TELVENT

config@WEB Software Users Guide

SAGE1-SFT-00001 V1.1

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For Reference Only

Manual No. **SAGE1-SFT-00001**

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1.0	04-25-11	1. Modified Customer Website Instructions. 2. Added Data Trap documentation to Data display chapter. 3. Added documentation for quality codes to Data display chapter. 4. Added qualifying note to example for changing ip address	11908		
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				Garry Macejewski, Manager, RTU Engineering	Dan Stark, Manager, RTU S/W Engineering

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CHAPTER 1

Introduction

This user manual describes the software operation and features of the Telvent 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 Telvent 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 3030Magnum 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 new features:

- Easy-to-use Graphical User Interface (GUI) via Microsoft Internet Explorer
- Embedded web server
- Built-in Ethernet with TCP/IP
- File Transfer Protocol (FTP)
- 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 Graphical User Interface (GUI)

The SAGE RTU is easily configured using the standard web browser, Internet Explorer version 6.0 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.

The GUI supports File Transfer Protocol (FTP) to transfer files to/from the RTU and the client. The file types include RTU applications, Web pages, Configuration files, and the operating system. In short, every file within one RTU can be transferred to another RTU or parts of the RTU file system can be upgraded as needed. This provides a powerful means of performing firmware upgrades or configuration changes.

General Operational Considerations

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

Note: With the release of firmware C0 and later, the initial TCP/IP address is now 172.18.150.50.

Note: For the latest manual, please see the appendix Accessing the Customer Website.

1.4 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 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.

1.5 Communications

The SAGE RTU supports a large suite of communication protocols over many different types of communications media. Ethernet and RS232 come as standard hardware. However, installation of media converters allow for just about any physical communications media to be supported.

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 Telvent 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.

1.6 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.

CHAPTER 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 all 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 6.0™ or greater.

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

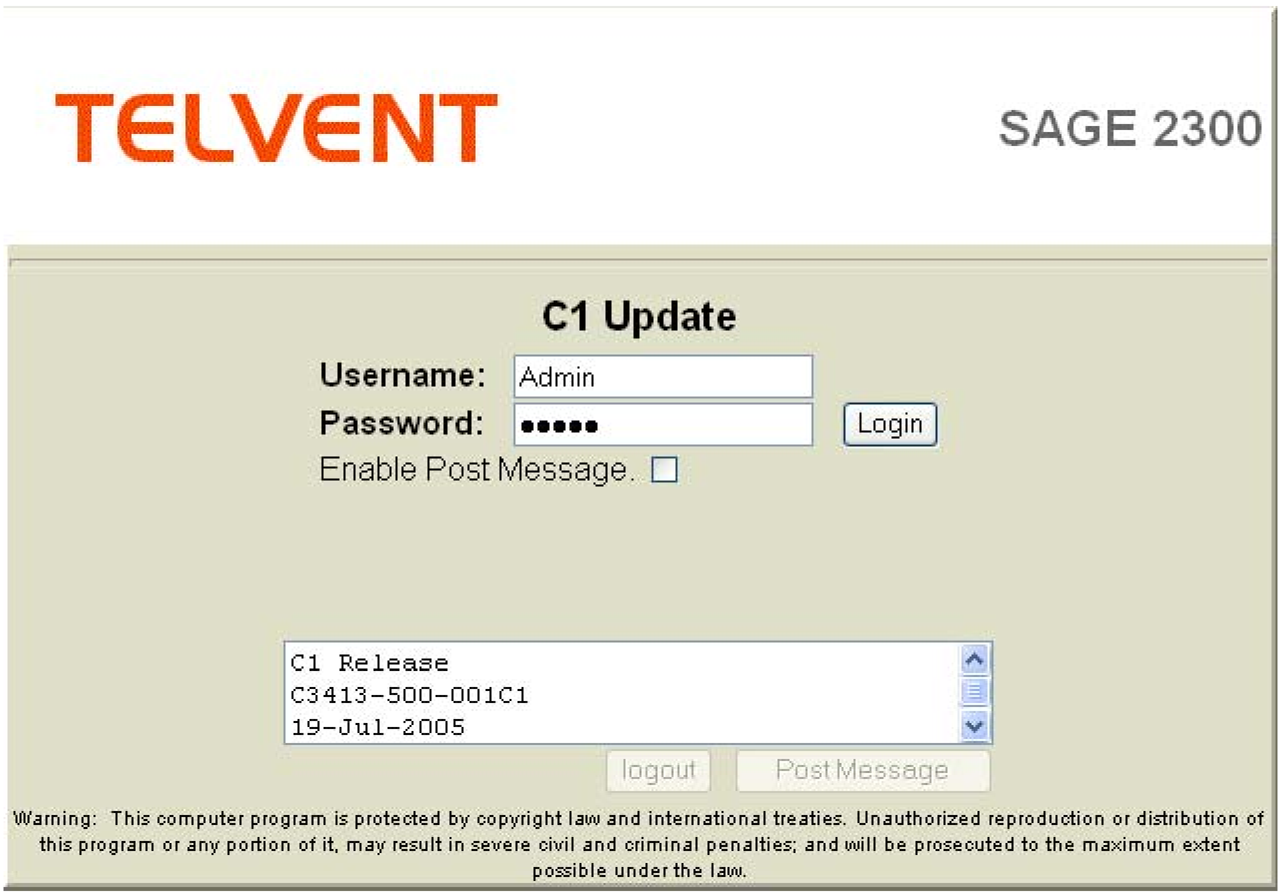
Launch Internet Explorer and type in the I.P. address of your RTU. The first screen that you encounter is the Login screen (see Figure 2-1). Enter your Username and Password.

Note: Username and Password and all security issues are explained in Chapter 6 Administration.

This screen will have the name of the substation RTU above the Username field. There is also a scratch pad to leave a message for the next user. The scratch pad is a scrollable box for larger messages (up to 500 characters).

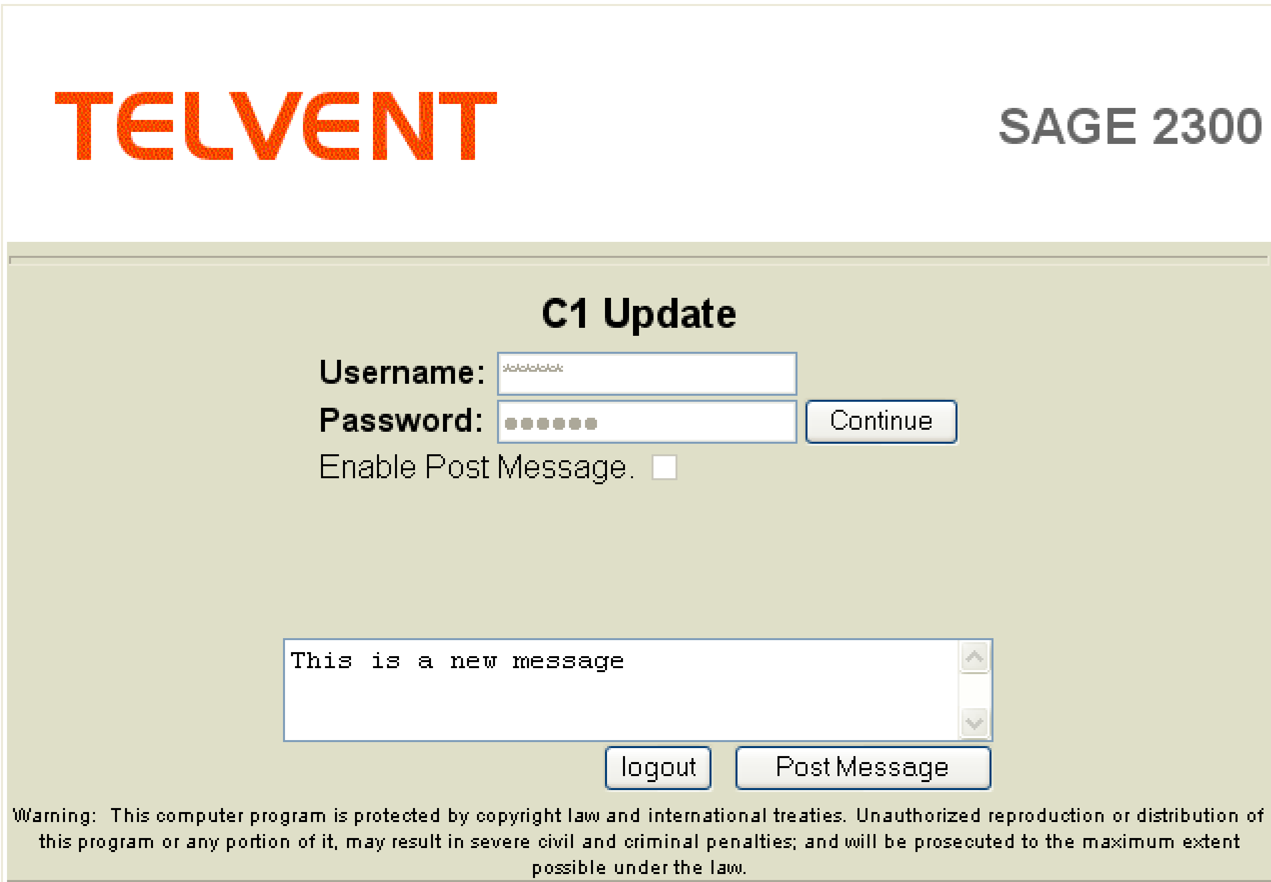
The following is an example of how to use the scratch pad. Before you click Login, check the “Enable Post Message” box, as shown.

Figure 2-1 Login Screen



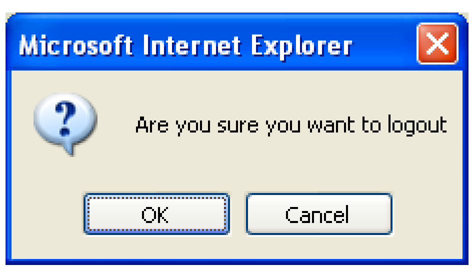
This action will bring you to the screen shown below. Type in your message, as shown below, then click "Post Message." At this point, you can click Continue to continue to Login, or you can click Logout, if your only purpose was to post a message.

Figure 2-2 Posting a Message



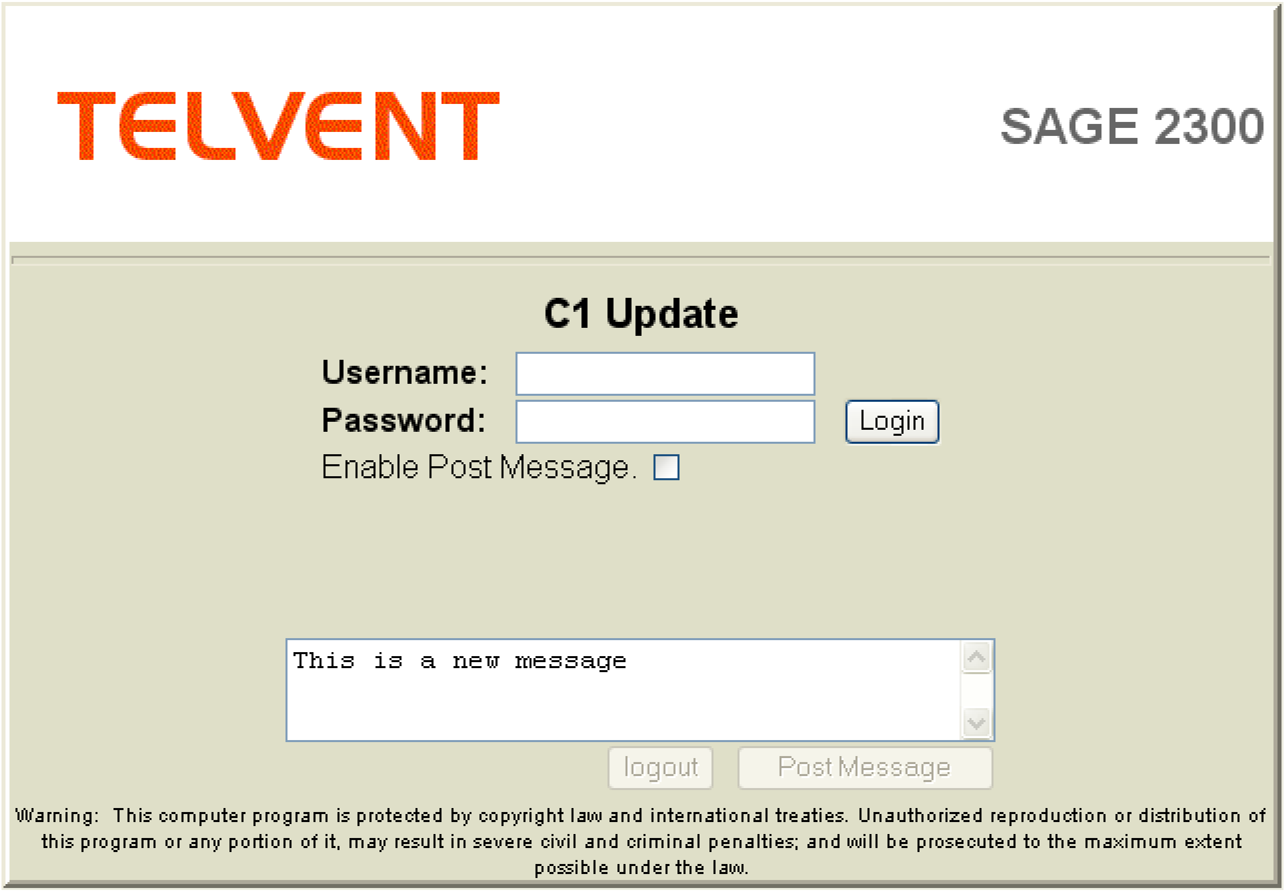
The following screen shows the result of clicking Logout. You first get a warning that you are about to logout..

Figure 2-3 Logging Out After Posting a Message



After you logout, the new message is displayed, as shown.

Figure 2-4 Logging Out After Posting a Message



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 five tabs that allow you to jump between the Configuration page, Data Display page, Command page, Up/Download page, and Admin 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 2-5 Typical SAGE 1X10 First Page

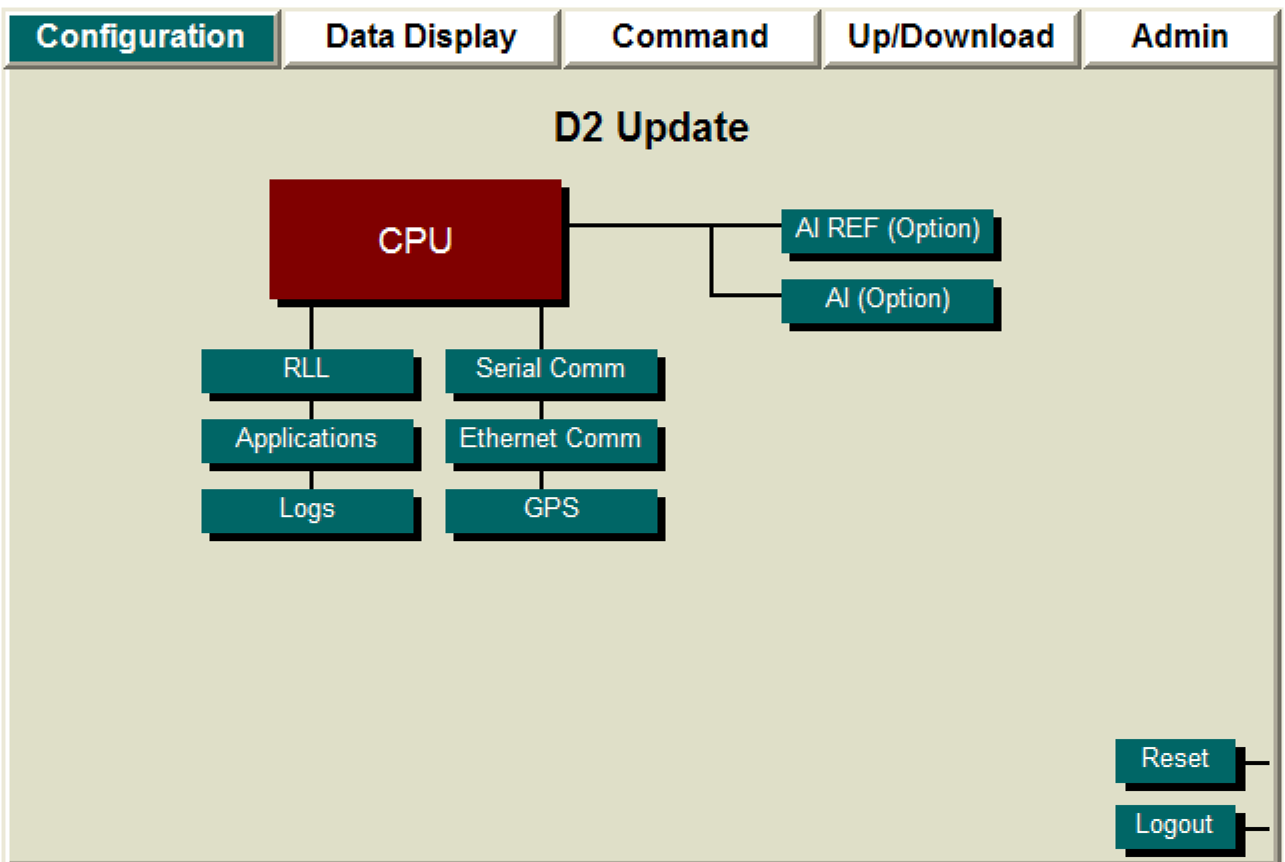


Figure 2-6 Typical SAGE 1X30 First Page

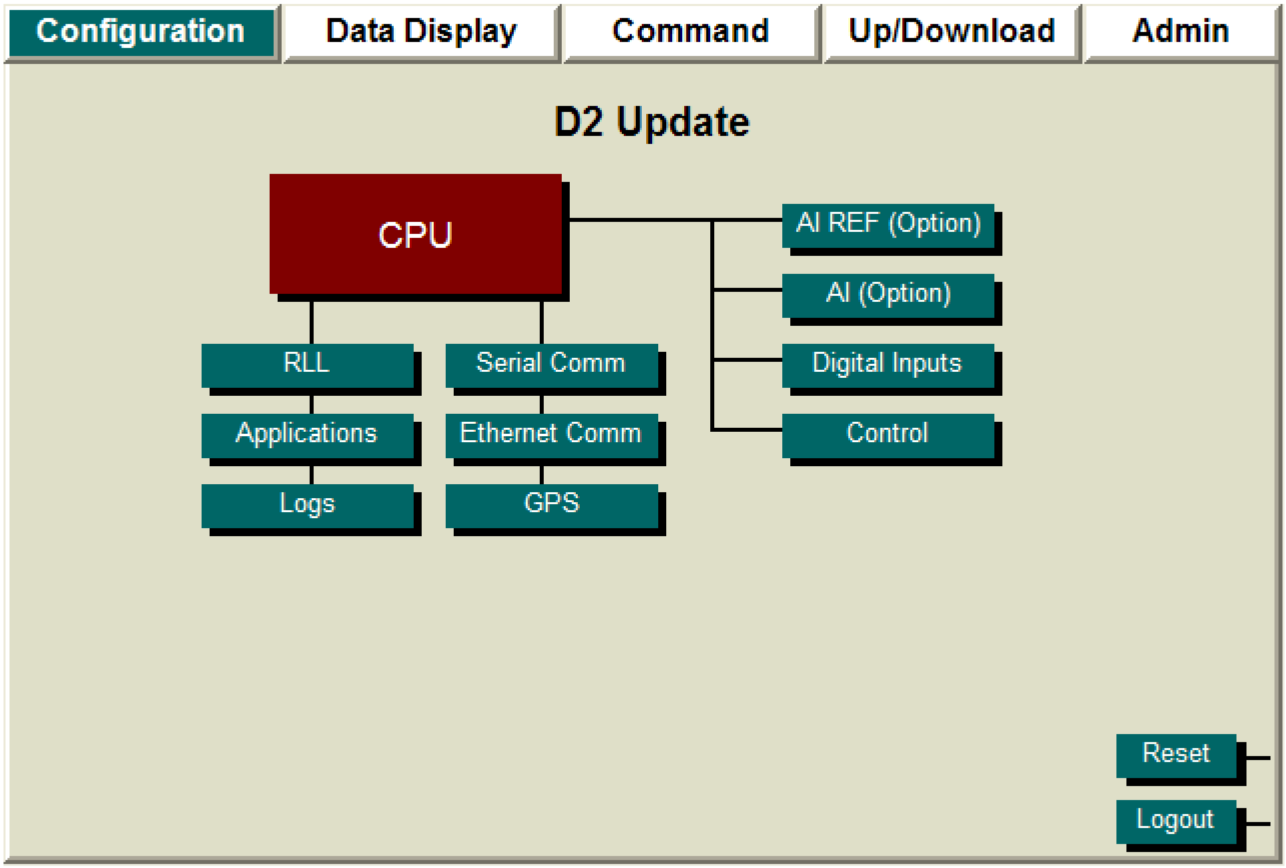


Figure 2-7 Typical SAGE 1X50 First Page

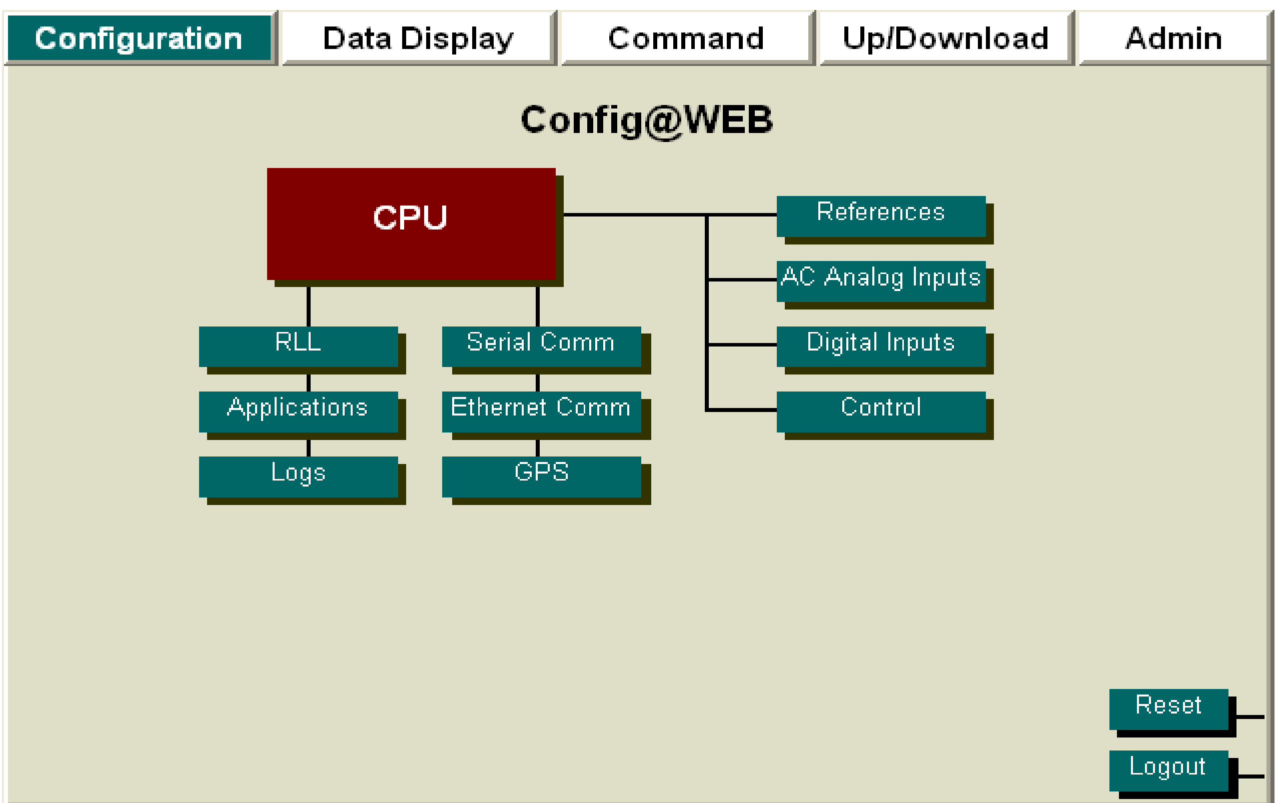


Figure 2-8 Typical SAGE 2X00 First Page

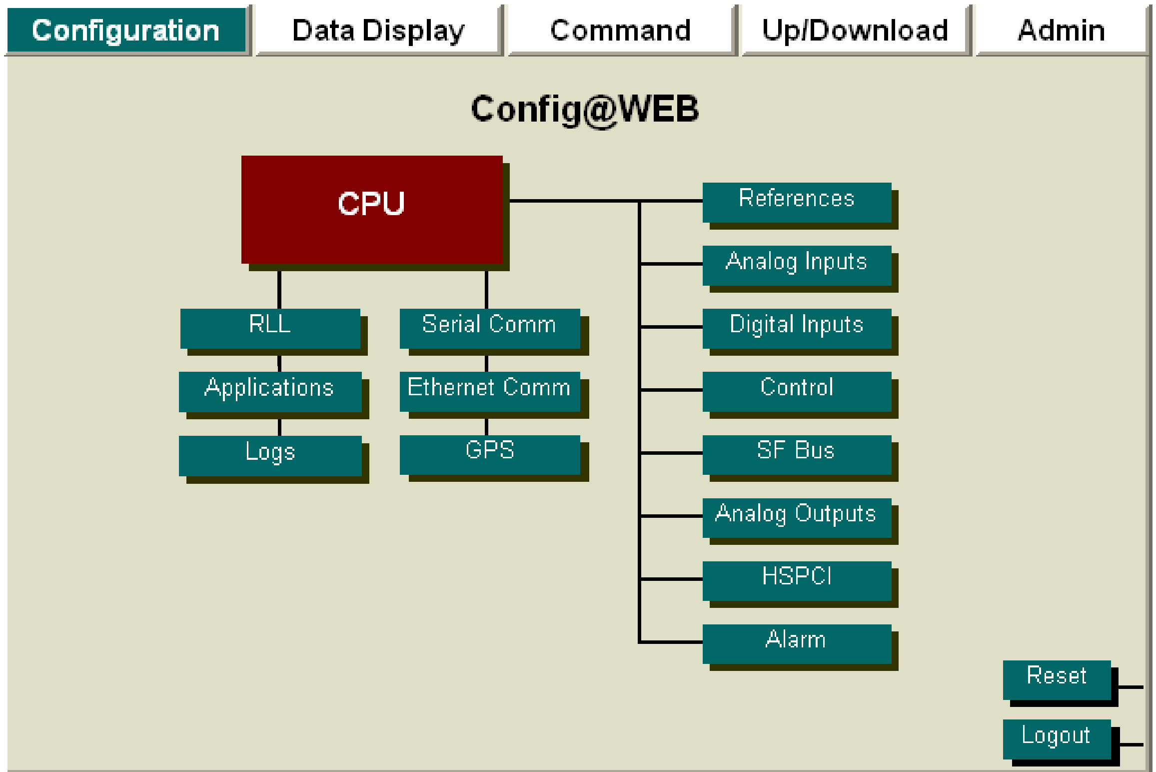
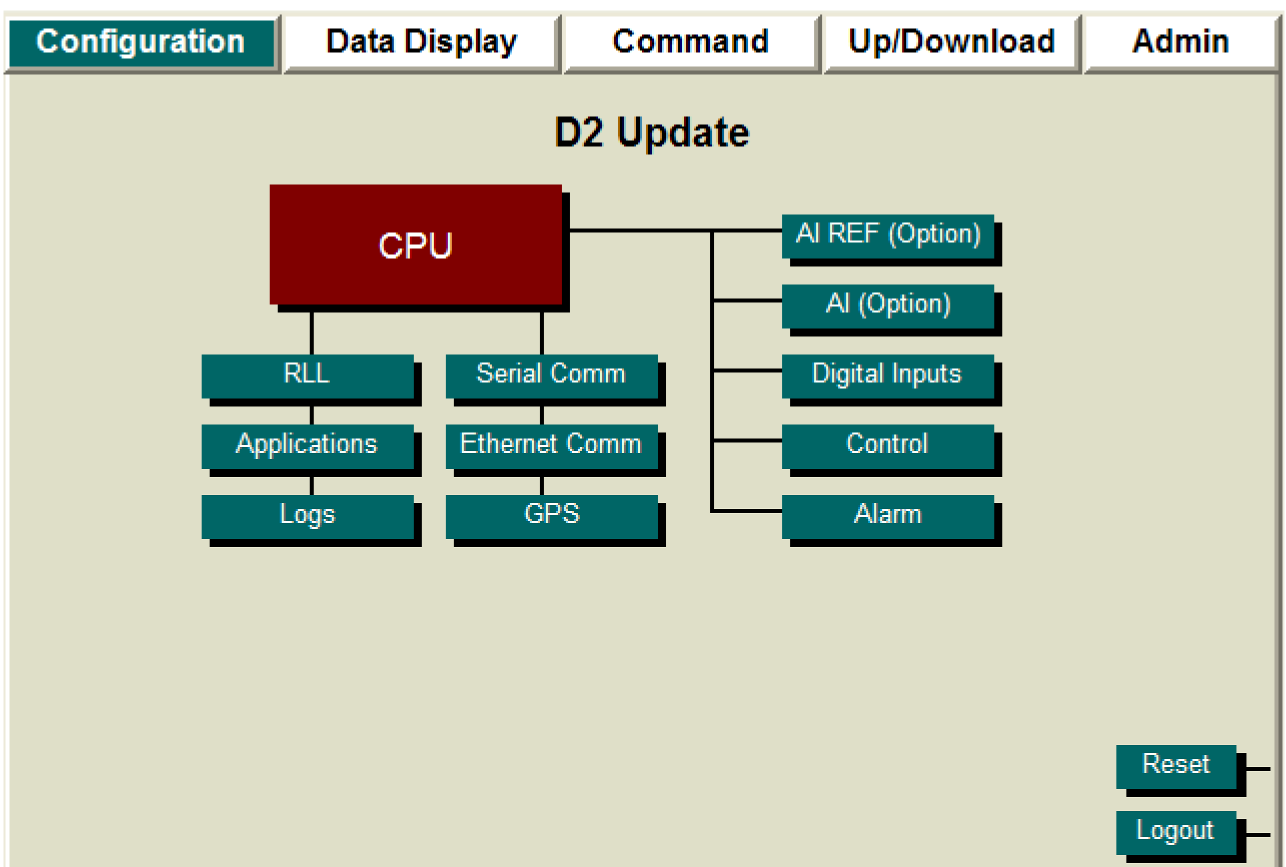
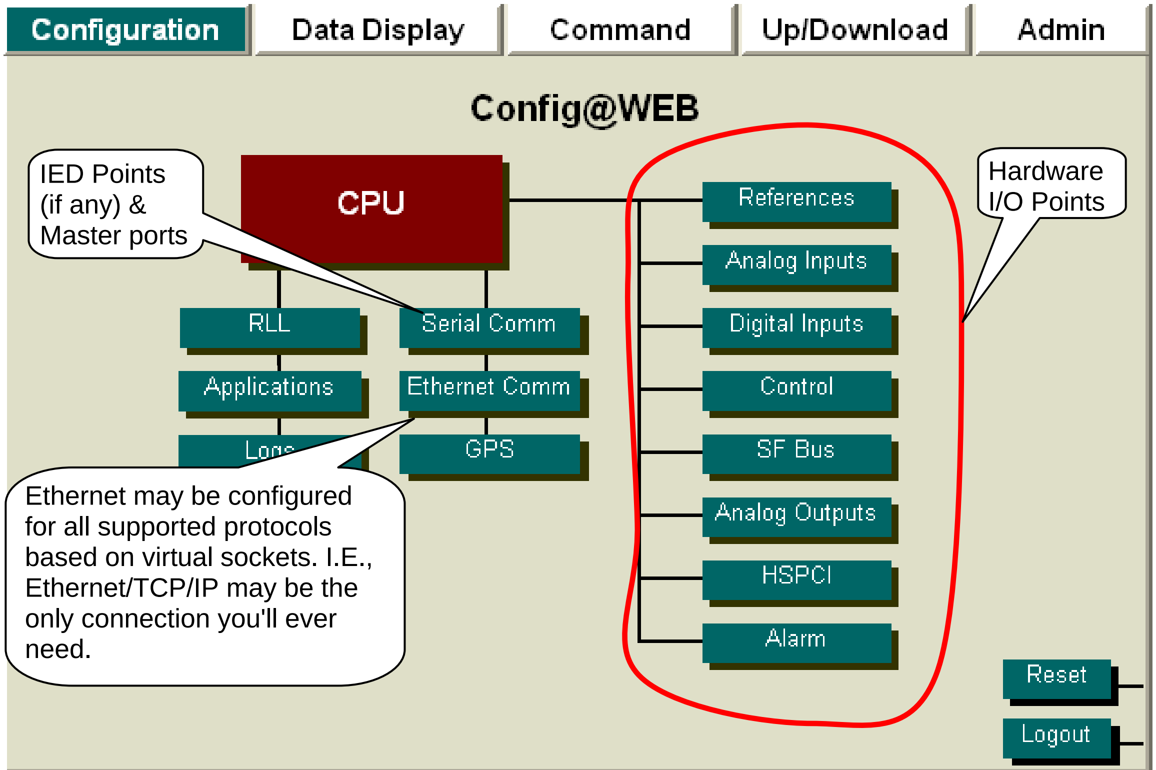


Figure 2-9 Typical SAGE 3030X First Page



Immediately after a successful login, you will see the Configuration screen (if the login is an unrestricted Admin login) as shown in Figure 2-10. 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 configuration. Master ports are also part of the Serial 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.

