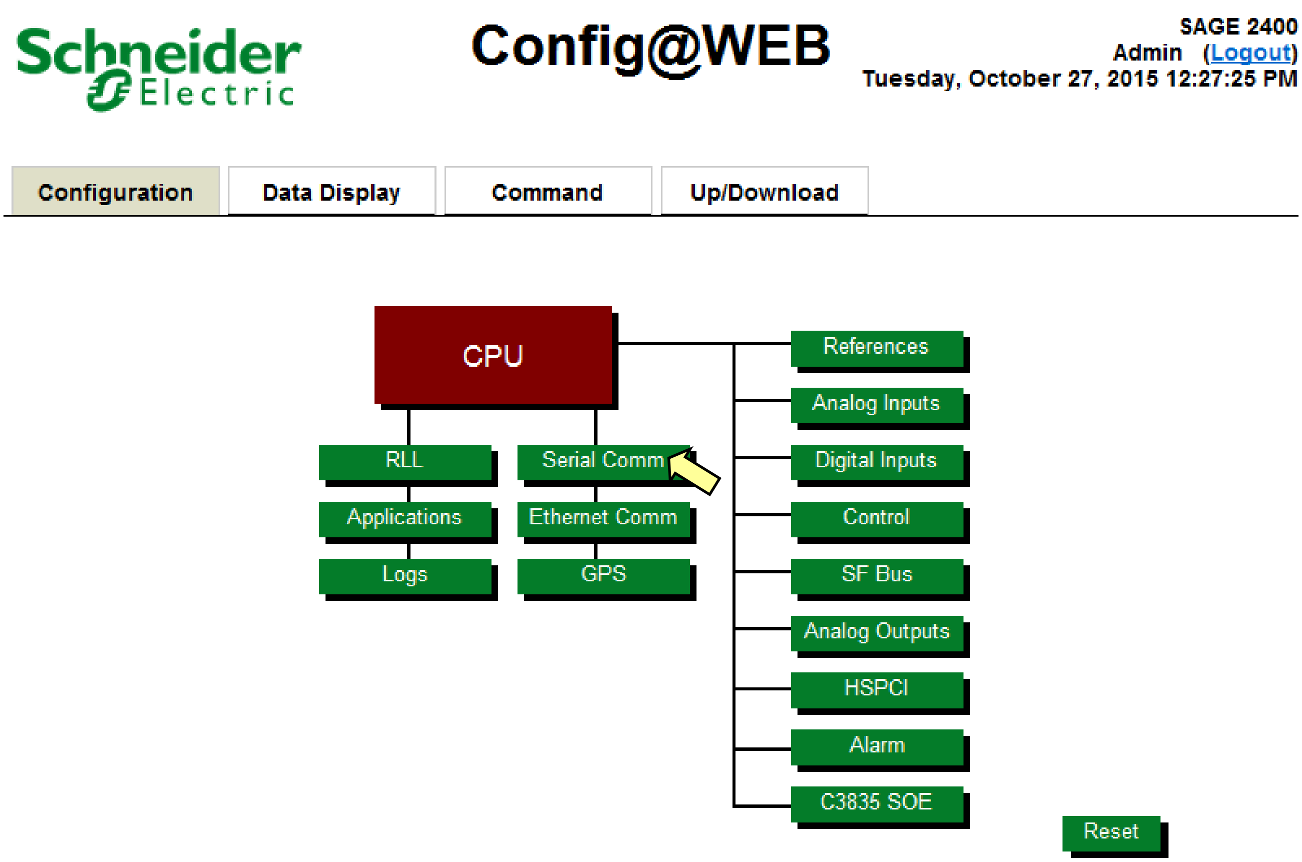
- Configure Hardware I/O
- Configure IEDs - see Config@WEB Protocols-RTU-IED manual
- Configure Master Station interface ports - see Config@WEB Protocols-MTU-RTU manual

Caution: Configure only ports that physically exist. For instance, if the RTU does not have comm. expansion cards for ports 5 through 12, do not configure any protocols for these ports. If a non-existing port were to be configured, the RTU would use all its resources looking for that port. That is, it would "hang." To recover from such a loop, boot-up would have to be halted from the console when you see this message. Refer to the Console Appendix to boot up in Safe Mode. This will allow you to correct the configuration.

Notice: Do not configure a port without configuring points for that port.

To begin serial communications configuration, select Serial Comm as shown in Figure 2-57.

Figure 2-57 Selecting Serial Comm



The Communication Port Configuration screen has a number of features that are explained below.

Exception: For S3030X, this column is a choice of 0V or +5V. See text

Figure 2-58 Communication Port Configuration

Communication Port Configuration

Port Number	RTS	DTR	Configure IRQs	Name	Protocol	Configure Protocol	Point Operations	Copy to Port / Socket
Port #1	K	K	IRQ6	Port 1	DNPR	Port 01	Map Points	Select
Port #2	K	K		Port 2	None	Port 02	-	Select
Port #3	K	K		Port 3	None	Port 03	-	Select
Port #4	K	K		Port 4	None	Port 04	-	Select
Port #5	K	K	IRQ6	Port 5	None	Port 05	-	Select
Port #6	K	K		Port 6	None	Port 06	-	Select
Port #7	K	K		Port 7	None	Port 07	-	Select
Port #8	K	K		Port 8	None	Port 08	-	Select
Port #9	K	K	IRQ6	Port 9	None	Port 09	-	Select
Port #10	K	K		Port 10	None	Port 10	-	Select
Port #11	K	K		Port 11	None	Port 11	-	Select
Port #12	K	K		Port 12	None	Port 12	-	Select

Communication Associations Config Back

Port Number

This is the physical port number. **Note:** The SAGE 3030X has 16 ports

RTS, DTR, (and +5V on the S3030X only – see below)

Note: This option is not available on baseboard RS-485 or on fiber optic serial ports. In these instances, the option is grayed out and cannot be selected.

Request **T**o **S**end and **D**ata **T**erminal **R**eady. Using the drop-down list, set to K, H, or L.

"K" represents Keyed (Radio/Modem).

The RTU firmware asserts/deasserts the signal according to the protocol timing configuration. See Figure 2-59. Typically used as a Radio/Modem key output (Default Setting).

"H" represents Positive RS232 Voltage.

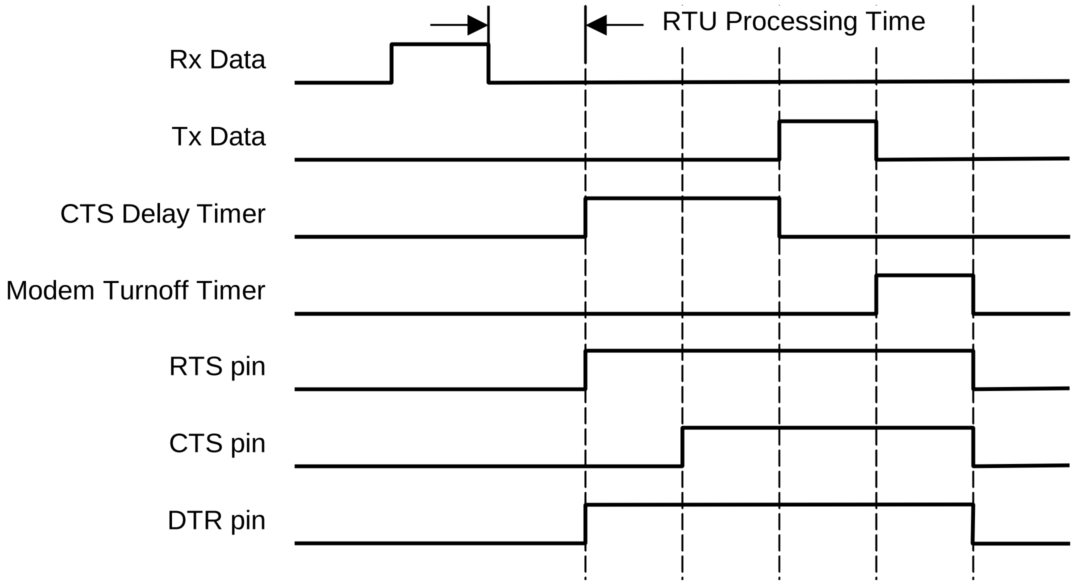
When the RTU firmware is active, the output will be driven to the positive RS232 voltage except when the Z85230 (Communications Controller chip) channel driving the output is being reset. While the reset is occurring, the output will drop to the negative RS232 voltage. When the reset is complete, the output will rise to the Positive RS232 Voltage. This setting can be used to power RS232 to RS485 converters, RS232 to Fiber Optic converters, or any other device requiring the Positive RS232 Voltage.

Note: Setting RTS to "H" (High) provides approximately +12V to pin 7 of the RS232 port. Setting DTR to "H" (High) provides +12V to pin 4 of the RS232 port.

"L" represents Negative RS232 Voltage.

The output will be driven to the negative RS232 voltage at power-up and always be the negative RS232 voltage.

Figure 2-59 Communications Timing Diagram



+5V (S3030X only)

Yes

Provides +5V at approximately 100mA on pin 1 of the RS-232 connector to power auxiliary communications devices.

No

Turns pin 1 on the RS-232 connector to be a Data Carrier Detect (DCD) input.

Name

Port name. Click the default port under Name to name the port (or accept the default). Click Submit to accept the name, as shown in **Section 2.16.1**.

Protocol

Select the desired protocol from the drop-down list. See **Section 2.16.3**.

Configure Protocol

See Section 2.16.3

Point Operations

See the applicable Protocol Manual

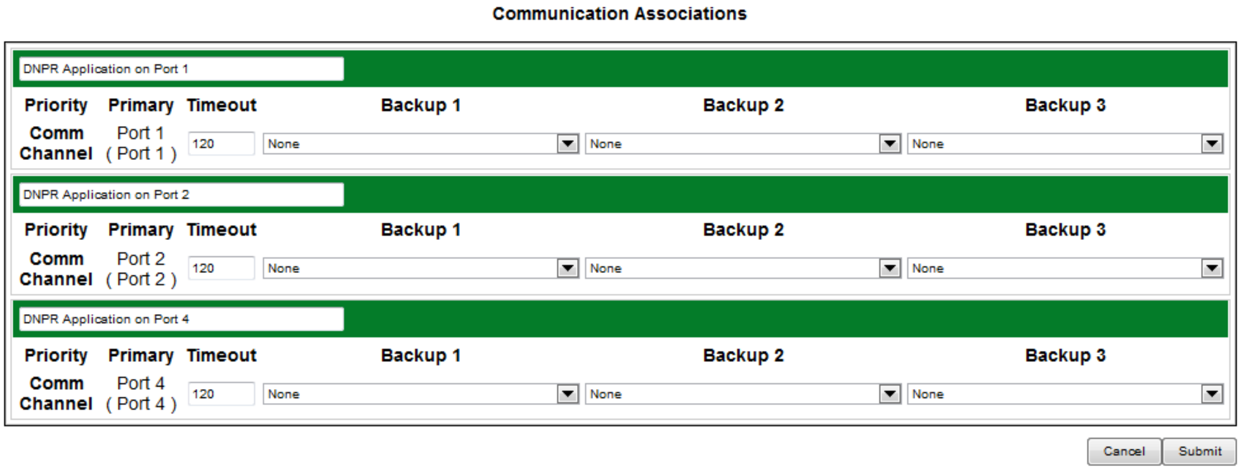
2.16.1 Communication Associations

The purpose of the Communication Associations Config button (bottom left) is to set up backup ports. This may not apply to all protocols. Please see the Protocols Manual for the protocol of interest.

This page creates a link between a single DNPR Application Layer (Database and Events) with multiple Data Link Layers. This is useful in creating backup channels so the same set of events will be available to a serial channel and an Ethernet socket to facilitate backup channels.

Figure 2-60 Config Button

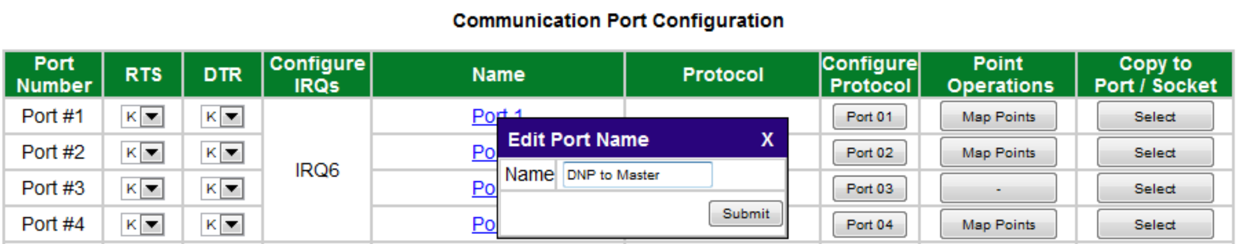
Figure 2-61 Setup Comm Associations



2.16.2 Port Names

Port Name may be edited by clicking on the blue script as shown below.

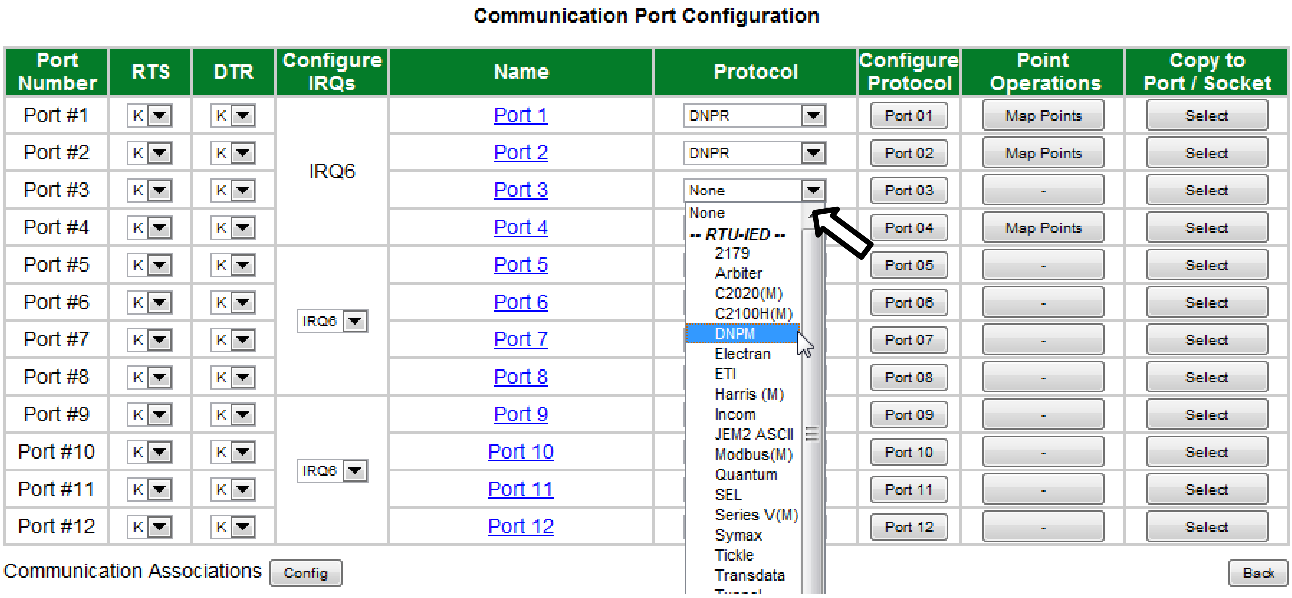
Figure 2-62 Communication Port Configuration: Port Name



2.16.3 Selecting Port Protocols & Copying Ports

From the drop-down menu, select a protocol. If the selected protocol is for IEDs, the Point Operations button will say "Configure". If the selected protocol is to talk to a Master, the Point Operations button will say "Map Points". See below.

Figure 2-63 Communication Port Configuration: Selecting Protocol from Drop-down List



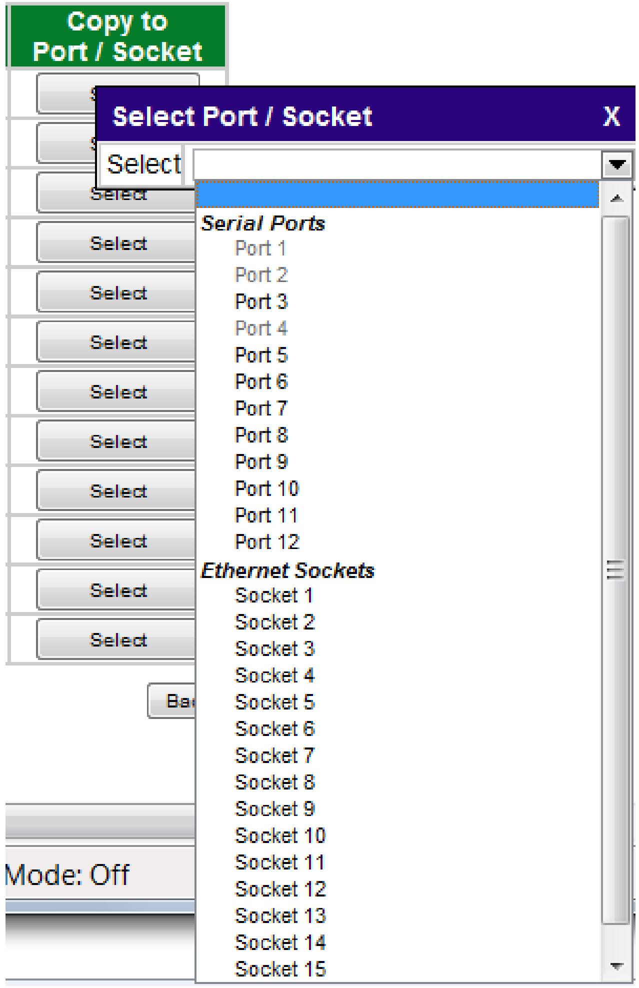
If you have several ports with nearly the same configuration, you may want to copy configuration from one port to another. Enter the target port number under Copy to Port and click Copy. See below.

Figure 2-64 Copying Ports

Copy to Port / Socket

This function copies everything in the port configuration except the port name to the target port. Click Select and choose the port to which to copy.

Figure 2-65 Copy to Port / Socket



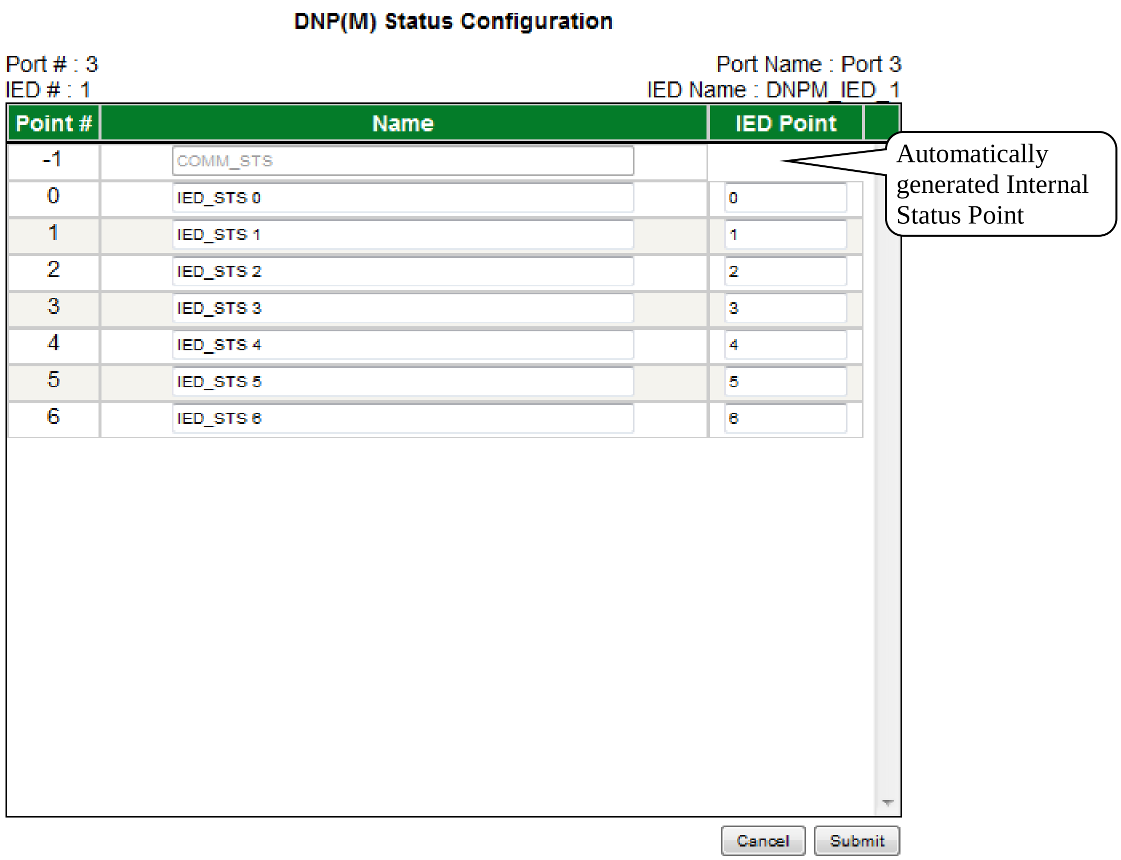
The result of the Copy to Port is shown below. You may assign a different name to the new port.

Figure 2-66 Result of Copying to Port

2.16.4 Internal COMM Status Points

COMM Status applies to any port. Shown below are two examples; one for DNPM, then another for DNPR.

Figure 2-67 DNPM COMM Status Point



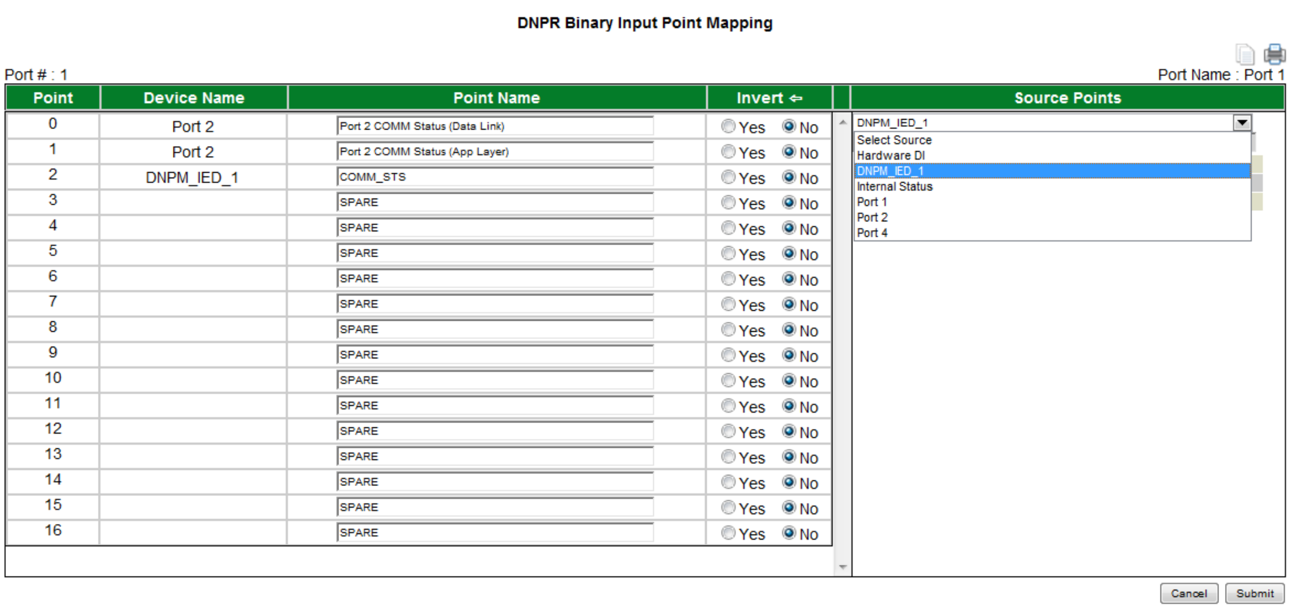
DNP(M) Status Configuration

Port # : 3 Port Name : Port 3
IED # : 1 IED Name : DNPM_IED_1

Point #	Name	IED Point
-1	COMM_STS	
0	IED_STS 0	0
1	IED_STS 1	1
2	IED_STS 2	2
3	IED_STS 3	3
4	IED_STS 4	4
5	IED_STS 5	5
6	IED_STS 6	6

In the mapping example below, note that we are mapping both the COMM Status for the DNPM port and the COMM Status for the DNPR port back to the Master on DNPR.

Figure 2-68 DNPR COMM Status Point



DNPR Binary Input Point Mapping

Port # : 1 Port Name : Port 1

Point	Device Name	Point Name	Invert ⇐	Source Points
0	Port 2	Port 2 COMM Status (Data Link)	Yes / No	DNPM_IED_1
1	Port 2	Port 2 COMM Status (App Layer)	Yes / No	
2	DNPM_IED_1	COMM_STS	Yes / No	
3		SPARE	Yes / No	
4		SPARE	Yes / No	
5		SPARE	Yes / No	
6		SPARE	Yes / No	
7		SPARE	Yes / No	
8		SPARE	Yes / No	
9		SPARE	Yes / No	
10		SPARE	Yes / No	
11		SPARE	Yes / No	
12		SPARE	Yes / No	
13		SPARE	Yes / No	
14		SPARE	Yes / No	
15		SPARE	Yes / No	
16		SPARE	Yes / No	

COMM Status points will be open when the comm. channel is operational, and closed when the comm. channel is failed.

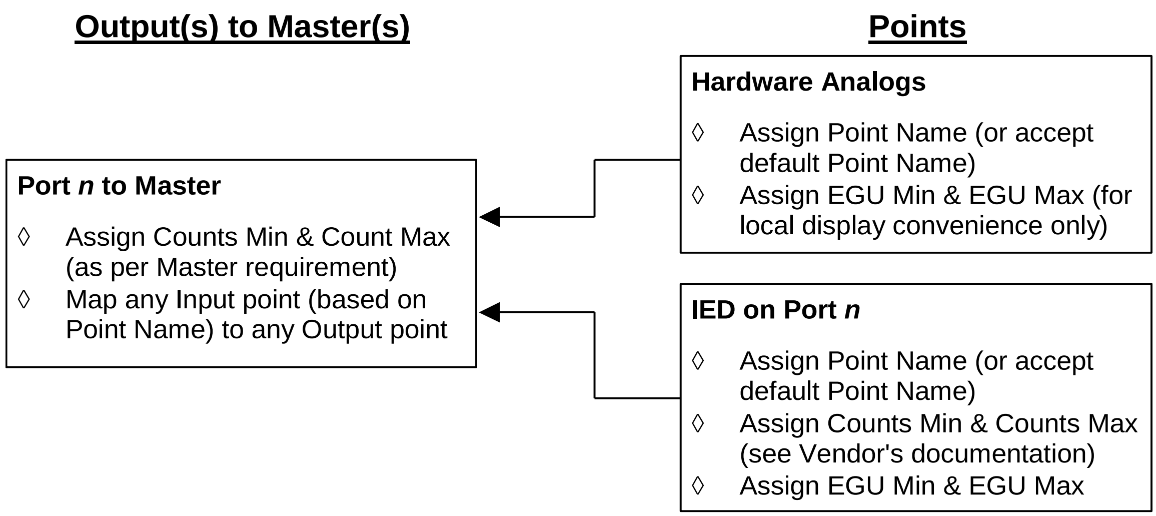
2.16.5 Point Scaling Principles & Examples

Perhaps the ease of mapping can best be shown with the analog input example as described in Figure 2-69. For the sake of illustration, consider that points have an input to the RTU and an output from the RTU. We use analog points in Figure 2-69 because analog scaling from an IED is usually a tricky task.

Notice in Figure 2-69 that you only have to do a few things to untangle the complex problem of getting a usable IED analog from the IED to the Master:

(Points)	Assign a unique point name (or accept the default name)
(Points)	Assign Engineering Unit minimum and maximum values
(Points)	Assign minimum and maximum counts (taken from the vendor's manual)
(Output)	Assign minimum and maximum counts to match what is expected at the Master
(Output)	Map any Input point to any Output point

Figure 2-69 Analog Inputs & Outputs



The configuration utility simplifies all analog scaling to a few fundamental principles that are easy to follow. For the sake of discussion, we will say that analog outputs are also Source Points because they are scaled the same as other analogs.

Point scaling is accomplished using a concept called the Full Range Factor (FRF). This factor is calculated using properties associated with the point we are scaling. For any one point only one property will be used to calculate the FRF:

- Hardware Analogs are scaled when the proper Point Type is entered.
- IED Analogs are scaled by entering the proper Counts Min (C Min) and Counts Max (C Max). C Min and C Max for an IED Analog point are obtained from the IED vendor's manual.

Hardware Analog Example

The database in the RTU stores a number called FRF (Full Range Factor). This number is typically a fraction from 0 to 1 of the full range of the analog input. The FRF is derived as follows:

$$\text{FRF} = \frac{\text{Measured Value} - \text{Data Min}}{\text{Data Max} - \text{Data Min}}$$

This formula is generalized to apply to any step along the way, where:

> Measure value is the actual value at a given time, whether it is counts, current, voltage, temperature, etc.
>
> Data Max is either Data Maximum, or EGU Max, or C Max
>
> Data Min is either Data Minimum, or EGU Min, or C Min

Obviously, you must stick to one set of units for every step. Let's do the FRFs for temperature and Sensor Type based on Figure 2-70:

$$\text{Temperature FRF} = \frac{175 - (-50)}{250 - (-50)} = \frac{225}{300} = 0.75$$

Now that we know the FRF, we can solve for current at the Sensor Type by transposing the formula:

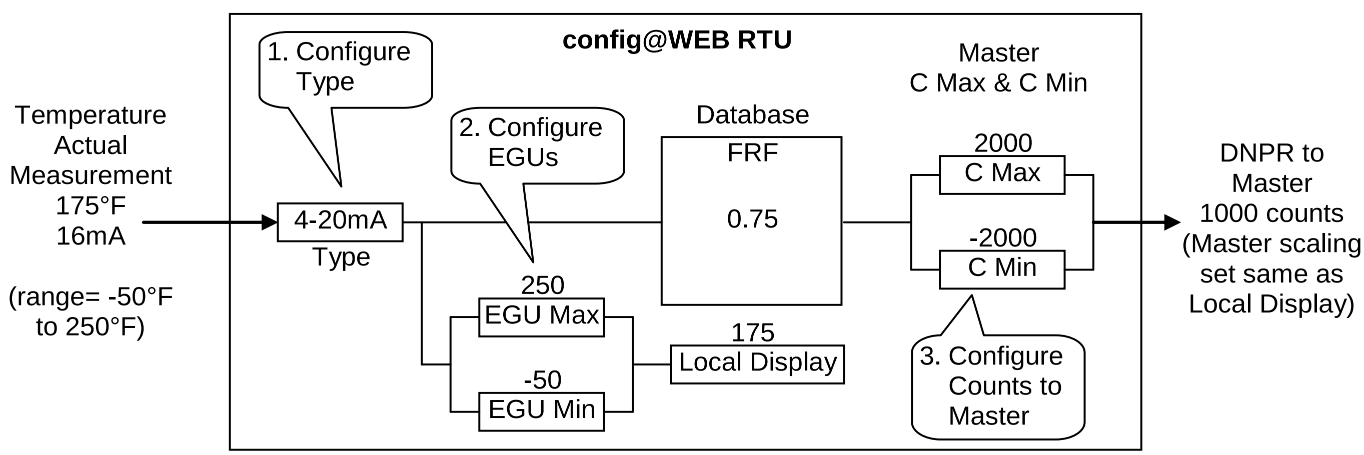
Sensor Type Data Value = FRF (Data Max – Data Min) + Data Min
Sensor Type Data Value = 0.75 (20 – 4) + 4
Sensor Type Data Value = 16

Conversely, knowing the FRF and the minimum and maximum counts required by the Master, we can solve for the number of counts that will be sent to the Master (see Figure 2-70):

Counts to Master = FRF (C Max – C Min) + C Min
Counts to Master = 0.75 (2000 – (-2000)) + (-2000)
Counts to Master = 1000

Figure 2-70 shows the path of an analog hardware point from measurement to Master.

Figure 2-70 Analog Scaling for Hardware Point



We learn from the sensor vendor's manual that the sensor covers a real-world range of –50°F to 250°F. It converts this temperature range to a current range of 4-20mA.

- Set Type to 4-20mA.
- Set EGU Min and Max to –50 and 250.

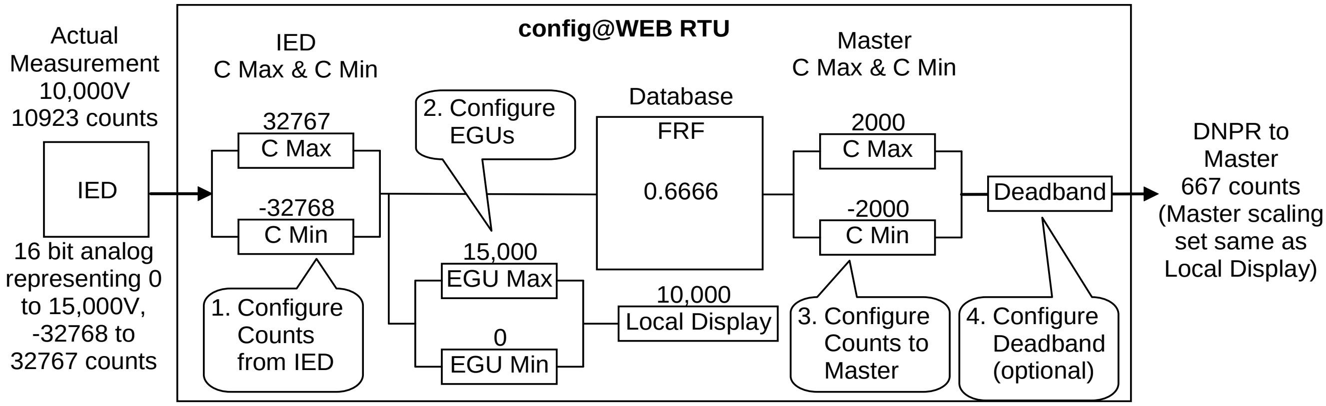
We learn from the Master Station vendor's manual that the Master Station's DNPR protocol expects a count range of –2000 to 2000.

- Set C Min and C Max to –2000 and 2000.

IED Analog Example

Scaling for IEDs is just as easy, as shown in Figure 2-71. The formula for calculating FRF is the same as it was for the hardware analog.

Figure 2-71 Analog Scaling for IED Point



We learn from the IED vendor's manual that the IED covers a real-world range of 0V to 15,000V. It converts this voltage range to a 16-bit count range of –32768 to 32767.

- Set C Min and Max to –32768 and 32767.
- Set EGU Min and Max to 0 and 15,000.

We learn from the Master Station vendor's manual that the Master Station's DNPR protocol expects a count range of –2000 to 2000.

- Set C Min and C Max to –2000 and 2000.

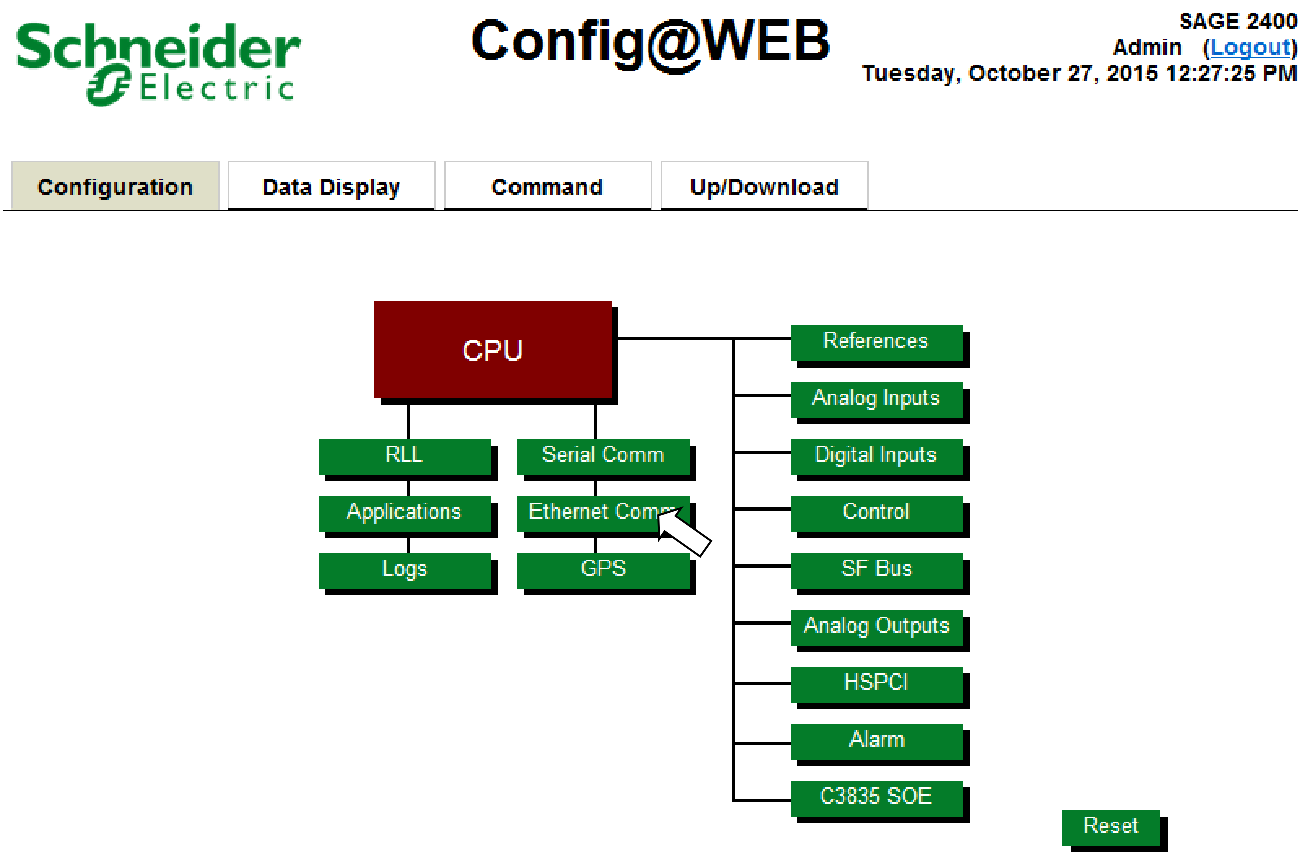
Handy Binary to Decimal Converter

Type of Binary Word	Counts
Bipolar 12 bit	+2047 –2048
Bipolar 16 bit	+32,767 –32,768
Bipolar 32 bit	+2,147,483,647 –2,147,483,648

2.17 Ethernet Comm Configuration

From the Configuration screen, click on Ethernet Comm as shown in Figure 2-72.

Figure 2-72 Configuration Screen



As shown below, the Ethernet Comm port has sockets that are independent channels within Ethernet. You may configure the available protocols for any or all of the sockets. The Configure Protocol for each socket is explained in the Config@WEB Protocols Manuals. Point Operations are identical to the Point Operations for Serial Comm Configuration

Figure 2-73 Ethernet Comm Port Configuration

Communication Port Configuration

Socket Number	Name	Protocol	Configure Protocol	Point Operations	Copy to Port / Socket
Socket #1	Socket 1	None	Socket 1	-	Select
Socket #2	Socket 2	None	Socket 2	-	Select
Socket #3	Socket 3	None	Socket 3	-	Select
Socket #4	Socket 4	None	Socket 4	-	Select
Socket #5	Socket 5	None	Socket 5	-	Select
Socket #6	Socket 6	None	Socket 6	-	Select

Socket Number

The physical socket number.

Name

The name of the socket. You may change the name. The default name is the same as the physical socket number.

Protocol

The protocol to be used for the socket. Multiple protocols are available.

Configure Protocol

Click this button to set up the communication and other basic parameters of the protocol.

Point Operations

If an RTU protocol (DNPR) has been selected, the legend on the button will be "Map Points". If a Master protocol (DNPM) has been selected, the legend on the button will be "Configure". Point Operations are identical to the Point Operations for Serial Comm Configuration.

Copy to Port

A socket configuration may be copied to another socket by entering the number of the target socket.

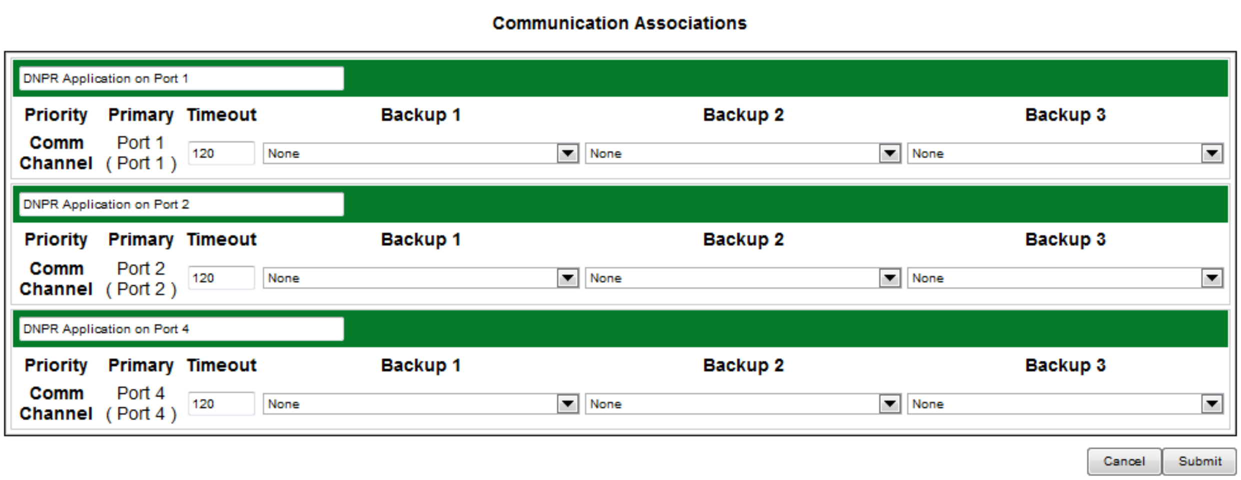
2.17.1 Communication Associations

The purpose of the Communication Associations Config button (bottom left) is to set up backup ports. This may not apply to all protocols. Please see the Protocols Manual for the protocol of interest.

This page creates a link between a single DNPR Application Layer (Database and Events) with multiple Data Link Layers. This is useful in creating backup channels so the same set of events will be available to a serial channel and an Ethernet socket to facilitate backup channels.

Figure 2-60 Config Button

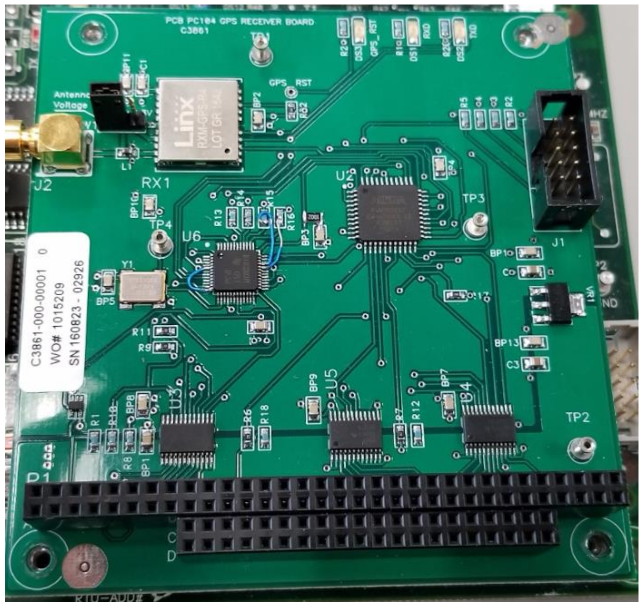
Figure 2-61 Setup Comm Associations



2.18 GPS Configuration

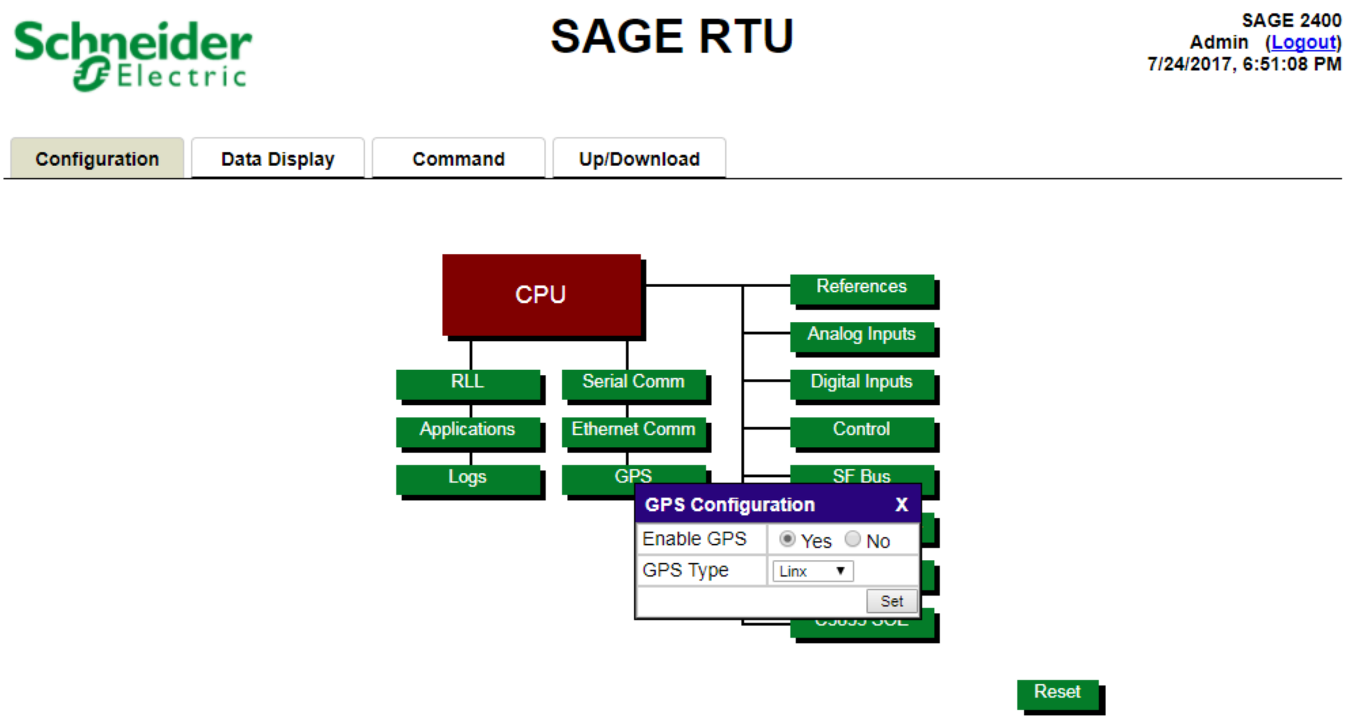
To enable use of GPS as a time source, click GPS on the main Configuration page to get a screen as shown in Figure 2-75. Click Yes, then Set to enable the GPS. This will make the GPS available as a Time Server Source. Select the correct GPS Type based on the PC104 GPS Card attached to your RTU. Below is the new C3861 Linx GPS card. The older Trimble GPS cards can be identified by the daughter board attached to the PC104 card.

Figure 2-74: Linx GPS Card



Next, set the GPS as either the Primary or Secondary Time Server Source under the CPU Configuration (see Figure 2-6). It is recommended the GPS be set as the Primary Timer Server Source. When the RTU reboots, the RTU will begin communicating with the GPS, and once the antenna can track the GPS satellites, will start using UTC time to update the RTU internal Real Time Clock.

Figure 2-75 GPS Configuration

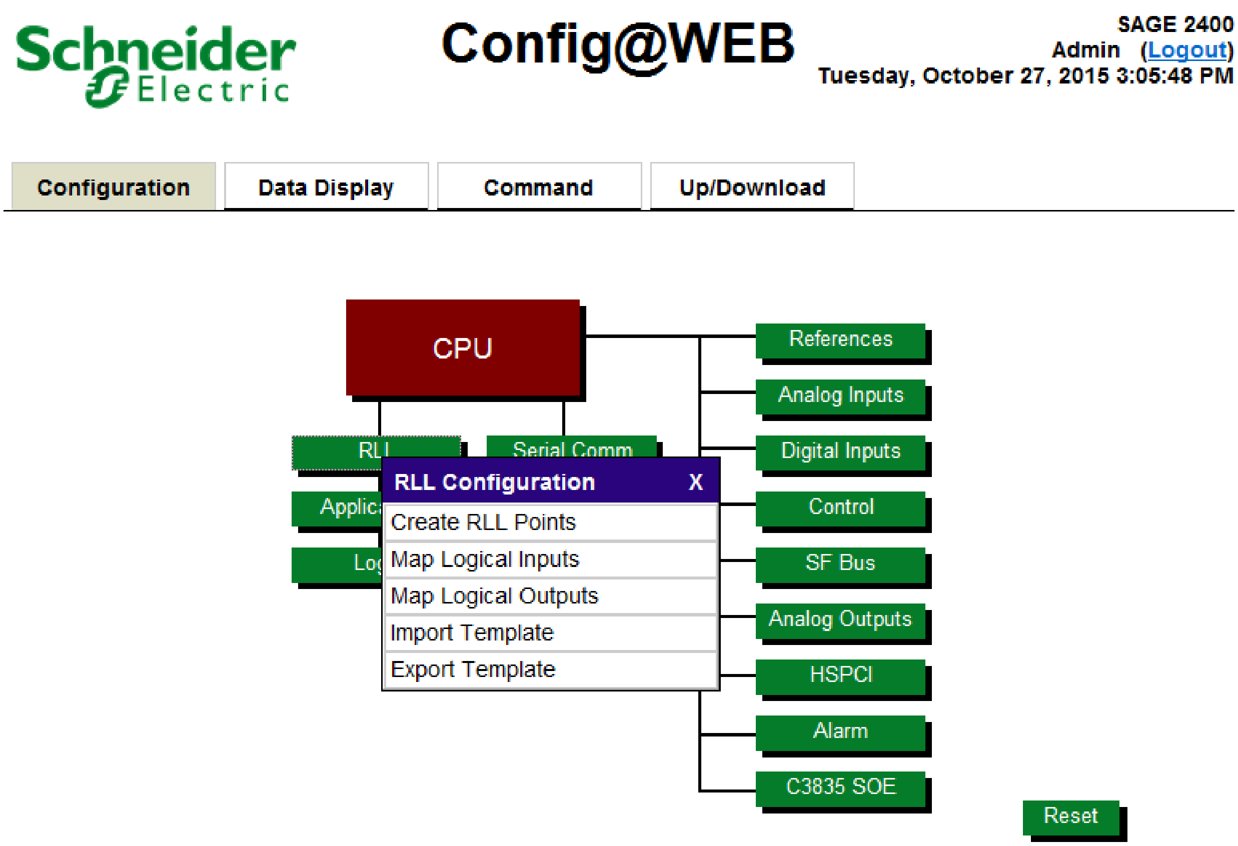


See the Data Display chapter for GPS Display information.

2.19 RLL Configuration

ISaGRAF PRO is a program for Schneider Electric RTUs with the Config@WEB GUI interface that supports IEC 61131-3 programming languages. Four of the six languages supported are easy-to-use graphical languages. Please see the Config@WEB Relay Ladder Logic Manual for further information.

Figure 2-76 RLL Configuration



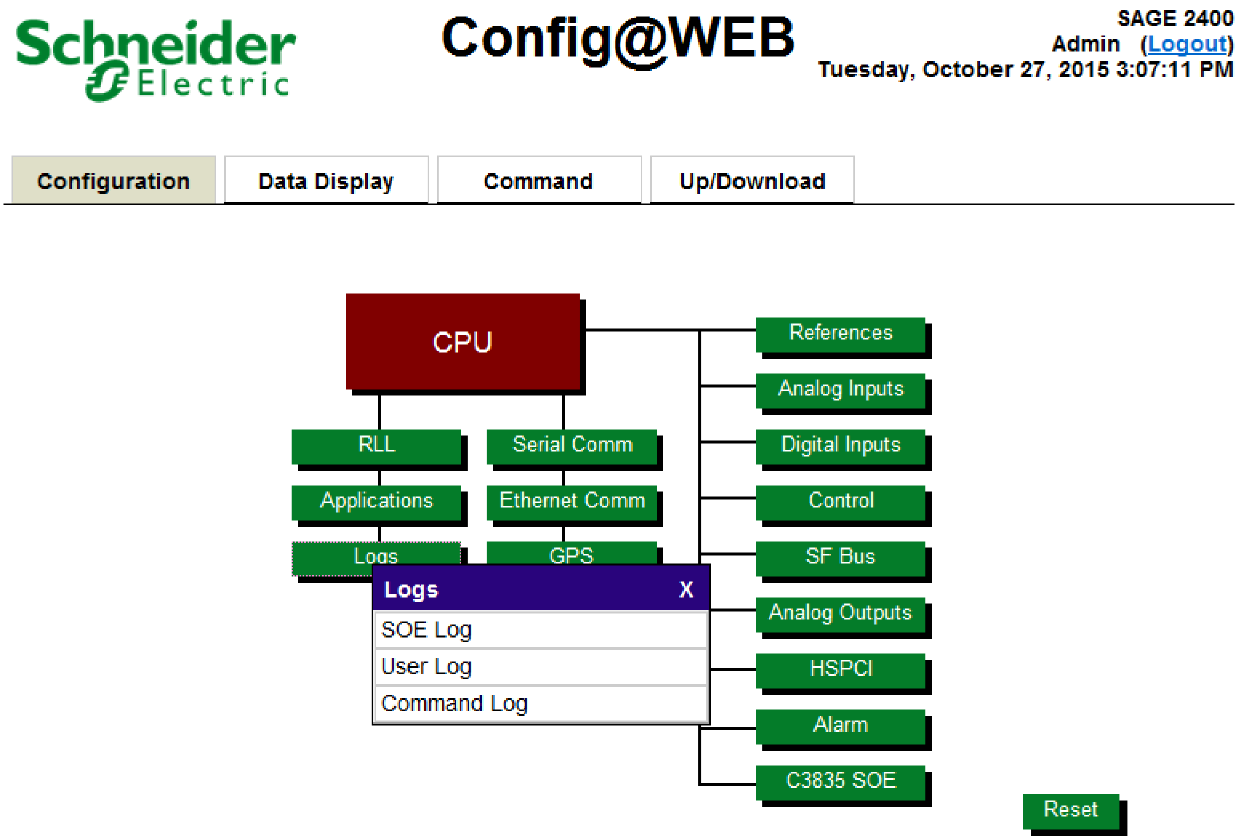
2.20 Applications Configuration

Please refer to the Config@WEB Applications manual.

2.21 Logs

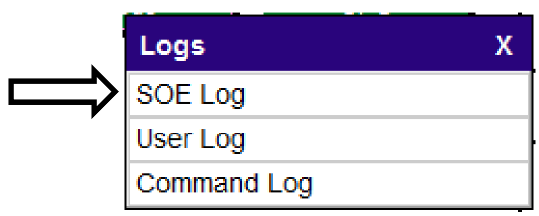
Click on Logs to get the selection of SOE Log or User Log.

Figure 2-77 Logs



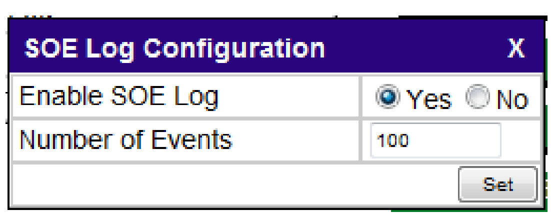
2.21.1 SOE Log

SOE Log is a function that allows you to configure the collection and storage of time-stamped event data. Select SOE log.



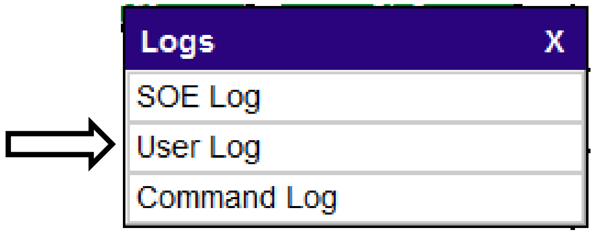
The default settings are to Enable the SOE Log, and to set the initial Number of Events at 100. The Number of Events may be set in a range of 100 to 300. The Events are stored in the RTU.

Click “Set” to submit the new setting; Click “X” to dismiss the SOE Log Configuration.



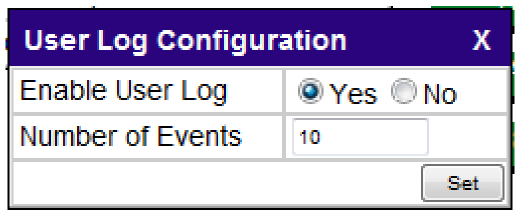
2.21.2 User Log

User Log is a function that allows you to configure the collection and storage of time-stamped event data. Click on Logs, then click on User Log as shown below.

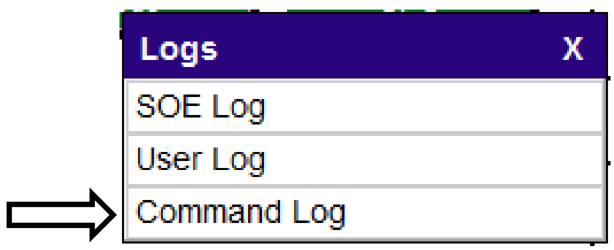


The default settings are to Enable the User Log, and to set the initial Number of Events at 10. The Number of Events may be set in a range of 10 to 300. The Events are stored in the RTU.

Click “Set” to submit the new setting; Click “X” to dismiss the User Log Configuration.



2.21.3 Command Log



This is a new application which enables the RTU to save critical events to log files in the RTU. The log files can be downloaded to your PC via the Config@WEB GUI, SFTP, or they may be pushed Syslog server using UDP over RFC 3164 protocol specifications.

The application can save events to the compact flash in the form of comma separated value text files. These files can be viewed in Microsoft Excel or any spreadsheet application (Open Office or Google Docs).

Figure 2-78 Command Log Configuration

Command Log Configuration

Logging Config	Value
Enable Command Log	(•) Yes ( ) No
Send to Syslog Server	( ) Yes (•) No
SysLog server IP	172.18.150.41
Syslog UDP Port	514
Log to File	(•) Yes ( ) No
Max Disk Space to Use	200 MB
Create File Every	Hour
Min Severity to Send Syslog	Notice

Log Entry Types	Enabled	Syslog Severity
Log SBOs	(•) Yes ( ) No	Notice
Log Analog Outputs	(•) Yes ( ) No	Notice
Log Digital Outputs	(•) Yes ( ) No	Notice
Log Time Syncs	( ) Yes (•) No	Notice
Log Time Changes	( ) Yes (•) No	Notice
Log Accumulator Freezes	( ) Yes (•) No	Notice
Log Accumulator Change	(•) Yes ( ) No	Notice
Log User Reboots	(•) Yes ( ) No	Notice
Log Config Changes	(•) Yes ( ) No	Notice
Log Alt SBO Cmd	(•) Yes ( ) No	Notice
Log Login Fails	(•) Yes ( ) No	Notice
Log Reset Comm Cntrs	(•) Yes ( ) No	Notice
Log Alarm Acks	(•) Yes ( ) No	Notice
Log Forced Data	(•) Yes ( ) No	Notice
Log DNPR Socket Connect	(•) Yes ( ) No	Notice
Log Startup AOUT	(•) Yes ( ) No	Notice
Log Startup DOUT	( ) Yes (•) No	Notice
Log Startup Acc	(•) Yes ( ) No	Notice
Log Internal Sts Chg	(•) Yes ( ) No	Notice
Log System Log Entries	(•) Yes ( ) No	Notice

Cancel Submit

To view Command Log Files, go to Display -> Logs -> Command Log on the SAGE Config@WEB GUI. The filenames corresponds to the Date and Time the file was created. It is in the format logYYYYMMDD_HH, so log20130228_11 refers to a file created on February 28, 2013 at 11 AM.

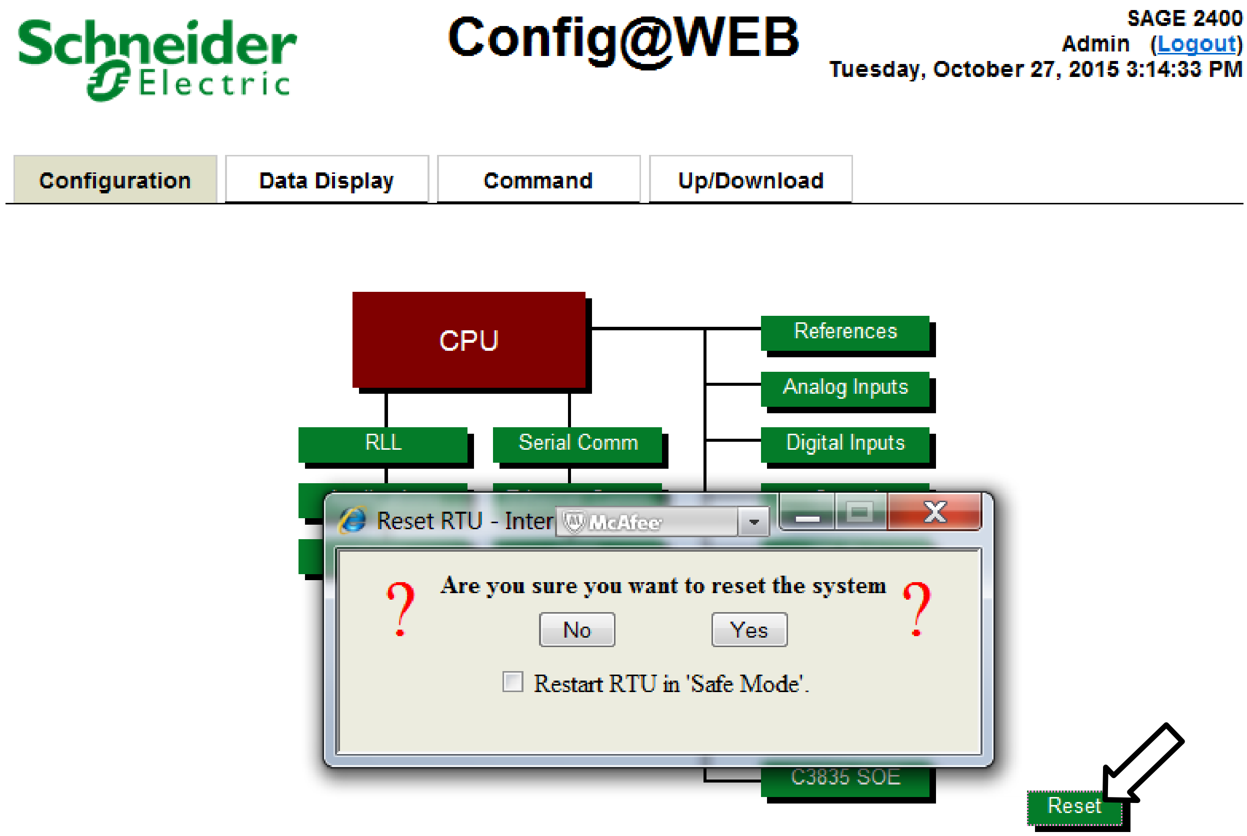
To use the Syslog Server you must Select Yes on the Send to Syslog Server option above. You must also configure the server's IP address and listening port number. The format of the messages follows the RFC 3164 format. https://tools.ietf.org/html/rfc3164

Additionally, you may filter which events are sent to the Syslog Server by configuring the Min Severity to log along with the Severity for each log type. Clicking the Enabled column to No will also prevent that Event type from being logged locally or sent to the Syslog Server.

2.22 Normal Reset

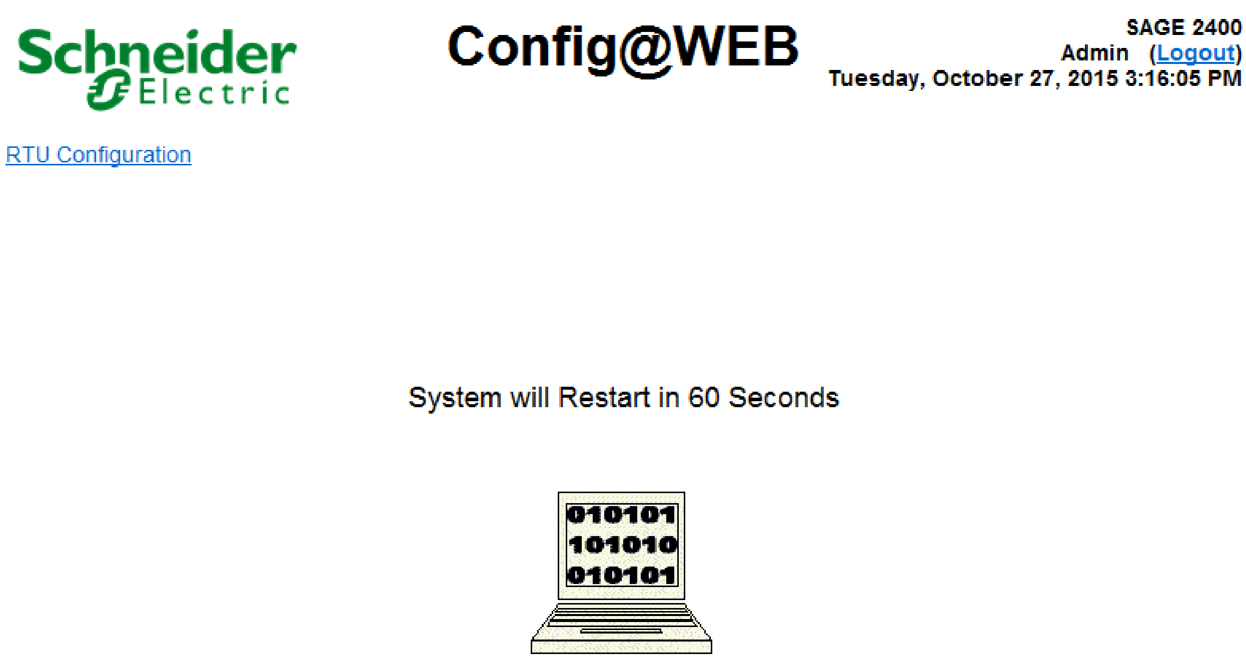
Click Reset to reset the system. Click Yes on the Warning dialog box for a normal reset.

Figure 2-79 Reset



You must allow approximately 60 seconds for the system to reset. The reset function logs you out and will ultimately take you back to the login page.

Figure 2-80 Normal Reset



2.23 Safe Mode Reset

If the Safe Mode box is checked, as shown below, and the Yes button is clicked, the RTU will start in Safe Mode as shown in

Figure 2-81.

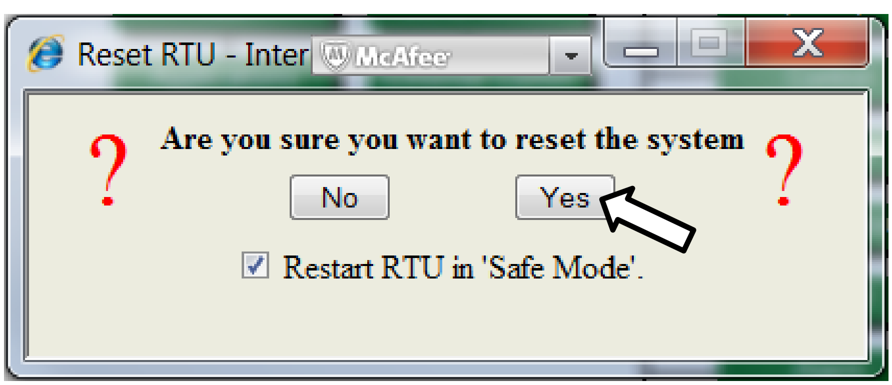
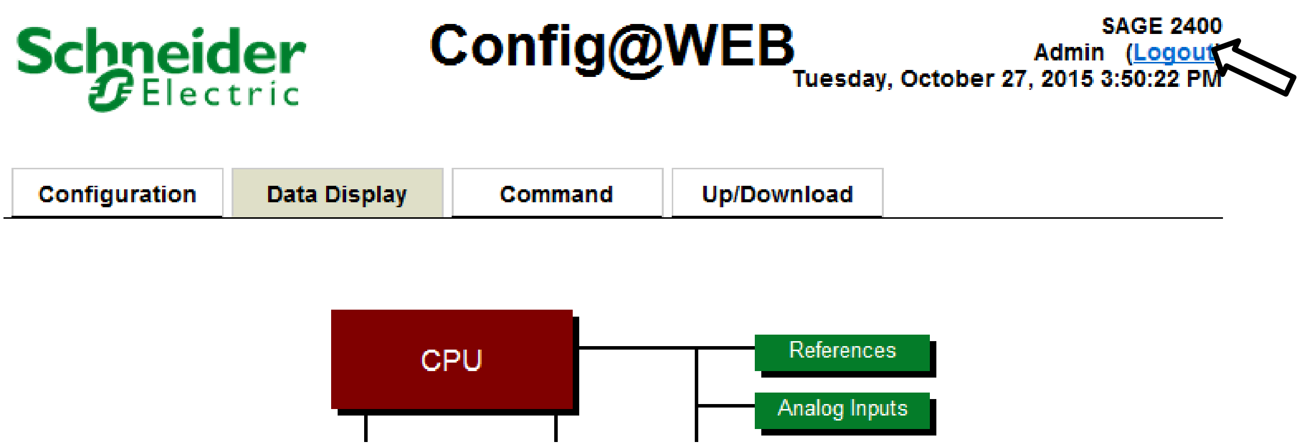


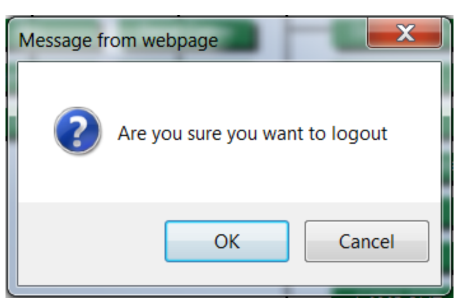
Figure 2-81 Safe Mode Reset

2.24 Logout

Click Logout to complete your session. You will get a small dialog box before you log out, as shown below. Logging out will take you to the Login screen. From there, you may close Internet Explorer. You should always log out instead of just closing the browser in order to avoid having open sessions on your RTU.

Figure 2-82 Logging Out





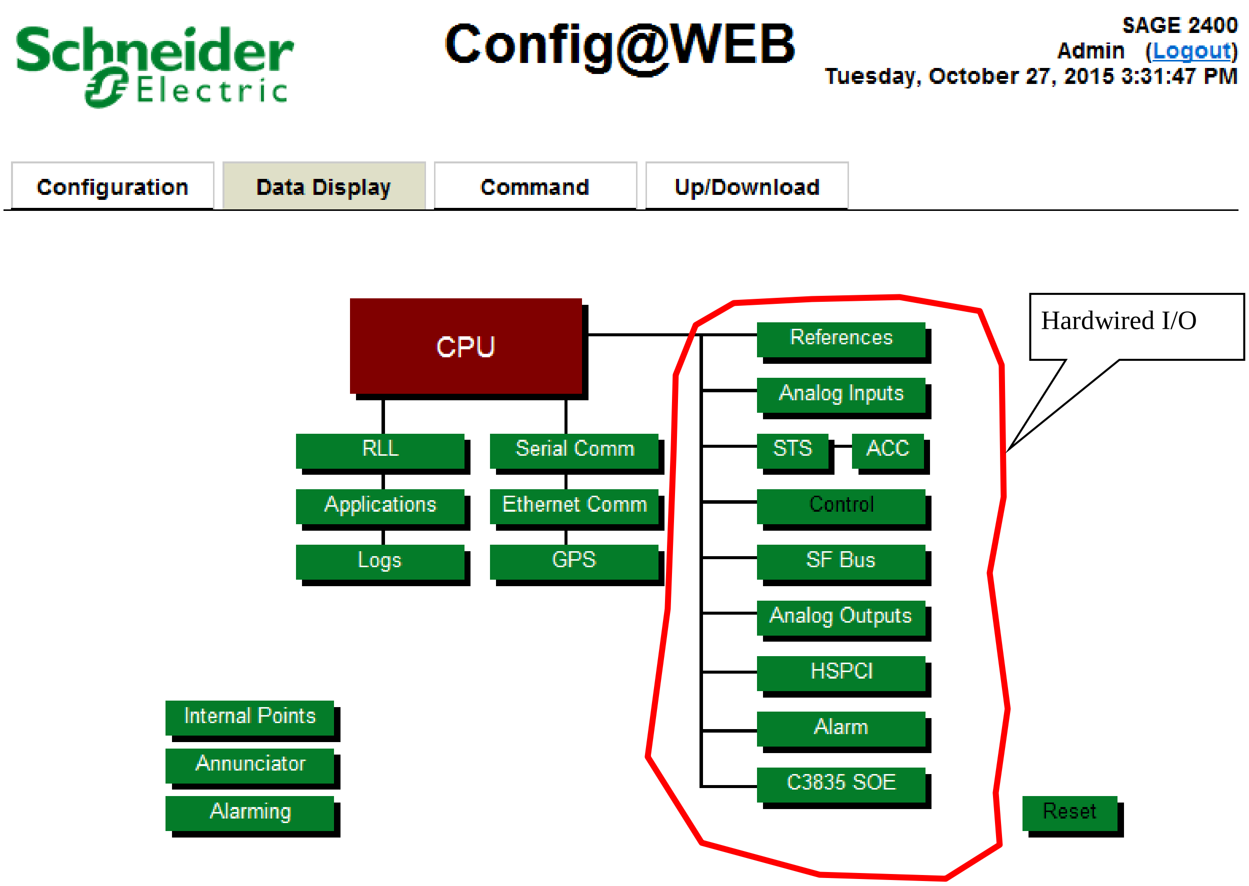
3 Data Display

The SAGE RTU has a unique approach to data display. In fact, if you have become familiar with the Configuration of the SAGE RTU, you will find Data Display straight-forward and very user friendly.

Immediately after a successful login, you will see the Configuration screen (if the login is an unrestricted Admin login). You will now need to press the Data Display Tab located at the top of the Configuration screen. One of the few noticeable differences between the Data Display screen and the other (tab) screens is that the Data Display screen digital inputs are divided into Status (STS) and Accumulator (ACC) points. Note that the newly configured points will not appear in Data Display until the RTU has been RESET and allowed to add all new points to the Database.

Navigation to data to be displayed is the same as navigation used during configuration and again the same for Command output.

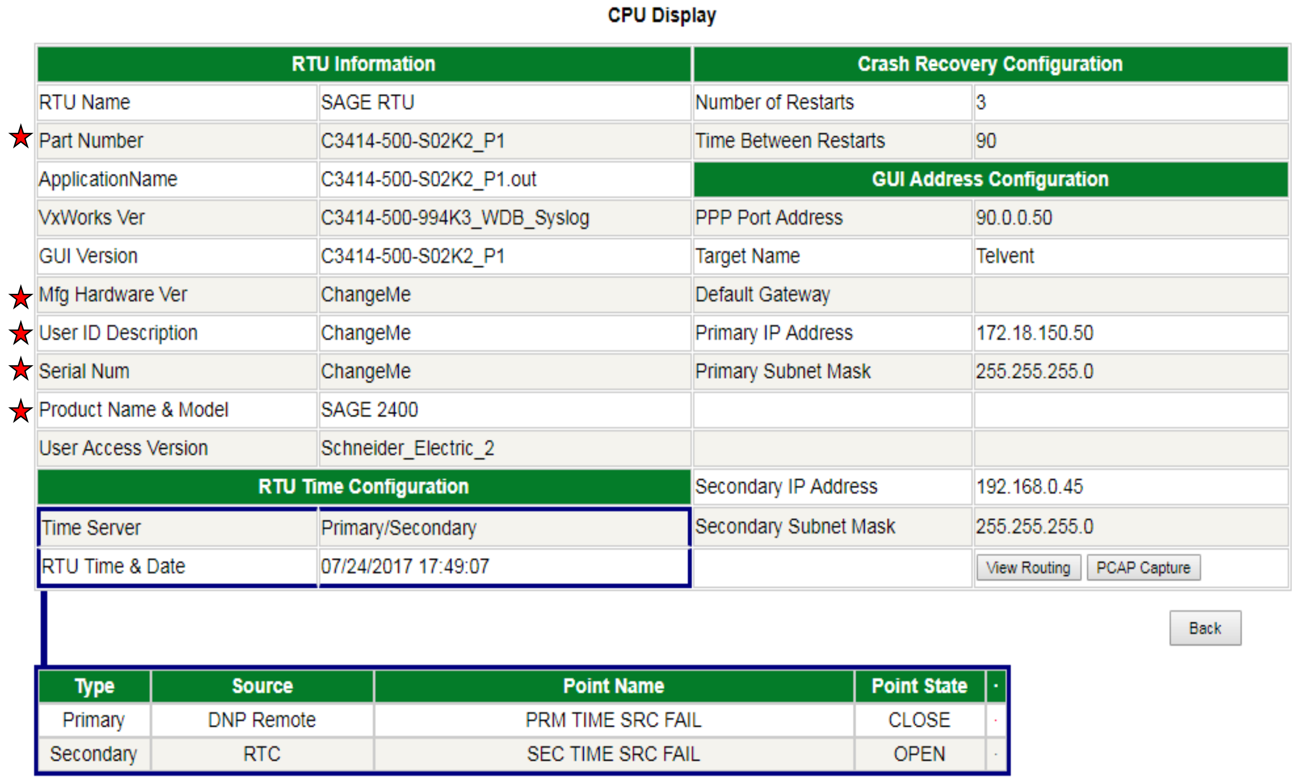
Figure 3-1 Data Display



3.1 CPU Data Display

From the Data Display screen, click CPU. The CPU Data Display screen reflects the CPU Configuration as shown in Figure 3-2.

Figure 3-2 CPU Data Display



CPU Display

RTU Information		Crash Recovery Configuration	
RTU Name	SAGE RTU	Number of Restarts	3
★ Part Number	C3414-500-S02K2_P1	Time Between Restarts	90
ApplicationName	C3414-500-S02K2_P1.out	**GUI Address Configuration**	
VxWorks Ver	C3414-500-994K3_WDB_Syslog	PPP Port Address	90.0.0.50
GUI Version	C3414-500-S02K2_P1	Target Name	Telvent
★ Mfg Hardware Ver	ChangeMe	Default Gateway	
★ User ID Description	ChangeMe	Primary IP Address	172.18.150.50
★ Serial Num	ChangeMe	Primary Subnet Mask	255.255.255.0
★ Product Name & Model	SAGE 2400		
User Access Version	Schneider_Electric_2		
RTU Time Configuration		Secondary IP Address	192.168.0.45
Time Server	Primary/Secondary	Secondary Subnet Mask	255.255.255.0
RTU Time & Date	07/24/2017 17:49:07		View Routing PCAP Capture

Back

Type	Source	Point Name	Point State	-
Primary	DNP Remote	PRM TIME SRC FAIL	CLOSE	-
Secondary	RTC	SEC TIME SRC FAIL	OPEN	-

RTU Information

RTU Name

The name of this RTU as selected in Configuration

Application Name

File name of the firmware

VxWorks Ver

VxWorks Version number assigned by

GUI Version

Version number assigned by Schneider Electric

User Access Version

The name and version of the file being used for the accounts, passwords and SSH keys.