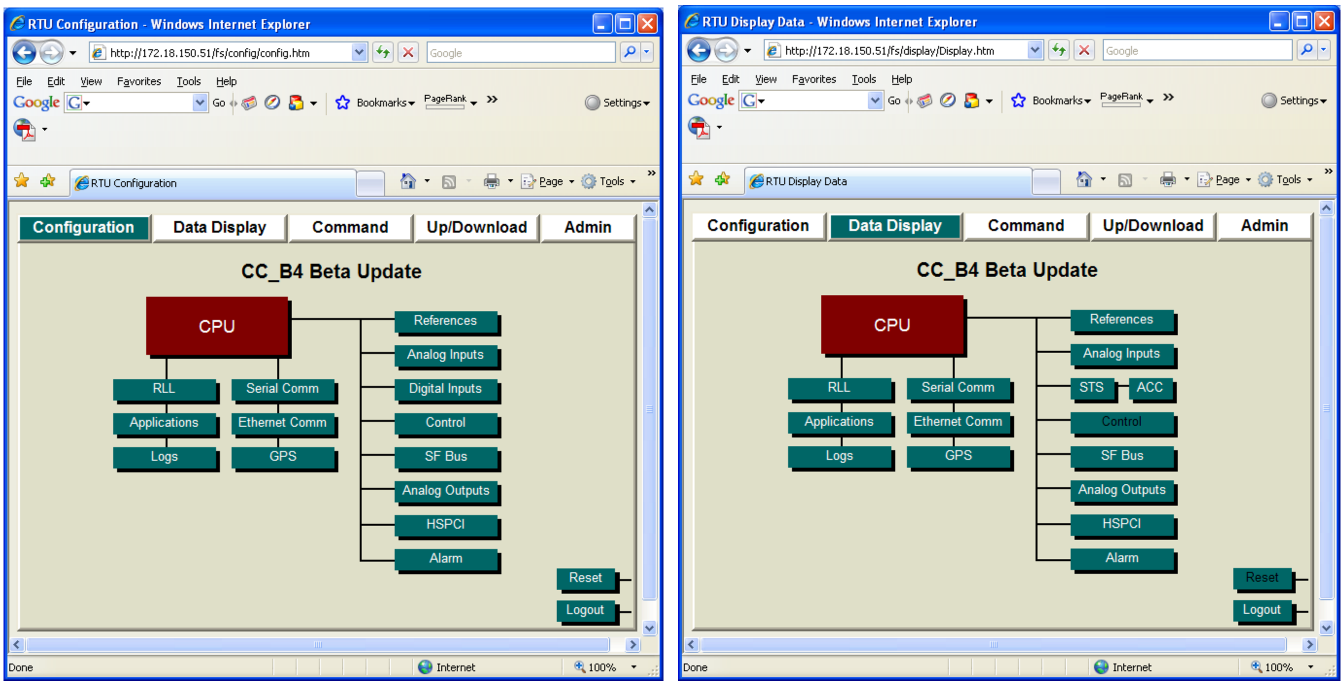
Figure 2-10 Configuration Screen



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 2-11 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.

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

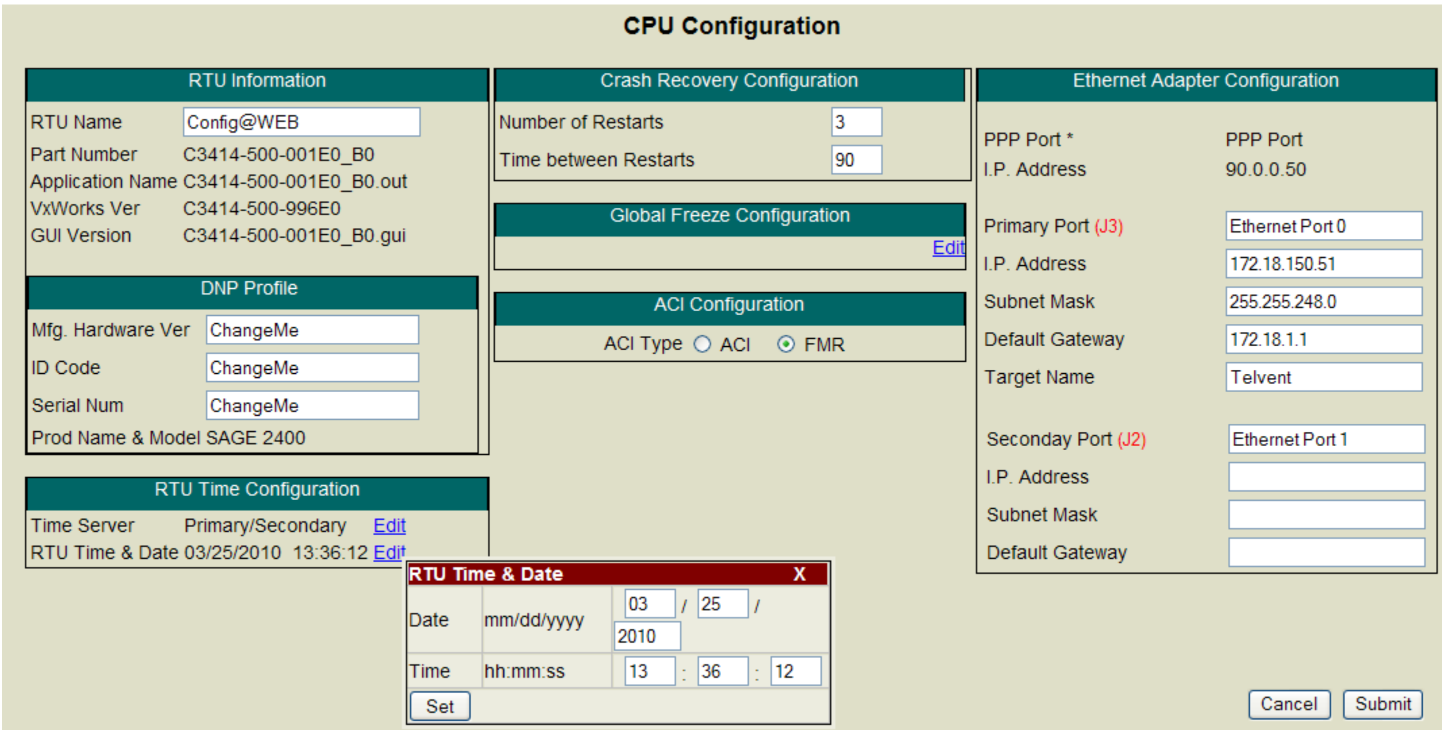
Navigation shortcuts are now included on all screens below the tab level. No matter how far down you drill, you can always return to the top level, or any intermediate level. An example is shown below.

Config >> Serial Comm Setup >> Port 2 : DNPM IED List >> DNPM_IED_1 Config

2.5 CPU Configuration

From the Configuration screen, click the CPU block. You will get a screen similar to that shown in Figure 2-12. With the possible exception of adjusting the real-time clock, the CPU configuration may not ever have to be touched again.

Figure 2-12 CPU Configuration



Note: Ethernet Adapter Configuration may have one or two ports depending on the CPU card used.

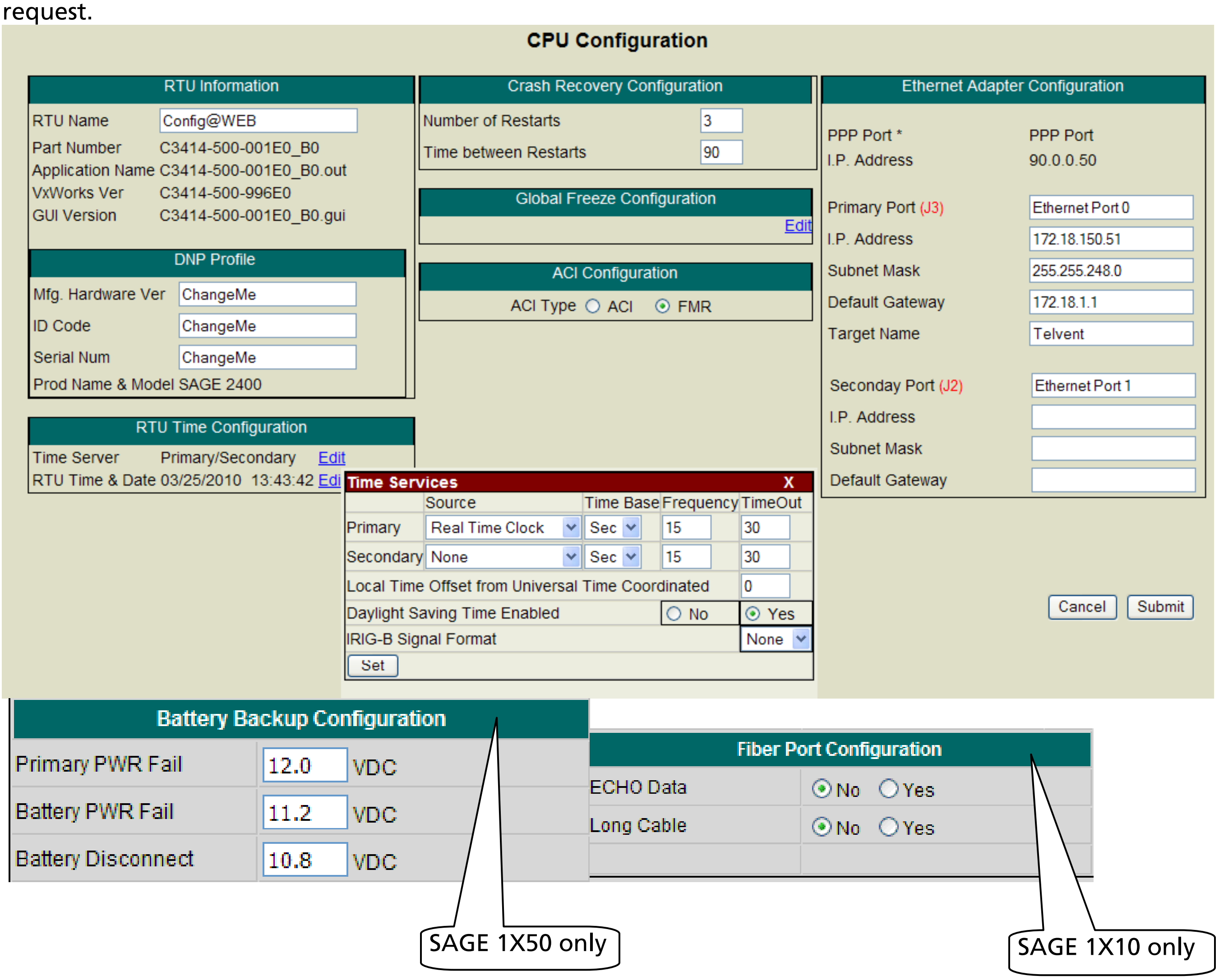
2.5.1 RTU Information

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 Telvent (Var 242 – Device Mfg software ver – see below)
Application Name	File name of the firmware
VxWorks Ver	VxWorks Version number assigned by Telvent
GUI Version	Version number assigned by Telvent
Mfg. Hardware Ver	User define information
ID Code	User define information
Serial Num	User define information

These fields may be used to bring back any information the user needs, like coordinates for GIS, etc.

Support for DNP Object 0 was added for Level 1 and Level 2 compliance. The following information can now be returned to the DNPR Master by the Object 0 var X request.



Note: SAGE 1X10 and 1X50 have additional CPU Configuration.

2.5.2 RTU Time Configuration

Time Server

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.

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).

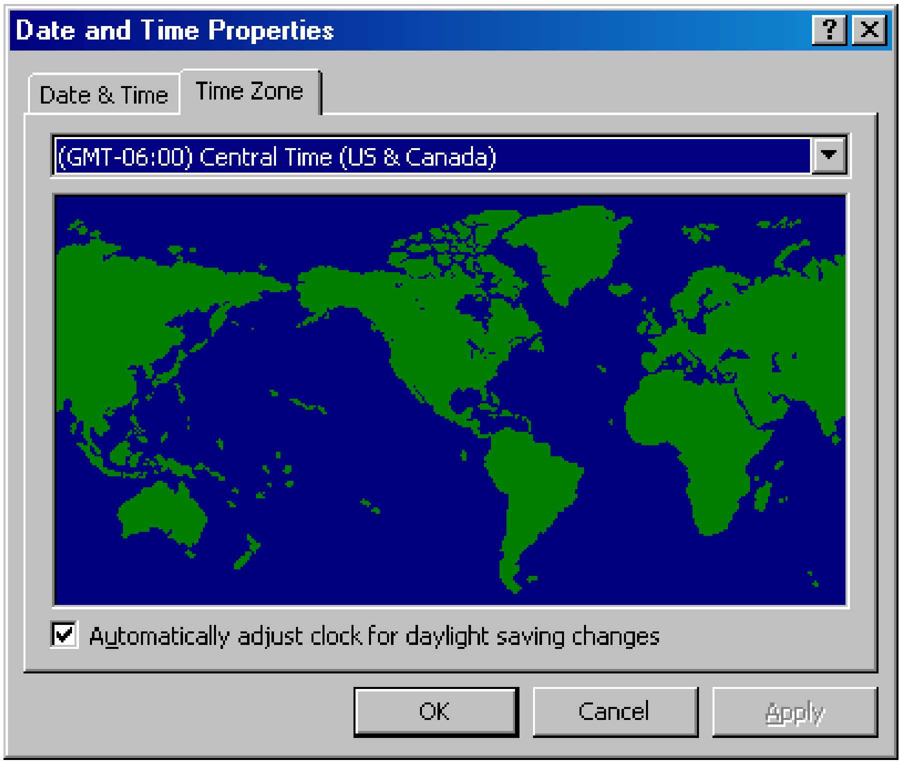
Note: The coordination between UTC and local time is a feature that may be ignored. If you want your RTU to act as it always has in regard to time syncs, set Local Time Offset from Universal Time Coordinated to 0, Daylight Saving Time Enabled to No, and IRIG-B Signal Format to None.

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.



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.

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 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.

2.5.5 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.

2.5.6 Ethernet Adapter Configuration

PPP Port Address	Address assigned by Telvent. See Appendix E.
Primary Port	Name of the primary Ethernet port
I.P. Address	Primary I.P. Address of this RTU
Subnet Mask	Primary Subnet Mask of this RTU
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.
Target Name	Network server name of the RTU (the network server that resolves this name to the I.P. address is the DNS server)
Secondary Port	Name of the secondary Ethernet port
I.P. Address	Secondary I.P. Address of this RTU
Subnet Mask	Secondary Subnet Mask of this RTU
Default Gateway	I.P. Address of the secondary default gateway. This default gateway should not be set unless you are utilizing two networks in which case the secondary default gateway must be different from the primary.

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:

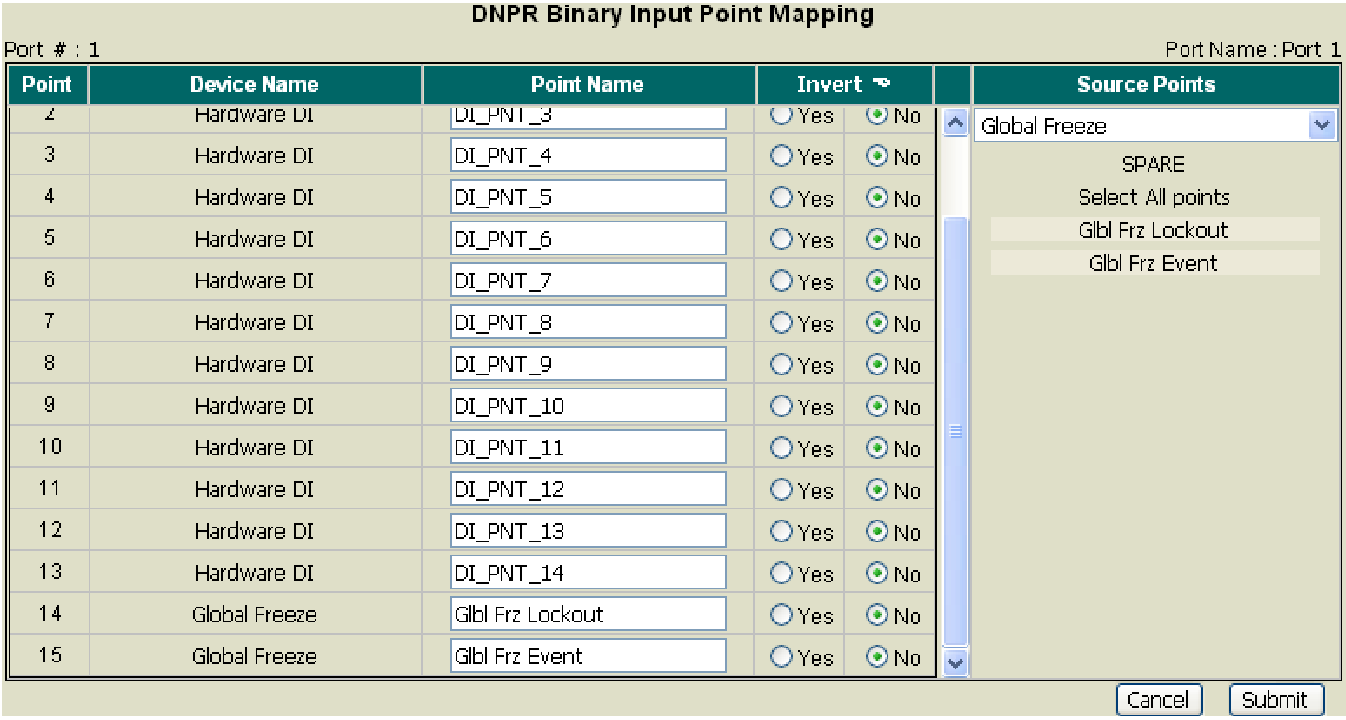
1. If the RTU clock is enabled then the Freeze Delay plus the Lockout Period must be less than the freeze interval (Freeze Delay + Lockout Period < Freeze Interval).
2. If none of the options are selected the Global Freeze task will suspend.

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 2-13 Global Freeze Status Points Mapping


DNPR Binary Input Point Mapping

Port # : 1 Port Name : Port 1

Point	Device Name	Point Name	Invert	
2	Hardware DI	DI_PNT_3	Yes	No
3	Hardware DI	DI_PNT_4	Yes	No
4	Hardware DI	DI_PNT_5	Yes	No
5	Hardware DI	DI_PNT_6	Yes	No
6	Hardware DI	DI_PNT_7	Yes	No
7	Hardware DI	DI_PNT_8	Yes	No
8	Hardware DI	DI_PNT_9	Yes	No
9	Hardware DI	DI_PNT_10	Yes	No
10	Hardware DI	DI_PNT_11	Yes	No
11	Hardware DI	DI_PNT_12	Yes	No
12	Hardware DI	DI_PNT_13	Yes	No
13	Hardware DI	DI_PNT_14	Yes	No
14	Global Freeze	Glbl Frz Lockout	Yes	No
15	Global Freeze	Glbl Frz Event	Yes	No

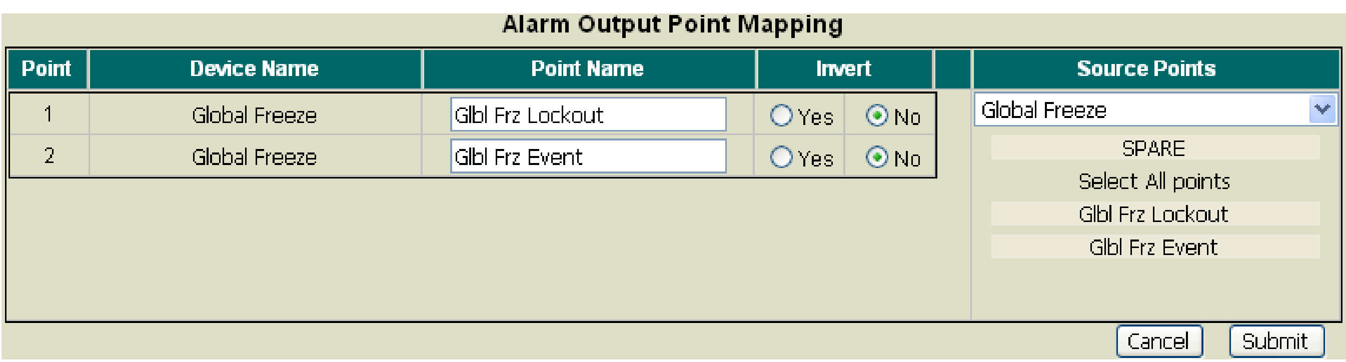
Glbl Frz Lockout

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 2-14 Mapping Global Freeze Status Points to Alarms


Alarm Output Point Mapping

Point	Device Name	Point Name	Invert	
1	Global Freeze	Glbl Frz Lockout	Yes	No
2	Global Freeze	Glbl Frz Event	Yes	No

2.5.8 ACI Type

Use the radio button to choose either ACI or FMR. Please see section "2.12.1 ACI Type" on page 2-36 for further information.

Navigation

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

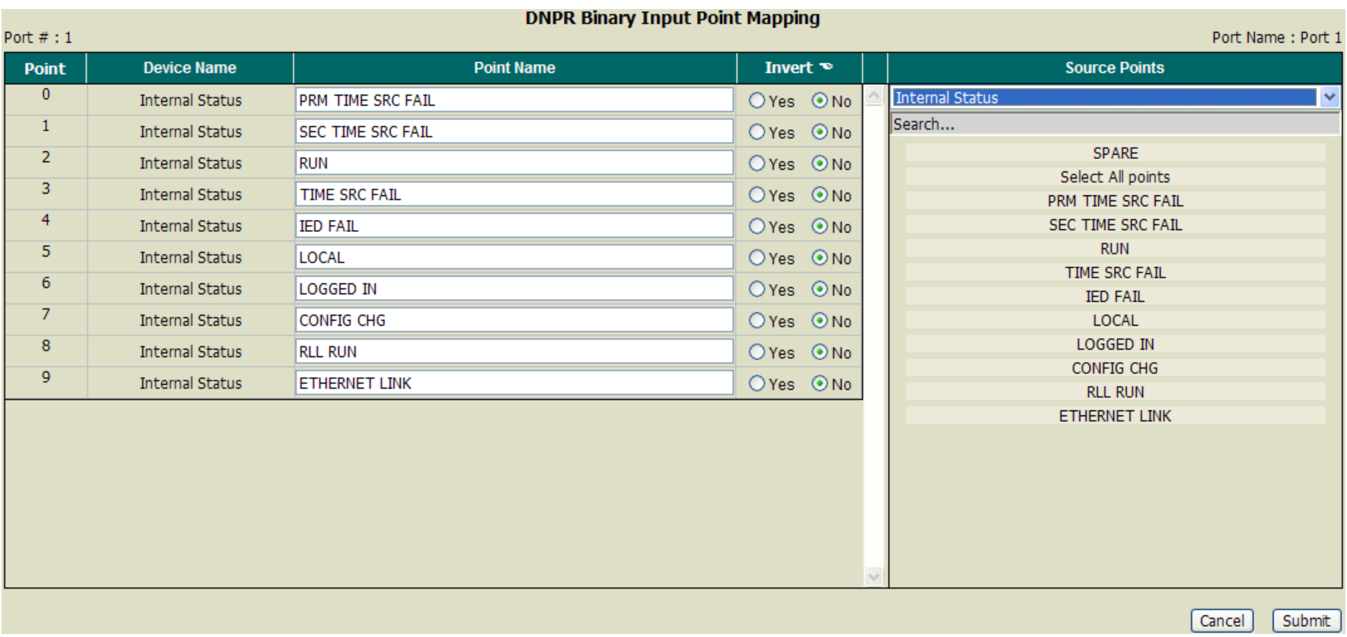
Please note: No configuration changes take effect until the RTU is reset.

2.5.9 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



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 Power/Run LED on the CPU card (although they won't necessarily be in sync). Normally blinking.

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 the IED. Close means an IED (or communications with it) has failed. Open means the IED is operational. 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.

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.

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

2.6 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 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 2-16 Special Characters

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

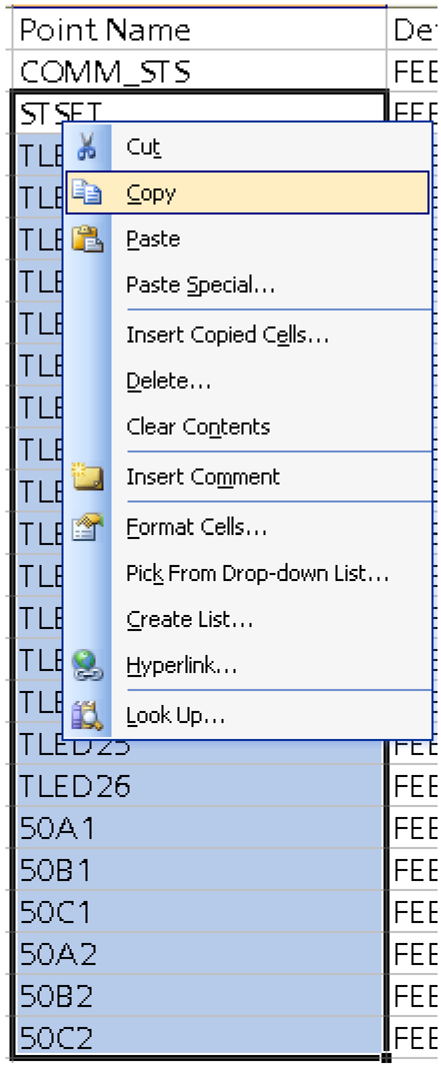
Warning: The lesson is that, if you write a macro to place point names in an XML file, be sure you limit names to forty five characters and that you replace special characters with the "Replace by" string listed above.

2.7 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.

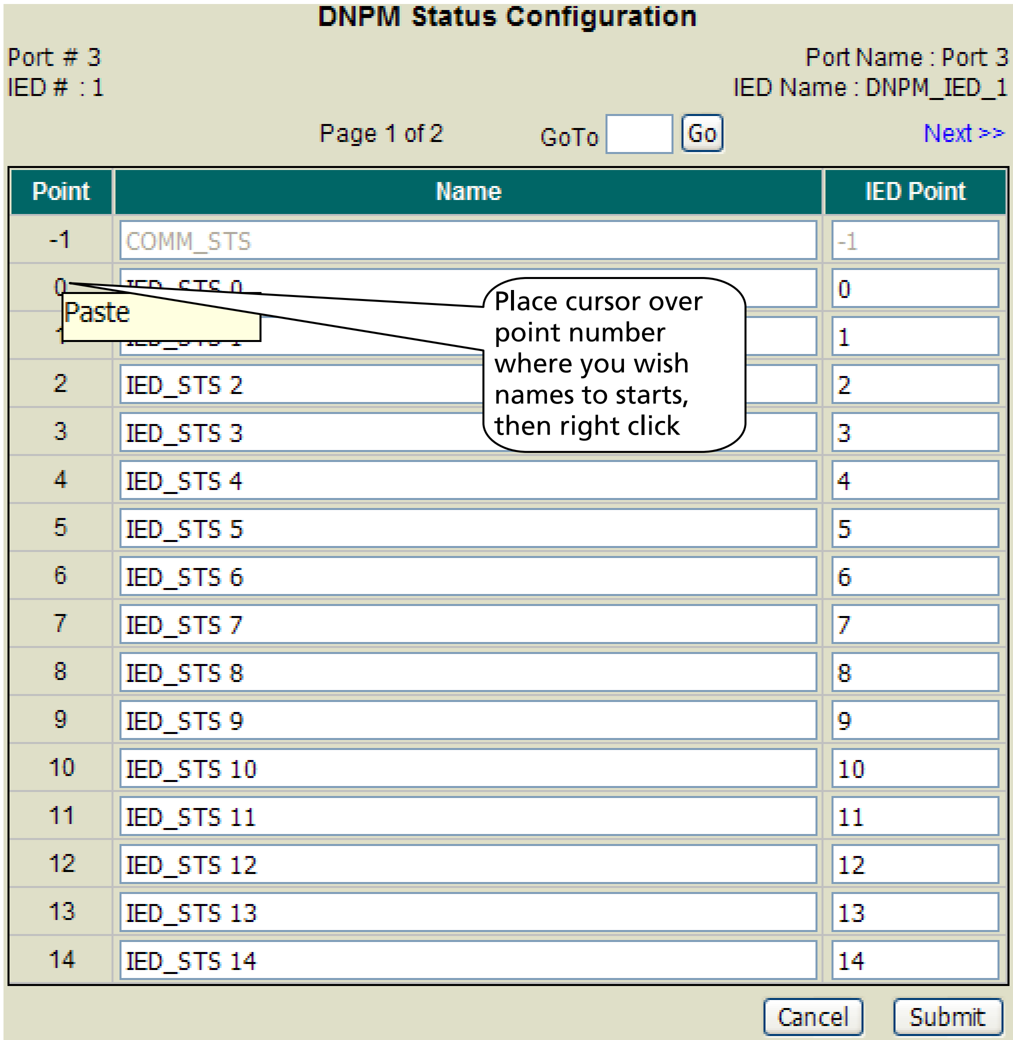
Note: Not all configurations or protocols support this feature.

Figure 2-17 Spreadsheet Column of Point Names



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

Figure 2-18 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 2-19 Dialog Message

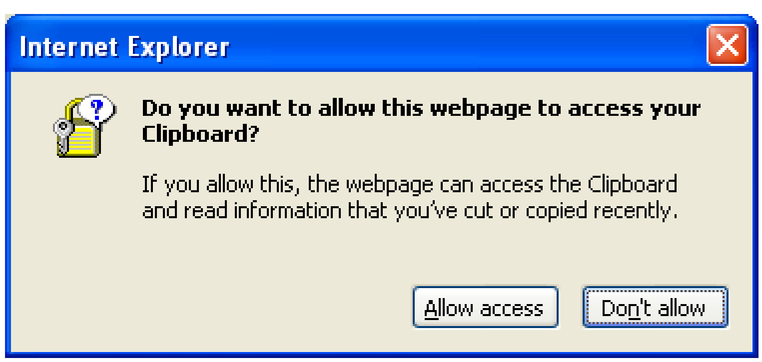
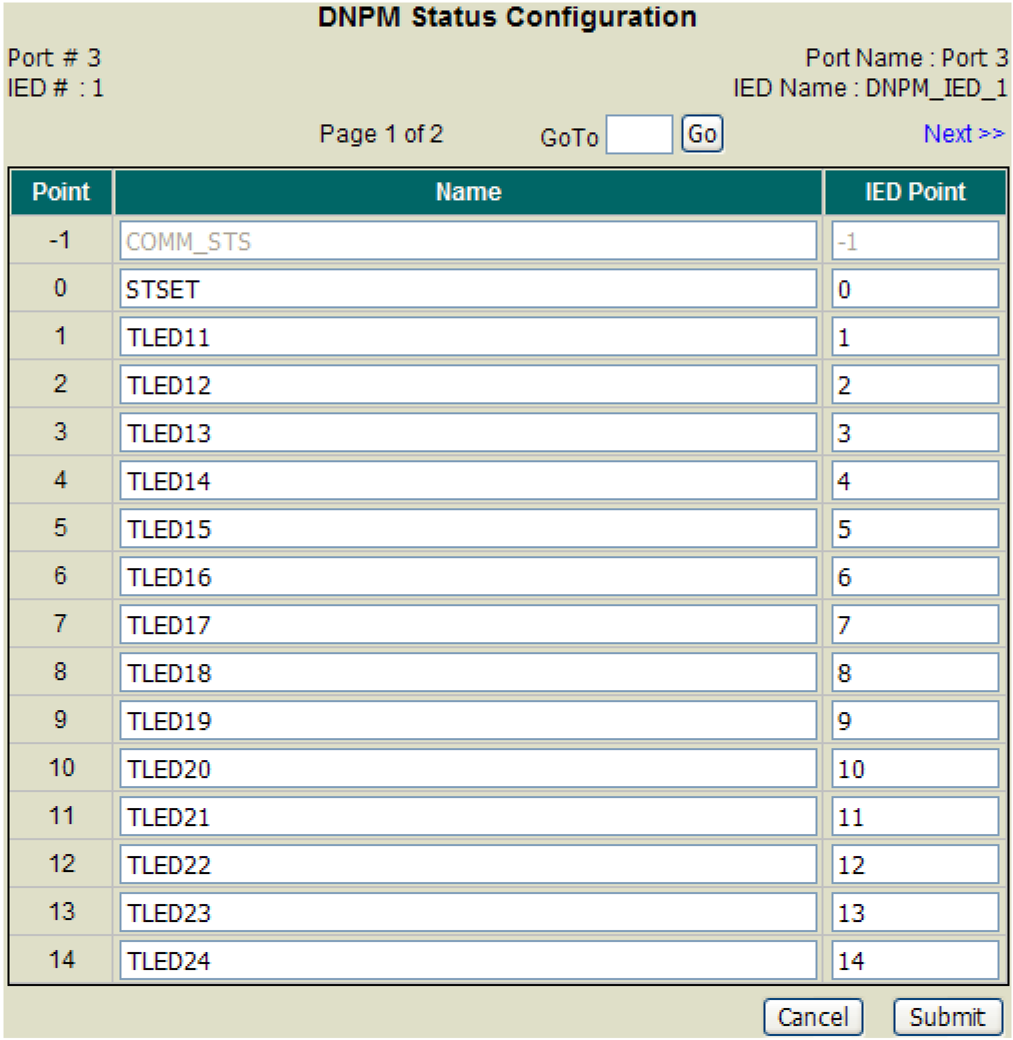


Figure 2-20 Results of Paste



DNPM Status Configuration

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

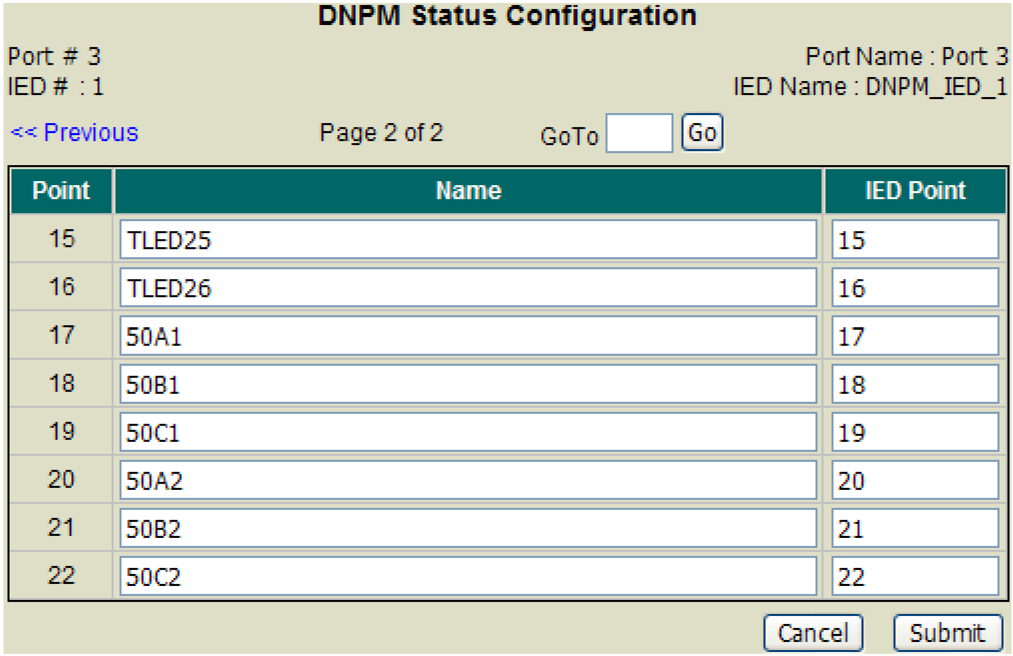
Page 1 of 2 GoTo Go Next >>

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 2-21 Second Page



DNPM Status Configuration

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

<< Previous Page 2 of 2 GoTo Go

Point	Name	IED Point
15	TLED25	15
16	TLED26	16
17	50A1	17
18	50B1	18
19	50C1	19
20	50A2	20
21	50B2	21
22	50C2	22

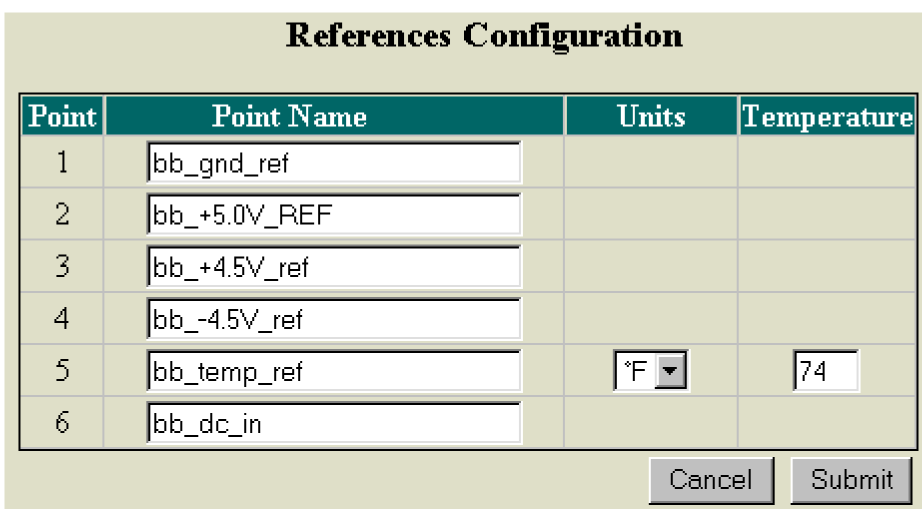
Cancel Submit

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 2-22. Click Submit when you are satisfied with the configuration, or Cancel to back out of the function without saving.

Figure 2-22 References Configuration



References Configuration

Point	Point Name	Units	Temperature
1	bb_gnd_ref		
2	bb_+5.0V_REF		
3	bb_+4.5V_ref		
4	bb_-4.5V_ref		
5	bb_temp_ref	°F	74
6	bb_dc_in		

Cancel Submit

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

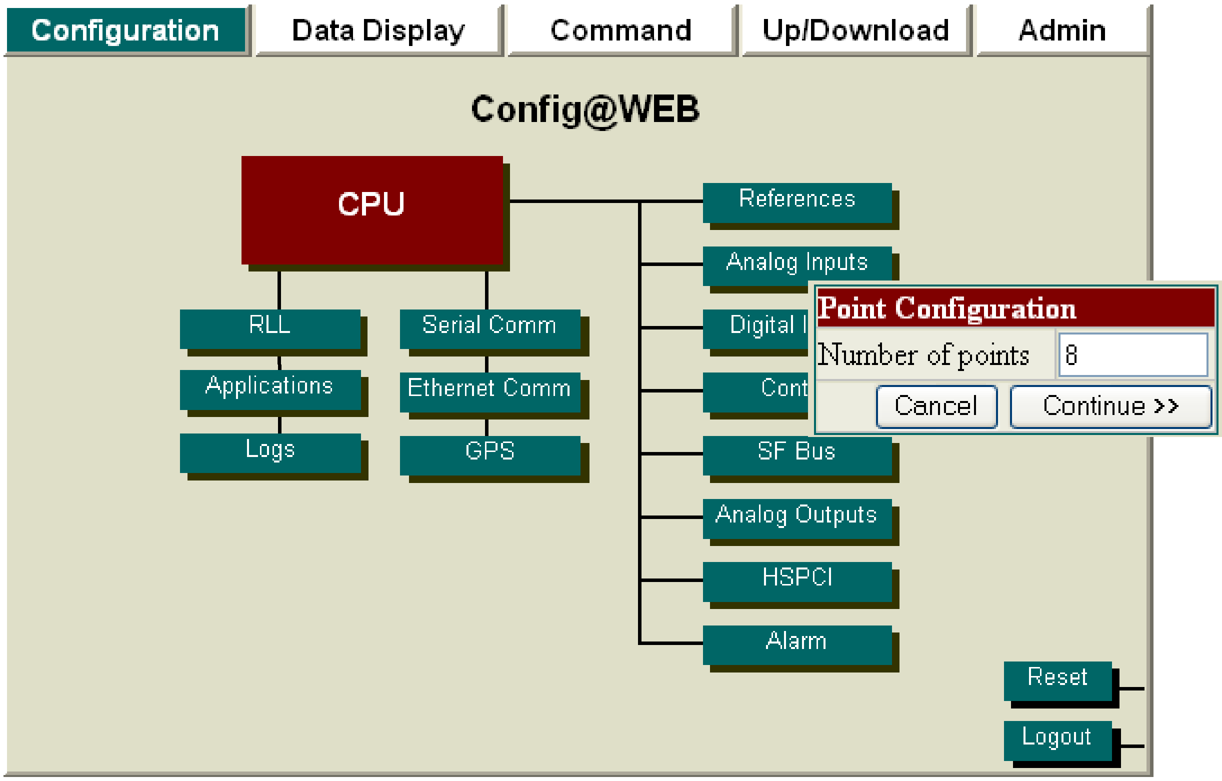
Table 2-3 C3830 Reference Points

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 2-23. Click Continue to configure the points, or Cancel to back out of the function without saving.

Figure 2-23 Analog Inputs Configuration

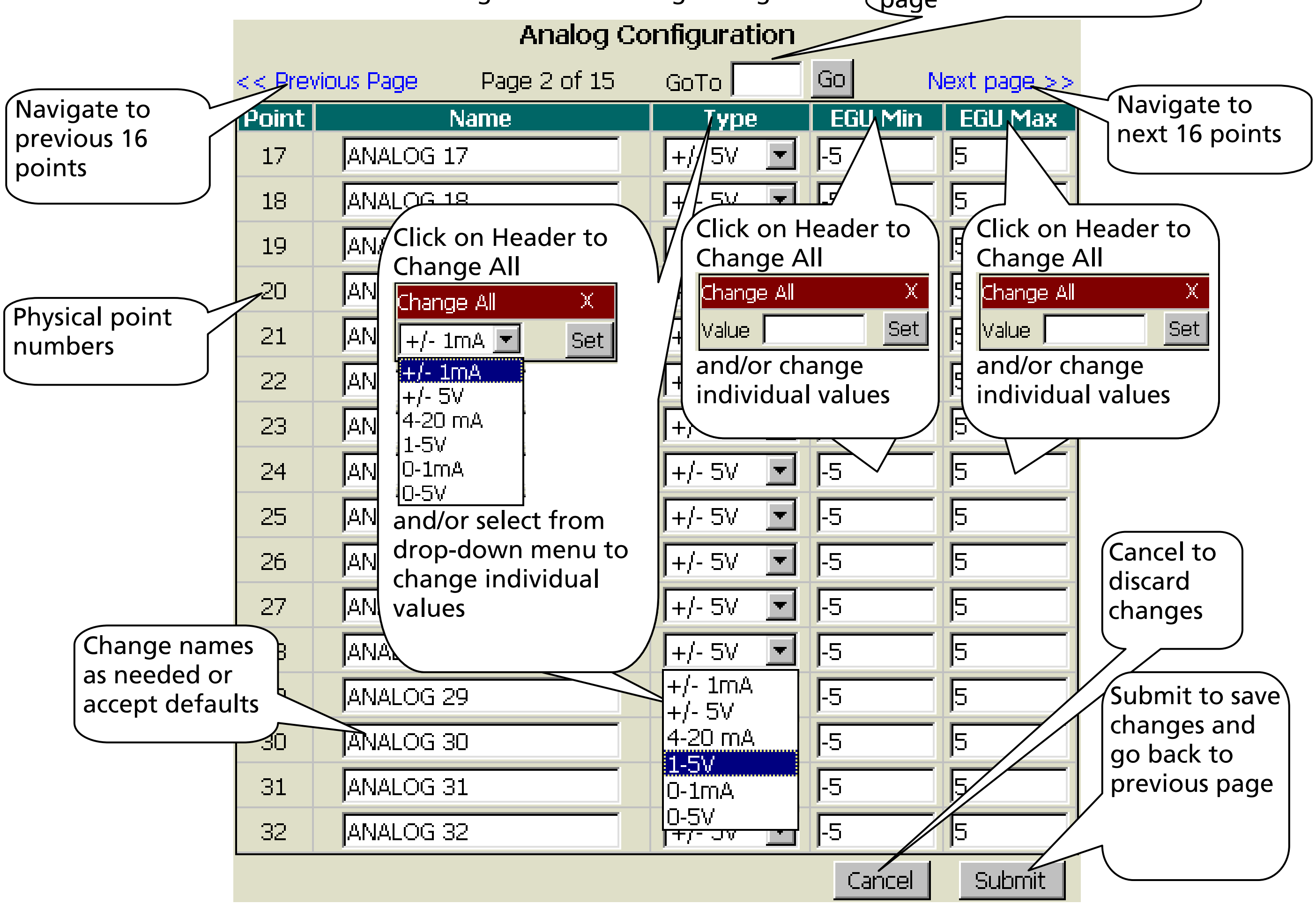


The Analog Configuration screen (Figure 2-24) allows you to name each analog point, select the type of input from a drop-down menu, and set the engineering scaling.

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 2-24 Analog Configuration

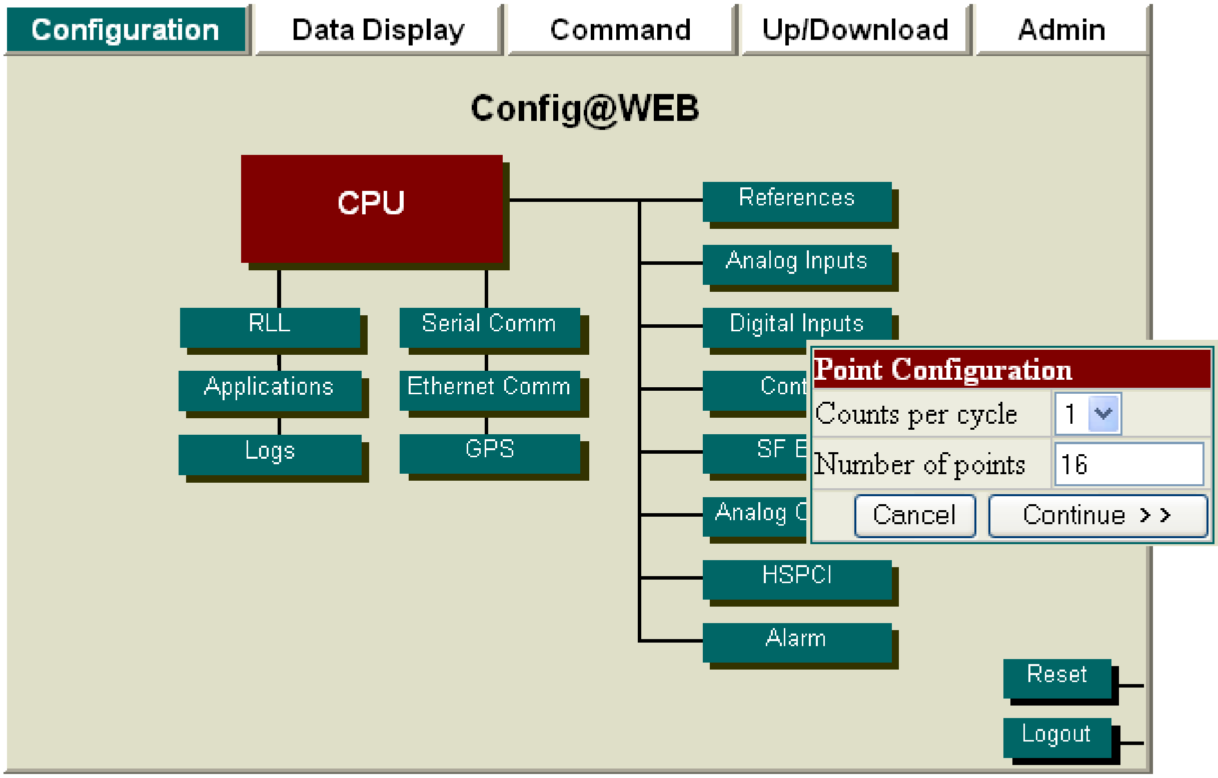


Please note: No configuration changes take effect until the RTU is reset.

2.10 Digital Inputs Configuration

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

Figure 2-25 Configure Digital Inputs



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:

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.

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.

Number of points

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

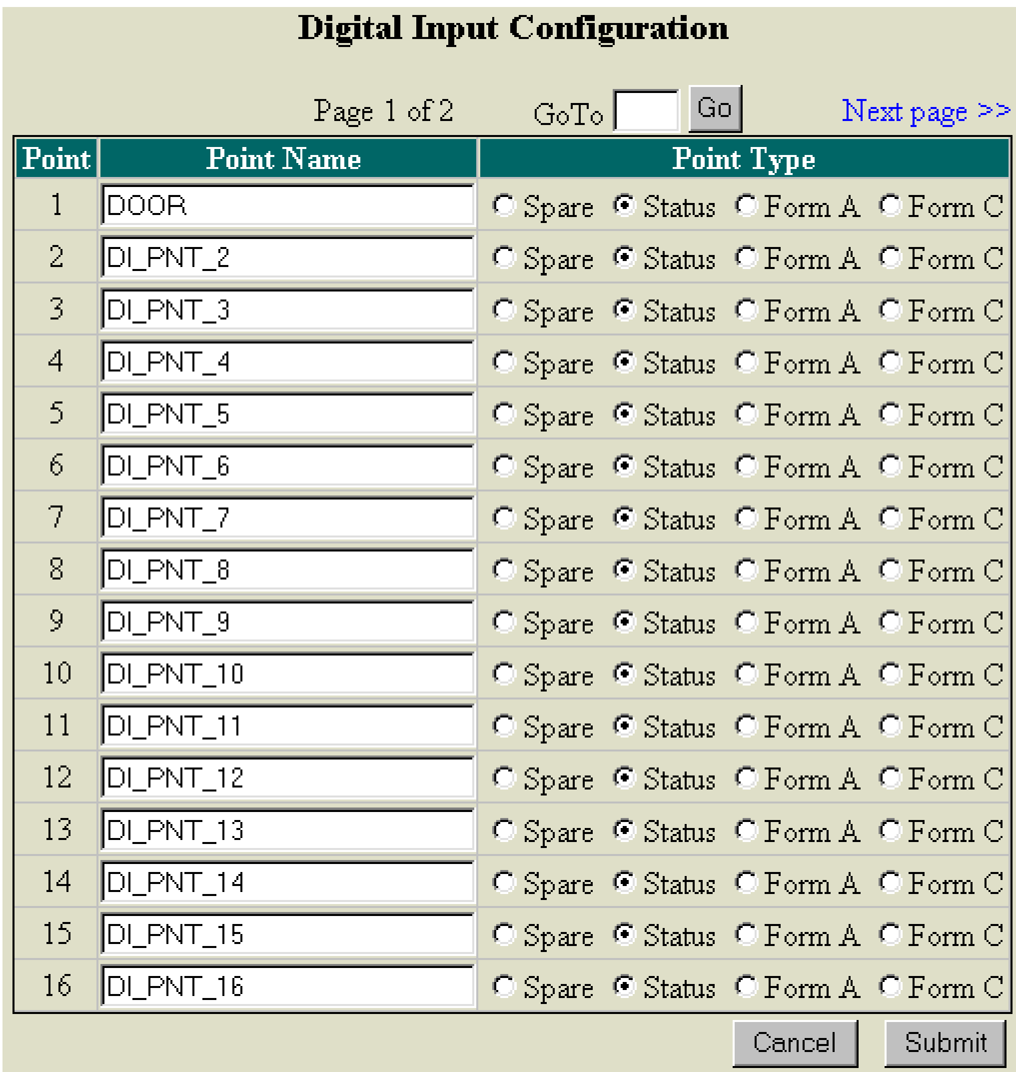
Click Continue to configure the points, or Cancel to back out of the function without saving.

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 2-26 Digital Input 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 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

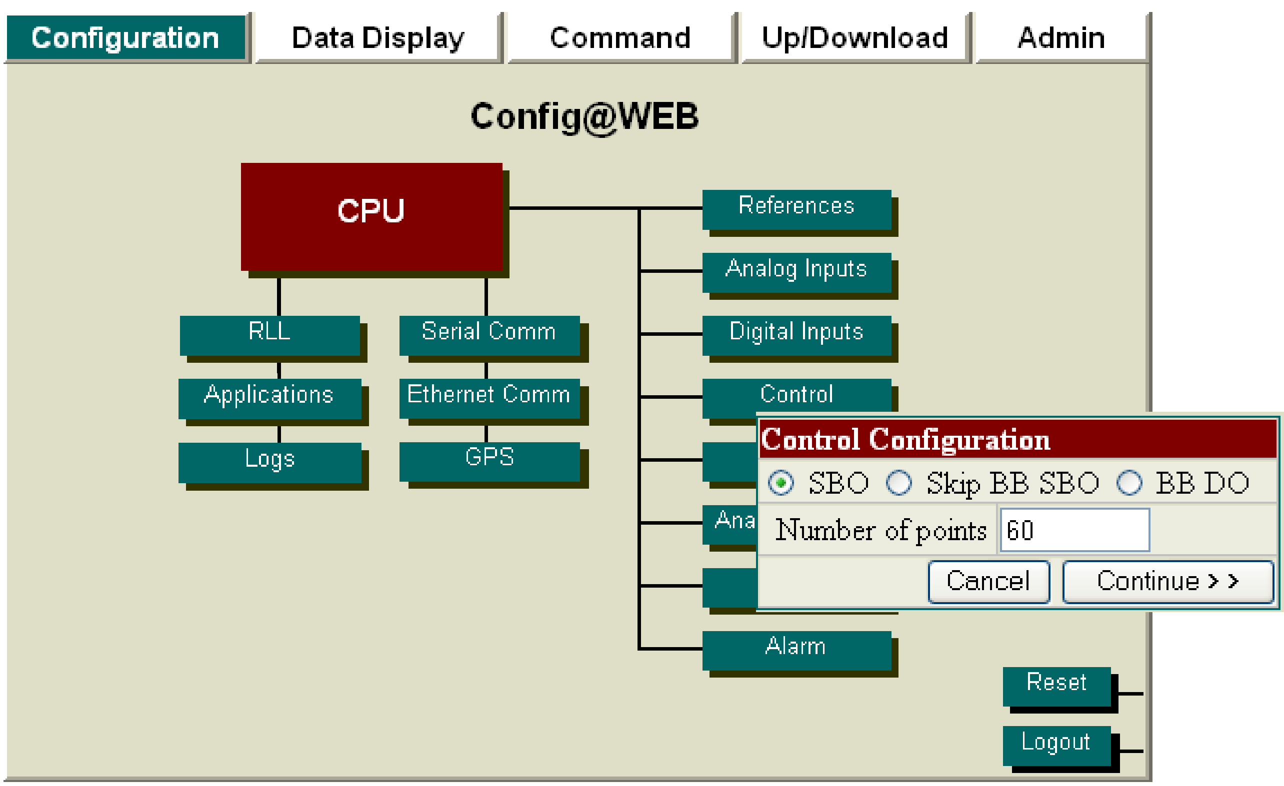
Click on Control button, then type in the number of control points. Select either SBO, Skip BB SBO, or BB DO (BB means baseboard). Skipping baseboard SBOs would be a good option if the baseboard SBOs were not suitable for the application. Baseboard SBOs *must* be skipped to use the full compliment of 128 SBO XTs. Only 124 SBOs may be configured if the baseboard SBOs are not skipped.

Note: If you intend to use SFB DOs without using BB DOs, or BB SBOs, be sure to check "Skip BB SBO".

Note: The SBO options do not apply to the SAGE 1X50 or the SAGE 3030X. You can only enter the number of control points ,then Cancel or Continue

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

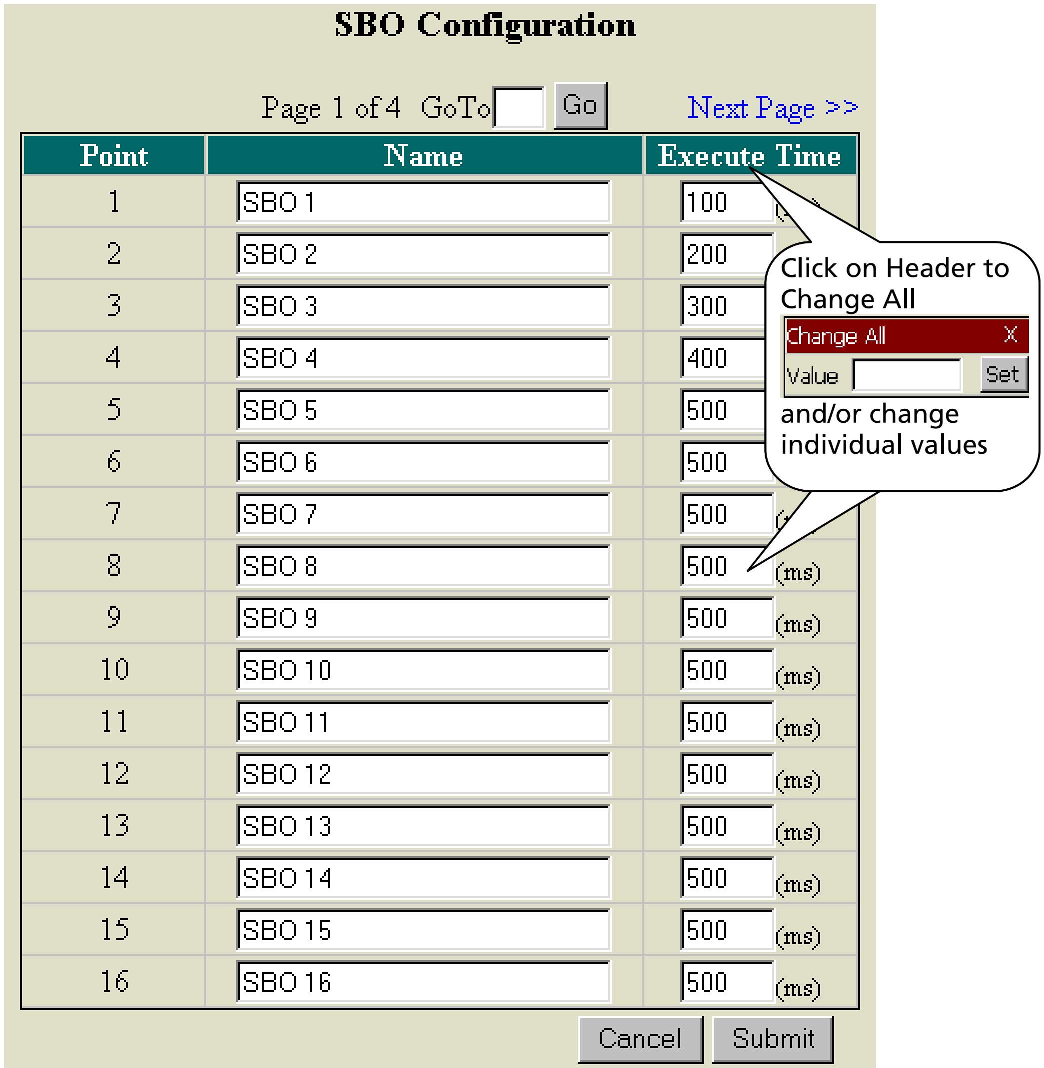
Figure 2-27 Control Configuration



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 2-28 SBO Configuration



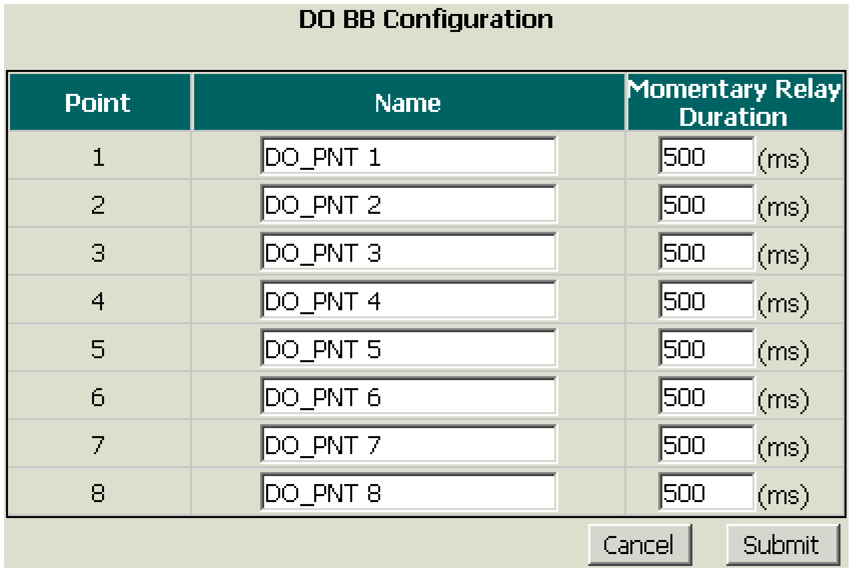
Navigation

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 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 2-29 will come up when the continue button is depressed.