★See the "**Config@WEB MTU to RTU Protocols**"

RTU Time Configuration

Time Server

This RTU has a Primary and a Secondary Time Server.

RTU Time & Date

Reflects the Date and Time as derived from the common time. Common time is initially synced from the real time clock on startup; thereafter, the common time is synced by the Primary Time Server and, if the Primary fails, by the Secondary Time Server. .

Type

The Type of Time Server.

Source

The source of the Time Server as determined during Configuration.

Point Name

The name of the point from which the Time Sync is derived.

Point State

The status of the Time Sync for that particular source. CLOSE means the Time Sync is failed; OPEN means the Time Sync is operational.

Crash Recovery Configuration (See the appendices for detailed information)

Crash Recovery is a state of the RTU that allows you to back out of a bad configuration gracefully. The recovery process is based on the premise that you can have a way to boot VxWorks without running any applications. This allows you to reconfigure the RTU without actually having to run the last configuration.

Number of Restarts

The number of restarts before the RTU starts VxWorks without applications (for troubleshooting purposes). Works best under normal conditions if the user accepts the default value.

Time between Restarts

If crash happens in shorter time, it is logged as a restart. Works best under normal conditions if the user accepts the default value.

Example: If the RTU crashes within 90 seconds after the beginning of bootup, that counts as one restart. If this happens three times in a row, the RTU goes into Crash Recovery mode.

Notice that the default Time between Restarts is 90 seconds. Because the RTU takes about 60 seconds to reboot, 30 seconds is allowed for a crash. If you have reason to believe that the configuration problem takes longer to crash the RTU, enter a longer Time between Restarts.

GUI Address Configuration

PPP Port Address

Address assigned by Schneider Electric . See the appendices.

Target Name

Network server name of the RTU (the network server that resolves this name to the I.P. address is the DNS server). Default is Schneider Electric

Default Gateway

I.P. Address of the device connected to multiple physical TCP/IP networks capable of routing or delivering IP packets between them. A gateway translates between different transport protocols or data formats (for example, IPX and IP) and is generally added to a network primarily for its translation ability.

Primary I.P. Address

Primary I.P. Address of this RTU

Primary Subnet Mask

Primary Subnet Mask of this RTU

Secondary I.P. Address

I.P. Address used by the secondary Ethernet port

Secondary Subnet Mask

Subnet Mask used by the secondary Ethernet port

Navigation

Click the Back button to go back to the Data Display screen.

3.1.1 View Routing

Displays Ethernet routing information.

Ethernet Routing Tables

Ethernet Routing Tables

Route Number	Route Type	Gateway	IP Address	Subnet Mask	Status
Default Gateway	-	172.18.150.1	-	-	●
Primary Route 1	H	172.18.150.1	192.168.1.2	-	●
Primary Route 2	N	172.18.150.1	192.168.2.0	255.255.255.0	●
Primary Route 3	-	-	-	-	●
Primary Route 4	-	-	-	-	●
Primary Route 5	-	-	-	-	●
Primary Route 6	-	-	-	-	●
Primary Route 7	-	-	-	-	●
Primary Route 8	-	-	-	-	●
Primary Route 9	-	-	-	-	●
Primary Route 10	-	-	-	-	●
Secondary Route 1	-	-	-	-	●
Secondary Route 2	-	-	-	-	●
Secondary Route 3	-	-	-	-	●
Secondary Route 4	-	-	-	-	●
Secondary Route 5	-	-	-	-	●
Secondary Route 6	-	-	-	-	●
Secondary Route 7	-	-	-	-	●
Secondary Route 8	-	-	-	-	●
Secondary Route 9	-	-	-	-	●
Secondary Route 10	-	-	-	-	●

Back

Route Number – Displays Primary and Secondary Routes up to 10.

Route Type – N for "Network" or H for "Host".

Gateway – Displays the IP of the gateway to the network

IP Address – Displays the IP Address of the device on the network

Subnet Mask – Displays the Subnet Mask for the network

Status – Displays green if active, red if inactive

3.1.2 PCAP Capture

The user can start a PCAP Capture from the CPU Display Page by clicking the PCAP Capture button. Be aware that starting a PCAP capture may cause your web browser to operate more slowly than usual. Starting a PCAP capture will log all the packets coming into and leaving the specified Ethernet Interface.

Figure 3-3: PCAP Capture

PCAP Capture

#	Interface	Max File Size	Status	Cur File Size	Start / Stop	
1	Primary Port (J3)	500 kb			Start	Download
2	Secondary Port (J2)	500 kb			Start	Download

Back

3.2 Internal Analog Points

Internal Analog Points can be seen in any display that has mapping capabilities. The example shown below happens to be mapped to a DNP Master.

Figure 3-4 Internal Analog Points

Internal Analog Inputs (AI) Display

Point	Device Name	Point Name	Status	Value	Counts
0	RTU Internal Analog	YEAR		2017.000	2017
1	RTU Internal Analog	MONTH	A	7.000	7
2	RTU Internal Analog	DAY	A	24.000	24
3	RTU Internal Analog	HOURS	A	18.000	18
4	RTU Internal Analog	MINS	A	47.000	47
5	RTU Internal Analog	SECS		33.000	33
6	RTU Internal Analog	UTC_CORRECT	A	60.000	60

Page 1of 1 Go To Go Done

Legend

YEAR

Scales the analog to the year set in the RTU Time Configuration.

MONTH

Scales the analog to the month set in the RTU Time Configuration.

DAY

Scales the analog to the day set in the RTU Time Configuration.

HOURS

Scales the analog to the hour set in the RTU Time Configuration.

MINS

Scales the analog to the minute set in the RTU Time Configuration.

SECONDS

Scales the analog to the second set in the RTU Time Configuration.

UTC_CORRECT

If there is a correction, scales the analog to the UTC Correction in minutes, set in the RTU Time Configuration.

Internal Status Points

Internal Status Points can be seen in any display that has mapping capabilities. The example shown below happens to be mapped to a DNP Master.

Figure 3-5 Internal Status Points

Internal Digital Input (DI) Display

Point	Point Name	Status	Value	Changes	Last Change
0	PRM TIME SRC FAIL		CLOSE	0	--/--/-- --:--:--.---
1	SEC TIME SRC FAIL	A	OPEN	1	09/05/2009 06:32:11.132
2	RUN	A	CLOSE	0	--/--/-- --:--:--.---
3	TIME SRC FAIL		CLOSE	0	--/--/-- --:--:--.---
4	IED FAIL		OPEN	176	07/24/2017 18:27:59.436
5	LOCAL	A	OPEN	0	--/--/-- --:--:--.---
6	LOGGED IN		CLOSE	1	09/05/2009 06:34:05.880
7	CONFIG CHG		CLOSE	1	09/05/2009 07:07:29.015
8	RLL RUN		CLOSE	1	09/05/2009 06:32:11.132
9	ETHERNET LINK		CLOSE	0	--/--/-- --:--:--.---
10	LOGIN FAILURE	A	OPEN	0	--/--/-- --:--:--.---
11	NEW USERS FILE RECEIVED		OPEN	0	--/--/-- --:--:--.---
12	NEW CONFIG FILE RECEIVED		OPEN	0	--/--/-- --:--:--.---
13	NEW FIRMWARE FILE RECEIVED		OPEN	0	--/--/-- --:--:--.---
14	INVALID UPDATE FILE RECEIVED		OPEN	0	--/--/-- --:--:--.---
15	MAX LOGIN FAILURES EXCEEDED		OPEN	0	--/--/-- --:--:--.---
16	RTU POINTS FORCED		OPEN	0	--/--/-- --:--:--.---

PRM TIME SRC FAIL

Indicates the health of the Primary Time Source. Open (green) means the time source is operational. Closed (red) indicates a failure.

SEC TIME SRC FAIL

Indicates the health of the Secondary Time Source. Open (green) means the time source is operational. Closed (red) indicates a failure.

RUN

Indicates whether or not the CPU is running. Look for the signature "heartbeat"; that is, blinking at an approximately one-second rate. A "steady ON" light means the CPU is in either Safe mode or Crash Recovery mode. No light means the CPU is not running. Normally blinking.

TIME SRC FAIL

Indicates the health of the either Time Source. Open (green) means both the time sources are operational. Closed (red) indicates a failure in one of the time sources.

IED FAIL

Indicates the status of the IED. Open (green) means the IED is responding. Closed (red) means the IED is not responding. Note that the IED may not be responding because a comm. channel has failed.

LOCAL

Indicates the status of the Remote/Local switch. Open (green) means the switch is in the Remote position. Closed (red) means the switch is in the Local position.

LOGGED IN

Indicates whether or not someone is logged into the device. Closed (red) means that one or more logins are active. Open (green) means that there are no active logins.

CONFIG CHG

Indicates whether or not the configuration has been changed since the last reset. Open (green) means no configuration changes have been submitted. Closed (red) means that at least one configuration change has been submitted.

RLL RUN

Indicates whether or not an RLL program is running. Open (green) means there is no RLL program running. Closed (red) mean there is an RLL program running.

ETHERNET LINK

Indicates whether or not there is a valid Ethernet link circuit connected to the Ethernet connector. Closed (red) means there is a valid connection to the Ethernet connector. Open (green) means there is no valid connection to the Ethernet connector.

LOGIN FAILURE

This point toggles from Open to Closed and back to Open when an unsuccessful login attempt occurs on any interface. This point can be mapped to a remote protocol to monitor for intrusion attempts in real time.

NEW USERS FILE RECEIVED

This point toggles from Open to Closed and back to Open when a new users file is received.

NEW CONFIG FILE RECEIVED

This point toggles from Open to Closed and back to Open when a new config file is received.

NEW FIRMWARE FILE RECEIVED

This point toggles from Open to Closed and back to Open when a new firmware file is received.

INVALID UPDATE FILE RECEIVED

This point toggles from Open to Closed and back to Open if a new but invalid users, config, or firmware file is received.

MAX LOGIN FAILURES EXCEEDED

This point toggles from Open to Closed and back to Open if the configurable number successive of login failures has been exceeded. This point can be mapped to a remote protocol to monitor for intrusion attempts in real time.

RTU POINTS FORCED

This point is normally open but changes to closed when a point has been forced in the RTU. This can be used to remotely monitor the RTU for forced points.

3.4 Internal Accumulator Points

Internal Accumulator Points can be seen in any display that has mapping capabilities. The example shown below happens to be mapped to a DNP Master.

Figure 3-6 Internal Accumulator Points

Internal Accumulator (ACC) Display

Point	Point Name	Status	Value
0	UPTIME		4473
1	SUCCESSFUL LOGINS		99
2	FAILED LOGINS		9
3	USER ACCOUNT VERSION		2
4	RTU POINTS FORCED		0
5	CONFIGURATION CHANGES		98

Page 1of 1 Go To [ ] Go Done

Legend

UPTIME

Displays the number of seconds of UPTIME since last reset.

SUCCESSFUL LOGINS

Displays the number of successful login since last reset.

FAILED LOGINS

Displays the number of failed login since last reset.

USER ACCOUNT VERSION

Displays the version number of the User Accounts File. This is incremented each time the users file is edited with the User Management Program.

RTU POINTS FORCED

Displays the number of points which are currently forced.

CONFIGURATION CHANGES

Displays the number of XML file changes on this RTU. This number can be mapped to a remote protocol and used for auditing the RTU for config changes in real time.

3.5 Point Status Codes

Point Status (quality) codes depend upon the data type for which it is being displayed. Up to four codes (flags) may or may not be displayed in the Point Status field at the same time. A code will only be displayed if it is valid for a particular data type under the proper status condition.

The possible values depend on the data type, as follows.

- Status Points
  - ‘F’ indicates the point is Failed (stale). Its source is not responding to polls.
  - ‘m’ indicates that at least some of the quality code flags are manually-entered.
  - ‘f ‘ indicates that the value of the point has been manually-entered (“forced”).
  - ‘C’ indicates that the point has been manually disabled because its value is changing for no valid reason (“Chattering”).
  - ‘A’ indicates that the point is in its alarm state.
  - ‘u’ indicates that the point is in an unacknowledged alarm state.

Note: ‘A’ and ‘u’ are alarm flags and only apply to points that have been configured as alarm points.

- Analog Inputs
  - ‘F’ indicates the point is Failed (stale). Its source is not responding to polls.
  - ‘m’ indicates that at least some of the quality code flags are manually-entered.
  - ‘f ‘ indicates that the value of the point has been manually-entered (“forced”).
  - ‘L’ indicates that the point is below its Low instrument rating.
  - ‘H’ indicates that the point is above its High instrument rating.
  - ‘O’ indicates that the point is Over-range.
  - ‘A’ indicates that the point has exceeded its high alarm limit.
  - ‘a’ indicates that the point is below its low alarm limit.
  - ‘u’ indicates that the point is in an unacknowledged alarm state.

Note: ‘A’, ‘a’ and ‘u’ are alarm flags and only apply to points that have been configured as alarm points.

- Accumulators
  - ‘F’ indicates the point is Failed (stale). Its source is not responding to polls.
  - ‘m’ indicates that at least some of the quality code flags are manually-entered.
  - ‘f ‘ indicates that the value of the point has been manually-entered (“forced”).
  - ‘O’ indicates that the counter has Overflowed.
- Analog Outputs
  - ‘F’ indicates the point is marked Failed (point is offline).
  - ‘L’ indicates Logic power failure.
  - ‘P’ indicates field Power failure.
- Floating Points
  - ‘F’ indicates the point is Failed (stale). Its source is not responding to polls.
  - ‘m’ indicates that at least some of the quality code flags are manually-entered.
  - ‘f ‘ indicates that the value of the point has been manually-entered (“forced”).

- ‘N’ indicates an invalid value (not valid floating point format).
- Digital Outputs and SBO Controls
  - ‘F’ indicates the point is marked Failed (point is offline).
  - ‘U’ indicates that the open/closed state of this point is Unknown because it has not been commanded to any state since the RTU last started.

3.6 Force Points

Starting in the C3414-500-S02K0 firmware, the ability to force point values and flags has been implemented. This tool is very useful while commissioning new RTU’s and verifying point mappings between the RTU and the Master station. Analog, Status, and Accumulator points can now be forced.

To force a point, navigate to its display screen. You can force a point from its source, like its DNPM point display screen, or you can force it through the slave protocol point display screens. If the forced point is mapped into multiple slave protocols, all of the slave protocols will send out the forced value for that point.

3.6.1 Expected Behavior - Protocols

If the point being forced is mapped into DNPR:

When forcing a point of any type, an event is generated for that point if the forced value or state is different from the natural value or state of the point.

When forcing a point’s flags, an event is generated for that point if the flag state differs from the natural flag state of the point.

When restoring a point from a forced state, an event is generated with the point’s natural value and flags if it differs from the force value, state, or flags.

The forced point value or state, and flags will be transmitted to the master for static data scans (integrity scans), regardless if an event was previously generated when the point was forced.

If the point being forced is mapped into another protocol, which does not support events or point flags, the forced point value or state will be transmitted to the master station.

3.6.2 Expected Behavior – GUI

To force a point, navigate to any display page, either slave point display or source point display (master protocol, application, etc.) containing the desired point to be forced and click on the row containing the point to be forced.

A popup window will show up similar to the ones shown in Figure 3-6 for each point type.

Whenever navigating away from the display page with points still forced, a flashing indication that some points are still forced will appear on the top right of the screen under the RTU time.

An Internal Status point is set to a 1 (Closed) whenever any points of any type in the system are in the forced state.

An Internal Accumulator point indicates how many points are forced in the RTU.

Analog Input points

To force the point value change the **Forced Value** text box and click the " Force" button.

To force the point flags, use the check boxes to set the desired flags. Some of the flags are grayed out because they are not yet supported. As future enhancements to the DNP protocol are implemented, those flags will be available to force.

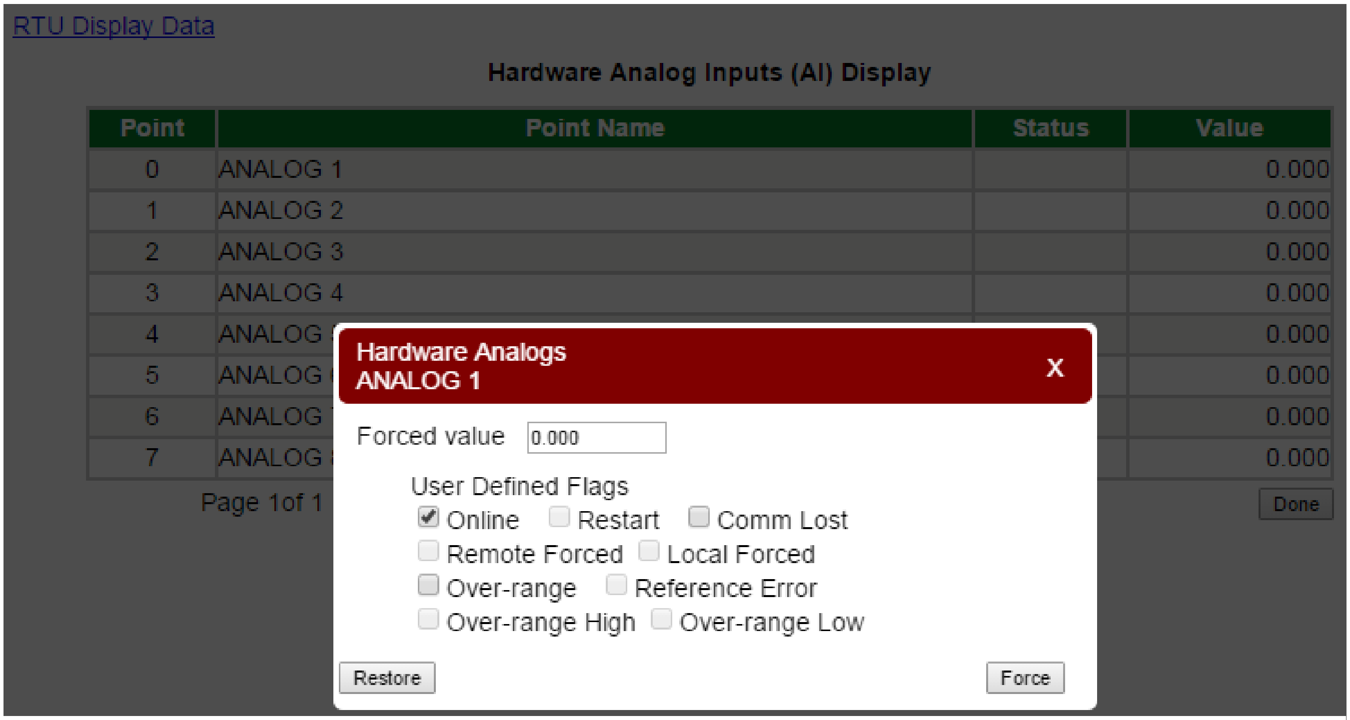


Figure 3-7: Force Analog Point Popup

When you click the "Force" button, the point value and flags are set to the values you input. To facilitate testing of multiple values per point, the popup will not close until you click the X or Restore. This way you can test at 0%, 25%, 50%, 75%, and 100% of full scale to verify the scaling between the RTU and the Master.

Once a point is forced, it is highlighted in yellow on all display pages containing that point as shown below. A full description of the status flags is in Section 3.5 Point Status Codes.

Hardware Analog Inputs (AI) Display

Point	Point Name	Status	Value
0	ANALOG 1	f O	2.500
1	ANALOG 2		0.000
2	ANALOG 3		0.000
3	ANALOG 4		0.000
4	ANALOG 5		0.000
5	ANALOG 6		0.000
6	ANALOG 7		0.000
7	ANALOG 8		0.000

Page 1of 1 Go To [ ] Go Done

Figure 3-8: Analog Point Forced

To restore a point from its forced state, click on the highlighted row, and then click on the Restore button of the Force Popup. The restored point will no longer be highlighted and the display will now reflect the natural value and flags of the point.

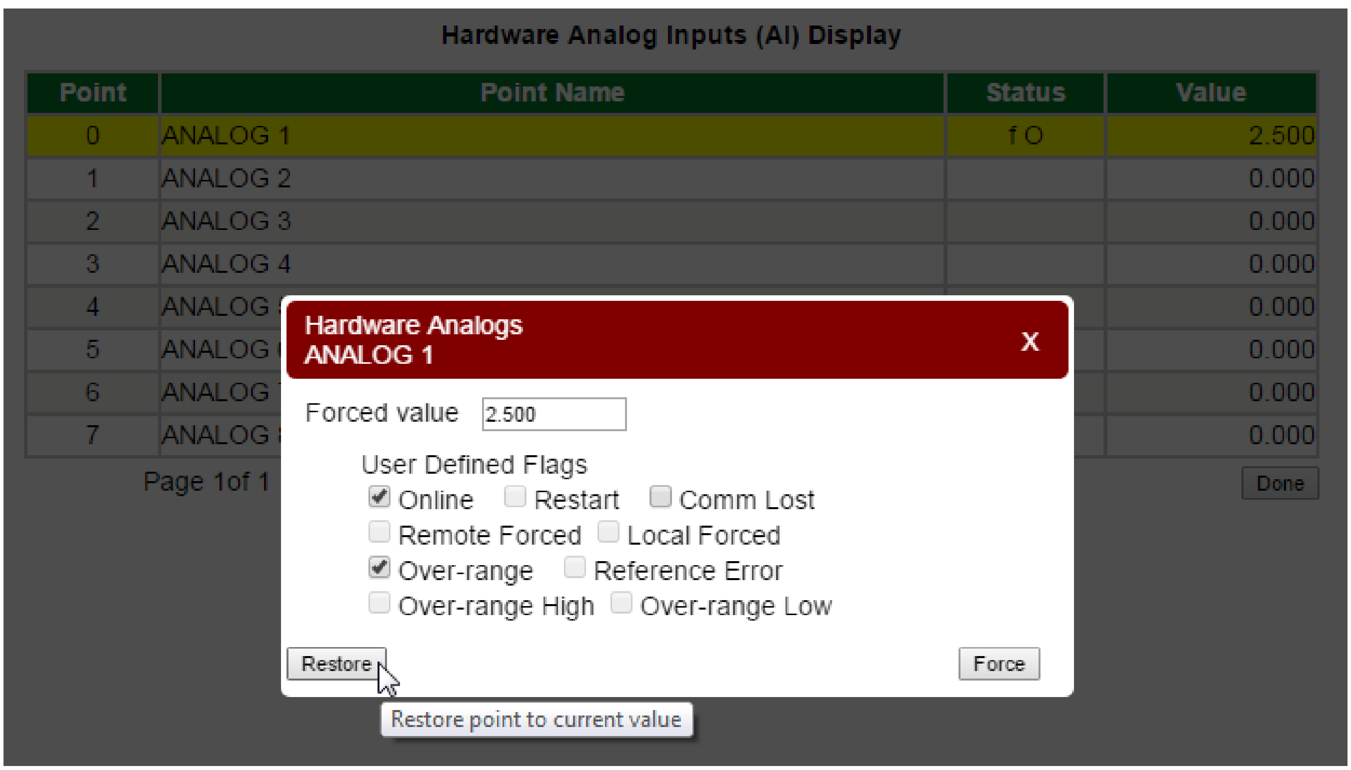


Figure 3-9: Restore Analog Point

Status Input Points

Select the desired state from the Forced Value pull-down menu to force the point state and click the “Force” button.

Use the check boxes to set the desired forced flags. Some of the flags are grayed out because they are not yet supported. As future enhancements to the DNP protocol are implemented, those flags will be available to force.

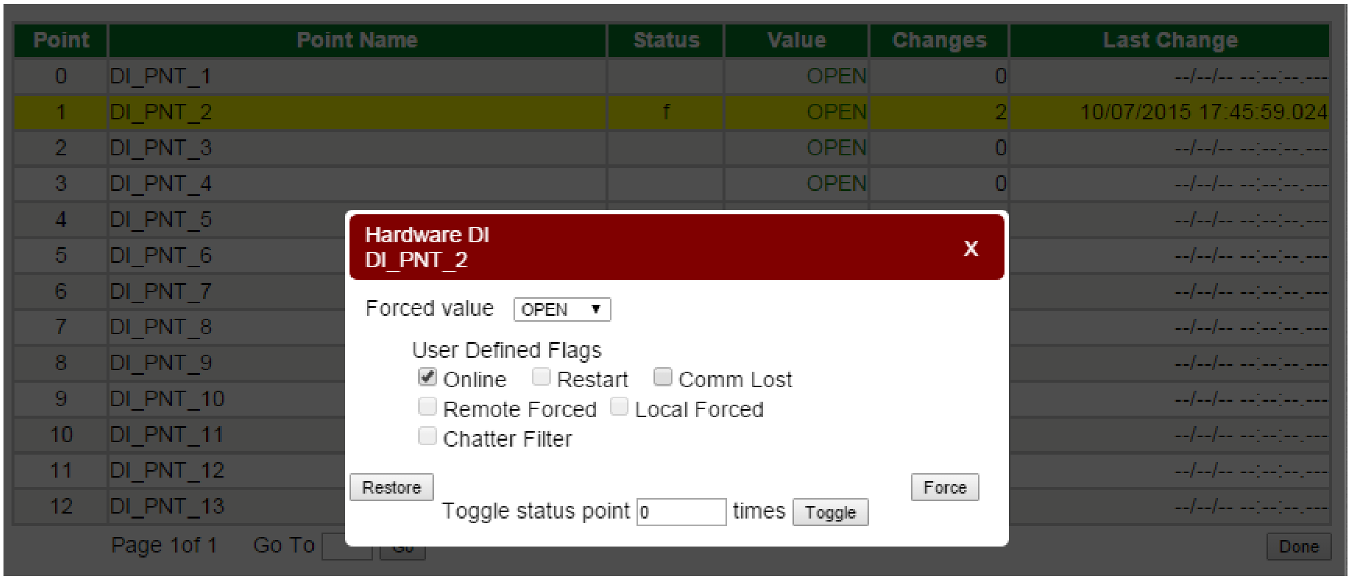


Figure 3-9. Forced STS point popup.

To generate multiple state changes on a STS point, enter the value indicating how many change events will be generated 1 millisecond apart into the “Toggle status point” box, and click the “Toggle” button. This will generate the number of events prescribed, with the final forced state of the STS point being what the “Forced value” box indicates. This is useful for testing that numerous time-tagged STS point state change events are returned properly through SCADA.

Hardware Digital Input (DI) Display

Point	Point Name	Status	Value	Changes	Last Change
0	DI_PNT_1		OPEN	0	--/--/-- --:--:--.---
1	DI_PNT_2	f	OPEN	2	10/07/2015 17:45:59.024
2	DI_PNT_3		OPEN	0	--/--/-- --:--:--.---
3	DI_PNT_4		OPEN	0	--/--/-- --:--:--.---
4	DI_PNT_5		OPEN	0	--/--/-- --:--:--.---
5	DI_PNT_6		OPEN	0	--/--/-- --:--:--.---
6	DI_PNT_7		OPEN	0	--/--/-- --:--:--.---
7	DI_PNT_8		OPEN	0	--/--/-- --:--:--.---
8	DI_PNT_9		OPEN	0	--/--/-- --:--:--.---
9	DI_PNT_10		OPEN	0	--/--/-- --:--:--.---
10	DI_PNT_11		OPEN	0	--/--/-- --:--:--.---
11	DI_PNT_12		OPEN	0	--/--/-- --:--:--.---
12	DI_PNT_13		OPEN	0	--/--/-- --:--:--.---

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Figure 3-10. STS point forced.

Once a point is forced, it is highlighted in yellow on all display pages containing that point as shown in Figure 3-10. A full description of the status flags is in Section 3.5 Point Status Codes.

To restore a point from its forced state, click on the highlighted row, then click on the Restore button of the Force Popup. The restored point will no longer be highlighted and the display will now reflect the natural state and flags of the STS point.

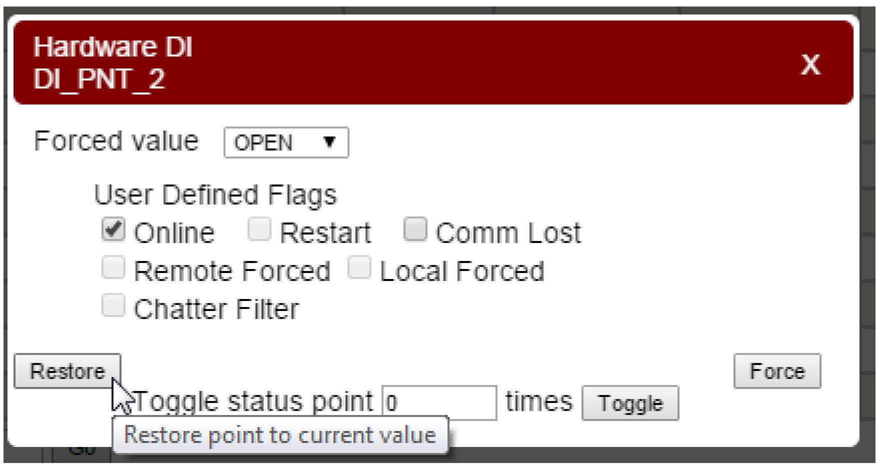


Figure 3-11. Restore STS point.

Accumulator Points

To force the point value change the **Forced Value** text box and click the “ Force” button.

Use the check boxes to set the desired forced flags. Some of the flags are grayed out because they are not yet supported. As future enhancements to the DNP protocol are implemented, those flags will be available to force.

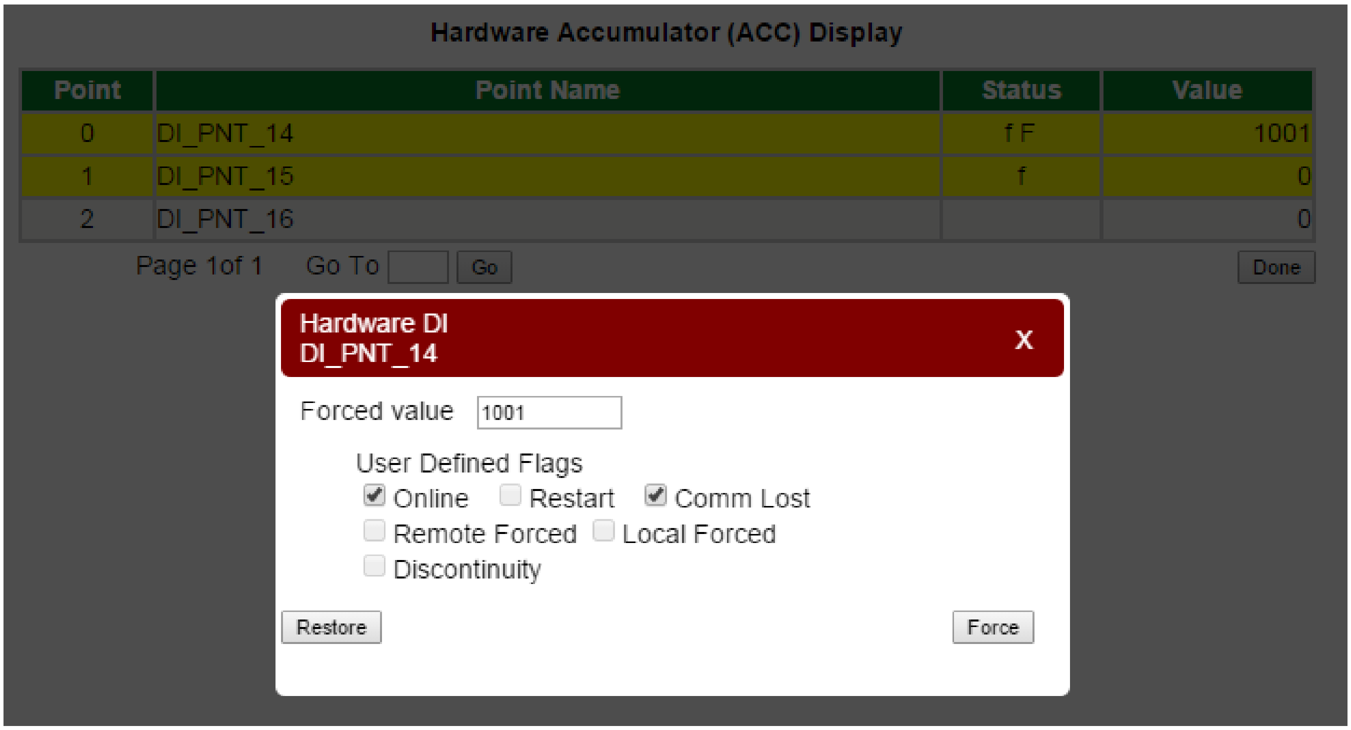


Figure 3-12. Force Accumulator points popup.

When you click the “Force” button, the point value and flags are set to the values you input. To facilitate testing of multiple values per point, the popup will not close until you click the X or Restore. This way you can test with multiple values easily.

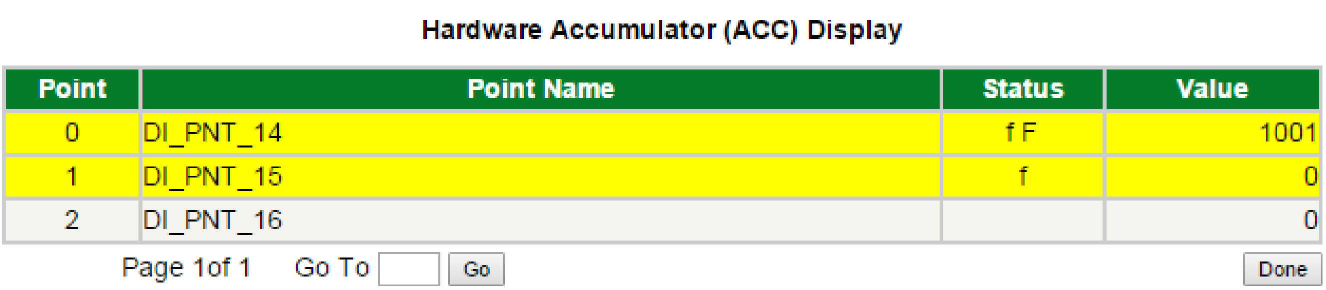


Figure 3-13. Forced ACC point.

Once a point is forced, it is highlighted in yellow on all display pages containing that point as shown in Figure 3-13. A full description of the status flags is in Section 3.5 Point Status Codes.

Figure 3-14. Restore ACC point.

3.6.3 All Forced Points Display

Click on the flashing red Forced text in the header as shown in Figure 3-15: Points forced indication to display a page that shows all of the forced points in the system appears. On this page the forced points may be modified or you can restore a point so that it is no longer forced. See above for Force popup help.

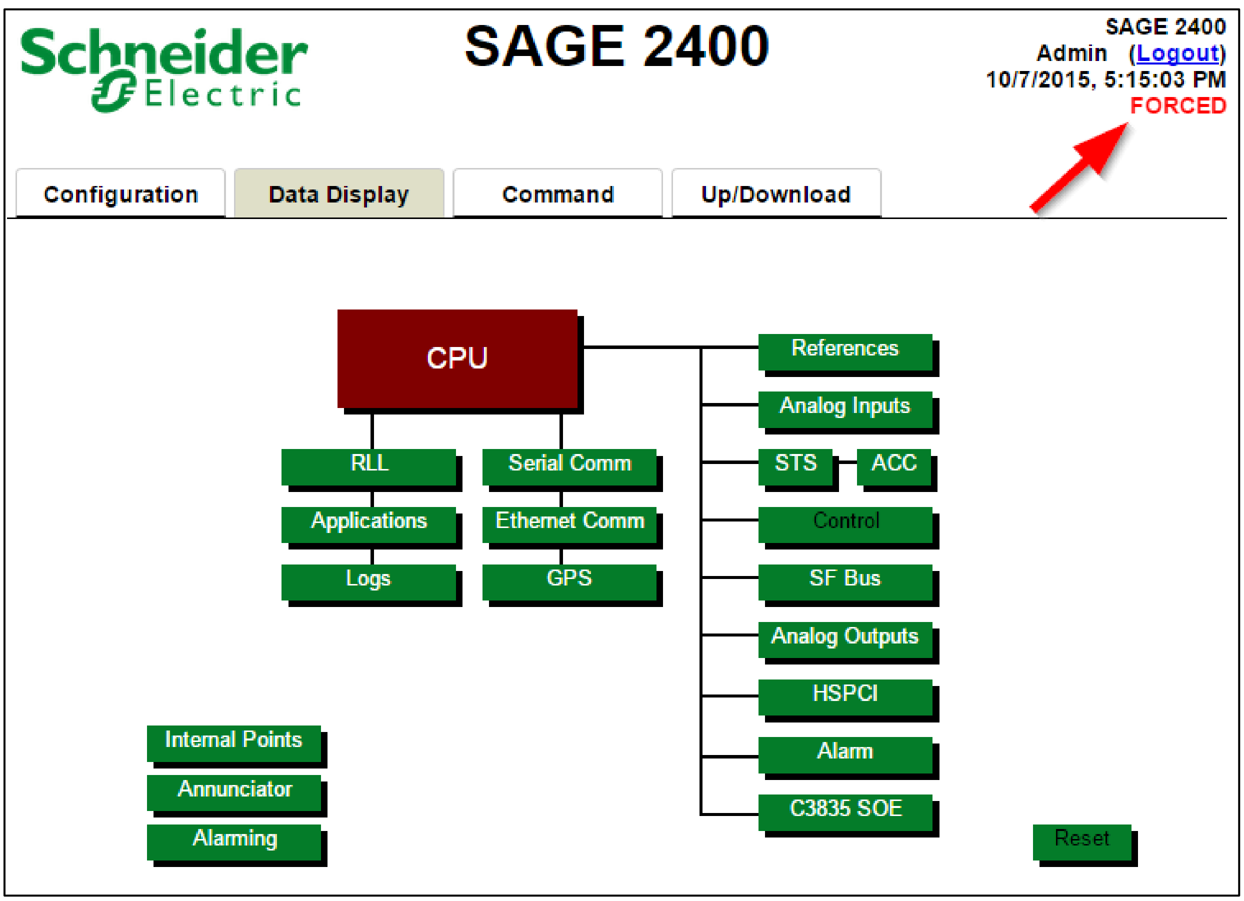
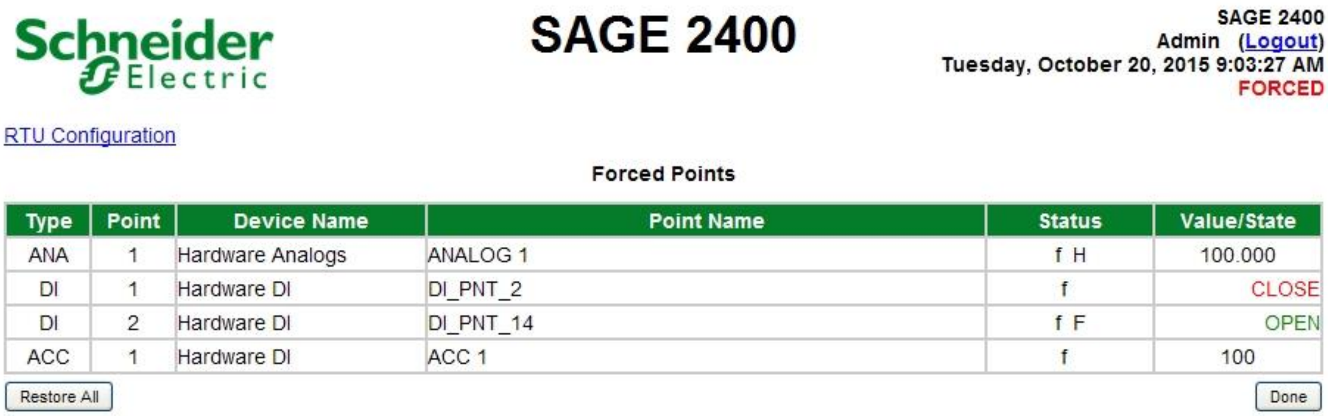


Figure 3-15: Points forced indication.


SAGE 2400

SAGE 2400
Admin (Logout)
Tuesday, October 20, 2015 9:03:27 AM
FORCED

RTU Configuration

Forced Points

Type	Point	Device Name	Point Name	Status	Value/State
ANA	1	Hardware Analogs	ANALOG 1	f H	100.000
DI	1	Hardware DI	DI_PNT_2	f	CLOSE
DI	2	Hardware DI	DI_PNT_14	f F	OPEN
ACC	1	Hardware DI	ACC 1	f	100

Restore All   Done

Figure 3-10: All Forced Points Display

Type

Indicates what type of point is forced.

- ANA = Analog Input
- DI = Status (Binary) Input
- ACC = Accumulator (Counter)

Point

Each point type has a separate number count so you can see how many of each point type are forced.

Device Name and Point Name

Same as all other display pages.

Status

Shows you the flags which are forced for this point. See Section 3.5 Point Status Codes for a full description of all of the flags.

Value/State

For Analog Input points, this is the Engineering Unit Value which has been forced.

For Status Input points, this is the Open / Closed forced value.

For Accumulator points, this is the accumulator value which has been forced.

Restore All

Remove all points from their forced states. Events will get generated so master stations will know the new real value and flags.

3.6.4 Forced Internal Indication Points

To see the Forced Internal Indication Points, click Display -> Internal Points -> Internal Status or Internal Acc buttons. That will bring up the screens below.

Internal Points Display

Type	Number	View
Internal Analogs	7	View
Internal Status	17	View
Internal Accumulators	5	View

Done

Figure 3-11: Internal Points Display

The Internal Status Point named "RTU POINTS FORCED" is 1 (CLOSE) if there are any points forced, otherwise, it is a 0 (OPEN). This point can be mapped into any slave protocol so your master station will be know if there are any forced points active.

Internal Digital Input (DI) Display

Point	Point Name	Status	Value	Changes	Last Change
16	RTU POINTS FORCED		CLOSE	3	10/07/2015 16:14:54.867

< Page 2of 2 Go To Go Done

Figure 3-12: Forced Internal Status Point

The Internal Accumulator Point named "RTU POINTS FORCED" counts the number of points which are currently being forced. This point can also be mapped into any slave protocol so your master station will know how many forced points are active.

Internal Accumulator (ACC) Display

Point	Point Name	Status	Value
0	UPTIME		17526
1	SUCCESSFUL LOGINS		1
2	FAILED LOGINS		0
3	USER ACCOUNT VERSION		3
4	RTU POINTS FORCED		4

Page 1of 1 Go To [ ] Go Done

Figure 3-13: Forced Internal Accumulator Point

3.7 References Data Display

From the Data Display screen, click References. The References will display with the name you assigned under Configuration. Point Status uses the same code used for other analog inputs. See the next section. Voltage reference Point Values are in Volts, except for temperature, which will display in either °F or °C, depending on which was chosen during Configuration.

Reference Analog Inputs (AI) Display

Point	Point Name	Status	Value
0	bb_gnd_ref		0.003
1	bb_+5.0V_ref		5.000
2	bb_+4.5V_ref		4.501
3	bb_-4.5V_ref		-4.500
4	bb_temp_ref		78.723
5	bb_dc_in		26.377

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- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'L' indicates that the point is below its Low instrument rating.
- 'H' indicates that the point is above its High instrument rating.
- 'O' indicates that the point is Over-range.
- 'A' indicates that the point has exceeded its high alarm limit.
- 'a' indicates that the point is below its low alarm limit.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A', 'a' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-14 References Display for SAGE 2X00

References Display

Point	Point Name	Point Status	Point Value
1	bb_gnd_ref		0.001
2	bb_+2.5V_ref		2.503
3	bb_-2.5V_ref		-2.503
4	bb_temp_ref		60.970
5	bb_bat_in_ref		13.624
6	bb_pwr_in_ref		15.660
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Back

Figure 3-15 References Display for SAGE 1X50

References Display

Point	Point Name	Point Status	Point Value
1	bb_gnd_ref		0.004
2	bb_+5.0V_ref		5.000
3	bb_+4.5V_ref		4.342
4	bb_-4.5V_ref		-4.343
5	bb_temp_ref		134.446
6	C3830_gnd_ref		0.000
7	C3830_gnd_ref		0.000
8	C3830_aux_in		2.493
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Back

Figure 3-16 References Display for SAGE C3830

Point

The physical point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

Not used for References.

Point Value

The engineering unit value based on internal scaling for references.

Navigation

Click the Back button to go back to the Data Display screen.

3.8 Analog Inputs Data Display

From the Data Display screen, click Analog Inputs to view the DC analog inputs. The inputs are shown in Figure 3-17 and are in the following order:

- Baseboard inputs
- Analog expansion bus inputs.

Hardware Analog Inputs (AI) Display

Point	Point Name	Status	Value
0	ANALOG 1		1.386
1	ANALOG 2		1.385
2	ANALOG 3	H	5.137
3	ANALOG 4	H	5.137
4	ANALOG 5		0.000
5	ANALOG 6		0.000
6	ANALOG 7		-0.001
7	ANALOG 8		-0.001
8	ANALOG 9		0.009
9	ANALOG 10		0.011
10	ANALOG 11		0.010
11	ANALOG 12		0.012
12	ANALOG 13		0.012
13	ANALOG 14		0.014
14	ANALOG 15		0.012
15	ANALOG 16		0.014

Page 1of 4 Go To Go > Done

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'L' indicates that the point is below its Low instrument rating.
- 'H' indicates that the point is above its High instrument rating.
- 'O' indicates that the point is Over-range.
- 'A' indicates that the point has exceeded its high alarm limit.
- 'a' indicates that the point is below its low alarm limit.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A', 'a' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-17 Analog Inputs (AI) Display

Point

The physical point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

An **H** or **L** will appear in the Point Status column when the point's input is outside the range of the configured point as follows: If no code is given, the point is healthy.

Input Range	H	L
±5VDC / ±1mA	>+5.0 VDC	<-5.0 VDC
0-5VDC / 0-1mA	>+5.0 VDC	< 0.0 VDC
1-5VDC / 4-20mA	>+5.0 VDC	<+1.0 VDC

Point Value

The engineering unit value based on the Min and Max scaling assigned during Configuration

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.9 STS Data Display

From the Data Display screen, click the STS button to go to the Hardware Status Display. This display shows only inputs from the baseboard and XTs, not including the SOE status points. The SOE status points have their own display. In addition to showing the point number and name assigned during Configuration, this display shows both a text message (OPEN/CLOSED), a green dot for OPEN and a red dot for CLOSED, the total number of changes, and the date and time of the last change.

Hardware Digital Input (DI) Display

Point	Point Name	Status	Value	Changes	Last Change
0	DI_PNT_1		OPEN	2	10/27/2015 16:57:52.800
1	DI_PNT_2		OPEN	4	10/27/2015 16:58:10.387
2	DI_PNT_3		OPEN	6	10/27/2015 16:58:19.239
3	DI_PNT_4		OPEN	2	10/27/2015 16:58:34.045
4	DI_PNT_5		OPEN	6	10/27/2015 16:58:52.019
5	DI_PNT_6		OPEN	0	--/--/-- --:--:--.---
6	DI_PNT_7		OPEN	0	--/--/-- --:--:--.---
7	DI_PNT_8		OPEN	0	--/--/-- --:--:--.---
8	DI_PNT_9		OPEN	6	10/27/2015 16:59:05.337
9	DI_PNT_10		OPEN	2	10/27/2015 16:59:13.364
10	DI_PNT_11		OPEN	6	10/27/2015 16:59:22.072
11	DI_PNT_12		OPEN	2	10/27/2015 16:59:29.797
12	DI_PNT_13		OPEN	0	--/--/-- --:--:--.---
13	DI_PNT_14		OPEN	0	--/--/-- --:--:--.---
14	DI_PNT_15		OPEN	0	--/--/-- --:--:--.---
15	DI_PNT_16		OPEN	0	--/--/-- --:--:--.---

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- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'C' indicates that the point has been manually disabled because its value is changing for no valid reason ("Chattering").
- 'A' indicates that the point is in its alarm state.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-18 Hardware Status Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Quality

See section 3.5 Point Status Codes. If no code given, the point is healthy.

Point State

Displays either CLOSED or OPENED for the present state.

●

Displays a green dot for OPEN and a red dot for CLOSED of the present state.

Total Changes

Displays the number of changes since last Reset.

Last Change

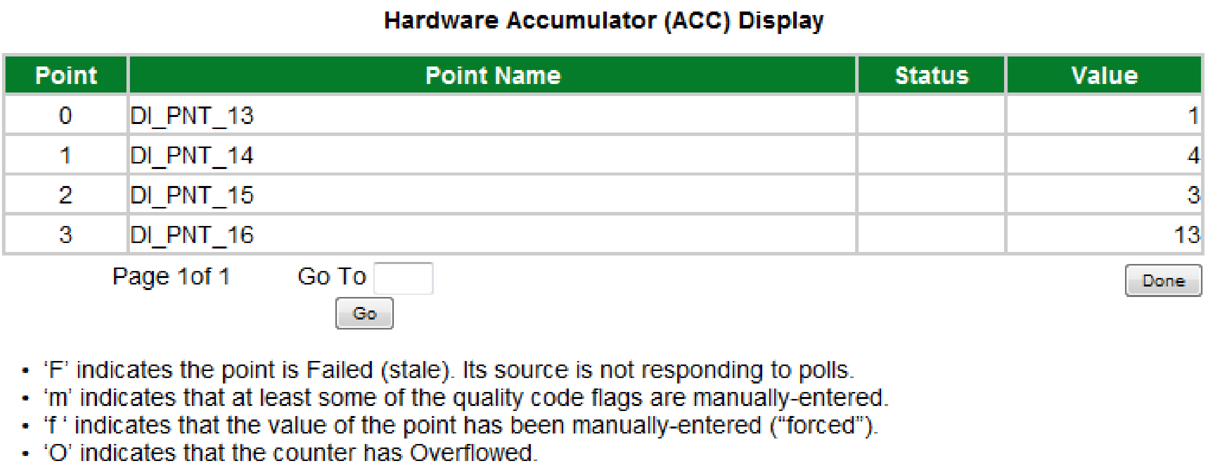
Displays the Date and Time of the last change since reset.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

ACC Data Display

From the Data Display screen, click the ACC button to go to the Hardware Accumulator Display. This screen shows Digital Inputs used as accumulators: Each accumulator register has a 32-bit unsigned field. The maximum value is 4,294,967,295. The next count will force a rollover to zero. Up to 32 bits are
3.10 returned to the MTU depending on the protocol being used.



Hardware Accumulator (ACC) Display

Point	Point Name	Status	Value
0	DI_PNT_13		1
1	DI_PNT_14		4
2	DI_PNT_15		3
3	DI_PNT_16		13

Page 1of 1 Go To [ ] Go Done

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'O' indicates that the counter has Overflowed.

Figure 3-19 Hardware Accumulator Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

See section 3.5 Point Status Codes. If no code given, the point is healthy.

Count

The maximum value is 4,294,967,295. The next count will force a rollover to zero.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go

button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.11 Control Data Display

From the Data Display screen, click the Controls button to go to the Hardware Controls Display. This shows the current state of the Hardware Controls. .

RLL Digital Outputs Display

Point	Point Name	Status	Value
0	RLL_DO 0		OPEN
1	RLL_DO 1		OPEN
2	RLL_DO 2		OPEN
3	RLL_DO 3		OPEN
4	RLL_DO 4		OPEN
5	RLL_DO 5		OPEN
6	RLL_DO 6		OPEN
7	RLL_DO 7		OPEN
8	RLL_DO 8		OPEN
9	RLL_DO 9		OPEN
10	RLL_DO 10		OPEN
11	RLL_DO 11		OPEN
12	RLL_DO 12		OPEN
13	RLL_DO 13		OPEN
14	RLL_DO 14		OPEN
15	RLL_DO 15		OPEN

Page 1of 2 Go To > Done

Go

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'C' indicates that the point has been manually disabled because its value is changing for no valid reason ("Chattering").
- 'A' indicates that the point is in its alarm state.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-20 Controls Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

See section 3.5 Point Status Codes. If no code given, the point is healthy.

Point State

Displays either CLOSED or OPENED for the present state.

3.12 SF Bus Data Display

From the Data Display screen, click the SF Bus. The Special Function Bus Data Display allows you to break out all the data from the Special Function Bus by type of card, then type of point. Two examples are given below: 1MSSOE and ACI.

Special Function Bus Data Display

Card Location	Card Type	Card Name	Display XT Data
Select 1	1MSSOE	1MSSOE on BUS 1	Display
Select 2	ACI	ACI on BUS 2	Display
Select 3	NONE	-	-
Select 4	NONE	-	-
Select 5	NONE	-	-
Select 6	NONE	-	-
Select 7	NONE	-	-
Select 8	NONE	-	-

Back

Figure 3-21 Special Function Bus Data Display

Card Location

Displays the physical position of the XT types cabled to the SFB.

Card Type

Displays the type of XT SFB card for each position.

Card Name

Displays the name of the XT SFB card for each position.

Display XT Data

Click on Display to break out the individual display data for each type of card connected to the SFB, as shown in the following sections.

Navigation

Click the Back button to go back to the Data Display screen.

3.12.1 1MSSOE Data Display

From the Special Function Bus Data Display screen, click Display (on a 1MSSOE card) to display the current states of each of the 1MSSOE points.

1 MSSOE Digital Input (DI) Display

Point	Point Name	Status	Value
0	Comm Status		OPEN
1	MSSOE_PNT1		CLOSE
2	MSSOE_PNT2		OPEN
3	MSSOE_PNT3		OPEN
4	MSSOE_PNT4		CLOSE
5	MSSOE_PNT5		CLOSE
6	MSSOE_PNT6		OPEN
7	MSSOE_PNT7		OPEN
8	MSSOE_PNT8		OPEN
9	MSSOE_PNT9		CLOSE
10	MSSOE_PNT10		CLOSE
11	MSSOE_PNT11		OPEN
12	MSSOE_PNT12		OPEN
13	MSSOE_PNT13		CLOSE

Page 1of 1 Go To Go Done

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'C' indicates that the point has been manually disabled because its value is changing for no valid reason ("Chattering").
- 'A' indicates that the point is in its alarm state.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-22 1MSSOE Display

Note: Point 1 is a Comm Status point that shows the health for the SOE channel. When the Point State is Closed, it means the SOE channel is not communicating. When it is Open, the channel is communicating.

Point

The physical point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

See section 3.5 Point Status Codes. If no code is given, the point is healthy.

Point State

This will be either CLOSED or OPEN.

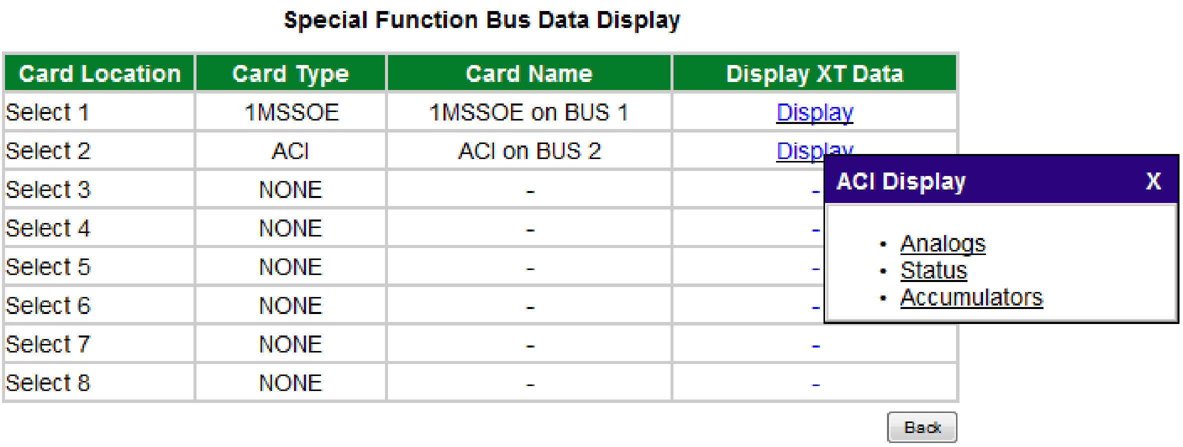
- Displays a green dot for OPEN and a red dot for CLOSED.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Special Function Bus Data Display screen.

3.12.2 ACI Data Display

From the Special Function Bus Data Display screen, click Display (on a ACI card) to display the Display Selection box. Display Selection will pop up, which allows you to choose Analogs, Status, or Accumulators.



Special Function Bus Data Display

Card Location	Card Type	Card Name	Display XT Data
Select 1	1MSSOE	1MSSOE on BUS 1	Display
Select 2	ACI	ACI on BUS 2	Display
Select 3	NONE	-	-
Select 4	NONE	-	-
Select 5	NONE	-	-
Select 6	NONE	-	-
Select 7	NONE	-	-
Select 8	NONE	-	-

Figure 3-23 Special Function Bus Data Display

Card Location

The location of the card with a maximum of 8 positions.

Card Type

The type of card: 1MSSOE, ACI, or DO.

Card Name

The name of the card. The name is fixed for 1msSOE and DO, but the name may be changed in Configuration for the ACI cards.

Display XT Data

Click on the Display legend to display card points. In the case of ACI, there are three types of points as shown above.

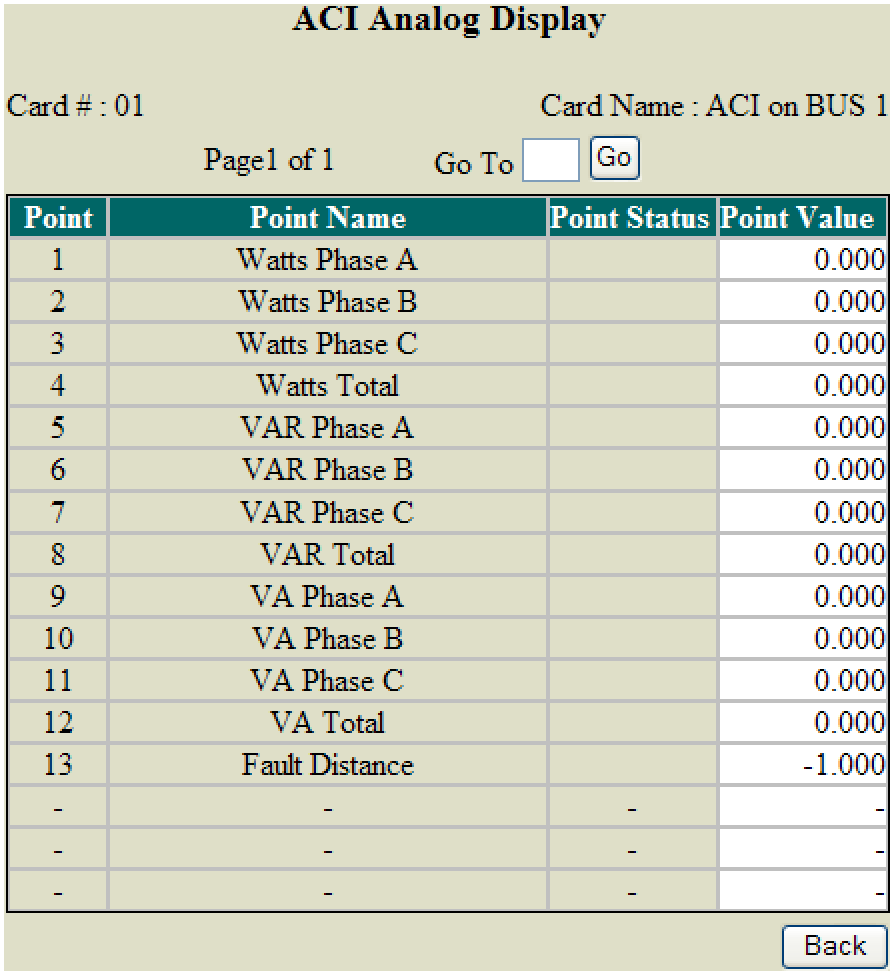
Navigation

Click Display legend to see points. Click the Back button to go back to the Data Display screen.

3.12.2.1 ACI Analog Data Display

From the Special Function Bus Data Display screen, click Display (on a ACI card) to display the Display Selection Box. Click Analogs on the Display Selection.

The ACI Analog Display shows all the AC analogs with the name you assigned (or accepted as default) during ACI Configuration. The point values will be based on the values you assigned (or accepted as default) during ACI Configuration.



ACI Analog Display

Card # : 01 Card Name : ACI on BUS 1

Page1 of 1 Go To Go

Point	Point Name	Point Status	Point Value
1	Watts Phase A		0.000
2	Watts Phase B		0.000
3	Watts Phase C		0.000
4	Watts Total		0.000
5	VAR Phase A		0.000
6	VAR Phase B		0.000
7	VAR Phase C		0.000
8	VAR Total		0.000
9	VA Phase A		0.000
10	VA Phase B		0.000
11	VA Phase C		0.000
12	VA Total		0.000
13	Fault Distance		-1.000
-	-	-	-
-	-	-	-
-	-	-	-

Back

Figure 3-24 ACI Analog Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

See section 3.5 Point Status Codes. If no code is given, the point is healthy.

Point Value

Displays the point value in engineering units.

Navigation

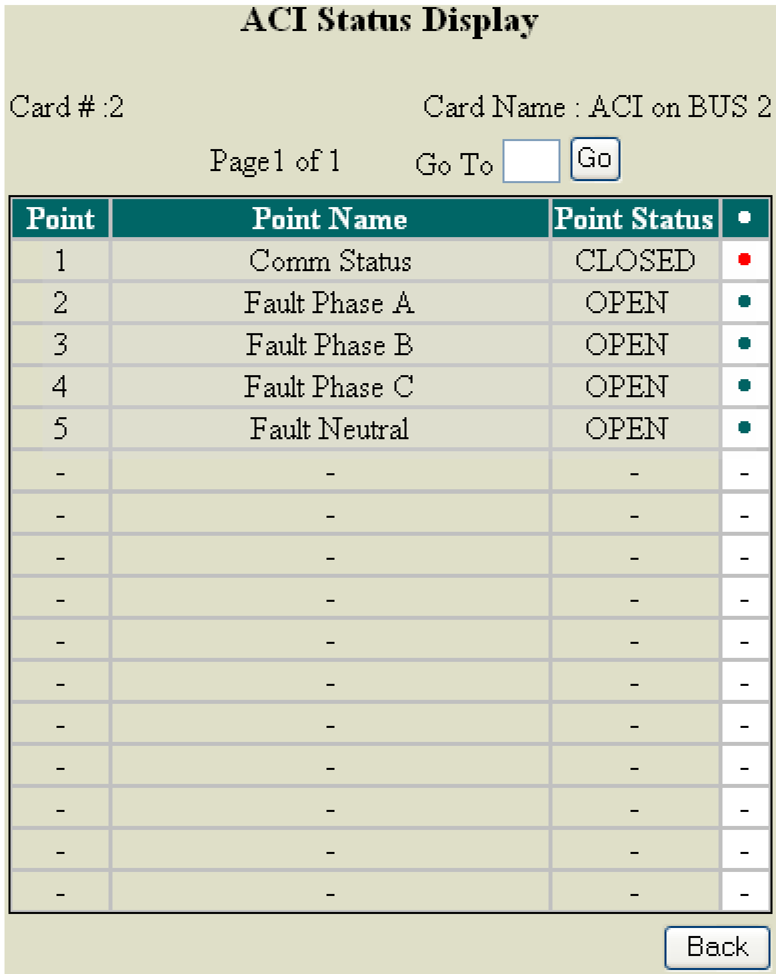
Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go

button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Special Function Bus Data Display screen.

3.12.2.2 ACI Status Data Display

From the Special Function Bus Data Display screen, click Display (on the ACI row) to display the Display Selection Box. Click Status on the Display Selection.

The ACI Status Display shows all the AC status values with the name you assigned (or accepted as default) during ACI Configuration.



ACI Status Display

Card # :2 Card Name : ACI on BUS 2

Page1 of 1 Go To [ ] Go

Point	Point Name	Point Status	•
1	Comm Status	CLOSED	•
2	Fault Phase A	OPEN	•
3	Fault Phase B	OPEN	•
4	Fault Phase C	OPEN	•
5	Fault Neutral	OPEN	•
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Back

Figure 3-25 ACI Status Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

This will be either CLOSED or OPEN. Please note that the Fault status points will not change state during a fault. They are used as database place holders to get the information back to a protocol.

- Displays a green dot for OPEN and a red dot for CLOSED.

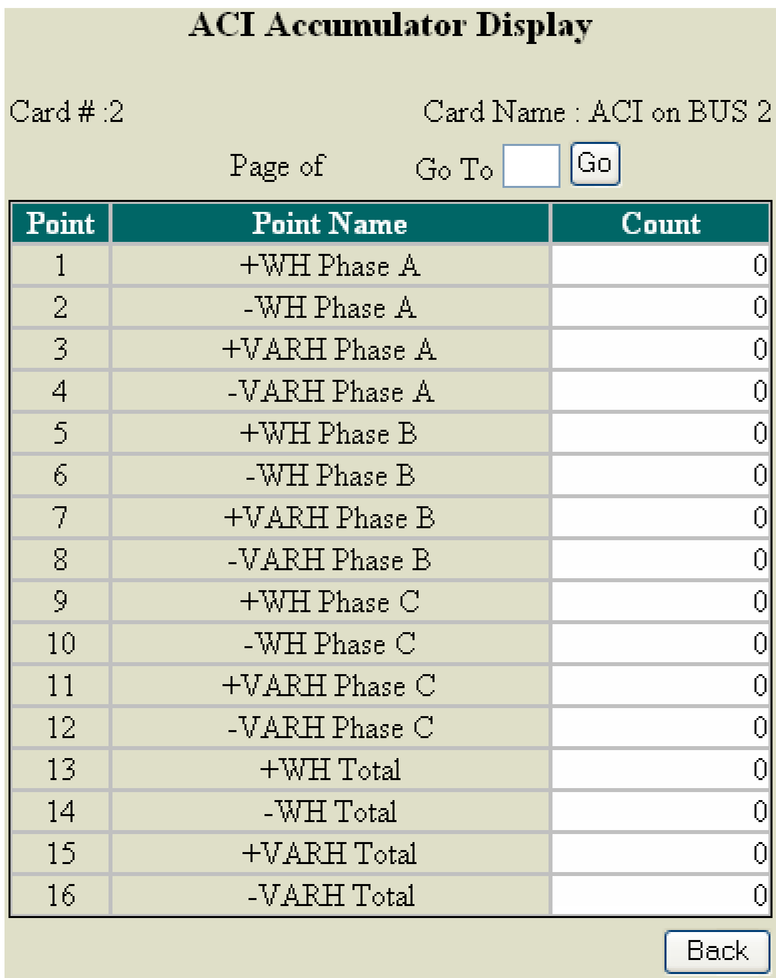
Navigation

Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click the Back button to go back to the Special Function Bus Data Display screen.

3.12.2.3 ACI Accumulator Data Display

From the Special Function Bus Data Display screen, click Display (on the ACI row) to display the Display Selection Box. Click Accumulators on the Display Selection.

The ACI Accumulator Display shows all the AC accumulator values with the name you assigned (or accepted as default) during ACI Configuration. Each accumulator register has a 32-bit unsigned field. The maximum value is 4,294,967,295. The next count will force a rollover to zero. Up to 32 bits are returned to the MTU depending on the protocol being used.



ACI Accumulator Display

Card # :2 Card Name : ACI on BUS 2

Page of Go To Go

Point	Point Name	Count
1	+WH Phase A	0
2	-WH Phase A	0
3	+VARH Phase A	0
4	-VARH Phase A	0
5	+WH Phase B	0
6	-WH Phase B	0
7	+VARH Phase B	0
8	-VARH Phase B	0
9	+WH Phase C	0
10	-WH Phase C	0
11	+VARH Phase C	0
12	-VARH Phase C	0
13	+WH Total	0
14	-WH Total	0
15	+VARH Total	0
16	-VARH Total	0

Back

Figure 3-26 ACI Accumulator Display

Point

The point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Count

The maximum value is 4,294,967,295. The next count will force a rollover to zero.

Navigation

Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click the Back button to go back to the Data Display screen.

Analog Outputs Data Display

From the Data Display screen, click Analog Outputs to view the analog outputs.

3.13

Hardware Analog Output (AO) Display

Point	Point Name	Status	Value
0	ANA_OUT 1	F	-5.000
1	ANA_OUT 2	F	-5.000
2	ANA_OUT 3	F	-5.000
3	ANA_OUT 4	F	-5.000
4	ANA_OUT 5	F	-5.000
5	ANA_OUT 6	F	-5.000
6	ANA_OUT 7	F	-5.000
7	ANA_OUT 8	F	-5.000
8	ANA_OUT 9	F	-5.000
9	ANA_OUT 10	F	-5.000
10	ANA_OUT 11	F	-5.000
11	ANA_OUT 12	F	-5.000

Page 1of 1 Go To Go Done

- 'F' indicates the point is marked Failed (point is offline).
- 'L' indicates Logic power failure.
- 'P' indicates field Power failure.

Figure 3-27 Analog Outputs (AO) Display

Point

The physical point number.

Point Name

The point name assigned (or the default name accepted) during Configuration.

Point Status

See section 3.5 Point Status Codes. If no code is given, the point is healthy.

Point Value

The engineering unit value based on the EGU Min and EGU Max scaling assigned during Configuration

Navigation

Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click the Back button to go back to the Data Display screen.

3.14 HSPCI Data Display

HSPCI is not supported.

Figure 3-28 HSPCI Message

3.15 Annunciator

Please see the Config@WEB Applications manual.

3.16 Alarm Data Display

Please see the Config@WEB Applications manual.

3.17 Serial Comm Data Display

From the Data Display screen, click the Serial Comm button to display the communications port data. This screen shows communications counters and port data for each port.

<u>Exception</u>: For S3030X, this column displays either Yes or No. See text.

Display Communication Port Data

Port Number	RTS	DTR	Name	Protocol	Comm Counters	Display Port Data
Port # 1	K	K	Port 1	DNPR	View	Port Data
Port # 2	K	K	Port 2	DNPR	View	Port Data
Port # 3	K	K	Port 3	DNPM	View	Port Data
Port # 4	K	K	Port 4	DNPR	View	Port Data
Port # 5	K	K	Port 5	None	View	Port Data
Port # 6	K	K	Port 6	None	View	Port Data
Port # 7	K	K	Port 7	None	View	Port Data
Port # 8	K	K	Port 8	None	View	Port Data
Port # 9	K	K	Port 9	None	View	Port Data
Port # 10	K	K	Port 10	None	View	Port Data
Port # 11	K	K	Port 11	None	View	Port Data
Port # 12	K	K	Port 12	None	View	Port Data

Communication Associations Display Back

Figure 3-29 Display Communication Port Data

Port Number

The physical port number.

RTS and DTR

Request **T**o **S**end and **D**ata **T**erminal **R**eady.

"K" represents Keyed (Radio/Modem).

The RTU firmware asserts/deasserts the signal according to the protocol timing configuration. Typically, K is used as a Radio/Modem key output (Default Setting).

"H" represents Positive RS232 Voltage.

When the RTU firmware is active, the output will be driven to the positive RS232 voltage except when the Z85230 (Communications Controller chip) channel driving the output is being reset. While the reset is occurring, the output will drop to the negative RS232 voltage. When the reset is complete, the output will rise to the Positive RS232 Voltage. This setting can be used to power RS232 to RS485 converters, RS232 to Fiber Optic converters, or any other device requiring the Positive RS232 Voltage.

"L" represents Negative RS232 Voltage.

The output will be driven to the negative RS232 voltage at powerup and always be the negative RS232 voltage.

+5V (S3030X only)

Yes

Provides +5V at approximately 100mA on pin 1 of the RS-232 connector to power auxiliary communications devices.

No

Turns pin 1 on the RS-232 connector to be a Data Carrier Detect (DCD) input.

Name

The port name assigned (or the default name accepted) during Configuration.

Protocol

The protocol assigned to the port. If no protocol is assigned, the legend will be NONE. Please see the Config@WEB Protocols manual for specific protocols.

Comm Counters

Click the View button to see the communications counters for the port of interest. Please see the Config@WEB Protocols manual for specific protocols.

Display Port Data

Click the Port Data button to see port data. Please see the Config@WEB Protocols manual for specific protocols.

Navigation

Click the Back button to go back to the Data Display screen.

3.17.1 Communication Association

When you click on the Communication Association button, you get a display similar to the one below. This display shows that there is a backup for the channel to the Master. This function may not apply to all protocols. See the Config@WEB Protocols manual.

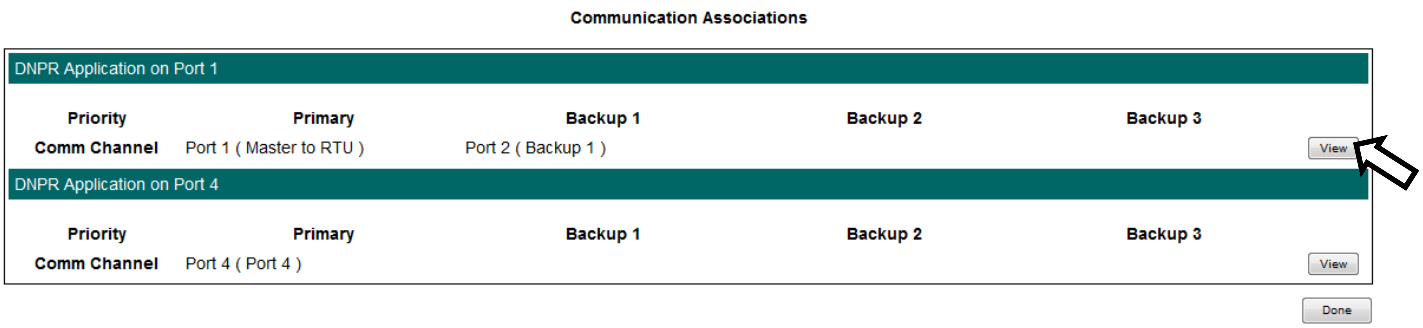


Figure 3-30 Communication Association Display

If you click View, you will get a Counters display similar to that shown below. The exact counters depend upon the protocol.

Communication Associations Counters Display

Primary : Port 2 (Backup 1)

Point	Counter Name	Counts
1	Frames Sent	0
2	Frames Received	0
3	No Replies	0
4	CRC Errors	0
5	Framing Errors	0
6	Overrun Errors	0
7	Data Link rejects	0
8	Transport Layer rejects	0
9	Application Layer rejects	499
10	Application Confirm Timeouts	0
11	Free Frames Exhausted	0
12	Available Frames	0

Backup 1 :

Point	Counter Name	Counts

Backup 2 :

Point	Counter Name	Counts

Backup 3 :

Point	Counter Name	Counts

Back

Figure 3-31 Communication Association Counters Display

3.17.2 Internal COMM Status Points

A COMM Status point is automatically generated for any active port. Shown below is an example for DNPM.

DNP (M) Digital Input (DI) Display

Port # : 3 Port Name : Port 3
IED # : 1 IED Name : DNPM_IED_1

Point	Point Name	Status	Value	Changes	Last Change
-1	COMM_STS		OPEN	2	10/28/2015 11:30:32.912
0	IED_STS 0		OPEN	4	10/28/2015 11:30:56.908
1	IED_STS 1		OPEN	5	10/28/2015 11:30:46.983
2	IED_STS 2		OPEN	2	10/28/2015 11:31:07.576
3	IED_STS 3		CLOSE	8	10/28/2015 11:31:38.090
4	IED_STS 4		OPEN	0	--/--/-- --:--:--.---
5	IED_STS 5		OPEN	0	--/--/-- --:--:--.---
6	IED_STS 6		OPEN	0	--/--/-- --:--:--.---
7	IED_STS 7		OPEN	6	10/28/2015 11:32:43.626
8	IED_STS 8		OPEN	2	10/28/2015 11:32:50.750
9	IED_STS 9		OPEN	6	10/28/2015 11:32:59.074
10	IED_STS 10		OPEN	2	10/28/2015 11:33:05.687
11	IED_STS 11		OPEN	0	--/--/-- --:--:--.---

Page 1of 1 Go To Go Done

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'C' indicates that the point has been manually disabled because its value is changing for no valid reason ("Chattering").
- 'A' indicates that the point is in its alarm state.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-32 DNPM COMM Status Point

COMM Status points will be open (green) when the comm. Channel or IED is operational, and closed (red) when the comm. Channel or IED is failed.

3.17.3 Internal Global Freeze Points

These apply only when the Global Freeze has been configured. See the Global Freeze Configuration section in the Configuration chapter. Below is an example of the Global Freeze Points displayed after they have been mapped to a Master.

DNP (R) Digital Input (DI) Display

Port # : 1 Port Name : Master to RTU

Point	Device Name	Point Name	Assigned Class	Status	Value
0	RTU Internal Status	PRM TIME SRC FAIL	1		OPEN
1	Global Freeze	Glbl Frz Lockout	1		OPEN
2	Global Freeze	Glbl Frz Event	1		OPEN
[illegible]	RTU Internal Status	TIME SRC FAIL	1		OPEN

Global Freeze Points

Page 1of 1 Go To Go Done

- 'F' indicates the point is Failed (stale). Its source is not responding to polls.
- 'm' indicates that at least some of the quality code flags are manually-entered.
- 'f ' indicates that the value of the point has been manually-entered ("forced").
- 'C' indicates that the point has been manually disabled because its value is changing for no valid reason ("Chattering").
- 'A' indicates that the point is in its alarm state.
- 'u' indicates that the point is in an unacknowledged alarm state.

Note: 'A' and 'u' are alarm flags and only apply to points that have been configured as alarm points.

Figure 3-33. Global Freeze STS points in DNPR display

3.18
Ethernet Comm Data Display

Ethernet Comm will display whatever protocols have been activated for Ethernet. A different protocol may be configured for each socket. Please see the Config@WEB Protocols manuals for protocol-over-Ethernet details. Everything else on this screen is very similar to the Serial Comm Data Display.

Display Communication Port Data

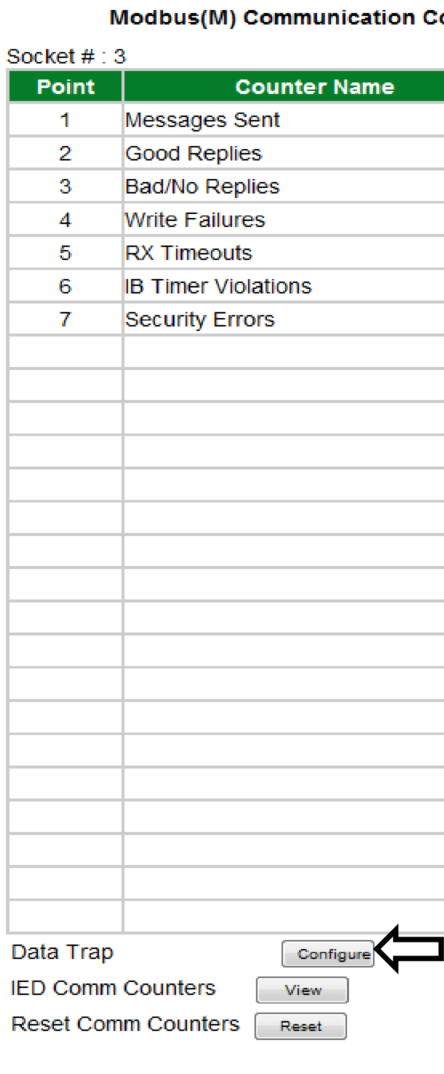
Socket Number	Name	Protocol	Comm Counters	Display Port Data
Socket # 1	Socket 1	DNPR	View	Port Data
Socket # 2	Socket 2	DNPM	View	Port Data
Socket # 3	Socket 3	Modbus(M)	View	Port Data
Socket # 4	Socket 4	None	View	Port Data
Socket # 5	Socket 5	None	View	Port Data
Socket # 6	Socket 6	None	View	Port Data
Socket # 7	Socket 7	None	View	Port Data
Socket # 8	Socket 8	None	View	Port Data
Socket # 9	Socket 9	None	View	Port Data
Socket # 10	Socket 10	None	View	Port Data
Socket # 11	Socket 11	None	View	Port Data
Socket # 12	Socket 12	None	View	Port Data
Socket # 13	Socket 13	None	View	Port Data
Socket # 14	Socket 14	None	View	Port Data
Socket # 15	Socket 15	None	View	Port Data
Socket # 16	Socket 16	None	View	Port Data

Communication Associations Display Back

Figure 3-34 Display Ethernet Communication Port Data

3.19
Data Trap

At the bottom of Counters displays for all protocols is a function called Data Trap, as shown in the example below.



Modbus(M) Communication Counters Display

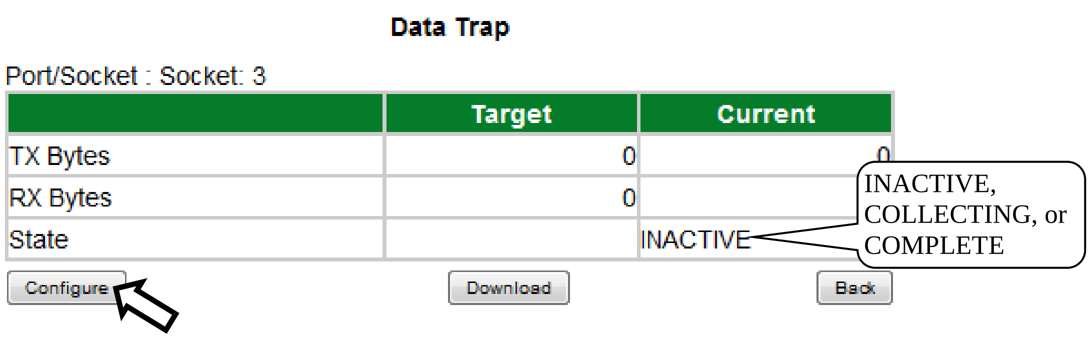
Socket # : 3 Port Name : Socket 3

Point	Counter Name	Counts
1	Messages Sent	76
2	Good Replies	0
3	Bad/No Replies	76
4	Write Failures	0
5	RX Timeouts	76
6	IB Timer Violations	0
7	Security Errors	0

Figure 3-33 Data Trap Example

When you click on Configure for Data Trap, you get the display shown in Figure 3-34.

Note: The first time you run Data Trap, the RTU will attempt to send a CAB file or files to your PC. These files can be large, so there will be a short delay. For a list of these files, see the IE Settings appendix of your applicable hardware manual.



Data Trap

Port/Socket : Socket: 3

	Target	Current
TX Bytes	0	0
RX Bytes	0	
State		INACTIVE

Figure 3-34 Data Trap

The Data Trap function is always in one of three states, "INACTIVE", "COLLECTING"" or "COMPLETE". Configure or Analyze will stop an active collection of data. Data collection can be started and other GUI functions can be performed while the data is being collected.

Note 1: Only one instance of Data Trap can run at a time.

Note 2: The Data Trap function button appears under the Comm Counters Display for every protocol.

Click on Configure, then select the port you want to analyze as shown below.

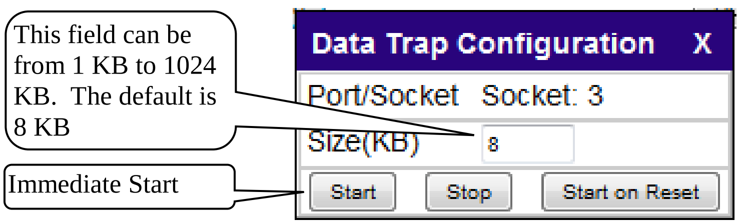


Figure 3-35 Data Trap Configuration

If you use the "Start on Reset" function, after the next reset of the RTU and for only that reset, the Data Trap function will be started with this configuration before any communications is initiated by the RTU. This will allow the user to capture startup sequences (initialization opcodes, deadband downloads, etc).

The Stop function is used to cancel the current collection of data and to cancel a "Start on Reset" request.

When you click Start, the state is updated to COLLECTING.

Data Trap will stay in the Collecting state until either of the Target values is reached or the user manually stops the collection.

Data Trap

Port/Socket : Socket: 3

	Target	Current
TX Bytes	8192	0
RX Bytes	8190	0
State	Socket: 3	COLLECTING

Configure Download Back

Figure 3-36 Data Trap COLLECTING

With the Configuration Target shown above, the results are as shown below.

Data Trap

Port/Socket : Port: 3

	Target	Current
TX Bytes	1024	1024
RX Bytes	1020	0
State	Port: 3	COMPLETE

Configure Download Back

Figure 3-37 Data Trap COMPLETE

Notice that the data gathering stage stops when either the TX or the RX hits the Target size, or when you click on Configure.

To analyze the captured data, a utility program called "Protolyzer" is provided in the Firmware Update package that will parse the Data Trap capture file and parse the protocol traffic. This program is available online at:

https://infrastructurecommunity.schneider-electric.com/groups/rtu-downloads

3.20 GPS Data Display

Under Display Data tab, click GPS. The GPS Display should look similar to Figure 3-38 if you have enabled the GPS as explained in the Configuration chapter.

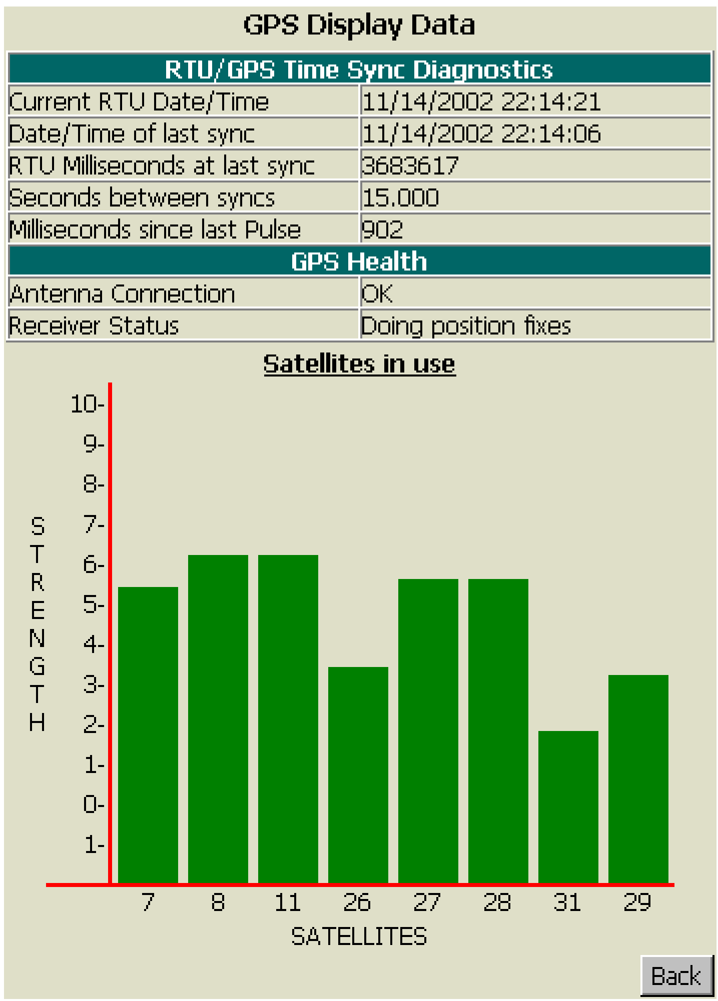


Figure 3-38 GPS Display

3.20.1 RTU/GPS Time Sync Diagnostics

Current RTU Date/Time

Current RTU Date and Time from the GPS. This is UTC (previously called GMT) time.

Date/Time of last sync

This value is the last time that the time was set using data from the GPS connected to the RTU.

RTU Milliseconds at last sync

This is the value of the internal 1ms counter of the RTU when the time was last set from the GPS receiver.

Seconds between syncs

This reflects the sync interval set up during configuration.

Milliseconds since last Pulse

This is the number of milliseconds since the last top-of-the-second Pulse from the GPS.

3.20.2 GPS Health

Antenna Connection

This line will reveal if the antenna is connected or not, or if there is another problem with the antenna or lead. Compare Figure 3-38 to Figure 3-39. The possible messages are

"OK"

"Short or open"

Receiver Status

Reports the Receiver Status. Compare Figure 3-38 to Figure 3-39. The possible messages are:

- "Doing position fixes"
- "No GPS time yet"
- "Need initialization"
- "PDOP too high"
- "No satellites available"
- "Only 1 satellite available"
- "Only 2 satellites available"
- "Only 3 satellites available"
- "No satellites usable"
- "Only 1 satellite usable"
- "Only 2 satellites usable"
- "Only 3 satellites usable"
- "Unknown code"

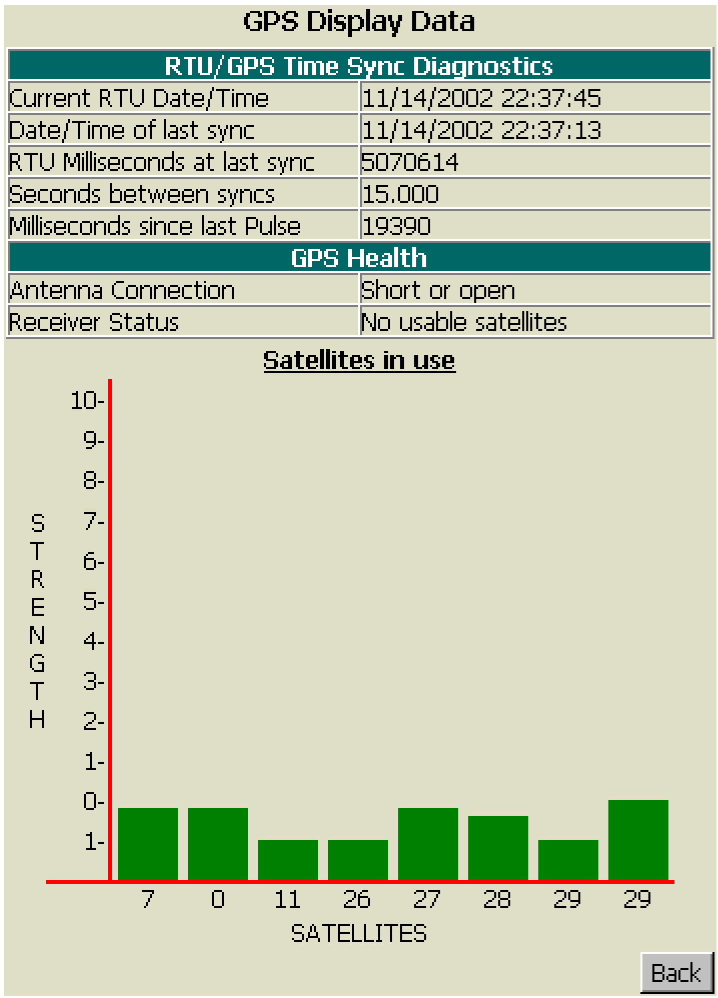
Satellites in use

The GPS module tracks up to eight satellites, giving each satellite's I.D. number (bottom, X axis) and relative signal strength (left side, Y axis). For best results (that is, to track the most satellites with the highest possible signal strength), your GPS antenna must have an unobstructed view of the sky. If buildings or trees block the antenna, fewer satellites will be tracked at any given time. This could result in intermittent loss of time sync.

Navigation

Click the Back button to go back to the Data Display screen.

Figure 3-39 GPS Display With Antenna Disconnected



3.21 RLL Data Display

Please see the Config@WEB Relay Ladder Logic Manual, Part # S2200-AAA-00003

3.22 Applications Data Display

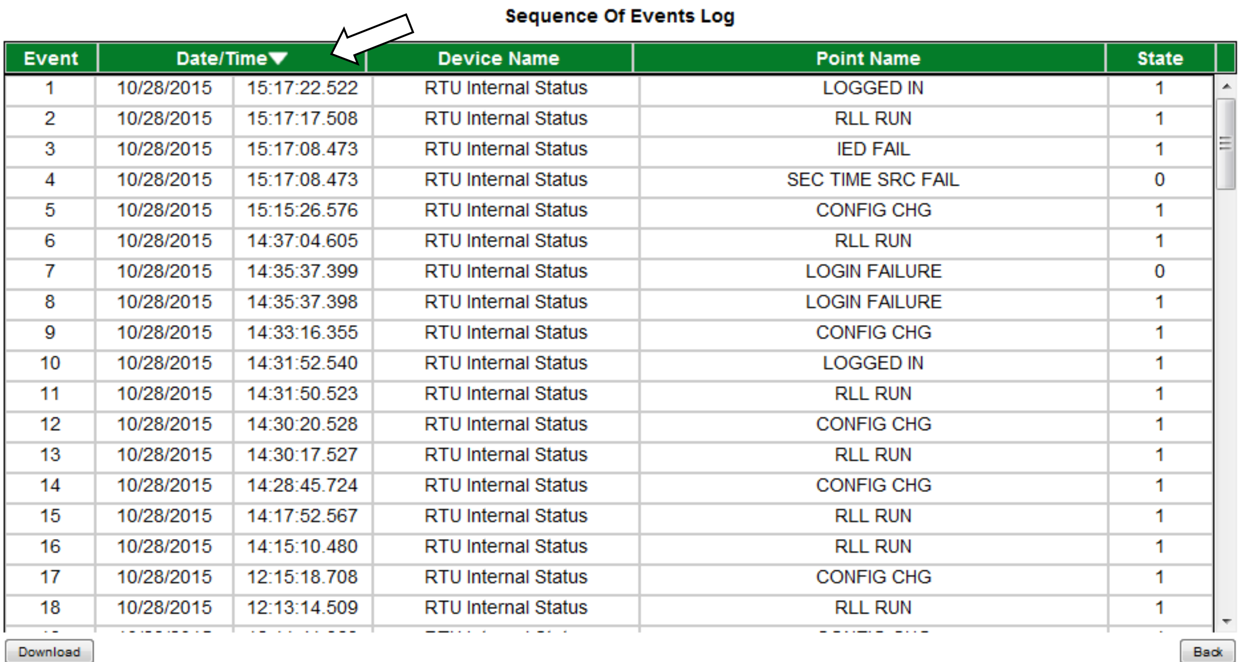
Please refer to the Config@WEB Applications manual.

3.23 Logs

3.23.1 SOE Log

The SOE Log Configuration determines the number of SOE Events stored in the RTU. The SOE Log Display will display all events stored. In addition, as new events take place, they will show up on the SOE Display as they are happening. Even as the Event Log in the RTU rolls over according to the number configured (first in, first out), the display will retain all events as long as the display is up on your computer. Therefore, you may see many more events in the display than are Set in Configuration.

Figure 3-40 SOE Log Display



Sequence Of Events Log

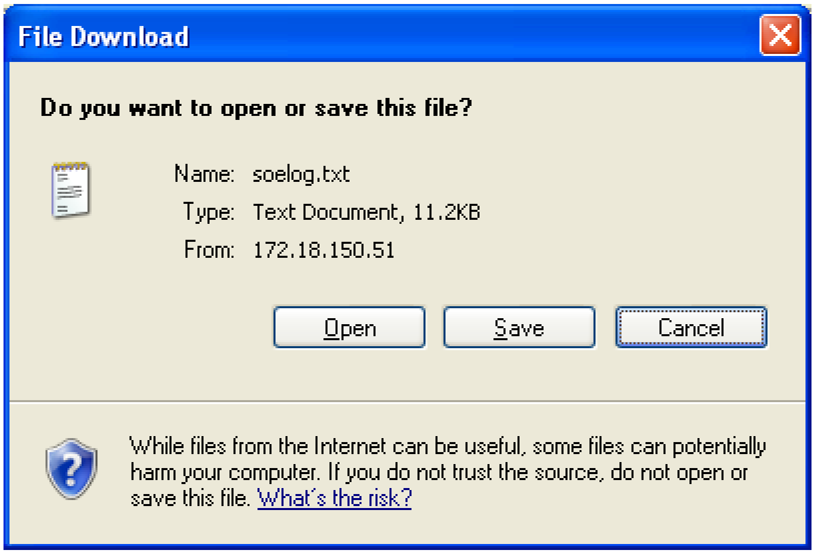
Event	Date/Time		Device Name	Point Name	State
1	10/28/2015	15:17:22.522	RTU Internal Status	LOGGED IN	1
2	10/28/2015	15:17:17.508	RTU Internal Status	RLL RUN	1
3	10/28/2015	15:17:08.473	RTU Internal Status	IED FAIL	1
4	10/28/2015	15:17:08.473	RTU Internal Status	SEC TIME SRC FAIL	0
5	10/28/2015	15:15:26.576	RTU Internal Status	CONFIG CHG	1
6	10/28/2015	14:37:04.605	RTU Internal Status	RLL RUN	1
7	10/28/2015	14:35:37.399	RTU Internal Status	LOGIN FAILURE	0
8	10/28/2015	14:35:37.398	RTU Internal Status	LOGIN FAILURE	1
9	10/28/2015	14:33:16.355	RTU Internal Status	CONFIG CHG	1
10	10/28/2015	14:31:52.540	RTU Internal Status	LOGGED IN	1
11	10/28/2015	14:31:50.523	RTU Internal Status	RLL RUN	1
12	10/28/2015	14:30:20.528	RTU Internal Status	CONFIG CHG	1
13	10/28/2015	14:30:17.527	RTU Internal Status	RLL RUN	1
14	10/28/2015	14:28:45.724	RTU Internal Status	CONFIG CHG	1
15	10/28/2015	14:17:52.567	RTU Internal Status	RLL RUN	1
16	10/28/2015	14:15:10.480	RTU Internal Status	RLL RUN	1
17	10/28/2015	12:15:18.708	RTU Internal Status	CONFIG CHG	1
18	10/28/2015	12:13:14.509	RTU Internal Status	RLL RUN	1

The default SOE Log Display is sorted by Date/Time with the most recent at the top. You may reverse this sorting by clicking on the Date/Time header, as shown by the arrow above. You may also sort by Device Name, Point Name, or State, either in ascending or descending order, by clicking on these headers.

In addition to the SOE Log Display shown above, the SOE Log may be saved as a file by clicking on Download.

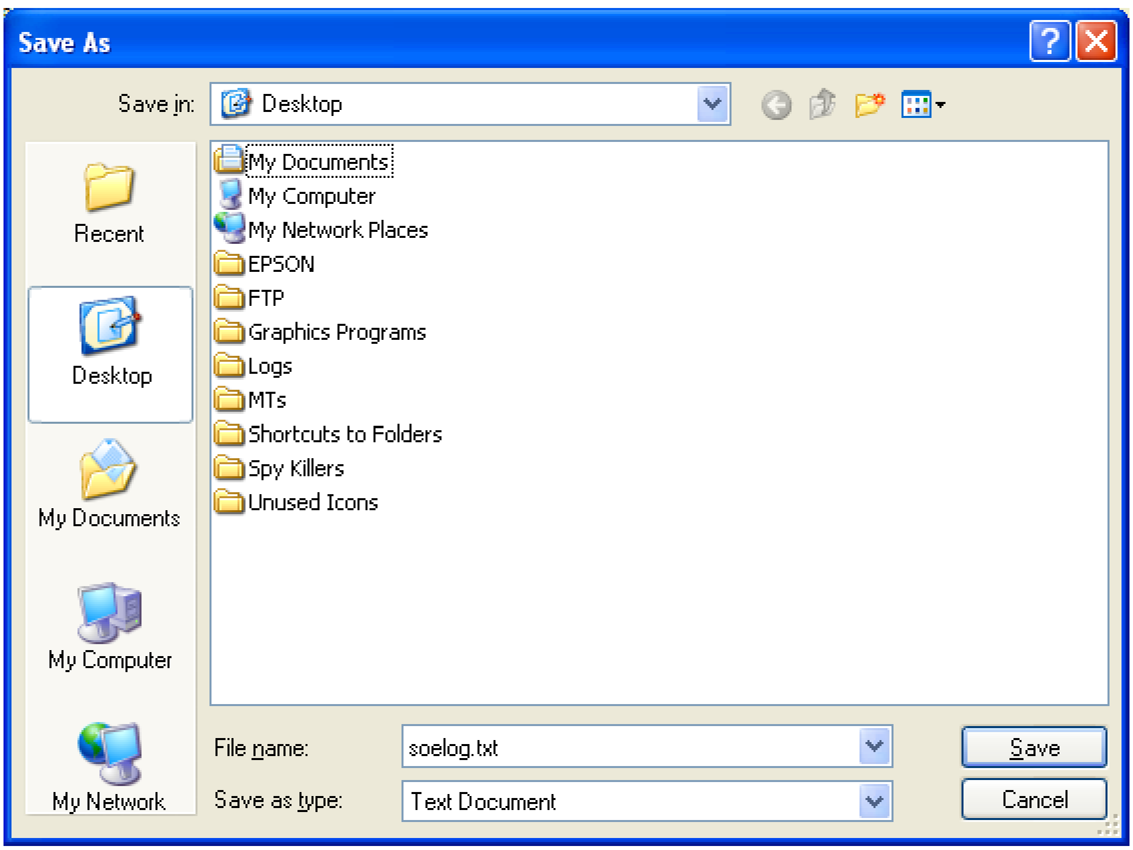
You will be given the choice of opening the log, or saving the log as shown below.

Figure 3-41 File Download



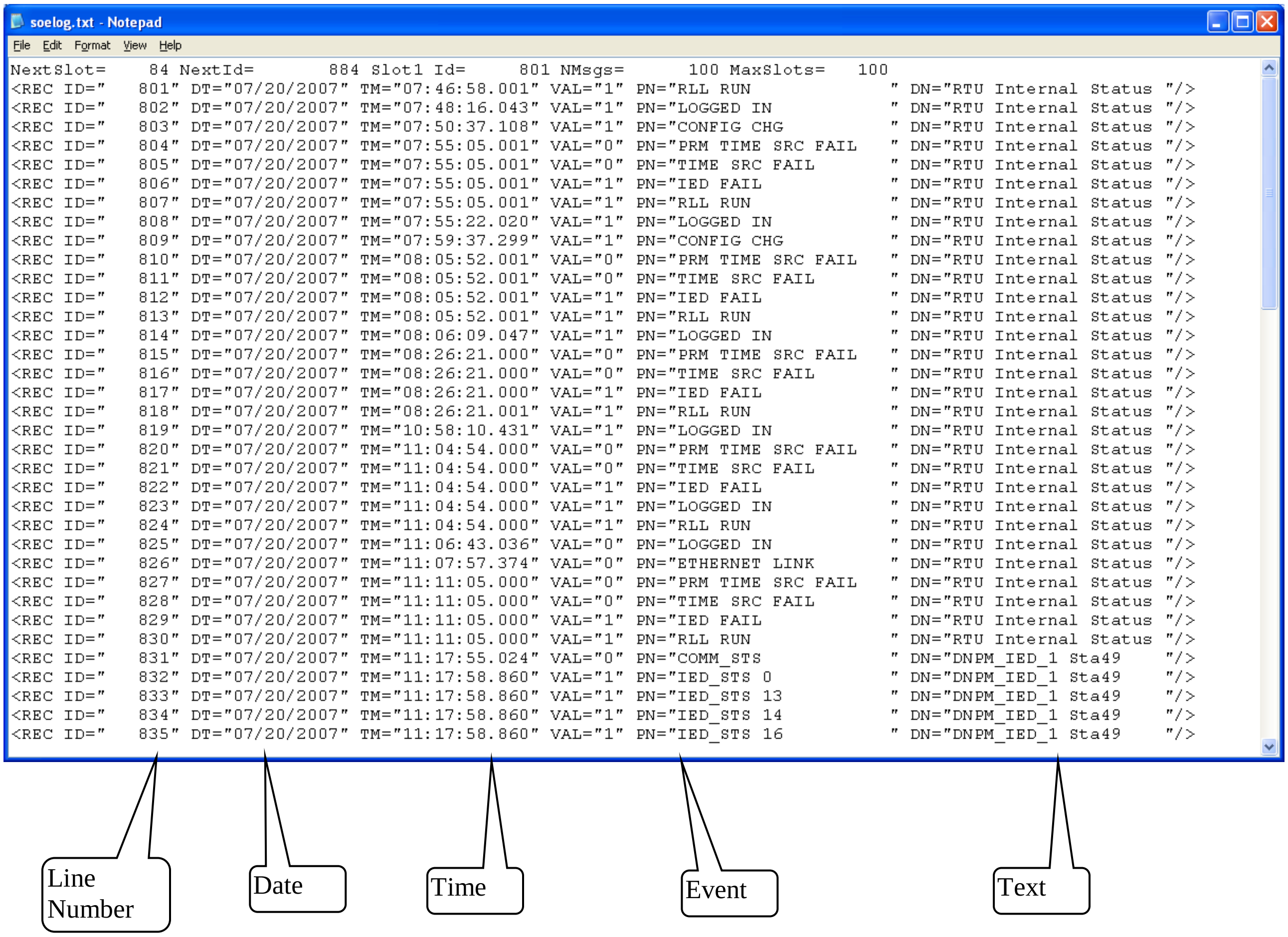
If you save the file, you will get a dialog box as shown.

Figure 3-42 Save As



When this file is opened, it will look as shown below.

Figure 3-43 SOE log File



```
NextSlot=     84 NextId=       884 Slot1 Id=      801 NMsgs=       100 MaxSlots=   100
<REC ID="    801" DT="07/20/2007" TM="07:46:58.001" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    802" DT="07/20/2007" TM="07:48:16.043" VAL="1" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    803" DT="07/20/2007" TM="07:50:37.108" VAL="1" PN="CONFIG CHG             " DN="RTU Internal Status "/>
<REC ID="    804" DT="07/20/2007" TM="07:55:05.001" VAL="0" PN="PRM TIME SRC FAIL      " DN="RTU Internal Status "/>
<REC ID="    805" DT="07/20/2007" TM="07:55:05.001" VAL="0" PN="TIME SRC FAIL          " DN="RTU Internal Status "/>
<REC ID="    806" DT="07/20/2007" TM="07:55:05.001" VAL="1" PN="IED FAIL               " DN="RTU Internal Status "/>
<REC ID="    807" DT="07/20/2007" TM="07:55:05.001" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    808" DT="07/20/2007" TM="07:55:22.020" VAL="1" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    809" DT="07/20/2007" TM="07:59:37.299" VAL="1" PN="CONFIG CHG             " DN="RTU Internal Status "/>
<REC ID="    810" DT="07/20/2007" TM="08:05:52.001" VAL="0" PN="PRM TIME SRC FAIL      " DN="RTU Internal Status "/>
<REC ID="    811" DT="07/20/2007" TM="08:05:52.001" VAL="0" PN="TIME SRC FAIL          " DN="RTU Internal Status "/>
<REC ID="    812" DT="07/20/2007" TM="08:05:52.001" VAL="1" PN="IED FAIL               " DN="RTU Internal Status "/>
<REC ID="    813" DT="07/20/2007" TM="08:05:52.001" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    814" DT="07/20/2007" TM="08:06:09.047" VAL="1" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    815" DT="07/20/2007" TM="08:26:21.000" VAL="0" PN="PRM TIME SRC FAIL      " DN="RTU Internal Status "/>
<REC ID="    816" DT="07/20/2007" TM="08:26:21.000" VAL="0" PN="TIME SRC FAIL          " DN="RTU Internal Status "/>
<REC ID="    817" DT="07/20/2007" TM="08:26:21.000" VAL="1" PN="IED FAIL               " DN="RTU Internal Status "/>
<REC ID="    818" DT="07/20/2007" TM="08:26:21.001" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    819" DT="07/20/2007" TM="10:58:10.431" VAL="1" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    820" DT="07/20/2007" TM="11:04:54.000" VAL="0" PN="PRM TIME SRC FAIL      " DN="RTU Internal Status "/>
<REC ID="    821" DT="07/20/2007" TM="11:04:54.000" VAL="0" PN="TIME SRC FAIL          " DN="RTU Internal Status "/>
<REC ID="    822" DT="07/20/2007" TM="11:04:54.000" VAL="1" PN="IED FAIL               " DN="RTU Internal Status "/>
<REC ID="    823" DT="07/20/2007" TM="11:04:54.000" VAL="1" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    824" DT="07/20/2007" TM="11:04:54.000" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    825" DT="07/20/2007" TM="11:06:43.036" VAL="0" PN="LOGGED IN              " DN="RTU Internal Status "/>
<REC ID="    826" DT="07/20/2007" TM="11:07:57.374" VAL="0" PN="ETHERNET LINK          " DN="RTU Internal Status "/>
<REC ID="    827" DT="07/20/2007" TM="11:11:05.000" VAL="0" PN="PRM TIME SRC FAIL      " DN="RTU Internal Status "/>
<REC ID="    828" DT="07/20/2007" TM="11:11:05.000" VAL="0" PN="TIME SRC FAIL          " DN="RTU Internal Status "/>
<REC ID="    829" DT="07/20/2007" TM="11:11:05.000" VAL="1" PN="IED FAIL               " DN="RTU Internal Status "/>
<REC ID="    830" DT="07/20/2007" TM="11:11:05.000" VAL="1" PN="RLL RUN                " DN="RTU Internal Status "/>
<REC ID="    831" DT="07/20/2007" TM="11:17:55.024" VAL="0" PN="COMM_STS               " DN="DNPM_IED_1 Sta49    "/>
<REC ID="    832" DT="07/20/2007" TM="11:17:58.860" VAL="1" PN="IED_STS 0              " DN="DNPM_IED_1 Sta49    "/>
<REC ID="    833" DT="07/20/2007" TM="11:17:58.860" VAL="1" PN="IED_STS 13             " DN="DNPM_IED_1 Sta49    "/>
<REC ID="    834" DT="07/20/2007" TM="11:17:58.860" VAL="1" PN="IED_STS 14             " DN="DNPM_IED_1 Sta49    "/>
<REC ID="    835" DT="07/20/2007" TM="11:17:58.860" VAL="1" PN="IED_STS 16             " DN="DNPM_IED_1 Sta49    "/>
```


3.23.2 User Log

The User Log Configuration determines the number of User Events stored in the RTU. The User Log Display will display all events stored. In addition, as new events take place, they will show up on the User Log Display as they are happening. Even as the Event Log in the RTU rolls over according to the number configured (first in, first out), the display will retain all events as long as the display is up on your computer. Therefore, you may see many more events in the display than are Set in Configuration. In addition, the Date/Time, Events and Text headers may each be clicked on in order to sort the data.

Figure 3-44 User Log Display

User Log

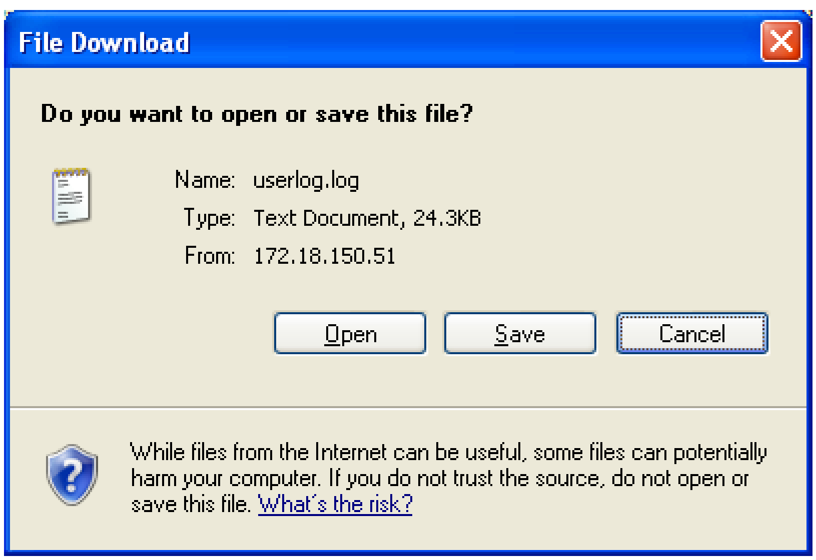
Line	Date/Time		Event	Text
1	10/28/2015	15:17:21.998	Logged In	172.18.150.12-GUI, Admin
2	10/28/2015	15:16:36.002	Power Up	RTU Started Up, Mode: NORMAL
3	10/28/2015	15:15:49.746	Reset	RTU Reset, Mode: NORMAL
4	10/28/2015	15:15:38.160	Config Changed	File: rtusetup.xml, Tag: CPU
5	10/28/2015	15:15:36.353	Config Changed	File: time.xml, Tag: TIME
6	10/28/2015	15:15:26.449	Config Changed	File: time.xml, Tag: GPS
7	10/28/2015	14:36:45.874	Logged In	172.18.150.12-GUI, Admin
8	10/28/2015	14:36:23.002	Power Up	RTU Started Up, Mode: NORMAL
9	10/28/2015	14:35:41.334	Logged In	UIF PORT-CONSOLE, Admin
10	10/28/2015	14:35:37.399	Login Failed	UIF PORT-CONSOLE, reboot 2

Download Back

The log may be sorted by Date/Time either ascending or descending. In addition to the User Log Display shown above, the User Log may be saved as a file by clicking on Download.

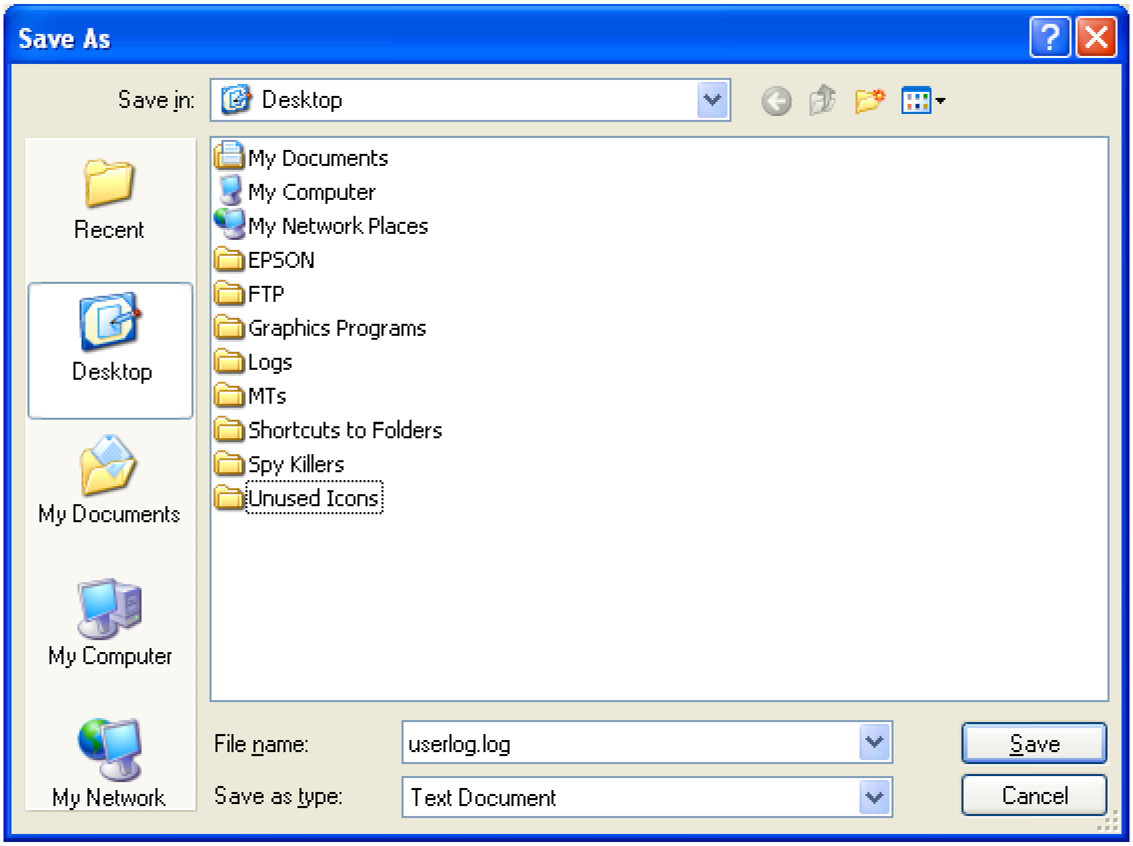
You will be given the choice of opening the log, or saving the log as shown below.

Figure 3-45 File Download



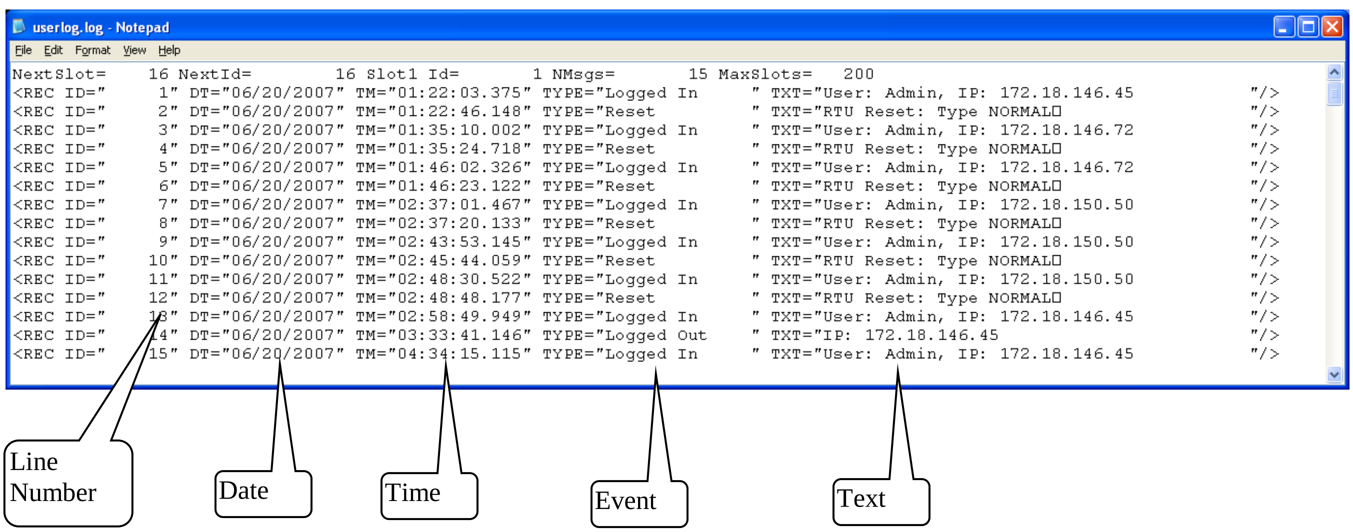
If you save the file, you will get a dialog box as shown.

Figure 3-46 Save As



When this file is opened, it will look as shown below.

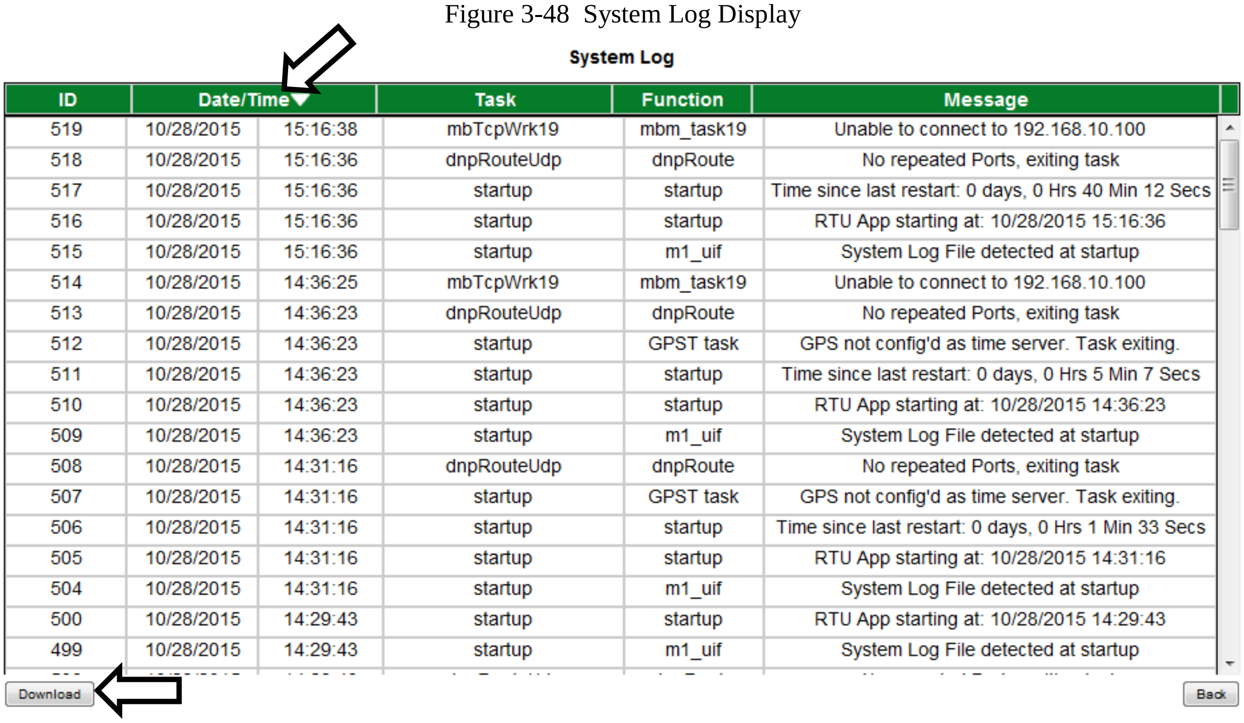
Figure 3-47 User.log File



3.23.3 System Log

The System Log Display will display all events created by system tasks, informational and system errors. In addition, as new events take place, they will show up on the System Log Display as they are happening. As with the other logs, the Date/Time may be sorted in ascending or descending order and may also be downloaded.

Figure 3-48 System Log Display

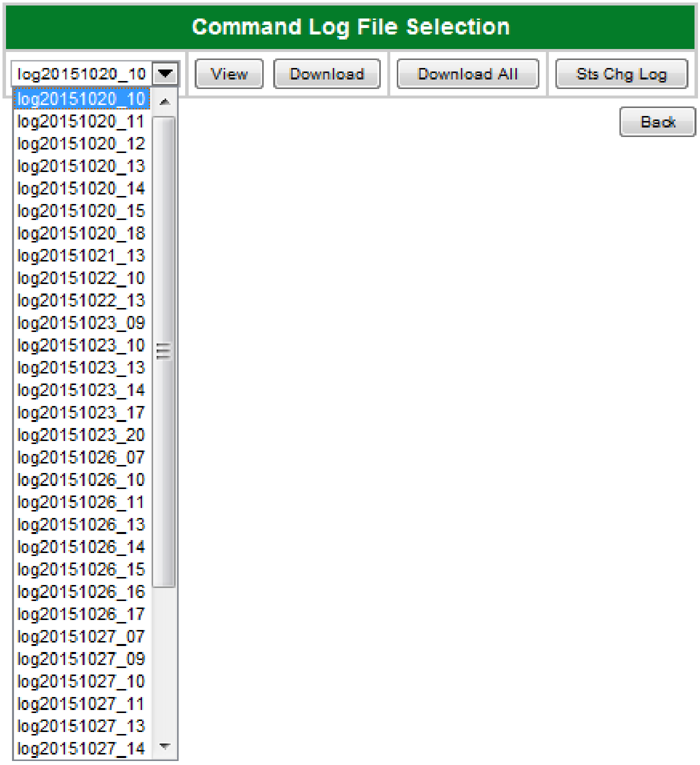


ID	Date/Time		Task	Function	Message
519	10/28/2015	15:16:38	mbTcpWrk19	mbm_task19	Unable to connect to 192.168.10.100
518	10/28/2015	15:16:36	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
517	10/28/2015	15:16:36	startup	startup	Time since last restart: 0 days, 0 Hrs 40 Min 12 Secs
516	10/28/2015	15:16:36	startup	startup	RTU App starting at: 10/28/2015 15:16:36
515	10/28/2015	15:16:36	startup	m1_uif	System Log File detected at startup
514	10/28/2015	14:36:25	mbTcpWrk19	mbm_task19	Unable to connect to 192.168.10.100
513	10/28/2015	14:36:23	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
512	10/28/2015	14:36:23	startup	GPST task	GPS not config'd as time server. Task exiting.
511	10/28/2015	14:36:23	startup	startup	Time since last restart: 0 days, 0 Hrs 5 Min 7 Secs
510	10/28/2015	14:36:23	startup	startup	RTU App starting at: 10/28/2015 14:36:23
509	10/28/2015	14:36:23	startup	m1_uif	System Log File detected at startup
508	10/28/2015	14:31:16	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
507	10/28/2015	14:31:16	startup	GPST task	GPS not config'd as time server. Task exiting.
506	10/28/2015	14:31:16	startup	startup	Time since last restart: 0 days, 0 Hrs 1 Min 33 Secs
505	10/28/2015	14:31:16	startup	startup	RTU App starting at: 10/28/2015 14:31:16
504	10/28/2015	14:31:16	startup	m1_uif	System Log File detected at startup
500	10/28/2015	14:29:43	startup	startup	RTU App starting at: 10/28/2015 14:29:43
499	10/28/2015	14:29:43	startup	m1_uif	System Log File detected at startup

3.23.4 Command Log

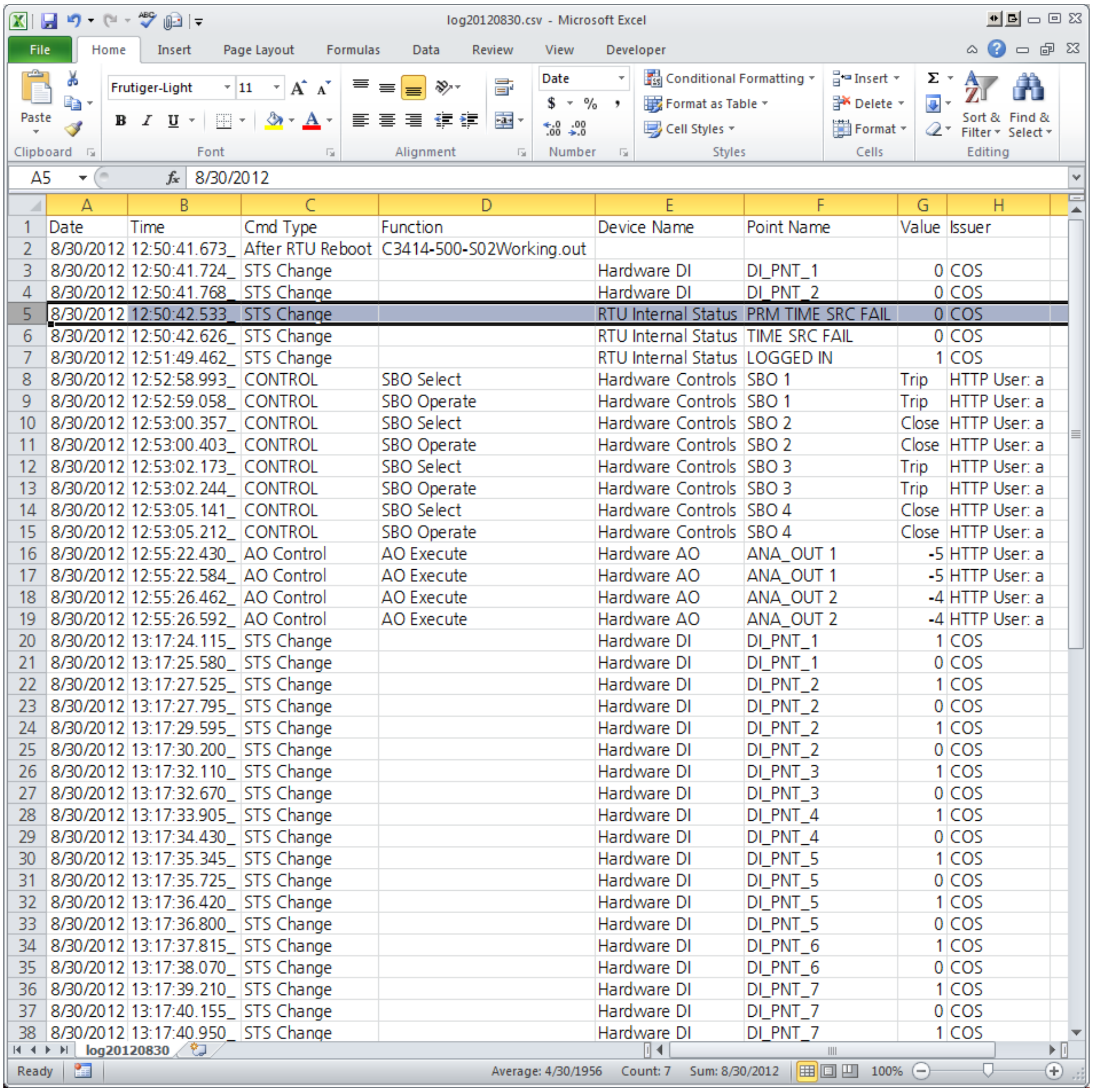
To view Command Log Files, go to Display -> Logs -> Command Log on the SAGE Config@WEB GUI. Choose a file from the drop down menu on the left. The file name corresponds to the Date and Time the file was created. It is in the format logYYYYMMDD_HH, so log20130228_11 refers to a file created on February 28, 2013 at 11 AM. Click View to examine the file. It should download and you can open it with Microsoft Excel.

Figure 3-49Command Log Display



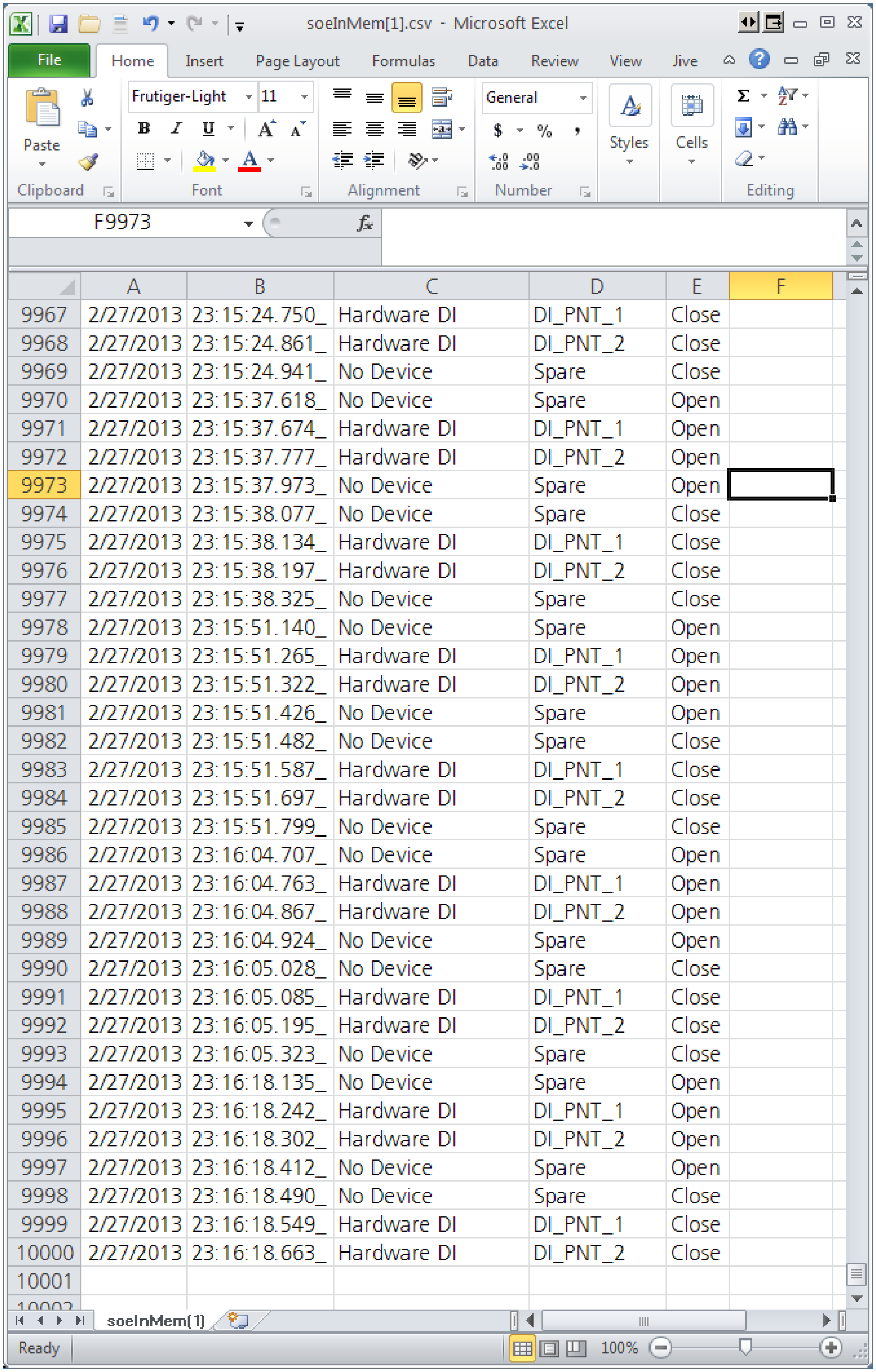
Each command has a time and date stamp, the command type, the function performed (select, operate, direct operate, etc.), the device and point name, the value, and the user or task which issued the command.

Figure 3-50 Sample Command Log File



	A	B	C	D	E	F	G	H
1	Date	Time	Cmd Type	Function	Device Name	Point Name	Value	Issuer
2	8/30/2012	12:50:41.673_	After RTU Reboot	C3414-500-S02Working.out				
3	8/30/2012	12:50:41.724_	STS Change		Hardware DI	DI_PNT_1	0	COS
4	8/30/2012	12:50:41.768_	STS Change		Hardware DI	DI_PNT_2	0	COS
5	8/30/2012	12:50:42.533_	STS Change		RTU Internal Status	PRM TIME SRC FAIL	0	COS
6	8/30/2012	12:50:42.626_	STS Change		RTU Internal Status	TIME SRC FAIL	0	COS
7	8/30/2012	12:51:49.462_	STS Change		RTU Internal Status	LOGGED IN	1	COS
8	8/30/2012	12:52:58.993_	CONTROL	SBO Select	Hardware Controls	SBO 1	Trip	HTTP User: a
9	8/30/2012	12:52:59.058_	CONTROL	SBO Operate	Hardware Controls	SBO 1	Trip	HTTP User: a
10	8/30/2012	12:53:00.357_	CONTROL	SBO Select	Hardware Controls	SBO 2	Close	HTTP User: a
11	8/30/2012	12:53:00.403_	CONTROL	SBO Operate	Hardware Controls	SBO 2	Close	HTTP User: a
12	8/30/2012	12:53:02.173_	CONTROL	SBO Select	Hardware Controls	SBO 3	Trip	HTTP User: a
13	8/30/2012	12:53:02.244_	CONTROL	SBO Operate	Hardware Controls	SBO 3	Trip	HTTP User: a
14	8/30/2012	12:53:05.141_	CONTROL	SBO Select	Hardware Controls	SBO 4	Close	HTTP User: a
15	8/30/2012	12:53:05.212_	CONTROL	SBO Operate	Hardware Controls	SBO 4	Close	HTTP User: a
16	8/30/2012	12:55:22.430_	AO Control	AO Execute	Hardware AO	ANA_OUT 1	-5	HTTP User: a
17	8/30/2012	12:55:22.584_	AO Control	AO Execute	Hardware AO	ANA_OUT 1	-5	HTTP User: a
18	8/30/2012	12:55:26.462_	AO Control	AO Execute	Hardware AO	ANA_OUT 2	-4	HTTP User: a
19	8/30/2012	12:55:26.592_	AO Control	AO Execute	Hardware AO	ANA_OUT 2	-4	HTTP User: a
20	8/30/2012	13:17:24.115_	STS Change		Hardware DI	DI_PNT_1	1	COS
21	8/30/2012	13:17:25.580_	STS Change		Hardware DI	DI_PNT_1	0	COS
22	8/30/2012	13:17:27.525_	STS Change		Hardware DI	DI_PNT_2	1	COS
23	8/30/2012	13:17:27.795_	STS Change		Hardware DI	DI_PNT_2	0	COS
24	8/30/2012	13:17:29.595_	STS Change		Hardware DI	DI_PNT_2	1	COS
25	8/30/2012	13:17:30.200_	STS Change		Hardware DI	DI_PNT_2	0	COS
26	8/30/2012	13:17:32.110_	STS Change		Hardware DI	DI_PNT_3	1	COS
27	8/30/2012	13:17:32.670_	STS Change		Hardware DI	DI_PNT_3	0	COS
28	8/30/2012	13:17:33.905_	STS Change		Hardware DI	DI_PNT_4	1	COS
29	8/30/2012	13:17:34.430_	STS Change		Hardware DI	DI_PNT_4	0	COS
30	8/30/2012	13:17:35.345_	STS Change		Hardware DI	DI_PNT_5	1	COS
31	8/30/2012	13:17:35.725_	STS Change		Hardware DI	DI_PNT_5	0	COS
32	8/30/2012	13:17:36.420_	STS Change		Hardware DI	DI_PNT_5	1	COS
33	8/30/2012	13:17:36.800_	STS Change		Hardware DI	DI_PNT_5	0	COS
34	8/30/2012	13:17:37.815_	STS Change		Hardware DI	DI_PNT_6	1	COS
35	8/30/2012	13:17:38.070_	STS Change		Hardware DI	DI_PNT_6	0	COS
36	8/30/2012	13:17:39.210_	STS Change		Hardware DI	DI_PNT_7	1	COS
37	8/30/2012	13:17:40.155_	STS Change		Hardware DI	DI_PNT_7	0	COS
38	8/30/2012	13:17:40.950_	STS Change		Hardware DI	DI_PNT_7	1	COS

Click on the Sts Chg Log to view the latest 10000 status event entries since the last reboot. Below shows an example of the status change log.



	A	B	C	D	E	F
9967	2/27/2013	23:15:24.750_	Hardware DI	DI_PNT_1	Close	
9968	2/27/2013	23:15:24.861_	Hardware DI	DI_PNT_2	Close	
9969	2/27/2013	23:15:24.941_	No Device	Spare	Close	
9970	2/27/2013	23:15:37.618_	No Device	Spare	Open	
9971	2/27/2013	23:15:37.674_	Hardware DI	DI_PNT_1	Open	
9972	2/27/2013	23:15:37.777_	Hardware DI	DI_PNT_2	Open	
9973	2/27/2013	23:15:37.973_	No Device	Spare	Open	
9974	2/27/2013	23:15:38.077_	No Device	Spare	Close	
9975	2/27/2013	23:15:38.134_	Hardware DI	DI_PNT_1	Close	
9976	2/27/2013	23:15:38.197_	Hardware DI	DI_PNT_2	Close	
9977	2/27/2013	23:15:38.325_	No Device	Spare	Close	
9978	2/27/2013	23:15:51.140_	No Device	Spare	Open	
9979	2/27/2013	23:15:51.265_	Hardware DI	DI_PNT_1	Open	
9980	2/27/2013	23:15:51.322_	Hardware DI	DI_PNT_2	Open	
9981	2/27/2013	23:15:51.426_	No Device	Spare	Open	
9982	2/27/2013	23:15:51.482_	No Device	Spare	Close	
9983	2/27/2013	23:15:51.587_	Hardware DI	DI_PNT_1	Close	
9984	2/27/2013	23:15:51.697_	Hardware DI	DI_PNT_2	Close	
9985	2/27/2013	23:15:51.799_	No Device	Spare	Close	
9986	2/27/2013	23:16:04.707_	No Device	Spare	Open	
9987	2/27/2013	23:16:04.763_	Hardware DI	DI_PNT_1	Open	
9988	2/27/2013	23:16:04.867_	Hardware DI	DI_PNT_2	Open	
9989	2/27/2013	23:16:04.924_	No Device	Spare	Open	
9990	2/27/2013	23:16:05.028_	No Device	Spare	Close	
9991	2/27/2013	23:16:05.085_	Hardware DI	DI_PNT_1	Close	
9992	2/27/2013	23:16:05.195_	Hardware DI	DI_PNT_2	Close	
9993	2/27/2013	23:16:05.323_	No Device	Spare	Close	
9994	2/27/2013	23:16:18.135_	No Device	Spare	Open	
9995	2/27/2013	23:16:18.242_	Hardware DI	DI_PNT_1	Open	
9996	2/27/2013	23:16:18.302_	Hardware DI	DI_PNT_2	Open	
9997	2/27/2013	23:16:18.412_	No Device	Spare	Open	
9998	2/27/2013	23:16:18.490_	No Device	Spare	Close	
9999	2/27/2013	23:16:18.549_	Hardware DI	DI_PNT_1	Close	
10000	2/27/2013	23:16:18.663_	Hardware DI	DI_PNT_2	Close	
10001						

3.23.5 Alarming

These screens may be viewed by a web browser without logging into the RTU by pointing to http://172.18.150.50/fs/display/summalarmlog.htm

Where 172.18.150.50 is your RTU IP. Use https if http is disabled in your CPU Configuration.

Please see the Alarming chapter in the Applications manual.

3.23.6 Annunciator

These screens may be viewed by a web browser without logging into the RTU by pointing to

http://172.18.150.50/fs/display/anunctor.htm

Where 172.18.150.50 is your RTU IP. Use https if http is disabled in your CPU Configuration.

Please see the Annunciator chapter in the Applications manual.

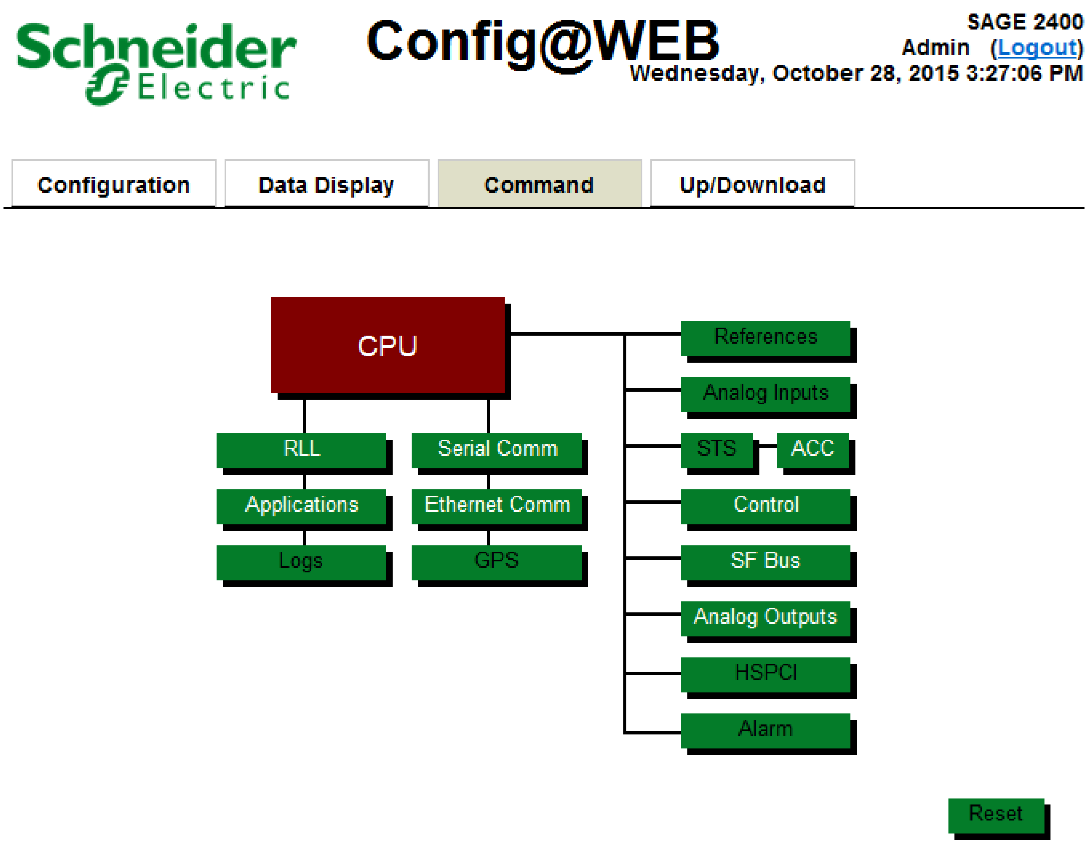
4 Command Output

This chapter tells you how to Command Output devices on the RTU. Other chapters cover Configuration, Data Display, Upload/Download, and Administration. See the appendices for hardware User Interface connections. See Chapter 1 for Comm Port Configuration, Point Mapping, and Scaling.

Only those items that may be commandable will be highlighted. Other buttons that are not commandable will not be highlighted.

Log in and click the Command tab. You should see a display similar to Figure 4-1.

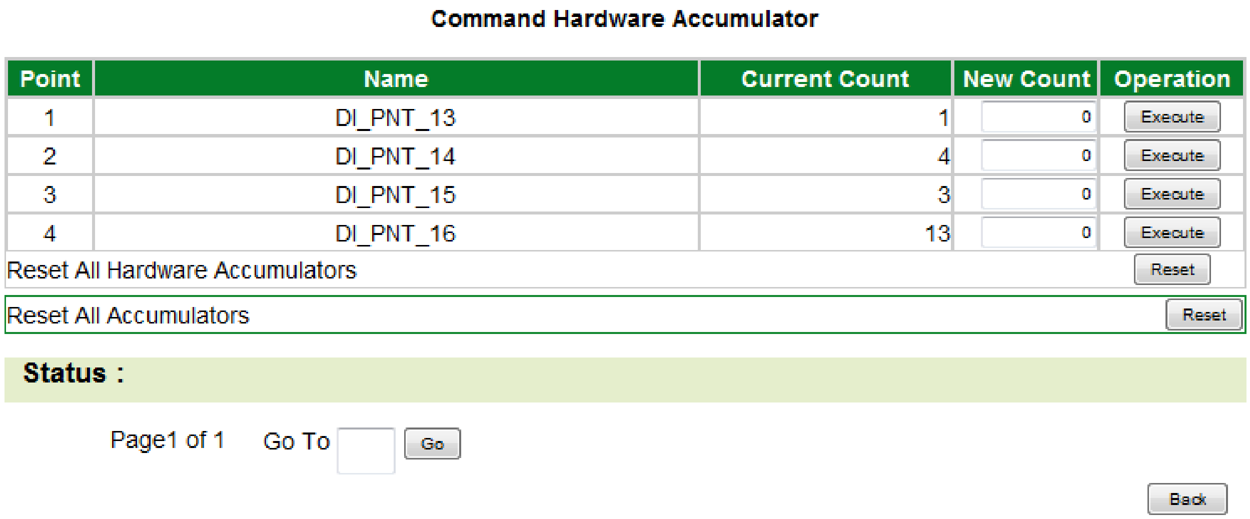
Figure 4-1 Command Screen



4.1 ACC Command

From the Command screen, click ACC to reset accumulators. The resulting screen will be similar to the one below.

Figure 4-2 Command ACC



Point

The point number.

Name

The point name assigned (or the default name accepted) during Configuration.

Current Count

The count read from the running ACC register.

New Count

Enter a count for a new starting point (i.e., if zero is entered, the count starts from zero).

Operation

Click the Execute button to begin at the count entered under New Count.

Reset All Hardware Accumulators

This button will reset Current Count to zero for all hardware accumulators.

Reset All Accumulators

This button will reset the current count to zero for all accumulators, hardware and IED.

Note: IED accumulators will be reset to zero only until the next count is received from the IED.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Command screen.

Control Command

From the Command screen, click Control to exercise controls. You may choose Execute Time and either Trip or Close for any SBO. Click the Execute button to execute.

Figure 4-3 Command SBO

BB Controls Command

4.2

Point #	Name	Execute Time (ms)	Point Operations
1	SBO 1	500	Trip Close Execute
2	SBO 2	500	Trip Close Execute
3	SBO 3	500	Trip Close Execute
4	SBO 4	500	Trip Close Execute

Status :

Page 1 of 1 Go To Go Back

Point

The point number.

Name

The point name assigned (or the default name accepted) during Configuration.

Execute Time (ms)

Accept the default execute time or choose another execute time by typing in the time in milliseconds.

Point Operations

Trip

Click the Trip button to select Trip.

Close

Click the Close button to select Close.

Execute

The Execute button will be active only if either the Trip or the Close has been selected. Once it is active, clicking the button will execute the action.

Status

The Status message at the lower left will show the result of your command.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Command screen.

4.3 SF Bus Command

Click on SF Bus, then click on Command, as shown below.

Special Function Bus Command

SFB Card Location	SFB Card type	Command XT points
Select 1	1DO	Command
Select 2	NONE	-
Select 3	NONE	-
Select 4	NONE	-
Select 5	NONE	-
Select 6	NONE	-
Select 7	NONE	-
Select 8	NONE	-

Back

4.3.1 SFB Digital Output Command

Points on a DO XT card on the SFB may be commanded, as shown below. Enter the Momentary Relay Duration (or accept the default), click either Open or Close on the point you want to command, then click Execute.

Figure 4-4 SFB Digital Output Command

SFB Digital Output Command

Port Name :

Point #	Name	Momentary Relay Duration	Point Operations
1	DO_PNT 1	500	Open Close Execute
2	DO_PNT 2	500	Open Close Execute
3	DO_PNT 3	500	Open Close Execute
4	DO_PNT 4	500	Open Close Execute
5	DO_PNT 5	500	Open Close Execute
6	DO_PNT 6	500	Open Close Execute
7	DO_PNT 7	500	Open Close Execute
8	DO_PNT 8	500	Open Close Execute
9	DO_PNT 9	500	Open Close Execute
10	DO_PNT 10	500	Open Close Execute
11	DO_PNT 11	500	Open Close Execute
12	DO_PNT 12	500	Open Close Execute
13	DO_PNT 13	500	Open Close Execute
14	DO_PNT 14	500	Open Close Execute
15	DO_PNT 15	500	Open Close Execute
16	DO_PNT 16	500	Open Close Execute

Status :

Page 1 of 1 Go To Go Back

Point

The point number.

Name

The point name assigned (or the default name accepted) during Configuration.

Momentary Relay Duration (ms)

Accept the default execute time or choose another execute time by typing in the time in milliseconds.

Point Operations

Open

Click the Open button to select Open.

Close

Click the Close button to select Close.

Execute

The Execute button will be active only if either the Open or the Close has been selected. Once it is active, clicking the button will execute the action.

Status

The Status message at the lower left will show the result of your command.

Navigation

Click the Back button to go back to the Command screen.

4.4 Analog Outputs Command

From the Command screen, click Analog Outputs to exercise analog output controls. The resulting screen will be similar to Figure 4-5

Figure 4-5 Command Analog Outputs

Hardware Analog Outputs (AO) Command

Point	Name	Range	Value	Operation
1	ANA_OUT 1	-5.000 to 5.000	3.5	Execute
2	ANA_OUT 2	-5.000 to 5.000	-5.000	Execute
3	ANA_OUT 3	-5.000 to 5.000	-5.000	Execute
4	ANA_OUT 4	-5.000 to 5.000	-5.000	Execute
5	ANA_OUT 5	-5.000 to 5.000	-5.000	Execute
6	ANA_OUT 6	-5.000 to 5.000	-5.000	Execute
7	ANA_OUT 7	-5.000 to 5.000	-5.000	Execute
8	ANA_OUT 8	-5.000 to 5.000	-5.000	Execute
9	ANA_OUT 9	-5.000 to 5.000	-5.000	Execute
10	ANA_OUT 10	-5.000 to 5.000	-5.000	Execute
11	ANA_OUT 11	-5.000 to 5.000	-5.000	Execute
12	ANA_OUT 12	-5.000 to 5.000	-5.000	Execute

Status :

Page 1of 1 Go To Go Done

Point

The point number.

Name

The point name assigned (or the default name accepted) during Configuration.

Range

The EGU range as determined by the values chosen in the Configuration.

Value

Enter a value within the Range to exercise the point.

Operation

Click the Execute button to execute the command.

Status

The Status message at the lower left will show the result of your command.

Navigation

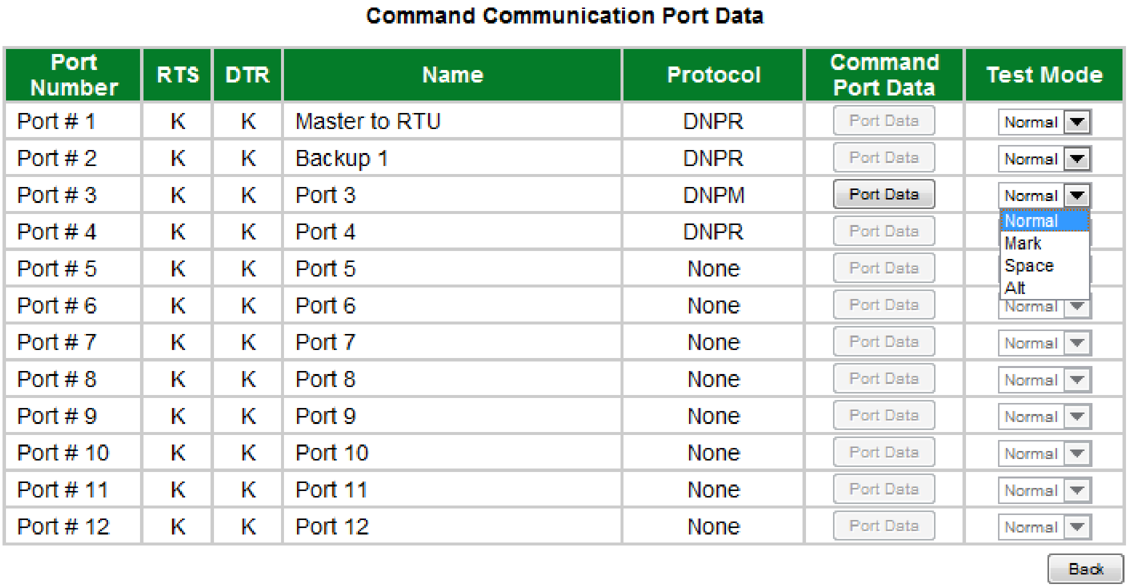
Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Command screen.

Serial Comm Command

From the Command screen, click Serial Comm to exercise serial comm controls. The resulting screen will be similar to Figure 4-6.

The Command Communication Port Data has two aspects, depending on the protocol: Command Port Data, and Test Mode. The Port Data button will be grayed out if the port reports to a Master because you cannot command a Master. If the port is an IED or sub-remote port, then the Command Port Data button
4.5 will be active. Please see the Config@WEB Protocols manual to Command Port Data.

Figure 4-6 Command Communications Port Data



Command Communication Port Data

Port Number	RTS	DTR	Name	Protocol	Command Port Data	Test Mode
Port # 1	K	K	Master to RTU	DNPR	Port Data	Normal
Port # 2	K	K	Backup 1	DNPR	Port Data	Normal
Port # 3	K	K	Port 3	DNPM	Port Data	Normal
Port # 4	K	K	Port 4	DNPR	Port Data	
Port # 5	K	K	Port 5	None	Port Data	
Port # 6	K	K	Port 6	None	Port Data	Normal
Port # 7	K	K	Port 7	None	Port Data	Normal
Port # 8	K	K	Port 8	None	Port Data	Normal
Port # 9	K	K	Port 9	None	Port Data	Normal
Port # 10	K	K	Port 10	None	Port Data	Normal
Port # 11	K	K	Port 11	None	Port Data	Normal
Port # 12	K	K	Port 12	None	Port Data	Normal

4.5.1 Test Mode

Test Mode produces either a Mark, Space, or Alt to test a port. You must have a protocol assigned to the port for this test. Please see the appropriate hardware manual for the model of your RTU. (Example:
4.6 SAGE 2400 Operation & Maintenance manual.)

4.7 Ethernet Command

Please refer to the specific protocol in the Config@WEB Protocols Manual.

RLL Command

4.8 Please see the following manual for further information:

Config@WEB Relay Ladder Logic Manual, Part # S2200-AAA-00003

Applications Command

Please see the following manual for Applications Commands that are supported.

Config@WEB Applications Manual, Part # S2200-AAA-00006

5 Secure Administration

This chapter tells you how to set up Secure Usernames and Passwords on the RTU. Certain privileges may require a SSH Public/Private Key. With the advent of the secure firmware (C3414-500-S02YZ), the process of adding users is now a separate program from the RTU interface. All versions of the secure firmware update sets are located on the Web Site. Please contact RTU Customer Service to get instructions on how to access this site. The version of the User Manager tool must match the version of the firmware that the Usernames and Passwords are being generated for. You will need this zip file to proceed.

Note: In the rest of this document, YZ is used to indicate a Version and Step of the C3414-500-S02YZ firmware. It may be just a letter (Y – first release version of the firmware is "H") and a number (Z – first release level of the firmware is "0"), but it may also have an appended patch level ("_P1" or "_2.2"). Two special strings are used in this document, <DESC> to represent the description (site or group name) for the output files, and <VER>, which is the version number of the output files.

Note: Microsoft .Net framework 3.5 or later must be present on the client computer to use the tools (Config Converter and User Manager).

5.1 User Manager

5.1.1 Introduction

The User Management program is used to create and update one of the three packages that are used to put a set of firmware into a SAGE RTU running C3414-500-S02YZ secure firmware.

This program outputs two files:

1. <DESC>_<VER>_Users.tar.gz
2. access_<DESC>_<VER>.cfg.

The access_<DESC>_<VER>.cfg file contains the user name, password, privileges and locations of the SSH key files entered for this <VER> of the package.

The "user" package (<DESC>_<VER>_Users.tar.gz) created by this program will be sent to the RTU using the Up/Download feature of the GUI.

The package contains the following:

1. C3414-500-S02YZ – version of program marker
2. bootparams_<DESC>_<VER> - encrypted account and password file
3. Public Folder – SSH Public Key for every account that requires an SSH service
4. RTU Folder – DSA and RSA SSH keys for the SSH server in the RTU

This program can be used in two ways:

1. Load an previously created access configuration file to update with new information, i.e. add/delete users, modify passwords, change priviliges, change SSH keys for users or for the SSH server in the RTU firmware. This is the typical usage of this program.

2. Create a new set of Usernames and Passwords for the initial package to be installed in the RTU firmware. It is not typically used in this manner. It is suggested you use the baseline file included with the firmware update zip file as the starting point.

The <DESC> of the package can be used to build unique sets of users update packages. File names should NOT be renamed after they are created. If more than one file with same description needs to be generated they can be organized into folders.

The files generated by the program are encrypted and cannot be viewed with regular tools. Care should be taken to secure the access_<DESC>_<VER>.cfg files as these can be loaded using this program (see Importing users or Password recovery).