Figure 2-29 DO BB Configuration



Navigation

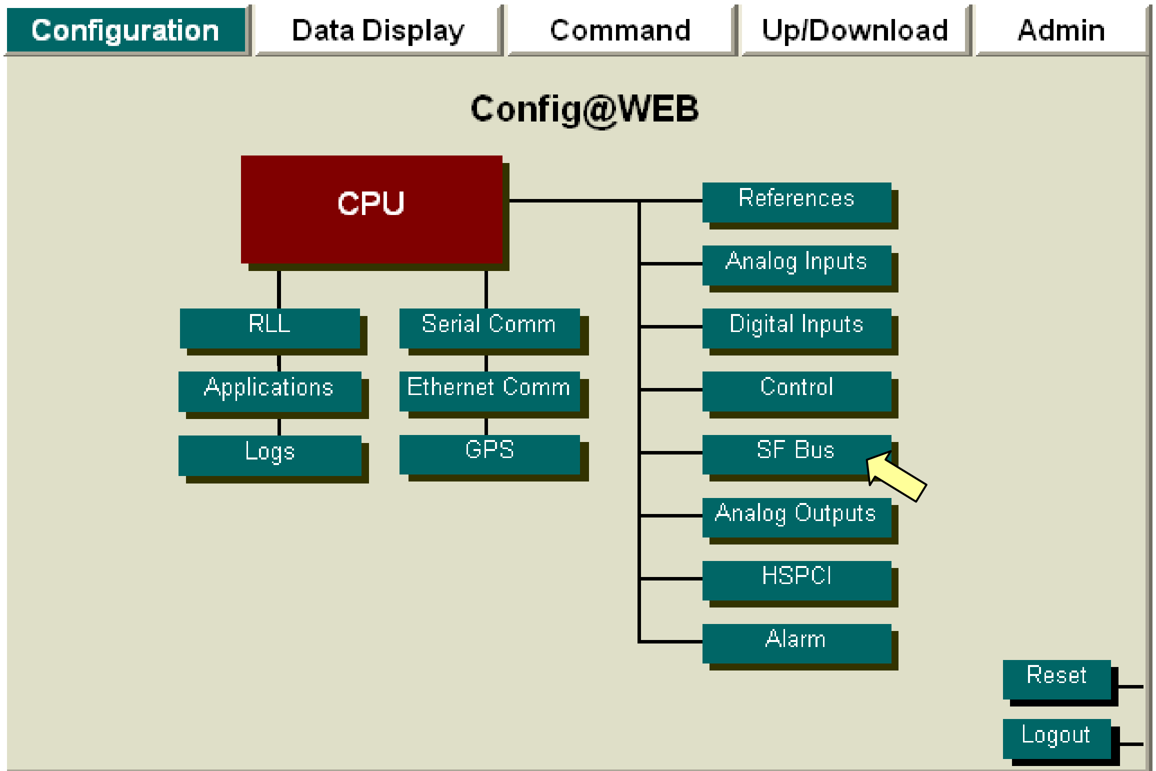
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

2.12 SF Bus Configuration (SAGE 2X00 Only)

Click on SF Bus button to configure the Special Function Bus (SFB), as shown in Figure 2-30. 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 2-30 Configuring Special Function Bus



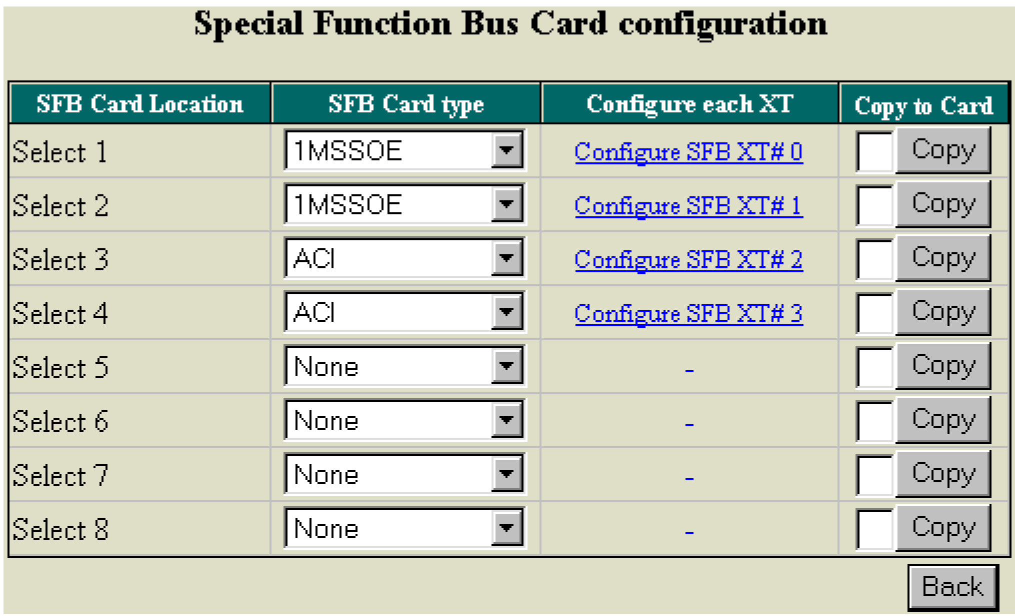
Select from the drop-down menu the SFB Card Types cabled to the SFB. Start at the RTU and follow the ribbon cable to the last XT on the cable chain. See Figure 2-31.

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 2-31.

Figure 2-31 Example SFB Configuration



Navigation

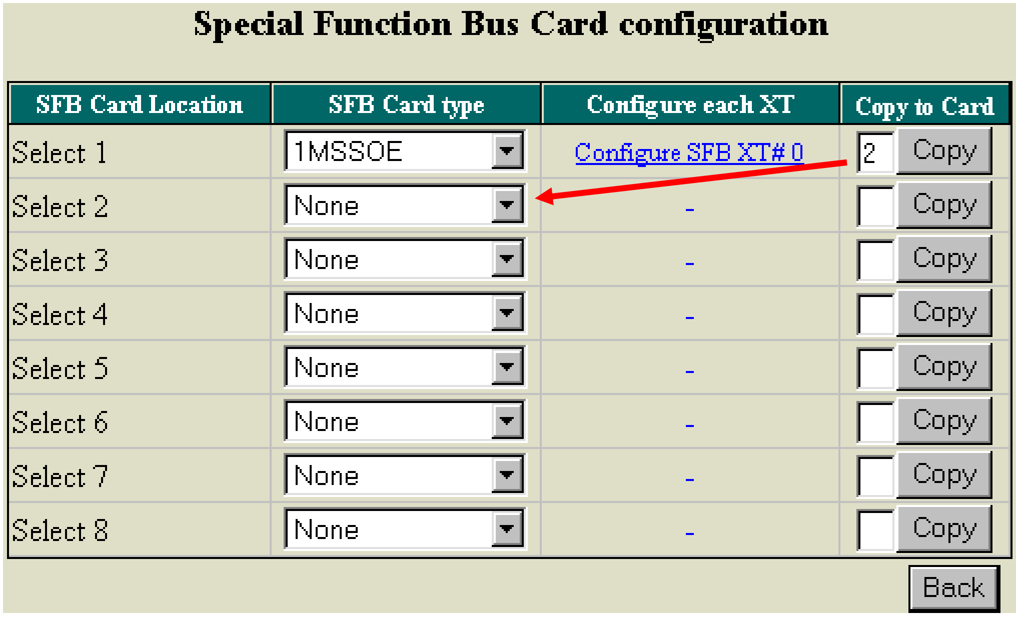
Click the Back button to go back to the Configuration screen.

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 2-32.

Figure 2-32 Copying an SFB Configuration



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)

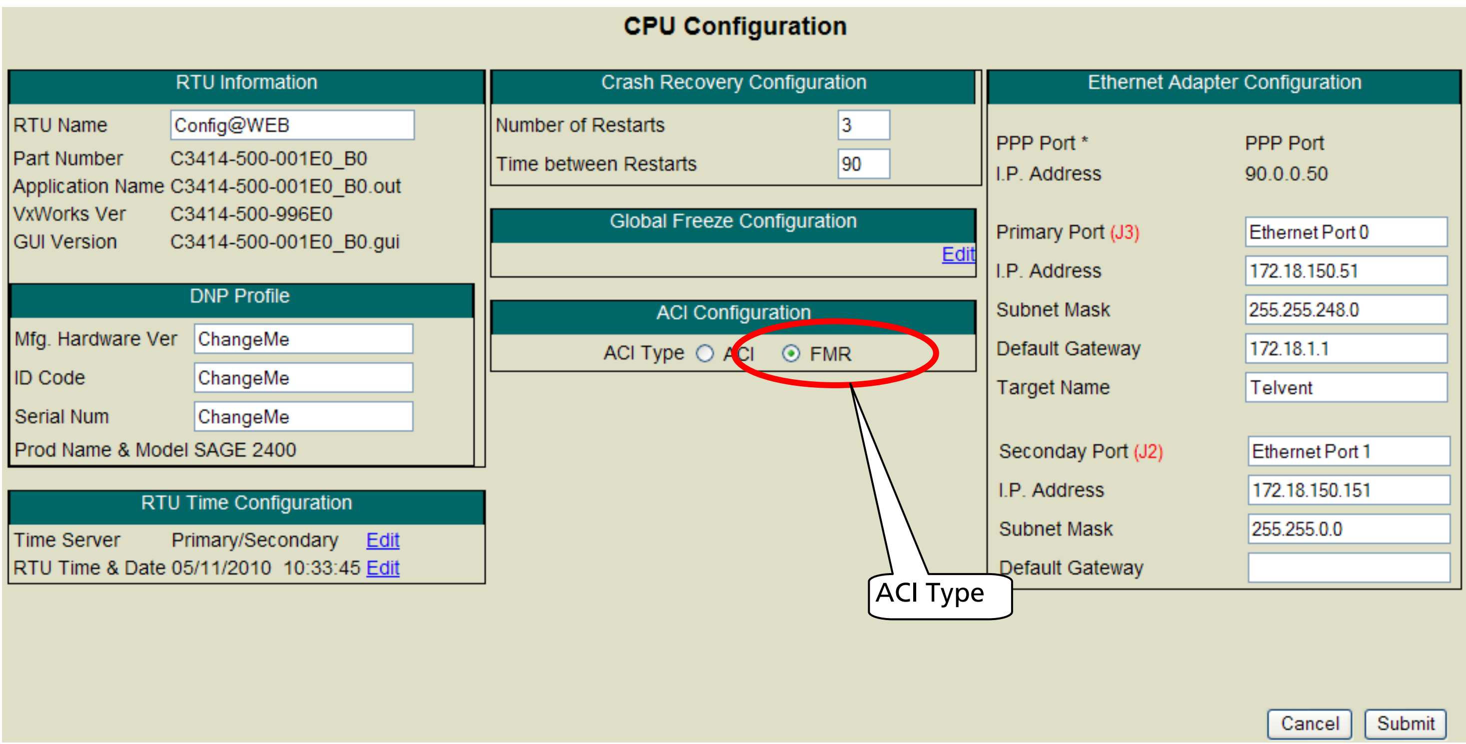
Warning: The applications Energy Calculation, Timing, and the ACI function all use the same BB ram memory space; therefore only one of these applications may be run at any given time.

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 2-33 Choosing Between FMR or ACI



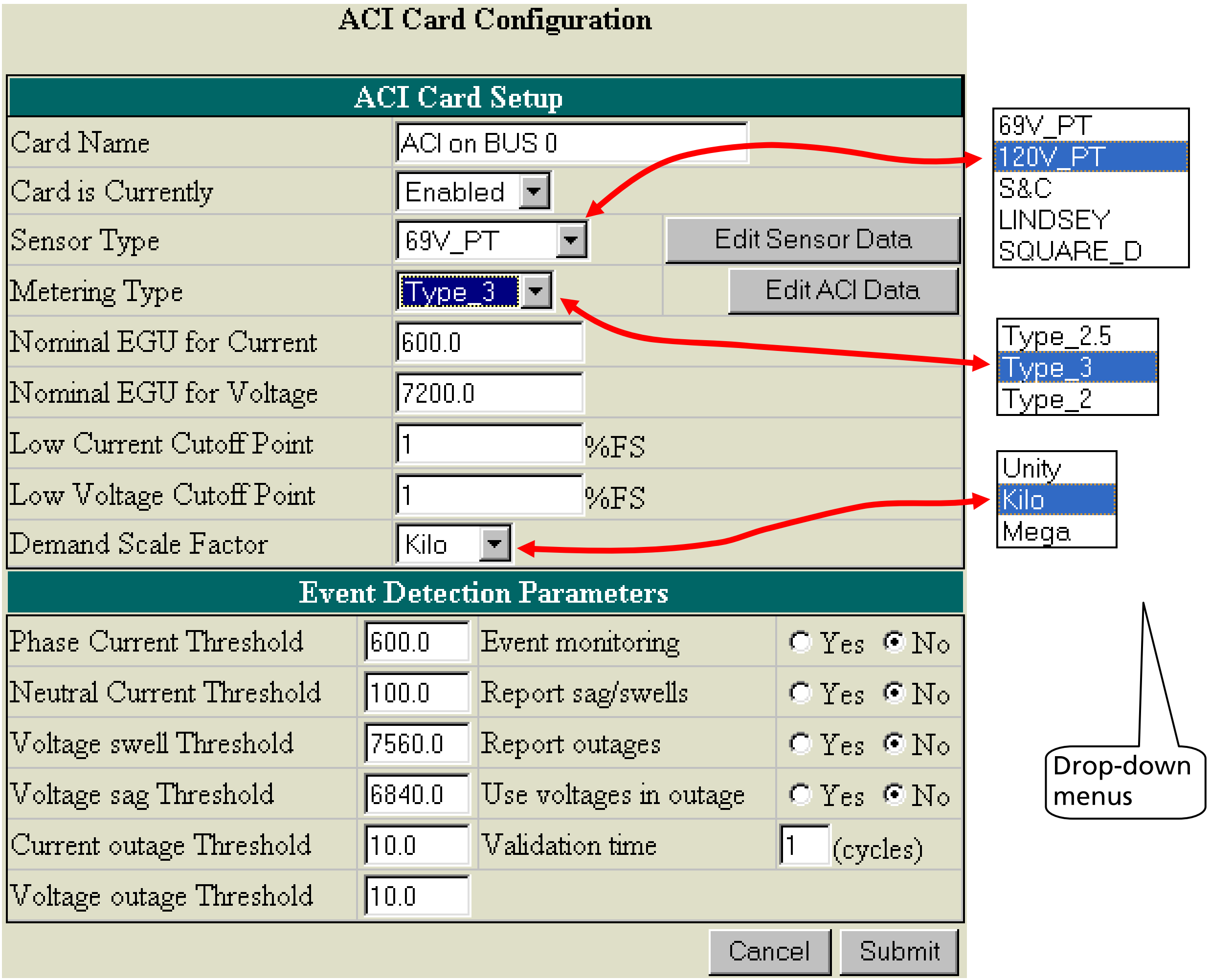
Navigation

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 2-34 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

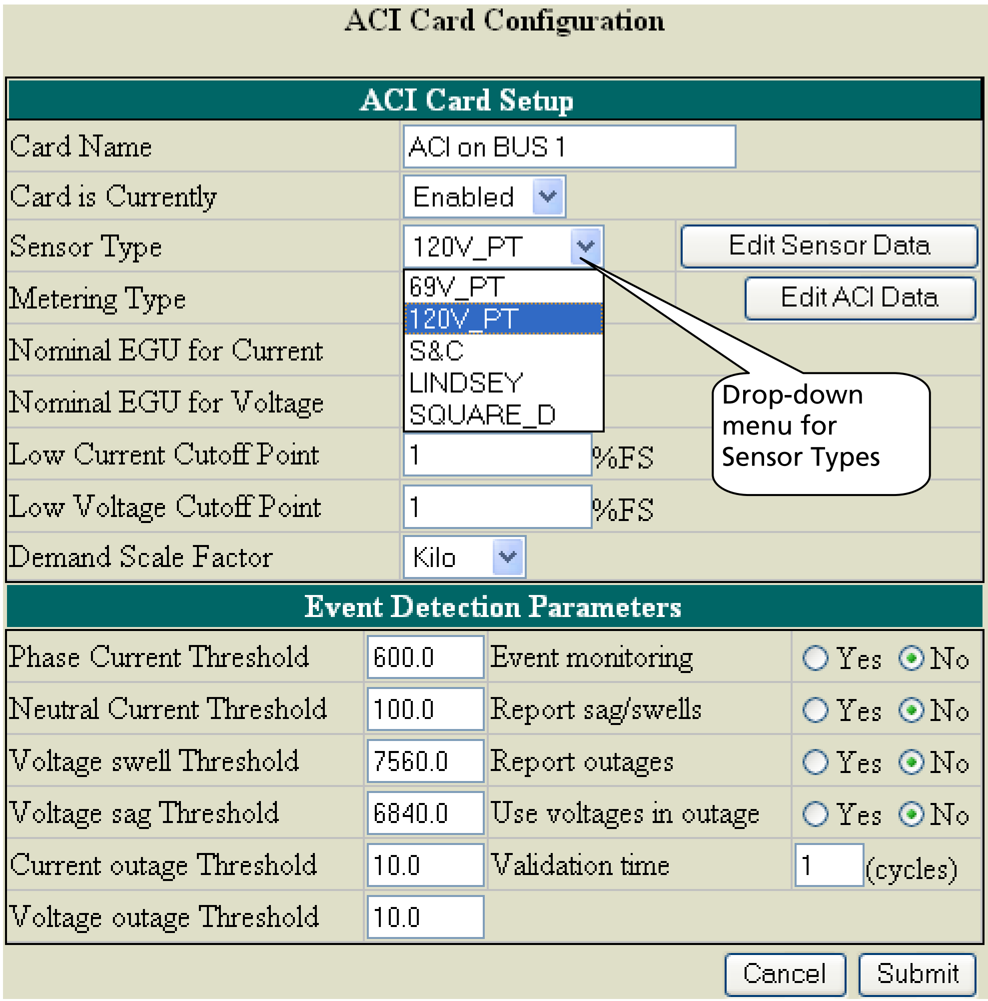
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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 2-35. 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 2-35 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 2-36). Use the scroll bar as necessary to access all functions on this screen.

Figure 2-36 FMR Type ACI Data Configuration

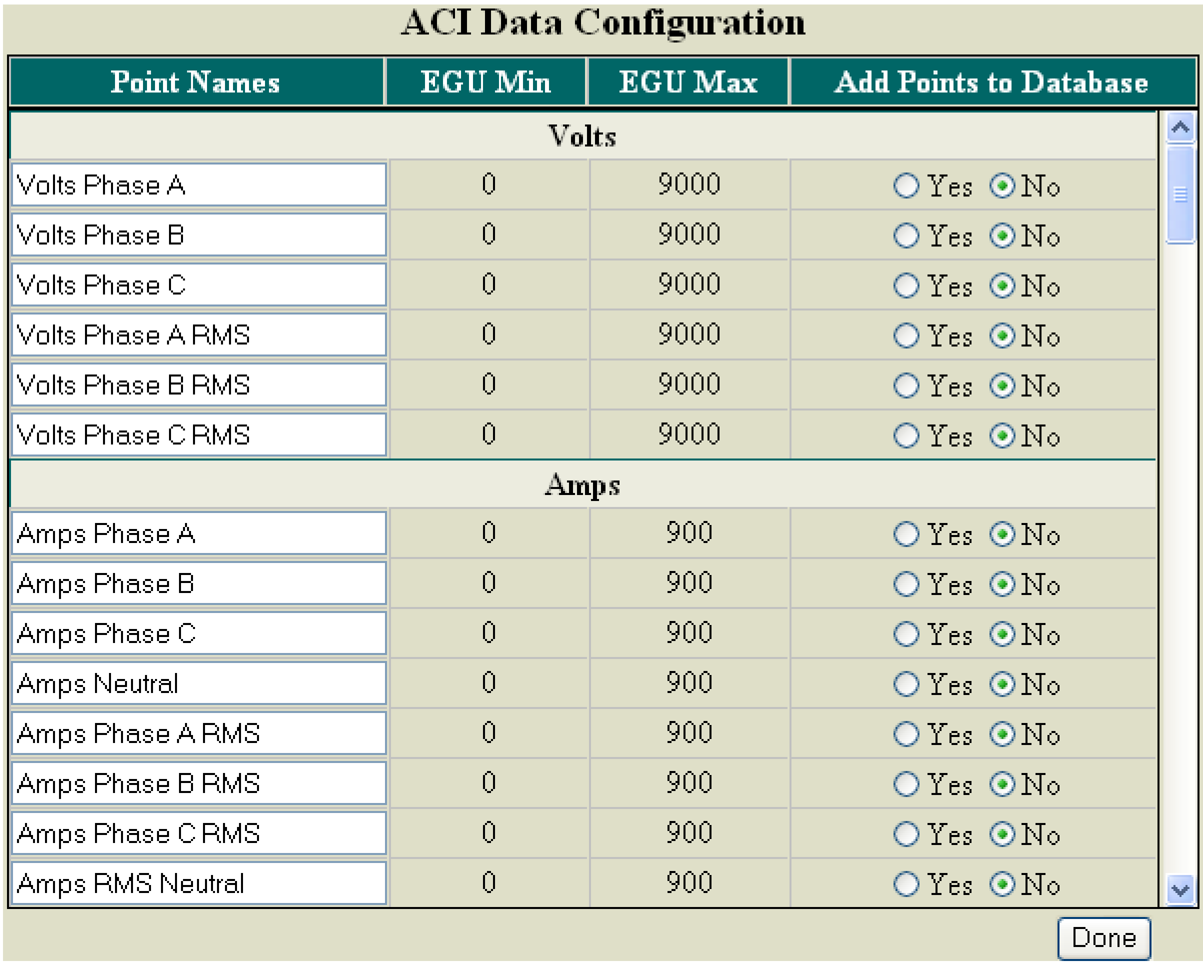


Table 2-8 explains the way EGU Min and EGU Max are determined for ACI Data Configuration screen.

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

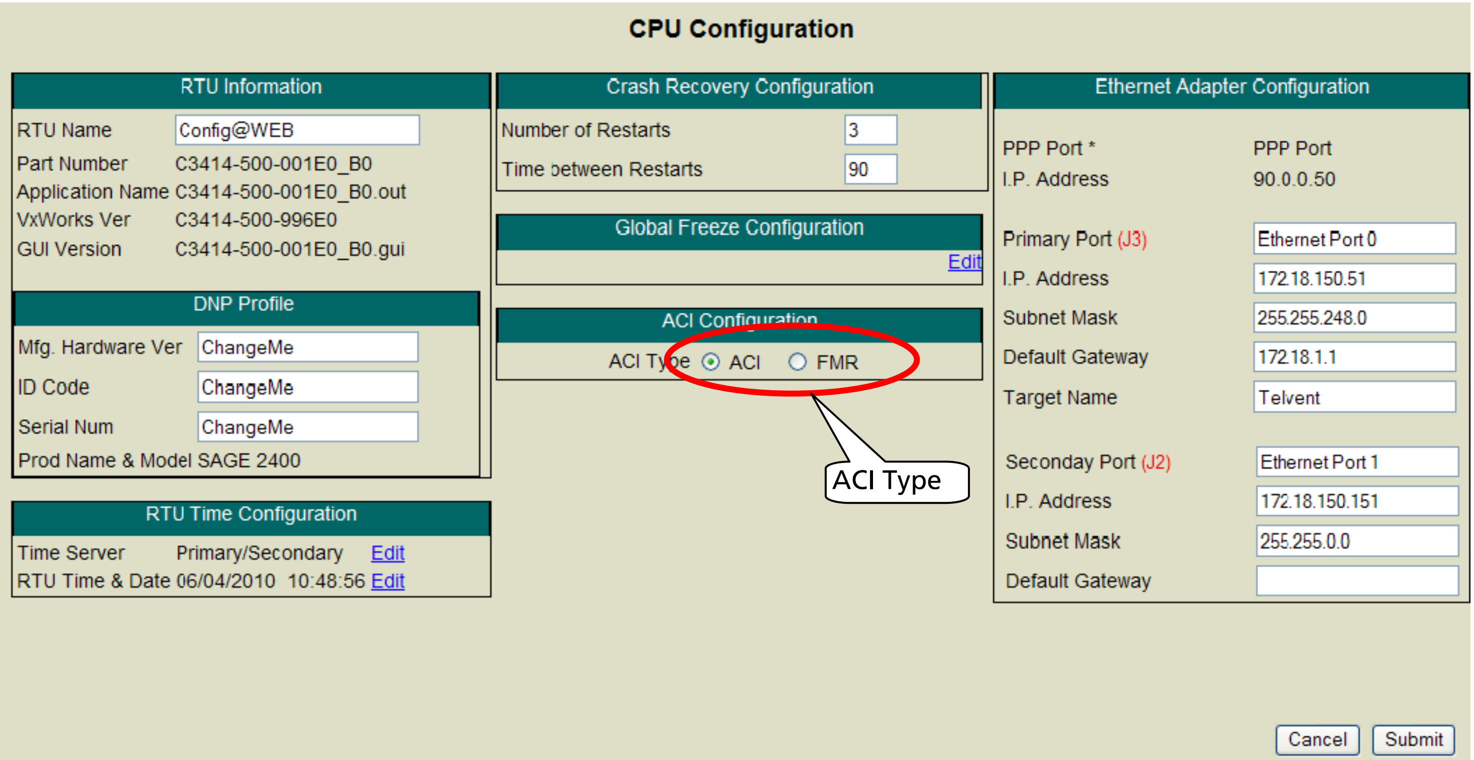
Click the Done button to accept the changes.