5.1.2 Getting a Copy of User Manager

This program is contained in the RTU update zip file for every version of C3414-500-S02YZ. Make sure that you are running the version that is associated with the version of the firmware you are going to install.

The RTU Update package is available on the Web site. If you need to get a copy of the Update package, please contact Houston RTU Customer Service so that you can be provided instructions on how to access the site.

Currently this page is located at:

https://infrastructurecommunity.schneider-electric.com/groups/rtu-downloads

5.1.3 Before you Launch the Program

SSH sessions need a private and public key to initiate a secure session. The Secure Shell replaces Telnet and SFTP replaces FTP in the Secure Firmware.

Before you proceed to use this program, make sure you have access to or have created SSH keys for the server and every account user that will have a privilege that needs secure functionality.

If you are going to run a truly secure set of the firmware, a set of SSH Keys for the SSH server running in the RTU firmware must be generated to include in this package. If you choose to use the firmware in this manner, you must generate these items using the tools provided by your company or have your IT department generate these items for you for use with the RTU firmware.

These server public and private keys (four items) must be included in this package, so they must be generated in advance of their inclusion in the package.

These keys can be unique to or shared among the RTU(s) being configured.

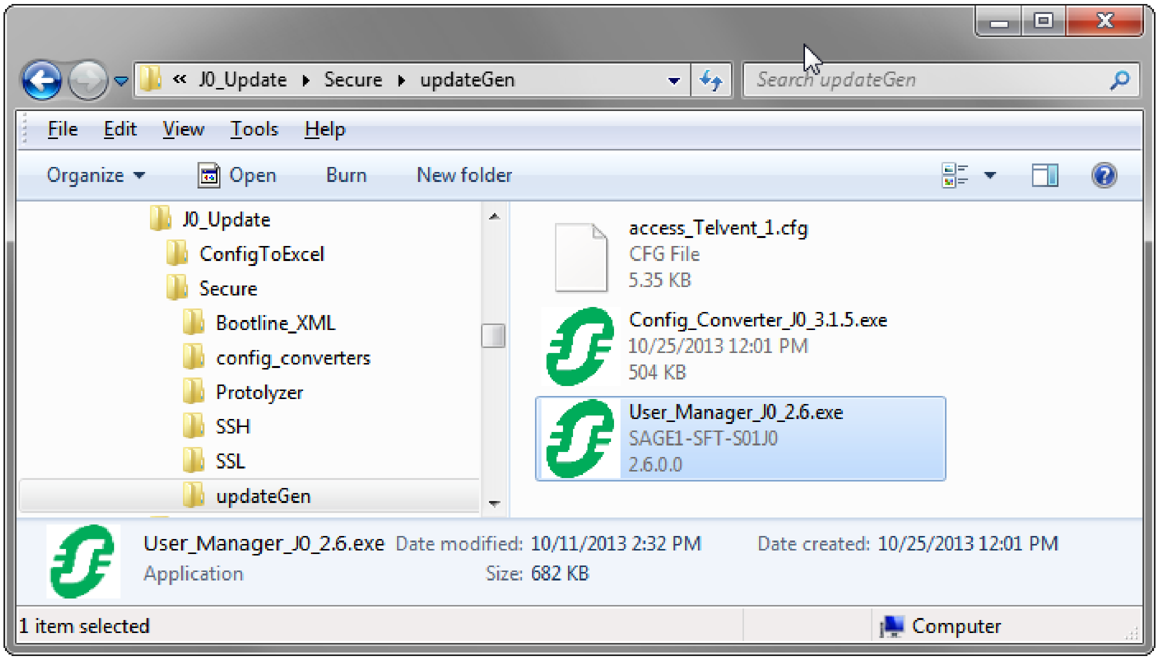
Every user that needs any of the SSH services must have a set of SSH keys created for the account to include in this package. They must be generated in advance so that the users public key can be included in the package. The users private key must be placed on their PC for use in establishing a connection using SSH or SFTP with the RTU.

See **Section 5.1.10** for information on how an SSH key is created, and also the document "**Config@WEB Key & Certificate Generation**".

5.1.4 Launching the Program

To launch this program, you must have acquired a copy of the file C3414-500-S02XY_Firmware_Update.zip and unzip it onto your PC.

Figure 5-1 Location of User Manager Program

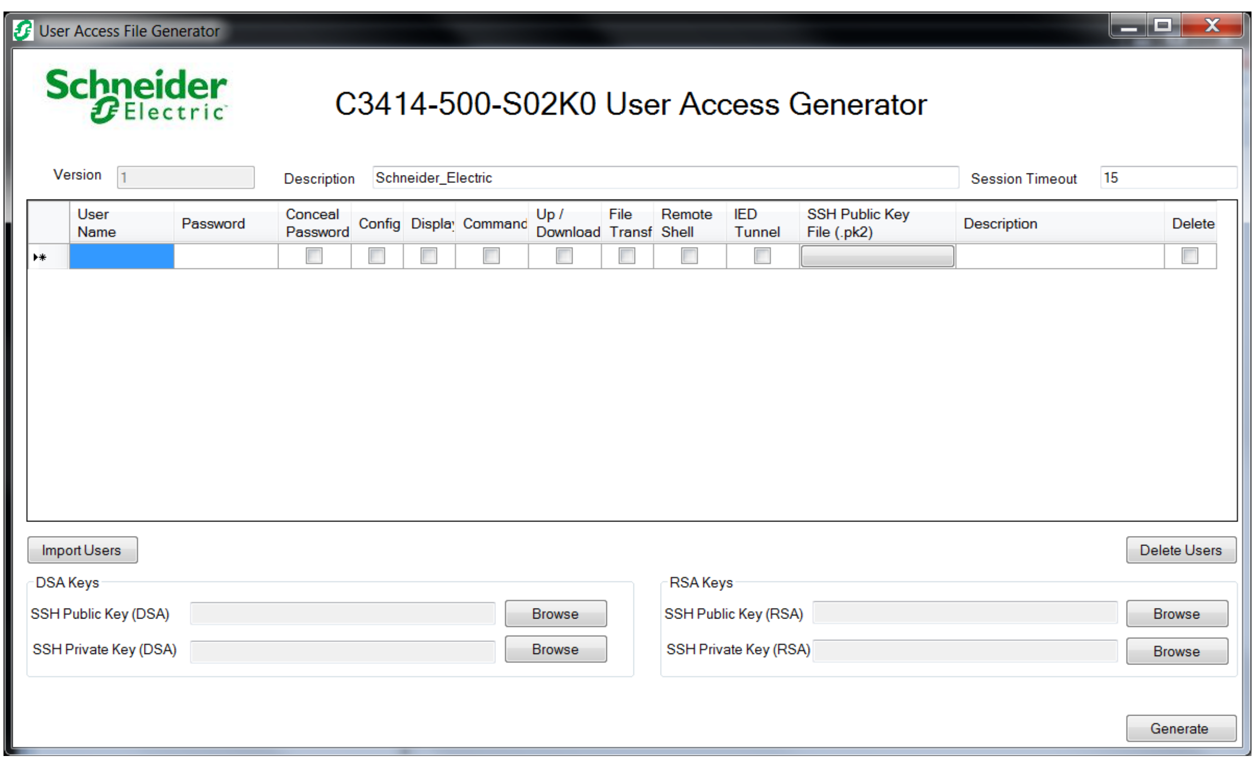


Once you have done this, navigate to the following location on your PC:

"…\Telvent_Secure\SAGE2400\YZUpdate\Secure\updateGen"

Select the file: "User_ManagerYZ.exe" and launch the program.

Figure 5-2 User Manager Program



5.1.5 Terminating the Program

To terminate the program, click the "x" in the upper right corner of the User Access Generator display. Any changes made since the last "Generator" will be lost when the program is terminated.

5.1.6 Importing an Existing Users Package

The "Import Users" box is used to select the file(s) to use with the tool.

A good starting point for the package is to use the baseline configuration by following the directions below. Once you have your own package, use this feature to update the package.

Click the "Import Users" button and navigate to an existing configuration package and click the file to select, then click "open".

To revert to a baseline configuration for the RTU, navigate to:

"…\Telvent_Secure\SAGE2400\YZUpdate\Secure\updateGen"

and select:

access_Schneider Electric _1.cfg

Figure 5-3 Navigate to Template File

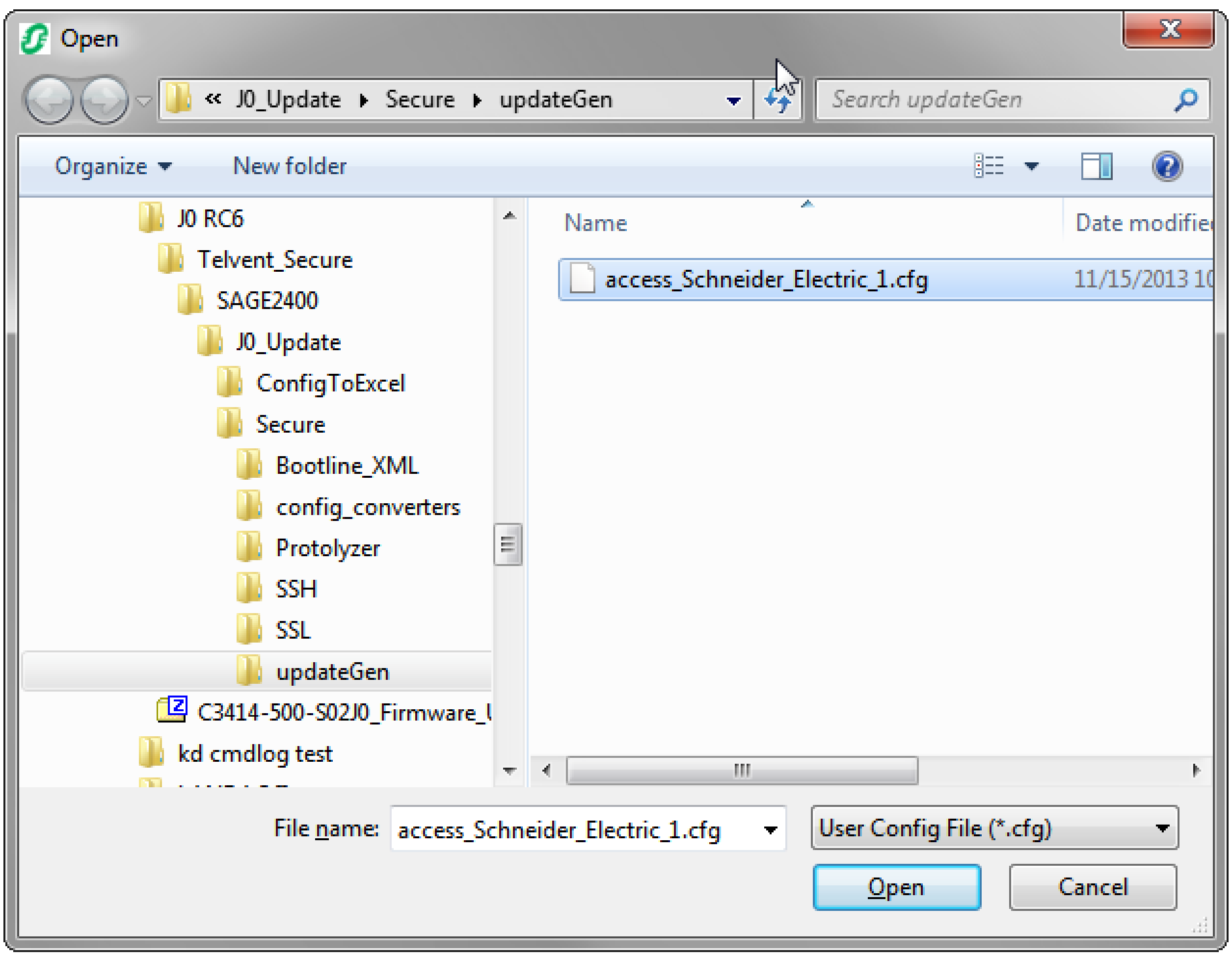
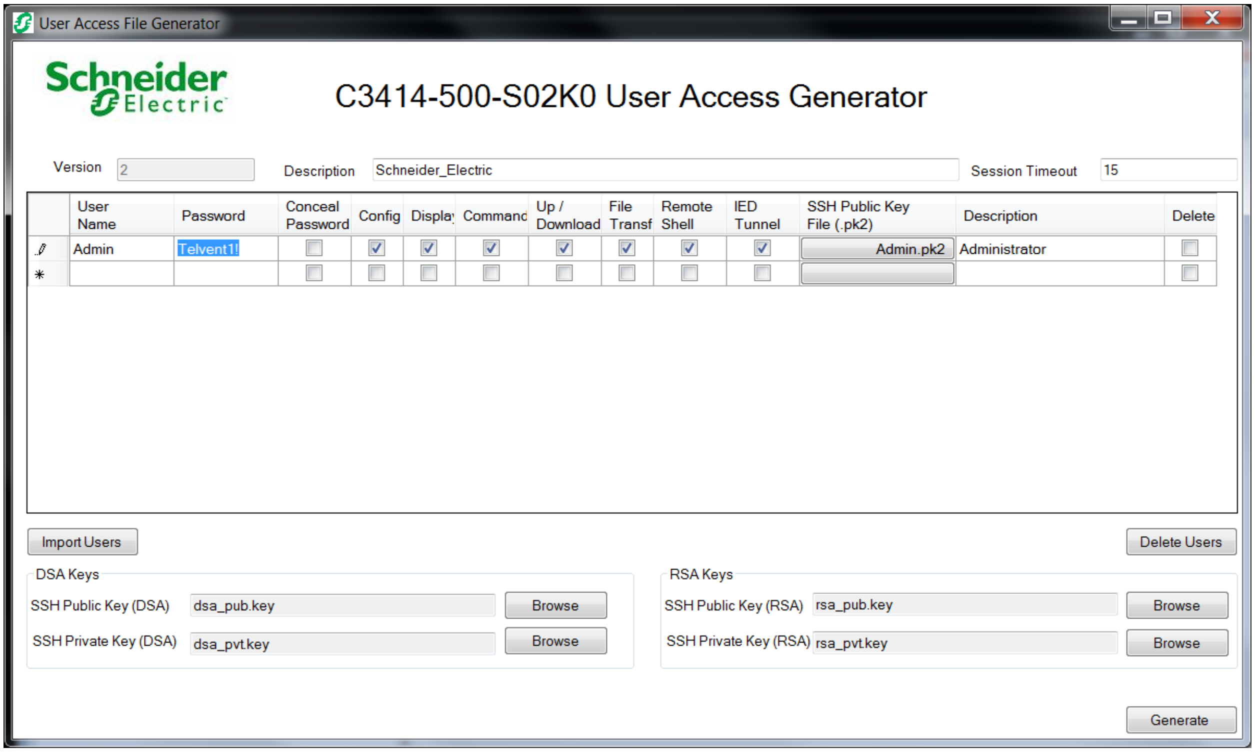


Figure 5-4 User Manager After Import



Now you are ready to add accounts and the RTU server DSA/RSA SSH keys.

Please see the configuration section below for information on how to use these features.

5.1.7 Version <VER>

Version number is an auto generated sequence number to keep track of the Boot Params files. If the import users feature is used this number gets incremented automatically.

5.1.8 Descripton <DESC>

Use this field to add a description to the generated file. The description will be part of the file name that is geneated. Ex Schneider_Electric_1_Users.tar.gz.

5.1.9 Session Timeout

Session timout controls the time the Config@WEB session expires when there is no activity on the GUI. The max is 180 min.

5.1.10 DSA & RSA Keys

Note: Please see "**Config@WEB Key & Certificate Generation**" document for details on Key generation. (Available on the customer website)

The SSH public and private keys for DSA and RSA must be added to the package by browsing to their location and selecting the file containing the key.

The keys can either be the keys provided with the RTU update package or generated by the user of the RTU.

The default set of keys for the RTU are contained in the RTU Update zip file.

"…\Telvent_Secure\SAGE2400\YZUpdate\Secure\SSH\RTU_keys"

SSH Public Key(DSA) – dsa_pub.key

SSH Private Key(DSA) – dsa_pvt.key

SSH Public Key(RSA) – rsa_pub.key

SSH Private Key(RSA) – rsa_pvt.key

User provided keys must have the same names as the keys above.

Each user requiring SSH services must have their public key in the package.

The default public key for the Admin user is:

"…\Telvent_Secure\SAGE2400\YZUpdate\Secure\SSH\Admin_keys"

"Admin.pk2"

The default private key for the Admin user is:

"Admin.ppk"

If your client requires an OpenSSH format key, the default private key is:

"Admin_OpenSSH_private.key

5.1.11 User Functions

To add a user, click in the blank User Name box and begin editing the following data. The <tab> and <shift><tab> may be used to move forward and backward on the line and a <SpaceBar> will toggle the state of the check boxes.

All existing users will show up in the users grid. Any changes required may be made by selecting the box and typing or clicking in the box.

5.1.11.1 Username

The username must be provided, be at least 5 characters in length and cannot have any special characters.

5.1.11.2 Password

Must be at least 8 characters long and have at least one character from the following groups:

1) upper case letter
2) lower case letter
3) number
4) puncuation mark

5.1.11.3 User Privileges:

At least one of the user access rights must be selected. If any of the secure features are selected then a corresponding SSH public key must be provided.

Conceal Password – See Section 5.1.12.

Config - User will have permission to access the configuraton portion of the RTU web GUI application.

Display - User will have access to Display section.

Command - To grant access to the user to send commands from the GUI.

Up/Download - Grants access to the file upload/ Download section. Use this option to grant user the permission to make user, firmware and configuration updates.

Secure FTP - Needs SSH key - Secure Shell File Transfer Protocol. Also includes FTP privelages.

Secure shell - Needs SSH key - Secure Shell. Also includes Telnet privelages.

IED Tunnel - Needs SSH key - Secure Shell to SEL tunnel and Tunnel protocols.

Description – Required - use this field to add a description for the user.

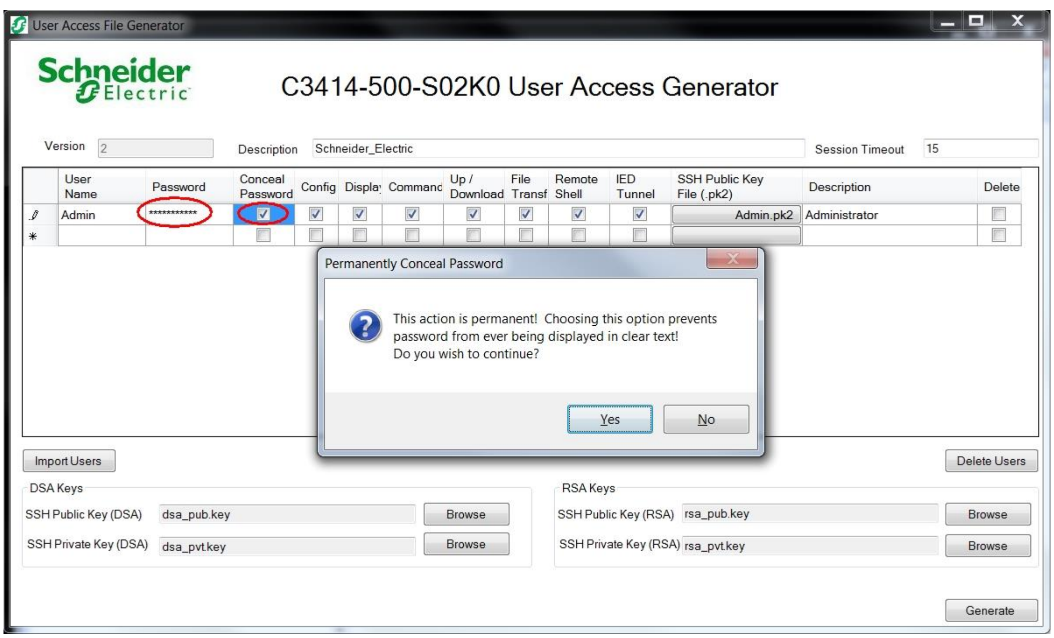
Delete - See Section 5.1.13.

5.1.12 Conceal Password

When entering or editing a password, it is diplayed in clear text until you tab over to the next field or select another field with the mouse and then it is displayed as a string of asterisks to hide it. However, selecting the password field

Generating a users update package with this box checked will prevent the user manager program from ever being able to display the user's password in clear text. Use this feature carefully as there is no way to recover a concealed password.

Figure 5-5. Conceal user's password from being displayed in clear text.



5.1.13 Delete Users

To delete users, select the check box for every user to be deleted and click on the Delete users button.

5.1.14 Generate

To Geneate a users update package click on the Generate button. The program will ask for a folder path to save the package files.

Figure 5-5 Generate Users File

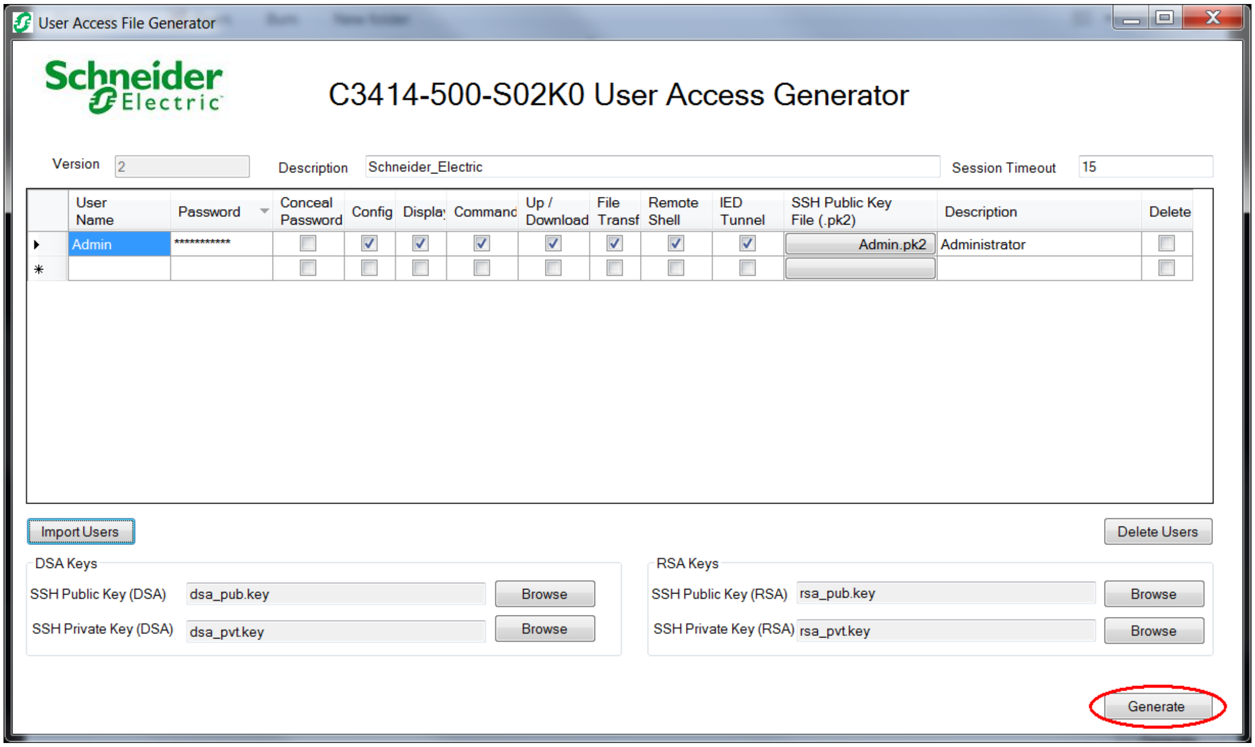


Figure 5-6 Navigate to Destination

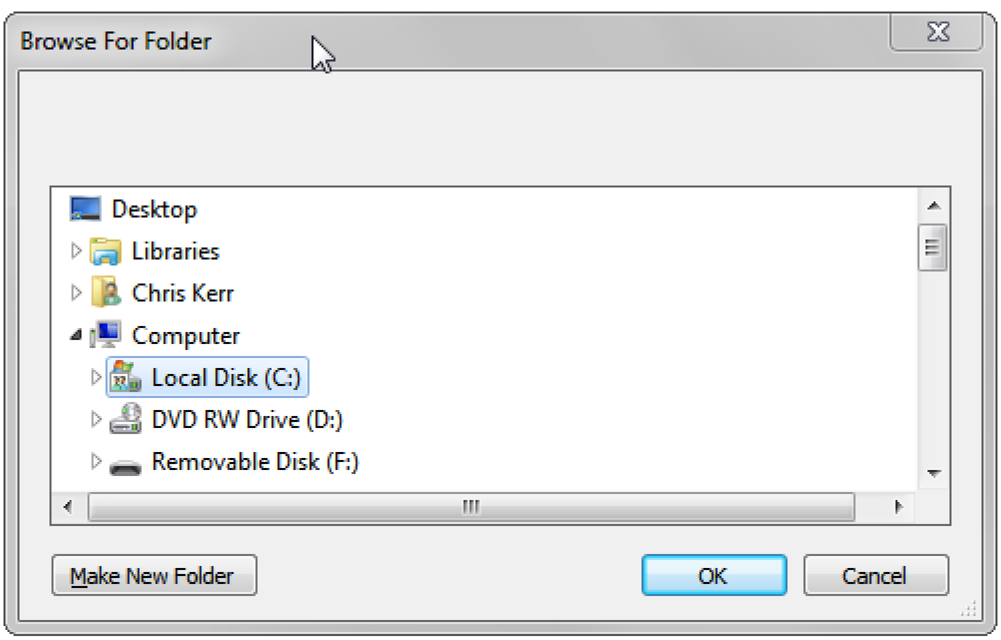
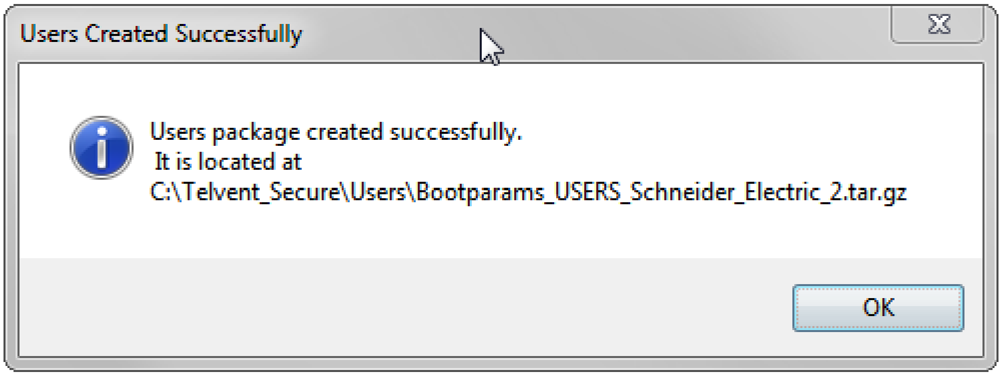


Figure 5-7 Package Successfully Created



5.1.15 Password recovery

If the generated files are archived, a lost user name or password may be retrieved from the archive if the password was not concealed. If the password was concealed, there is, unfortunately, no way to retreive it.

When the RTU is reset and allowed to boot up, a message is printed on the console in the start up process in the following format:

User Access File version: "Schneider_Electric_1"

This string is the <DESC> and <VER> of the file that is currently being used for accessing the RTU. With this information and the archived package file, the usernames and passwords can be retrieved.

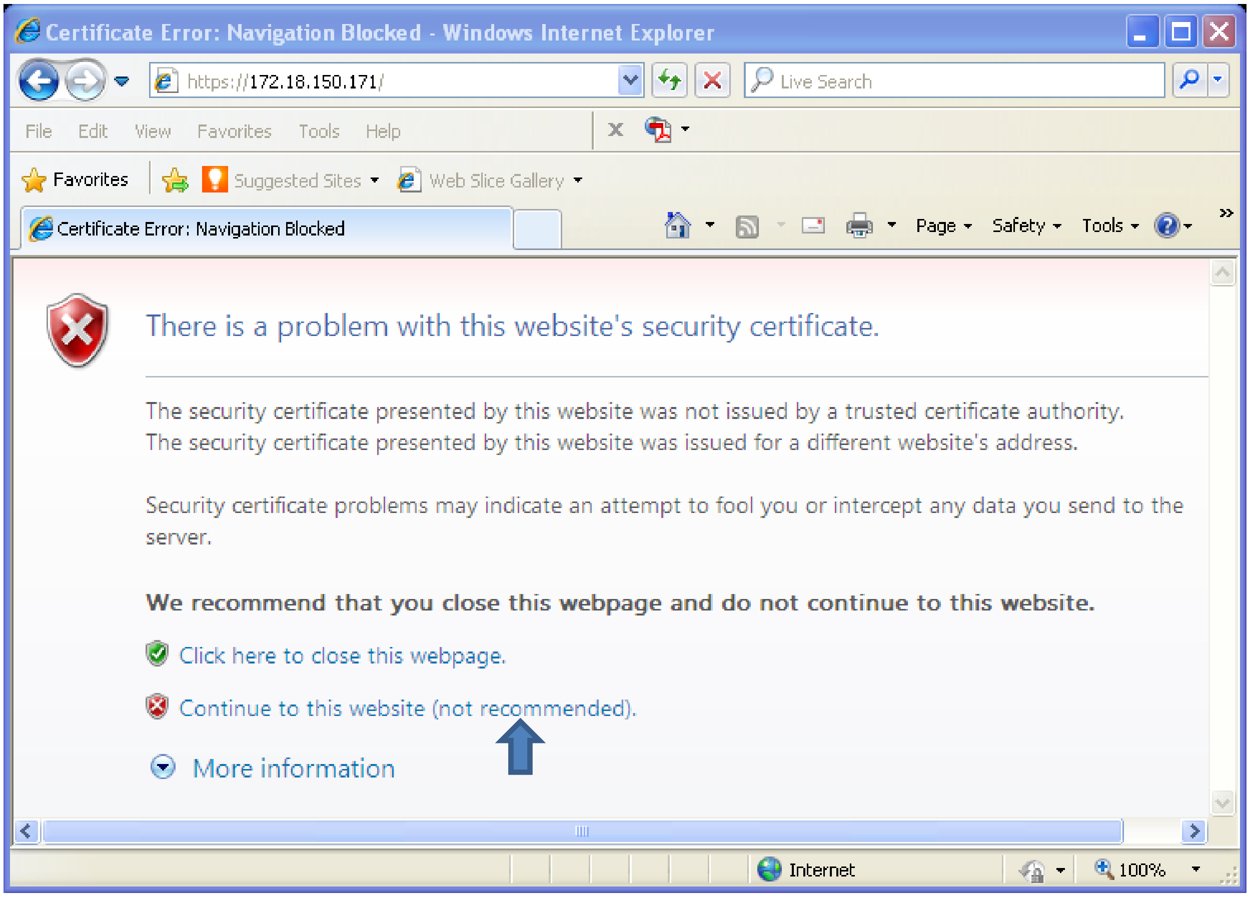
5.2 Logging In to the RTU

Note: The number of concurrent login sessions is limited to five (5). If multiple windows are needed to simultaneously view in Display mode the results of an action in, for instance, the Command mode, please see the "Multiple Window Technique" in the Configuration chapter.

Warning: Each concurrent login session must be logged out properly (i.e., if the browser is killed without logging out, the session will be active until the session times out).

Create an Explorer window and enter the RTU's IP address. If your system does not have certificates in place, you will get a window similar to Figure 5-8.

Figure 5-8 Internet Explorer Window With IP Address of RTU



Click on "Continue to this website (Not recommended)" as shown.

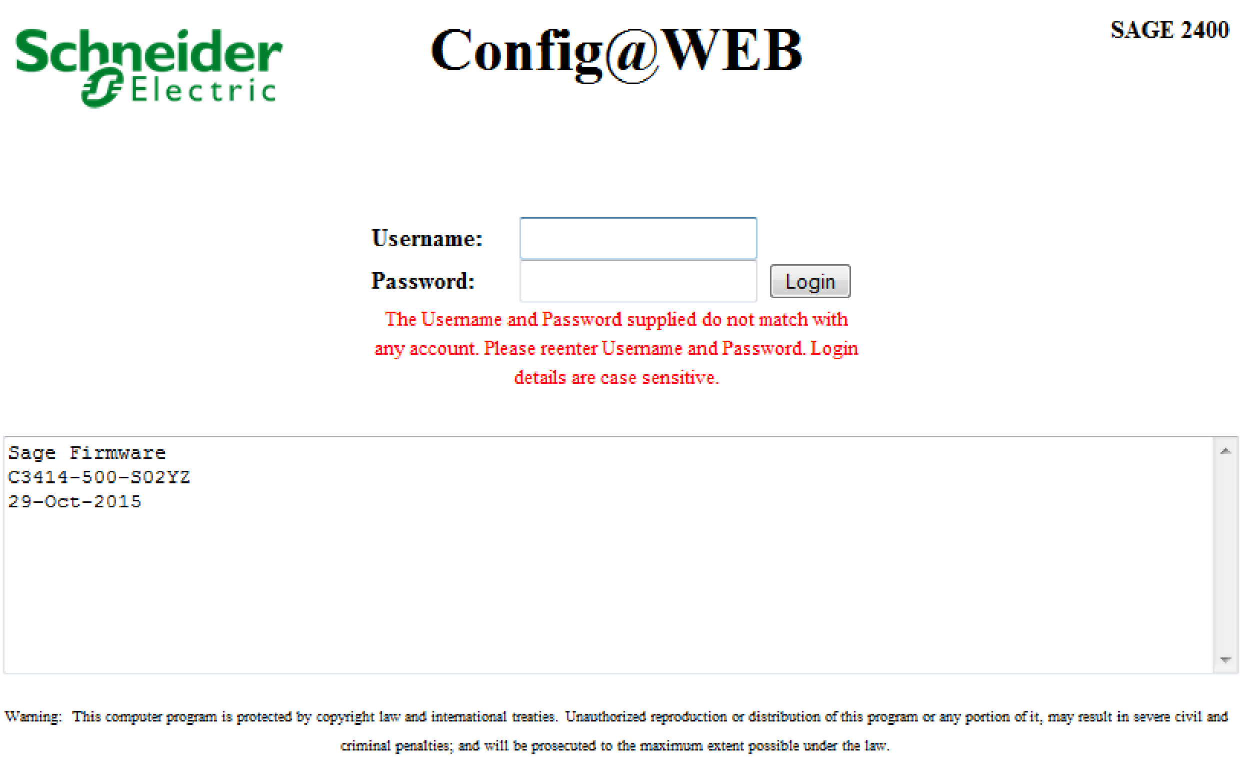
The address and certificate windows will be red tinted, if the system has no certificate.

The initial default setup is for a Username of "Admin" and a Password of "Telvent1!". Please note, the Username and Password fields are case sensitive. As the Administrator of the SAGE RTU, login using this Username and Password, as shown in Figure 5-9. Click Login.

Figure 5-9 Logging in

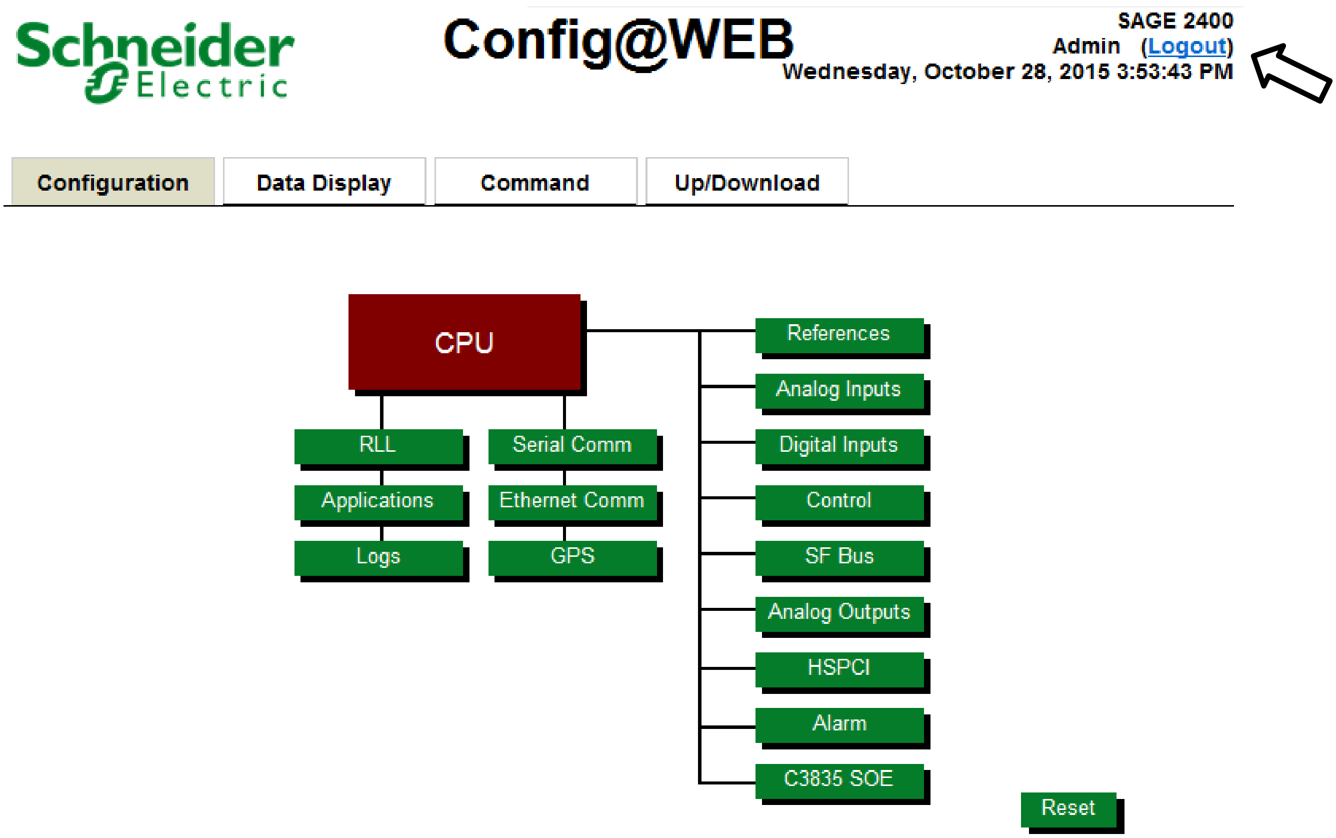
If you login incorrectly, you will get a screen as follows.

Figure 5-10 Screen for Incorrect Login



With the secure firmware, the Config@WEB interface has a new look; there is no Admin tab. The secure interface looks like Figure 5-11.

Figure 5-11 The Admin Screen

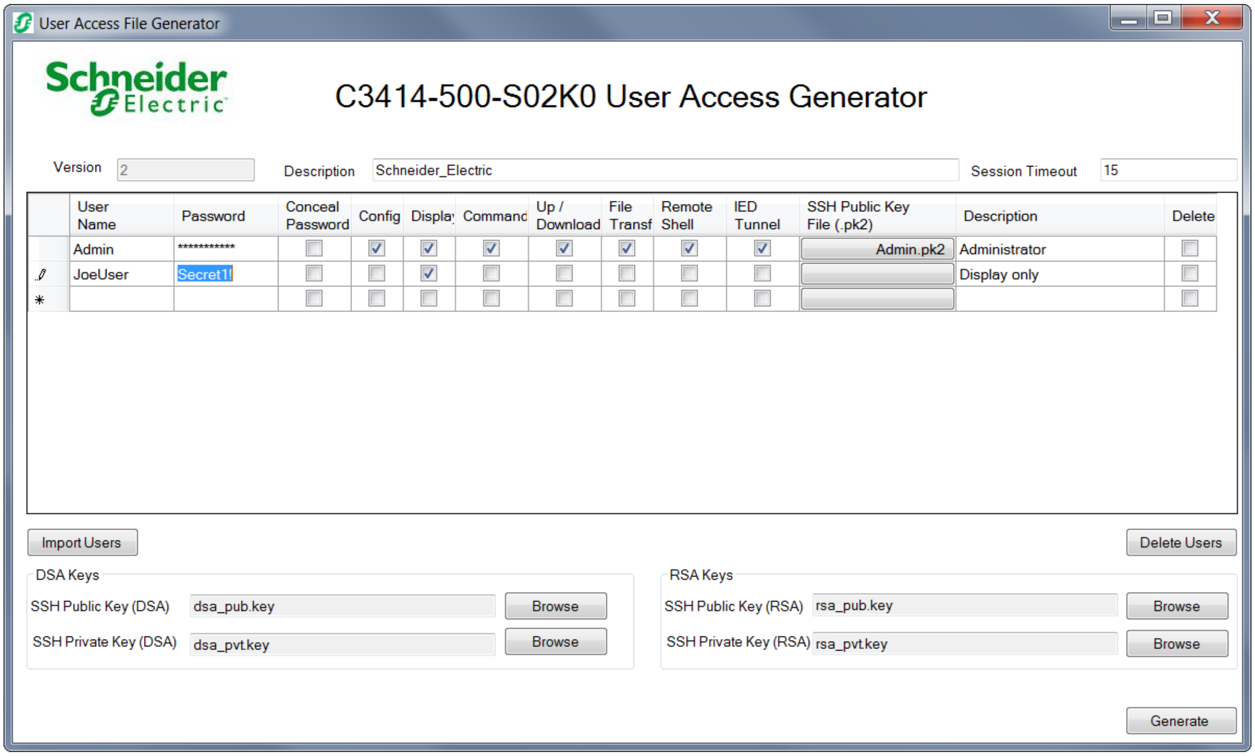


Notice also in the upper right corner of the page, there is additional information, what user is logged in, current date and time in the RTU, Sage RTU model that is connected, and the “Logout” link.

The following example demonstrates how the interface might look with a very limited privileges account:

If you create an account (see 5.1.11 User Functions) with a user name of JoeUser and a password of Secret1!, it would look like Figure 5-12 in the User Access Generator.

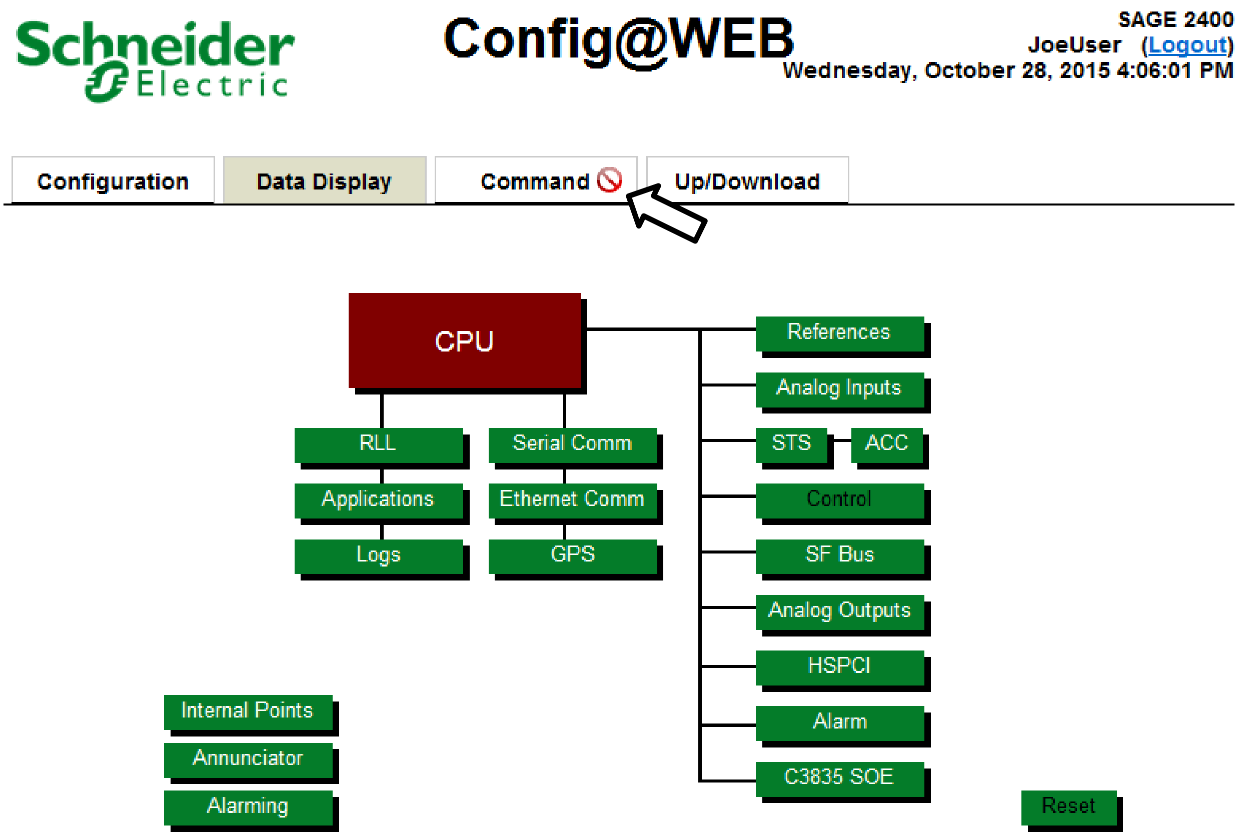
Figure 5-12 Joe User Account Creation



The new users file would have to be downloaded to the RTU under Up/Downlaod tab (see the Up-Download chapter for details).

When JoeUser logs in to the RTU, his only privilege would be Display, as shown in Figure 5-13. Moving the mouse onto any other tab results in showing the universal “NO” icon (red circle with slash), and nothing happening if the user clicks on anything but Data Display.

Figure 5-13 Joe User Login



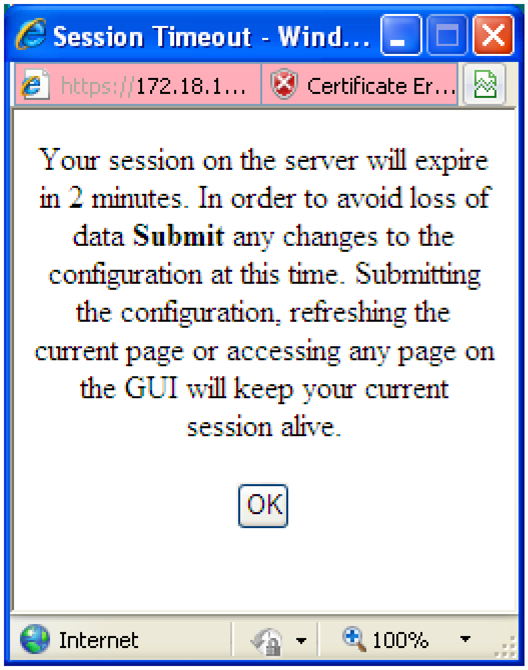
Session timeout is a security feature. If the user is not submitting a configuration, refreshing the current page, or accessing any page on the GUI during a login for the amount of time selected in the User Access Generator, the session will be automatically logged out.

Warning: If you are configuring points and the session times out, any configuration changes that have not been submitted will be lost. Be sure to submit all changes in a timely manner.

Two minutes before the session times out, you will get a warning message as shown below.

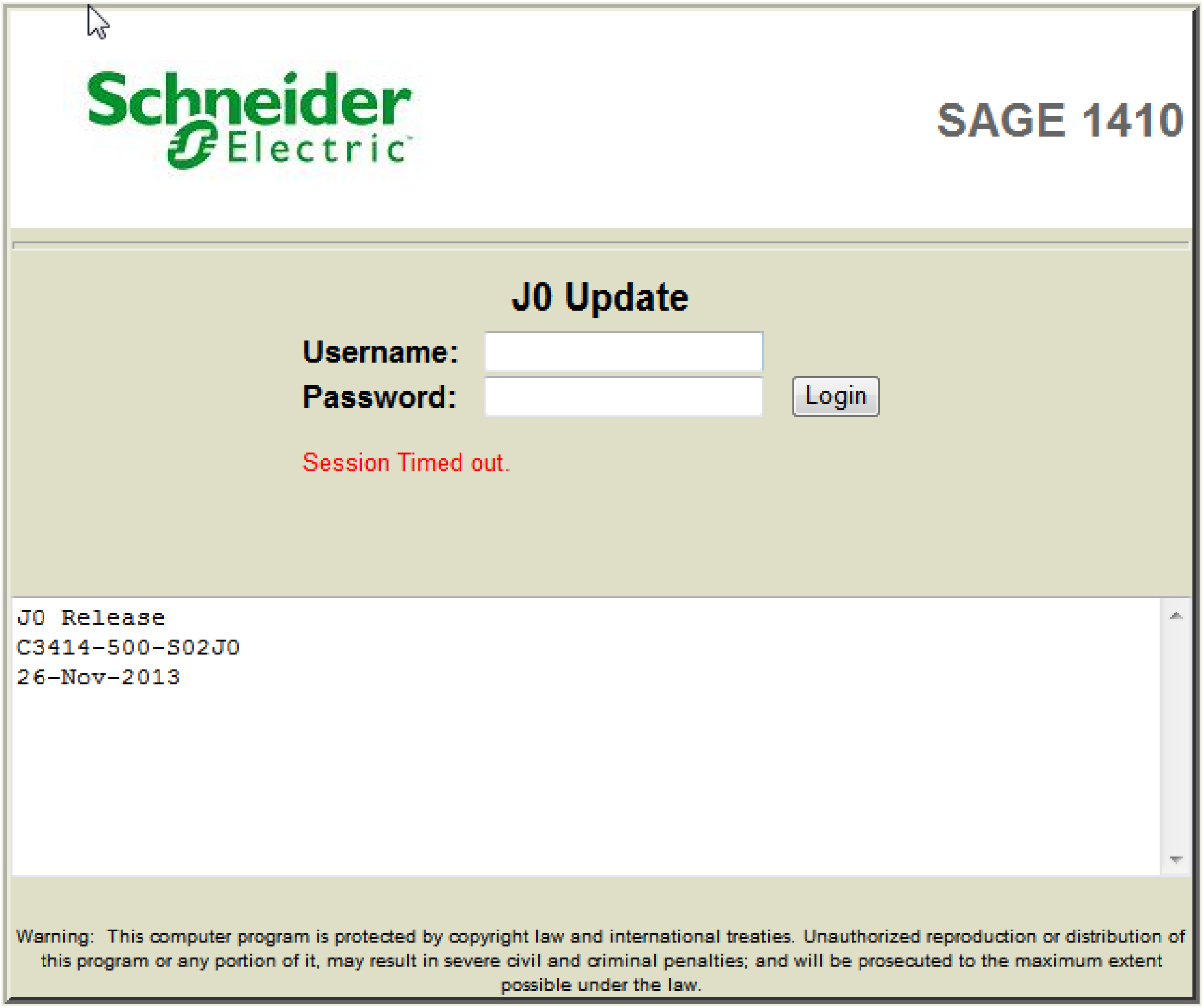
Note: If your computer is running software that blocks popups, the following Session Timeout message may not appear, although the session will still timeout at the correct time.

Figure 5-14 Session Timeout Warning Message



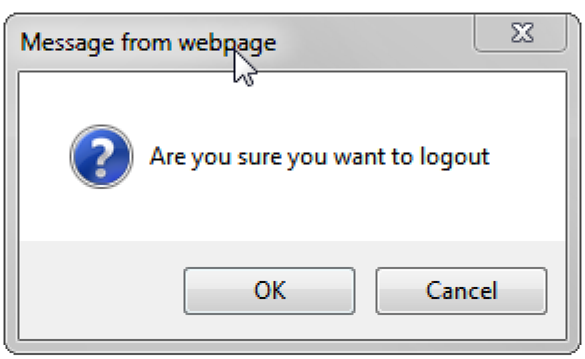
When a Session times out, the Login screen looks as shown below.

Figure 5-15 Timed Out Login



When you are ready to Logout, click the Logout button. You will get a warning window as shown below.

Figure 5-16 Logout Warning



When you click OK, you will be logged out.

6 Configuration Converter

Note: In the rest of this document, YZ is used to indicate a Version and Step of the C3414-500-S02YZ or -001YZ firmware. It may be just a letter (Y – first release version of the secure firmware is "H") and a number (Z – first release level of the secure firmware is "0"), but it may also have an appended patch level ("_P1" or "_2.2").

Note: Microsoft .Net framework 3.5 or later must be present on the client computer to use the Configuration Converter and User Manager programs.

6.1 Introduction

The configuration converter program is used to:

1. Modify an existing S02 configuration to the revision level indicated in the Configuration Converter program name. (Ex. Using the "C3414-500-S02K0 Configuration Converter" converts all S02 configuration packages to the K0 revision level)
2. Convert a G3 configuration to the S02 secure version

The configuration converter is used to update secure firmware (C3414-500-S02YZ) configuration packages that normally contain the following naming convention: (C3414-500-S02YZ_config.tar.gz).

This program uses as input an existing configuration package. This package may be either the baseline configuration package delivered with the Firmware Update package or an archived configuration package designed by the customer on an earlier firmware revision, depending on what desired output is.

The configuration package (C3414-500-S02YZ_config.tar.gz) generated by this program is what will be uploaded to the RTU using the Up-Download feature of the GUI (see the Up-Download chapter).

This configuration converter can update the following elements, and package those changes in C3414-500-S02YZ_config.tar.gz (to be sent to the RTU):

Elements relating to the RTU application:

1. Configuration – the XML configuration files for the application
2. Templates – IED configurations selected for reuse as the root for additional IEDs
3. ISaGRAF program – logic program to perform additional functions

Elements relating to the RTU operating system:

1. script files – optional Operating system commands
2. firewall rules – controls the built in firewall
3. IPsec Config – configuration files for IKE/IPsec
4. Boot Line – boot up and first Ethernet port configuration
5. Routing – network routing and the second Ethernet port configuration
6. SSL Key – the key used with HTTPS
7. SSL Certificate – the certificate used with HTTPS

6.2 Obtaining a Copy of this Program

This program is contained in the RTU update zip file (example: C3414-500-S02H1_Firmware_Update.zip) for every version of C3414-500-S02YZ. Make sure that you are running the version that is associated with the version of the firmware you are going to install.

The RTU Update package is available on the customer web site. If you need an account on the site, please contact RTU Customer Service so an account can be created for you.

The RTU update zip file also contains the older configuration programs needed to convert the older model RTU configurations to the format needed to use with this program.

Currently this page is located at:

https://infrastructurecommunity.schneider-electric.com/groups/rtu-downloads

6.3 Configuration Converter overview

The Configuration Converter utility is divided into two sections denoted by tabs on the main page labeled "Basic" and "Advanced". The basic configuration tab contains the items that are the most commonly modified elements when updating a configuration. The advanced configuration tab contains less commonly modified elements that deal with more technical features of the RTU firmware.

The following items (listed in the sub-headers) can be changed in the configuration package used in the RTU. The instructions describe what actions can be done to each of these items.

The following rules apply within the program:

1) The default for all "No Change"/"Replace" entries is "No Change".
2) The default for all "No Change"/"Delete"/"Add/Replace" entries is "No Change".
3) If the "Browse" option is not used, the existing data in the configuration file will be used.

6.3.1 Basic Configuration Tab

Note: If the configuration is from any firmware other than C3414-500-S02YZ, the configuration must be converted to the G3 revision level first, as shown in **Section 6.6** through **6.8**.

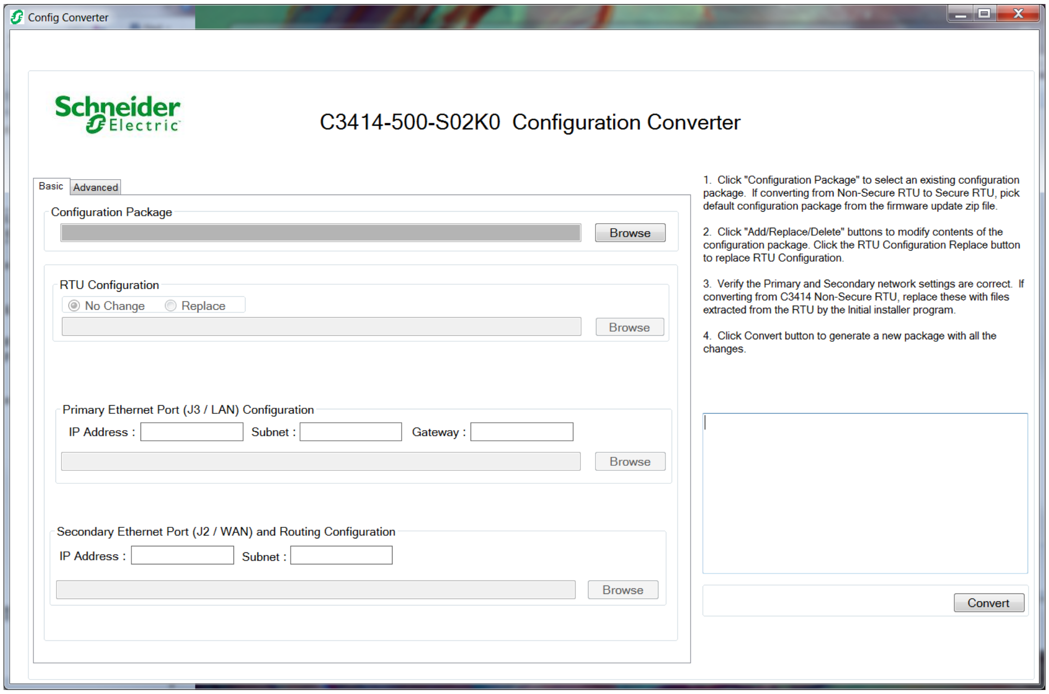


Figure 6-1 Basic Tab contents.

The items on this tab are the most commonly modified elements to an RTU configuration and can be one or several of the following:

- Earlier revision Configuration Package. (ex: Converting from J2 to K0)
- G3 Configuration XML files containing hardware I/O, protocol mappings, application setups, etc. that will be applied onto the default S02XY configuration package to create an S02XY version of the G3 configuration.
- IP addressing for the two Ethernet interfaces, default gateway assignment, and any routing table information to be folded into the output Configuration Package.

6.3.1.1 Configuration Package

This field is the primary input to the Configuration Converter and must be an S02 revision style configuration package with the naming convention XYZ**_Config.tar.gz**, where the XYZ portion of the filename can be whatever the user wishes to name it, but it must end with "**_Config.tar.gz**".

Click the Browse button to navigate to the configuration update package to be used as a starting point. This is the configuration package that will be modified and the final output will contain all modifications and additions or deletions to make it compatible with the firmware revision this package was delivered with.

6.3.1.2 RTU Configuration

This section is usually only modified when using the baseline S02 configuration as a starting point when converting an existing G3 configuration to run on the S02 revision level firmware.

6.3.1.3 Primary Ethernet Port (J3/LAN) Configuration

This section is filled in automatically when the Configuration Package is specified, but it may not contain the desired IP address, Subnet mask, and default gateway information for your installation. Enter in the correct IP and default gateway (if any) address and Subnet mask if desired to change these defaults from the specified Configuration Package. This information is stored in a file named "Bootline.xml" and contains other parameters that are best changed using the RTU console and GUI. A new "config" package can then be created using the GUI and saving a copy on the PC for archiving and later use.

In seldom cases, it is possible modify this information from another bootline file by clicking the Browse button and navigating to the bootline.xml file containing the desired information for this section.

If you have an existing "config" package, you most likely will never change this setting.

If you used the initial install tool to configure the RTU for C3414-500-S02YZ firmware operation from C3414-500-001YZ firmware, the file is located in the tree on your PC that you selected to store the converted configuration created during this process

If you started from any other set of firmware, the "bootline.xml" file already included in the package from the RTU update zip file will have to be used and the process described above used for the modification of the file followed.

6.3.1.4 Secondary Ethernet Port (J2/WAN) and Routing Configuration

This section is filled in automatically when the Configuration Package is specified, but it may not contain the desired IP address and Subnet mask for the secondary Ethernet interface. Enter in the correct IP address and Subnet mask if desired to change these defaults from the specified Configuration Package.

This information is stored in a file named "Ethernet.xml" that also contains routing table entries found in the Configuration Package (see section **6.3.1.1**). The routing table entries are not shown in the Configuration Converter program but they are included in the output Configuration Package so therefore we recommend that the parameters in the "ethernet.xml" file are best changed using the GUI or with the Offline Editing utility. A new "config" package can then be created using the GUI and saved to a PC for archiving and later use.

In seldom cases, it is possible modify this information from another Ethernet file by clicking the Browse button and navigating to the Ethernet.xml file containing the desired information for this section.

6.3.2 Advanced Configuration Tab

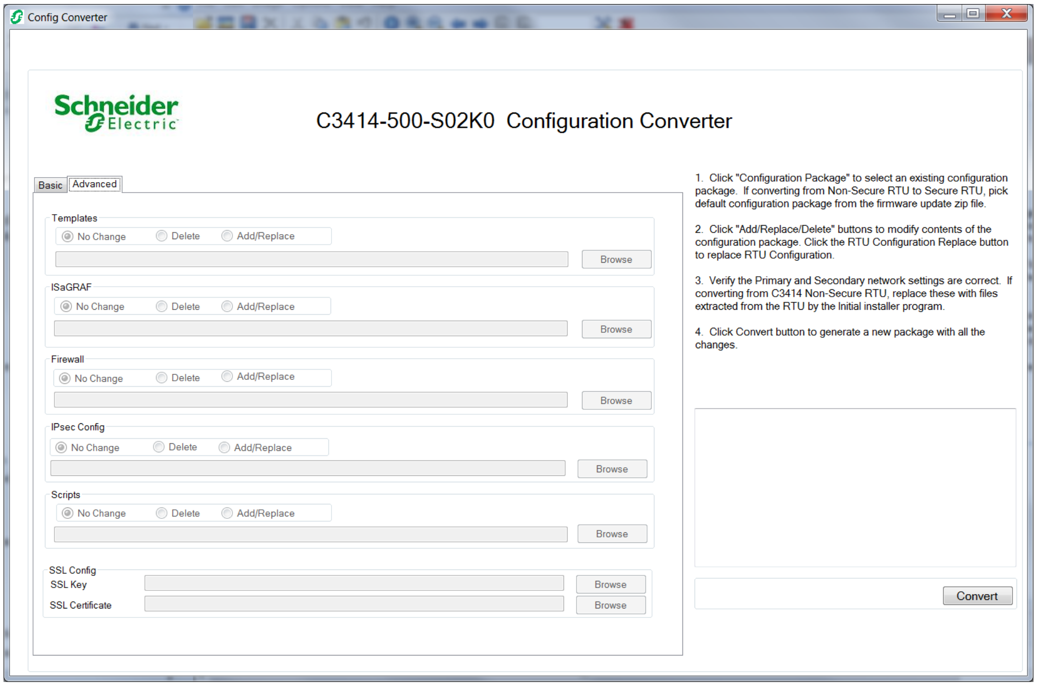


Figure 6-2 Advanced Tab contents.

6.3.2.1 Templates

The templates section is used to attach a new set of templates to or delete an existing set of templates from the Configuration Package specified in section 6.3.1.1.

Select from the following functions as required:

1. No Change – existing configuration is OK
2. Delete – Remove the current set of templates from the configuration
3. Replace – Replace the current set of templates in the configuration with a set from the folder that I browse to.

6.3.2.2 ISaGRAF

The ISaGRAF section is used to add a new, replace an existing, or to delete an existing ISaGRAF program from the Configuration Package specified in section 6.3.1.1.

Select from the following functions as required:

1. No Change – existing configuration is OK
2. Delete – Remove the current ISaGRAF program from the configuration
3. Add/Replace – Add or Replace the current ISaGRAF in the configuration with a ISaGRAF program from the folder that I browse to.

6.3.2.3 Firewall

Select from the following functions as required:

1. No Change – existing configuration is OK

2. Delete – Remove the current firewall configuration from the configuration
3. Replace – Replace the current firewall configuration with a new fw4.cfg file.

6.3.2.4 IPsec Config

The IPsec Config option allows the user to add a new configuration for the IKE/IPsec (VPN) to the Configuration Package specified in section 6.3.1.1. The folder that you browse to may also contain certificates and keys for use by IKE/IPsec.

6.3.2.5 Scripts

The scripts files may contain commands to be performed at two different points in the startup phase of the operating system and RTU application.

The two files that are supported are named startup.scp and vxworks_start.scp. Both must be in the same folder that is selected with the browse function. The default versions of these files perform no commands.

Select from the following functions as required:

4. No Change – existing configuration is OK
5. Delete – Remove the current set of templates from the configuration
6. Replace – Replace the current set of templates in the configuration with a set from the folder that I browse to.

6.3.2.6 SSL Key

The file name required for this item is “server.key”.

If you are going to use the default SSL Key provided with the RTU firmware, there is nothing to do.

If you are going to run the C3414-500-S02YZ firmware in the most secure mode, you will replace the SSL KEY with an SSL key specific to this RTU, generated by an external program. You will have to Browse to where this file is stored and select the file for inclusion in the package. See the document "**Config@WEB Key & Certificate Generation**.PDF" for additional information about how to build the SSL Key.

6.3.2.7 SSL Certificate

The file name required for this item is “server.crt”.

If you are going to use the default SSL Certificate provided with the RTU firmware, there is nothing to do.

If you are going to run the C3414-500-S02YZ firmware in the most secure mode, you will replace the SSL Certificate with a SSL certificate specific to this RTU, generated by an external program. You will have to Browse to where this file is stored and select the file for inclusion in the package. See the document "**Config@WEB Key & Certificate Generation**.PDF" for additional information about how to build the SSL Certificate.

6.4 Conversion Summary

Previous models of the SAGE RTU family may be updated to the C3414-500-S02YZ firmware by using a series of programs to update the existing configurations.

Section 6.5 provide instructions on how to convert from S02 to S02 (update an existing S02 configuration or convert to a newer version) and **Sections 6.6** through **6.8** provide the instructions on how to use older configuration converter programs to convert the existing configuration to a format compatible with this program. Once you have performed the steps to update the configuration, the process is the same as if you were upgrading from a RTU running the C3414-500-001YZ firmware.

To check the firmware number of your RTU, look at the CPU block in the GUI under RTU Information, as shown in Figure 6-3 Firmware Identity (Example).

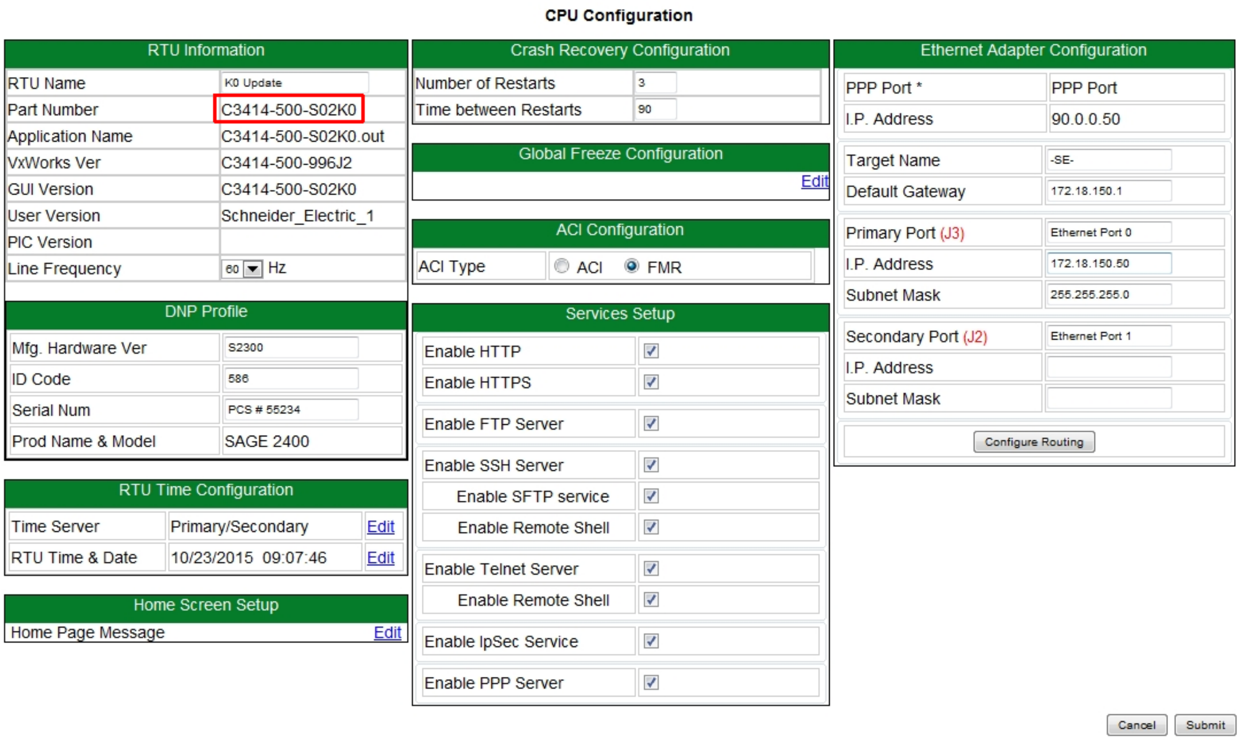


Figure 6-3 Firmware Identity (Example)

If you are already using C3414-500-S02YZ firmware, go to the following section:

6.5 Converting From existing S02 to Same or Newer Version of S02

These sections describe how to convert existing configurations to the C3414-500-001G3 needed with use with the S02 Config Converter program.

6.6 Converting From C3414-500-001YZ to G3

6.7 Converting From C3413-500-001YZ to G3

6.8 Converting From S2200-500-001YZ to G3

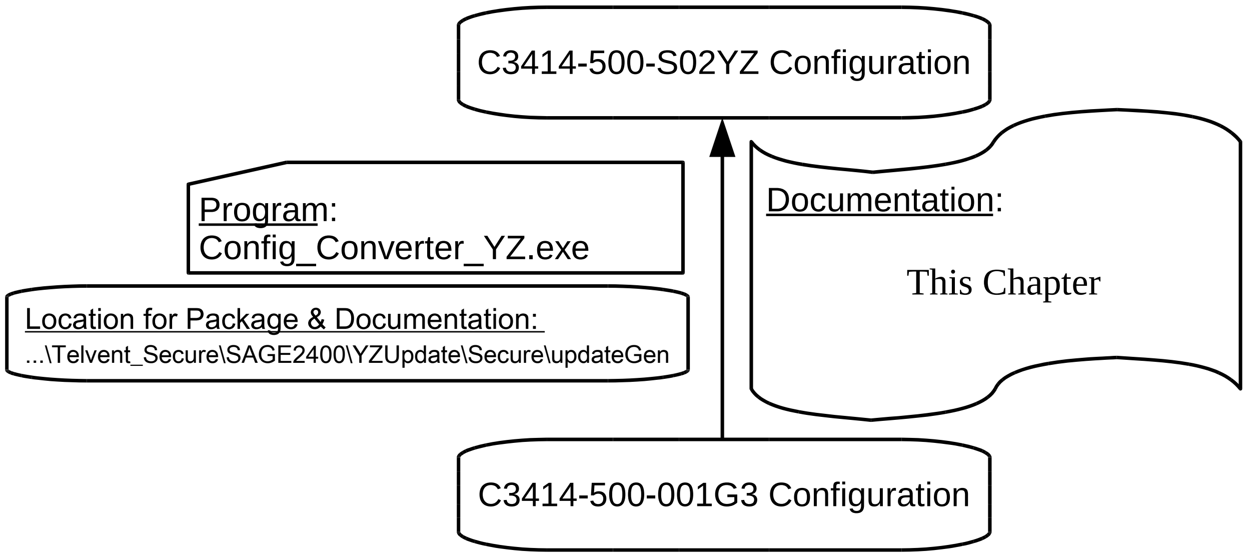


Figure 6-4 Converting From Non-S02 to S02

6.5 Converting From existing S02 to Same or Newer Version of S02

To convert an RTU running C3414-500-S02YZ to the same or newer version of firmware:

1. Use the existing "C3414-500-S02YZ_Config.tar.gz" from the currently running set of firmware in the RTU as the "Configuration" file parameter.
2. Select "No Change" for the "Add/Replace/Delete Configuration".

Proceed to **Section 6.9**.

6.6 Converting From C3414-500-001YZ to G3

Note: This conversion process need be done only once. See **Section 6.5** for the process of updating secure firmware to newer secure firmware.

Note: You will need two packages from the Customer Website: The C3414-500-S02YZ_Firmware_Update.zip, and the YZ_Initial_Install.zip.

The following is how to convert configurations for **SAGE 3030M, SAGE 2400, SAGE 1450, SAGE 1430, SAGE 1410 or LANDAC II** using C3414-500-001YZ firmware to C3414-500-S02YZ firmware.

6.6.1 Config@WEB S02 Initial Install

To condition the compact flash in the C3414 CPU card for use with the C3414-500-S02YZ firmware, you must run the initial installer. Follow the directions contained in the "Config@WEB S02 Initial Install.PDF" document. See Figure 6-5.

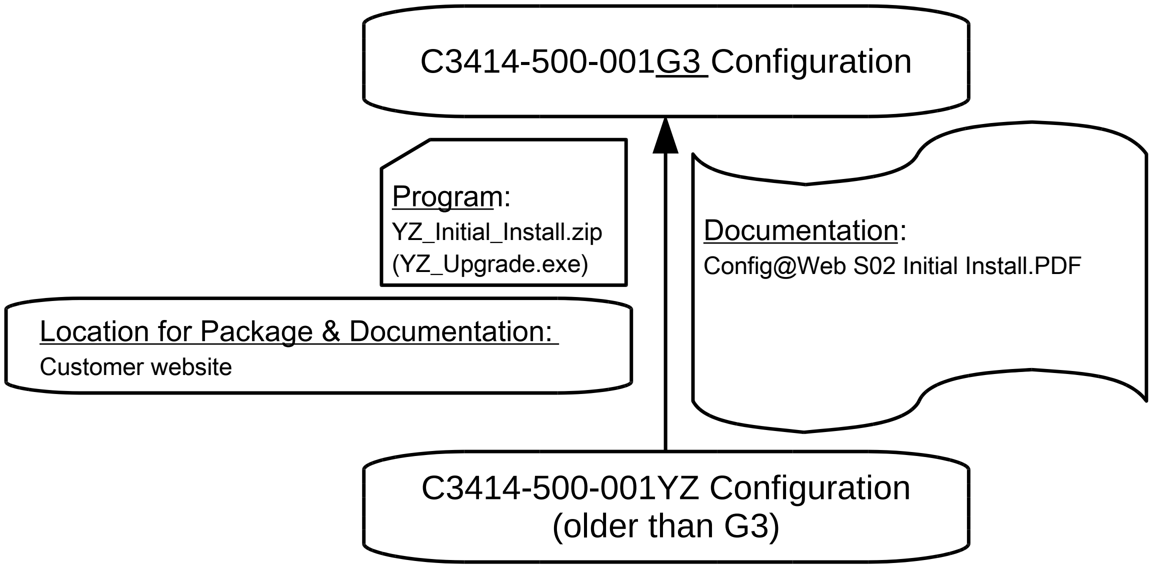


Figure 6-5 Convert From C3414-500-001YZ to G3

You will use the following steps when you start the Config Converter.exe, so mark this page because the specific steps are different depending on which version of firmware was your starting point.

1. Use the firmware update package file: "…\Telvent_Secure\SAGE2400YZUpdate\C3414-500-S02YZ_Config.tar.gz" as the "Configuration/Configuration" file parameter.
2. "Replace" the "Add/Replace/Delete Configuration" with the saved configuration from the Initial Install program.
3. Replace the Boot Line by use of the Browse function to the bootline.xml file created by the Initial Install program.

Proceed to **Section 6.9.**

6.7 Converting From C3413-500-001YZ to G3

Note: This conversion process need be done only once. See **Section 6.5** for the much simpler process of updating secure firmware to newer secure firmware.

Note: You will need the C3414-500-S02YZ_Firmware_Update.zip from the Customer Website.

The following is how to convert configurations for **SAGE 3030, SAGE 2300, SAGE 1350, SAGE 1330 or SAGE 1310** using C3413-500-001YZ firmware to C3414-500-S02YZ firmware.

6.7.1 Config@WEB C3414 RTU Update

Follow the directions contained in the "Config@WEB C3414 RTU Update V2.4.PDF" document. See Figure 6-6.

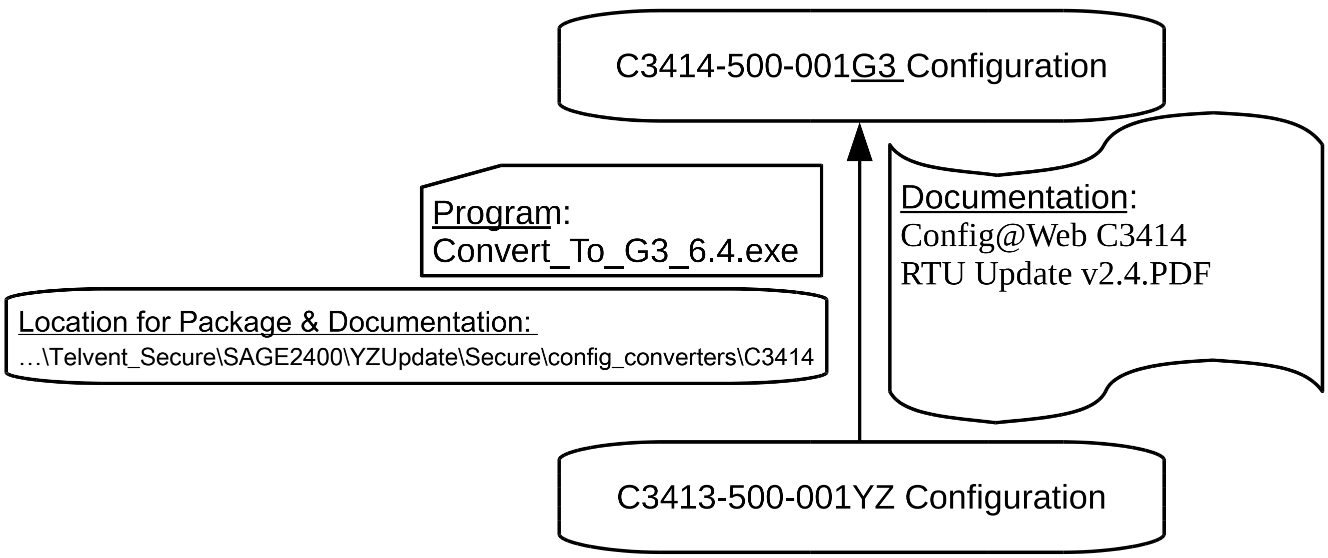


Figure 6-6 Convert From C3413-500-001YZ to G3

You will use the following steps when you start the Config Converter.exe, so mark this page because the specific steps are different depending on which version of firmware was your starting point.

1. Use the firmware update package file: "…\Telvent_Secure\SAGE2400YZUpdate\C3414-500-S02YZ_Config.tar.gz" as the "Configuration/Configuration" file parameter.
2. "Replace" the "Add/Replace/Delete Configuration" with the saved configuration.

Proceed to **Section 6.9**.

6.8 Converting From S2200-500-001YZ to G3

Note: This conversion process need be done only once. See **Section 6.5** for the much simpler process of updating secure firmware to newer secure firmware.

Note: You will need the C3414-500-S02H1_Firmware_Update.zip from the Customer Website.