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 2-37 Choosing ACI



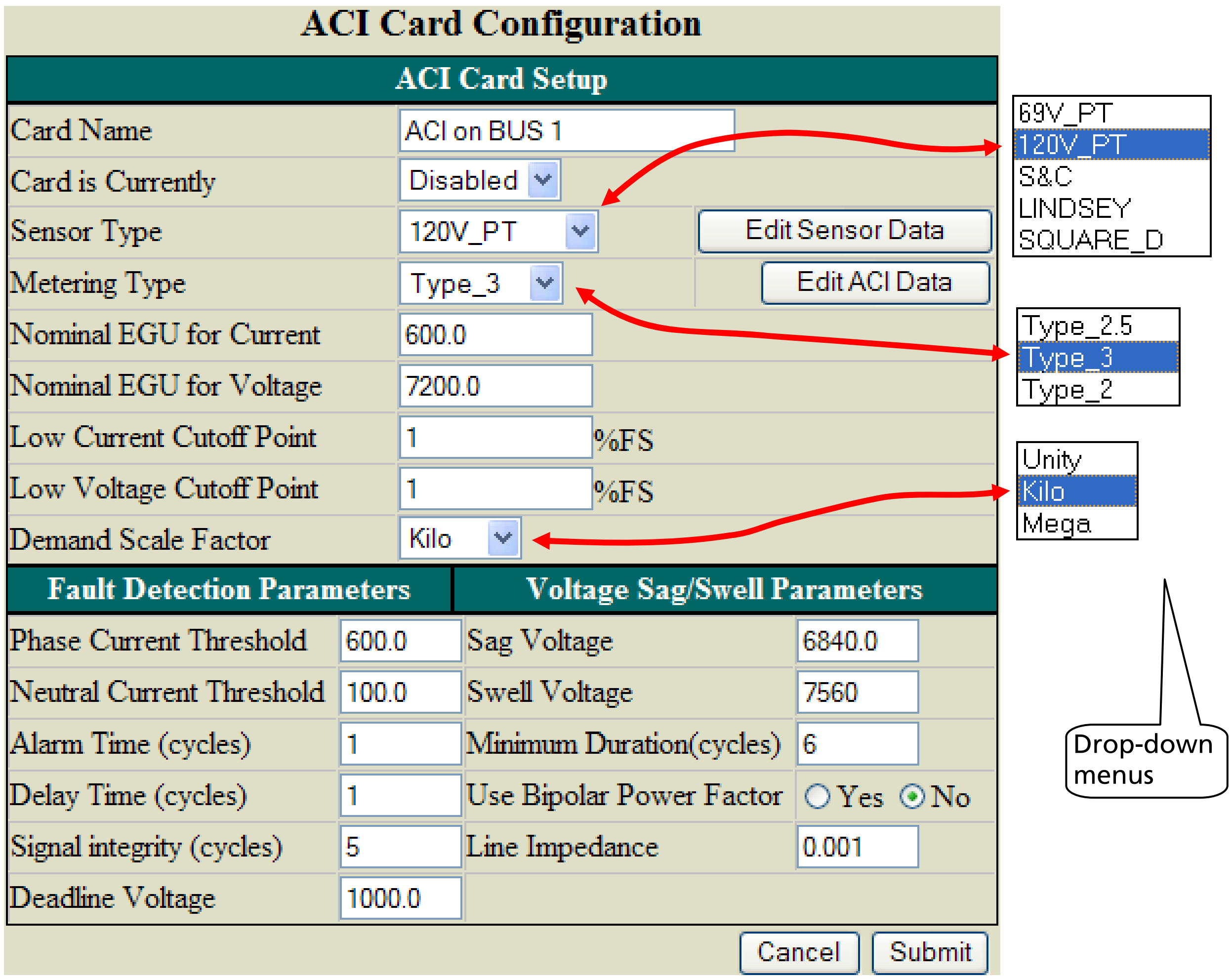
Navigation

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 2-38 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

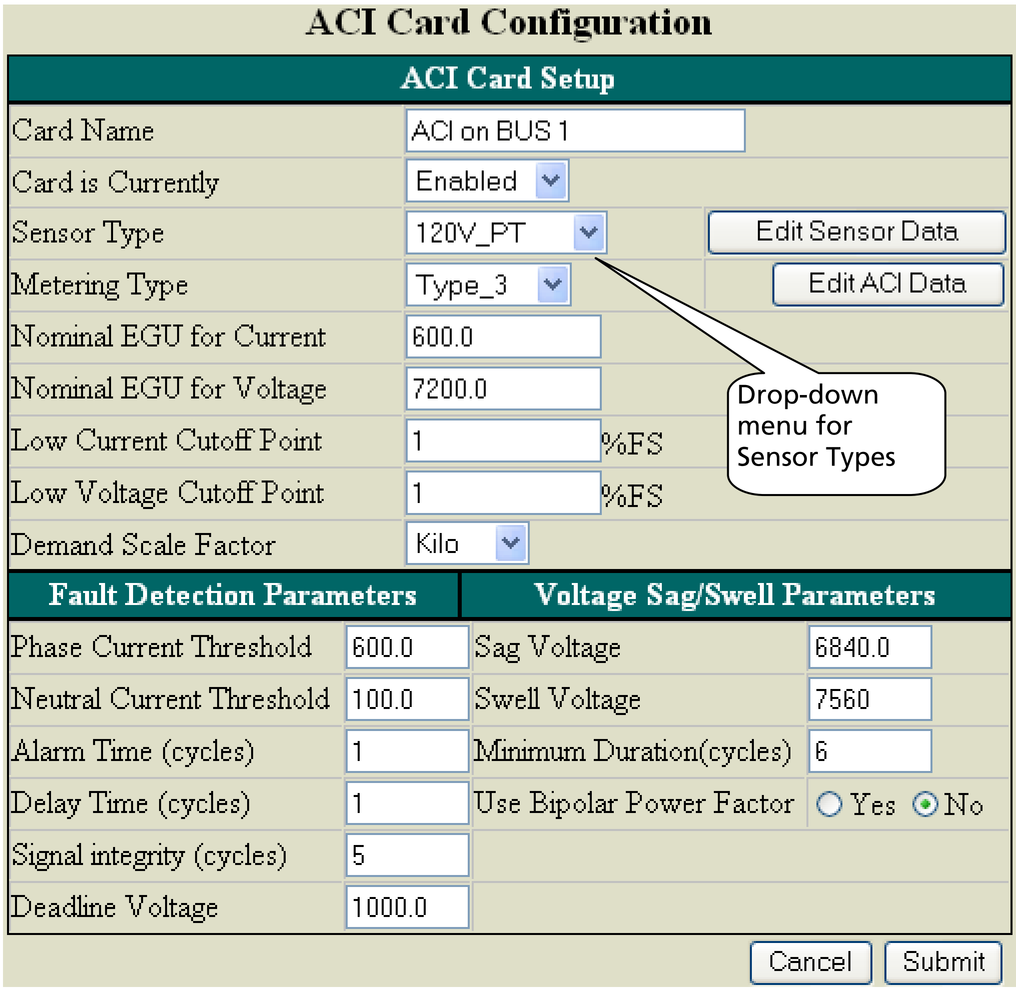
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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 2-39 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.

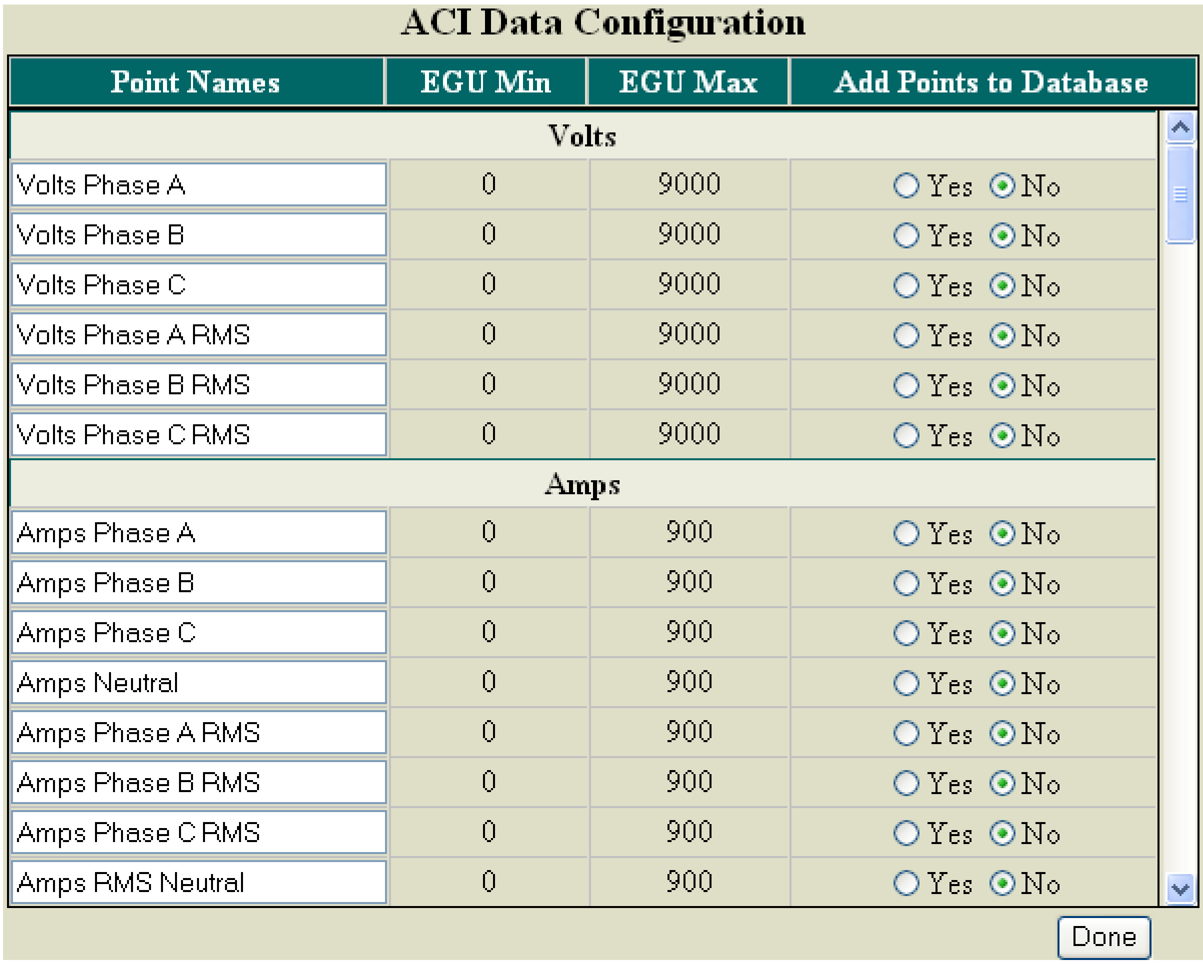
Line Impedance

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 2-40 ACI Type ACI Data Configuration



ACI Data Configuration

Point Names	EGU Min	EGU Max	Add Points to Database
Volts			
Volts Phase A	0	9000	Yes No
Volts Phase B	0	9000	Yes No
Volts Phase C	0	9000	Yes No
Volts Phase A RMS	0	9000	Yes No
Volts Phase B RMS	0	9000	Yes No
Volts Phase C RMS	0	9000	Yes No
Amps			
Amps Phase A	0	900	Yes No
Amps Phase B	0	900	Yes No
Amps Phase C	0	900	Yes No
Amps Neutral	0	900	Yes No
Amps Phase A RMS	0	900	Yes No
Amps Phase B RMS	0	900	Yes No
Amps Phase C RMS	0	900	Yes No
Amps RMS Neutral	0	900	Yes No

Done

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)
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.

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 2-41 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 2-42 Edit AC Analog Setup for 120 Volt PT

120V_PT Sensor Configuration

RTU Phase A		RTU Phase B		RTU Phase C	
Current		Current		Current	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
1.00064	0.0	1.00064	0.0	1.00064	0.0
Volts		Volts		Volts	
Magnitude	Phase Angle	Magnitude	Phase Angle	Magnitude	Phase Angle
0.980854	0.0	0.980854	0.0	0.980854	0.0

Done

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

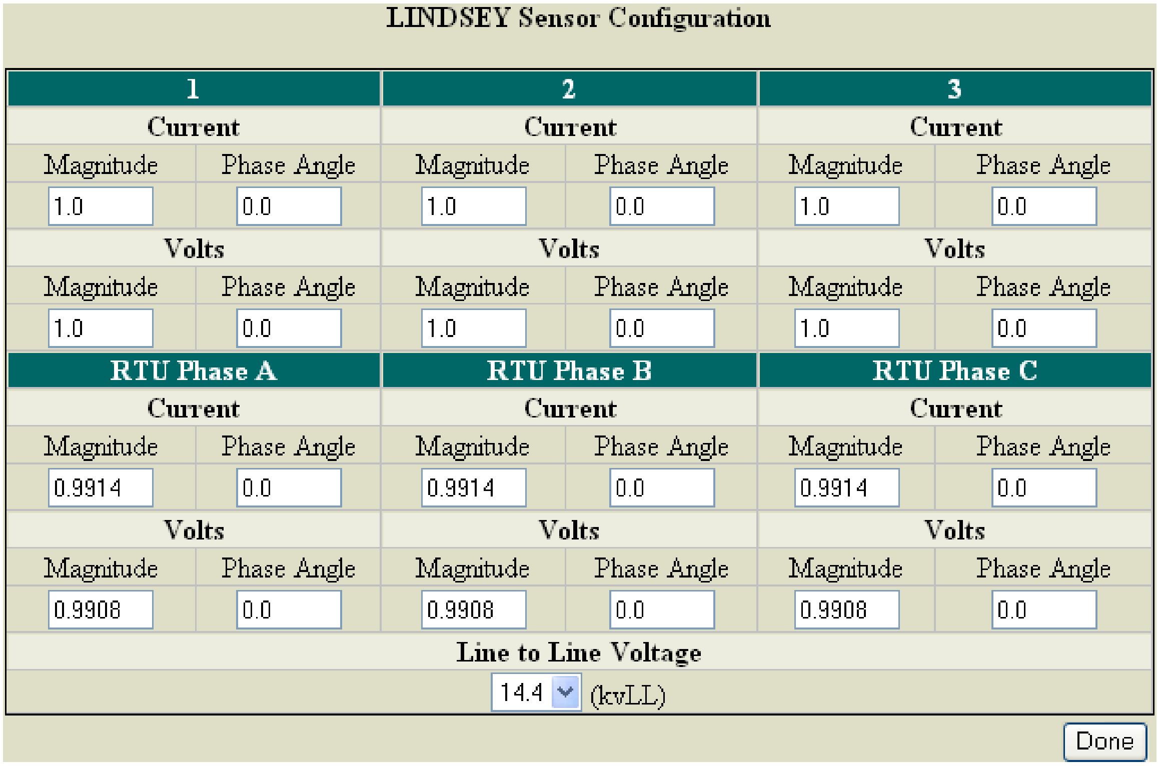
The values entered in these fields are correction values applied to the voltage phase angle measured by the secondary PT on the indicated phase. These values are stored in the software as defaults and will not need to be modified.

Navigation

Click the Done button to accept the changes.

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

Figure 2-43 LINDSEY Sensor Configuration



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

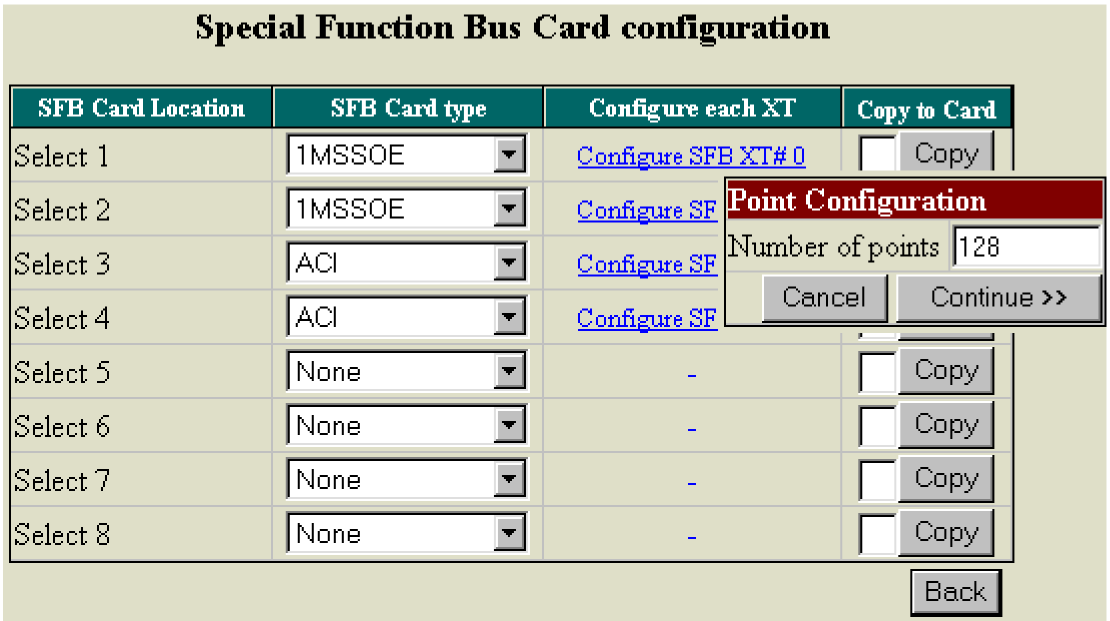
Click the Done button to accept the changes.

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)

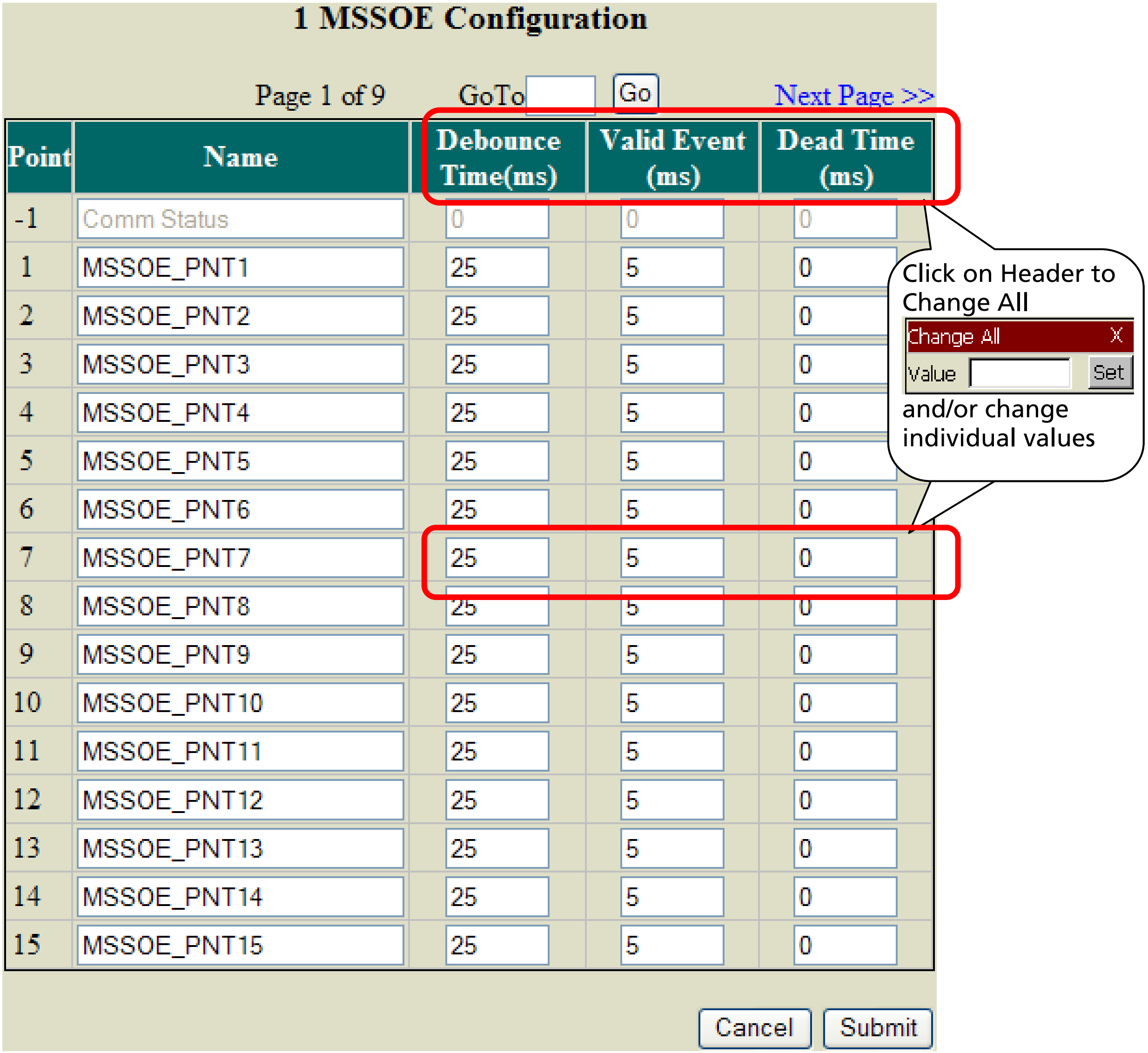
Click on "Configure SFB XT# 1" (in this example, 1MSSOE). Enter the number of points that are attached to this 1MSSOE card. Click Continue to accept your entry, or Cancel to back out without saving.

Figure 2-44 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 2-45 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.

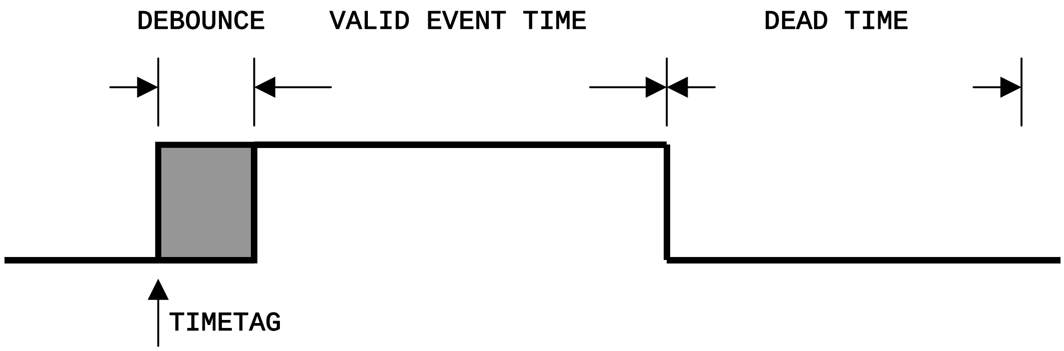
Valid event times (ms) 1-255

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 2-46 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. 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 2-47 SFB Digital Output Configuration

SFB Digital Output 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)
9	DO_PNT 9	500 (ms)
10	DO_PNT 10	500 (ms)
11	DO_PNT 11	500 (ms)
12	DO_PNT 12	500 (ms)
13	DO_PNT 13	500 (ms)
14	DO_PNT 14	500 (ms)
15	DO_PNT 15	500 (ms)
16	DO_PNT 16	500 (ms)

Cancel Submit

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 SFB Analog Outputs Configuration

(SFB AO CONFIGURATION NOT CURRENTLY IMPLEMENTED)

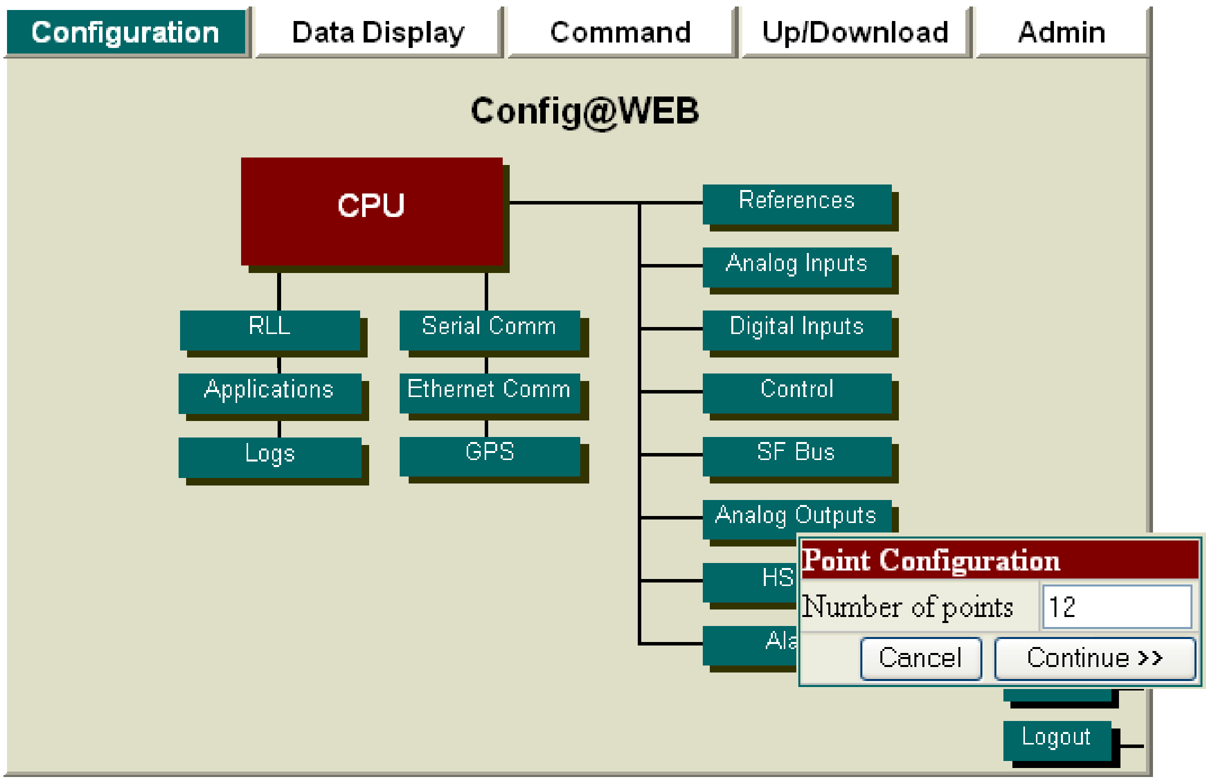
2.12.8 SFB HSPCI Configuration

(SFB HSPCI CONFIGURATION NOT CURRENTLY IMPLEMENTED)

2.13 Analog Outputs Configuration (SAGE 2X00 Only)

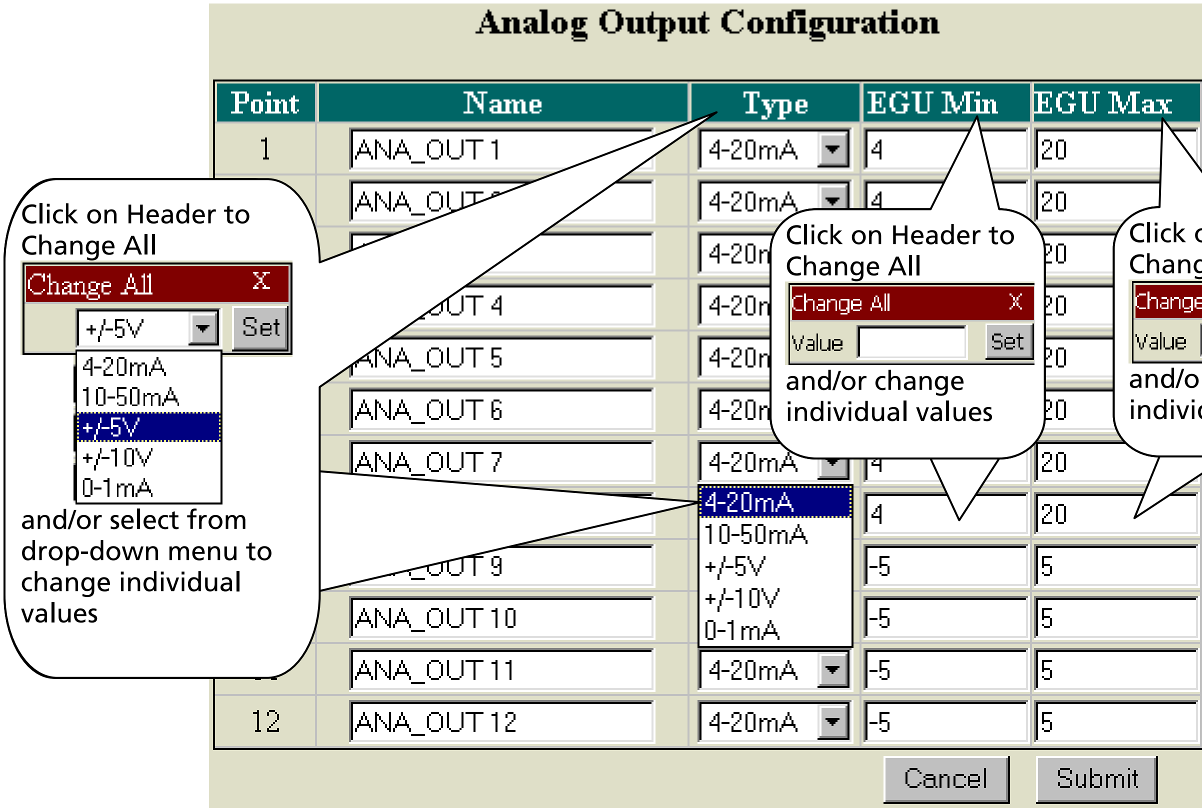
Click Analog Outputs. Type the number of points. Click Continue to configure the points.

Figure 2-48 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 2-49 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

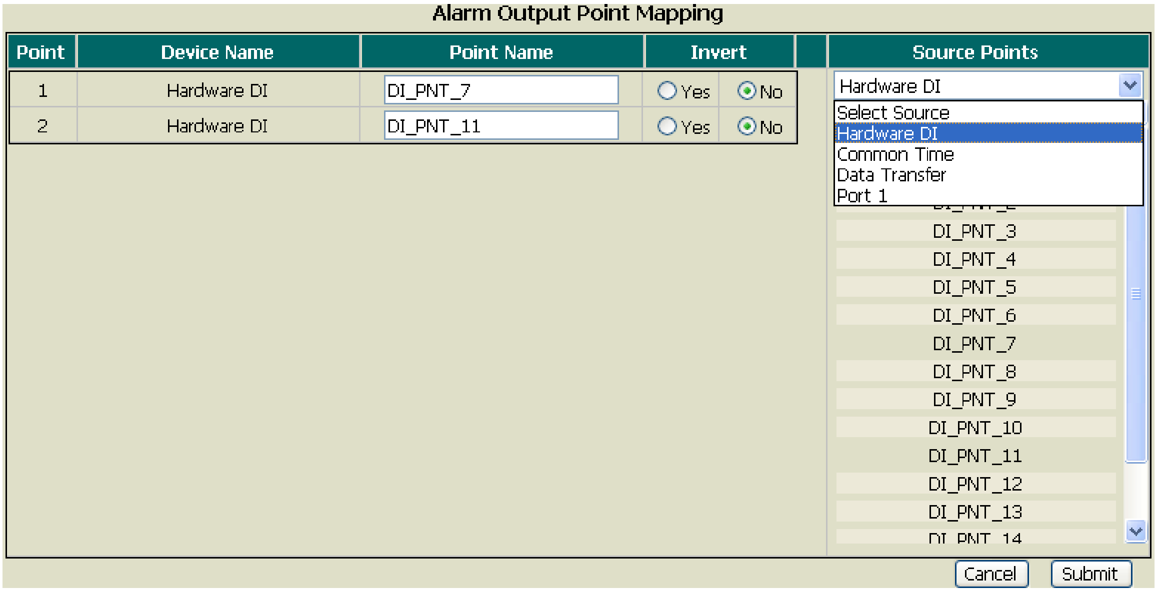
Note: This feature not implemented at this time.

Figure 2-50 Baseboard HSPCI Configuration

2.15 Alarm Configuration

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

Figure 2-51 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

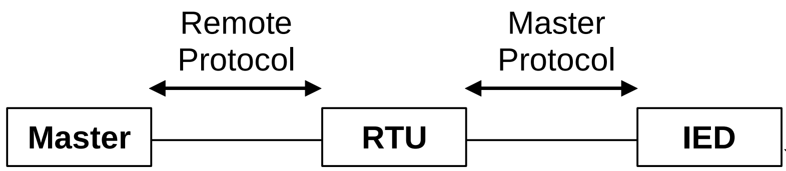
Select the DIs to trigger the alarms from the list of sources.

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 2-52.

Figure 2-52 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
- Configure Master Station interface ports

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:

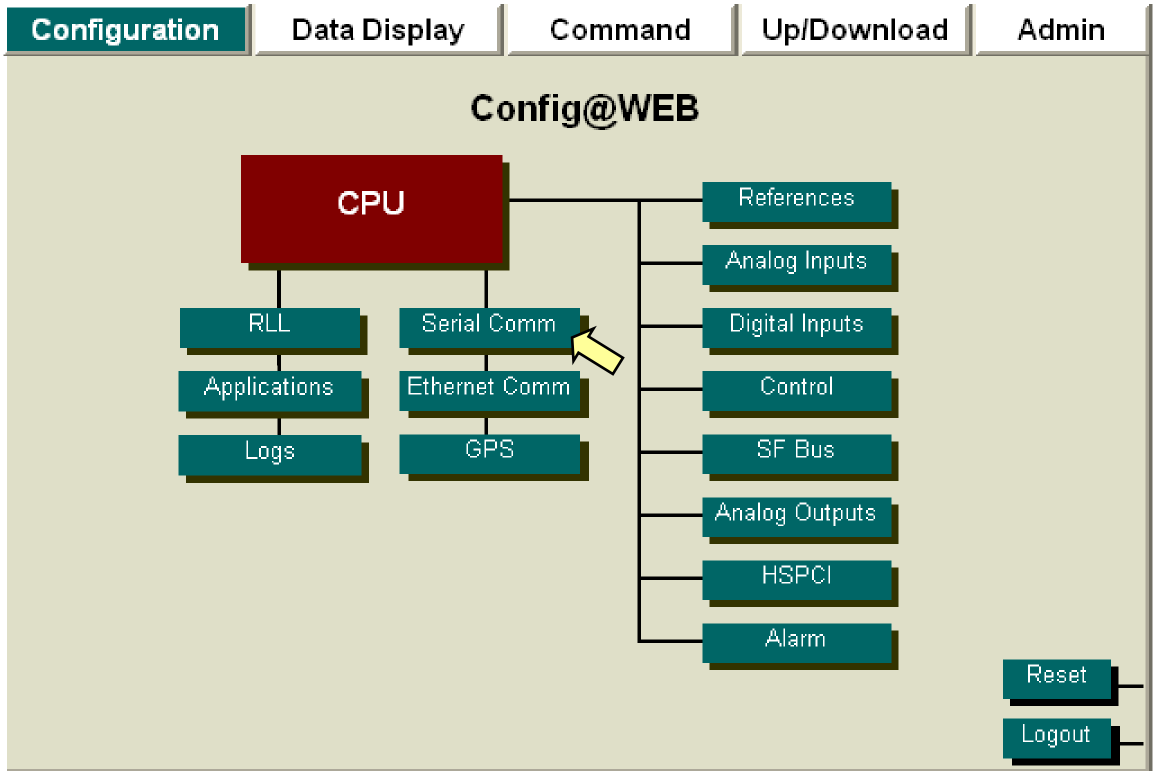
```
Press the SPACE bar to run the GUI only . . .
```

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 2-53.