The following is how to convert configurations for **SAGE 2200, SAGE 1250, SAGE 1230 or SAGE 1210** using SX2XX-500-001YZ firmware to C3414-500-S02YZ firmware. The first set of firmware that is possible to use with this process is SX2XX-500-001A5. All firmware sets after this version can be used with this process.

6.8.1 Config@WEB RTU Update

Do this first, if needed. If starting from any firmware except S2200-500-001 B6_P3 Firmware, follow instructions in Config@WEB RTU Update.PDF document. See Figure 6-7. If this step is not needed, skip to the next section.

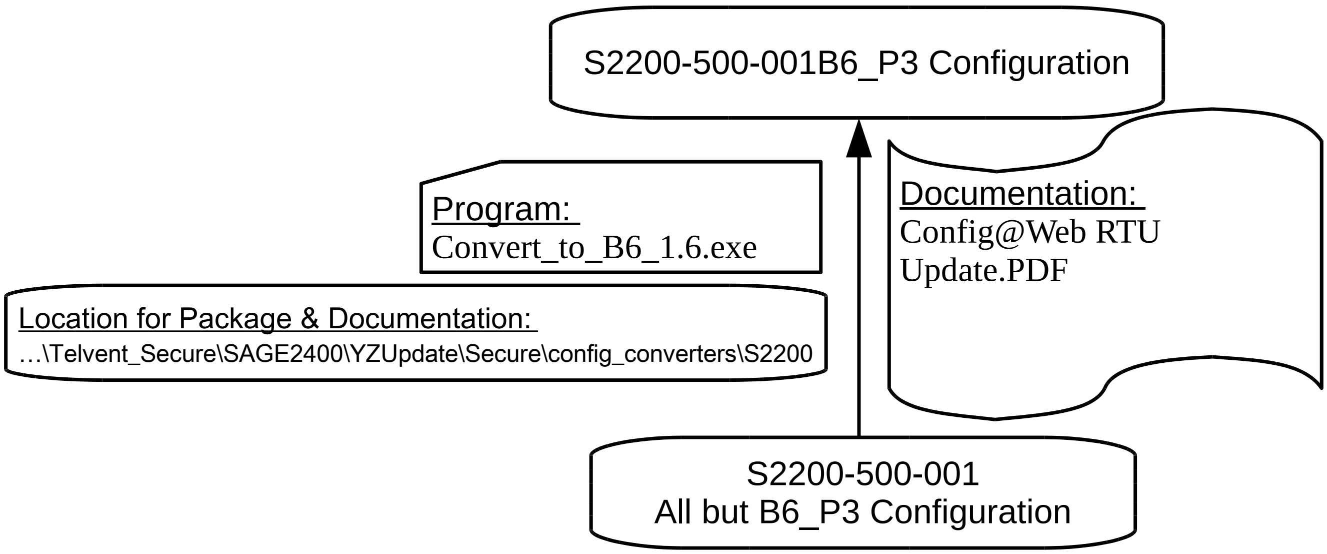


Figure 6-7 Convert From All But S2200-500-001B6_P3 to B6_P3.

6.8.2 Config@WEB C3414 RTU Update

Do this **second (or first, if previous section was not needed)**. If starting from S2200-500-001 B6_P3 Firmware, follow the instructions in “Config@WEB C3414 RTU Update V2.4.PDF” document. See Figure 6-8.

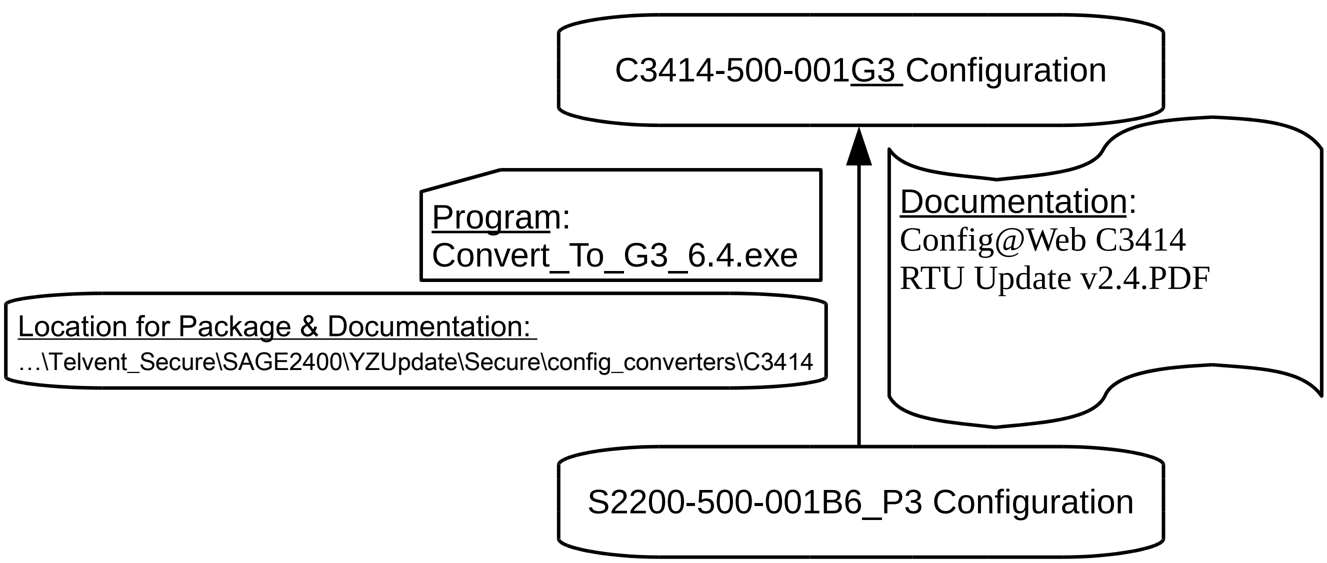


Figure 6-8 Convert From S2200-500-001B6_P3 to G3.

You will use the following steps when you start the Config Converter.exe, so mark this page because the specific steps are different depending on which version of firmware was your starting point.

1. Use the firmware update package file: "…\Telvent_Secure\SAGE2400YZUpdate\C3414-500-S02YZ_Config.tar.gz" as the "Configuration/Configuration" file parameter.
2. "Replace" the "Add/Replace/Delete Configuration" with the saved configuration.

Proceed to **Section 6.9**.

6.9 Launching the Configuration Converter

Launch the Configuration Converter program by double-clicking the Config_Converter_WX_y.z.exe program icon. (WX and y.z are revision numbers)

Note: To reduce the program size of the Configuration Converter in the update package, the program is contained as a WinZip self-extracting file.

The following steps are used with the C3414-500-S02YZ Configuration Converter to convert configurations from existing RTUs to the configuration file needed for the C3414-500-S02YZ firmware.

The default for all "No Change"/"Replace" entries is "No Change".

The default for all "No Change"/"Delete"/"Add/Replace" entries is "No Change".

If the "Browse" option is not used for the other options, the existing data in the configuration file will be used.

6.9.1 Start the Config Converter

Start the Config Converter. To launch this program, you must have acquired a copy of the file C3414-500-S02YZ_Firmware_Update.zip" and unzipped it onto your PC.

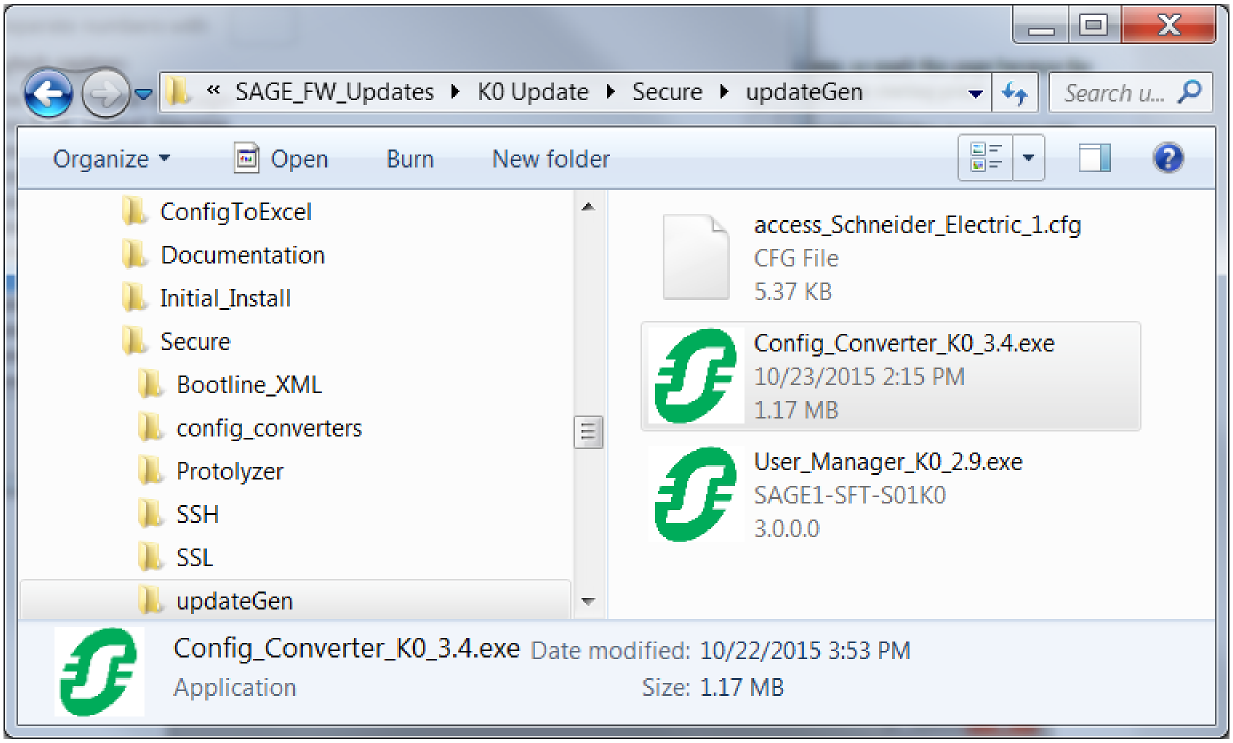


Figure 6-9 Navigate to Configuration Converter.

Once you have done this, navigate to the following location on your PC:

"…\Telvent_Secure\SAGE2400\YZUpdate\Secure\updateGen"

Select the file:

"Config_ConverterYZ.exe" (as shown above)

and click once or twice to launch the program.

A popup will appear on the display as follows:

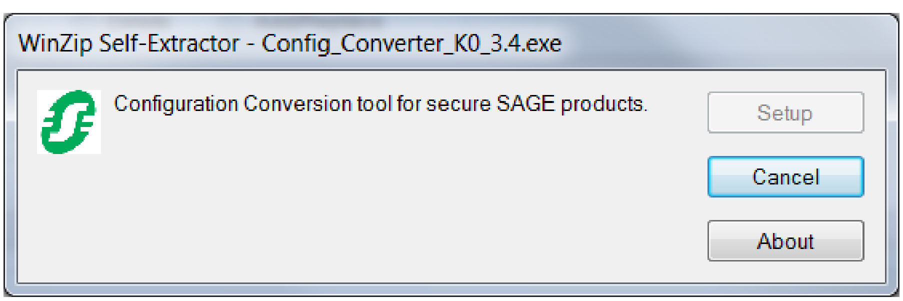


Figure 6-10 Starting the Program.

You can click “Setup” to start the program, “Cancel” to abort the program or “About” for information about the program.

When you click “Setup”, you will get the following display:

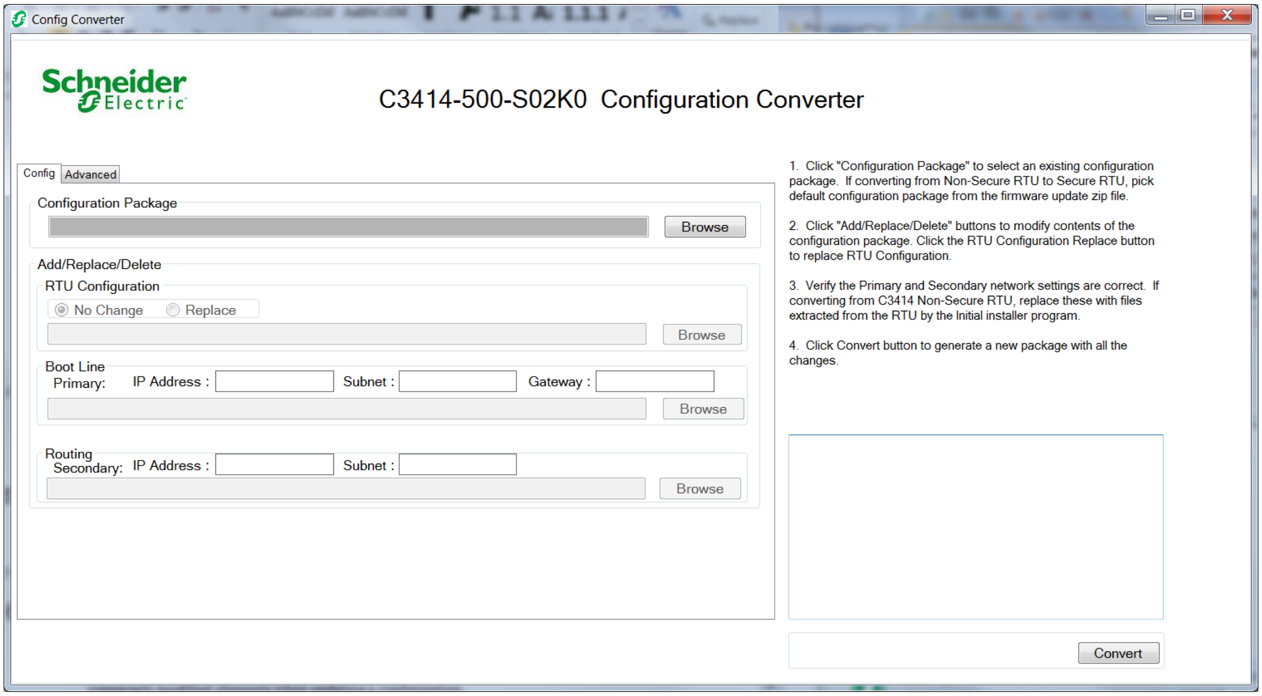


Figure 6-11 Configuration Converter.

6.9.2 Selecting the Configuration Package

Use the Configuration file that was determined with Step 1 in **Sections 6.5** through **6.8** as the “Configuration Package” file parameter.

The “Configuration Package” field is used to select the existing file to use with the tool.

Click the “Browse” button and navigate to an existing configuration package and click the file to select, then click “open”.

For the initial or to revert to a baseline configuration for the RTU, navigate to:

“…\SAGE_FW_Updates\YZ_Update”

and select:

“C3414-500-S02YZ_config.tar.gz”.

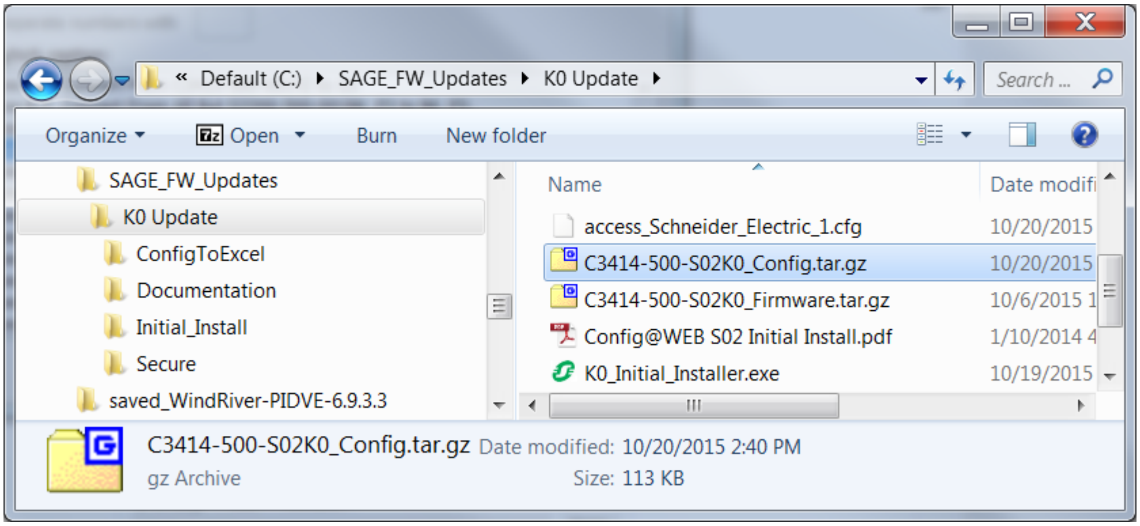


Figure 6-12 Reverting to Baseline Configuration.

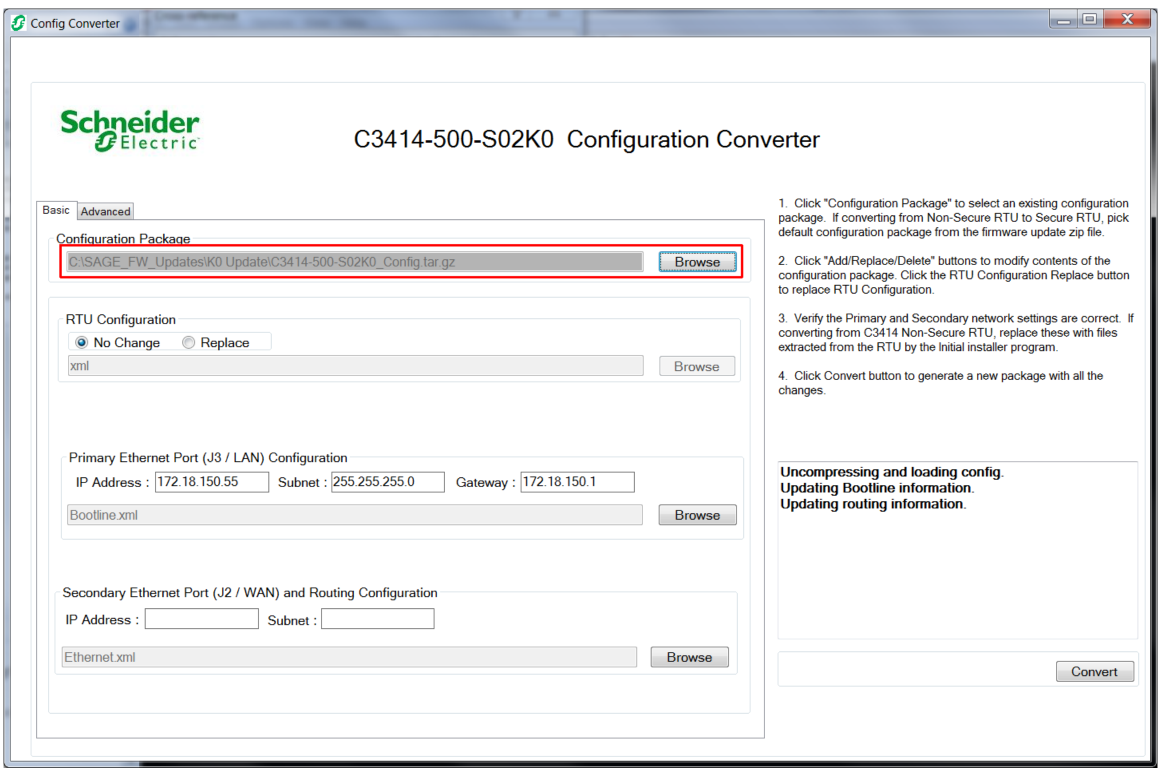


Figure 6-13 Configuration Package selected.

Now you are ready to Add/Replace/Delete components of the configuration package using the Add/Replace/Delete options for the items.

Please see the configuration section below for information on how to use these features.

6.9.3 Specifying the RTU Configuration

Use the "No Change" or "Replace" option that was determined with Step 2 in **Sections 6.5** through **6.8.**

If "Replace" is the option selected, browse to the new RTU configuration. This will be an XML folder.

6.9.4 ISaGRAF

Optionally “Add/Replace” or "Delete" the “ISaGRAF” as needed. If "Add/Replace" is the option selected, browse to the new ISaGRAF configuration.

6.9.5 Templates

Optionally “Add/Replace” or "Delete" the “Templates” as needed. If "Add/Replace" is the option selected, browse to the new Templates configuration.

6.9.6 Scripts

Optionally “Add/Replace” or "Delete" the “Scripts” as needed. If "Add/Replace" is the option selected, browse to the new Scripts configuration.

6.9.7 Firewall

Optionally “Add/Replace” or "Delete" the “Firewall” as needed. . If "Add/Replace" is the option selected, browse to the new Firewall configuration.

6.9.8 IPSec Config

Optionally “Add/Replace” or "Delete" the “IPsec Config” as needed. . If "Add/Replace" is the option selected, browse to the new IPsec Config configuration.

6.9.9 Boot Line

Optionally “Browse” to a folder and select a “bootline.xml” file and the IP address of the resulting “Convert” configuration file will be the same as in the selected file. If a bootline.xml file is not selected, the IP address will be 192.168.1.1 in the resulting “Convert” configuration file.

6.9.10 Routing

Optionally “Browse” to a new “Ethernet.xml” file for the “Routing Secondary” data for the RTU. If this is done, the IP address Secondary Ethernet of the resulting “Convert” configuration file will be the address in the selected file.

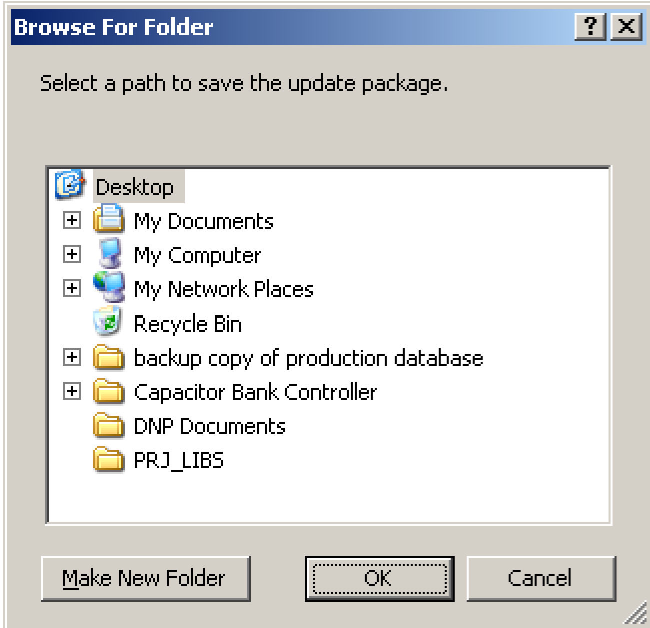
6.9.11 SSL Config

Optionally “Browse” to a folder and select a new “SSL Key”.

Optionally “Browse” to a folder and select a new "SSL Certificate”.

6.10 Convert Command

When you are finished with the modifications to the items in the Config Converter, click the “Convert” button. When the program has performed the operations needed, it will prompt you for the location of where to store the new “config” file.



The status of the conversion and the storage location of the output file is displayed on the right side of the display.

At this time, you can browse for a new configuration or terminate the program.

6.11 Terminating the Program

To terminate the program, click the "x" in the upper right corner of the Config Converter display. Any changes made since the last "Convert" will be lost when the program is terminated.

7 Up/Download

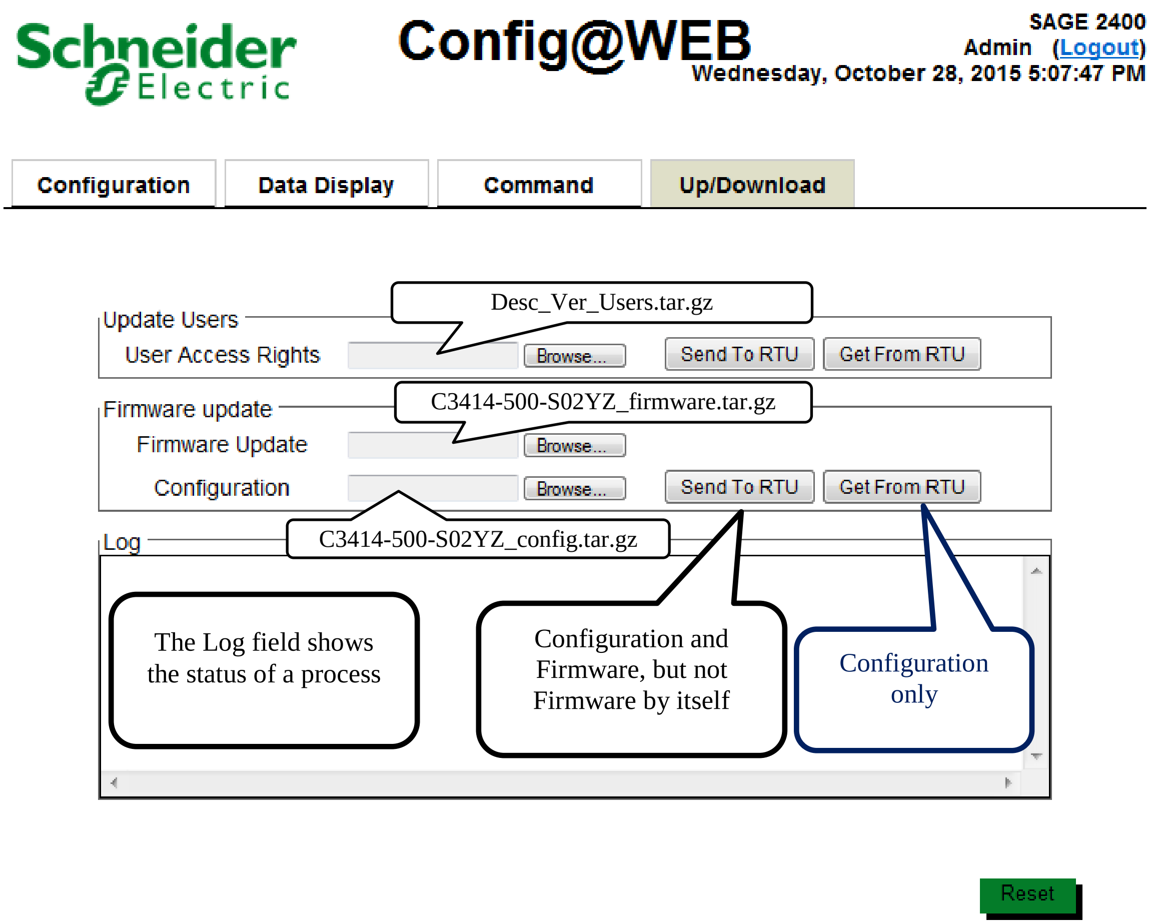
7.1 Up/Download Tab

The Up/Download function is used to update firmware and save and/or reload user configurations. Additionally, the administrator uses the Up/Download feature to set user privileges. Three files that represent the three functions control how the RTU behaves.

Because Up/Download is so critical to the ongoing mission of the RTU, the user and/or administrator should have a policy for storage of the three types of files represented by the three browse windows in the figure below. For instance, they could all be stored in the same folder that identifies the particular RTU. The particular policy, of course, is the responsibility of the administrator/user.

The rules for the new Up/Download page are as follows:

Figure 7-1 Upload/Download Screen



The functions allowed are:

7.2 Get From RTU Functions

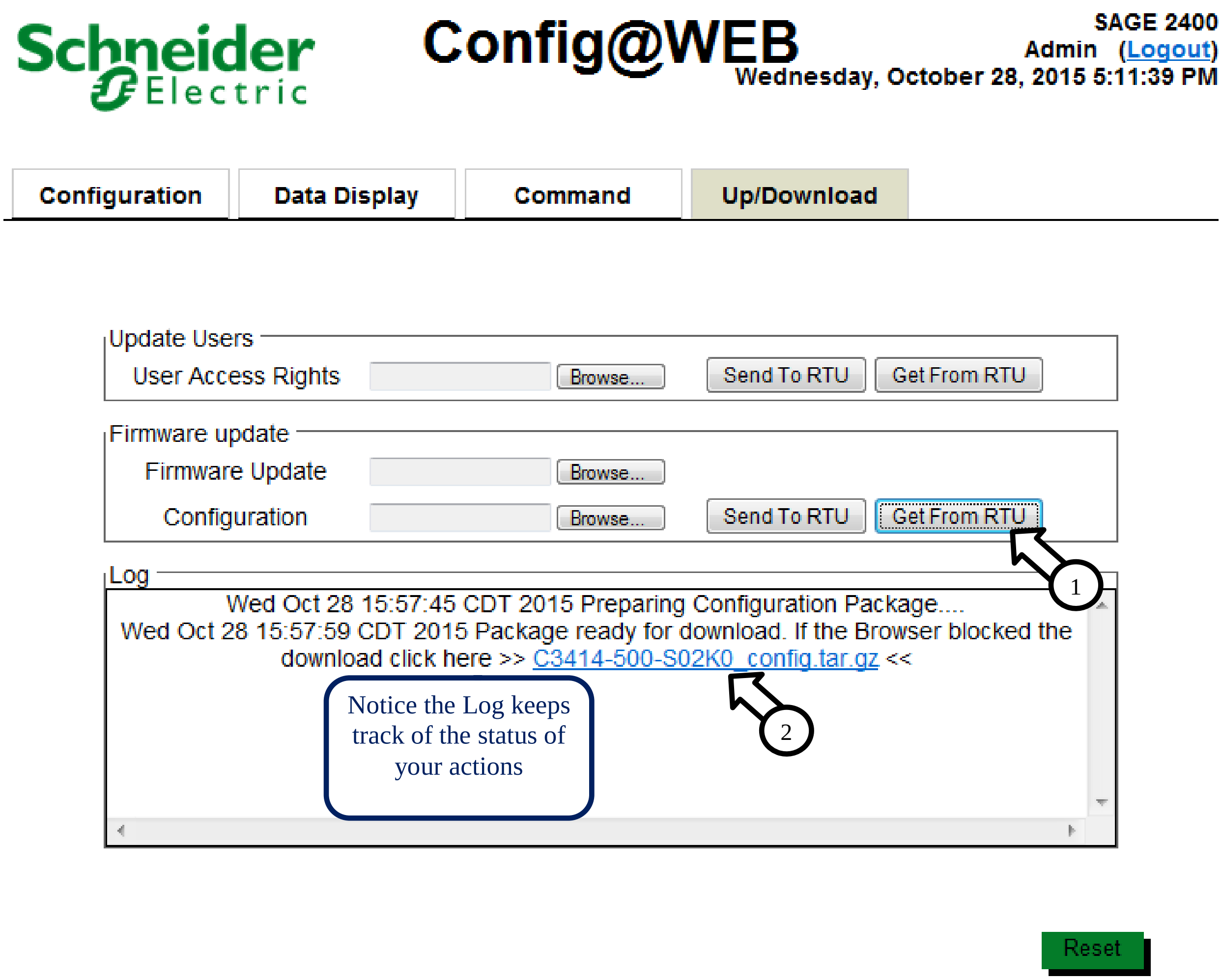
The Get from RTU functions are used to get updated configuration information from the RTU.

There are two packages involved in this process.

1. User Information –Desc_Ver_Users.tar.gz
2. Configuration – C3414-500-S02YZ_config.tar.gz

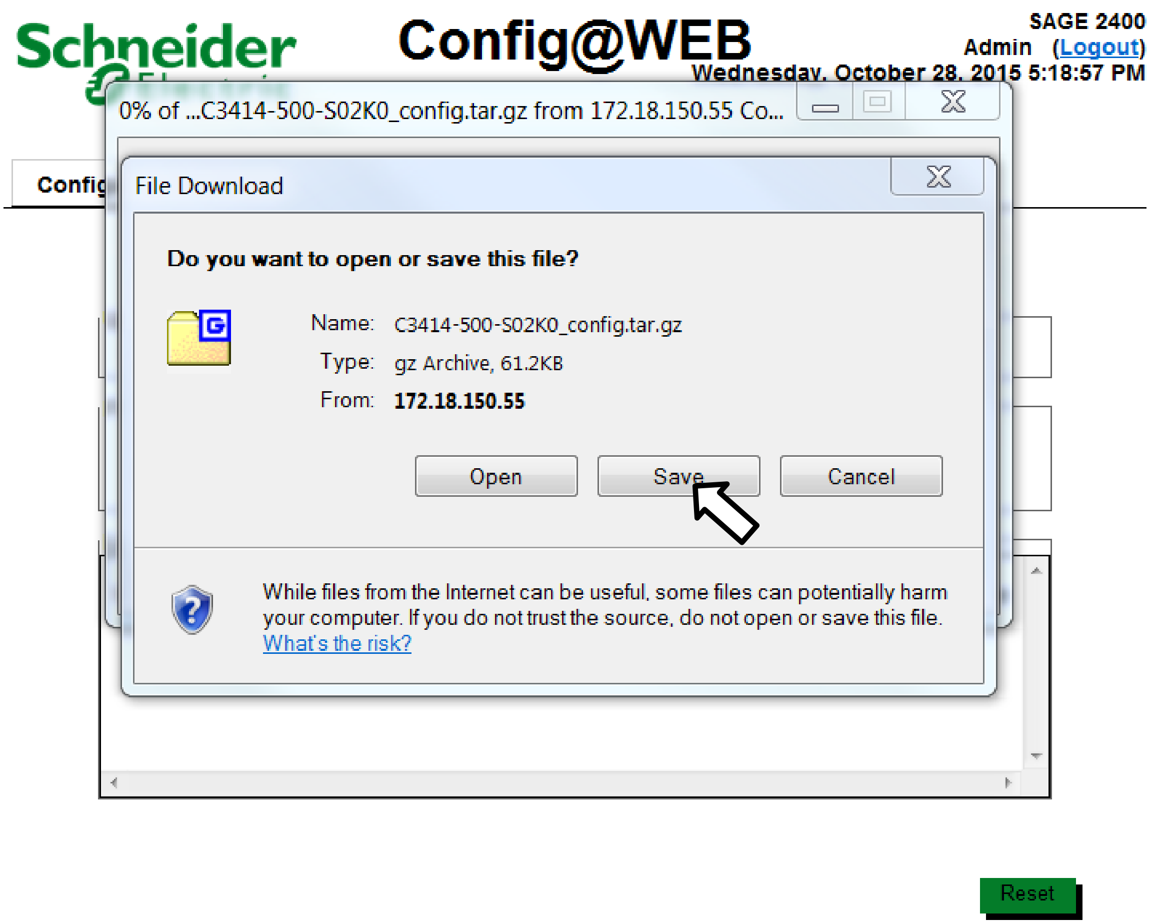
Let's go through an example of Get from RTU for Configuration. 1) Click on the Get From RTU button as shown below. If your site does not have a certificate, you will get a warning under the toolbar. You will also see a message under the Log window to click on the 2) Do so.

Figure 7-2 Get Configuration From RTU



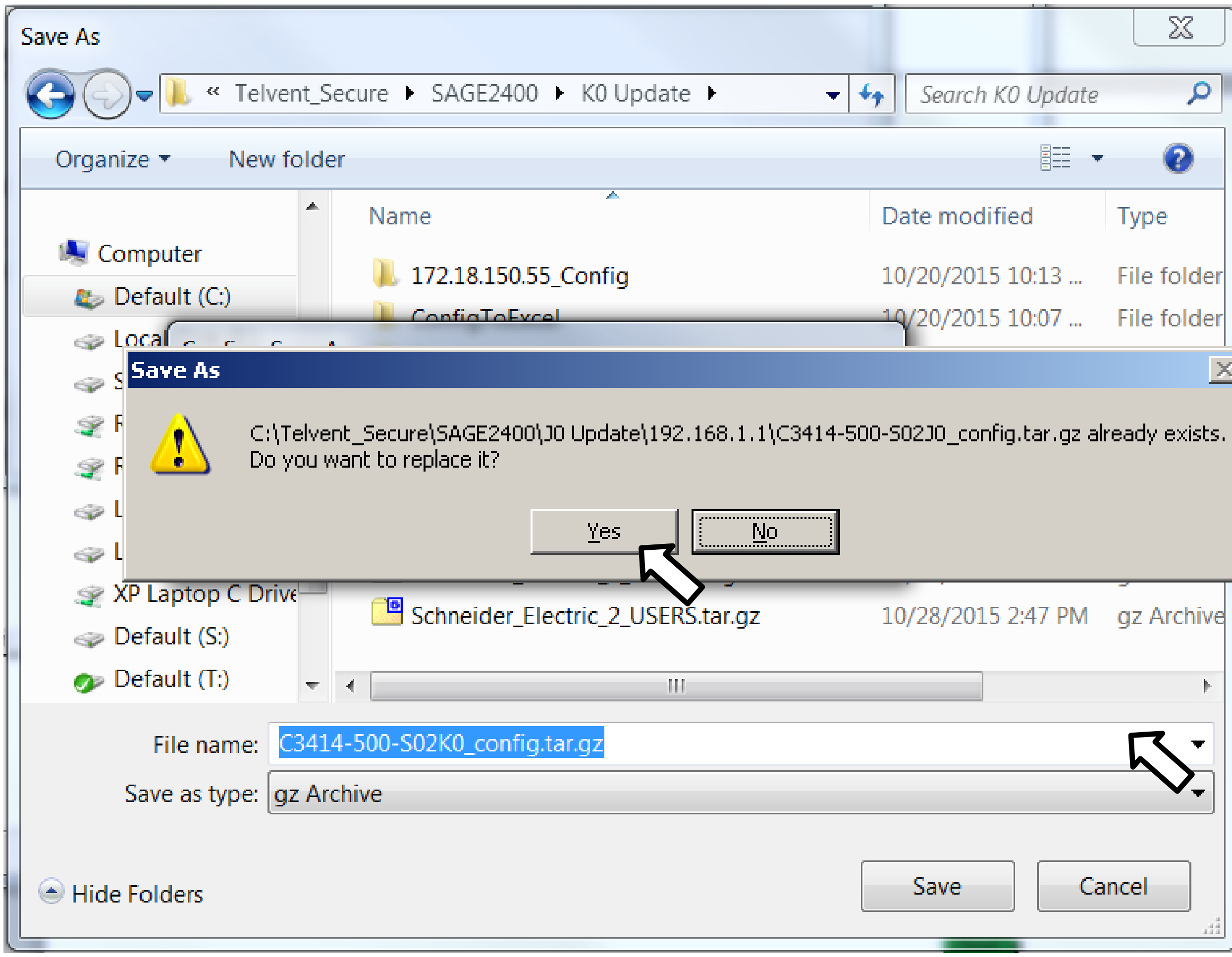
When the File Download box comes up, click on Save.

Figure 7-3 Save Configuration From RTU



If you are saving the configuration to the same location where it was originally stored on your computer, you will be asked if you want to overwrite the present file. This is probably not a good idea. The original configuration from the firmware update package has an empty configuration. An empty configuration might come in handy in the future. You should store your RTU configuration in a separate, secure location.

Figure 7-4 Save Configuration From RTU to a Directory



7.2.1 User Information - User Access Rights

The User Access Rights get function allows the user to get a copy of the existing file from the RTU. This file should be exactly the same as the file that was sent to the RTU on the last send User Access Rights function as there is no way to modify the content of this file while in the RTU.

7.2.2 Configuration

7.3 The Configuration Get from RTU function should be used to back up configuration changes made to the RTU. This should be done to make sure that all changes made to the RTU application configuration are available to restore to the RTU in case it has to be replaced. See the example under **section 7.2**.

Send to RTU Functions

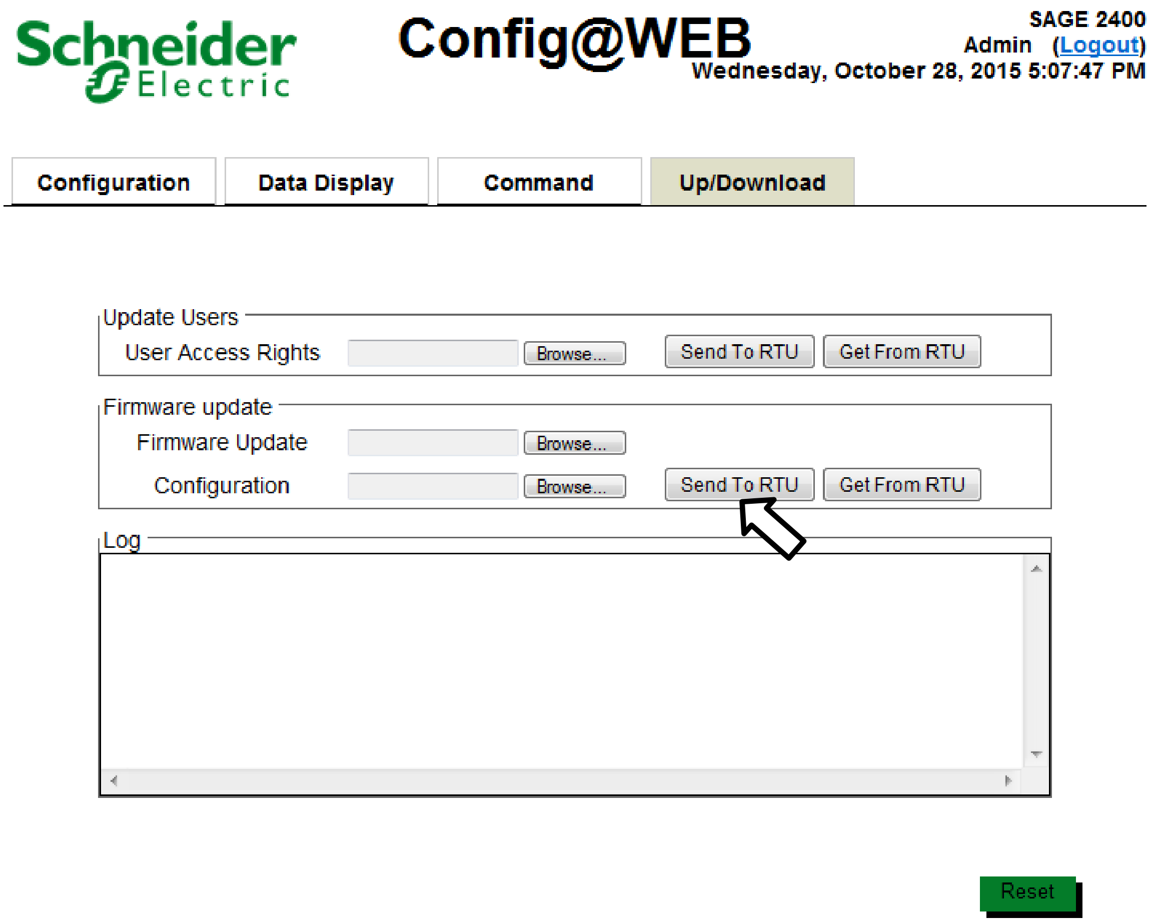
The Send To RTU functions are used to send updated configuration information and firmware to the RTU.

There are three packages involved in this process.

1. User Information – Schneider_Electric_1_USERS.tar.gz
2. Firmware – C3414-500-S02YZ_firmware.tar.gz
3. Configuration Update – C3414-500-S02YZ_config.tar.gz
4. Configuration Initial Install – C3414-500-S02J0_Firmware.tar.gz (see the Config@WEB S02 Initial Install manual)

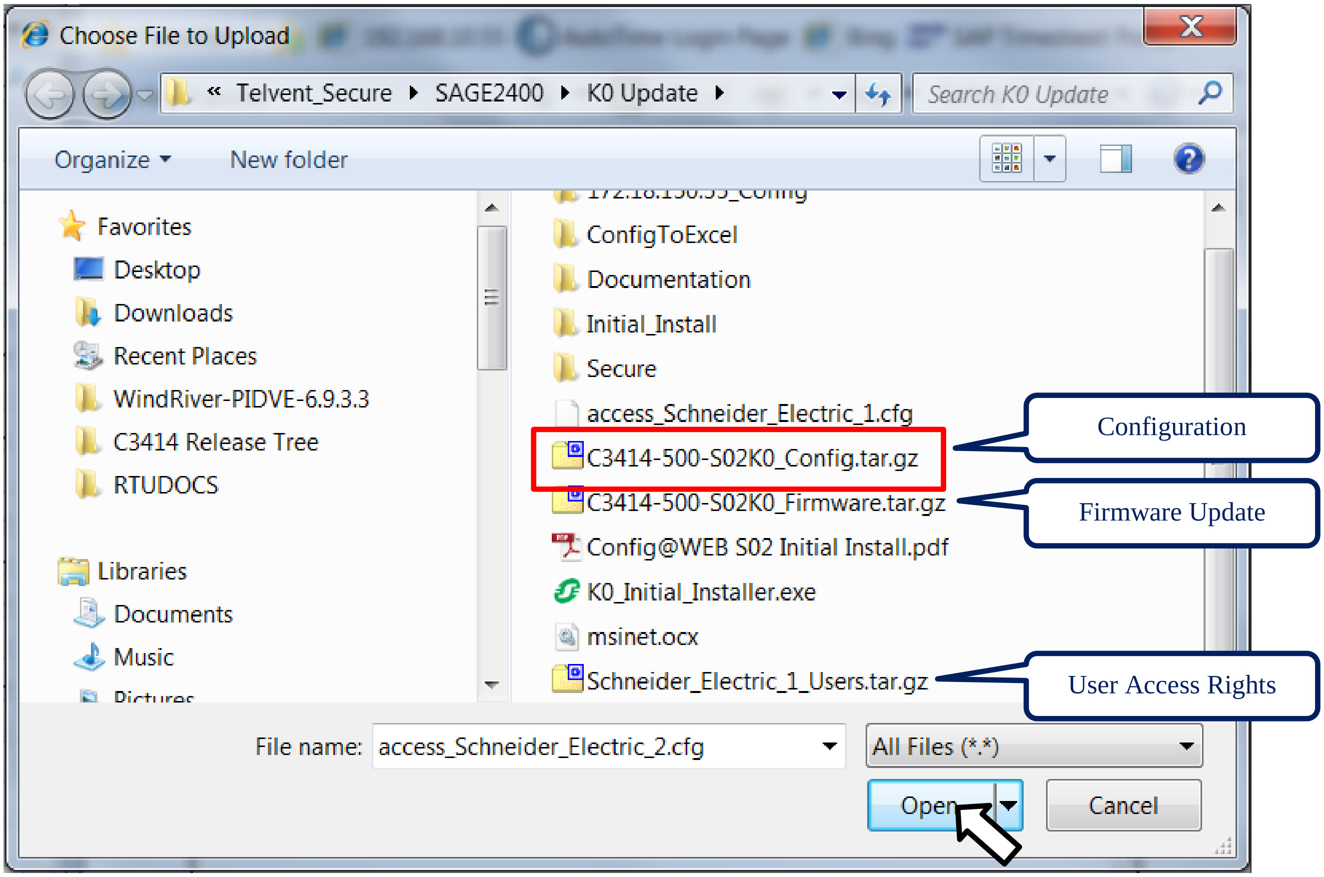
Let's look at an example of how Send to RTU is done. In this example, we will update the Configuration stored in a folder of a fictitious substation. First, click the Browse button for Configuration Update.

Figure 7-5 Browsing to Send Configuration to RTU



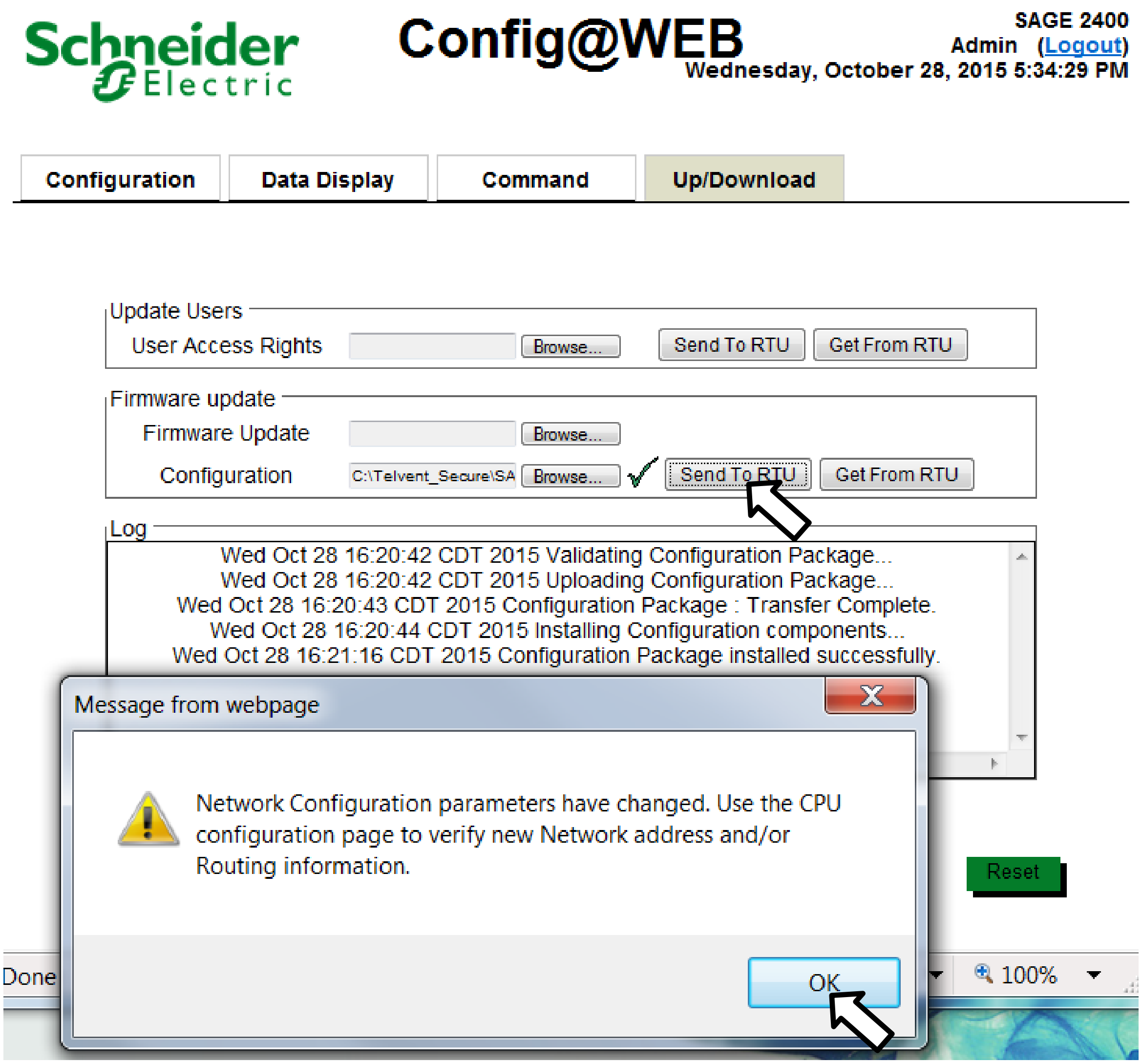
You will get a window similar to that shown below. Select the compressed file that has _config.tar.gz as part of its name, and click Open.

Figure 7-6 Choosing Configuration to Upload to RTU



The result is that the _config file gets loaded into the Browse window of the RTU. Click Send to RTU.

Figure 7-7 Completing Send Configuration to RTU



The green checkmark beside the Configuration Browse window shows that the Send to RTU function was successful. If an error occurs and you get a red X mark, try again.

Note: The message from webpage advises you to go back to the CPU Configuration page to verify correct routing information.

7.3.1 User Information - User Access Rights

The User Access Rights send function is used to update the user accounts, passwords and privileges in the RTU. This information is updated in the RTU in real time without a reset required. The file name will be in the format of "**Desc_Ver_Users.tar.gz**" with the desc and ver being replaced with the description entered and the version number of the file when it was created.

7.3.2 Configuration

The Configuration Send to RTU function is used to send a configuration to the RTU. The RTU must be reset after the configuration is sent for the changes to take effect. The file name will be in the format of "**C3414-500-S02YZ_config.tar.gz**" with YZ being the version and level.

7.3.3 Firmware Update

The Firmware Update send function is used to update the firmware set running in the RTU. The file sent is contained in a RTU firmware update zip set.

The file name is of the format "**C3414-500-S02YZ_firmware.tar.gz**" with YZ being the version and level. A configuration must be sent with the Firmware Update.

Backup

All three of the packages should be stored together as a backup set to allow the RTU to be updated in the future and to be able to replace an existing unit with the same configuration.

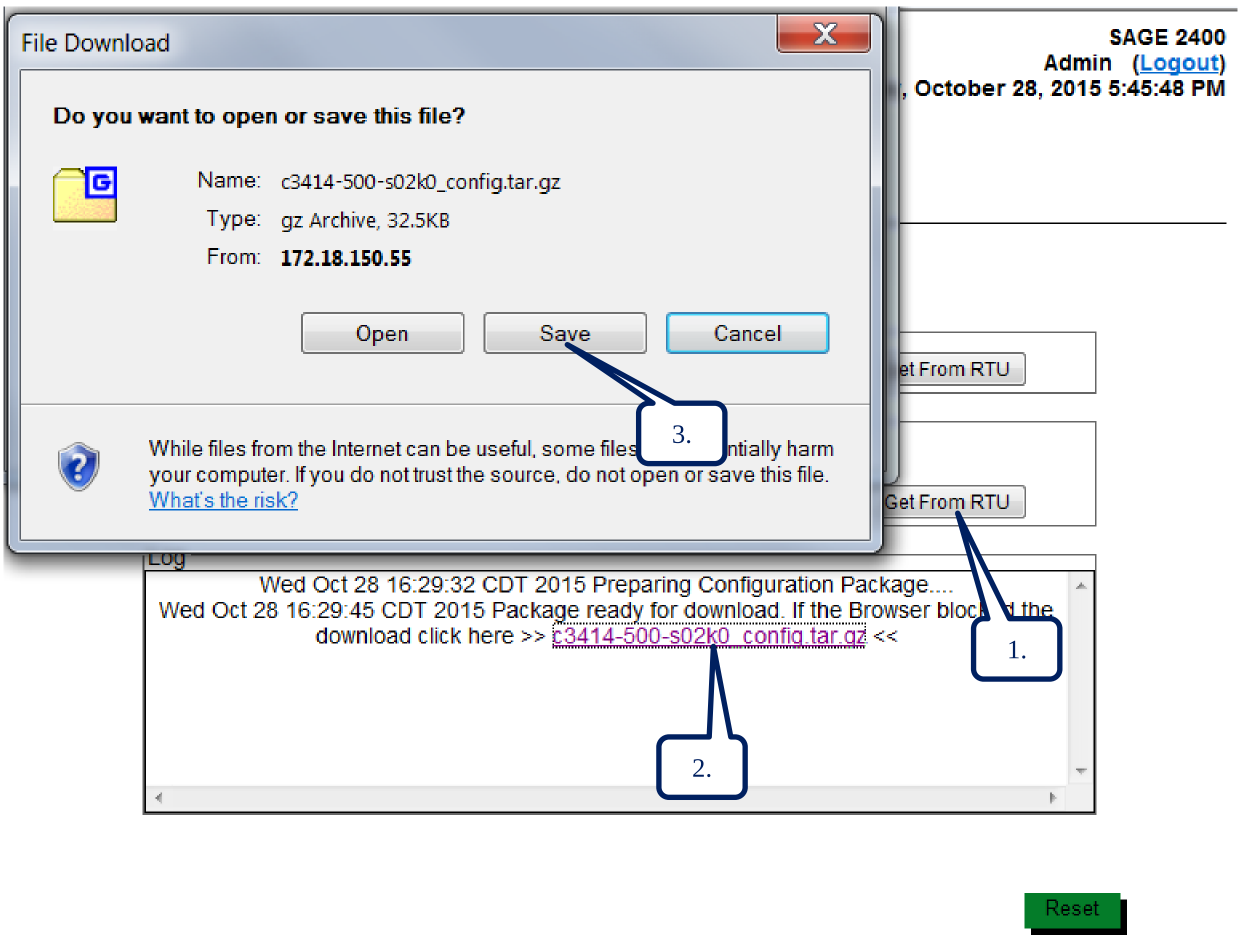
7.4 Updating Firmware from an Existing Set of Firmware

The example that follows is a firmware upgrade from C3414-500-S02H0 to C3414-500-S02H1.

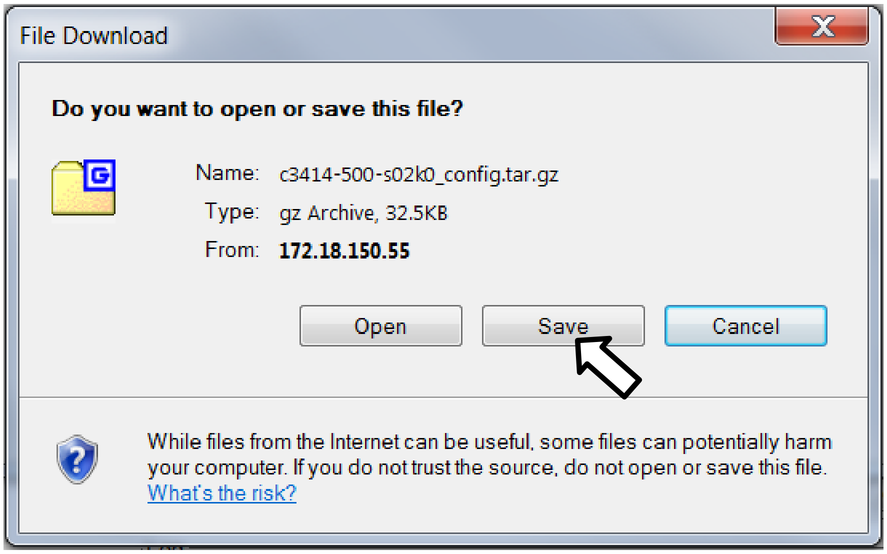
7.5

7.5.1 Save Current Configuration

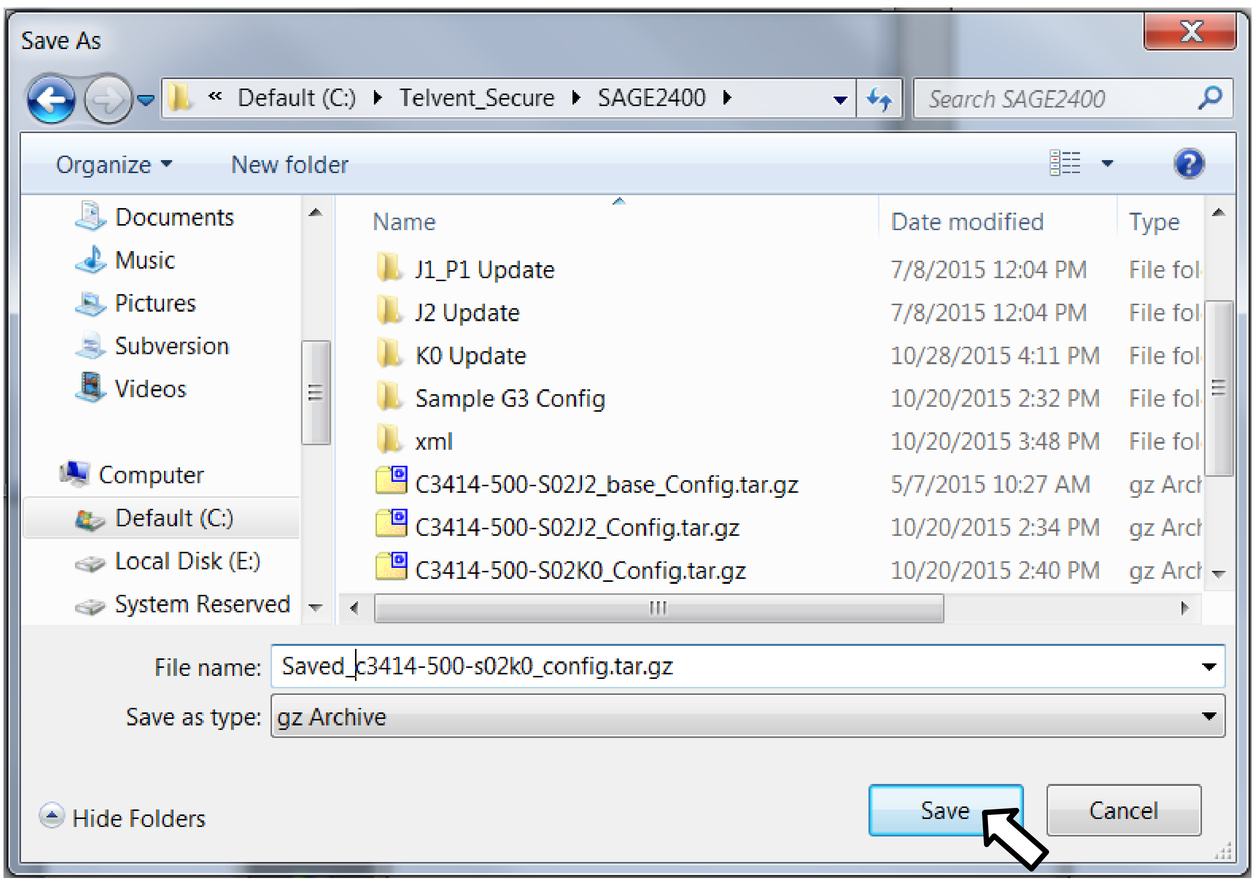
Click the buttons in the sequence as shown below.



Save the current K0 configuration as shown below.



For this example, a Saved Config folder has been created.



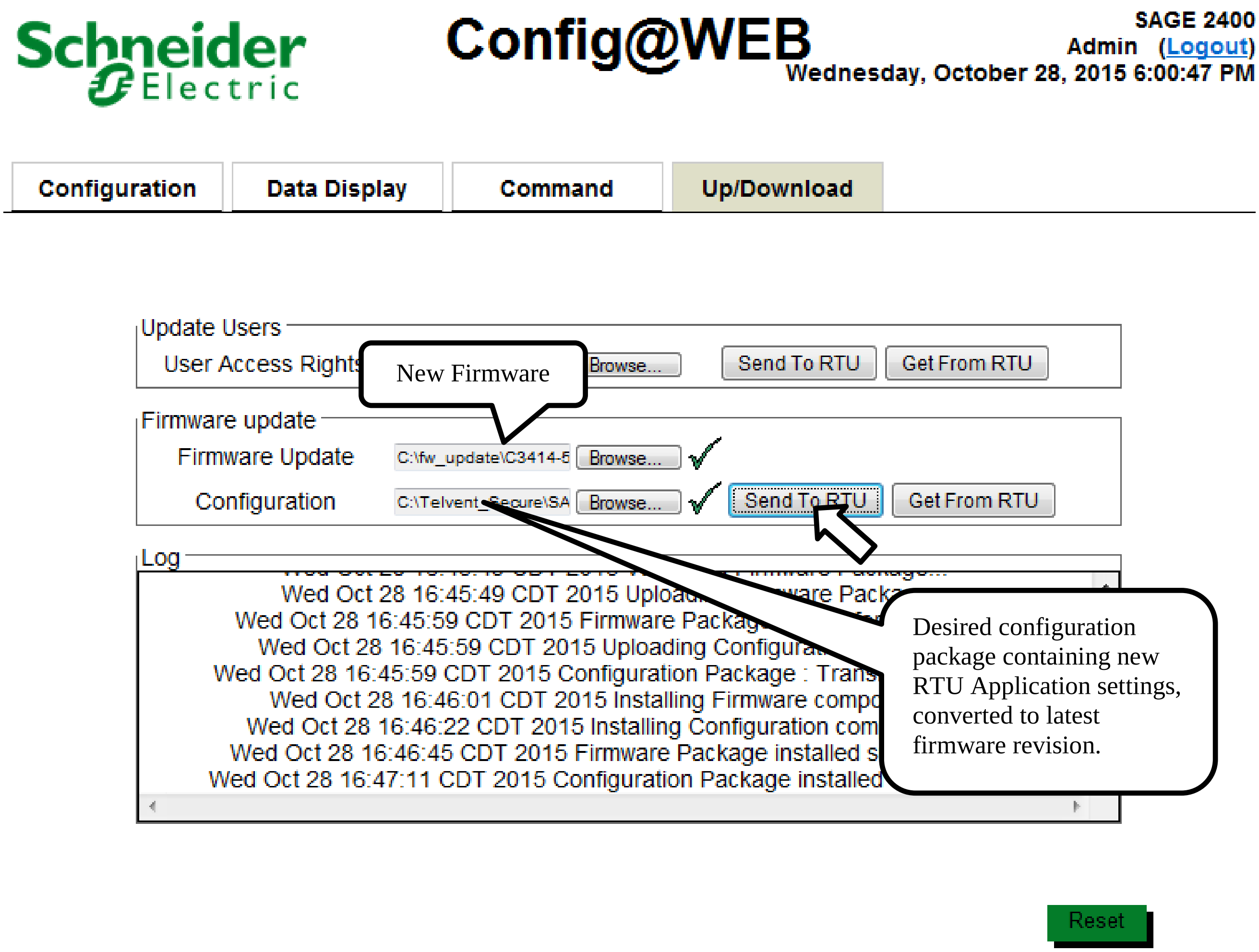
7.5.2 Run the Saved Configuration through the Config Converter

Refer to Chapter 6 - Configuration Converter for details.

7.5.3 Load Converted Configuration & New Firmware to RTU

On the Up/Download page of the RTU, Browse for the latest Firmware Update package, and for the recently converted older to latest configuration. Click Send to RTU.

The figure below shows a successful operation. The firmware and configuration upgrade is completed.



8 Internet Explorer Settings

8.1 Internet Explorer 8

The SAGE RTU GUI has to be run in “Compatibility View”.

To turn on Internet Explorer **Compatibility View**

1. Open Internet Explorer.
2. Click the **Tools** button, and then click **Compatibility View**.

If Internet Explorer recognizes a webpage that is not compatible, you will see the Compatibility View button on the Address bar. To turn Compatibility View on or off, click the **Compatibility View** button. From now on, whenever you visit this website, it will be displayed in Compatibility View. However, if the website receives updates to display correctly in the current version of Internet Explorer, Compatibility View will automatically turn off.

8.2 Microsoft .NET Framework 3.5 or Greater

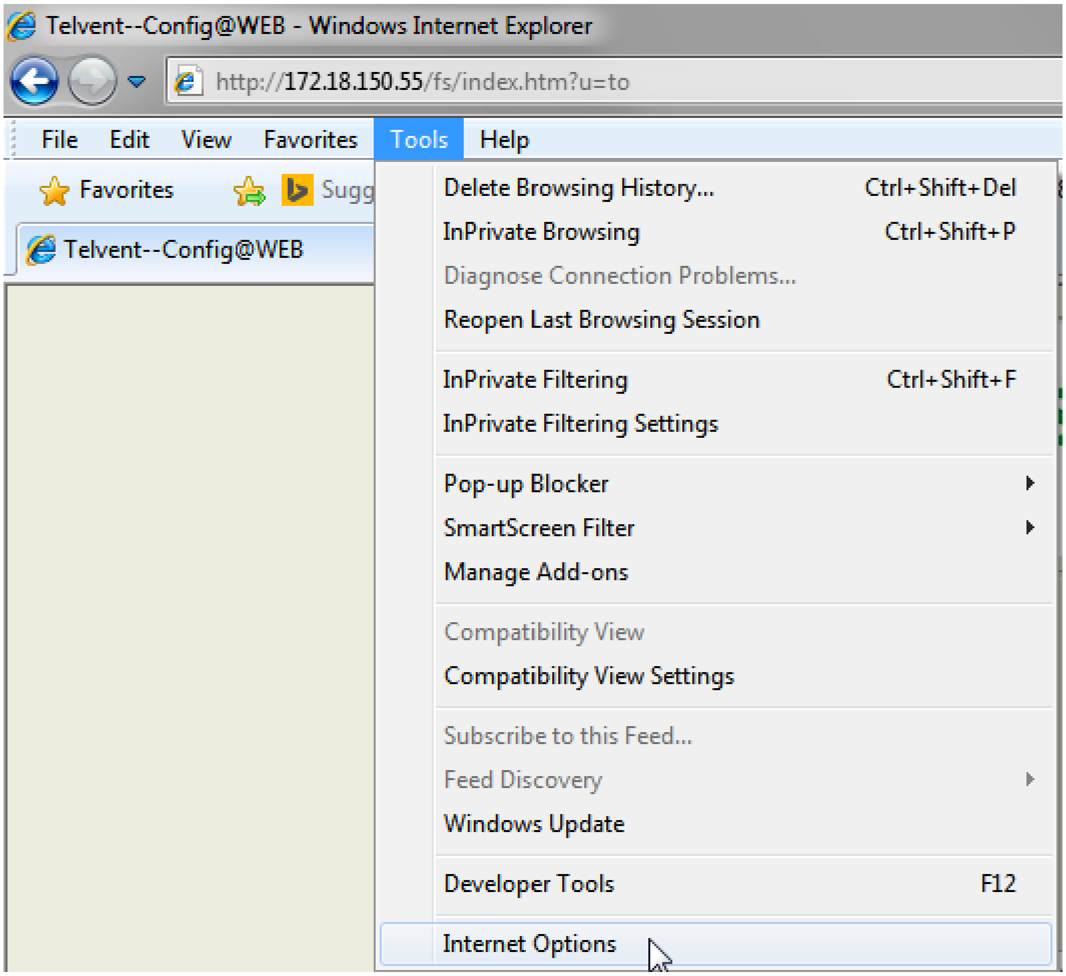
Microsoft .Net framework 3.5 or later must be present on the client computer to use the tools (Config Converter and User Manager).

8.2.1 File Download Settings

By default file downloads are enabled in IE. Administraion can disable this feature either by turning it off in the internet setting or using a group policy. If you are the administrator of the computer you can enable file download using this procedure.

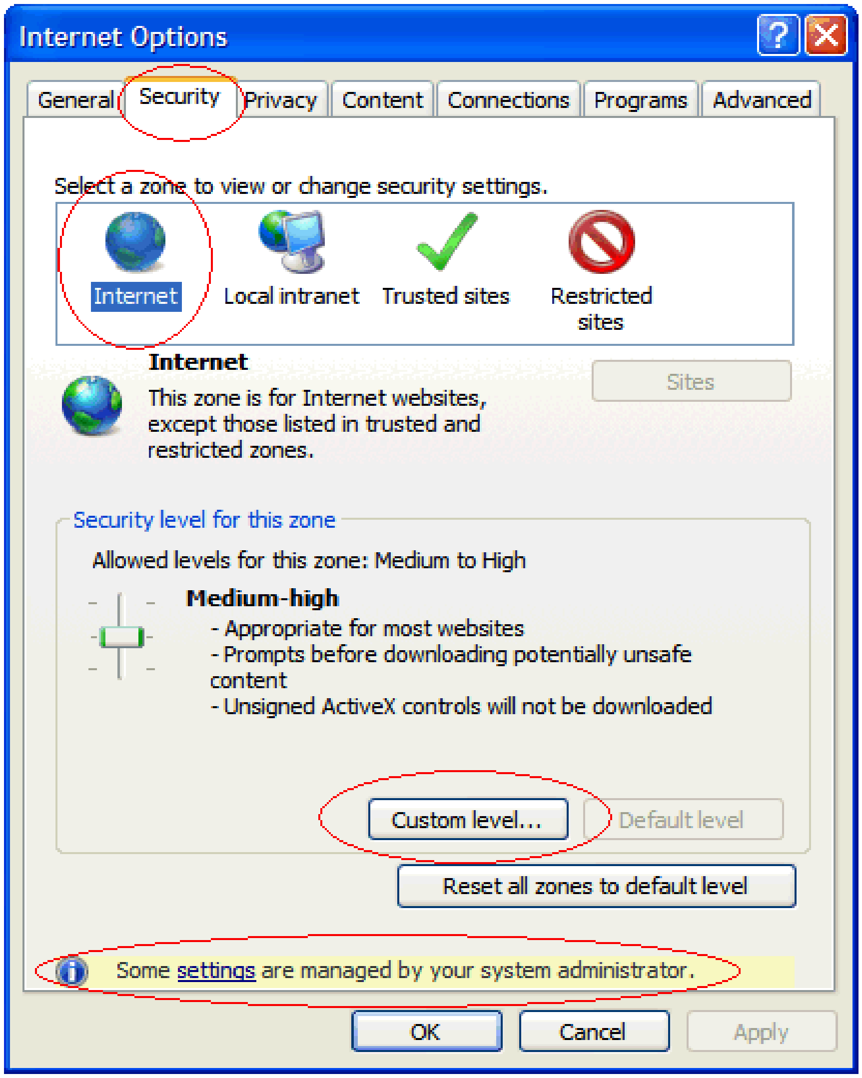
Launch IE and go to Internet Options using the Tools menu item.

Figure 8-1 Internet Options



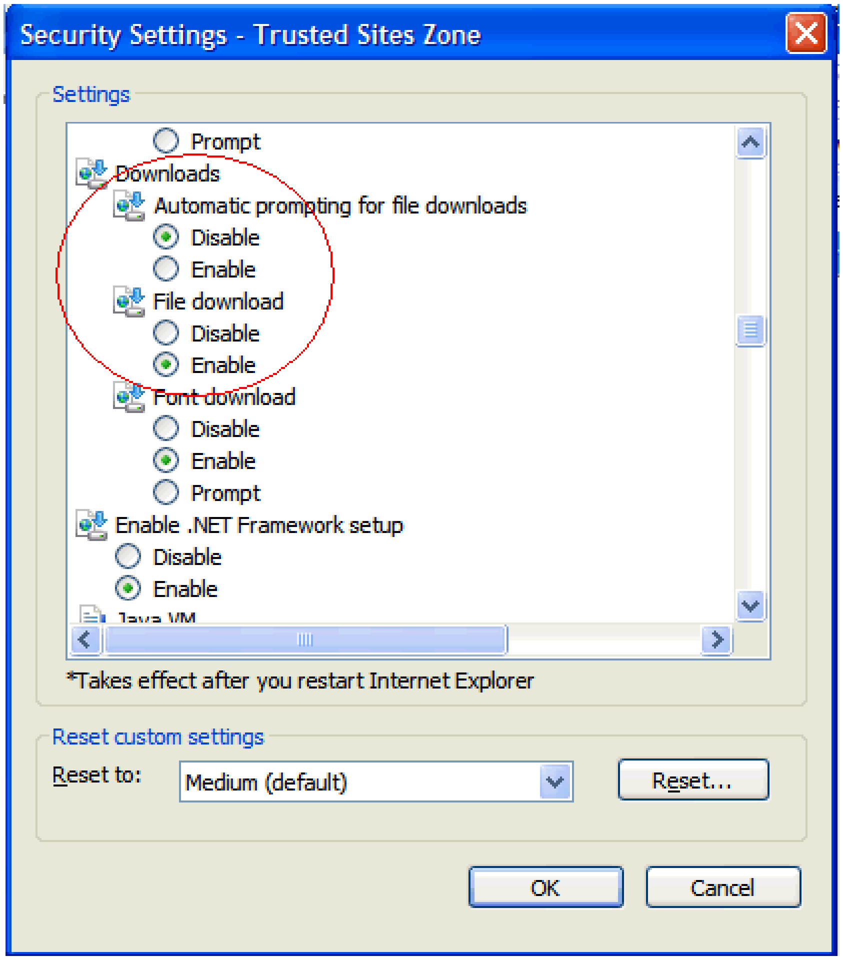
Go to the security Tab. Select the appropriate zone. In our case we are using the Internet zone. If the security level is at Medium-high then file downloads are enabled by default. If you are having trouble downloading files, click on Custom level to check/change the file download privileges. Also, notice the message at the bottom indicating some settings are managed by the System Administrator. If file download is enabled and you still can't download files, chances are it is turned off using group policy. Please contact your IT dept. to get this issue resolved.

Figure 8-2 Security Settings



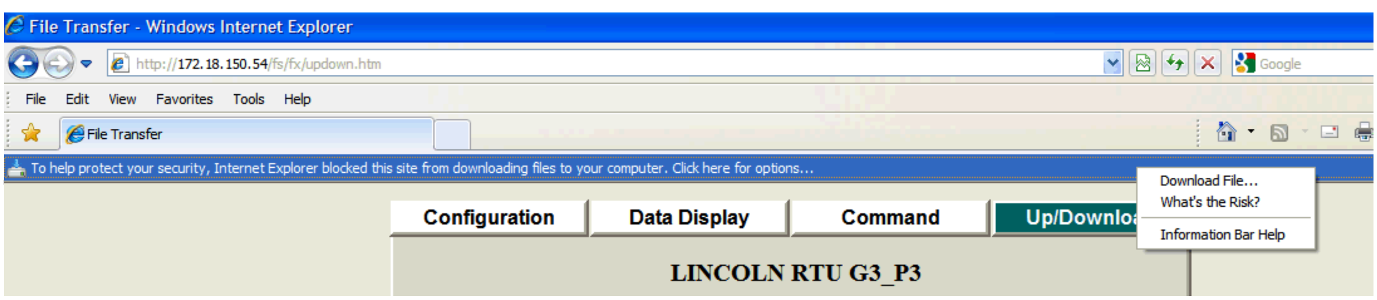
Under Custom Security Setting scroll down to the Downloads section and make sure the settings match the figure below.

Figure 8-3 Enable Downloads



If all the settings are in effect then you should see this dialog box prompting you to download a file when you click a button that invokes file download (e.g., Getting Config from RTU, Downloading Data Trap files or logs.). Click on the Download File option to download the file.

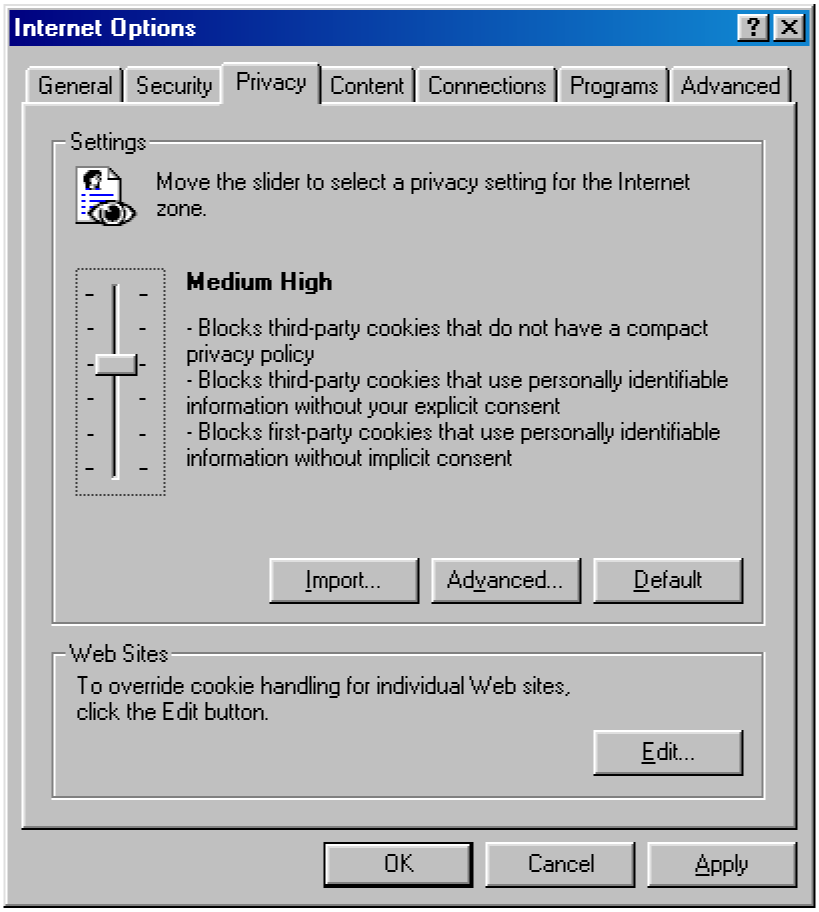
Figure 8-4 File Download Prompt



Internet Privacy Options

The GUI interface uses cookies through Internet Explorer. If your Privacy setting is too high, there might be a problem displaying some screens. To fix this potential problem, launch IE and select the Tools drop-down menu, then select Internet Options. From the Internet Options dialog box, click the Privacy tab. Set the slider bar to Medium High and click OK, as shown in Figure 8-5.