Figure 2-53 Selecting Serial Comm



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

Figure 2-54 Communication Port Configuration

Communication Port Configuration

Port Number	RTS	DTR	Configure IRQs	Name	Protocol	Configure Protocol	Point Operations	Copy to Port
Port #1	K	K	IRQ6	Series V to Master	Series V	Port 01	Map Points	Copy
Port #2	K (K, H, L)	K		Port 2	None	Port 02	-	Copy
Port #3		K		Port 3	None	Port 03	-	Copy
Port #4	K	K		Port 4	None	Port 04	-	Copy
Port #5	K	K	IRQ6	Port 5	None	Port 05	-	Copy
Port #6	K	K		Port 6	None	Port 06	-	Copy
Port #7	K	K		Port 7	None	Port 07	-	Copy
Port #8	K	K		Port 8	None	Port 08	-	Copy
Port #9	K	K	IRQ6	Port 9	None	Port 09	-	Copy
Port #10	K	K		Port 10	None	Port 10	-	Copy
Port #11	K	K		Port 11	None	Port 11	-	Copy
Port #12	K	K		Port 12	None	Port 12	-	Copy

Back

Port Number

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

RTS and DTR

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 2-55. Typically used as a Radio/Modem key output (Default Setting).

"H" represents Positive RS232 Voltage.

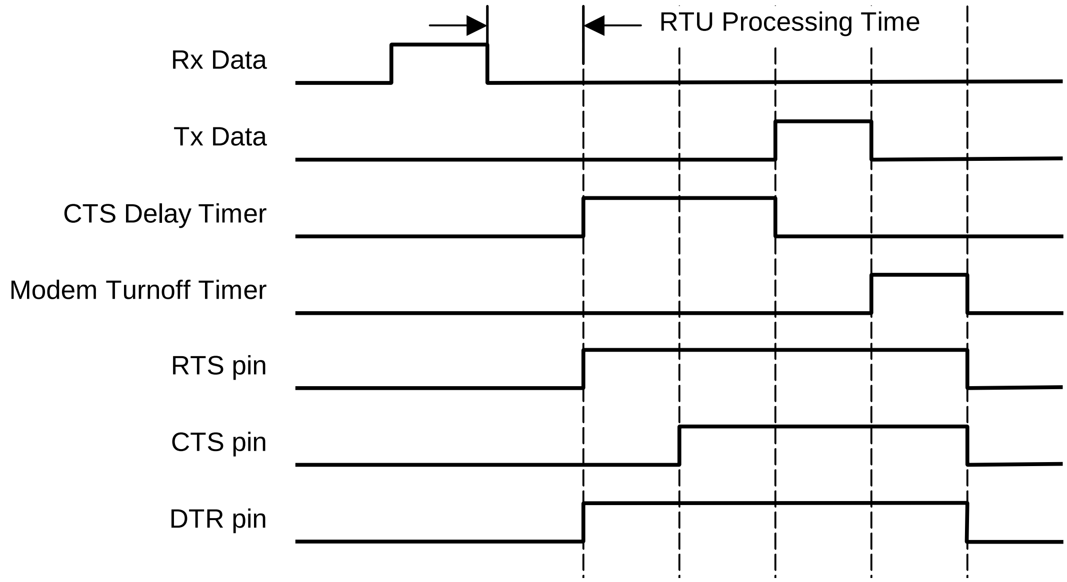
When the RTU firmware is active, the output will be driven to the positive RS232 voltage except when the Z85230 (Communications Controller chip) channel driving the output is being reset. While the reset is occurring, the output will drop to the negative RS232 voltage. When the reset is complete, the 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 powerup and always be the negative RS232 voltage.

Figure 2-55 Communications Timing Diagram



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 Figure 2-56.

Protocol

Select the desired protocol from the drop-down list. See Figure 2-57.

Configure Protocol

See section 2.16.2.1

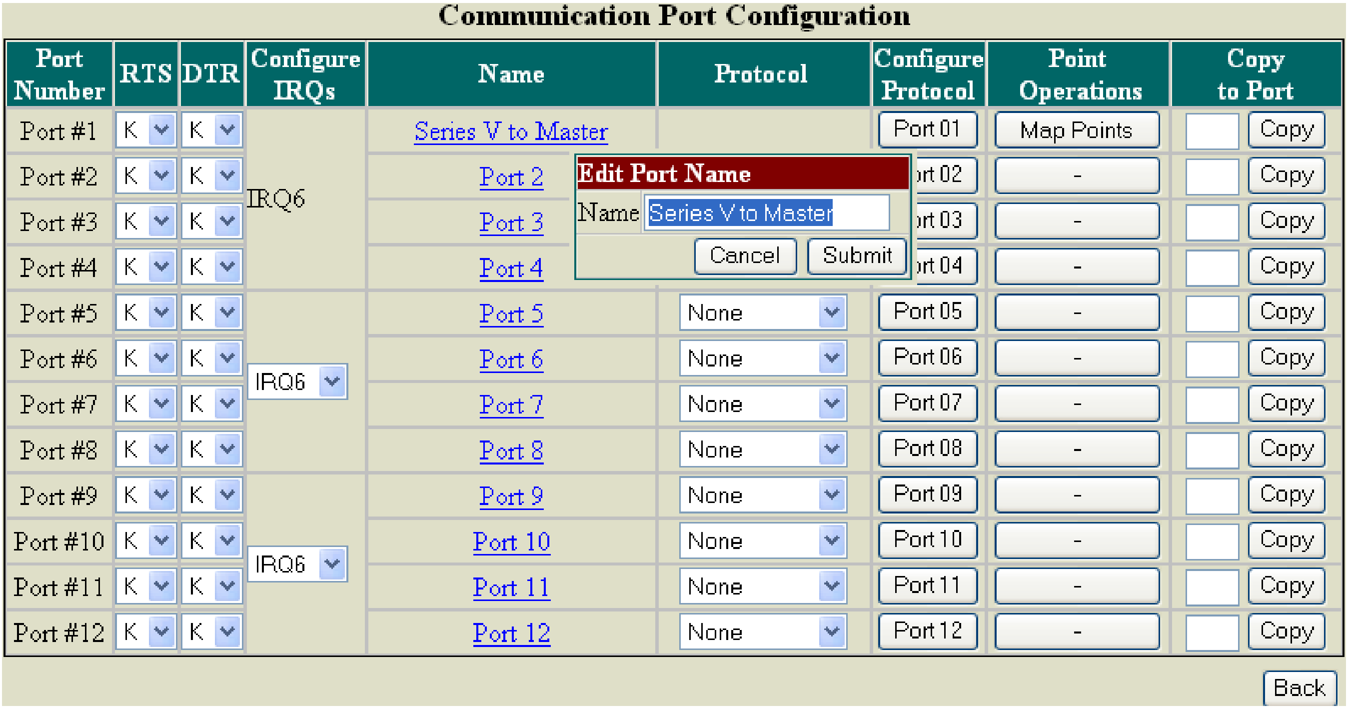
Point Operations

See section 2.16.2.7

Copy to Port

This function copies everything in the port configuration except the port name to the target port. Enter a port number to copy to, then click the Copy button. See Figure 2-59.

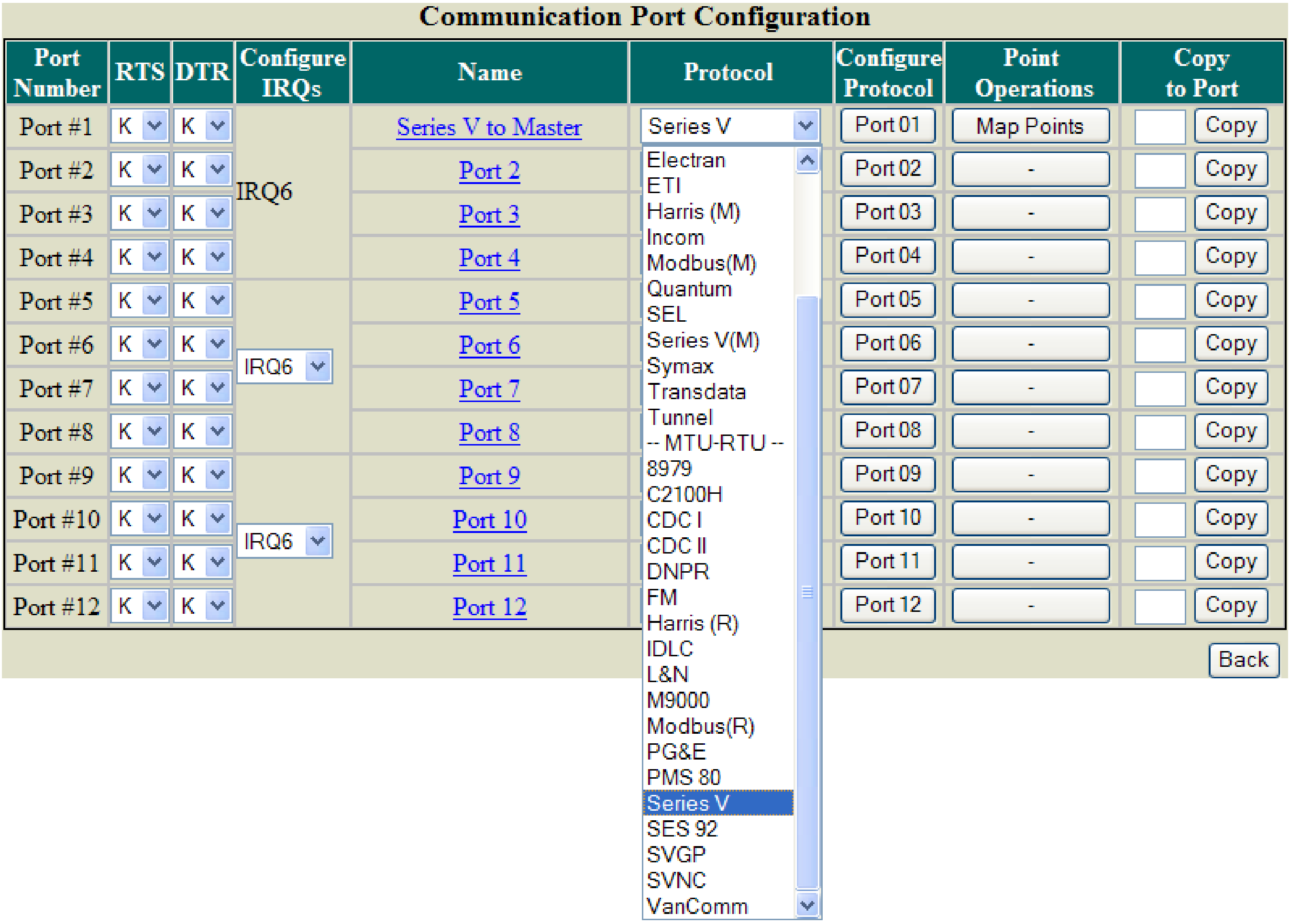
Figure 2-56 Communication Port Configuration: Port Name



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

From the drop-down menu, select a protocol (see Figure 2-57). 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 Figure 2-58).

Figure 2-57 Communication Port Configuration: Assigning Protocol



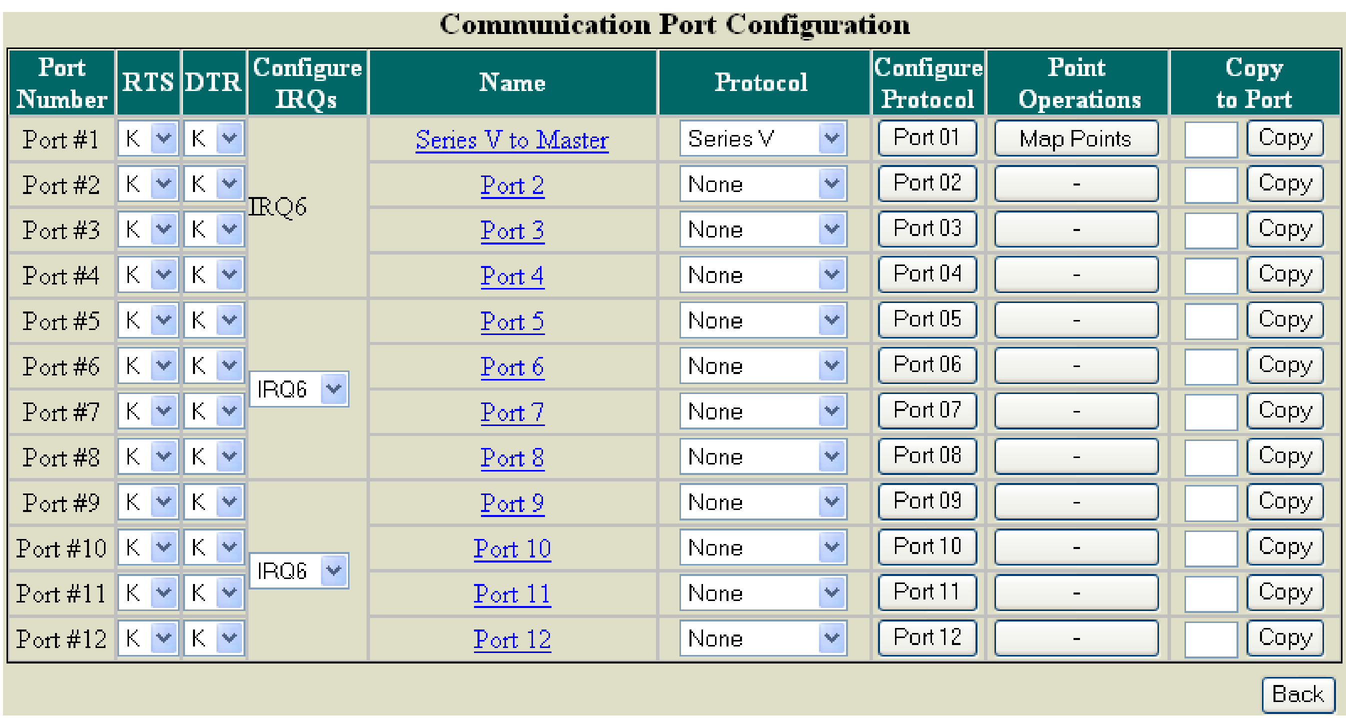
Communication Port Configuration

Port Number	RTS	DTR	Configure IRQs	Name	Protocol	Configure Protocol	Point Operations	Copy to Port
Port #1	K	K	IRQ6	Series V to Master	Series V	Port 01	Map Points	Copy
Port #2	K	K		Port 2		Port 02	-	Copy
Port #3	K	K		Port 3		Port 03	-	Copy
Port #4	K	K		Port 4		Port 04	-	Copy
Port #5	K	K	IRQ6	Port 5		Port 05	-	Copy
Port #6	K	K		Port 6		Port 06	-	Copy
Port #7	K	K		Port 7		Port 07	-	Copy
Port #8	K	K		Port 8		Port 08	-	Copy
Port #9	K	K	IRQ6	Port 9		Port 09	-	Copy
Port #10	K	K		Port 10		Port 10	-	Copy
Port #11	K	K		Port 11		Port 11	-	Copy
Port #12	K	K		Port 12		Port 12	-	Copy

Electran
ETI
Harris (M)
Incom
Modbus(M)
Quantum
SEL
Series V(M)
Symax
Transdata
Tunnel
-- MTU-RTU --
8979
C2100H
CDC I
CDC II
DNPR
FM
Harris (R)
IDLC
L&N
M9000
Modbus(R)
PG&E
PMS 80
Series V
SES 92
SVGP
SVNC
VanComm

Back

Figure 2-58 Communication Port Configuration: Assigning Protocol Results



Communication Port Configuration

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

Back

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 Figure 2-59.

Figure 2-59 Copying Ports

Communication Port Configuration

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

Back

The result of the Copy to Port is shown in Figure 2-60. You may assign a name to the new port as was shown in Figure 2-56.

Figure 2-60 Result of Copying to Port

Communication Port Configuration

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

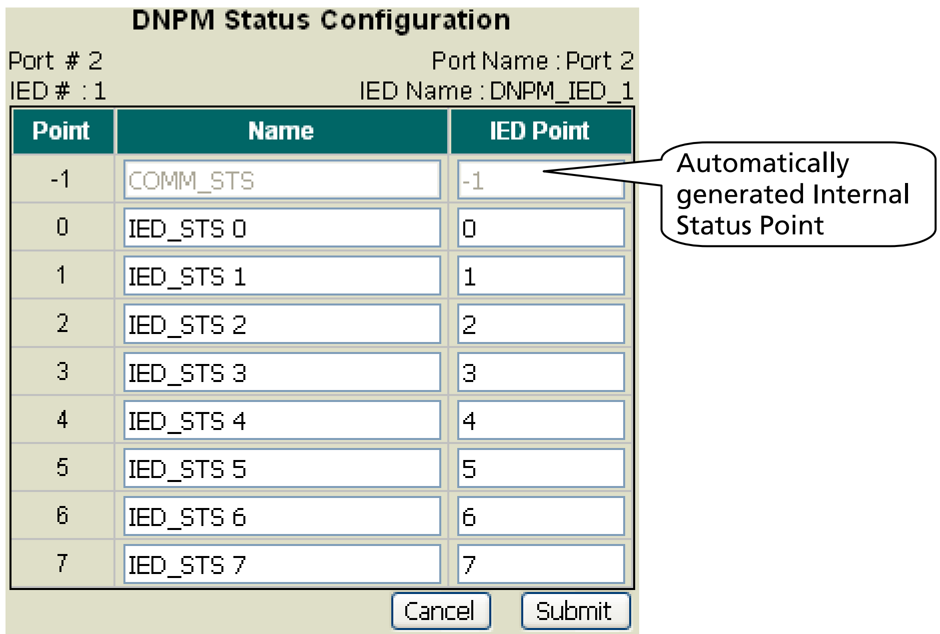
Back

The following sections cover examples of 2179 protocol configuration and Series 5 protocol configuration. Each protocol has two distinct parts to configure: "Configure Protocol" and "Point Operations." Remember, you must configure all the points on the input to the RTU before you configure an output port. Protocol 2179 is an input. Protocol Series 5 is an output port. First, configure the RTU hardware points, then configure the 2179 IED (input port) points, then configure the Series 5 output port.

2.16.1 Internal COMM Status Points

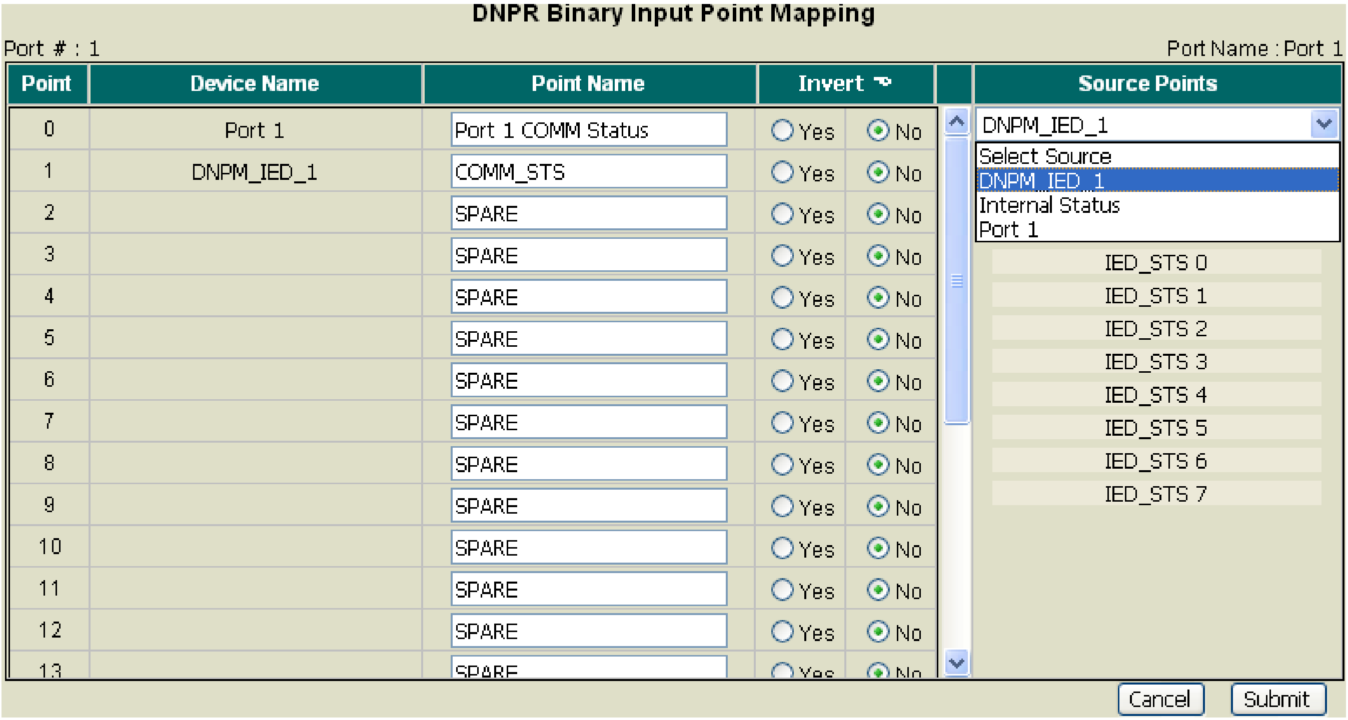
COMM Status applies to any port. Shown below are two examples; one for DNPM, then another for DNPR.

Figure 2-61 DNPM COMM Status Point



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 2-62 DNPR COMM Status Point



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

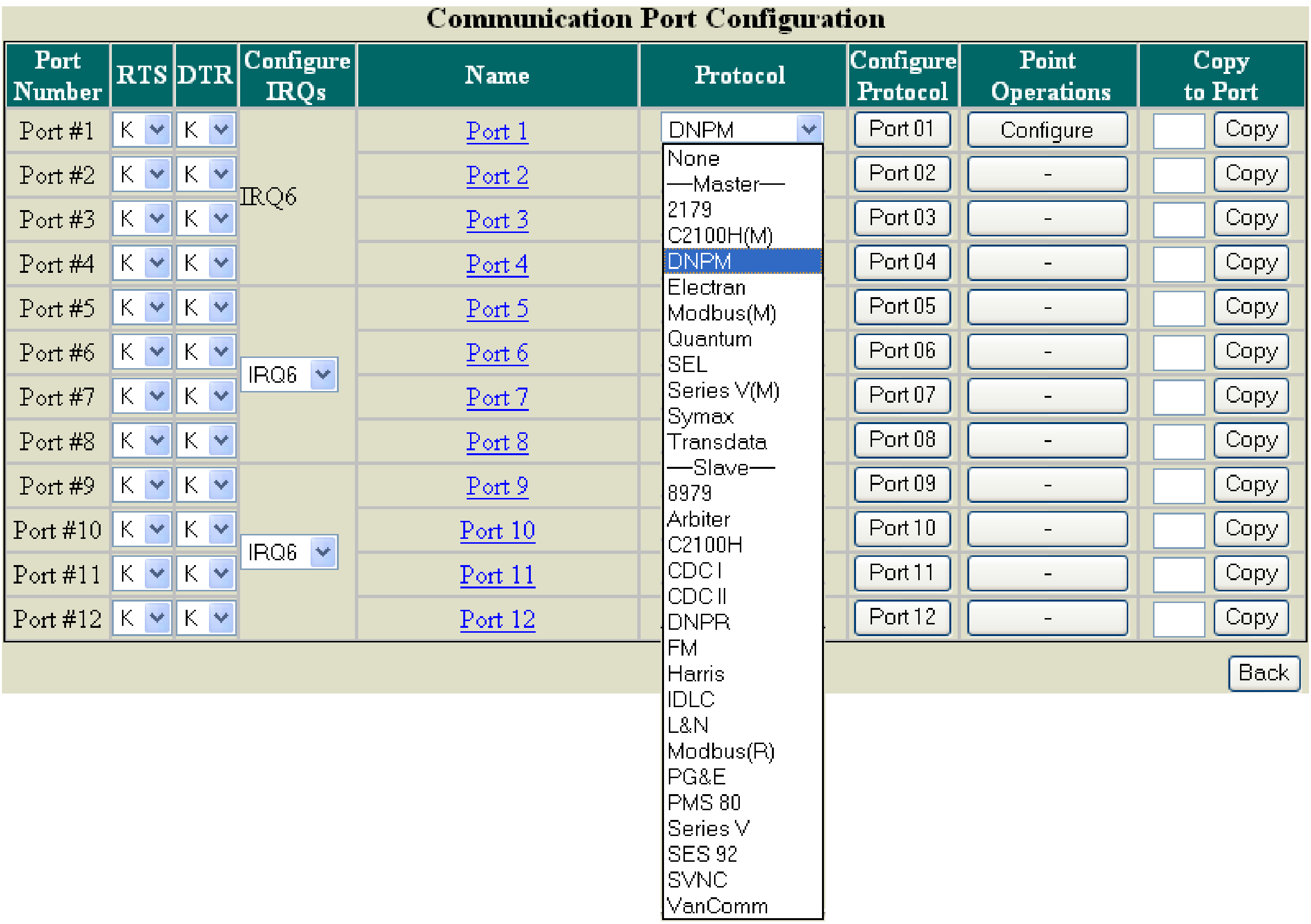
2.16.2 Serial Comm Configuration Examples

2.16.2.1 DNPM Serial Comm Port Configuration

DNPM is a protocol that communicates between the RTU and an IED.

From the Configuration screen, click Serial Comm. You will get a screen similar to Figure 2-63. See Chapter 1 for a complete explanation of the Communication Port Configuration screen. From this screen, click DNPM from the Protocol drop-down menu as shown.

Figure 2-63 DNPM Communication Port Configuration



Port Number

Physical Port number of the RTU.

RTS and DTR

Request To Send and Data Terminal Ready. Using the drop-down list, set to K, H, or L.

Note: This example applies to the SAGE 2300. Refer to the hardware manual for your particular RTU for variations.

"K" represents Keyed (Radio/Modem).

The RTU firmware asserts/deasserts the signal according to the protocol timing configuration. 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.

"L" represents Negative RS232 Voltage.

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

Name

Click on the "blue" name (see below) and rename the port, or accept the default name.

Protocol

From the drop-down list, select the protocol for this port.

Configure Protocol

Click the button under Configure Protocol to set up communication parameters for this port.

Point Operations

Click this button to assign points.

Copy to Port

Enter a port number to copy to, then click the Copy button.

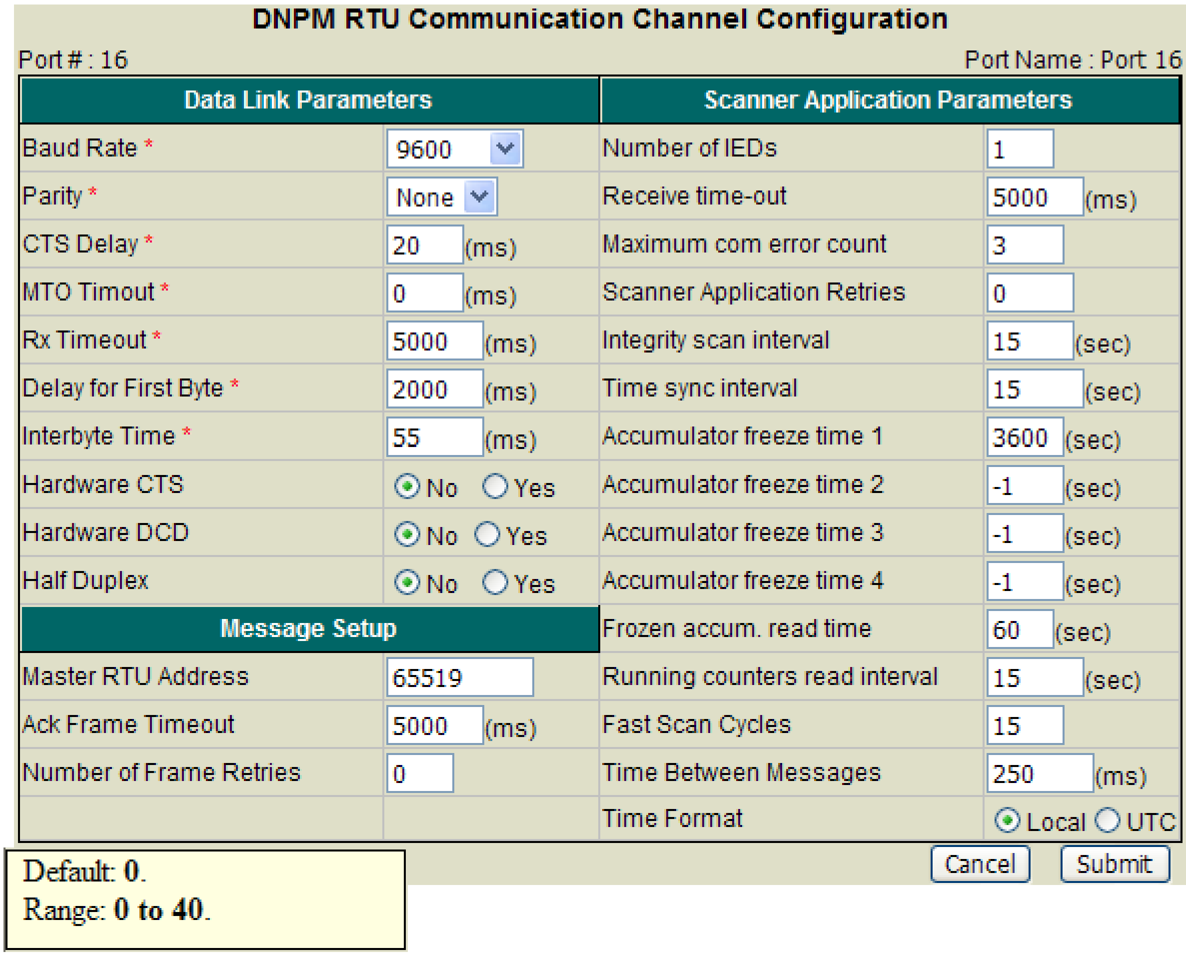
Navigation

Click the Back button to return to the previous screen.