Figure 8-5 Setting Medium High Privacy for Cookies



8.4

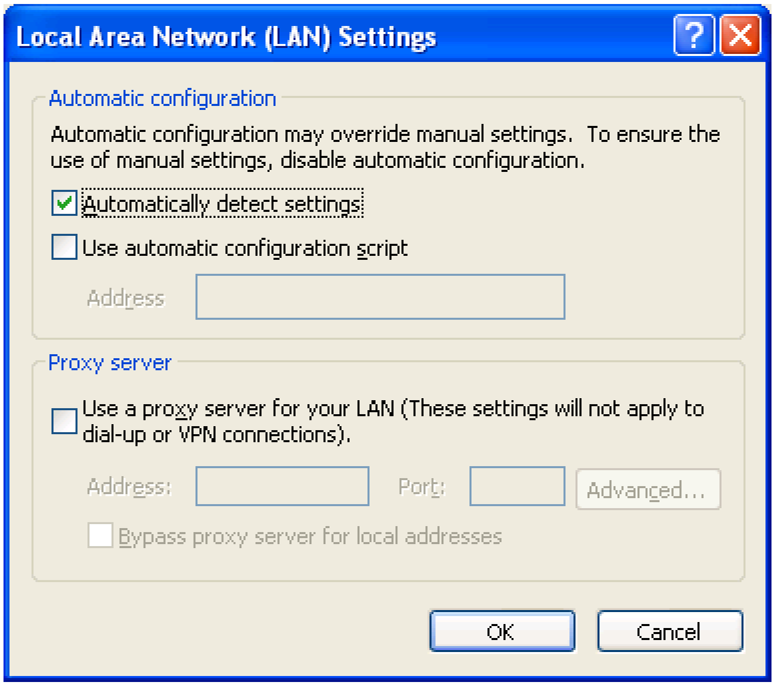
Connections Options

Click the Connections tab. You will get a screen similar to Figure 8-6.

Figure 8-6 Connections Tab

From the Connections tab, click LAN Setting. Make sure that you check "Automatically detect setting," as shown in Figure 8-7. Do not check "Use a proxy server… "

Figure 8-7 LAN Settings

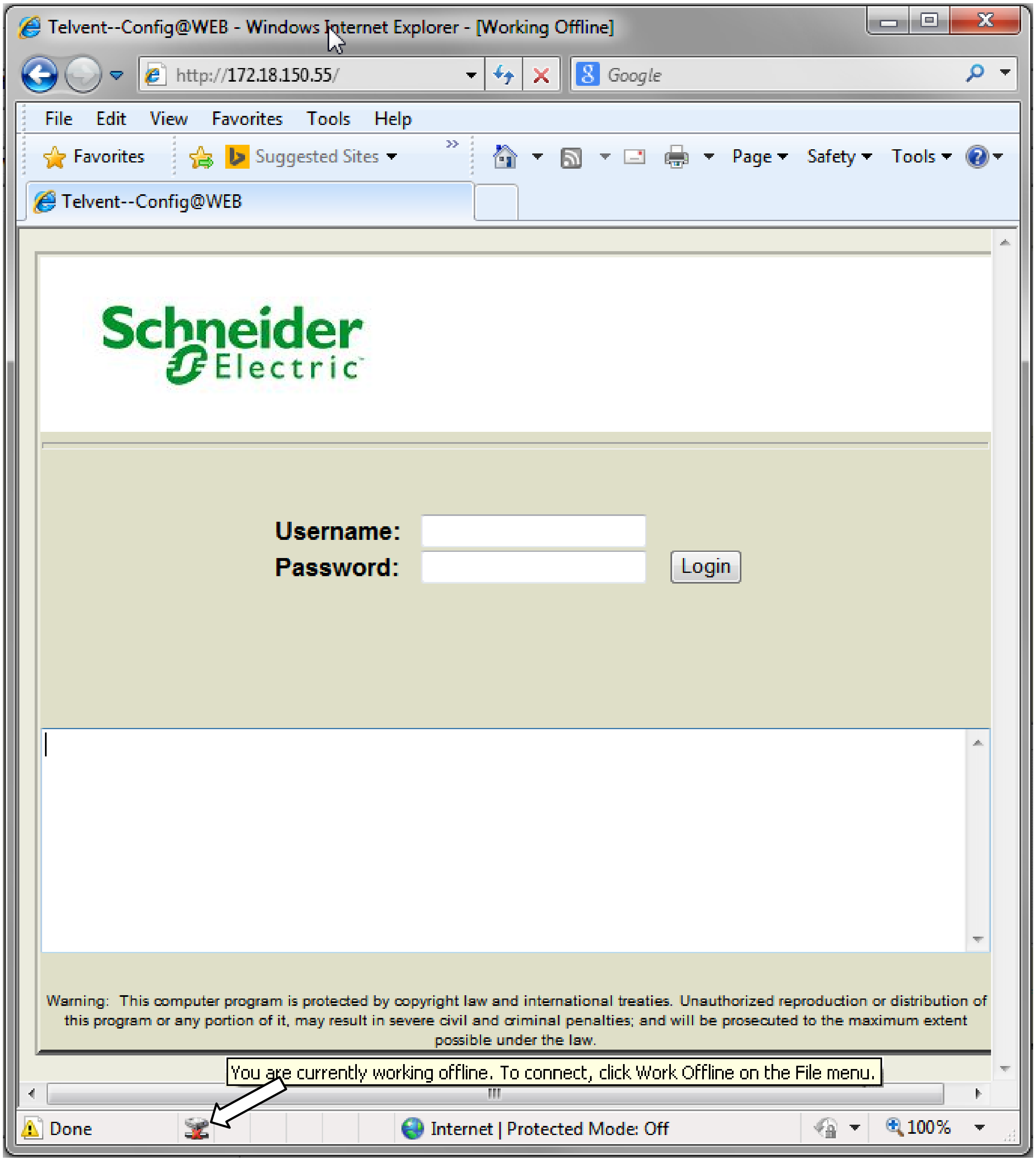


8.5 Working Online

When Internet Explorer is running, watch for a "Working Offline" icon at the bottom right of the window as shown in Figure 8-8. The existence of this icon means that IE is showing cached pages and NOT showing the live connection over the Ethernet cable, whether it's a direct connect (crossover cable), or a

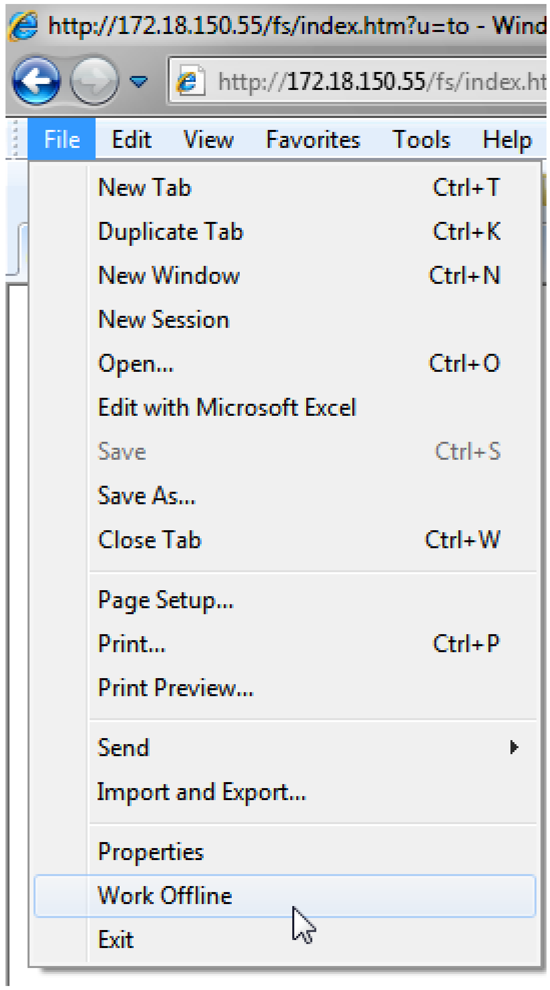
LAN connect. If you see the icon, you must take action. Also the Internet icon must be shown at the bottom as shown below.

Figure 8-8 Working Offline Icon



To correct the problem, click on the File menu and make sure Work Offline is <u>unchecked</u> (clear), as shown in Figure 8-9.

Figure 8-9 Unchecking Work Offline



8.6 Installing a Certificate in Browser

If the browser does not have a previously installed valid certificate, the https field will be red with a certificate error, as shown below.

Figure 8-10 Certificate Error

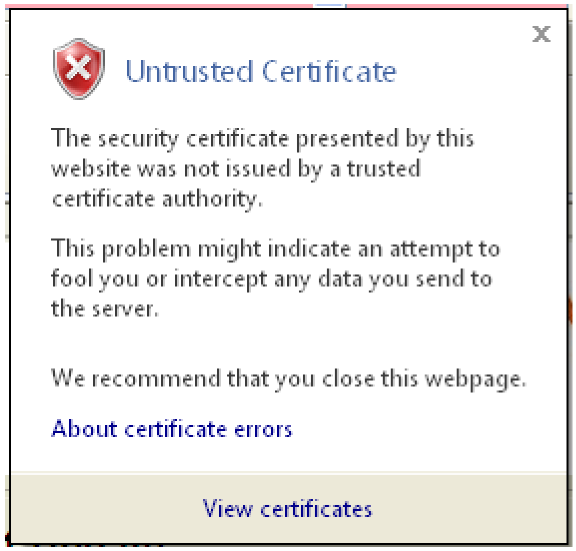
You must install the certificate to the browser from the RTU as follows:

Click on the Certificate Error.

Figure 8-11 Click Certificate Error

The following box will pop up. Click on View certificates.

Figure 8-12 View Certificates



Follow the clicks as shown below to install the certificate.

Figure 8-13 Install Certificate

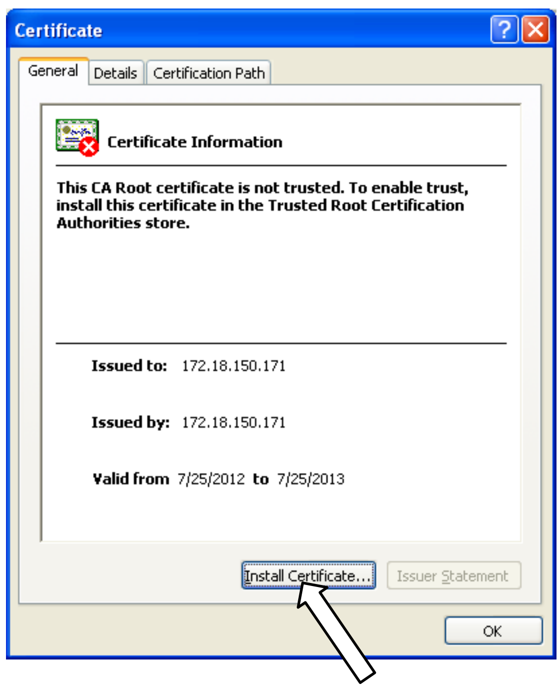


Figure 8-14 Import Certificate

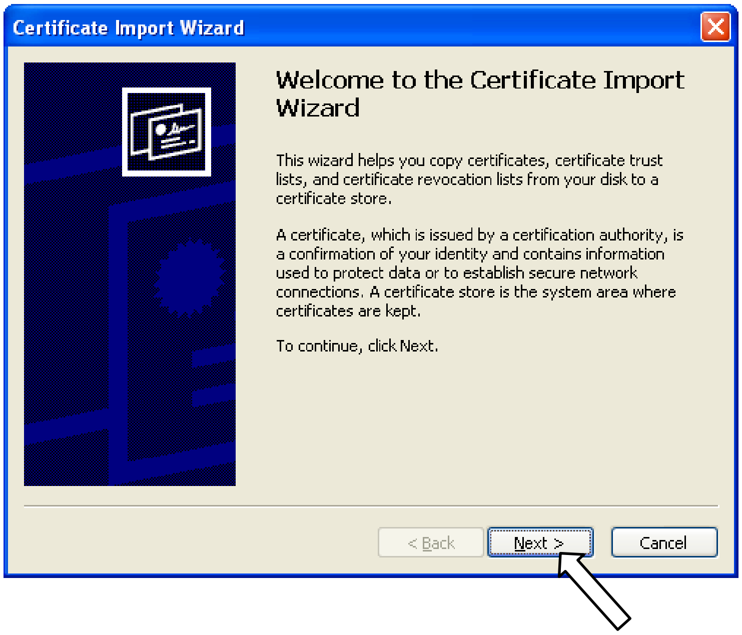


Figure 8-15 Automatically Select Type

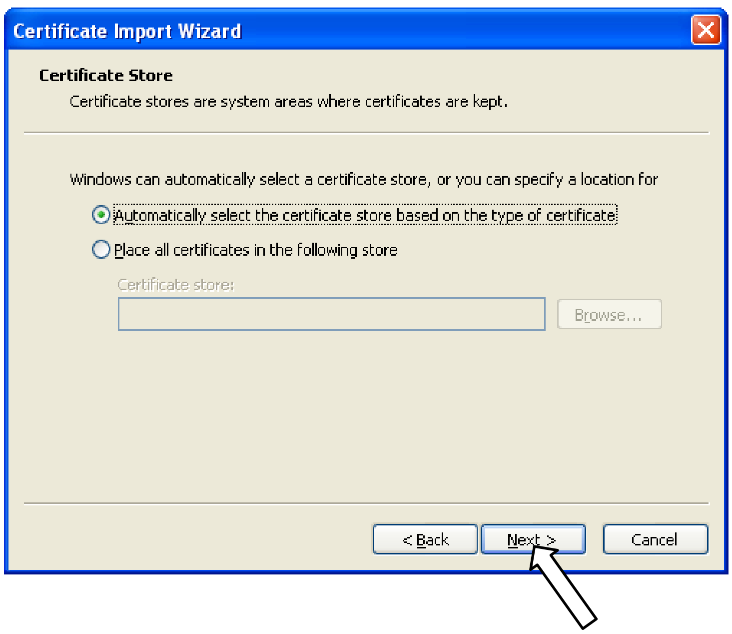


Figure 8-16 Finish Importing

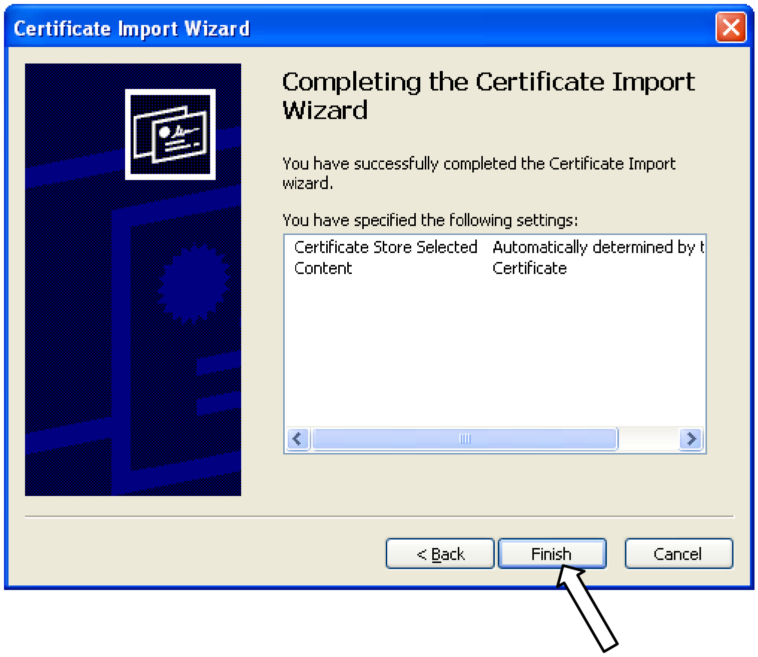


Figure 8-17 Security Warning - Click Yes

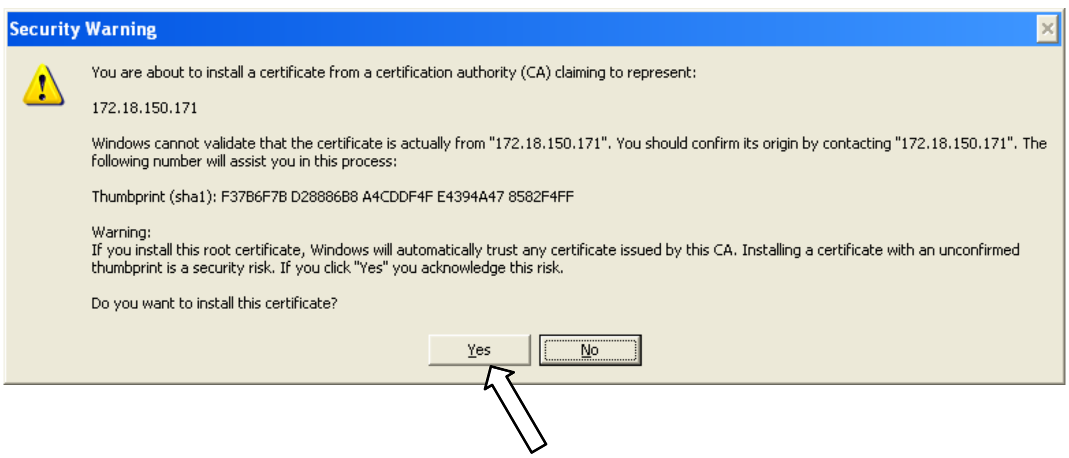
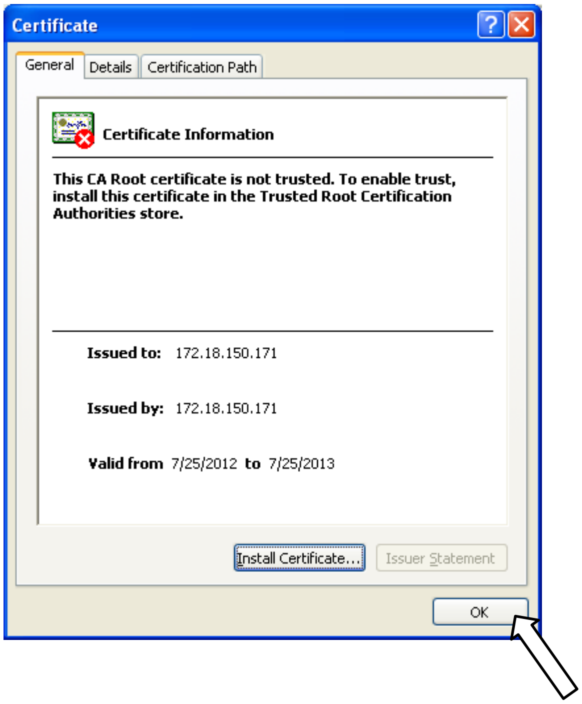


Figure 8-18 Successful Import

Figure 8-19 Click OK to Close Certificate Window



You will notice that your address field is still red and there is still a Certificate Error. **You must kill the browser and restart it before the installed certificate takes effect**. Refresh will not work. After restart and reconnect of the browser, the address field should be white with a lock symbol, as shown below.

Figure 8-20 Successful Certificate Import Finished

Certificate installation is completed.

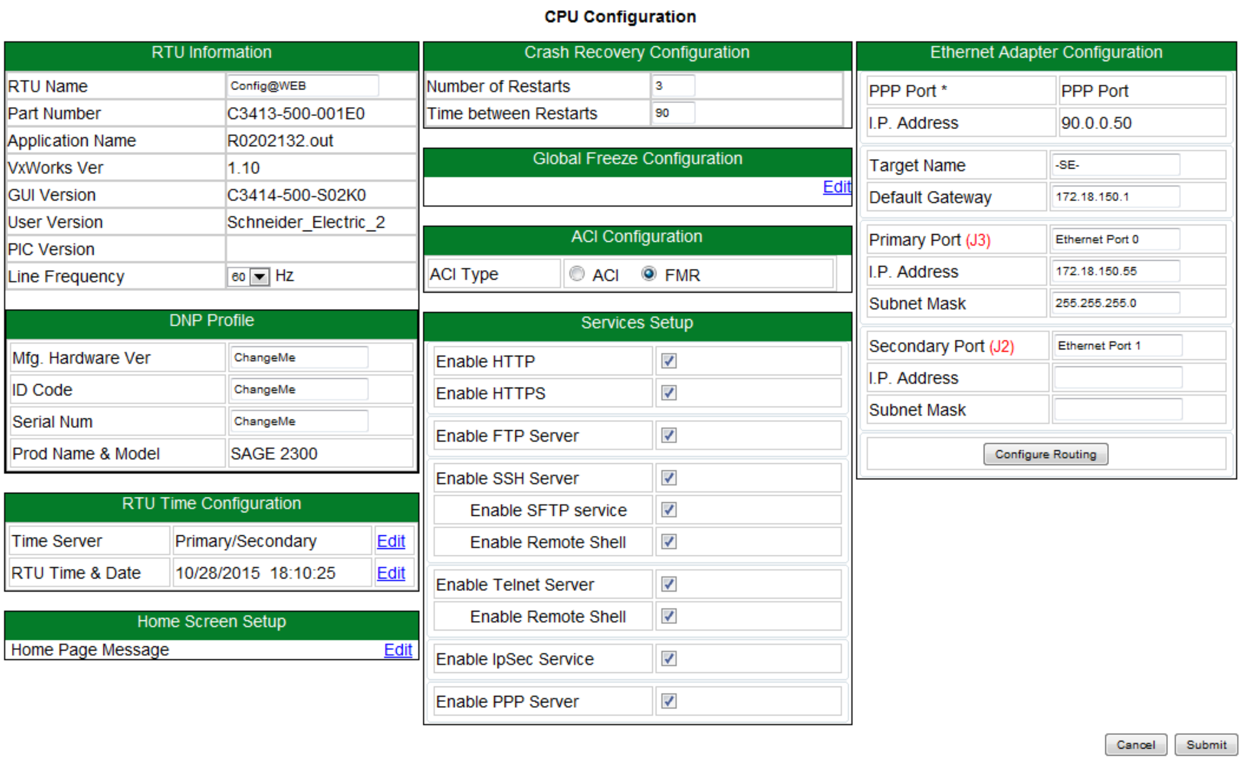
9 Crash Recovery and Safe Mode

9.1 Crash Recovery Configuration

Crash Recovery is a state of the RTU that allows you to back out of a bad configuration gracefully. The recovery process is based on the premise that you can have a way to boot VxWorks without running any applications. This allows you to reconfigure the RTU without actually having to run the last configuration.

See Figure 9-1 and the field explanations below the figure.

Figure 9-1 Crash Recovery Configuration



Number of Restarts

The number of restarts before the RTU starts VxWorks without applications (for troubleshooting purposes). Works best under normal conditions if the user accepts the default value.

Time between Restarts

If crash happens in shorter time, it is logged as a restart. Works best under normal conditions if the user accepts the default value.

Example: If the RTU crashes (or is reset, or the power cycles) within 90 seconds after the beginning of bootup, that counts as one restart. If this happens three times in a row, the RTU goes into Crash Recovery mode.

Notice that the default Time between Restarts is 90 seconds. Because the RTU takes about 60 seconds to reboot, 30 seconds is allowed for a crash. If you have reason to believe that the configuration problem takes longer to crash the RTU, enter a longer Time between Restarts.

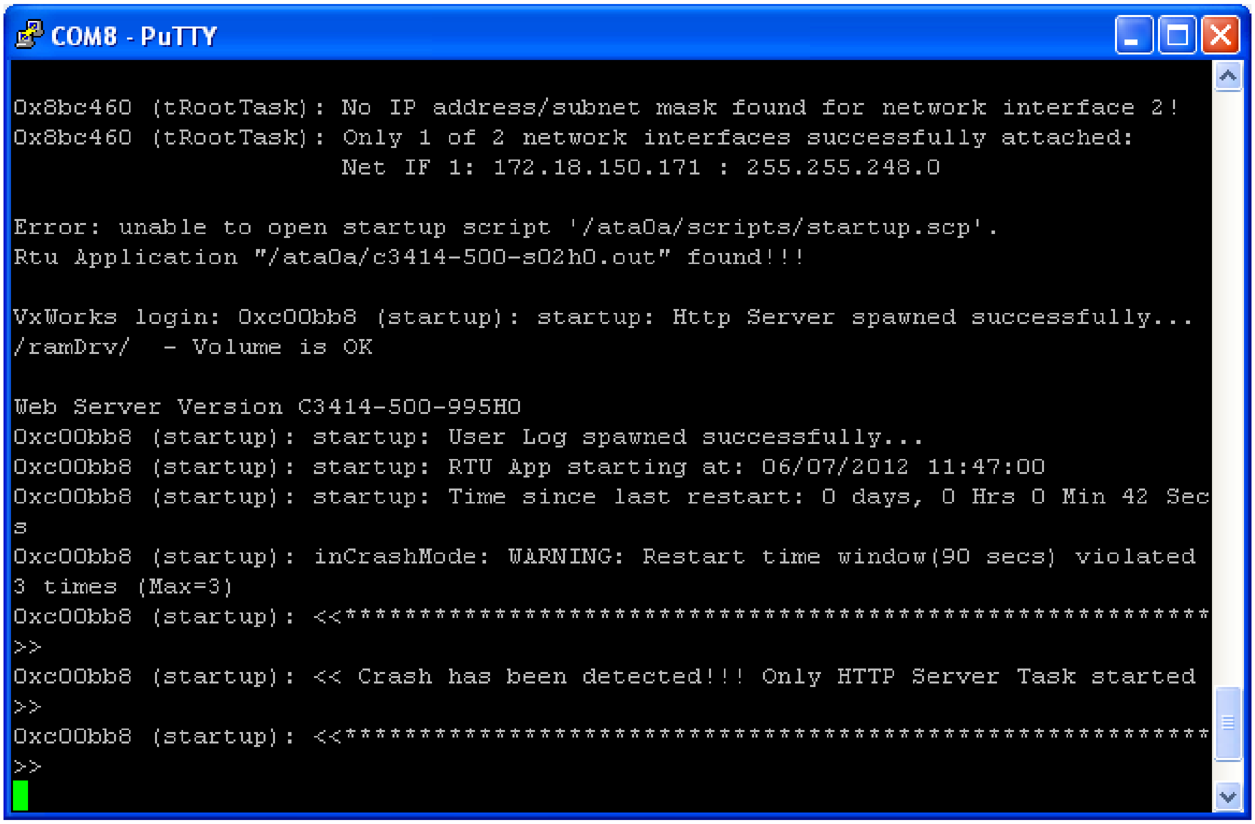
When the RTU is running in Crash Recovery mode, the Login looks like Figure 9-2. There are notices on other screens as well. Crash Recovery mode should be used only for reconfiguring the RTU to the previous working configuration. After reconfiguration, reset the RTU to go back to normal mode.

Figure 9-2 Running in Crash Recovery Mode

The RTU may be forced into Crash Recovery mode by the simple expedient of switching off RTU power, switching it back on, waiting 60 seconds for bootup, then switching power off again within 90 second (assuming default settings). Do this three times in a row. On the fourth power-on, the RTU will bootup in Crash Recovery mode.

When the RTU boots up in crash recovery mode, you may monitor the console. The bootup message will look like Figure 9-3.

Figure 9-3 Console Monitoring Crash Recovery Mode


COM8 - PuTTY

```
0x8bc460 (tRootTask): No IP address/subnet mask found for network interface 2!
0x8bc460 (tRootTask): Only 1 of 2 network interfaces successfully attached:
                      Net IF 1: 172.18.150.171 : 255.255.248.0

Error: unable to open startup script '/ata0a/scripts/startup.scp'.
Rtu Application "/ata0a/c3414-500-s02h0.out" found!!!

VxWorks login: 0xc00bb8 (startup): startup: Http Server spawned successfully...
/ramDrv/  - Volume is OK

Web Server Version C3414-500-995H0
0xc00bb8 (startup): startup: User Log spawned successfully...
0xc00bb8 (startup): startup: RTU App starting at: 06/07/2012 11:47:00
0xc00bb8 (startup): startup: Time since last restart: 0 days, 0 Hrs 0 Min 42 Sec
s
0xc00bb8 (startup): inCrashMode: WARNING: Restart time window(90 secs) violated
3 times (Max=3)
0xc00bb8 (startup): <<***********************************************************
>>
0xc00bb8 (startup): << Crash has been detected!!! Only HTTP Server Task started
>>
0xc00bb8 (startup): <<***********************************************************
>>
```

9.2 Crash Recovery by Uploading a Safe Configuration

But what if you can't remember the last configuration that worked? The answer is, once you get a configuration that works, you should download it and store it in a safe place. If a bad configuration drives the RTU into crash recovery, upload the safe configuration and reboot. See the Upload/Download chapter.

9.3 Safe Mode

There is a possibility that the RTU is resetting intermittently because of an untenable configuration, but not resetting consistently enough to drive the RTU into Crash Recovery mode. In this case, you may force the RTU into Safe Mode. Safe Mode is the same as Crash Recovery mode, only the user is allowed to enter

Safe Mode intentionally. You must enter Safe Mode from the console. See the Console Commands Chapter to enter Safe Mode.

Once the RTU is in Safe Mode, the Login screen will look as shown below.

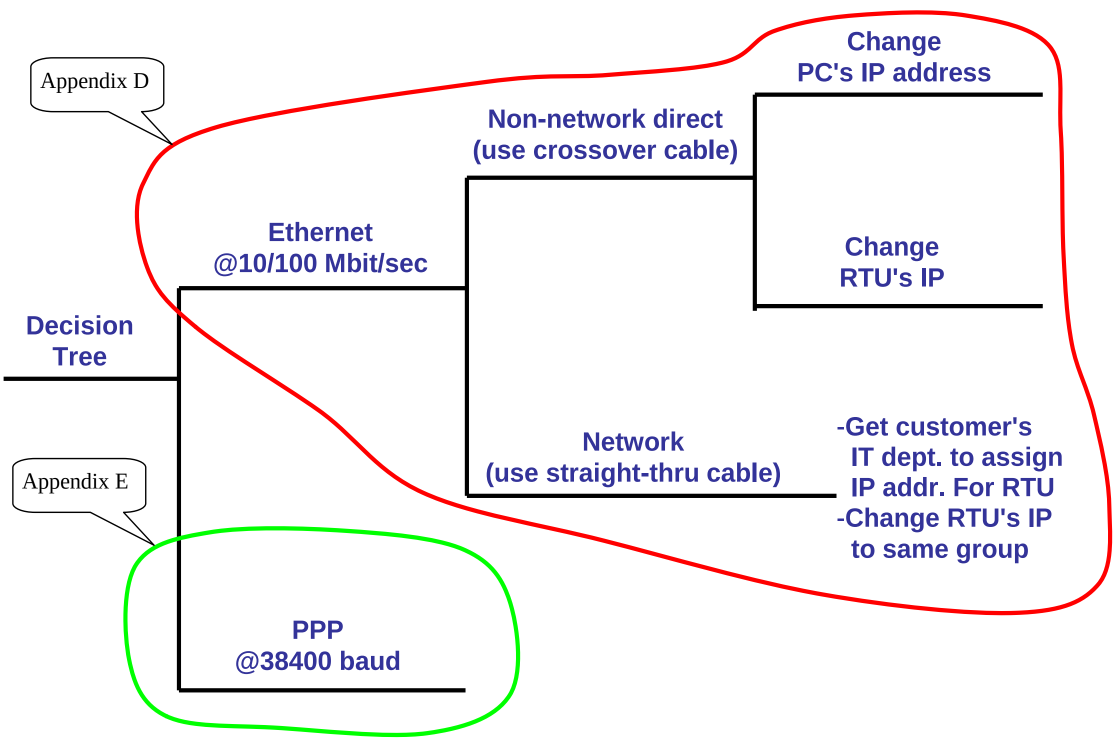
Figure 9-4 Safe Mode

10 Ethernet Connection

10.1 Where Do You Start?

Let's start with the basics: You have a Windows PC and a Config@WEB RTU. Figure 10-1 shows the possible combinations of your situation.

Figure 10-1 Decision Tree for Connection to Config@WEB



The advantage of using Ethernet connection is high speed. The disadvantage is that you might have to change your PC's IP address.

The advantage of using PPP connection is that you have the possibility of having a dial-up channel to your RTU for long distance configuration and monitoring if a network is unavailable. The disadvantage is the slow speed.

This appendix deals with the Ethernet branch of the decision tree. See Appendix B if you are interested in the PPP connection.

10.1.1 Non-Network Ethernet Communication With RTU

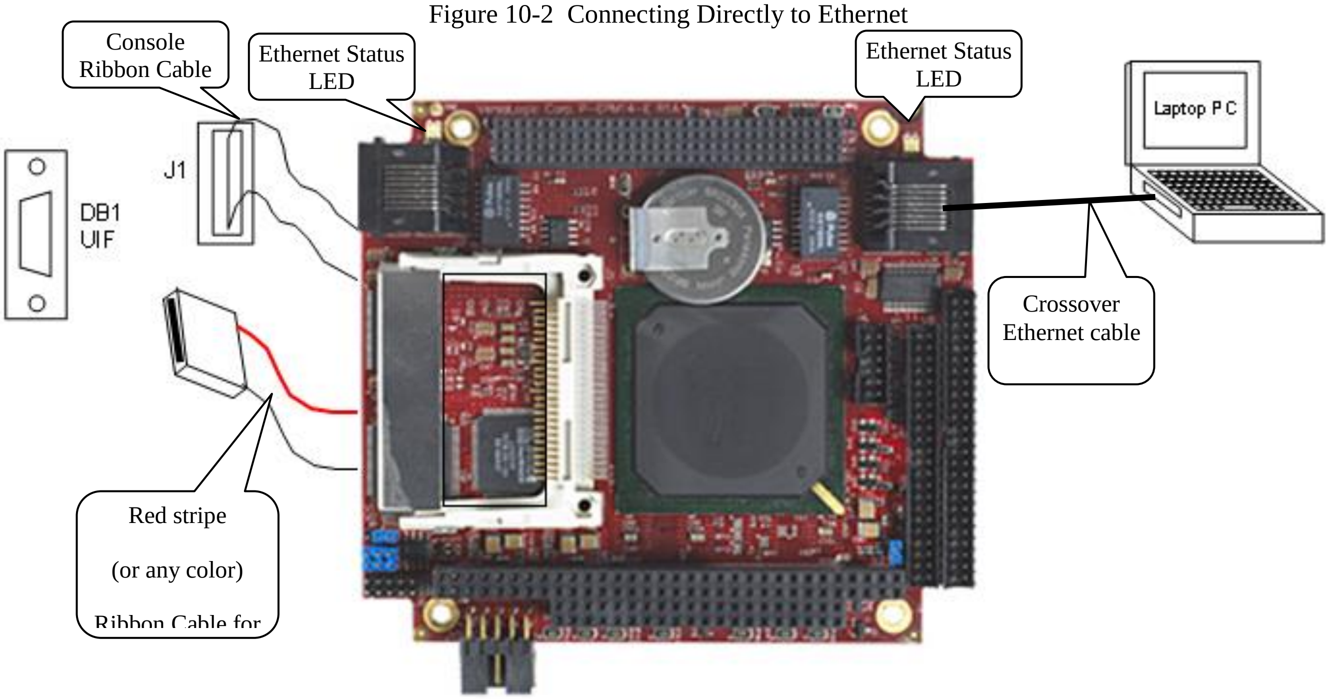
- You need an Ethernet Crossover Cable (supplied with each RTU)
- You need a PC with a static IP address and automatic dialup turned off (see later in this appendix)
- You need to have both RTU and the PC have IP addresses within the same group (you can change either the RTU IP address or the PC IP address). If you change the PC IP address, record the old setup so that you can return)

Note: It is possible to have two different TCP/IP profiles if you have two different NIC cards in your PC.

10.1.1.1 Physical Setup

The physical connection is straightforward, as shown in Figure 10-2 and Figure 10-3

Figure 10-2 Connecting Directly to Ethernet



10.1.1.2 Status LEDs

Each Ethernet controller has a two-colored LEDs located next to its RJ-45 connector to indicate the Ethernet status as follows:

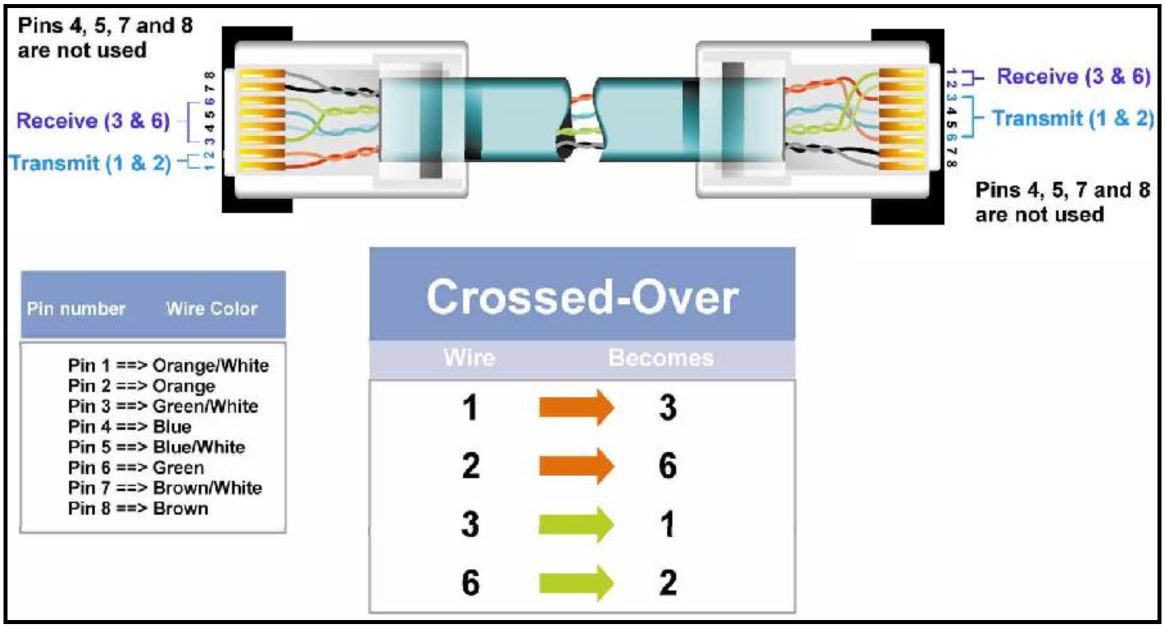
Green LED (Link):

- ON Active Ethernet cable plugged in
- OFF Active cable not plugged in or cable not plugged into active hub

Yellow LED (Activity):

- ON Activity detected on cable
- OFF No Activity detected on cable

Figure 10-3 Crossover Ethernet Cable



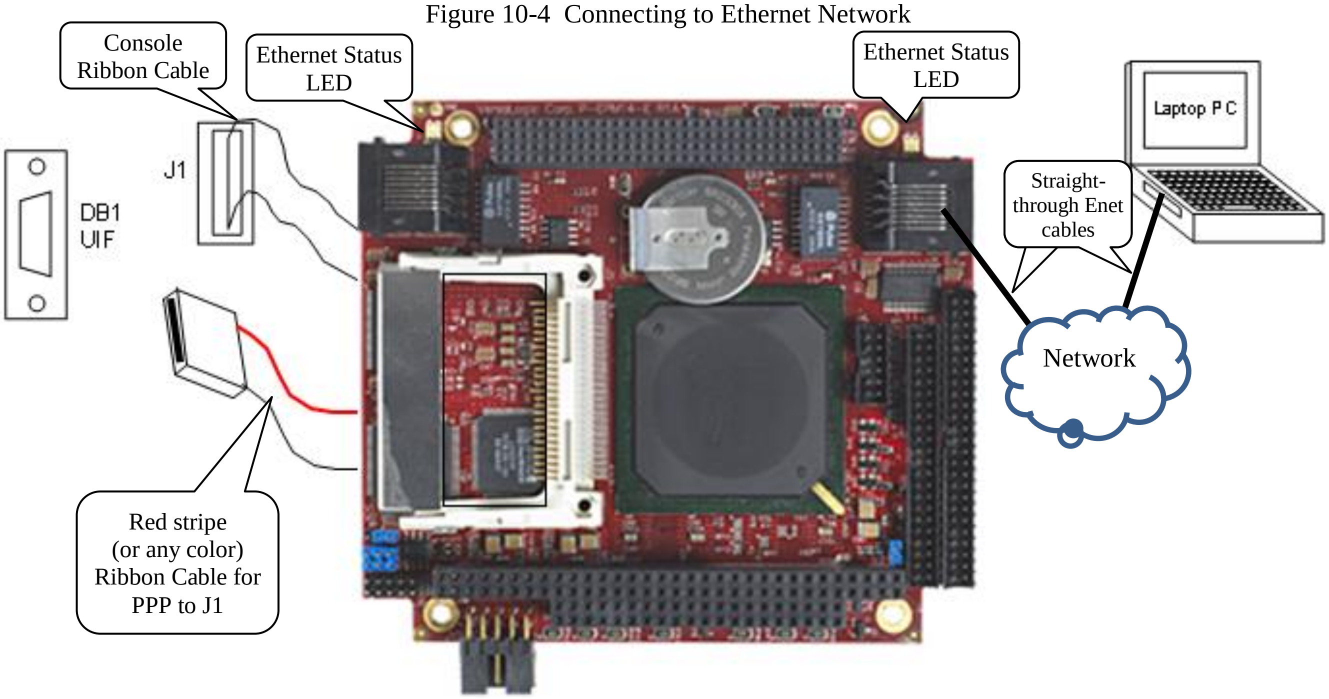
10.1.2 Network Ethernet Communication With RTU

- You need your IT department to assign an IP address and submask for your RTU
- You need to set the RTU to the above IP address and submask
- You need a straight-through Ethernet Cable connected to your network

10.1.2.1 Physical Setup

The absolute best way to operate is to have the RTU on a network. This allows you to access the RTU remotely. See Figure 10-4.

Figure 10-4 Connecting to Ethernet Network

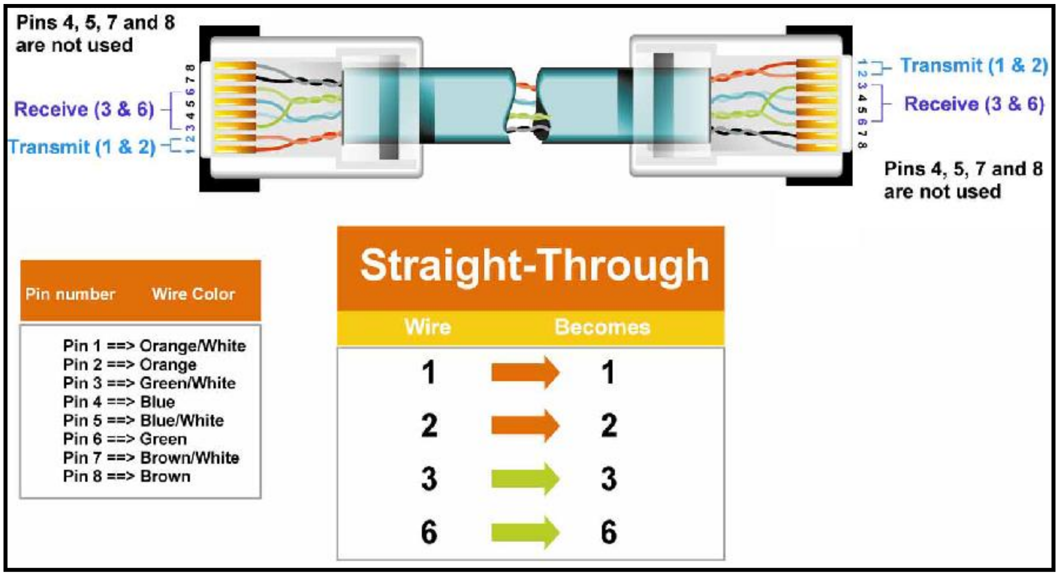


Note: For Ethernet Status LEDs, see **Section 10.1.1.2**.

Note: Obtain an IP address for your RTU from your IT department. The subnet mask for your RTU must match the subnet mask for your group. Do <u>not</u> use an IP address already on your network.

Note: You must reboot the RTU by turning it off/on before the new IP address will take effect.

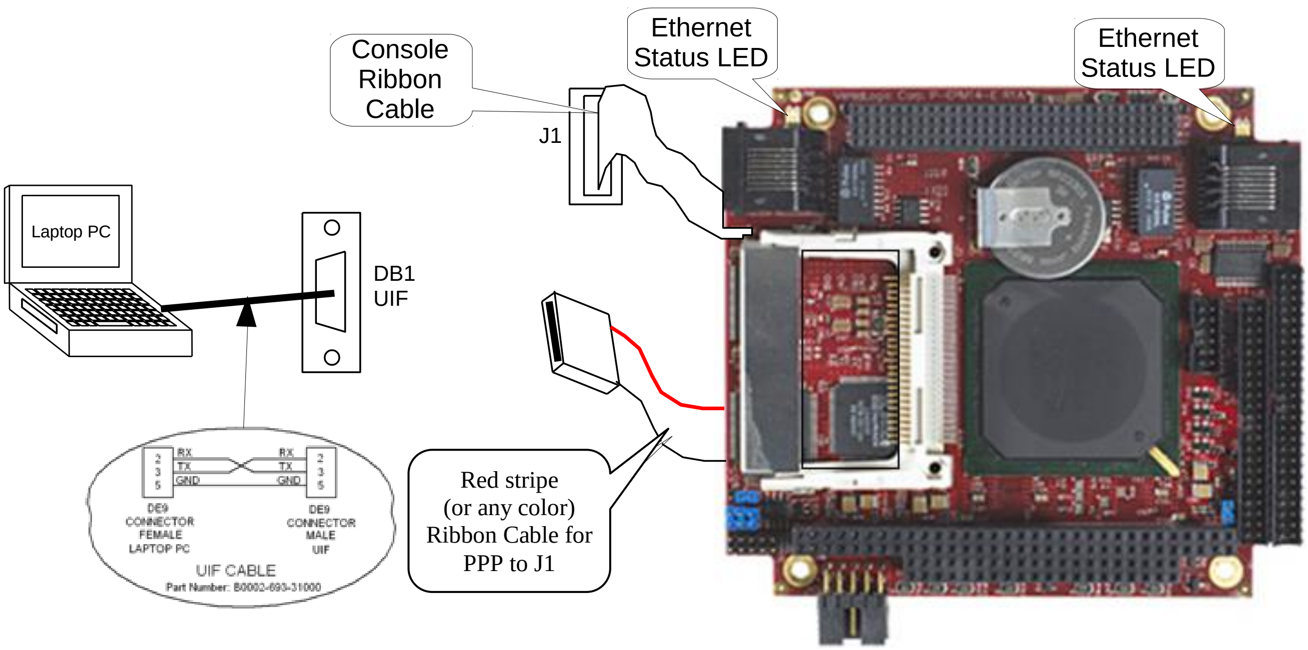
Figure 10-5 Straight-Through Ethernet Cable



10.2 How to Find/Change Your RTU's IP Address

If you do not know the IP address of your RTU, you may ask the RTU "whoru" (who are you) from the console. It's easy to talk to the CPU card through the console. Set the ribbon cable on the card as shown in Figure 10-6. Connect a three-wire null modem cable between your PC and DB1 on the RTU. Use any terminal emulation program, such as Terminal, or HyperTerminal. This example is for a SAGE 3400 baseboard. Please refer to the hardware document for the baseboard you are using for the designation of the connectors.

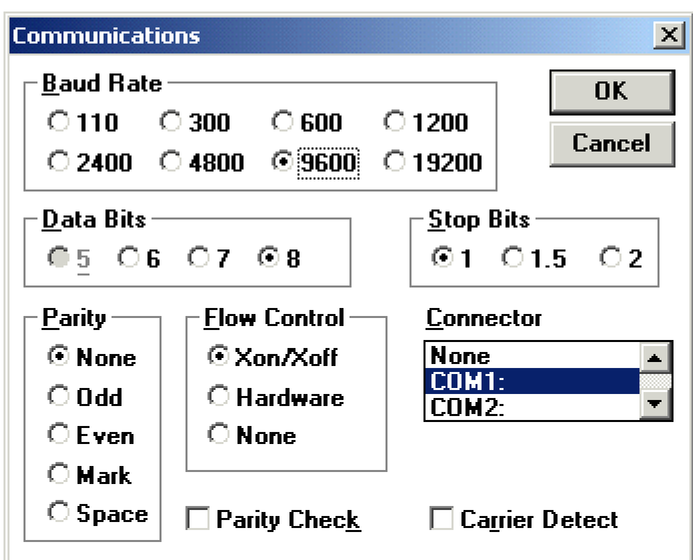
Figure 10-6 Talking to the RTU Through the Console



Note: For Ethernet Status LEDs, see **Section 10.1.1.2**.

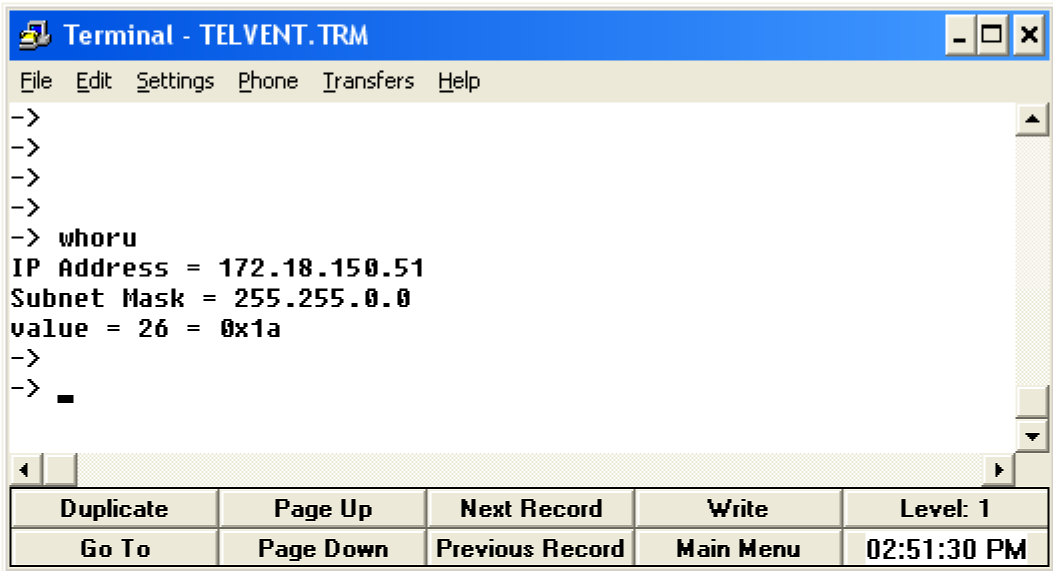
Set communication parameters on the terminal emulation program as shown in Figure 10-7.

Figure 10-7 Terminal Emulation Communication Parameters



Hit Enter a few times until you get a prompt, then type "whoru" as shown in Figure 10-8.

Figure 10-8 Console Display



Note: Obtain an IP address for your RTU from your IT department. The subnet mask for your RTU must match the subnet mask for your group. Do <u>not</u> use an IP address already on your network.

The following console commands are available:

setip	Set the IP address
showip	Show the IP address and subnet mask
whoru	Show the IP address and subnet mask (same as showip)

setip is the only command that takes an argument. The description of the argument is:

The format of the command is
setip "ddd.ddd.ddd.ddd:hhhhhhhh"

where ddd.ddd.ddd.ddd is an IP address, e.g., 172.18.150.53,
and hhhhhhhh is a subnet mask represented in hex format, e.g.,
ffff0000 is the subnet mask 255.255.0.0.

As an example, the following command sets the IP address to 172.18.150.100 and the subnet mask to 255.255.255.0.

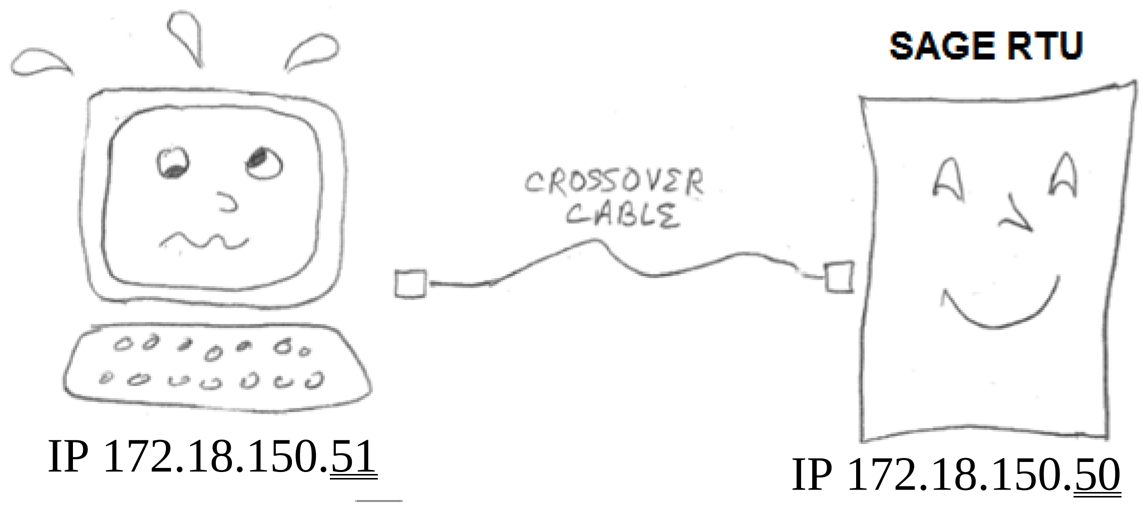
setip "172.18.150.100:ffffff00"

Note: You must reboot the RTU by turning it off/on before the new IP address will take effect.

How to Find/Change Your PC's IP Address

You may change your PC's IP address to one almost the same as the IP address on the RTU (as shipped). This method is rather painful because your PC is probably set with an IP that your network likes. If you use your PC on your network again, you will have to change it back.

10.3



If you decide to change your PC's IP address, keep these points in mind:

- Schneider Electric RTUs are shipped with a Class B IP address (172.18.150.50). This means the Mask you set on your PC should be 255.255.0.0.
- Your PC may have been set to obtain an IP address from your network server at boot-up. You must assign a static IP address to your PC (when connected directly to the RTU, there will be no server to assign your PC's IP address).
- Your PC may also have been set to automatically try to dial-in. You will have to disable this function.

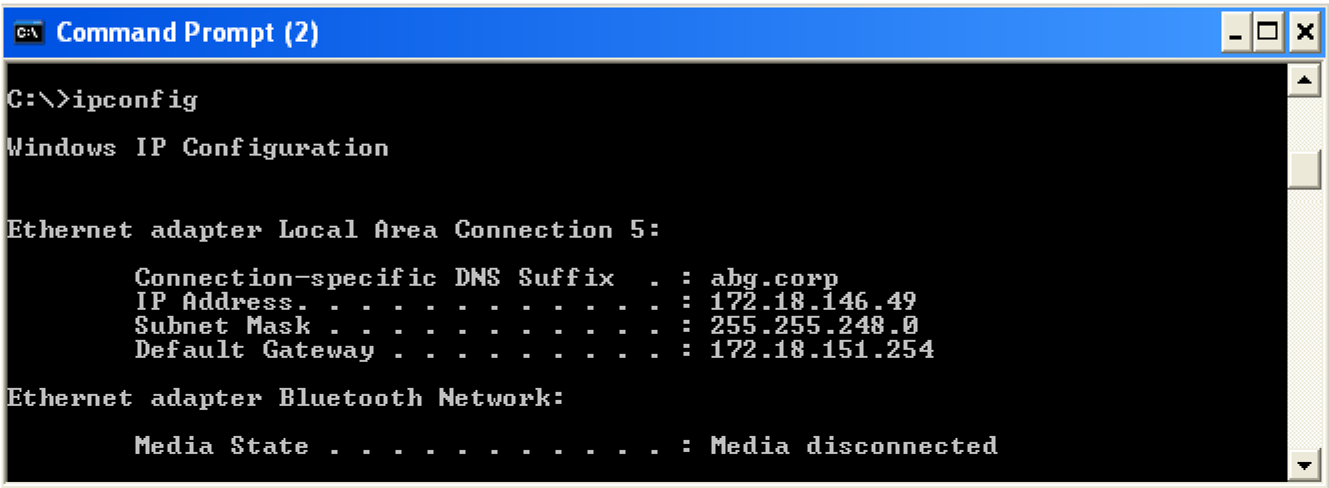
10.3.1 Windows XP Pro and Vista

10.3.1.1 Finding Your PC's IP

If you don't know your PC's IP address, go to a command line and type this command:

ipconfig

Figure 10-9 ipconfig Command

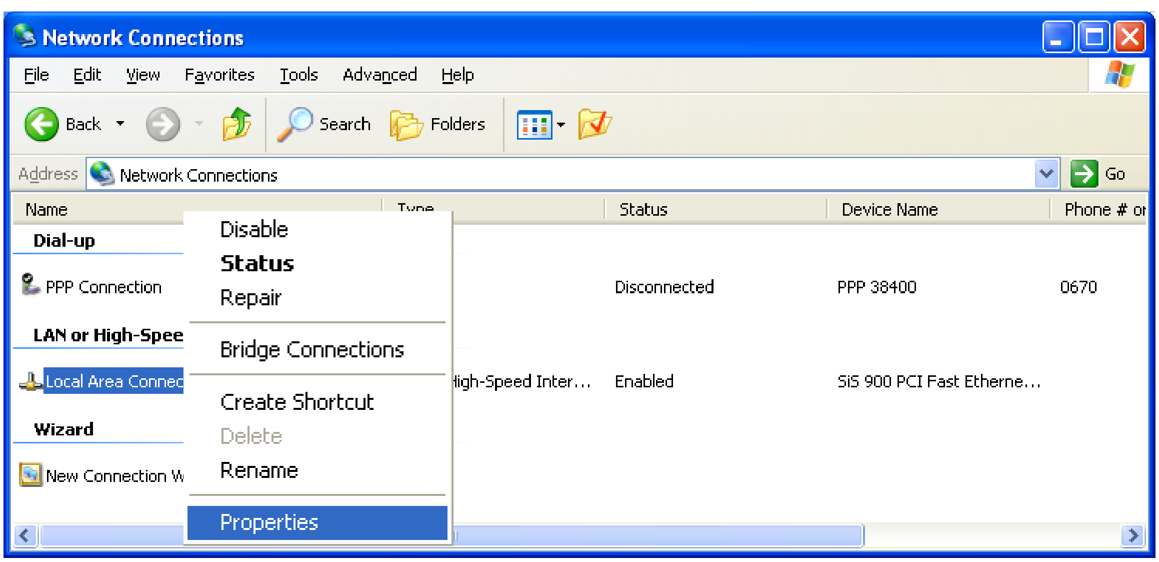


10.3.1.2 Setting Up the Alternate Connection

When you want to switch from your network connection to your RTU through a crossover cable, XP makes it easy because of the “Alternate Connection” setup. Proceed as follows.

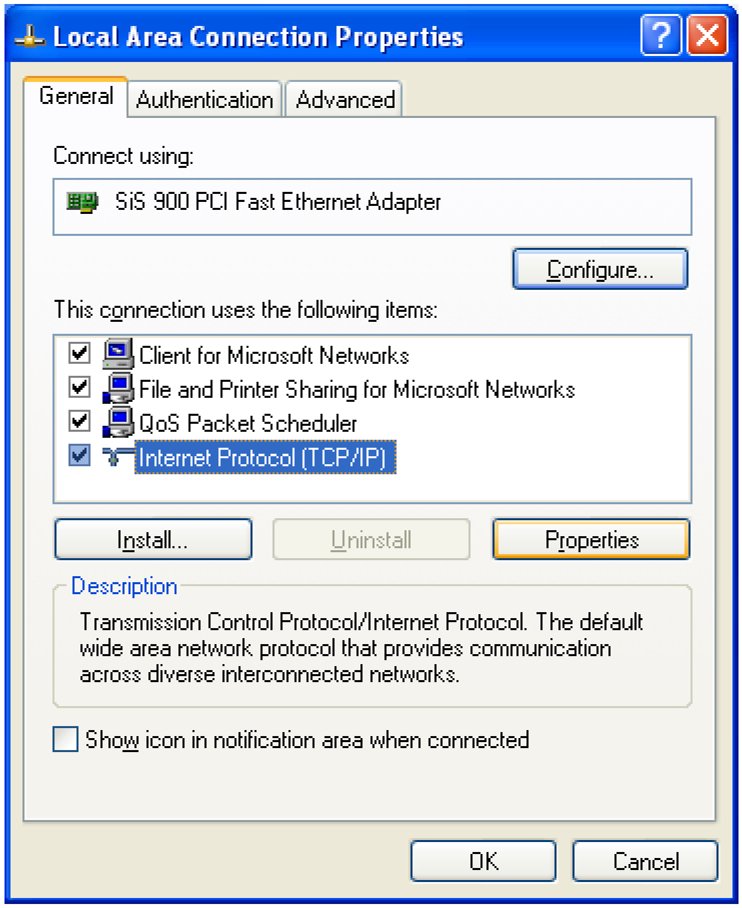
From the Control Panel, right-click on Local Area Connection and select Properties as shown below.

Figure 10-10 Right-Click on Local Area Connection



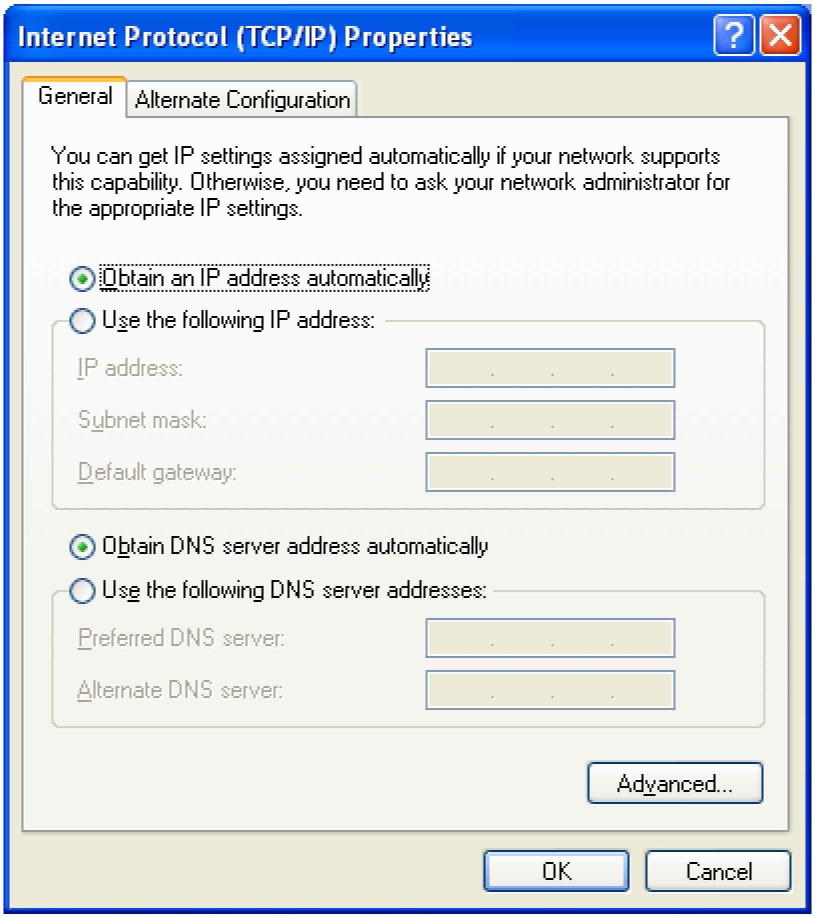
Select Internet Protocol (TCP/IP) and click on the Properties button as shown below.

Figure 10-11 TCP/IP Properties



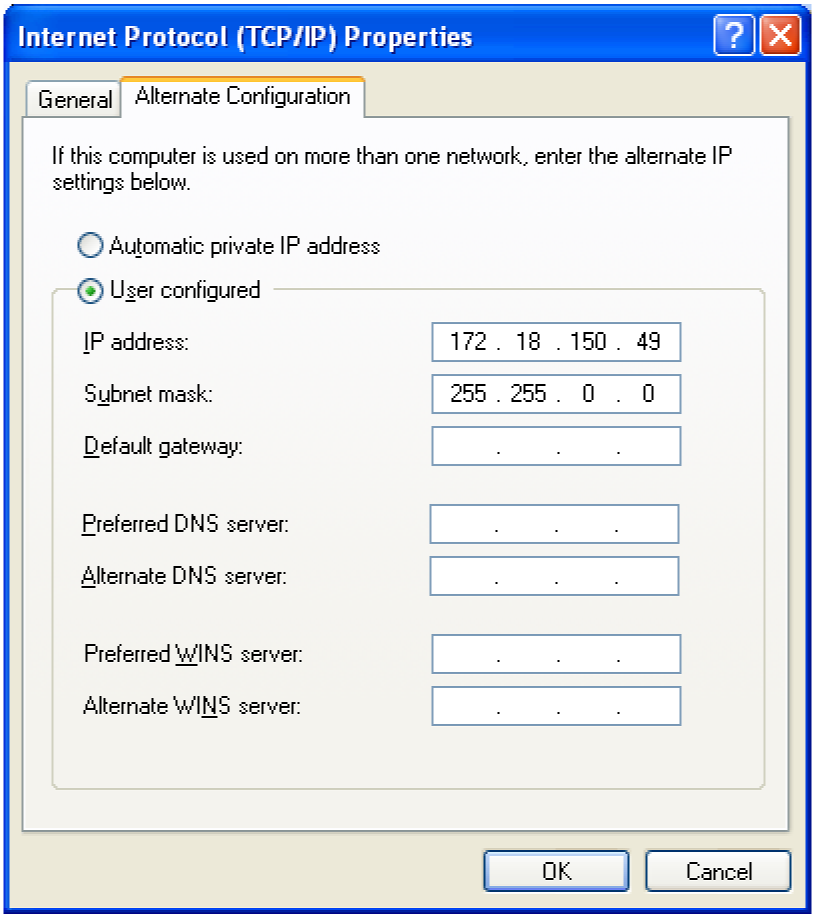
You computer will probably be set for "Obtain an IP address automatically", as shown below. If so, click on the Alternate Configuration tab.

Figure 10-12 TCP/IP Properties



The PC will revert to the Alternate Configuration if the PC cannot find an IP address from the Ethernet cable. After entering the alternate configuration, click OK.

Figure 10-13 Alternate Configuration



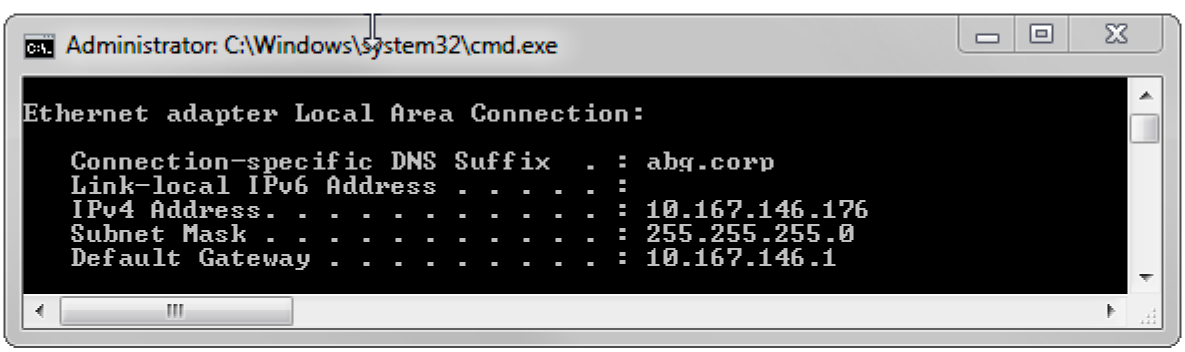
10.3.2 Windows 7

10.3.2.1 Finding Your PC's IP

If you don't know your PC's IP address, go to a command line and type this command:

ipconfig

Figure 10-14 ipconfig Command

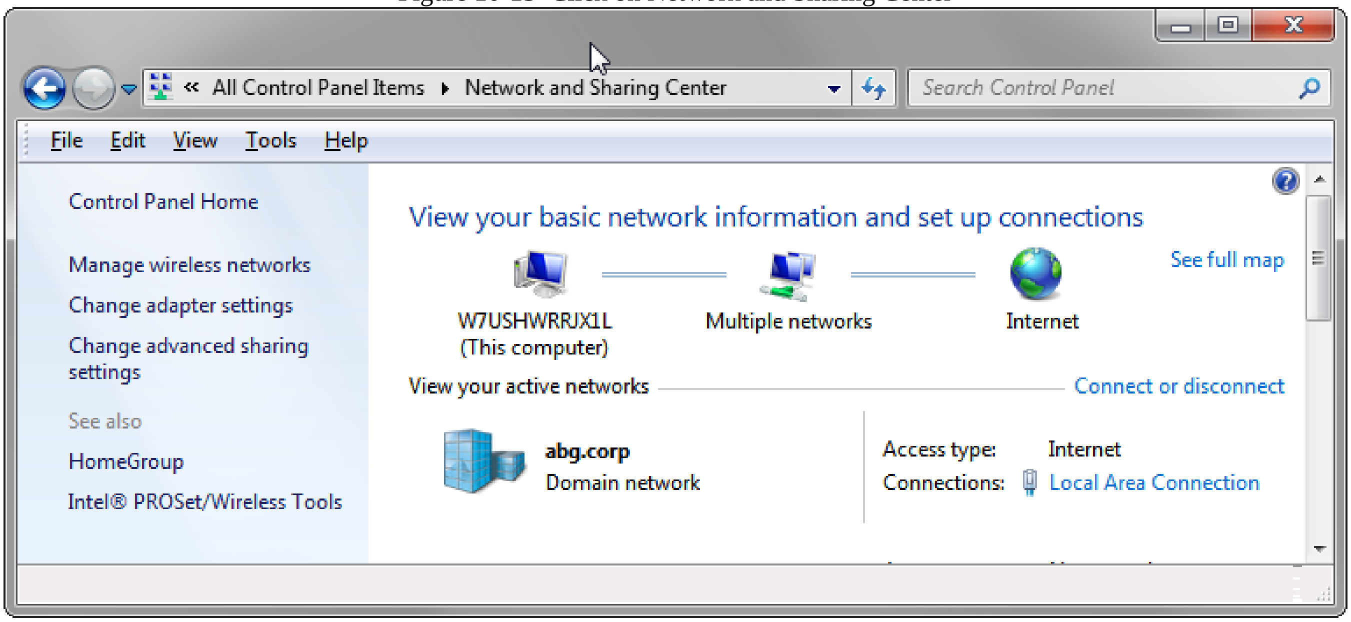


10.3.2.2 Setting Up the Alternate Connection

When you want to switch from your network connection to your RTU through a crossover cable, XP makes it easy because of the "Alternate Connection" setup. Proceed as follows.

From the Control Panel, open the Network and Sharing Center

Figure 10-15 Click on Network and Sharing Center



Click on Change adapter setting. Right Click on the Connection and choose Properties.

Figure 10-16 Select Connection to RTU, right click, select Properties

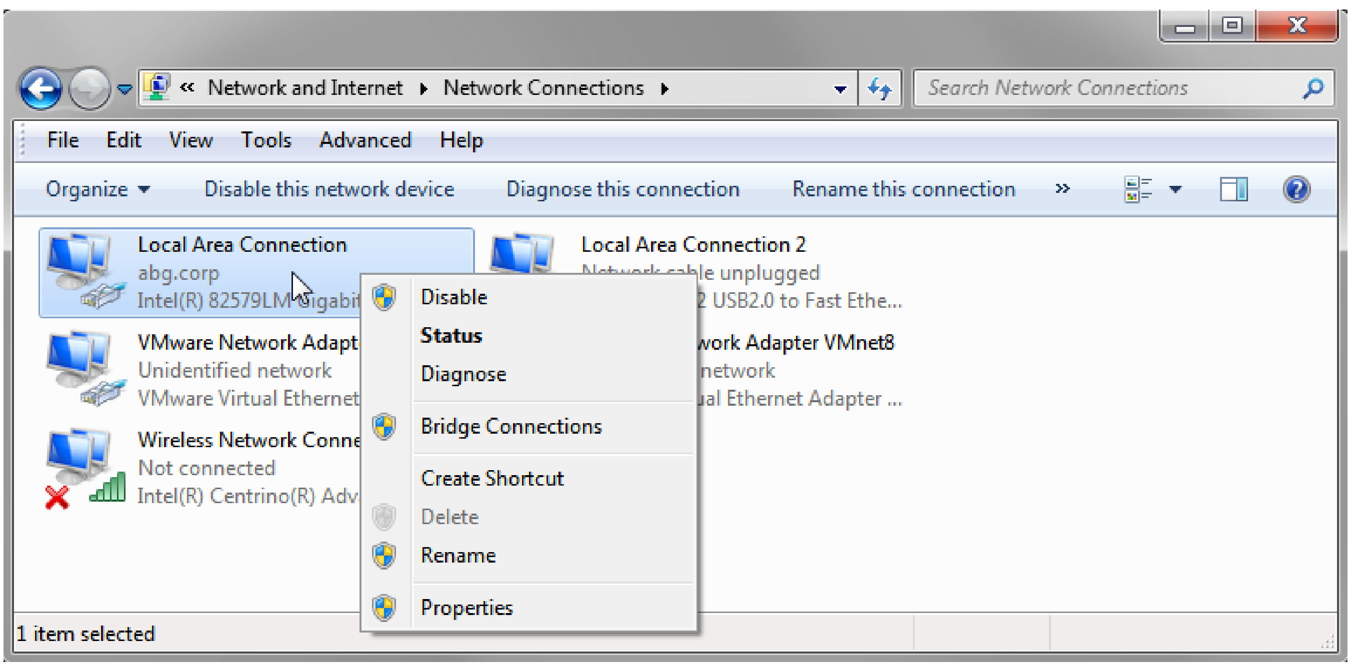
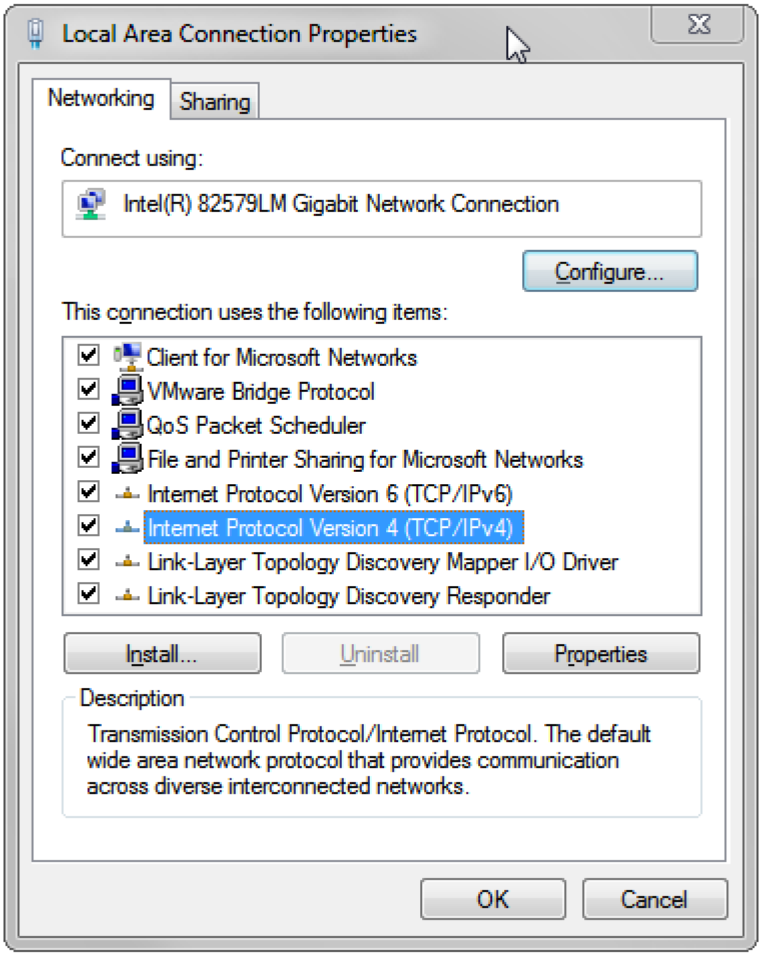
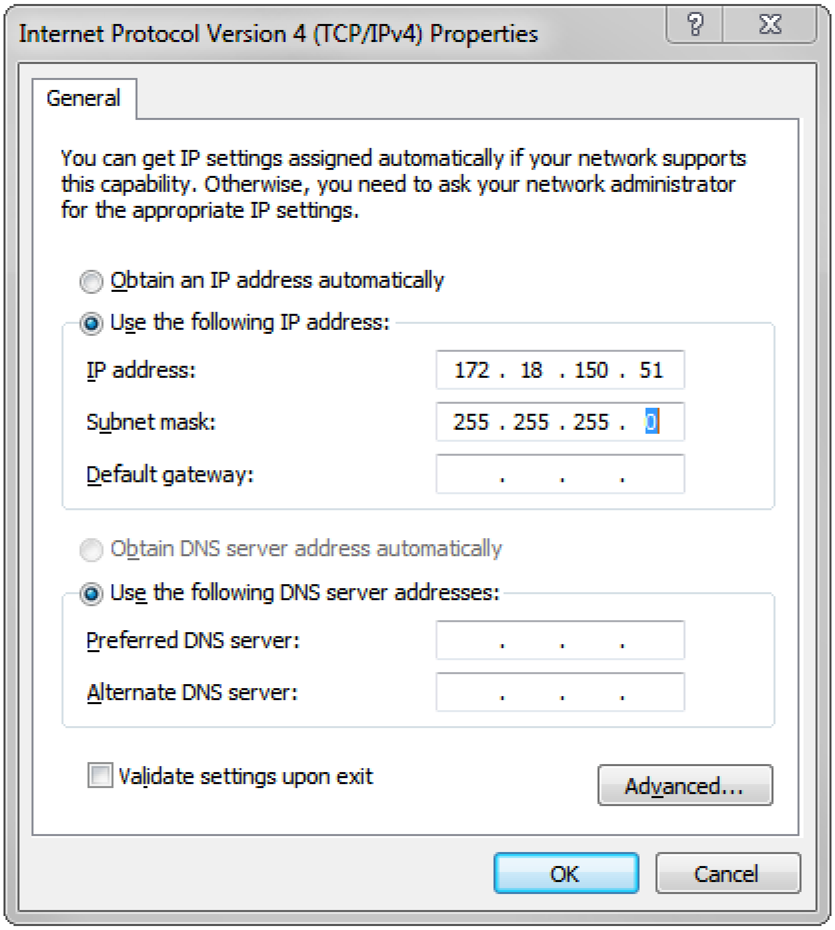


Figure 10-17 Click TCP/IPv4 Properties



Your computer will probably be set for “Obtain an IP address automatically”, as shown below. If so, click on the Use the following IP address radio button.

Figure 10-18 TCP/IP Properties



Enter an IP Address that is on the same network as the SAGE RTU. Click OK.

10.4 Network, PC, & RTU Notes

10.4.1 IP Address & Network Classifications

IP addresses are 32 bits divided into 4 bytes

Networks are classified into three sizes:

Table 10-1 Network Classifications

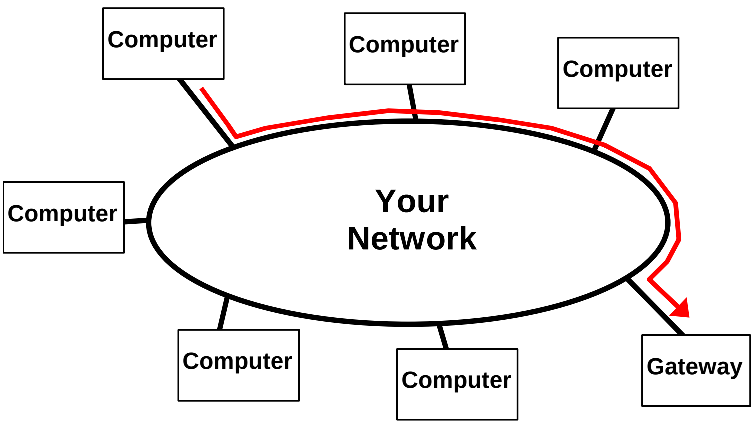
Class	1st Byte	2nd Byte	3rd Byte	4th Byte	Subnet Mask
A	1 – 126	PCs	PCs	PCs	255.0.0.0
B	128 – 191	Network	PCs	PCs	255.255.0.0
C	192 – 223	Network	Network	PCs	255.255.255.0

Notes: 1st byte always belongs to network
PCs = Address of individual nodes (PCs)
Network = Address extension of network
Default subnet mask (some cases may differ)

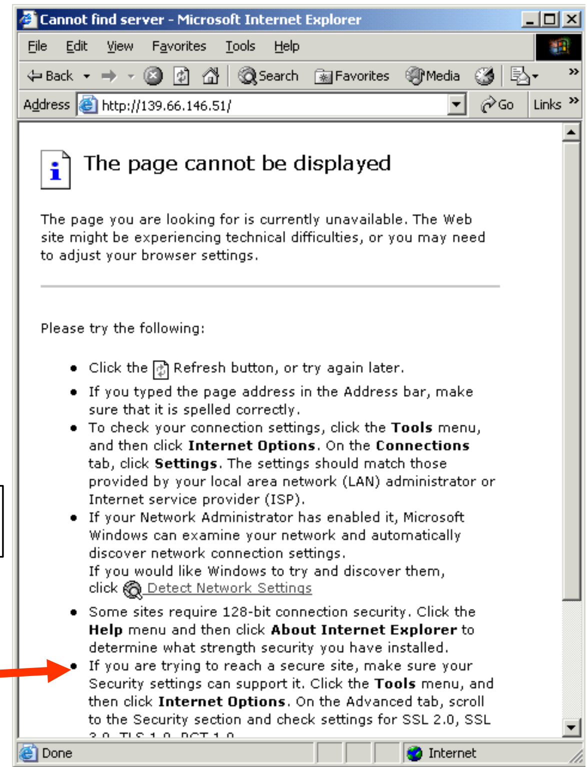
Example: 172.18.150.51 = Class B network, 1st two bytes for network location, last two bytes for individual nodes; Mask = 255.255.0.0

10.4.2 IP Address & Gateways

When you ask your computer to find an IP address whose 1st byte does not match your computer's IP 1st byte, your computer knows to go straight to the gateway of your network (because that address lies outside your network):



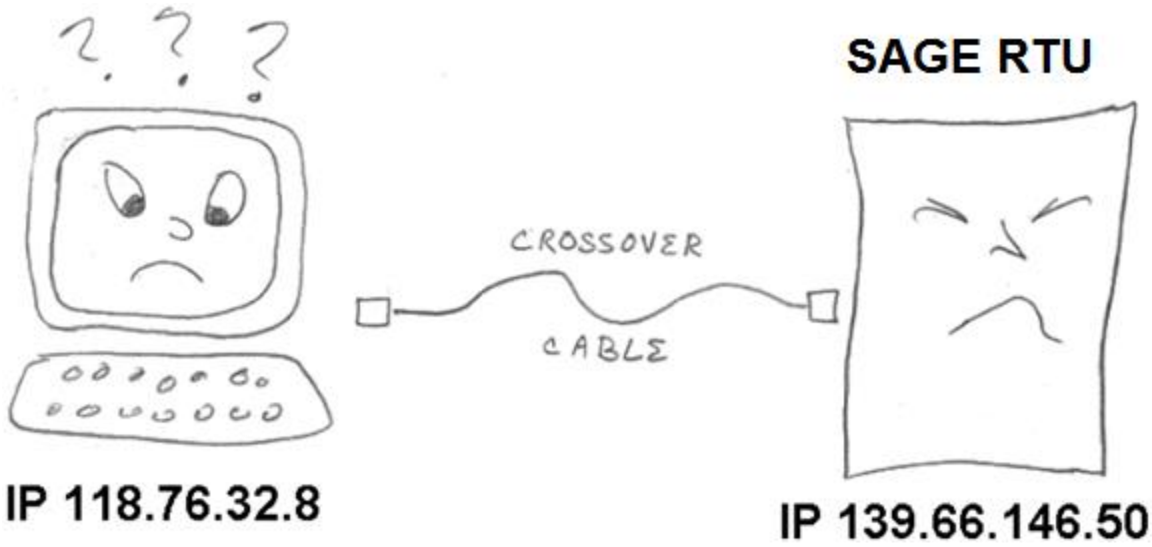
If for any reason the gateway is not available, your computer will not be able to find the address. You will get an IE page like this:



10.4.3 IP Address Mismatch

This is the same analogy as your computer trying to connect directly to a Schneider Electric Config@WEB RTU when they have different 1st bytes in their IP addresses:

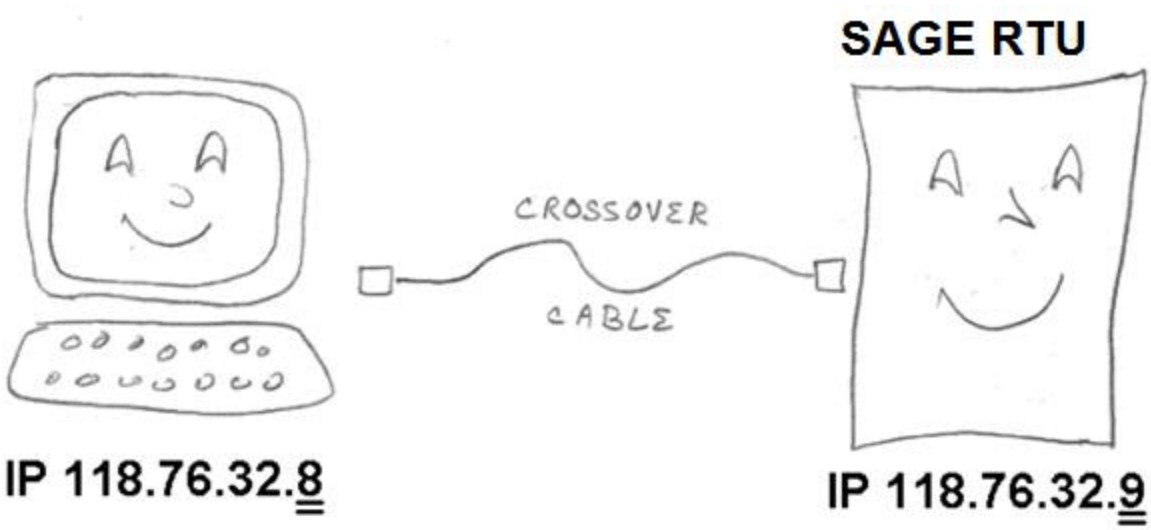
Figure 10-19 IP Mismatch



10.4.4 IP Address Non-network Match

The best method is to set the RTU's IP address within the same group as your own network's IP addresses. The address you choose should not be the same as your PC, or any other PC on your network. If in doubt, ask your IT department to assign IP addresses to your Schneider Electric RTUs. If and when you graduate your RTU operation to a network, your RTUs will be ready.

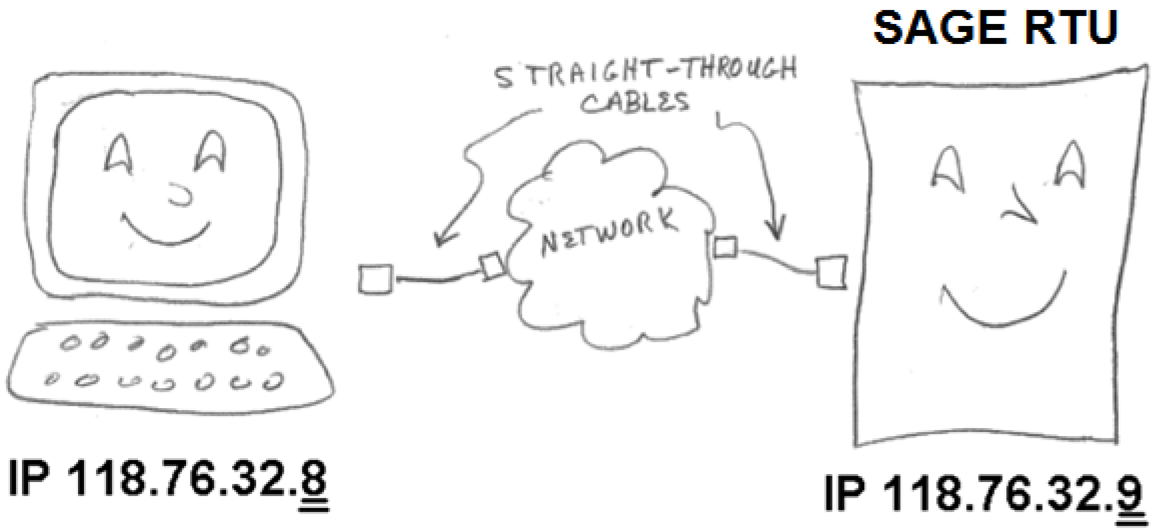
Figure 10-20 Matching IP Addresses



10.4.5 IP Address Network Match

The same principle applies if you put your RTUs on your network: The IP addresses must be in the same group as your existing IP addresses, yet every address must be unique.

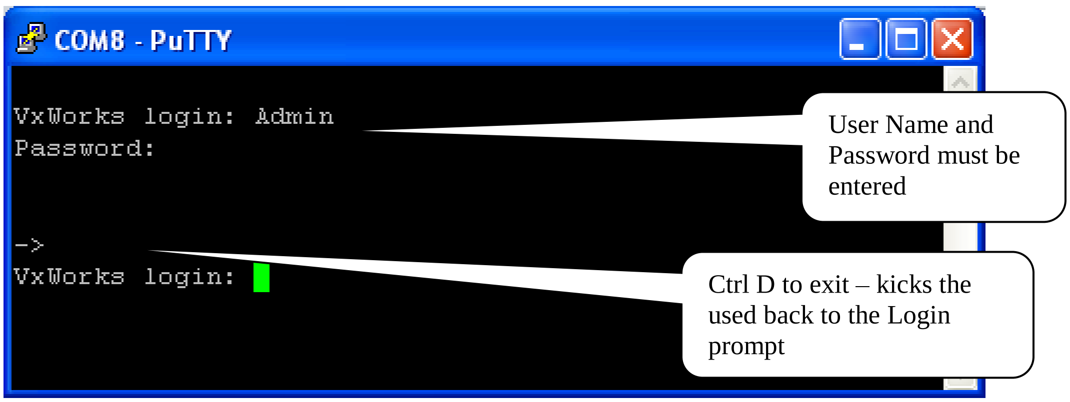
Figure 10-21 IP Addresses on Same Network



11 Console Commands

11.1 Logging In/Out

With the introduction of the Secure firmware, the user must Login to use Console. When finished using Console the user must exit by typing Ctrl D. See below.



11.2 List of Console Commands

The console now has two command modes, “C” and “cmd”.

Typing “cmd” at the console will bring you to the [VxWorks]# command prompt:

```
-> cmd

[vxWorks]#

[vxWorks]# help
```

At [VxWorks Boot] prompt, type? to get list of options

```
List of the registered topics:

EDR                 List of the shell commands related to ED&R.

basic               List of basic shell commands.

breakpoint          List of the shell commands related to
breakpoints.

filesystem          List of the shell commands related to file
system.

interpreter         Interpreter shell commands.

memory              List of the shell commands related to memory.

modules             List of the shell commands related to kernel
modules.

network             Network commands
```

```
object              List of the shell commands related to
objects.

symbols             List of the shell commands related to
symbols.

tasks               List of the shell commands related to tasks.

vxmux               VXMUX routines


List of the registered commands:

C                   Switch to C interpreter

alias               Add an alias or display alias

arp                 IPNET arp control

bp                  Display, set or unset a breakpoint

cd                  Change current directory.

ciphers             SSL Cipher Suites

demangle            Display demangled string

dprintf             Insert a dynamic printf eventpoint

echo                Display a line of text

echoclient          TCP/UDP echo client

echoserver          TCP/UDP echo server

edr ...

exit                Exit the shell session.

expr                Evaluate expressions

file ...

ftp                 FTP client

func ...

getenv              Get an environment variable

help                Display the list of the shell commands

ifconfig            IPNET interface configuration

ike                 IPIKE daemon control

ipsecctrl           config ipsec

keyadm              admin IPsec keys
```

logout	Logout the shell session.
lookup	Lookup a symbol
mem ...	
module ...	
more	Browse and page through a text file.
netstat	IPNET socket and route stats
object ...	
ping	IPNET ping utility
pppconfig	ppp config
print ...	
printf	Write formatted output
pwd	Display current working directory.
radiusc	Radius client
reboot	Reboot the system
repeat	Repeat a command
route	IPNET route table control
s_client	SSL client
s_server	SSL server
s_time	Time SSL connection
set ...	
setenv	Set an environment variable
show ...	
slab	Print slab cache information
sleep	Suspend execution for an interval.
ssl_clt	SSL client for performance measurements
ssl_srv	SSL server for performance measurements
string ...	
sysvar	System variable tool
task ...	
unalias	Remove an alias

```
unset ...

version             Display VxWorks version information.

vxslab              Print VXMUX slab cache information

[vxWorks]#
```

Typing “C” (uppercase only) at the will switch back to the C interpreter:

```
[vxWorks]# C

->

->
->
-> help
help                          Print this list
dbgHelp                       Print debugger help info
edrHelp                       Print ED&R help info
ioHelp                        Print I/O utilities help info
nfsHelp                       Print nfs help info
netHelp                       Print network help info
rtpHelp                       Print process help info
spyHelp                       Print task histogrammer help info
timexHelp                     Print execution timer help info
h          [n]                Print (or set) shell history
i          [task]             Summary of tasks' TCBs
ti         task               Complete info on TCB for task
sp         adr,args...        Spawn a task, pri=100, opt=0x19,
stk=20000
taskSpawn name,pri,opt,stk,adr,args... Spawn a task
tip        "dev=device1#tag=tagStr1", "dev=device2#tag=tagStr2",
...
                                      Connect to one or
            multiple serial lines
td         task               Delete a task
ts         task               Suspend a task
tr         task               Resume a task

Type <CR> to continue, Q<CR> or q<CR> to stop:

tw         task               Print pending task detailed info
w          [task]             Print pending task info
d          [adr[,nunits[,width]]] Display memory
m          adr[,width]        Modify memory
mRegs      [reg[,task]]       Modify a task's registers
interactively
pc         [task]             Return task's program counter
iam        "user"[,"passwd"]  Set user name and passwd
whoami                        Print user name
devs                          List devices
ld         [syms[,noAbort][,"name"]] Load stdin, or file, into
memory
```

```
                                                    (syms = add symbols to
            table:
                                                    -1 = none, 0 =
            globals, 1 = all)
lkup      ["substr"]           List symbols in system symbol
table
lkAddr    address              List symbol table entries near
address
checkStack  [task]             List task stack sizes and usage
printErrno  value              Print the name of a status value
period    secs,adr,args...     Spawn task to call function
periodically
repeat    n,adr,args...        Spawn task to call function n
times (0=forever)
version                        Print VxWorks version info, and
boot line
shConfig  ["config"]           Display or set shell configuration
variables

Type <CR> to continue, Q<CR> or q<CR> to stop:

strFree   [address]            Free strings allocated within the
shell (-1=all)

NOTE:  Arguments specifying 'task' can be either task ID or name.

value = 1 = 0x1
->
```

Some of the more common “C” commands not listed in help:

```
setip                          Set the IP address of the RTU

whoru                          Get the RTU IP address

dnp_al_rejects_report         Troubleshoot the DNP Applications
Layer for the configured ports.

dnp_dl_rejects_report         Troubleshoot the DNP Data Link
Layer for the configured ports.
```

Commonly used “cmd” command not listed in help

```
reboot 2                             Reboot the RTU
```

11.3 Recovering From a Corrupt IP Address

If an illegal character has been entered as an IP address, the bootup process will stop at the [VxWorks Boot] prompt. The condition can be corrected by following the example below.

`Accidentally` entered IP address with an illegal character. Once you hit Enter, you are stuck. Go ahead and reboot, as shown.

```
-> setip "172.18.1%0.51:fffff800"

OK.

value = 4 = 0x4
-> reboot 2
```

(With a “bad” IP address, the RTU continuously reboots. Carefully watch the display until the following message appears:)

```
Press any key to stop auto-boot...

 1
```

```
[VxWorks Boot]: ?
```

At [VxWorks Boot] prompt, type ? to get list of options

```
Commands:
 ?                      - print this list
 @                      - boot (load and go)
 p                      - print boot params
 c                      - change boot params
 l                      - load boot file
 g adrs                 - go to adrs
 e                      - print fatal exception
 v                      - print boot logo with version
 d adrs[,n]             - display memory
 m adrs                 - modify memory
 f adrs, nbytes, value  - fill memory
 t adrs, adrs, nbytes   - copy memory
 devs                   - print system devices

Bootline Format:
  $dev(0,procnum)host:/file h=# e=# b=# g=# u=usr [pw=passwd] f=#
                          tn=targetname s=script o=other

File System Boot Device Formats:
 boot device: fs
 file name: /FileSystemDeviceName/vxWorks
 other: network device name

 boot device: ata[=ctrl,drive]         file name: /ata0a/vxWorks

Boot Flags:
  0x0002 -   load local system symbols
  0x0004 -   don't autoboot
  0x0008 -   quick autoboot (no countdown)
  0x0080 -   use tftp to get boot image

Available Boot Devices:
  Filesystem Devices: /ata0a /ata00:2
  Enhanced Network Devices:  fei0 fei1
```

Type “p” to verify the incorrect IP address

```
[VxWorks Boot]: p

boot device          : ata=0,0
unit number          : 0
processor number     : 0
host name            : host
file name            : /ata0a/vxworks
inet on ethernet (e) : 172.18.1%0.51:ffff0000
host inet (h)        : 172.18.150.49
gateway inet (g)     : 172.18.1.1
user (u)             : target
ftp password (pw)    : password
flags (f)            : 0x8
target name (tn)     : Telvent
other (o)            : fei
```

The Problem

```
[VxWorks Boot]: c
```

Change boot parameters one step at a time by entering lowercase "c"

```
'.' = clear field;  '-' = go to previous field;  ^D = quit

boot device          : ata=0,0
processor number     : 0
host name            : host
file name            : /ata0a/vxworks
inet on ethernet (e) : 172.18.1%0.1:ffff0000 172.18.150.1:ffff0000
inet on backplane (b):
host inet (h)        : 172.18.150.49
gateway inet (g)     : 172.18.1.1
user (u)             : target
ftp password (pw) (blank = use rsh):
flags (f)            : 0x8
target name (tn)     : Telvent
startup script (s)   :
other (o)            : fei
```

When the offending IP address comes up

Type in correct IP address & mask here. Continue to hit Enter until [VxWorks Boot] prompt appears

```
NOTE: Bootline not saved to NVRAM
[VxWorks Boot]: p
```

Print boot parameters to verify correct IP

```
boot device          : ata=0,0
unit number          : 0
processor number     : 0
host name            : host
file name            : /ata0a/vxworks
inet on ethernet (e) : 172.18.150.1:ffff0000
host inet (h)        : 172.18.150.49
gateway inet (g)     : 172.18.1.1
user (u)             : target
ftp password (pw)    : password
flags (f)            : 0x8
target name (tn)     : Telvent
other (o)            : fei

[VxWorks Boot]: @
```

One-time boot with this set of parameters

```
-> setip "172.18.150.51:fffff800"
OK.
```

After normal bootup, you must now do setip again using the correct IP, then reboot again

```
value = 4 = 0x4
-> reboot 2
```

After bootup, whoru to verify correct IP address.

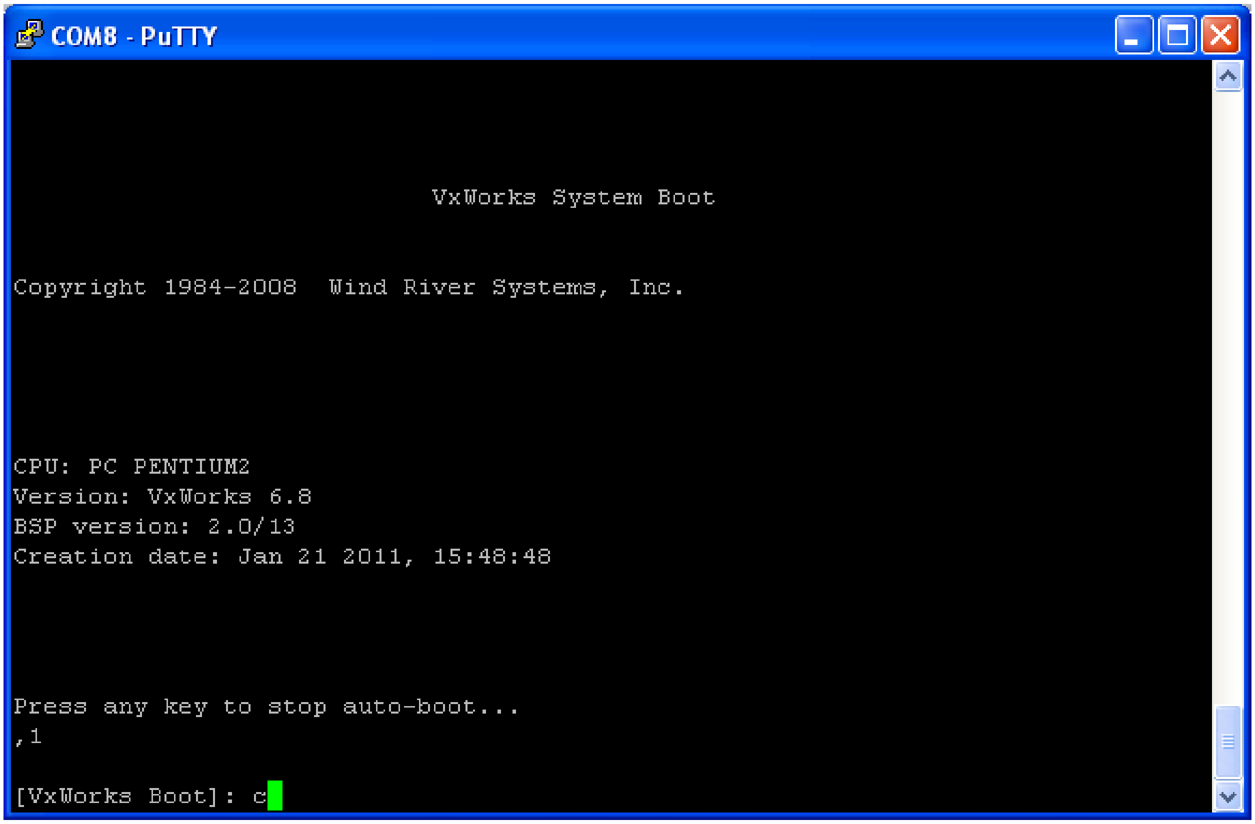
```
-> whoru
IP Address = 172.18.150.51
Subnet Mask = 255.255.248.0
value = 28 = 0x1c
->
```

11.4 Booting the RTU in Safe Mode

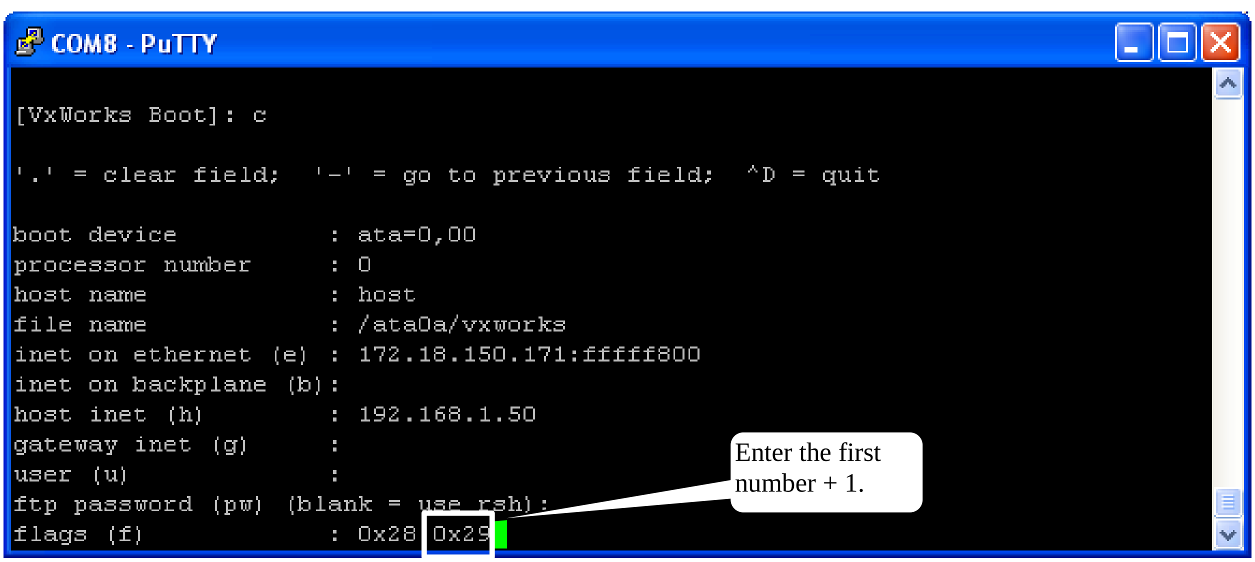
To bootup in Safe Mode from the console, you must first reboot in console by logging in (if not already logged in), then type reboot 2 as shown below, and hit return.

Press any key repeatedly as login begins. The login will stop at [VxWorks Boot]: as shown below.

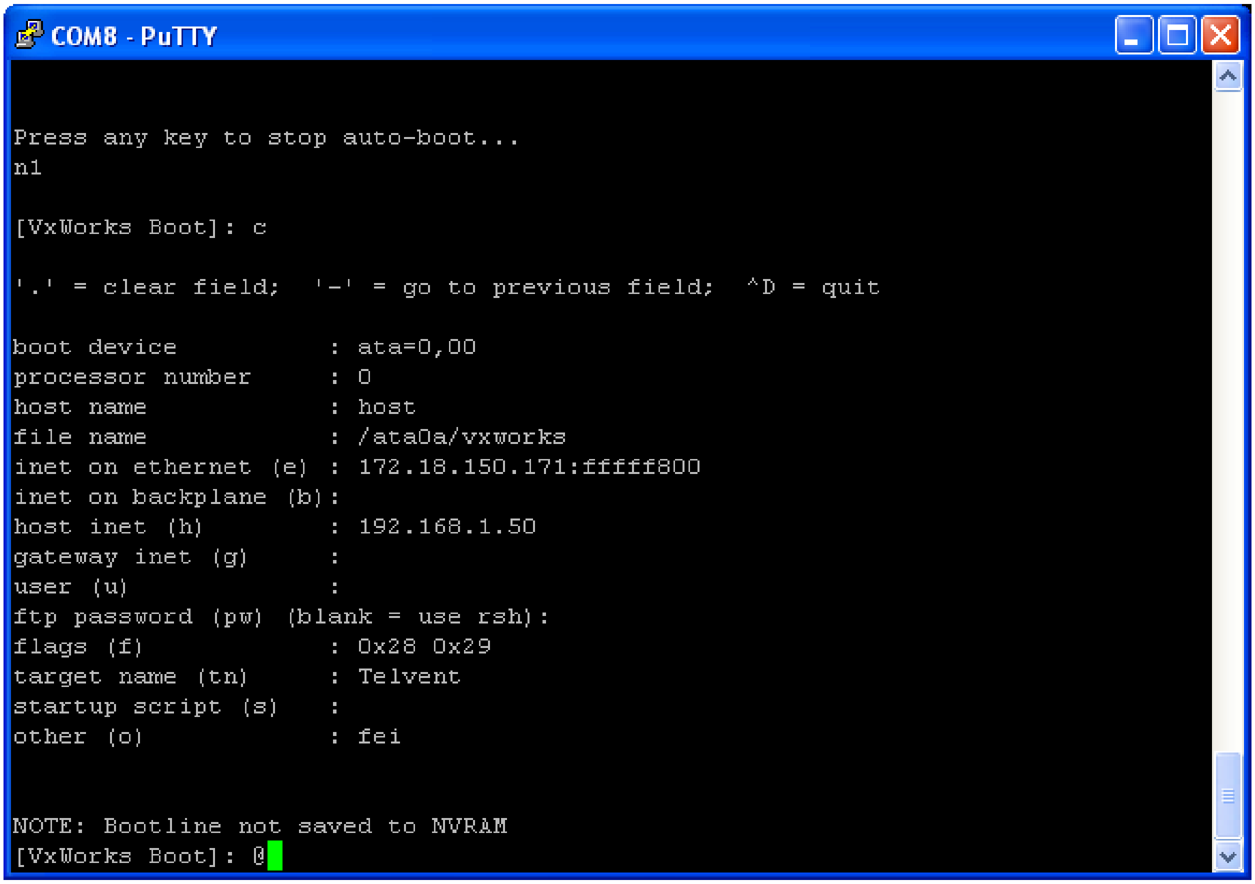
Enter a lower case c as shown below, and hit return.



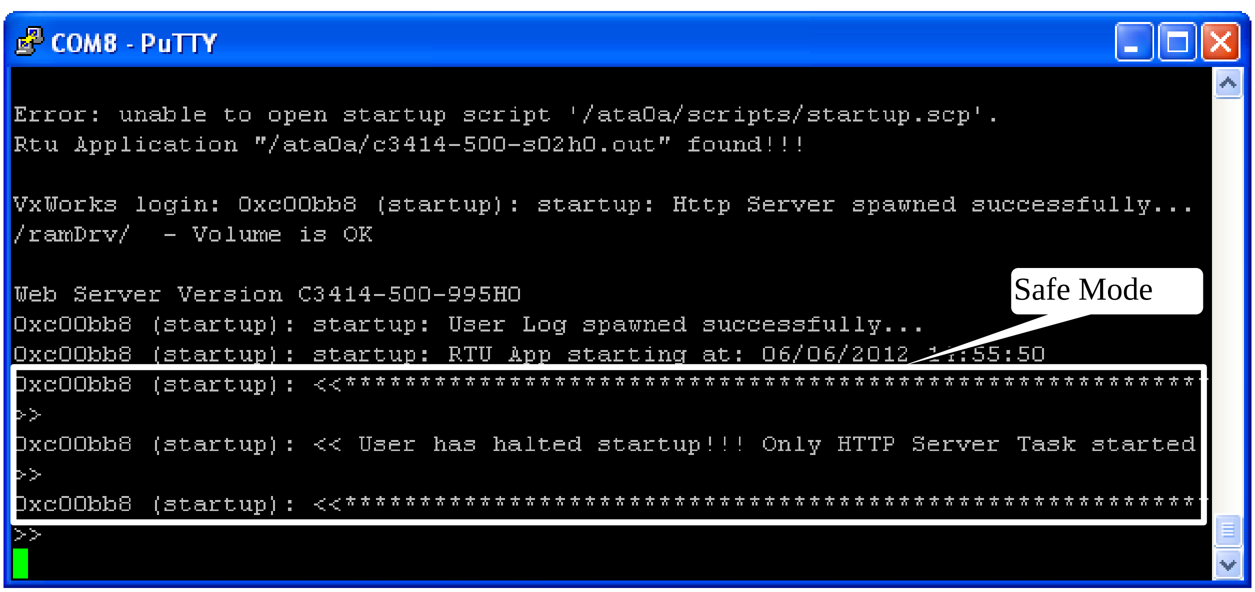
Keep hitting return to advance the cursor to flags (f) as shown below. Whatever number is displayed after the colon (in this case 0x28), add 1 to that number and enter the new number. The entered number entered must be odd.



Hit return until the cursor returns to [VxWorks Boot]: as shown below. Enter an "at" symbol, that is @ as shown, then hit return to continue bootup.



The RTU will bootup in Safe Mode as shown below.



11.5 Checking Task Status

Typing the lowercase I into the console prompt shows the status of all tasks running. The critical clue to watch for, if you suspect a problem, is the STATUS of each task. PEND, READY, and DELAY are okay, but a SUSP means trouble. See below.

For instance, the tHTTPd task serves up web pages to Internet Explorer. If this task is SUSP, then there will be no response in I.E. from the RTU.

Figure 11-1 Checking Task Status

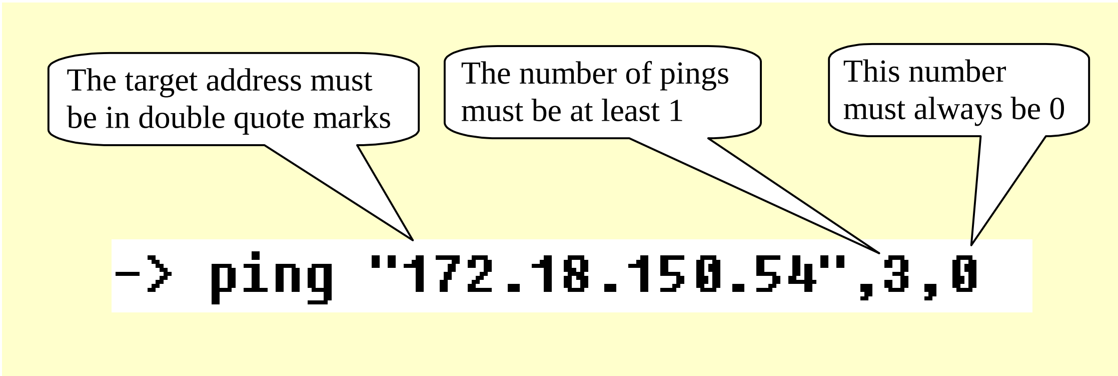
```
COM1 - PuTTY
->
-> i

  NAME         ENTRY         TID      PRI   STATUS      PC        SP      ERRNO  DELAY
----------   ------------ -------- --- ---------- -------- -------- ------- -----
tIsr0        43eb60         166a7ec   0 PEND         63d1b0   16d5f80        0     0
tJobTask     5c96f0         166e250   0 PEND         63d1b0   16dbf30        0     0
tExcTask     5c8a70          7c1d20   0 PEND         63d1b0    7bf220        0     0
tLogTask     logTask        16d8978   0 PEND         63b06a   16e1ed0        0     0
tNbioLog     5ca6b0         166e6c0   0 PEND         63d1b0   16e8ef0        0     0
tShell0      shellTask      18839bc   1 READY        6452e0   18c8120        0     0
tWdbTask     wdbTask        1891010   3 PEND         63d1b0   18b6f00        0     0
tErfTask     4460e0         16e5cf4  10 PEND         63d610   16edf20        0     0
ipcom_tick>  656080         187e348  20 DELAY        64320a   188af80        0     4
tAtaSvc0     432718         16de790  50 PEND         63d610   16c8f30        0     0
tNet0        ipcomNetTask   167cb10  50 PEND         63d1b0   170df20        6     0
ipcom_sysl>  462800         1841278  50 PEND         63d610   184ae50        0     0
ipcom_teln>  ipcom_telnet   166c1e4  50 PEND         63d1b0   1881e00        0     0
ipppp_work   40c16d         168c100  50 PEND         63d610   188ff30        0     0
ipftps       ipftps_main    185a828  50 PEND         63d1b0   189ee10        0     0
ipiked       ipike_proc     1896b38  50 PEND+T       63d1b0   18b09b0   3d0004     3
tXbdServic>  5c2650         18b86e4  50 PEND+T       63d610   18cdf40   3d0004    58
t5Msec       clk_task_5ms   ef26d4c  98 PEND         63d1b0   1b0df00        0     0
t50Msec      clk_task_50m   1b0a530  99 PEND         63d1b0   1b13f30        0     0
dcmgMain     dcmgMain       1c626e0 100 DELAY        64320a   1c69f80 1f5003d    22
ETCP         etcpMain       18849b0 100 DELAY        64320a   1c74f20 1f5003d     2
IsaIXD       dixdMain       1c7f6e8 100 DELAY        64320a   1c85f60 1f5003d     3
dnTcpSrv17   dnpTcpServ     1be2558 203 PEND         63d1b0   1c54c90        0     0
dnTcpWrk17   tcpProcess     1842000 203 PEND         63b06a   1c59eb0        0     0
dnUdpSrv17   dnpUdp         1843290 203 PEND         63d1b0   1c5ecf0        0     0
DBC          m1_dbc         1b8ab50 204 PEND+T       63d1b0   1b92f10   3d0004   122
SCHED        1a5d340        1b85eb0 205 PEND         63b06a   1b8ceb0        0     0
COS          m1_cos         1b90970 205 PEND+T       63b06a   1b98e70   3d0004   172
CTLR         m1_ctlr        1b90c60 205 PEND+T       63b06a   1b9fe00   3d0004    30
ANA          m1_ana         1b9d980 205 PEND         63d1b0   1ba6f10        0     0
DAC          m1_dac         1b9dd50 205 PEND+T       63b06a   1baddf0   3d0004   105
ISaGRAF_IF   1931950        1babc70 205 PEND         63d1b0   1bc49a0    30065     0
DNPMCOM 1    dnp_dl_task    1bc1c70 205 PEND+T       63d1b0   1be9ea0   3d0004    17
DNP COM 17   dnp_dl_task    1bd0c00 205 PEND+T       63d1b0   1c01ea0   3d0004    15
USERLOG      usrlog_task    ef279b0 206 PEND         63b06a   1af2e70   3d0002     0
MBM COM 2    mbm_task       1bd0980 206 DELAY        64320a   1bf9e20   3d0004    46
DNP_APPR17   dnp_appr_tas   1bd7980 206 PEND+T       63d1b0   1c09ea0        0   171
DNP_APPM1    dnp_appm_tas   1bc99f0 207 PEND+T       63d1b0   1bf1e50   3d0004     2
SOELOG       soelog_task    1bb2980 208 PEND+T       63d1b0   1bcbed0   3d0004   130
ALARMS       alarms_task    1bb2d68 208 PEND         63b06a   1bd2e90        0     0
SELF         m1_self        1ba4ad0 215 DELAY        64320a   1bb5a20   3d0001    57
GPST         gpst_task      1bab980 215 PEND+T       63d1b0   1bbcf30   3d0004   147
```

Pinging From The RTU

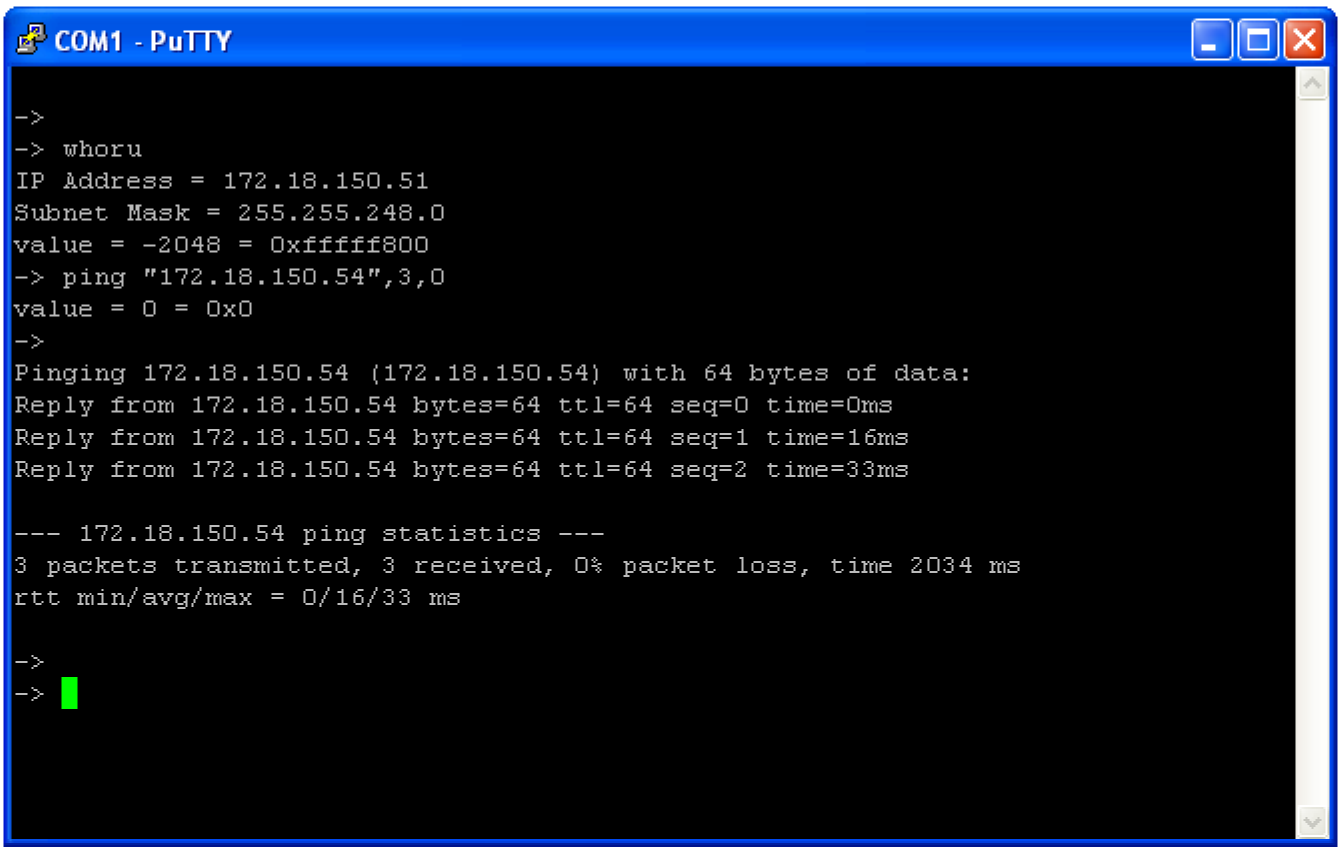
It has always been possible to ping the RTU from a device if you know the RTUs I.P. address. The RTU itself is now capable of sending a ping over TCP/IP with a console command. This function is useful if you want to check TCP/IP communication integrity directly from the RTU to any TCP/IP address compatible with the IP address range. See the syntax rules below.

Figure 11-2 Ping Syntax Rules



The following figure shows the result of a ping

Figure 11-3 Pinging From Within The RTU

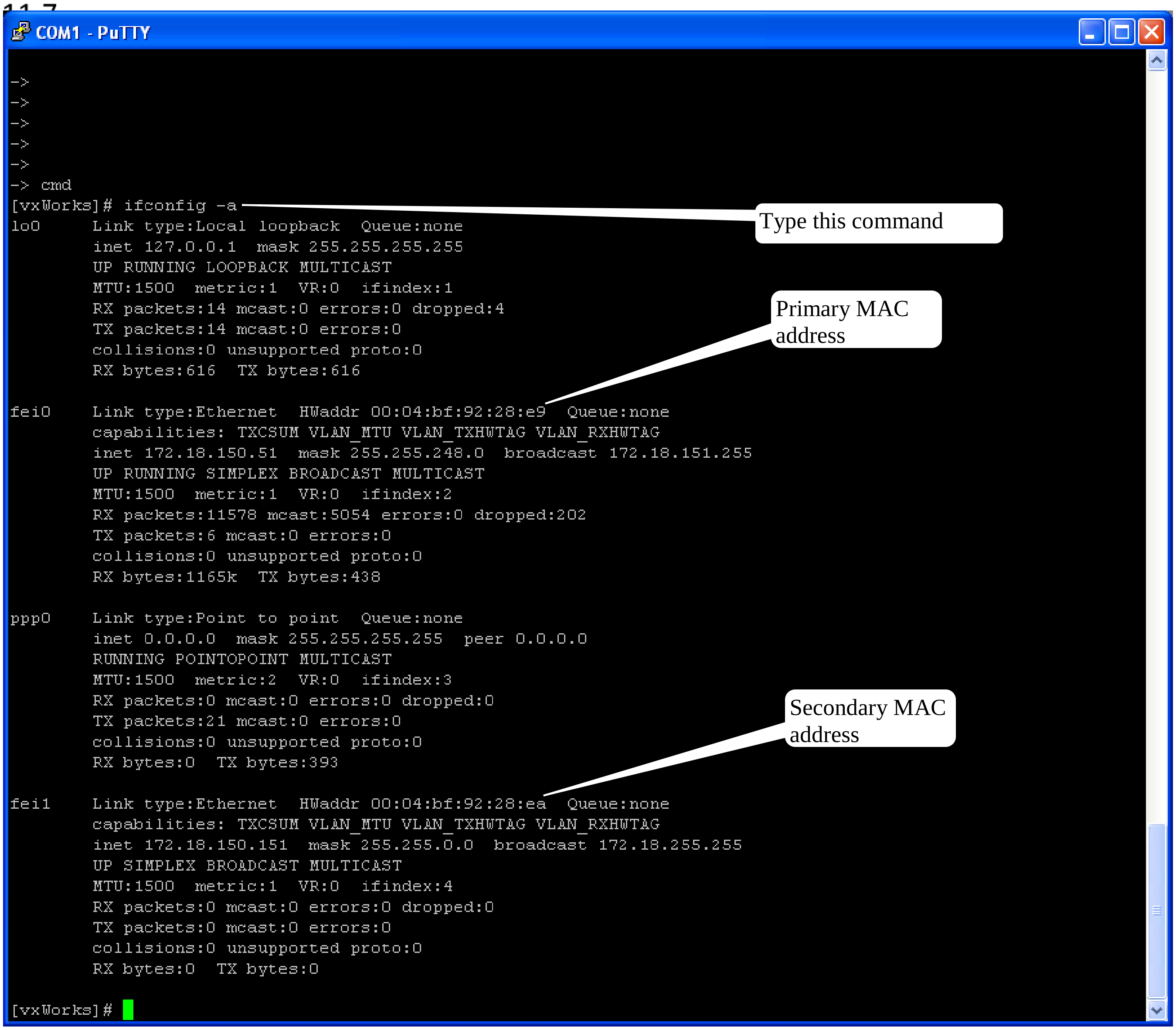


The RTU’s MAC Address

11.7.1 Finding RTU's MAC Address Using Console

Enter the command shown below to retrieve the MAC address of the Ethernet circuits on the CPU card.

Figure 11-4 Finding the CPU Card’s MAC Address Using Console

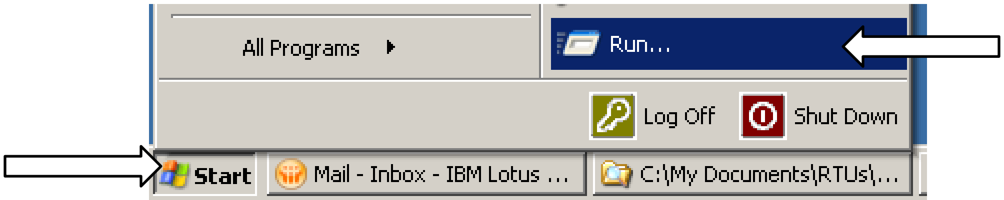


Note: Secondary Ethernet (fei1) is displayed only if the device has been configured via the GUI / Application firmware.

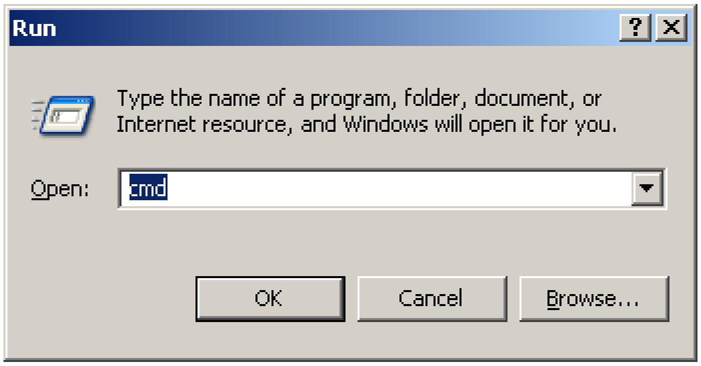
11.7.2 Finding RTU's MAC Address Remotely

If the console cannot be used remotely, you can find the MAC address though a Windows command line using the ARP command as follows if your PC is directly connected to the RTU. Otherwise, you will have to connect to the device serving as the gateway to the network for the RTU and use the ARP command appropriate for the device.

Go to Start and Run.

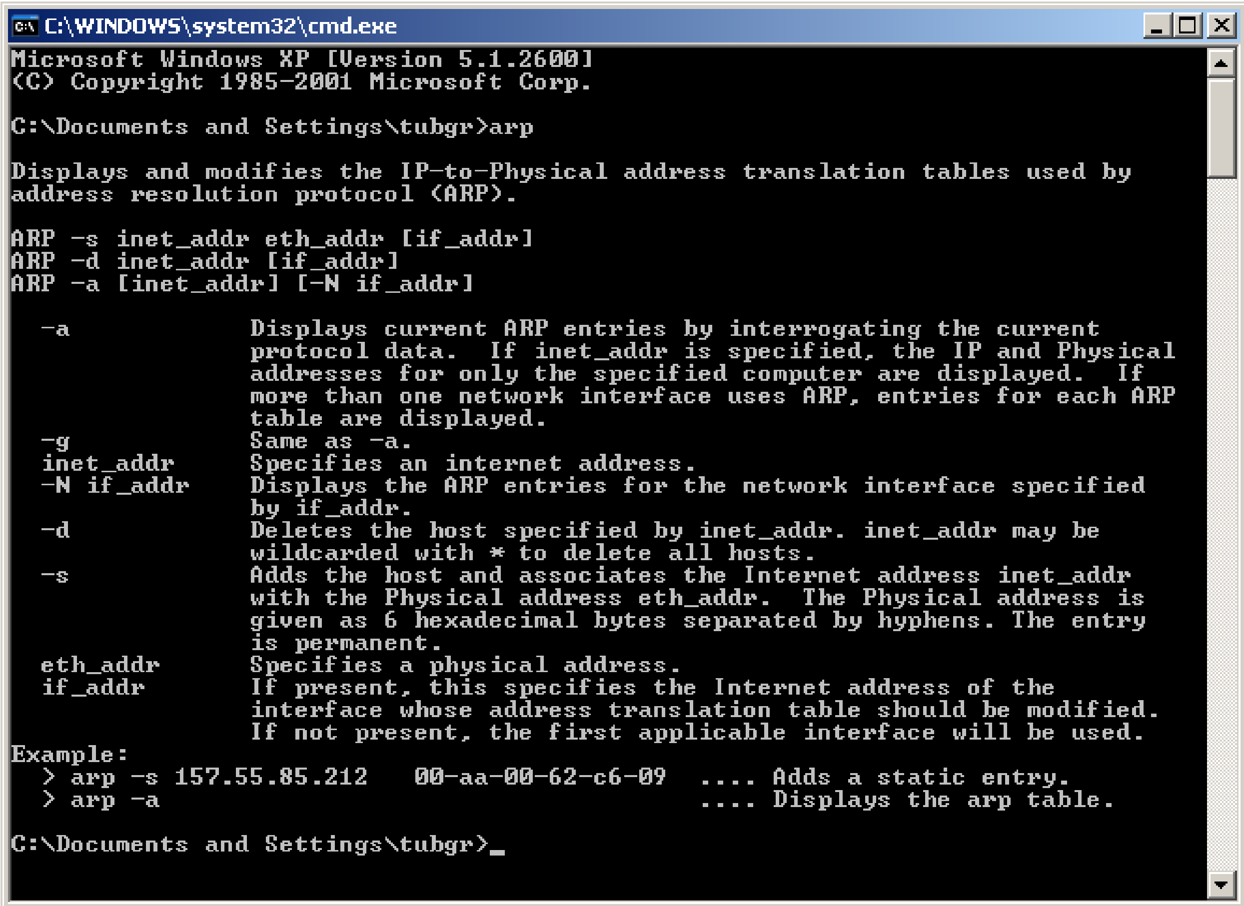


Click OK for cmd.



When you type arp alone, the Command window returns the definition of the command and all its modifiers.

Figure 11-5 The ARP Command



```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\tubgr>arp

Displays and modifies the IP-to-Physical address translation tables used by
address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr]
ARP -d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr]

  -a            Displays current ARP entries by interrogating the current
                protocol data.  If inet_addr is specified, the IP and Physical
                addresses for only the specified computer are displayed.  If
                more than one network interface uses ARP, entries for each ARP
                table are displayed.
  -g            Same as -a.
  inet_addr     Specifies an internet address.
  -N if_addr    Displays the ARP entries for the network interface specified
                by if_addr.
  -d            Deletes the host specified by inet_addr. inet_addr may be
                wildcarded with * to delete all hosts.
  -s            Adds the host and associates the Internet address inet_addr
                with the Physical address eth_addr.  The Physical address is
                given as 6 hexadecimal bytes separated by hyphens. The entry
                is permanent.
  eth_addr      Specifies a physical address.
  if_addr       If present, this specifies the Internet address of the
                interface whose address translation table should be modified.
                If not present, the first applicable interface will be used.
Example:
  > arp -s 157.55.85.212   00-aa-00-62-c6-09  .... Adds a static entry.
  > arp -a                                    .... Displays the arp table.

C:\Documents and Settings\tubgr>_
```

To find the Primary Port MAC address (Ethernet Port 0), Ping the IP address of the Primary Port in the RTU to establish a network connection. Then enter "ARP –a" as shown. The Physical Address displayed is the MAC Address.

Figure 11-6 Finding the CPU Card's MAC Address Remotely

```
C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\tubgr>ping 172.18.150.171

Pinging 172.18.150.171 with 32 bytes of data:

Reply from 172.18.150.171: bytes=32 time<1ms TTL=64
Reply from 172.18.150.171: bytes=32 time=20ms TTL=64
Reply from 172.18.150.171: bytes=32 time<1ms TTL=64
Reply from 172.18.150.171: bytes=32 time<1ms TTL=64

Ping statistics for 172.18.150.171:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 20ms, Average = 5ms

C:\Documents and Settings\tubgr>arp -a

Interface: 172.18.145.62 --- 0x3
  Internet Address      Physical Address      Type
  172.18.144.16         00-14-22-78-40-6d     dynamic
  172.18.144.17         00-1e-4f-1b-a6-1f     dynamic
  172.18.150.171        00-04-bf-92-30-16     dynamic
  172.18.151.254        00-1f-c9-f5-d4-08     dynamic

C:\Documents and Settings\tubgr>_
```

Note: To find the MAC address of the Secondary Port (Ethernet Port 1), set the computer's IP address in the same group as the RTU so that the Ping command and the ARP command will see the Secondary Port of the RTU. Then repeat the Ping and ARP commands above using the IP Address of the Secondary Port.

11.8 SBO Troubleshooting

Beginning with C3413-500-001C6 and newer firmware, the following function is available though the console to help trouble shoot the SBO bus. This function is valid only for the C3400 (SAGE 2300/SAGE 2400) and C3800 (SAGE 3030/SAGE 3030M) baseboards.

To use this function, connect your PC to the console port on the RTU and start the terminal emulation program. Type the <Enter> key and make sure that you get the "->" prompt.

Start the GUI and log on. Make sure to disconnect the field wiring from the point you are going to operate and perform the Trip or Close that does not work.

Type "c34_print_sbo_table" on the console (don't type the double quotes). After you have typed this in one time, you can type an "<ESC>k" to recall the history and type a "<Enter>" to execute the function again.

The following display is a successful trip of point 4 on the baseboard. If you have multiple executes (execute read - more than one bit set) or multiple selects (select read - more than one bit clear), the SBO control will fail. All of the IOPLD values will be 00 on a successful operation. The rt section of the display is valid only when the RTU detects a control error in real time. In this case, the RTU has started to perform the control but detects an error while the control is active. The selects expected and read, executes expected and read, and the time the relay was expected to close and time left to close to completion is displayed.

```
-> c34_print_sbo_table
```

```
progress counter   60
select expected  bfff
select read      bfff
execute expected 0001
execute read     0001
sel shift loops     0
driver chk loops    0
IOPLD_EXECUTE           00
IOPLD_DID               00
IOPLD_SBO_CSEL_HI       00
IOPLD_SBO_CSEL_LO       00
IOPLD_SBO_CEXEC_READ_LO 00
IOPLD_SBO_CEXEC_READ_HI 00
rt select expected  0000
rt select read      0000
rt execute expected 0000
rt execute read     0000
rt time expected       0
rt time left err       0
value = 25 = 0x19
->
```

The following display is a execute fail trip of point 4 on the baseboard. Note that execute 0 and execute 7 (CEXEC0 and CEXEC7 on the schematics) are both 1. Execute 0 is used for the baseboard relays or the last XT position on the SBO bus if the baseboard points are disabled.

```
-> c34_print_sbo_table
progress counter   50
select expected  bfff
select read      bfff
execute expected 0001
execute read     0081
sel shift loops     0
```

```
driver chk loops    0
IOPLD_EXECUTE           00
IOPLD_DID               00
IOPLD_SBO_CSEL_HI       00
IOPLD_SBO_CSEL_LO       00
IOPLD_SBO_CEXEC_READ_LO 00
IOPLD_SBO_CEXEC_READ_HI 00
rt select expected  0000
rt select read      0000
rt execute expected 0000
rt execute read     0000
rt time expected       0
rt time left err       0
value = 25 = 0x19
->
```

The following display is of a select fail, trip of point 4 on the baseboard. Note that select 14 and select 15 (CSEL14 and CSEL15 on the schematics) are both 0. The high byte of the selects is used for the baseboard relays.

```
-> c34_print_sbo_table
progress counter   30
select expected  bfff
select read      3fff
execute expected 0000
execute read     0000
sel shift loops     0
driver chk loops    0
IOPLD_EXECUTE           00
IOPLD_DID               00
IOPLD_SBO_CSEL_HI       00
IOPLD_SBO_CSEL_LO       00
IOPLD_SBO_CEXEC_READ_LO 00
```

```
IOPLD_SBO_CEXEC_READ_HI 00

rt select expected  0000

rt select read      0000

rt execute expected 0000

rt execute read     0000

rt time expected       0

rt time left err       0

value = 25 = 0x19

->
```

The progress counter code indicates the error/success code.

At reset or if there was an error detected on a previous SBO operation, a reset function is called to determine if the problem has cleared. These are the codes that this function produces.

100	initial check of registers on the baseboard failed, should have nonzero values in the IOPLD values
110	shifting of the select bits failed (shift in progress bit not set)
115	shifting of the select bits failed (shift in progress bit not clear)
120	execute bit stuck on
130	select bit stuck on
140	completion check of registers on the baseboard failed, should have nonzero values in the IOPLD values

These are the codes produced by the normal operation of the SBO control system.

10	check of registers on the baseboard failed, should have nonzero values in the IOPLD values
20	relay number out of range
30	select fail
40	check of registers on the baseboard failed, should have nonzero values in the IOPLD values
50	execute fail
60	successful operation

The following tables show the relationship between the control lines and the relays being controlled.

The Execute/Select column is based on the schematic. The digit before the “/” is the Execute number. The digit after the “/” is the Select number. For example, 0/8 CEXEC0/CSEL8. This combination is point 1 Trip.

Table 11-1 C3400 SBO Relay Assignments with Baseboard Enabled

Location	SBO Database Relay #	Sequential Relay #	Execute/Select	Comments
			0/0 to 0/7	do not exist
	1 trip to 4 close	1 to 8	0/8 to 0/15	baseboard relays
Bank 1 J7	5 trip to 12 close	9 to 24	1/0 to 1/15	1st 16-relay SBO XT
	13 trip to 20 close	25 to 40	2/0 to 2/15	2nd 16-relay SBO XT
	21 trip to 28 close	41 to 56	3/0 to 3/15	3rd 16-relay SBO XT
	29 trip to 36 close	57 to 72	4/0 to 4/15	4th 16-relay SBO XT
	37 trip to 44 close	73 to 88	5/0 to 5/15	5th 16-relay SBO XT
	45 trip to 52 close	89 to 104	6/0 to 6/15	6th 16-relay SBO XT
	53 trip to 60 close	105 to 120	7/0 to 7/15	7th 16-relay SBO XT
Bank 2 J8	61 trip to 68 close	121 to 136	8/0 to 0/15	8th 16-relay SBO XT
	69 trip to 76 close	137 to 152	9/0 to 1/15	9th 16-relay SBO XT
	77 trip to 84 close	153 to 168	10/0 to 2/15	10th 16-relay SBO XT
	85 trip to 92 close	169 to 184	11/0 to 3/15	11th 16-relay SBO XT
	93 trip to 100 close	185 to 200	12/0 to 4/15	12th 16-relay SBO XT
	101 trip to108 close	201 to 216	13/0 to 5/15	13th 16-relay SBO XT
	109 trip to116 close	217 to 232	14/0 to 6/15	14th 16-relay SBO XT
	117 trip to 124 close	233 to 248	15/0 to 7/15	15th 16-relay SBO XT

The Execute/Select column is based on the schematic. The digit before the “/” is the Execute number. The digit after the “/” is the Select number. For example, 0/8 CEXEC0/CSEL8. This combination is point 61 Trip.

Table 11-2 C3400 SBO Relay Assignments with Baseboard Disabled

Location	SBO Database Relay #	Sequential Relay #	Execute/Select	Comments
Bank 1 J4	1 trip to 8 close	1 to 16	1/0 to 1/15	1st 16-relay SBO XT
	9 trip to 16 close	17 to 32	2/0 to 2/15	2nd 16-relay SBO XT
	17 trip to 24 close	33 to 48	3/0 to 3/15	3rd 16-relay SBO XT
	25 trip to 32 close	49 to 64	4/0 to 4/15	4th 16-relay SBO XT
	33 trip to 40 close	65 to 80	5/0 to 5/15	5th 16-relay SBO XT
	41 trip to 48 close	81 to 96	6/0 to 6/15	6th 16-relay SBO XT
	49 trip to 56 close	97 to 112	7/0 to 7/15	7th 16-relay SBO XT
	57 trip to 64 close	113 to 128	0/0 to 0/15	8th 16-relay SBO XT
Bank 2 J3	65 trip to 72 close	129 to 144	8/0 to 8/15	9th 16-relay SBO XT
	73 trip to 80 close	145 to 160	9/0 to 9/15	10th 16-relay SBO XT
	81 trip to 88 close	161 to 176	10/0 to 10/15	11th 16-relay SBO XT
	89 trip to 96 close	177 to 192	11/0 to11/15	12th 16-relay SBO XT
	97 trip to 104 close	193 to 208	12/0 to 12/15	13th 16-relay SBO XT
	105 trip to112 close	209 to 224	13/0 to 13/15	14th 16-relay SBO XT
	113 trip to120 close	225 to 240	14/0 to 14/15	15th 16-relay SBO XT
	121 trip to 128 close	241 to 256	15/0 to 15/15	16th 16-relay SBO XT

Table 11-3 C3800 SBO Relay Assignments

Location	**SBO Database Relay #**	**Sequential Relay #**	**Execute/Select**	**Comments**
			0/0 to 0/15	do not exist
Bank 1 J3	1 trip to 8 close	1 to 16	1/0 to 1/15	1st 16-relay SBO XT
	9 trip to 16 close	17 to 32	2/0 to 2/15	2nd 16-relay SBO XT
	17 trip to 24 close	33 to 48	3/0 to 3/15	3rd 16-relay SBO XT
	25 trip to 32 close	49 to 64	4/0 to 4/15	4th 16-relay SBO XT
	33 trip to 40 close	65 to 80	5/0 to 5/15	5th 16-relay SBO XT
	41 trip to 48 close	81 to 96	6/0 to 6/15	6th 16-relay SBO XT
	49 trip to 56 close	97 to 112	7/0 to 7/15	7th 16-relay SBO XT

Table 11-4 C3800 / C3810 LANDAC II SBO Relay Assignments

Location	**SBO Database Relay #**	**Sequential Relay #**	**Execute/Select**	**Comments**
Bank 1 J7 (C3810)	1 trip to 8 close	1 to 16	1/0 to 1/15	1st 16-relay SBO XT
	9 trip to 16 close	17 to 32	2/0 to 2/15	2nd 16-relay SBO XT
	17 trip to 24 close	33 to 48	3/0 to 3/15	3rd 16-relay SBO XT
	25 trip to 32 close	49 to 64	4/0 to 4/15	4th 16-relay SBO XT
	33 trip to 40 close	65 to 80	5/0 to 5/15	5th 16-relay SBO XT
	41 trip to 48 close	81 to 96	6/0 to 6/15	6th 16-relay SBO XT
	49 trip to 56 close	97 to 112	7/0 to 7/15	7th 16-relay SBO XT
	57 trip to 64 close	113 to 128	0/0 to 0/15	8th 16-relay SBO XT
Bank 2 J8 (C3810)	65 trip to 72 close	129 to 144	8/0 to 8/15	9th 16-relay SBO XT
	73 trip to 80 close	145 to 160	9/0 to 9/15	10th 16-relay SBO XT
	81 trip to 88 close	161 to 176	10/0 to 10/15	11th 16-relay SBO XT
	89 trip to 96 close	177 to 192	11/0 to 11/15	12th 16-relay SBO XT
	97 trip to 104 close	193 to 208	12/0 to 12/15	13th 16-relay SBO XT
	105 trip to112 close	209 to 224	13/0 to 13/15	14th 16-relay SBO XT
	113 trip to120 close	225 to 240	14/0 to 14/15	15th 16-relay SBO XT
	121 trip to 128 close	241 to 256	15/0 to 15/15	16th 16-relay SBO XT
Bank 3 J9 (C3800)	129 trip to 136 close	257 to 272	1/0 to 1/15	17th 16-relay SBO XT
	137 trip to 144 close	273 to 288	2/0 to 2/15	18th 16-relay SBO XT
	145 trip to 152 close	289 to 304	3/0 to 3/15	19th 16-relay SBO XT
	153 trip to 160 close	305 to 320	4/0 to 4/15	20th 16-relay SBO XT
	161 trip to 168 close	321 to 336	5/0 to 5/15	21th 16-relay SBO XT
	169 trip to 176 close	337 to 352	6/0 to 6/15	22th 16-relay SBO XT
	177 trip to 184 close	353 to 368	7/0 to 7/15	23th 16-relay SBO XT
	185 trip to 192 close	369 to 384	0/0 to 0/15	24th 16-relay SBO XT

The tables above have a Execute/Select column. The format of the information displayed is Execute/Select order (execute is before the slash, the select follows the slash). The following tables convert the Execute and Select to the bit patterns displayed in c34_print_sbo_table.

The Select will be displayed in the c34_print_sbo_table as the following bit patterns:

Table 11-5 Select Bit Patterns

Select	**Bit Pattern**
0	FFFE
1	FFFD
2	FFFB
3	FFF7
4	FFEF
5	FFDF
6	FFBF
7	FF7F
8	FEFF
9	FDFF
10	FBFF
11	F7FF
12	EFFF
13	DFFF
14	BFFF
15	7FFF

The Execute will be displayed in the c34_print_sbo_table as the following bit patterns:

Table 11-6 Execute Bit Patterns

Execute	**Bit Pattern**
0	0001
1	0002
2	0004
3	0008
4	0010
5	0020
6	0040
7	0080
8	0100
9	0200
10	0400
11	0800
12	1000
13	2000
14	4000
15	8000

11.9 Restoring the RTU to a Known State

If the firmware in the compact flash is in an unstable state but still bootable, you may be able to restore it to a known configuration. Once it has been restored to this known configuration, a stable system will be in place so that you can use SFTP to restore the compact flash.

The UIF cable must be connected to your PC with a terminal emulator program running to determine if this is possible, and if so, perform the steps to install the system. The UIF serial configuration is 1 start, 8 data, no parity, and 1 stop bit @ 9600 baud, no flow control.

This capability exists on VxWorks versions greater than the 6.7 version. At bootup, the following (or similar) information is displayed as part of the startup sequence.

```
CPU: PC PENTIUM2
Version: VxWorks 6.7
BSP version: 2.0/10
Creation date: Aug 27 2009, 09:46:21
```

If the string "Version: VxWorks 6.7" is displayed, this capability is not available and it will be difficult to restore a system.

If the string "Version: VxWorks 6.8" or higher is displayed, this function is available. Older versions do not have the features in the boot ROM code required to restore to a known configuration.

To restore to the known configuration:

1) Reboot the RTU

2) Enter any key to stop the boot up process when you see the following prompt:

Press any key to stop auto-boot…

Type the following at the *[VxWorks Boot]:* prompt:

```
[VxWorks Boot]:  cd /ata0a/recovery
[VxWorks Boot]:  cp VxWorks /ata0a
[VxWorks Boot]:  cp recovery.scp /ata0a/scripts/vxworks_start.scp
[VxWorks Boot]:  @
```

The RTU should automatically restore itself to the initial state.

The IP address of the recovered RTU will be 192.168.1.1:255.255.0.0

The Username is Admin. The password is Telvent1!

You can now login to the RTU using a SFTP client after you make the private key file "Admin.ppk" distributed with the S02 Update File known to the client.

After you login to the RTU, you may transfer a new Firmware, Configuration, and User Access packages to the /ata0a/install directory.

11.10 Changing Operating System Parameters

Use the console commands below to test to make sure that the values you are setting are correct. Once you are satisfied with your changes, add or modify existing commands in the system start up script to make the changes take effect on the next startup.

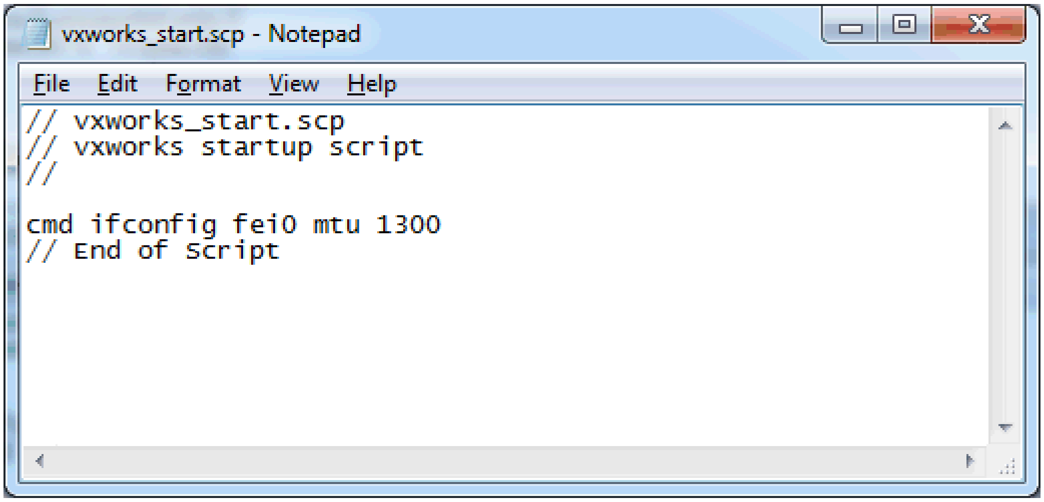
11.10.1 Using the Startup Script file to Permanently change the Parameters

The file "/ata0a/scripts/vxworks_start.scp" is used to modify some system parameters in VxWorks, the operating system of the RTU.

To do this, ftp or sftp the existing file onto your PC. Change the file to add the commands as needed below. SFTP or FTP the file back to the RTU, overwriting the existing file.

These changes are read only on startup.

Note: Lines beginning with // are comments




```
// vxworks_start.scp
// vxworks startup script
//

cmd ifconfig fei0 mtu 1300
// End of Script
```

Once you are satisfied with the changes, make sure to get a copy of the configuration so that you have a copy of your changes to the start up script file to archive to use in the future.

11.10.2 Forcing the FTP server to use ports 21 and 20

Here is how to force the FTP server in the RTU to use port 21 for FTP commands and 20 for FTP data.

11.10.2.1 What the sysvar ipftps looks like as default

```
[vxWorks]# sysvar list ipftps
```

System variables:

```
ipftps.authentications=3

ipftps.authsleep=5

ipftps.dir=/ata0a

ipftps.dsock_linger=10

ipftps.lportbase=49151

ipftps.max_sessions=8

ipftps.port_number=21

ipftps.pportbase=1023

ipftps.proxy=0

ipftps.readonly=0

ipftps.receive_timeout=30

ipftps.root=

ipftps.send_timeout=30

ipftps.session_timeout=300

ipftps.socket_backlog=0
```

```
   ipftps.system=UNIX

   ipftps.tls.cert_file=

   ipftps.tls.enable=0

   ipftps.tls.key_file=

   ipftps.tls.private.enable=0

   ipftps.versionstr=6.8

[vxWorks]#
```

11.10.2.2 The changes needed for the server to use ports 20 and 21

```
[vxWorks]# sysvar set -o ipftps.pportbase 65535

sysvar: ipftps.pportbase=65535 ok

[vxWorks]# sysvar set -o ipftps.lportbase 0

sysvar: ipftps.lportbase=0 ok

[vxWorks]#
```

11.10.2.3 What the sysvar ipftps look like after the change

```
[vxWorks]# sysvar list ipftps

System variables:

   ipftps.authentications=3

   ipftps.authsleep=5

   ipftps.dir=/ata0a

   ipftps.dsock_linger=10

   ipftps.lportbase=0

   ipftps.max_sessions=8

   ipftps.port_number=21

   ipftps.pportbase=65535

   ipftps.proxy=0

   ipftps.readonly=0

   ipftps.receive_timeout=30

   ipftps.root=

   ipftps.send_timeout=30

   ipftps.session_timeout=300

   ipftps.socket_backlog=0
```

```
    ipftps.system=UNIX

    ipftps.tls.cert_file=

    ipftps.tls.enable=0

    ipftps.tls.key_file=

    ipftps.tls.private.enable=0

    ipftps.versionstr=6.8

[vxWorks]#
```

11.10.3 Script file commands

```
cmd sysvar set -o ipftps.pportbase 65535

cmd sysvar set -o ipftps.lportbase 0
```

11.10.3.1 Changing the MTU (Maximum Transmission Unit) on an IP interface

This can be changed on fei0 (Primary Port) and fei1 (Secondary Port)

11.10.3.2 What the ifconfig fei0 looks like as default

```
[vxWorks]# ifconfig fei0

fei0    Link type:Ethernet  HWaddr 00:04:bf:91:ce:53  Queue:none

        capabilities: TXCSUM VLAN_MTU VLAN_TXHWTAG VLAN_RXHWTAG
MACSEC_SECY

        inet 192.168.250.250  mask 255.255.255.0  broadcast
192.168.250.255

        UP RUNNING SIMPLEX BROADCAST MULTICAST

        MTU:1500  metric:1  VR:0  ifindex:2

        RX packets:4263 mcast:0 errors:0 dropped:6

        TX packets:103 mcast:0 errors:0

        collisions:0 unsupported proto:0

        RX bytes:268k  TX bytes:25k

[vxWorks]#
```

The change needed to force ifconfig fei0 MTU to 1300 bytes

```
[vxWorks]# ifconfig fei0 mtu 1300

[vxWorks]#
```

What the ifconfig fei0 look like after the change

```
[vxWorks]# ifconfig fei0

fei0    Link type:Ethernet  HWaddr 00:04:bf:91:ce:53  Queue:none

        capabilities: TXCSUM VLAN_MTU VLAN_TXHWTAG VLAN_RXHWTAG
MACSEC_SECY

        inet 192.168.250.250  mask 255.255.255.0  broadcast
192.168.250.255

        UP RUNNING SIMPLEX BROADCAST MULTICAST

        MTU:1300  metric:1  VR:0  ifindex:2

        RX packets:4297 mcast:0 errors:0 dropped:6

        TX packets:103 mcast:0 errors:0

        collisions:0 unsupported proto:0

        RX bytes:270k  TX bytes:25k

[vxWorks]#
```

11.10.4 Using Script File

```
cmd ifconfig fei0 mtu 1300

cmd ifconfig fei1 mtu 1300
```

11.11 Changing Bootup Flags

On occasion, you may need to temporarily change or add IP protocol(s) or force safe mode operation of the RTU.

The way this is accomplished it by modification of the boot flags for the RTU.

You can enter these manually by interrupting the vxWorks boot process and "c"hanging the flags boot parameters by typing in the hex value of the boot flag combo you want and enter the boot flags (the "f" parameter, default is f="0x28") you require there.

Use the entries from the following table to enable the desired mode or protocol. Logically OR or clear the bit value with the existing flags and set the result into the boot parameters flag parameter. Remember to put the “0x” characters in front of the new flag parameter value

To Enable	Bit Value in Hex
Safe Mode	00000001
HTTPS	00010000
SFTP	00080000
SSH(1)	00004000
SSH Shell(2)	00020000
HTTP	00008000
FTP	00002000
Telnet(1)	00001000
Telnet Shell(2)	00040000

Note 1: It is valid to have only SSH and/or Telnet enabled without any Shell for use with just the tunnel function of the RTU.

Note 2: The command shell for SSH and Telnet will be enabled only if the associated protocol is enabled.

For the most secure system, only HTTPS will be enabled and the flag word value will be 0x10028. If a tunnel to an IED is needed, the flag word would be 0x14028.