2.16.2.2 Configure Protocol, Serial Comm

Under the heading Configure Protocol, click Port *n* to configure the DNPM port. You may accept all defaults or fill in the form according to the information following Figure 2-64.

Figure 2-64 DNPM Communication Channel Configuration



Note 1: All communication parameters with an asterisk * beside their names can be changed on the fly. That is, the change will take effect after Submit without having to reset.

Note 2: The default value and range of acceptable entries for a field where your cursor is placed is shown at the bottom-left of your screen. The example shown is for Number of IEDs.

2.16.2.3 Data Link Parameters

Baud Rate (300-38400)

From the drop-down menu, select the baud rate. The default setting is 9600.

Parity (None, Odd, Even)

Enter the parity for the associated channel. The default setting is None.

CTS Delay (0 to 1000ms)

Enter the clear-to-send delay in milliseconds for the associated channel. This is the delay of time the channel will wait to start transmitting following Request-To-Send being asserted. Valid entries are in the range of 0-1000 msec. The default setting is 20.

MTO Timeout (0 to 250ms)

Enter the Modem Turnoff Delay for the associated channel. The MTO Delay is used to designate the amount of time (in milliseconds) that will elapse after the last byte is transmitted before the modem is turned off. The default setting is 0 ms.

Rx Timeout (0 to 60,000ms)

Enter the receive timeout for the associated channel. The receive timeout is the length of time the channel will wait for valid communications prior to declaring the channel in communications error and resetting the channel. Valid entries are in the range of 0-60000. The default setting is 5000ms (5 sec).

Note: This timer must be greater than Delay for First Byte timer (below).

Delay for First Byte (1ms) (0 to 60,000)

Enter the delay time for the associated channel. This is the time allowed for a Slave Device to begin its response before the RTU assumes it is not going to reply and moves on to the next device. This parameter is typically set long because of delays in IED response. Valid entries are in the range of 0-60,000 msec. The default setting is 2000 (2 sec).

Note: This timer must be less than Rx Timeout (above).

Inter-byte time (0 to 30,000ms)

Enter the inter-byte time for the associated channel. The inter-byte time is the time allowed for the next byte of a message to be received after a byte has been accepted before the RTU discards the partial message and begins looking for the first byte of a new message. It is recommended that you increase the delay when using frequency-hopping radios. Valid values range from 0-30,000 milliseconds. The default setting is 55 msec.

Hardware CTS (No, Yes)

Click the radio button for Yes if you want the Hardware Clear-To-Send option selected. When this option is selected, the IEDs will not be polled unless the CTS signal is detected by the communications controller chip. This signal is examined after the user programmed CTS delay time has timed out. At the point where the RTU starts its CTS timer, the RTS signal is asserted to the modem. If no hardware CTS signal is present, the port aborts the transmission and tries again. Configuring a CTS delay in the RTU along with the hardware CTS will insure a minimum CTS delay of the configured time. The default setting is No.

Hardware DCD (No, Yes)

Click the radio button for Yes if you want the Hardware DCD selected. When this option is selected, the channel communications driver will accept requested message data bytes only if the carrier is detected by the modem. If the carrier is not detected, the data bytes are discarded. The default setting is No.

Half Duplex (No, Yes)

Click the radio button for Yes if you want half duplex operation. This function enables the RTU to properly condition the RS-232 control lines. The CTS delay is used for carrier conditioning. In full duplex operation, the CTS signal is used for collision avoidance. In Half duplex operation, the DCD signal is used for collision avoidance and to enable the receiver. The default setting is No.

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. 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.

2.16.2.4 Message Setup

Master RTU Address (0 to 65534)

This address is a unique address on the assigned communications channel of the polling RTU. Address 65535 is used only to broadcast to all stations by the MTU. Default is 65519.

Ack Frame Timeout (0 to 60,000ms)

The length of time the RTU waits for data link ack from the IED when requested. The ACK Frame Timeout default is 5000ms.

Number of Frame Retries (0 to 9)

The number of frame retries before an error is recorded. The default is 0.

2.16.2.5 Scanner Application Parameters

Number of IEDs (0 to 40)

Enter the number of Slave Devices connected to this communication channel. Default is 0.

Receive time-out (0-60,000ms)

Enter the receive timeout. The receive timeout is the length of time the DNPM task will wait for the entire message to be received from the IED. The default setting is 5000 (5 seconds).

Note: This value must be equal to, or greater than, the RX Timeout in Data Link Parameters.

Maximum com error count (0 to 100)

Enter the maximum comm error count per Slave Device before marking the points failed or setting the Comm Fail status point. The default is 3.

Scanner application retries (0 to 10)

Enter the number of scanner application retries. The default is 0.

Integrity scan interval (0 to 4320 sec)

Enter the number of seconds for the execution of an Integrity Scan. An integrity scan is a full refresh of all data from every IED on scan. The default is 15.

Time sync interval (0 to 3600 sec)

Enter the time for synchronizing the Slave Devices from the DNPM real-time clock. This is the time in seconds between time sync messages from the DNPM to the IEDs. The default is 15.

Accumulator freeze time 1 (-1 to 3600 sec)
Accumulator freeze time 2 (-1 to 3600 sec)
Accumulator freeze time 3 (-1 to 3600 sec)
Accumulator freeze time 4 (-1 to 3600 sec)

Four entries are provided as a means of scheduling accumulator reads from the slave RTUs. Each entry represents the number of seconds after the hour. The RTU compares the present time to each entry to determine when to freeze and read the accumulators. It is possible to schedule various freeze times during the hour. Times of 900, 1800, 2700 and 3600 would enable freezes every fifteen minutes during the hour. Each freeze time may be disabled with an entry of -1.

Frozen accum. Read time (1 to 60 sec)

Enter the number of seconds to read the accumulators after an accumulator freeze. The default is 60.

Running counter reads are not performed during this time interval between ACC freeze and the read time expiration.

Running counters read interval (0 to 3600 sec)

The running accumulators are read according to this timer when the accumulator freeze schedule above is not populated. The default is 15.

Fast Scan Cycles (0 to 2048)

When an SBO command is issued to an IED, the IED is scanned immediately this amount of times for status changes. This expedites a status change to the RTU in large systems with many IEDs. The default is 15.

Time Between Messages (0 to 60,000 ms)

This is the minimum time between polls. The poll could take longer, depending on the number of IEDs and other factors, but the entered value sets the least time the poll will take. The default is 250 ms.

Time Format (Local, UTC)

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 regards to time syncs, set Time Format to Local Time. See Time Configuration Settings in the Configuration chapter of the hardware manual for time settings under the CPU block.

If you want to send time synchronization to this device, you must know whether the device will accept Local time or UTC time, then set this radio button to match.

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. 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.

2.16.2.6 Series 5, Configure Protocol

On the Communication Port Configuration, under the heading Configure Protocol, click Port *n* to configure the Series 5 port as shown in Figure 2-65.

Figure 2-65 Communication Port Configuration: Assigning Protocol Results

Communication Port Configuration

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

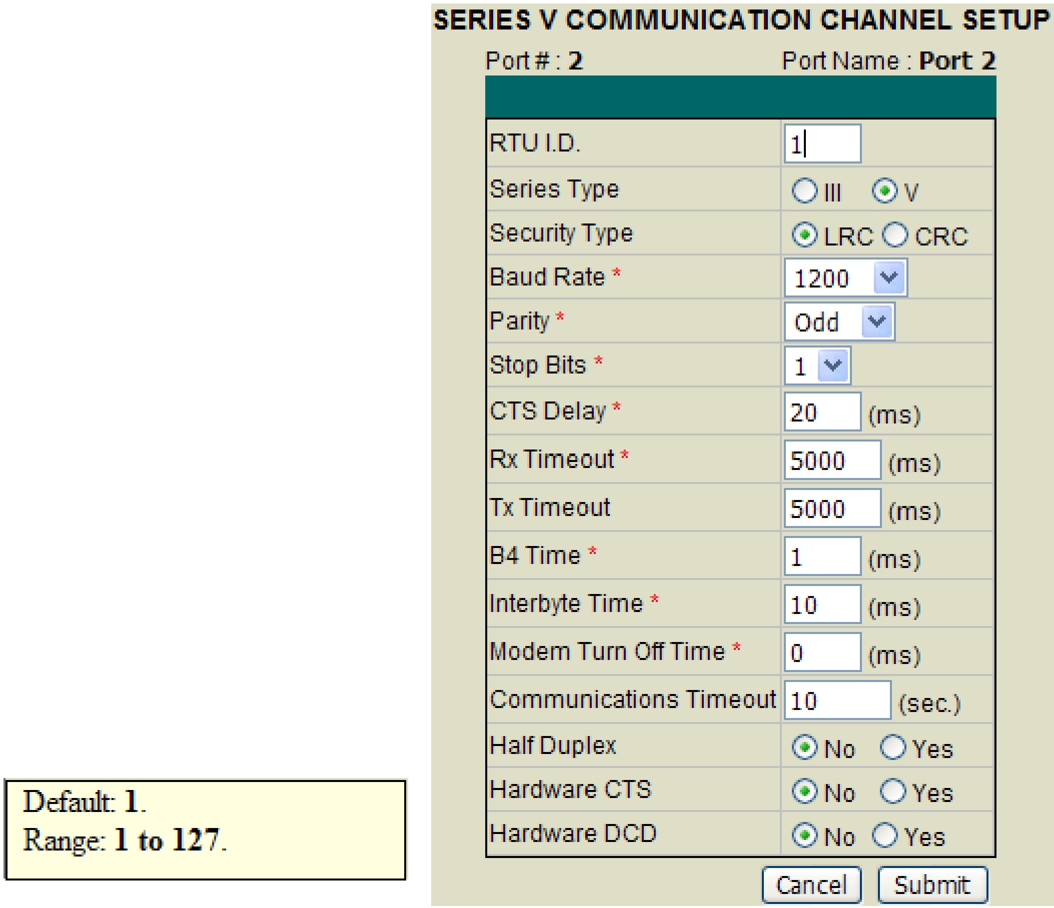
Back

Navigation

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

You may accept all defaults or fill in the form according to the information following Figure 2-66.

Figure 2-66 Communication Channel Setup for Series 3/5



Note 1: All communication parameters with an asterisk * beside their names can be changed on the fly. That is, the change will take effect after Submit without having to reset.

Note 2: The default value and range of acceptable entries for a field where your cursor is placed is shown at the bottom-left of your screen. The example shown is for RTU I.D.

RTU I.D. (1 – 127)

Enter the RTU I.D. number. This number is used to allow an RTU to respond to the master when it is received in a message. Default setting is 1.

Series Type

Identifies the communications protocol used between the MTU and RTU. The default is Series V.

Security Type

The Series V Communication Protocol uses two types of error detection techniques: Longitudinal Redundancy Check (LRC) or Cyclic Redundancy Check (CRC). Both security codes are described in the Series V Protocol Manual, B8300-AAA-00005. Default setting is LRC.

Baud Rate (300 – 19200)

Select the communications speed for the associated channel. Default setting is 1200.

Parity (None, Odd, Even)

Select the parity for the associated channel. The default setting is Odd.

Stop Bits (0,1,2)

Select the stop bits from the pull-down menu. The default is 1.

CTS Delay (0 – 1000ms)

Enter the Clear-To-Send delay in milliseconds for the associated channel. This is the time delay the channel will wait to start transmitting following Request-To-Send signal being asserted. Default setting is 20.

Rx Timeout (0 – 30,000ms)

Enter the receive timeout for the associated channel. The receive timeout is the length of time the channel will wait for valid communications prior to declaring the channel in communications error and resetting the channel. Default setting is 5000 (5 seconds).

Tx Timeout (0 – 30,000ms)

Enter the transmit timeout for the associated channel. This value limits the maximum transmission time from the RTU to the master. Default setting is 5000 (5 seconds).

B4 Time (0 – 250ms)

Enter the B4 time for the associated channel. The B4 time is the length of quiet time required on the channel following a transmission from the RTU prior to turning on the RTUs receive interrupts. Default setting is 1.

Interbyte Time (0 – 250ms)

Enter the interbyte time allowed before the received message is terminated. Default setting is 10.

Modem Turn Off Time (0 – 250ms)

Enter the time delay after the last transmitted byte before turning off the modem. Default setting is 0.

Communications Timeout (1 to 86,400 sec.)

Enter the communications timeout for the associated channel. The communications timeout is the length of time the channel will wait for valid communications prior to declaring the channel in communications error and resetting the channel. The default setting is 10 sec.

Half Duplex (No, Yes)

Enter Yes for half duplex or No for full duplex. This field enables the RTU to properly condition the RS-232 control lines. The CTS delay is used for carrier conditioning. In full duplex operation, the CTS signal is used for collision avoidance. In Half duplex operation, the DCD signal is used for collision avoidance and to enable the receiver. The default setting is No.

Hardware CTS (No, Yes)

If the hardware Clear-To-Send option is selected for a channel, then reply data bytes will not be transmitted unless the CTS signal is detected by the communications controller chip. This signal is examined after the user programmed CTS delay time has timed out. At the point where the RTU starts its CTS timer, the RTS signal is asserted to the modem. The CTS signal is asserted by the modem to the RTU after the programmed CTS delay. Configuring a CTS delay in the RTU along with the hardware CTS will insure a minimum CTS delay of the configured time. Default setting is No.

Hardware DCD (No, Yes)

If the hardware data carrier detect option is selected for a channel, then the channel communications driver will accept requested message data bytes only if carrier is detected by the modem. If carrier is not detected, the data bytes are discarded. Default setting is No.

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. 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.

2.16.2.7 Series 5, Point Operations, Point Mapping

The act of mapping points within the RTU creates a few interesting concepts that need to be understood.

1. Each Source Point (I/O type or IED) has its own database in the RTU. This database can be exposed to other parts of the system to accomplish data display or point mapping.
2. Each RTU protocol that connects to say, a master station, has its own database. This database can also be displayed once it is created. However, the act of creating this database is accomplished through the task of point mapping.

From the configuration diagram select the box Serial Comm. The following screen will appear. For the sake of illustrations the following example uses the Series 5 protocol to explain Point Mapping.

Click Map Points for the SV protocol from the following screen.

Figure 2-67 Communication Port Configuration

Communication Port Configuration

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

Back

Enter the number of points for the type of interest. Remember to include the total number of analog points (if you want them all to be sent to the Master), including References, hardware analogs, ACI analogs, IED analogs, etc.

Figure 2-68 Series 5 Communication Mapping

Series V Communication Mapping

Port # : 3 Port Name : Port 3

Type	Number	Map
Analog Inputs	34	MAP
Status Inputs	24	MAP
Accumulators	8	MAP
Digital Outputs	0	MAP
Analog Outputs	0	MAP
SBO	12	MAP

Back

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Back button to go back to the Communication Port Configuration.

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

Click MAP for the point-type of interest. A screen similar to Figure 2-69 will appear. You may select all points, a single point, or compile a list of points by using "Shift Click" and/or "Ctrl Click". Shift Click includes all in-between points. Ctrl Click selects individual points.

- From drop-down menu under Source Points, select type of points (e.g., for analogs, References, then Hardware, etc.)
- Individual source points may be dragged and dropped into the desired order.
- Select All points may be dragged and dropped at once.
- Select points in a customized list with "Shift Click" and/or "Ctrl Click". See Figure 2-70.
- SPAREs may be clicked and dropped where desired.
- There must be no "Missing Point Info". If a Point Name is unused, mark it as SPARE.
- Specific points or groups of points may be searched from the point database
- After mapping, points may be inserted (above or below) or deleted from the mapped list without having to remap all points.

Figure 2-69 Analog Source Point Mapping

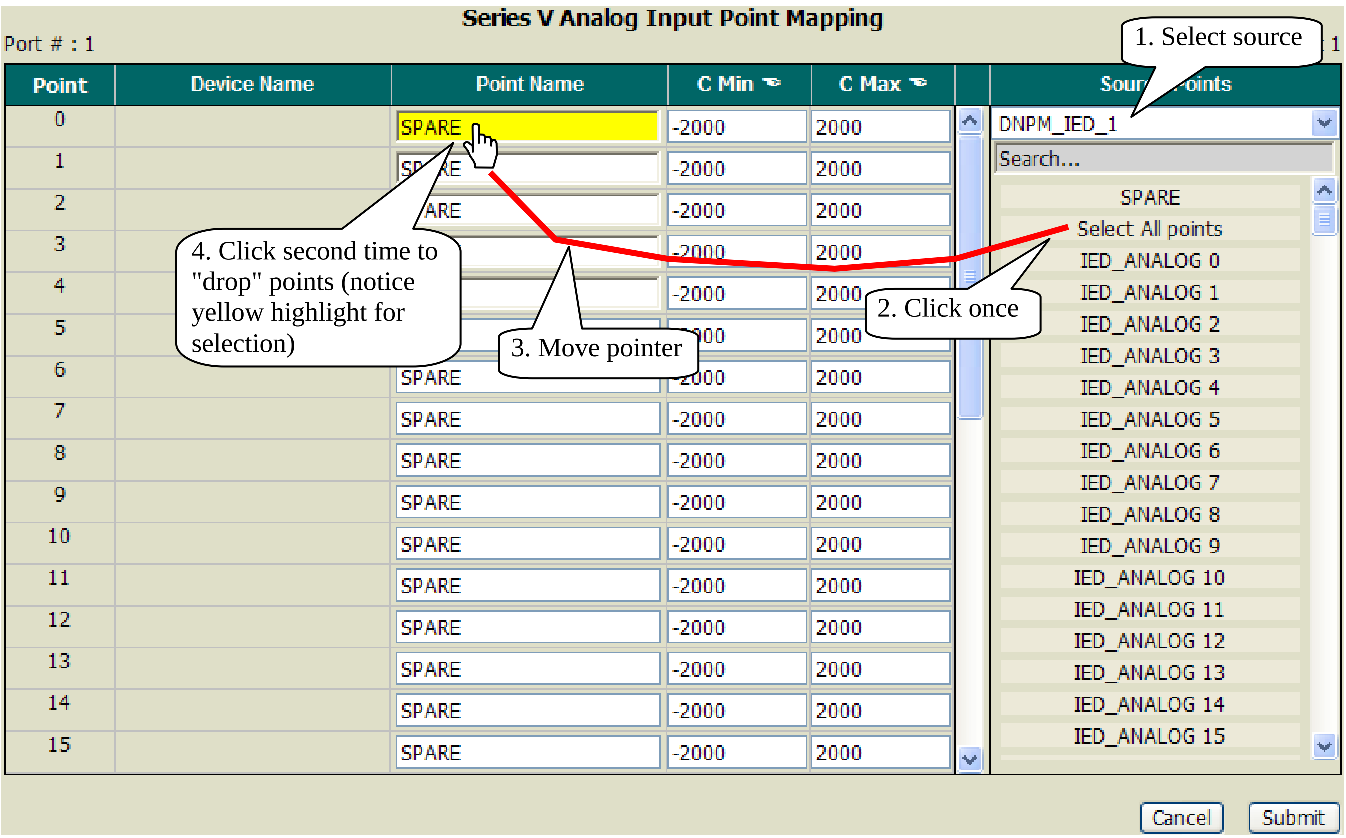
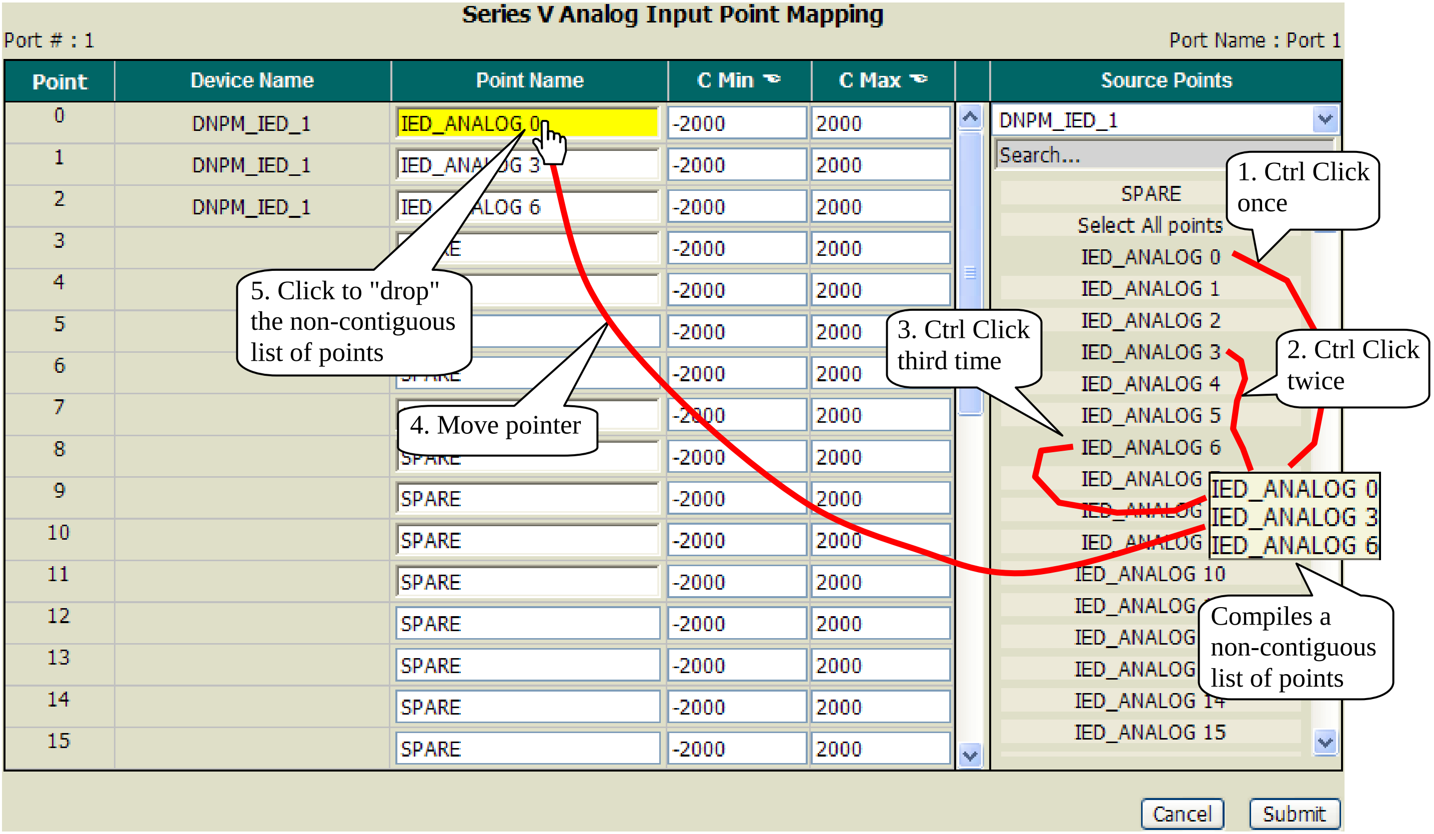


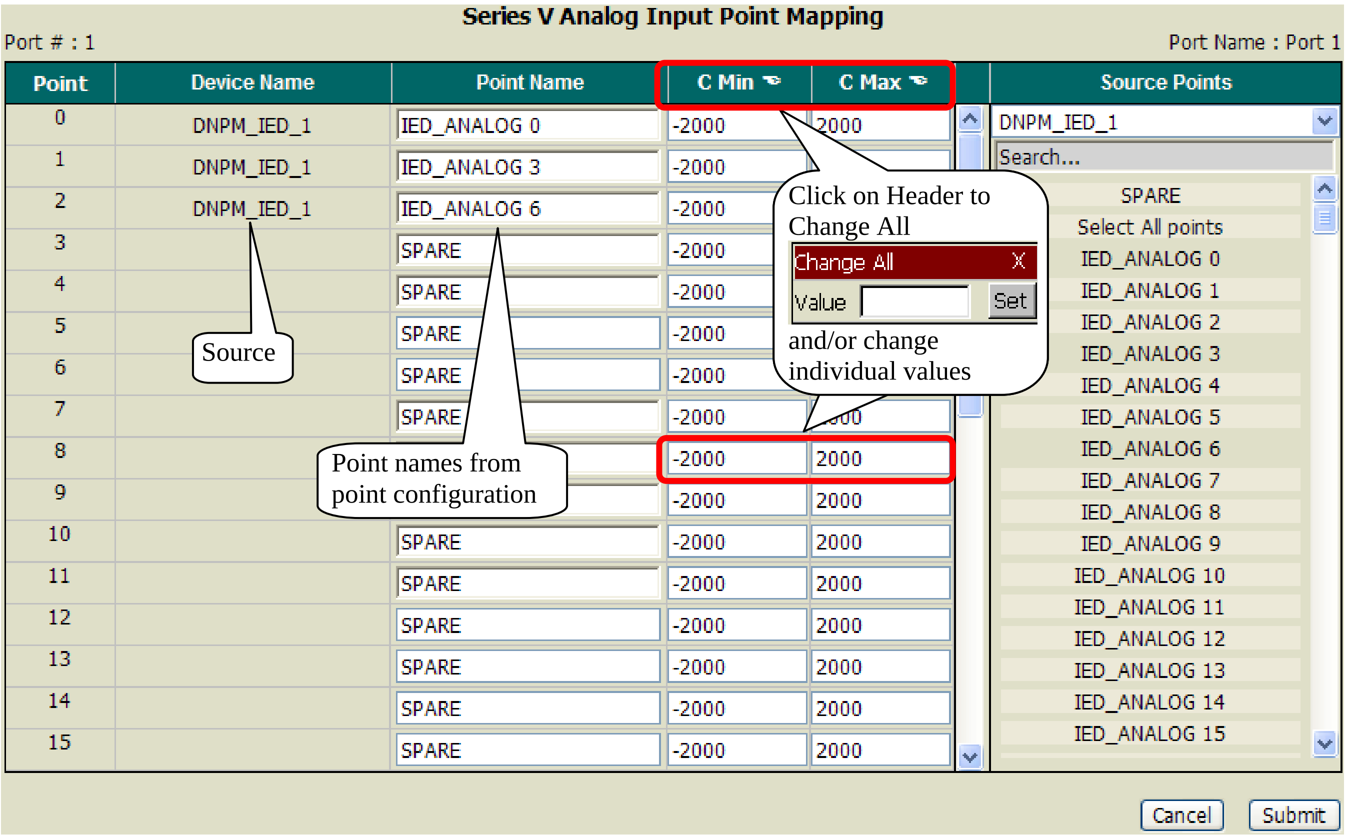
Figure 2-70 Point Mapping – Compiling a List



After your Source Points have been dropped as shown in Figure 2-71, you will notice that the Point name field and the Device Name field have been updated.

Next Enter the counts expected by the master.

Figure 2-71 Results of "Click-Drag-Click"



The Search function makes it easy to find and map specific points from any source. Put your cursor in the gray field below Sources and click once. Type in any combination of numbers or letters. If there is a match, those points will be displayed, as shown.