12 PPP Connect

12.1 General PC Requirements

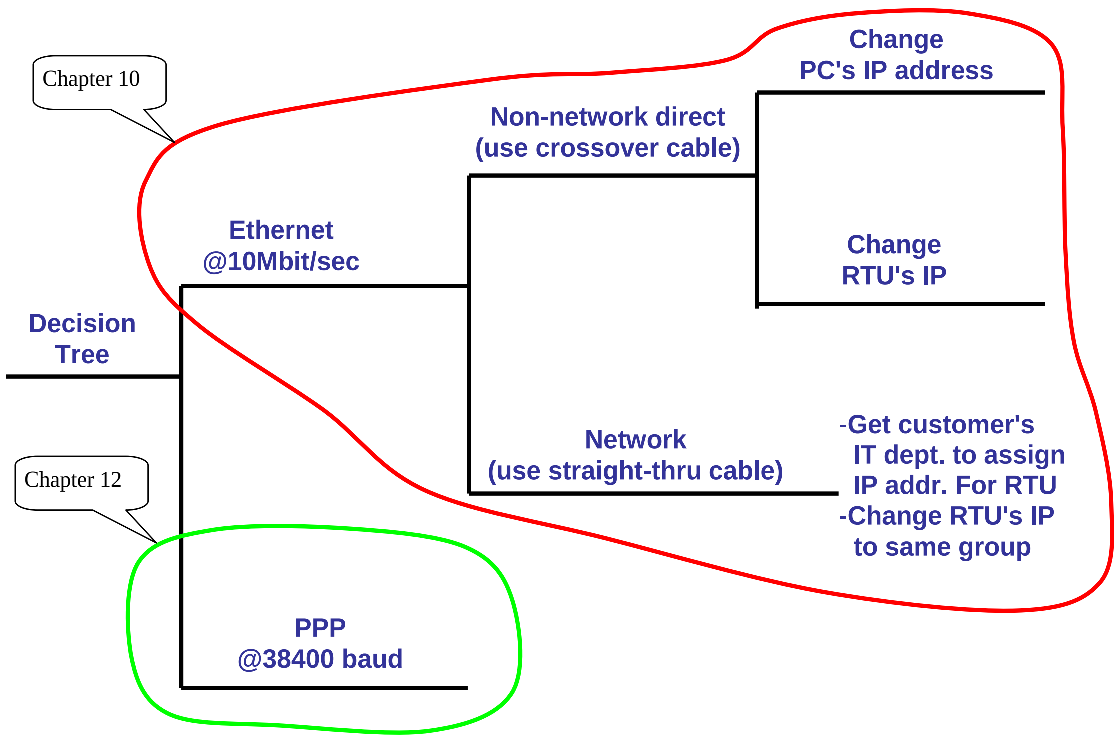
- All software that's necessary to connect to Schneider Electric RTUs comes with Windows XP (at the present time, PPP has been verified only for Windows XP Pro).
- Internet Explorer 6.0 or higher.

The PPP (Point-to-Point Protocol) is slower than Ethernet, but it has the advantage of requiring no changes in your PC's TCP/IP settings.

12.2 Where Do You Start?

Let's start with the basics: You have a Windows PC and a Config@WEB RTU. Figure 12-1 shows the possible combinations of your situation.

Figure 12-1 Decision Tree for Connection to Config@WEB



The advantage of using Ethernet connection is high speed. The disadvantage is that you might have to change your PC's IP address.

The advantage of using PPP connection is that you have the possibility of having a dial-up channel to your RTU for long distance configuration and monitoring if a network is unavailable. The disadvantage is the slow speed.

This appendix deals with the PPP branch of the decision tree. See Chapter 10 Ethernet Connection if you are interested in the Ethernet connection.

12.3 Steps to Achieve PPP

The following steps will be covered in the remainder of this appendix:

- Proper physical connection
- WinXP Setup
    - Creating WinXP dialup network connection for WNPPP
    - Creating WinXP direct serial network connection for WNPPP
    - Routine PPP connections

Physical Connection

PPP uses the User Interface Port (UIF), as shown in Figure 12-2. Notice that the ribbon cable with the red strip must be connected to J1 on the baseboard. Also notice that you must use a three-wire null modem cable exactly as shown (no other lines connected, no jumpered pins).

12.4

Figure 12-2 User Interface and UIF Cable

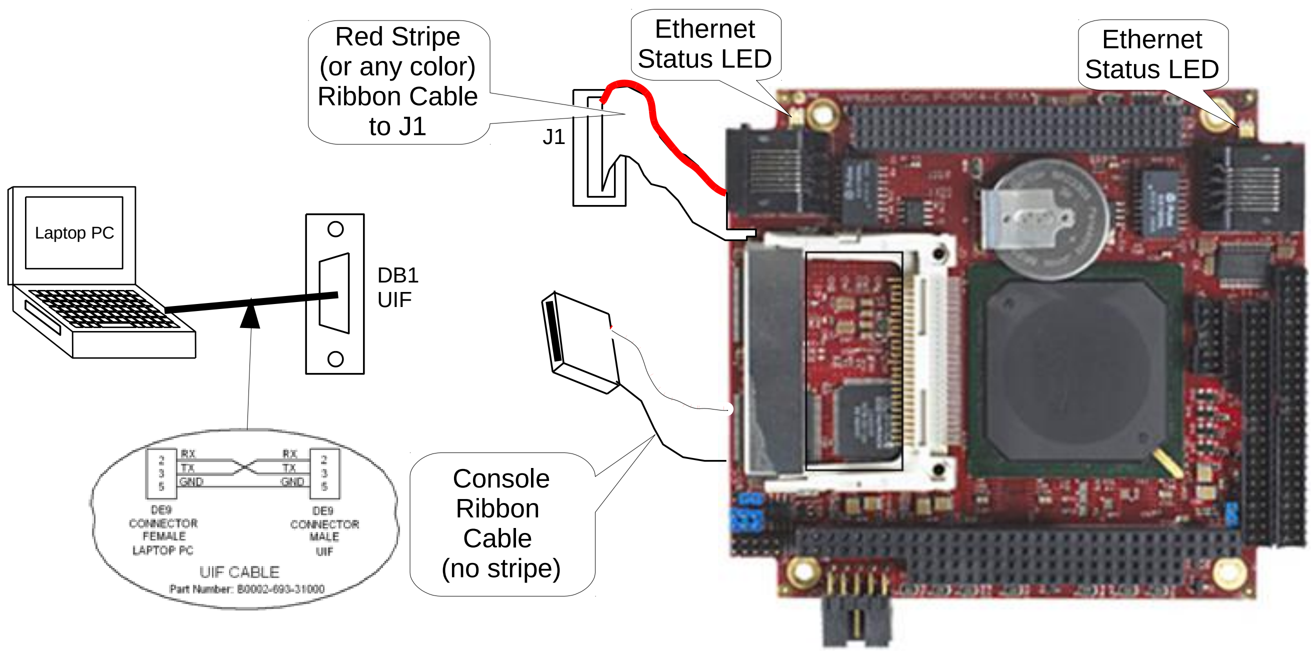


Table 12-1 PPP & Console Connector Pin-outs

Signal	Pin	Description	Type
DCD	1	Data Carrier Detect	Input
RX	2	Receive Data	Input
TX	3	Transmit Data	Output
DTR	4	Data Terminal Ready	Output
DGND	5	Digital Ground	n/a
DSR	6	Data Set Ready	Input
RTS	7	Request To Send	Output
CTS	8	Clear To Send	Input
RI	9	Ring Indicator	n/a

12.5 Modem Settings for PPP

This section describes the modem settings that have yielded the most successful results in connecting to the RTU's PPP port.

12.5.1 Overview

The PPP EIA-232 serial port is fixed at 38,400 BPS rate, and therefore requires a modem that can negotiate a connection with another modem at a similar speed. The slowest modem 'connect' speed observed that can still maintain adequate communications is ~24,000 BPS. If your negotiated modem-connect speed is less than this, the PPP connection is likely to fail.

The modem connected to the RTU is used in a passive slave mode (it never initiates a PPP connection), therefore the modem's EIA-232 serial port cannot be 'auto-Bauded' at runtime. The serial connect speed must be set manually before placing the modem in service. If the EIA-232 serial speed is not correctly set to 38,400 BPS, a successful PPP connection will never be established. In addition, the serial data that the RTU is looking for to indicate that a PPP connection is being attempted requires that the modem also be configured to suppress any event strings such as "RING" or "CONNECT 384000", and to suppress the echoing of all AT commands.

12.5.2 Setting The Modem's Serial Baud Rate

Most modems retain the last used serial baud rate through a power cycle, so all modem settings should be made at the 38,400 BPS baud rate. When the modem is powered off and installed for use, it will power back up with the serial port already at the 38,400 BPS baud rate.

All settings must be downloaded to the modem before placing the modem in service. Most Hayes-compatible modems have settings profiles that can be selected to be used at startup. The downloaded settings for use with PPP should be written to one of these profiles, and using the proper Hayes commands, that profile should be selected to be used at startup.

12.5.2.1 Sample Settings

Below are the settings used to establish a successful connection with a US Robotics modem connected to the RTU. The modem connected to the PC trying to establish a PPP connection should be configured similarly:

B1 – U.S. answer tone
E0 – Echo OFF
F1 – Local echo OFF
M1 – Speaker on until connect (optional)
Q1 – Suppress result codes
Y0 – Default Profile 0
Z1 – Resets modem to Profile 0
&D0 – DTR override
&H0 – Flow control disabled
&I0 – Software flow control disabled
&K1 – Auto enable/disable data compression
&N0 – Variable connect speed
&R1 – Ignore RTS
&S0 – DSR override; always ON
&U0 – Floor connect speed disabled

These settings should be written to Profile 0 using the &W0 command.

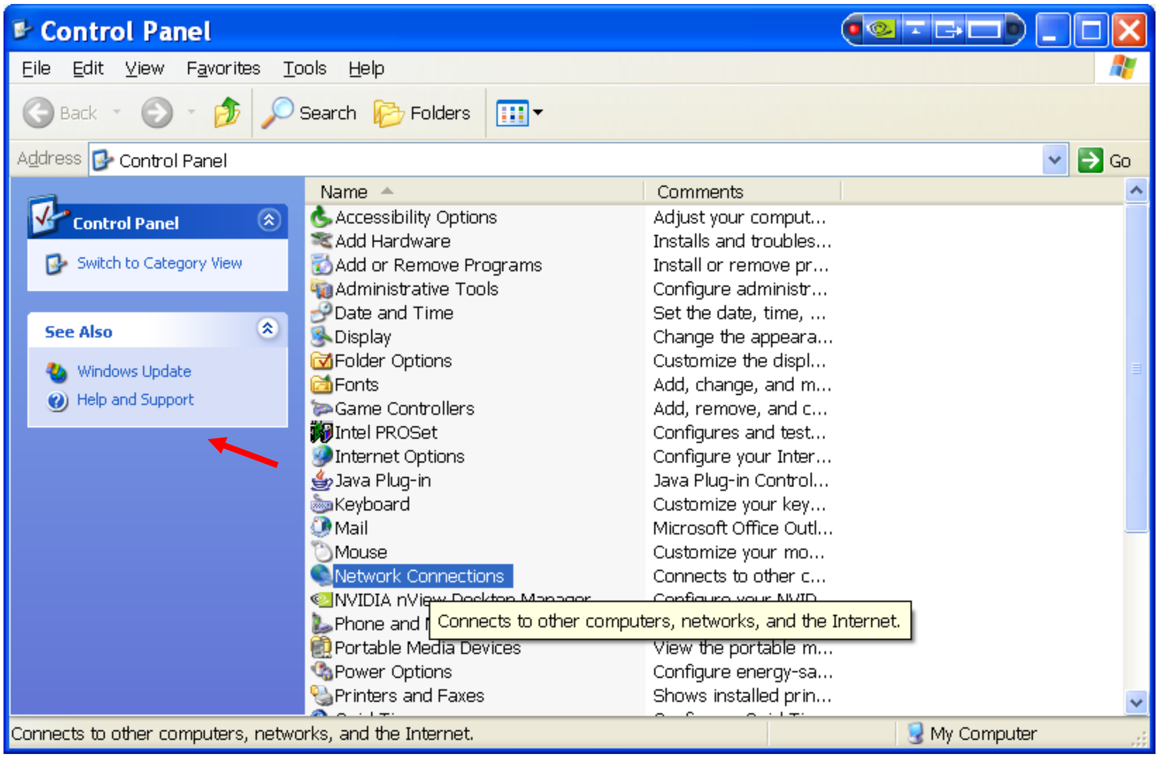
Note: Even though the above settings are for a Hayes-compatible modem, consult your modem's documentation to verify the correct command needed to accomplish what the above settings do.

Creating a Dialup PPP Network Connection for XP

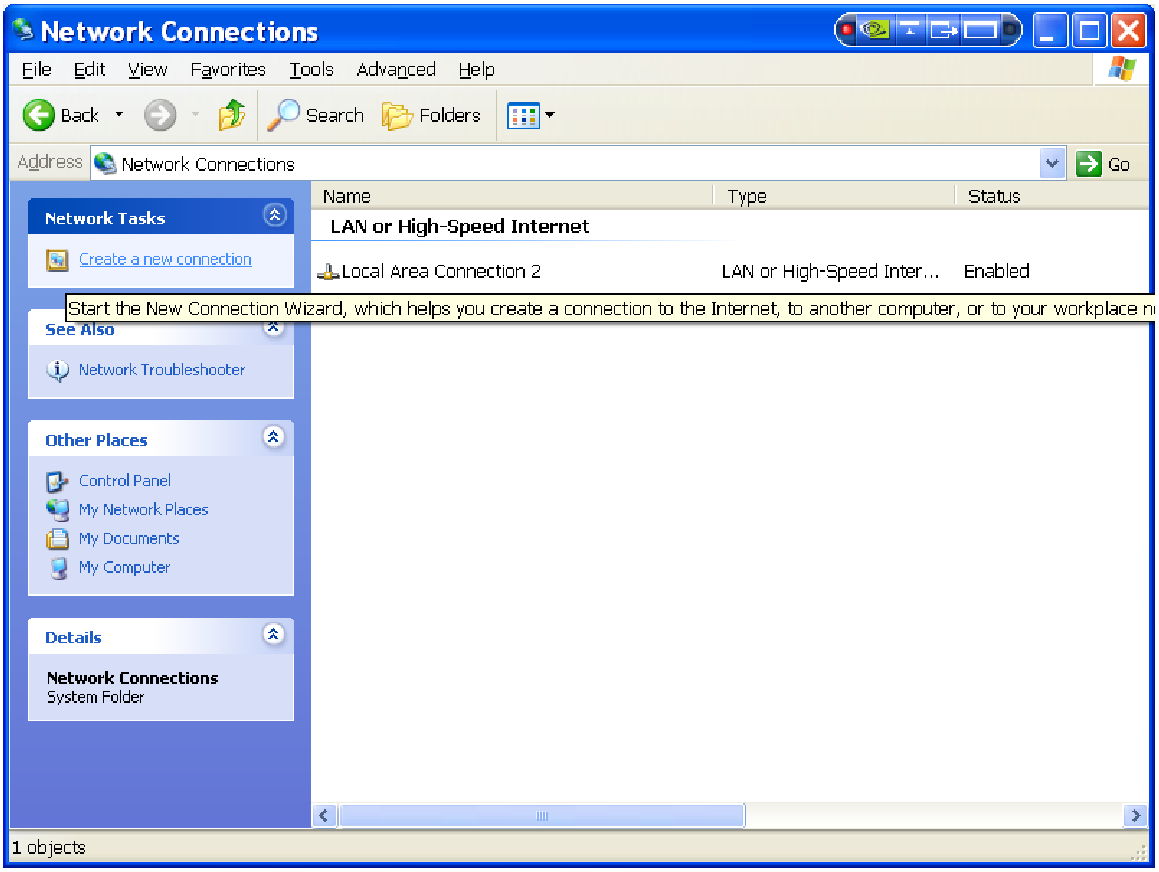
Note: before attempting any PPP connections, disconnect your computer from your LAN to avoid DNS server conflicts. When you finish your PPP session, you may reconnect your LAN.

Note: Use a three-wire null modem cable.

12.6 In the Control Panel, double-click on the Network Connections icon:



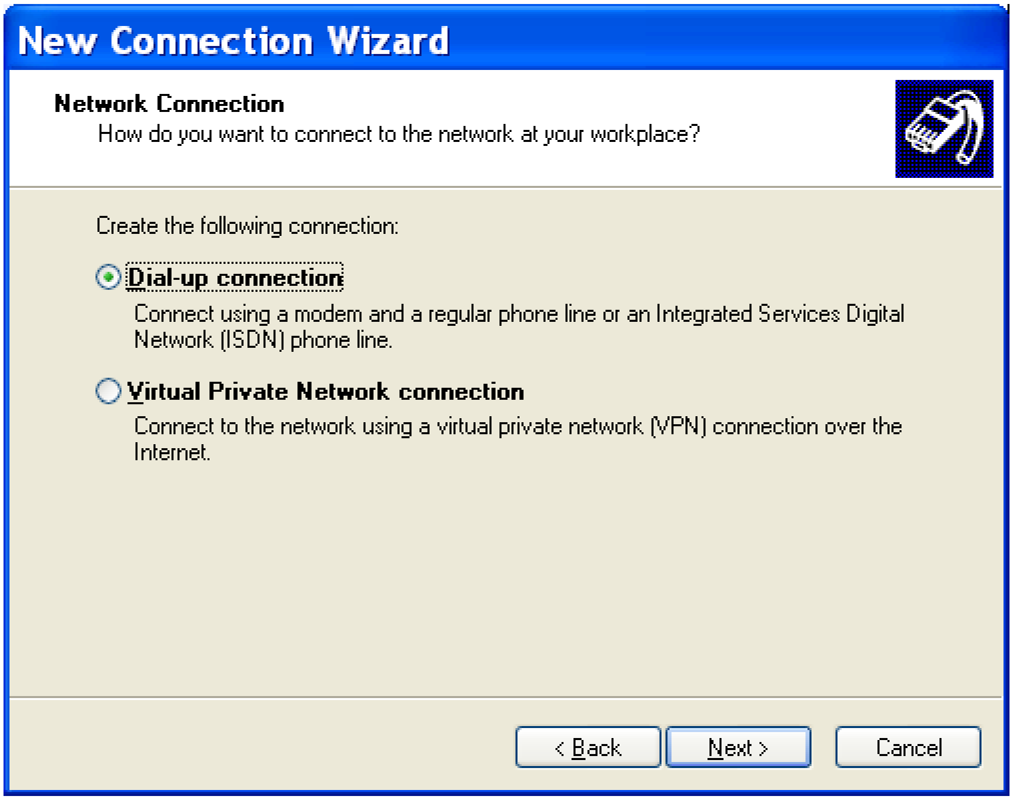
Click on the “Create a new connection” link:



The Connection Wizard will start, presenting the following window. Click “Next”.

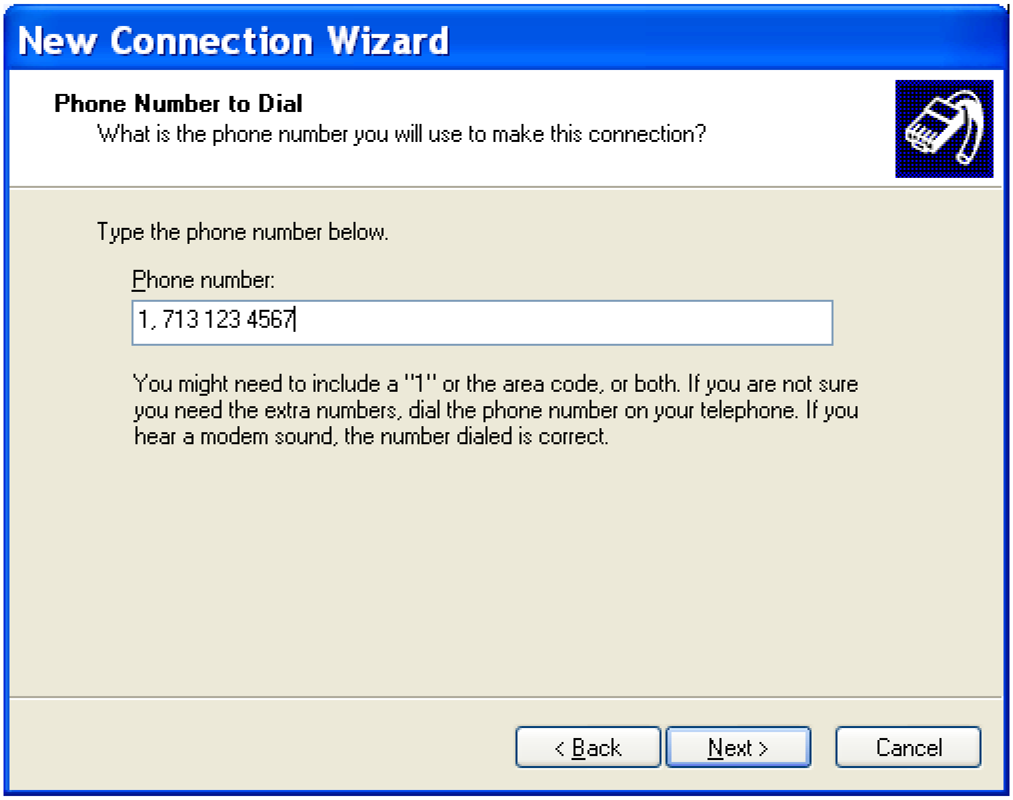
For Network Connection Type, pick “Connect to the network at my workplace”, then click “Next”.

Select "Dial-up connection" as to how to connect. Click "Next".



Give the new connection a name. This will also be the name of the shortcut placed on the desktop after completing the Connection Wizard. Click "Next".

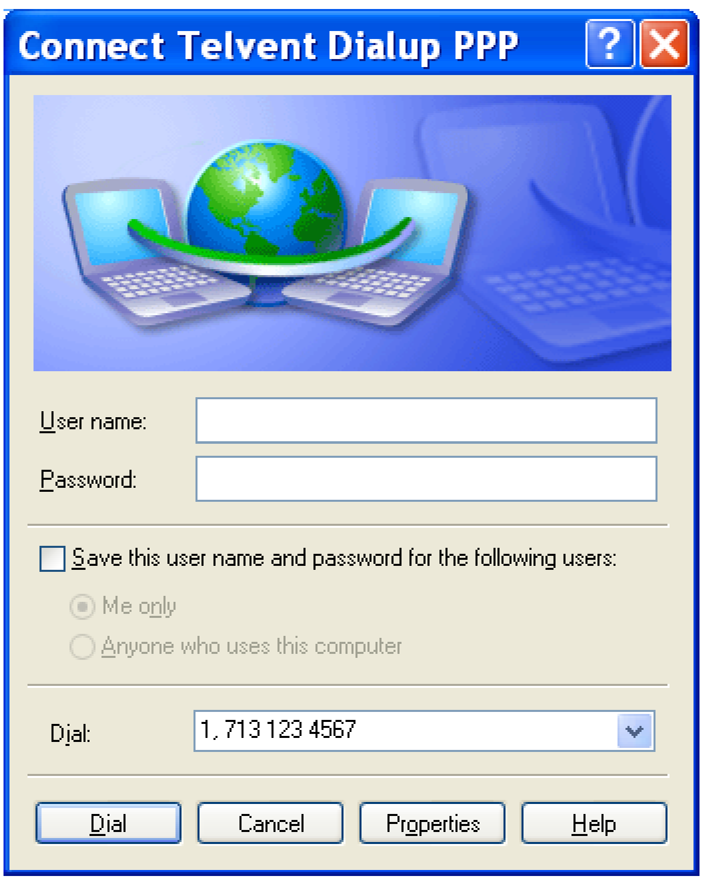
Enter the phone number of the remote modem site. Enter any special dial parameters here. For example, a comma pauses dialing for 2 seconds. Click “Next”.



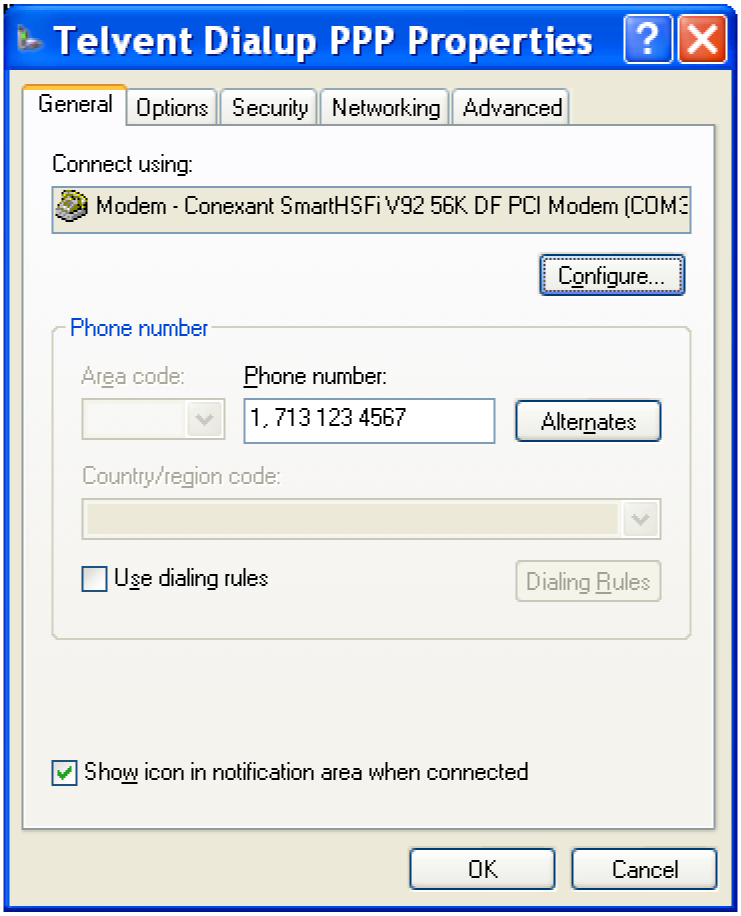
Make this connection available for “Anyone’s Use”, if desired. Otherwise, this connection will only be available to the current user.

Before completing the Connection Wizard, check the “Add a shortcut to this connection to my desktop” box. Click “Finish”.

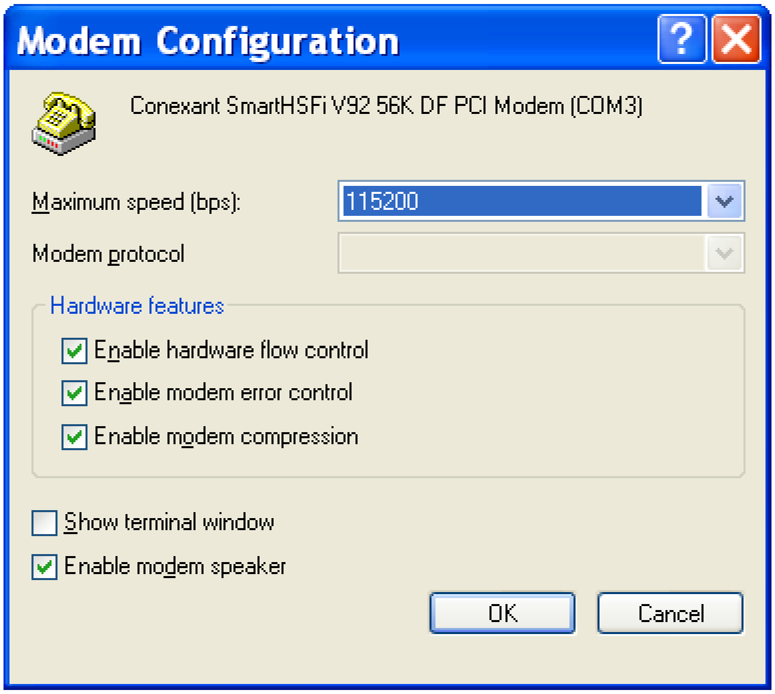
When the Connection Wizard completes, the following window will appear. Click “Properties”.



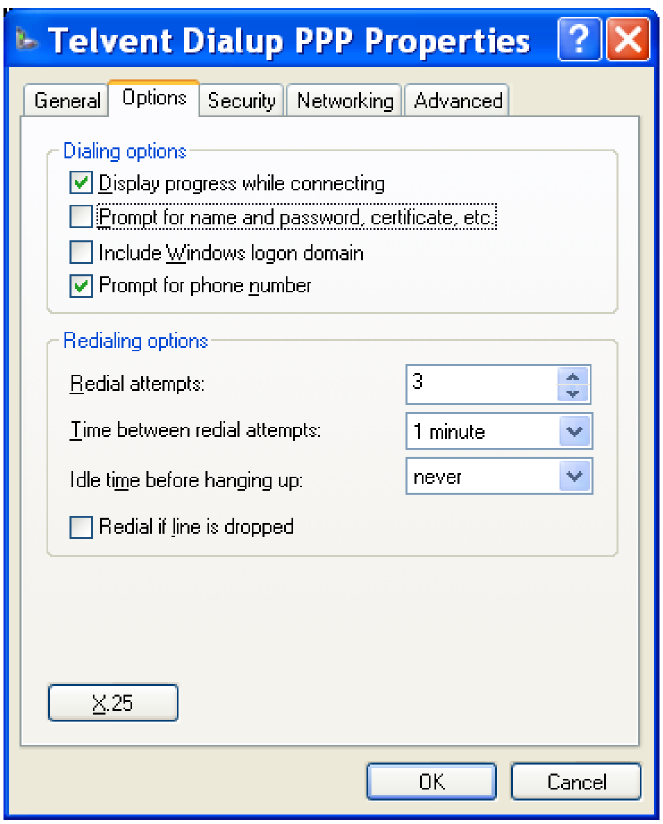
The following window will appear. The modem for this PC should be present in the "Connect using:" field. Click "Configure".



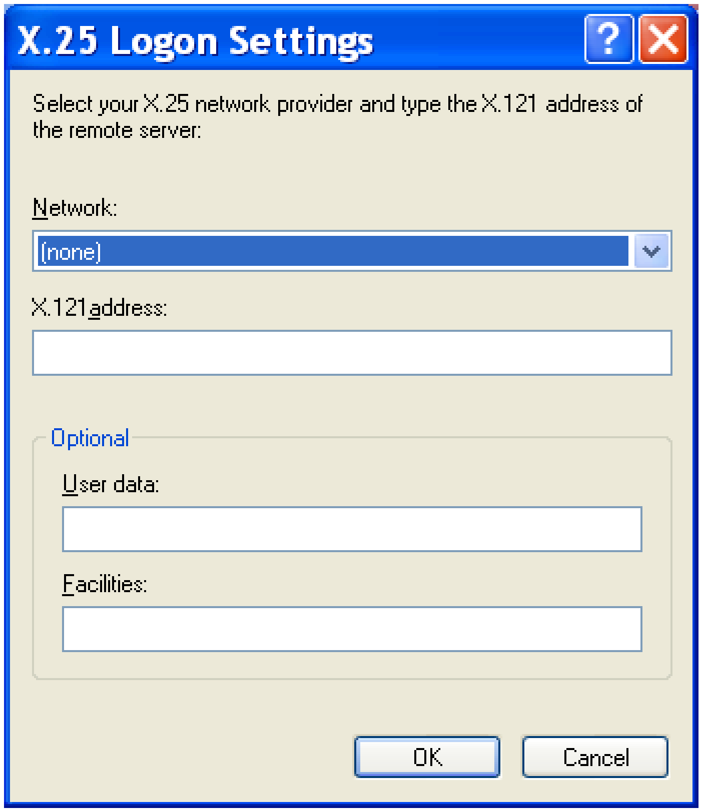
Make sure the settings for the modem on your PC match these. Click "OK".



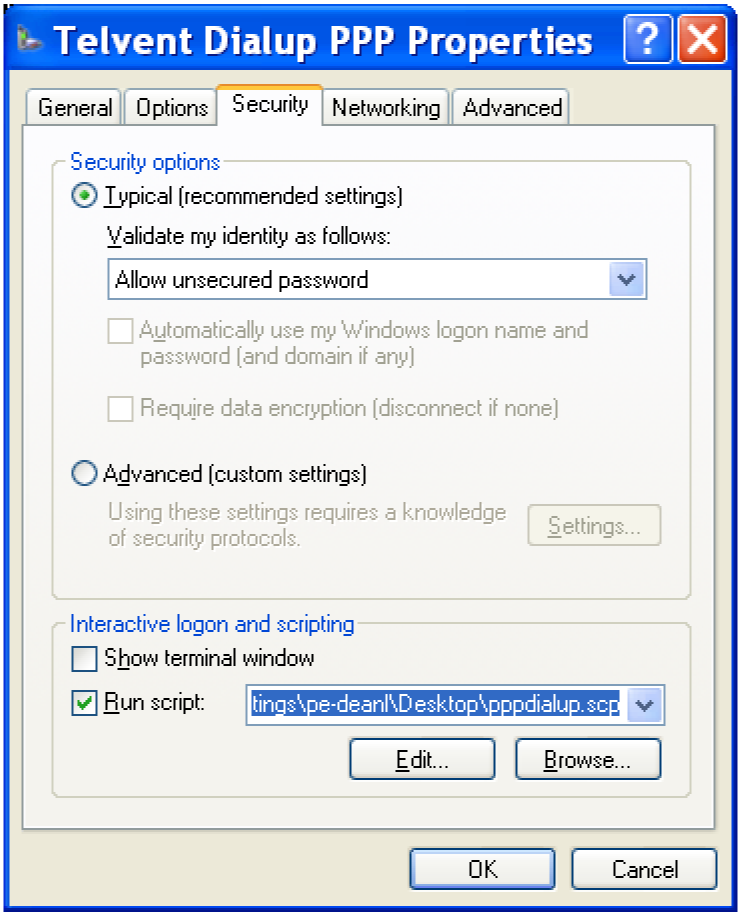
Click on the "Options" tab. Make sure the "Prompt for name and password, certificate, etc." checkbox is UNCHECKED. At the bottom of the window, click on the "X.25" button.



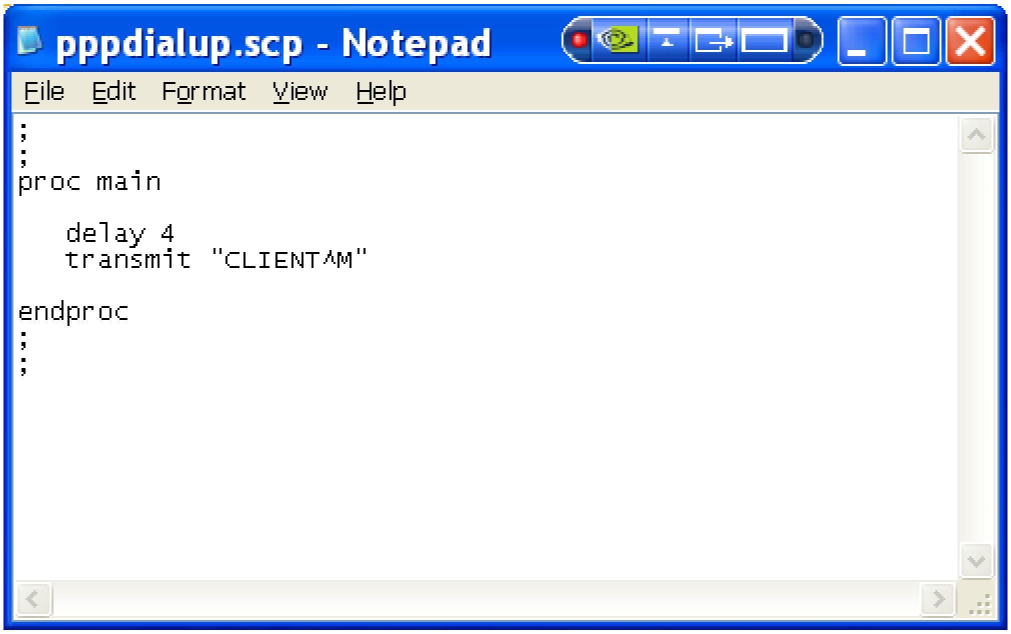
Make sure the settings on this window match these. Click "OK".



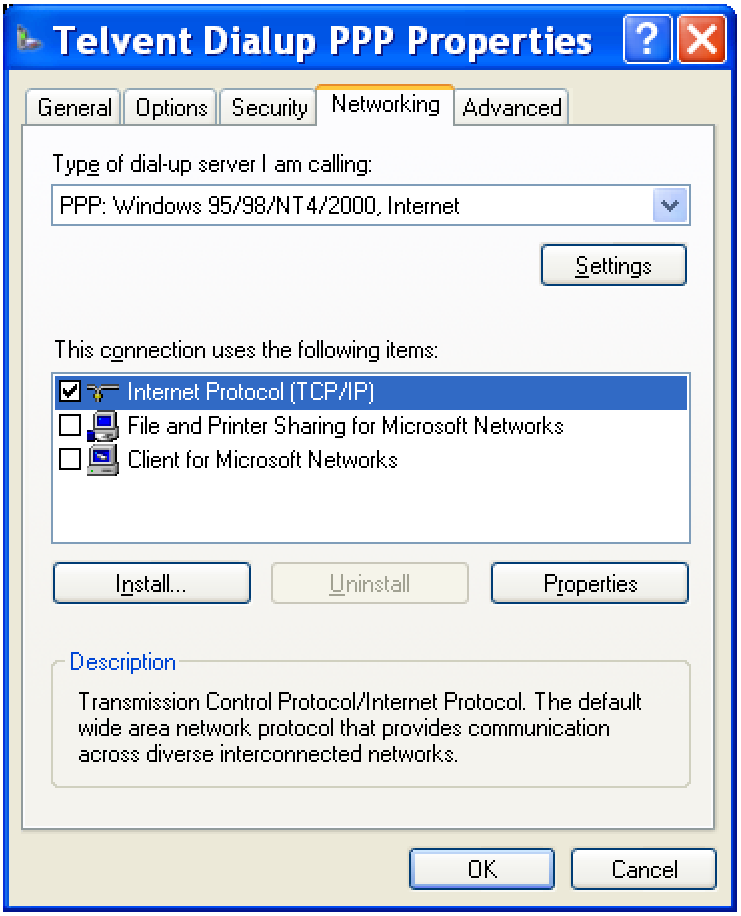
Click on the "Security" tab. In the "Security options" area make sure the settings on your PC match these. In the Interactive logon and scripting area, make sure the "Run script" checkbox is CHECKED. Click on the "Edit" button to create the script required to handshake with the remote RTU. Once the script file is created, click on the "Browse" button to navigate to and select the script file. The path and name of the script file should appear in the field next to the "Run script" checkbox.



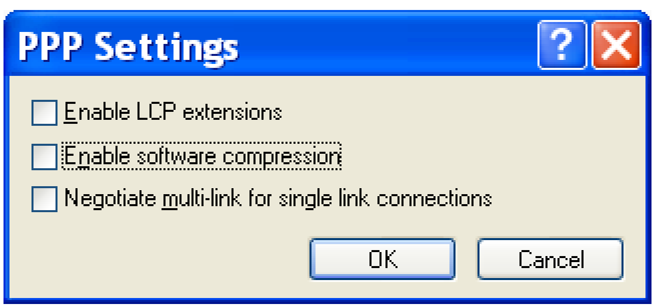
Create and save the script to any safe location on your PC. The contents of the script should contain the following.



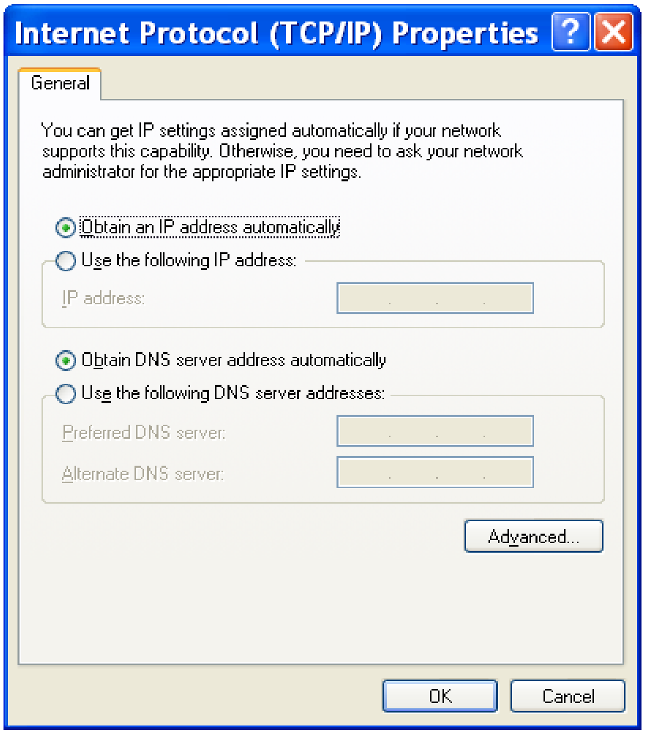
Click on the “Networking” tab. The “Type of dial-up server” field should be PPP. In the “This connection uses the following items:” area, make sure only Internet Protocol (TCP/IP)” is selected (checkbox is CHECKED). Click the “Settings” button.



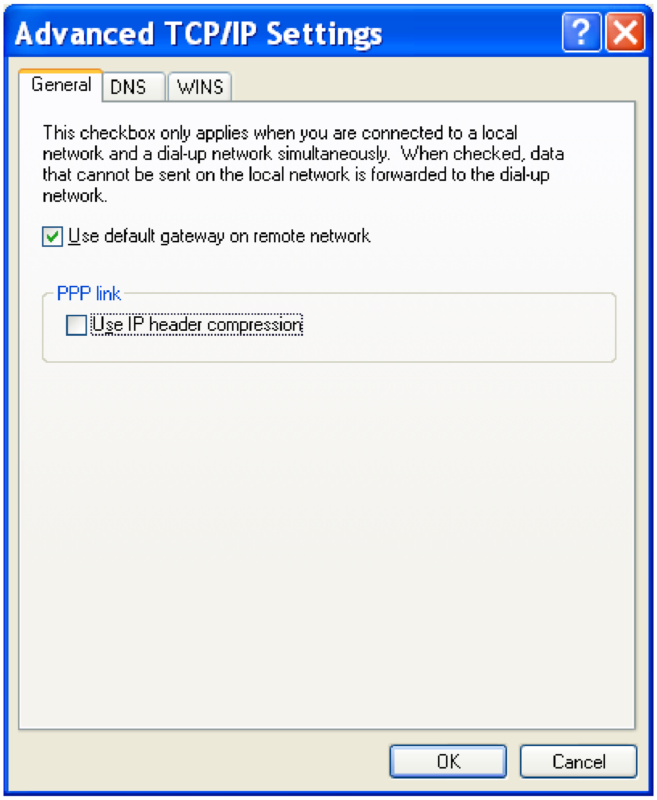
In the PPP Settings window, make sure all of the items are UNCHECKED. Click “OK”.



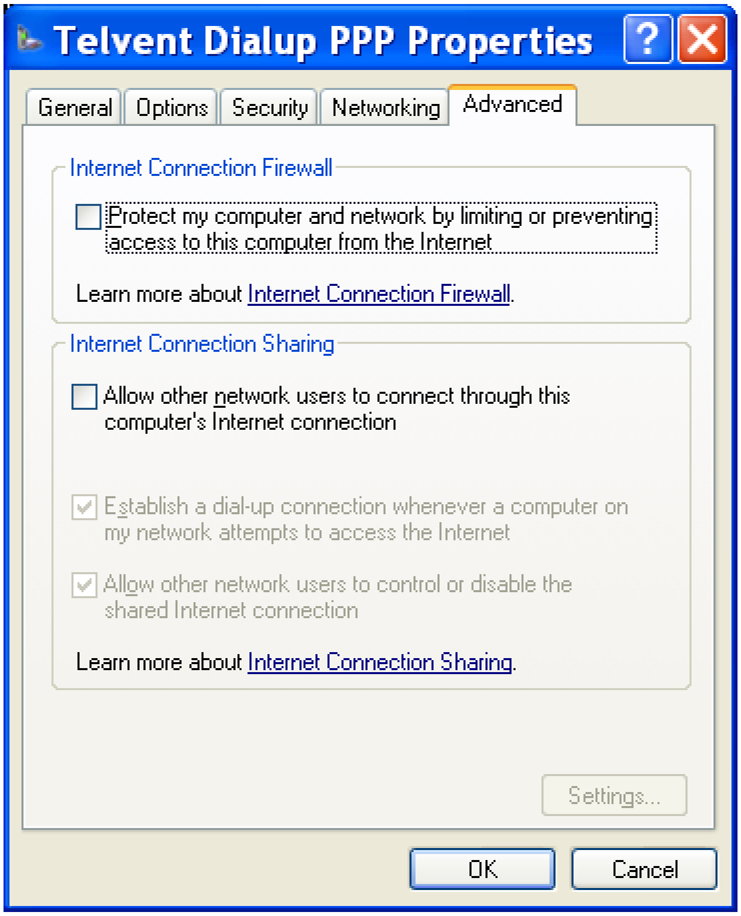
Click on the "Internet Protocol (TCP/IP)" item, and click on the "Properties" button. Click on the "Obtain an IP address automatically" and "Obtain DNS server address automatically" radio buttons are selected. Click on the "Advanced…" button.



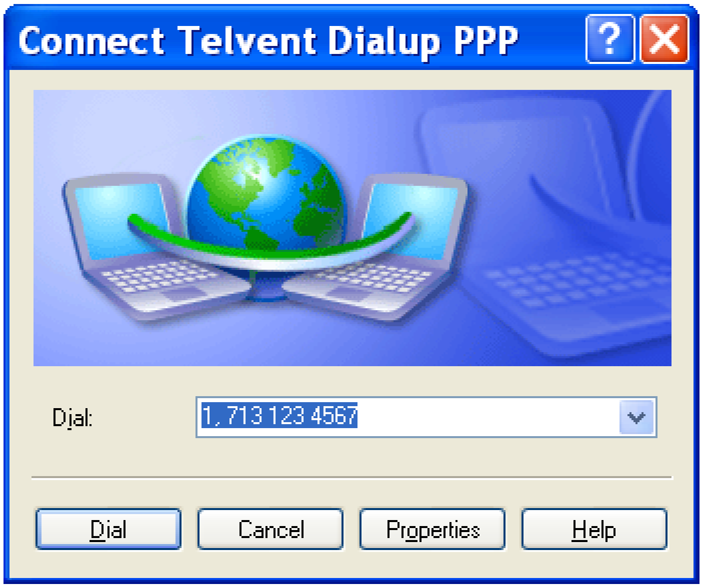
Select the “General” tab if not already selected. Select the “Use default gateway on remote network” checkbox (CHECKED). In the “PPP link” area, make sure the “Use IP header compression” checkbox is UNCHECKED. Click OK. (No changes to the DNS and WINS tabs are required)



Click on the "Advanced" tab. Change the settings if necessary to match the following. Click "OK".



The Dialup Network Connection window will now appear as shown:

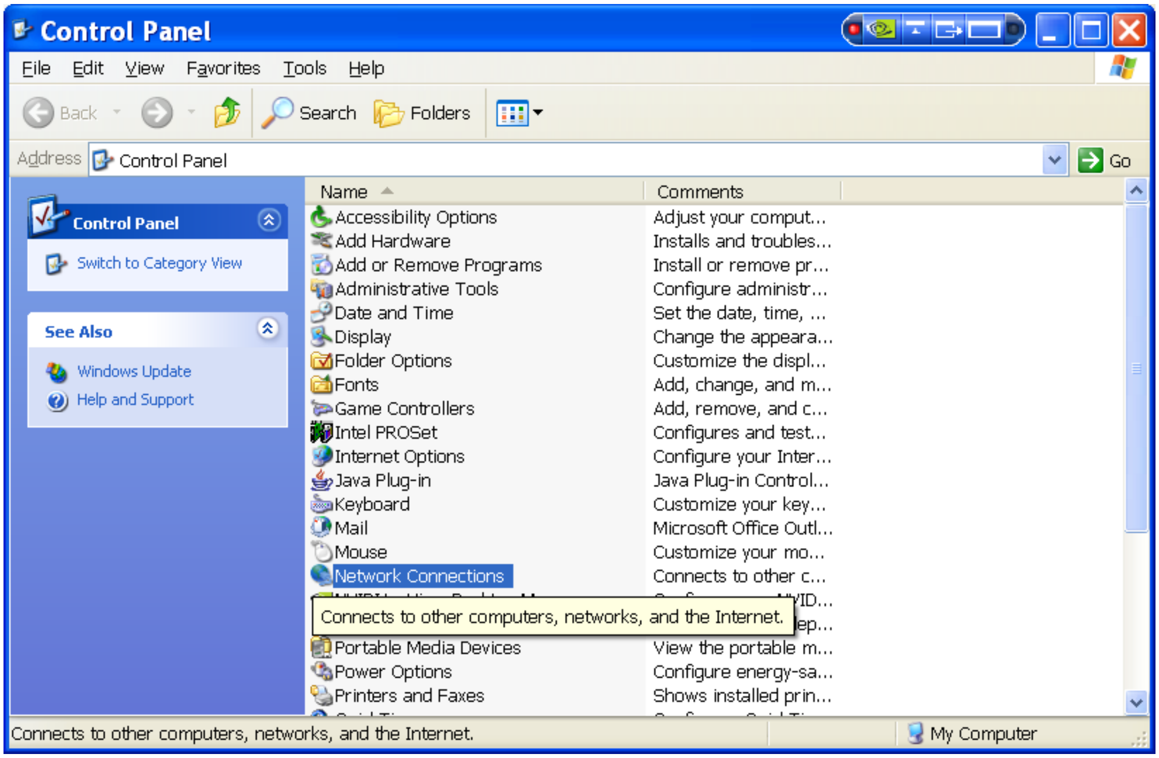


Dialup Network Connection setup is complete. Click on the Dial button to initiate the call.

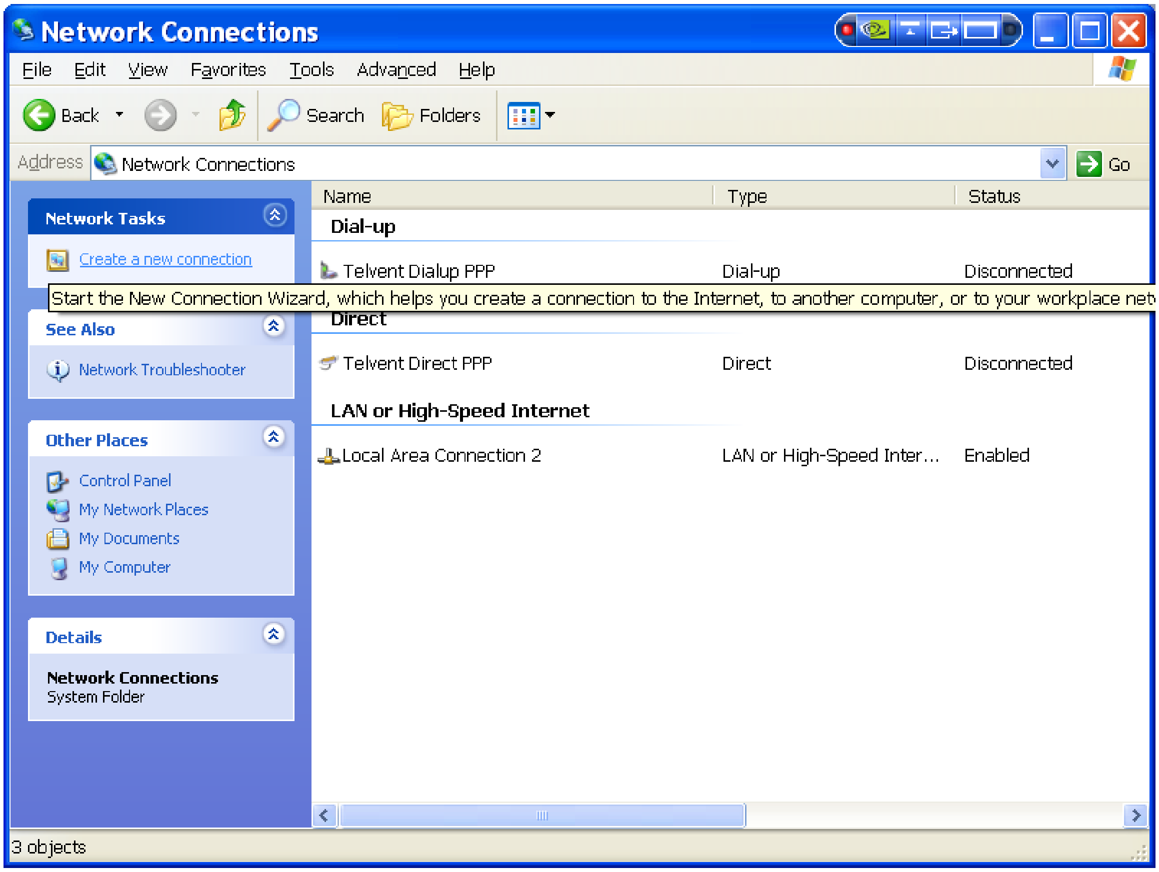
Creating a Direct Serial Network Connection for XP

In the Control Panel, double-click on the Network Connections icon:

12.7



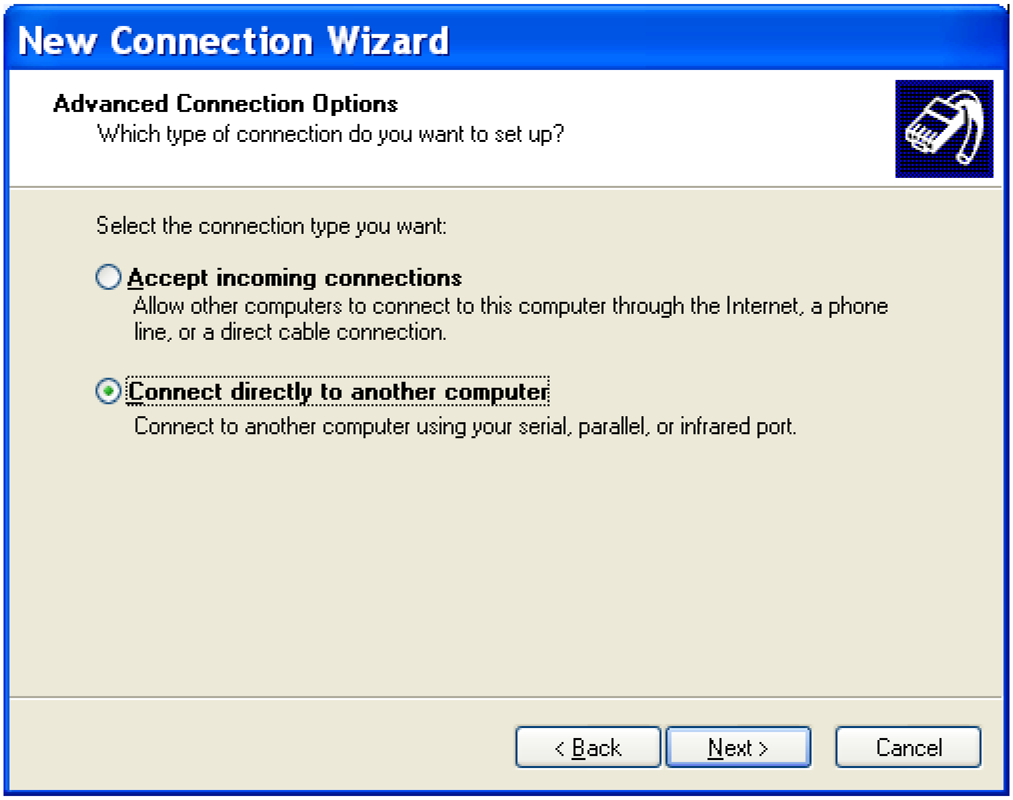
Click on the “Create a new connection” link:



The Connection Wizard will start, presenting the following window. Click “Next”.

For Network Connection Type, pick “Set up an advanced connection”, then click “Next”.

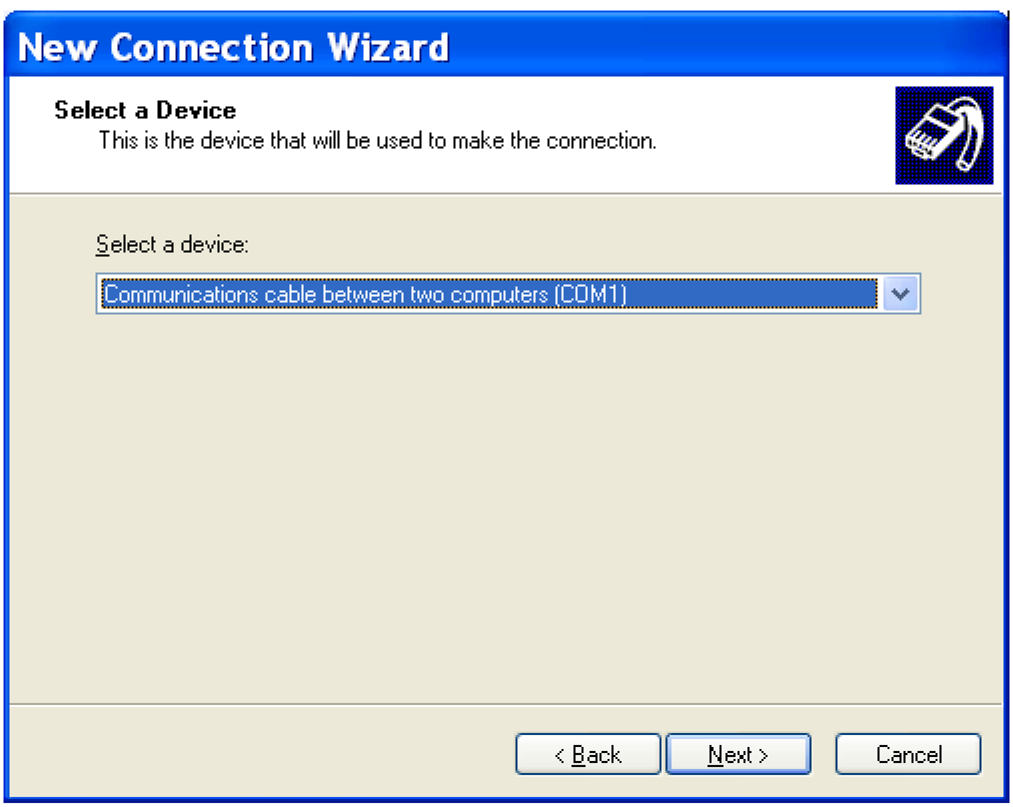
Select “Connect directly to another computer”. Click “Next”.



Select “Guest”. Click “Next”.

Give the new connection a name. This will also be the name of the shortcut placed on the desktop after completing the Connection Wizard. Click "Next".

Select the serial port on your computer that will be used to connect to the RTU. Click "Next".

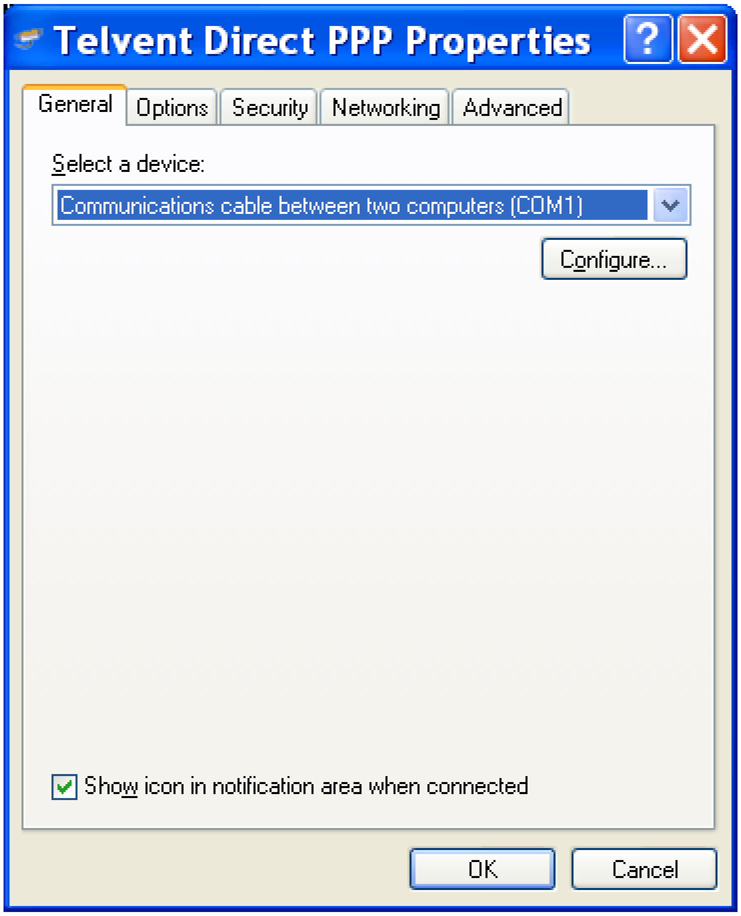


Make this connection available for “Anyone’s Use”, if desired. Otherwise, this connection will only be available to the current user.

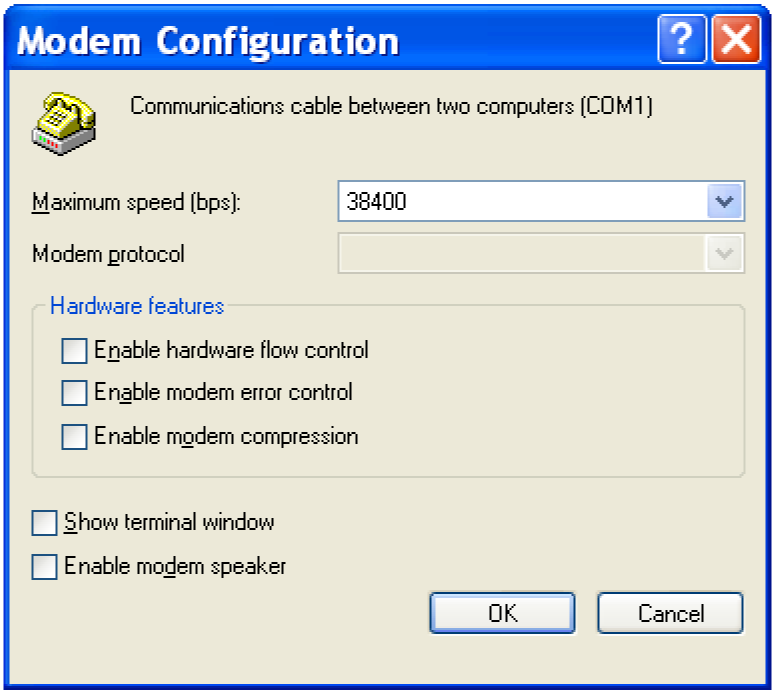
Before completing the Connection Wizard, check the "Add a shortcut to this connection to my desktop" box. Click "Finish".

When the Connection Wizard completes, the following window will appear. Click "Properties".

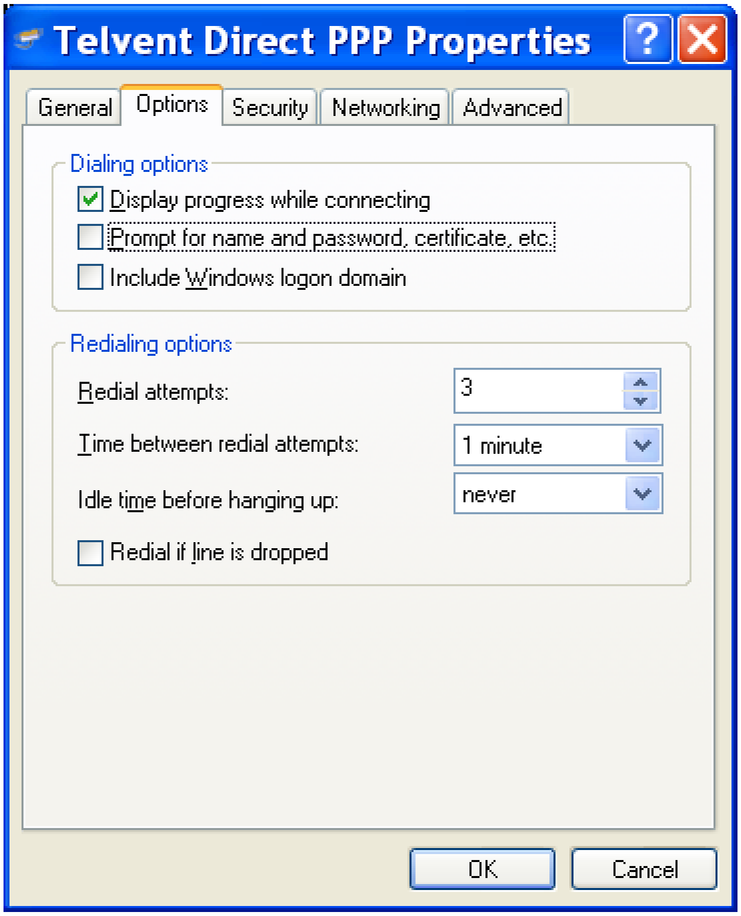
The following window will appear. The serial port selected in the setup should be present in the device field. Click “Configure”.



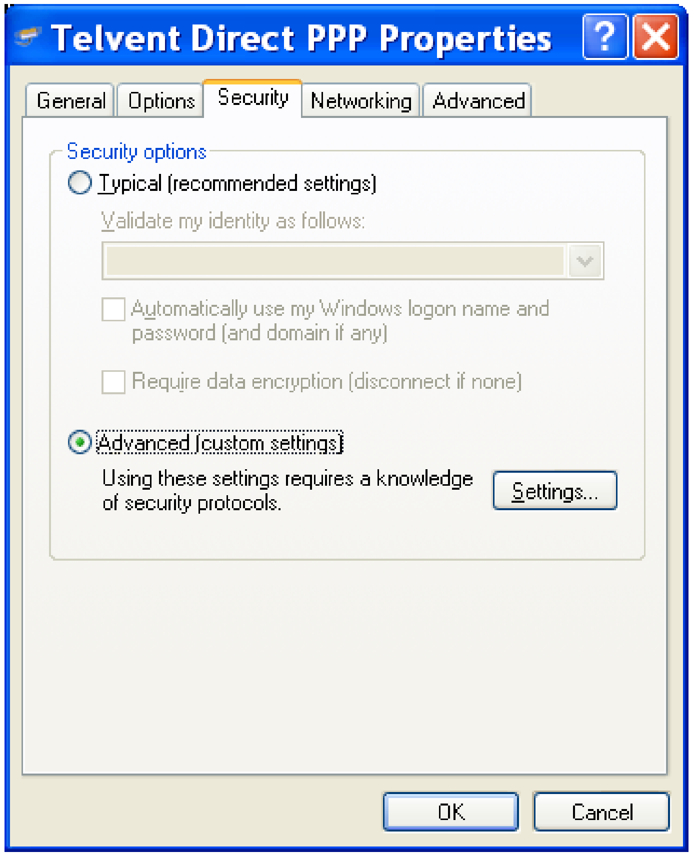
Set the Maximum speed to 38400 bps, and UNCHECK all check boxes. Click “OK”.



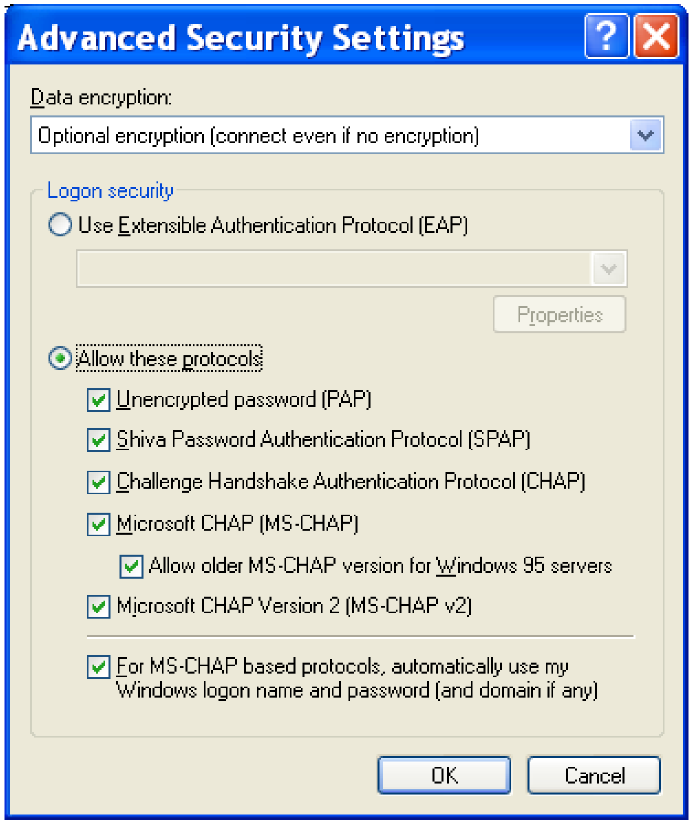
Click on the “Options” tab. Make sure the “Prompt for name and password, certificate, etc.” checkbox is UNCHECKED.



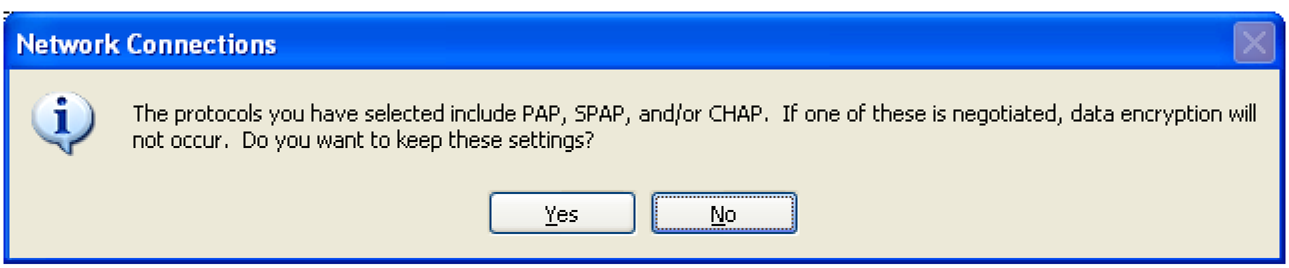
Click on the "Security" tab. In the "Security options" area select the "Advanced (custom settings) radio button. Click the "Settings…" button.



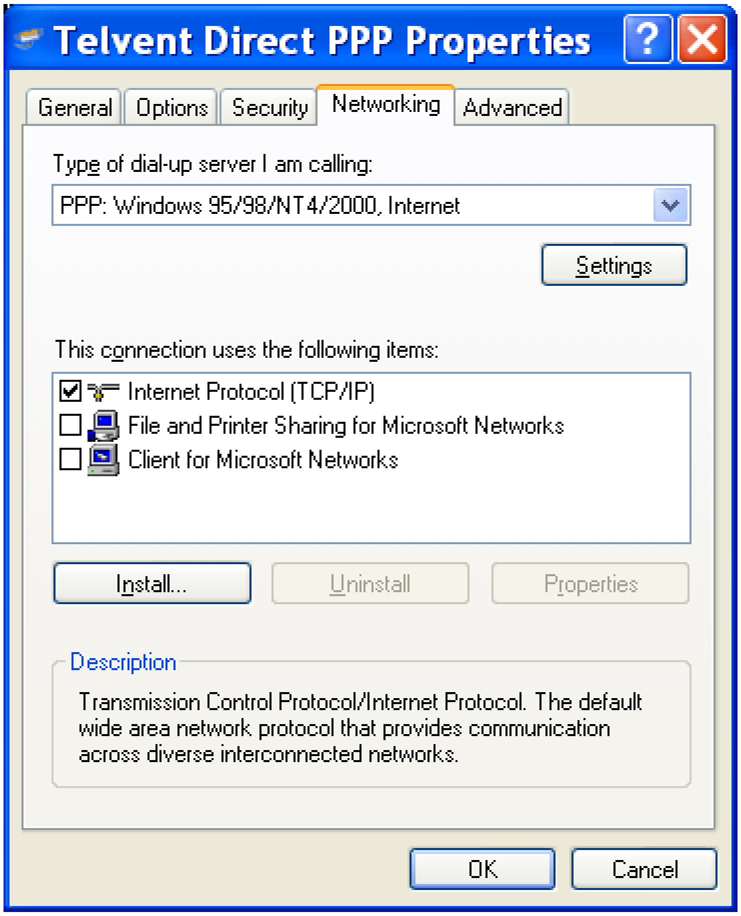
In the “Data encryption” field pull-down menu, select “Optional encryption (connect even if no encryption)”. In the “Logon security” area, select the “Allow these protocols” radio button, and CHECK all the checkboxes as shown. Click OK.



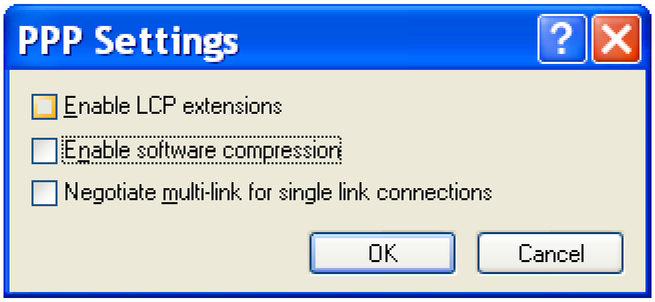
If a warning box comes up as shown, click Yes.



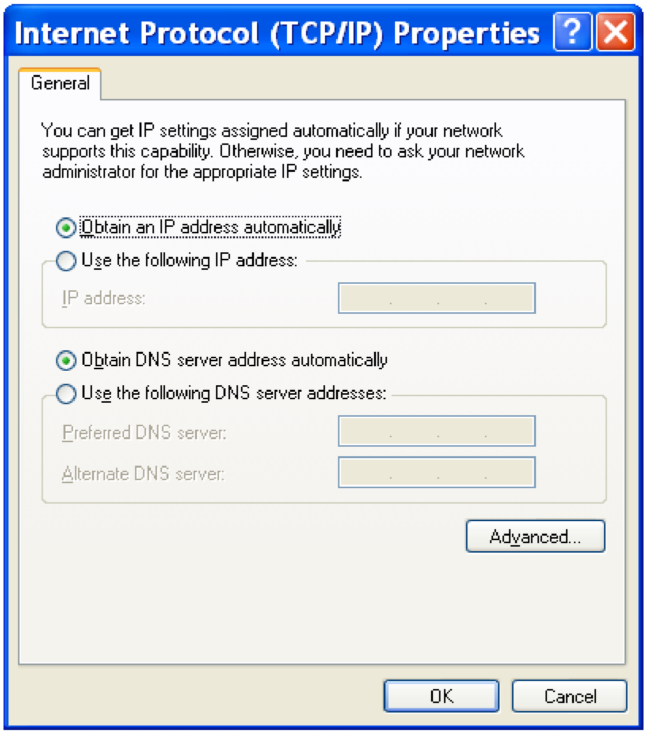
Click on the "Networking" tab. The "Type of dial-up server" field should be PPP. In the "This connection uses the following items:" area, uncheck everything that can be unchecked except Internet Protocol (TCP/IP)", which should be checked.. Click the "Settings" button.



In the PPP Settings window, make sure all of the items are UNCHECKED. Click "OK".

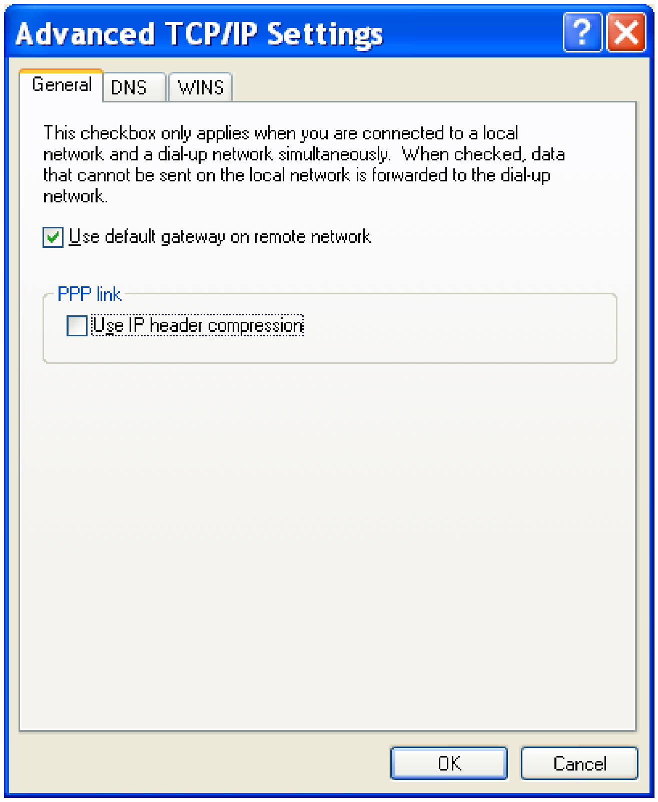


Click on the “Internet Protocol (TCP/IP)” item, and click on the “Properties” button. Click on the “Obtain an IP address automatically” and “Obtain DNS server address automatically” radio buttons are selected. Click on the “Advanced…” button.

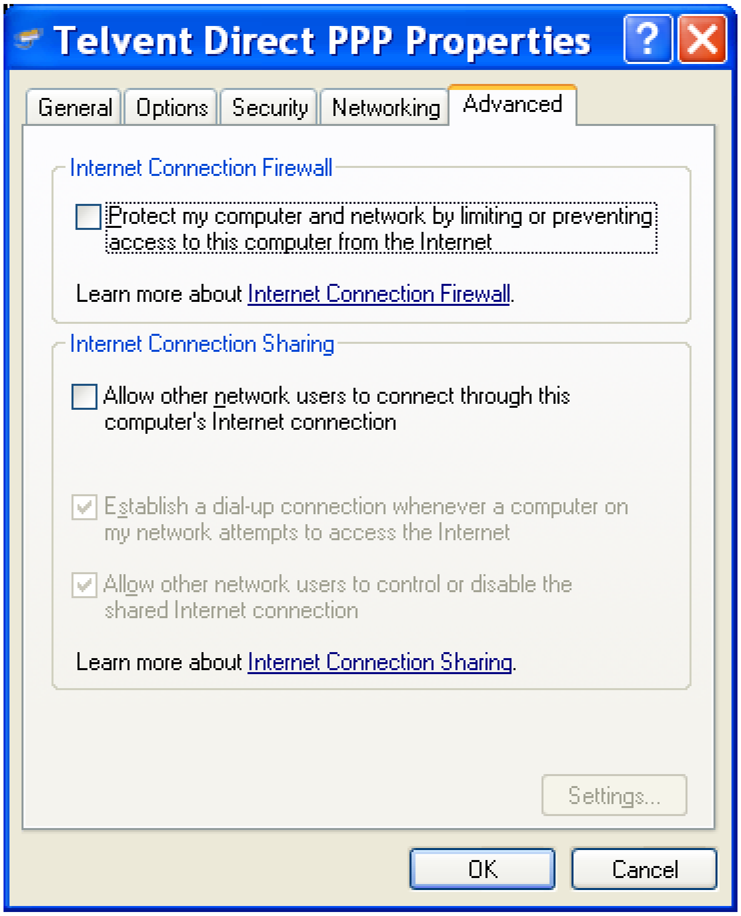


Select the “General” tab if not already selected. Select the “Use default gateway on remote network” checkbox (CHECKED). In the “PPP link” area, UNCHECK the “Use IP header compression” checkbox.

(No changes to the DNS and WINS tabs are required) Click "OK" to close the "Advance TCP/IP Settings" window. Click OK again to exit the Internet Protocol (TCP/IP) Properties box.



Click on the “Advanced” tab. Change the settings if necessary to match the following. Click “OK”. The Direct PPP Network Connection will immediately try to establish a connection. Click the “Cancel” button to interrupt this process if desired.



Direct Network Connection setup is complete.