Figure 2-72 Before Search

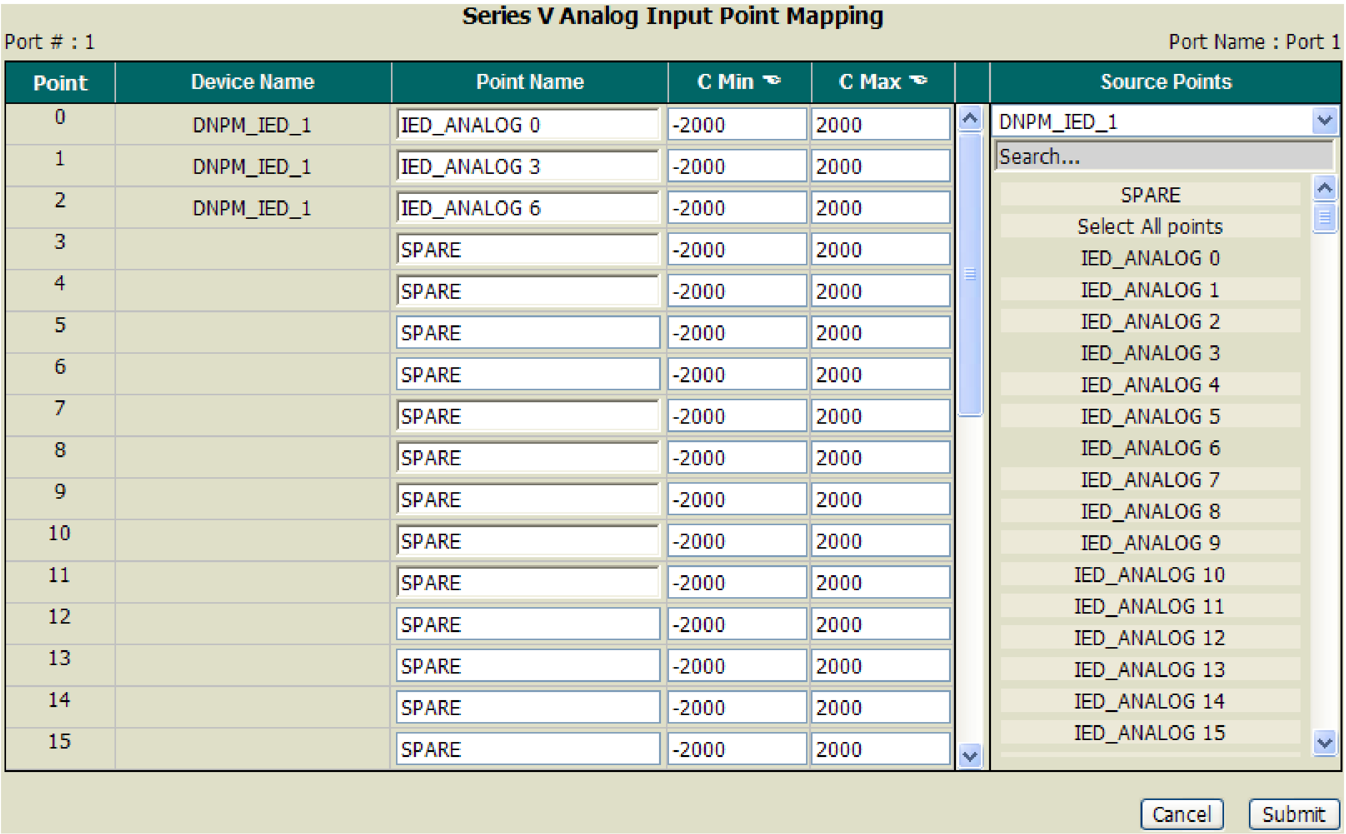
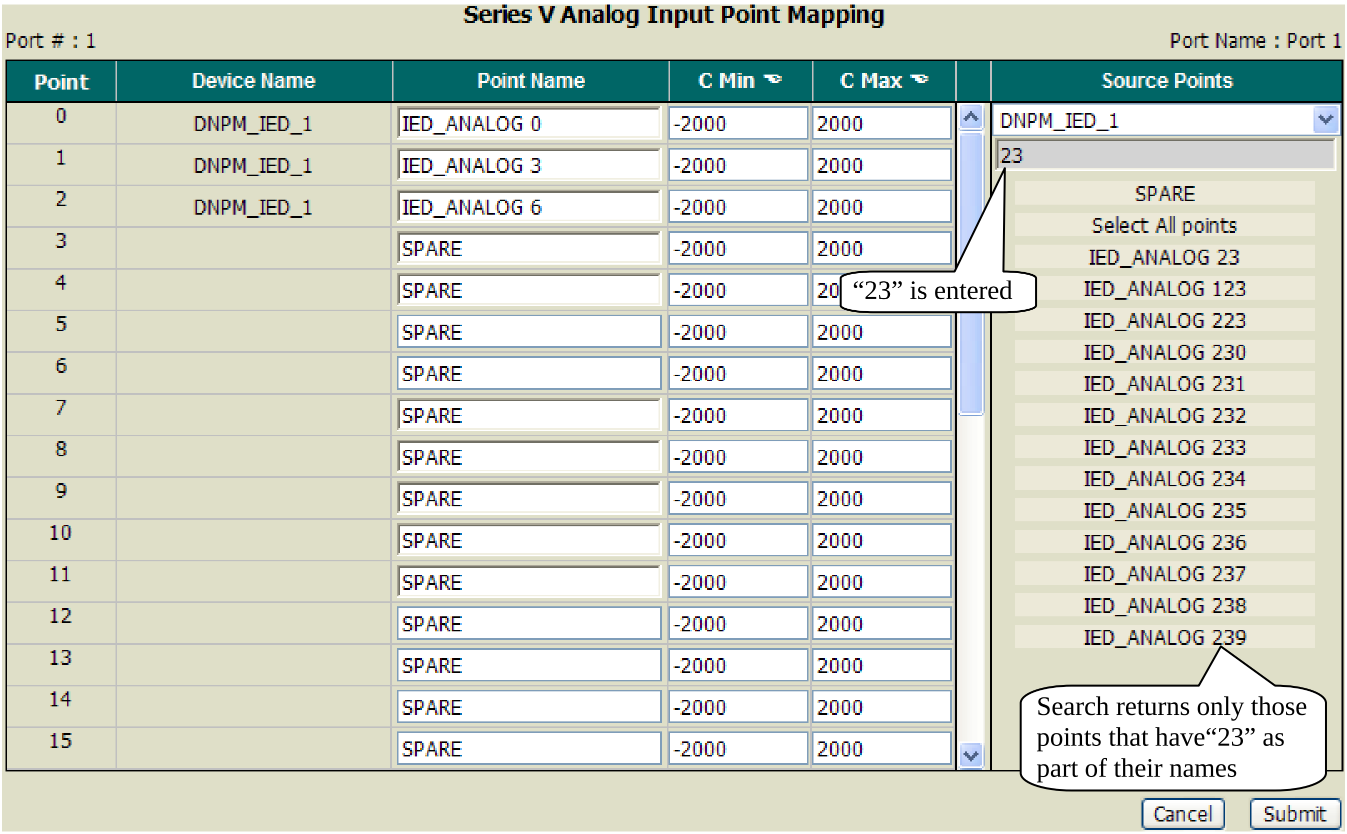
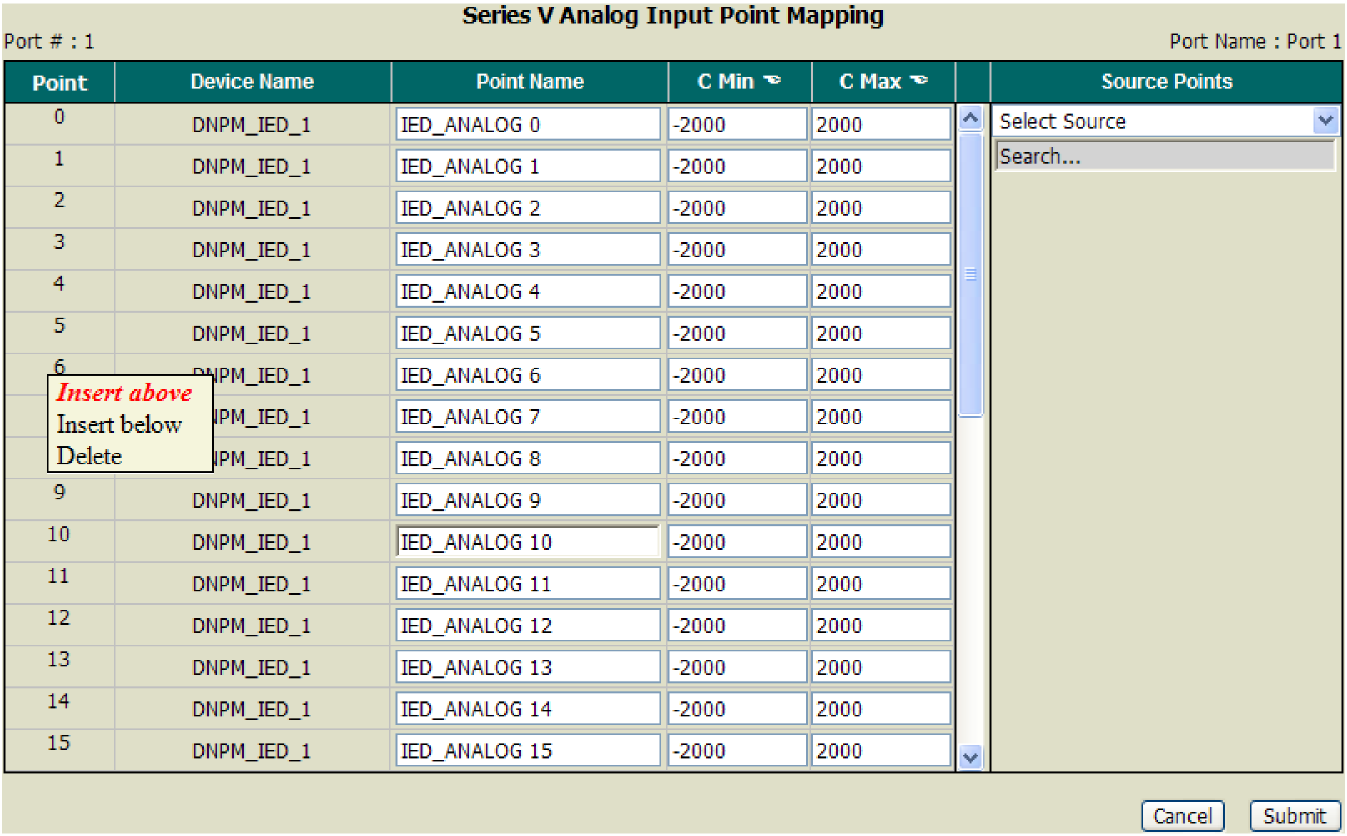


Figure 2-73 After Search



To Insert Above, place your cursor on a Point number (in this example, Point #6) and right click the mouse. The message box shown below appears. Select Insert above and left click.

Figure 2-74 Insert Above

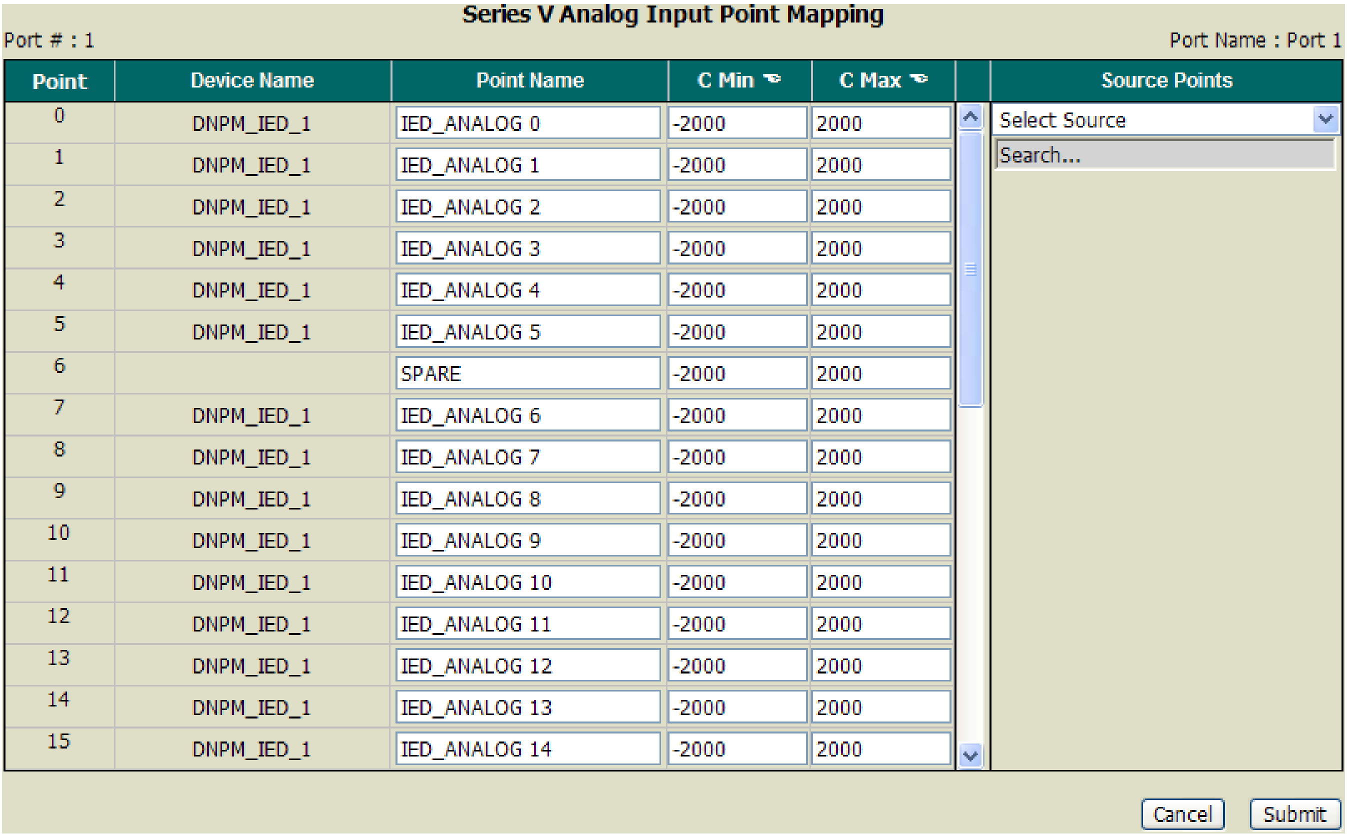


The results of Insert above is shown in the next Figure. Notice that the old Point #6, IED_ANALOG 6, is now pushed down. A Spare takes its place. Also notice that the Point numbers remain contiguous.

Insert below works the same way, only the Spare is created below the designated point.

The usefulness of this procedure is that any desired point can now be mapped to the Spare point.

Figure 2-75 Results of Insert Above



Series V Analog Input Point Mapping

Port # : 1   Port Name : Port 1

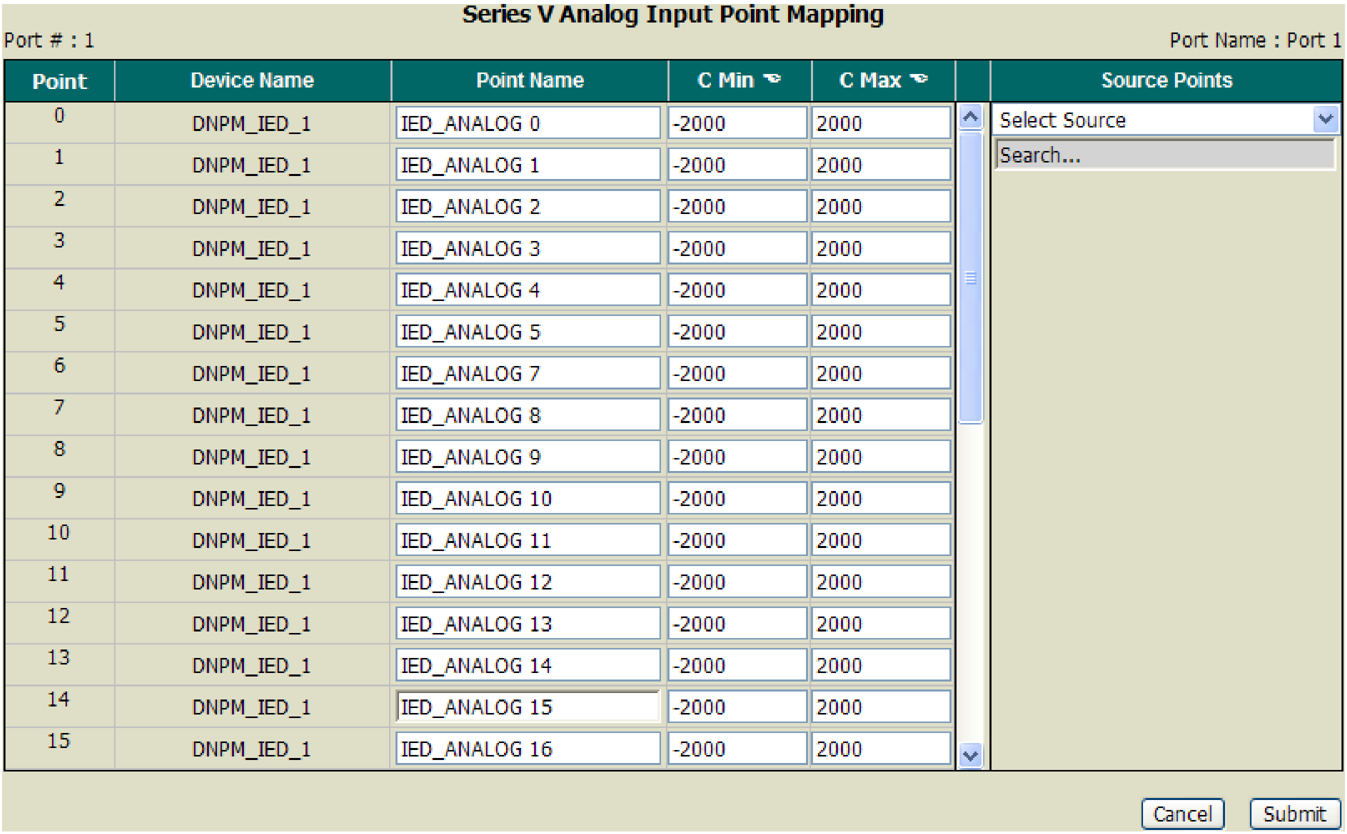
Point	Device Name	Point Name	C Min	C Max
0	DNPM_IED_1	IED_ANALOG 0	-2000	2000
1	DNPM_IED_1	IED_ANALOG 1	-2000	2000
2	DNPM_IED_1	IED_ANALOG 2	-2000	2000
3	DNPM_IED_1	IED_ANALOG 3	-2000	2000
4	DNPM_IED_1	IED_ANALOG 4	-2000	2000
5	DNPM_IED_1	IED_ANALOG 5	-2000	2000
6		SPARE	-2000	2000
7	DNPM_IED_1	IED_ANALOG 6	-2000	2000
8	DNPM_IED_1	IED_ANALOG 7	-2000	2000
9	DNPM_IED_1	IED_ANALOG 8	-2000	2000
10	DNPM_IED_1	IED_ANALOG 9	-2000	2000
11	DNPM_IED_1	IED_ANALOG 10	-2000	2000
12	DNPM_IED_1	IED_ANALOG 11	-2000	2000
13	DNPM_IED_1	IED_ANALOG 12	-2000	2000
14	DNPM_IED_1	IED_ANALOG 13	-2000	2000
15	DNPM_IED_1	IED_ANALOG 14	-2000	2000

Source Points: Select Source / Search...

Cancel   Submit

The Spare point can also be deleted. The following example shows the results of deleting the Spare, then also deleting Point#6, IED_ANALOG 6.

Figure 2-76 Results of Deleting a Point



Series V Analog Input Point Mapping

Port # : 1 Port Name : Port 1

Point	Device Name	Point Name	C Min	C Max	Source Points
0	DNPM_IED_1	IED_ANALOG 0	-2000	2000	Select Source
1	DNPM_IED_1	IED_ANALOG 1	-2000	2000	Search...
2	DNPM_IED_1	IED_ANALOG 2	-2000	2000	
3	DNPM_IED_1	IED_ANALOG 3	-2000	2000	
4	DNPM_IED_1	IED_ANALOG 4	-2000	2000	
5	DNPM_IED_1	IED_ANALOG 5	-2000	2000	
6	DNPM_IED_1	IED_ANALOG 7	-2000	2000	
7	DNPM_IED_1	IED_ANALOG 8	-2000	2000	
8	DNPM_IED_1	IED_ANALOG 9	-2000	2000	
9	DNPM_IED_1	IED_ANALOG 10	-2000	2000	
10	DNPM_IED_1	IED_ANALOG 11	-2000	2000	
11	DNPM_IED_1	IED_ANALOG 12	-2000	2000	
12	DNPM_IED_1	IED_ANALOG 13	-2000	2000	
13	DNPM_IED_1	IED_ANALOG 14	-2000	2000	
14	DNPM_IED_1	IED_ANALOG 15	-2000	2000	
15	DNPM_IED_1	IED_ANALOG 16	-2000	2000	

Cancel Submit

Notice that IED_ANALOG 6 is now missing, although Point numbers remain contiguous.

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

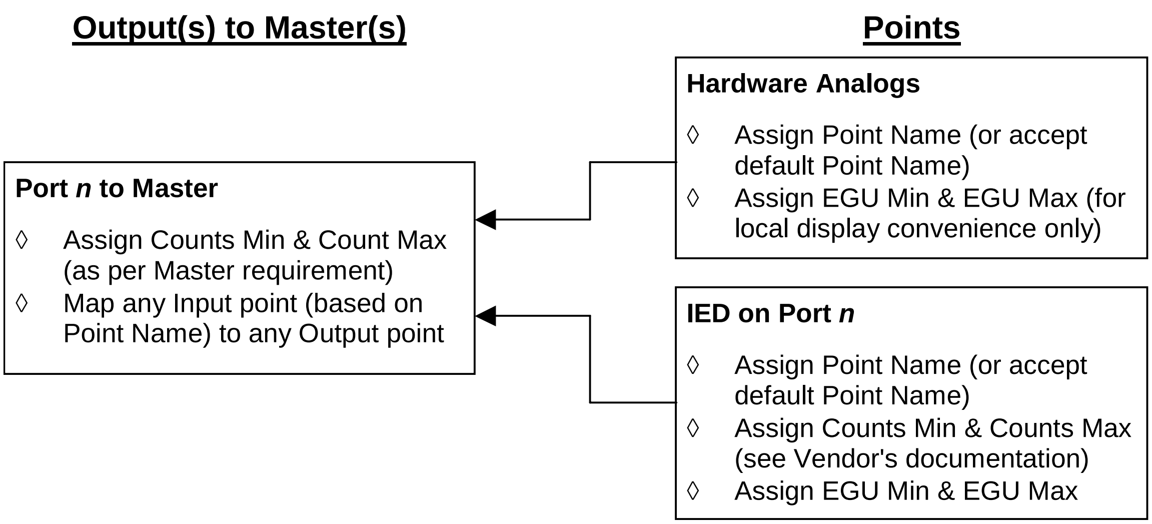
Please note: No configuration changes take effect until the RTU is reset.

Perhaps the ease of mapping can best be shown with the analog input example as described in Figure 2-77. 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 2-77 because analog scaling from an IED is usually a tricky task.

Notice in Figure 2-77 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 2-77 Analog Inputs & Outputs



2.16.2.8 Point Scaling Principles & Examples

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 2-78:

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

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

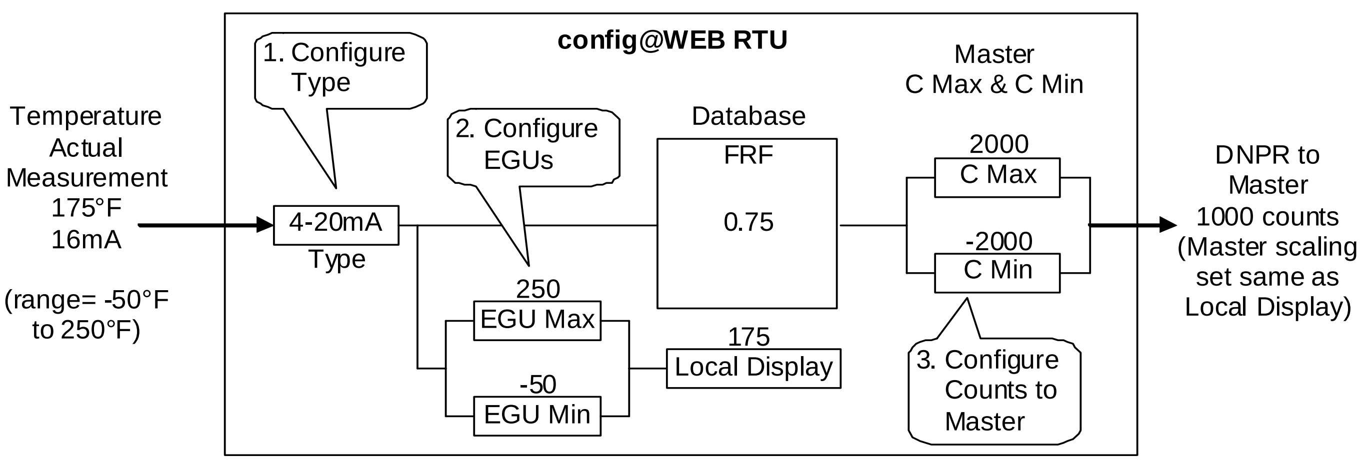
Sensor Type Data Value = FRF (Data Max – Data Min) + Data Min
Sensor Type Data Value = 0.75 (20 – 4) + 4
Sensor Type Data Value = 16

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 2-78):

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

Figure 2-78 shows the path of an analog hardware point from measurement to Master.

Figure 2-78 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.

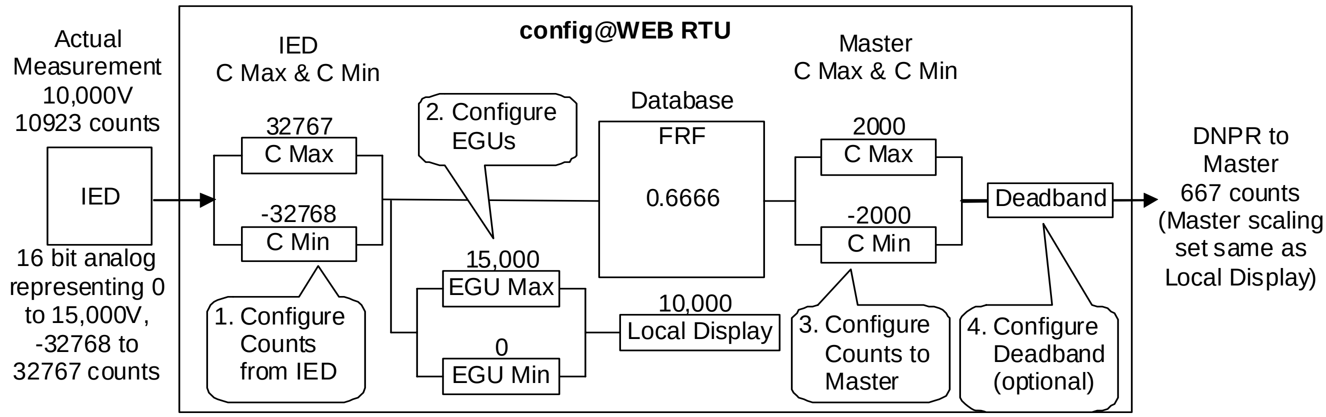
We learn from the Master Station vendor's manual that the Master Station's DNPR protocol expects a count range of –2000 to 2000.

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

IED Analog Example

Scaling for IEDs is just as easy, as shown in Figure 2-79. The formula for calculating FRF is the same as it was for the hardware analog.

Figure 2-79 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.

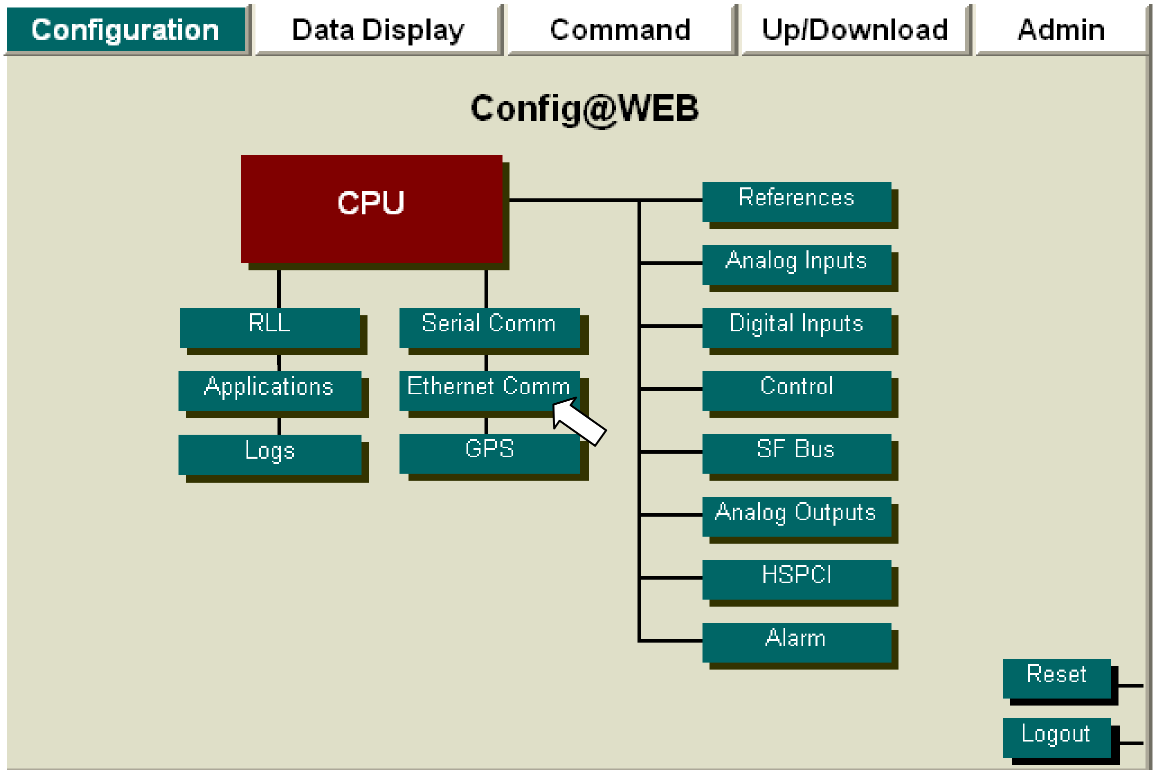
Handy Binary to Decimal Converter

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 2-80.

Figure 2-80 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 2-81 Ethernet Comm Port Configuration

Communication Port Configuration

Socket Number	Name	Protocol	Configure Protocol	Point Operations	Copy to Port
Socket #1	Socket 1	None	Socket 1	-	Copy
Socket #2	Socket 2	None	Socket 2	-	Copy
Socket #3	Socket 3	None	Socket 3	-	Copy
Socket #4	Socket 4	None	Socket 4	-	Copy
Socket #5	Socket 5	None	Socket 5	-	Copy
Socket #6	Socket 6	None	Socket 6	-	Copy
Socket #7	Socket 7	None	Socket 7	-	Copy
Socket #8	Socket 8	None	Socket 8	-	Copy

Back

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.

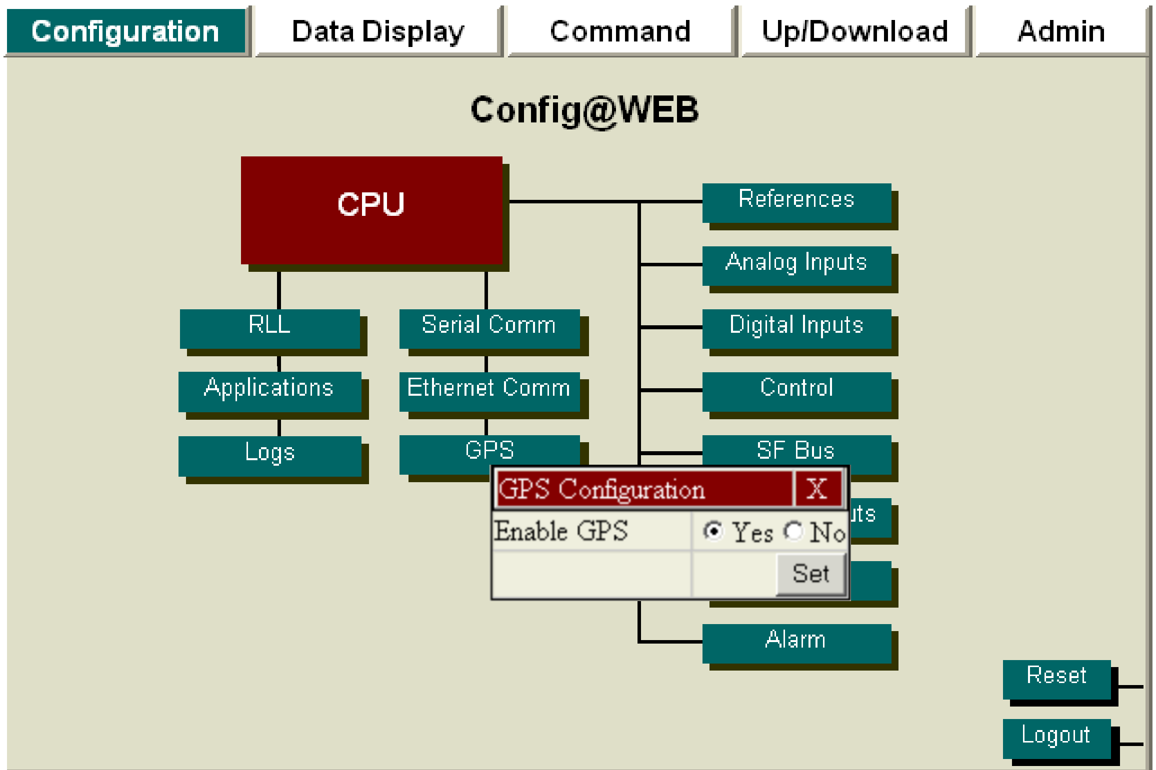
Copy to Port

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

2.18 GPS Configuration

If your RTU has a GPS, you may set the GPS as either the Primary or Secondary Time Server Source under the CPU Configuration (see Figure 2-12). Then, from the Configuration main screen, click GPS to get a screen as shown in Figure 2-82. Click Yes, then Set to enable GPS.

Figure 2-82 GPS Configuration



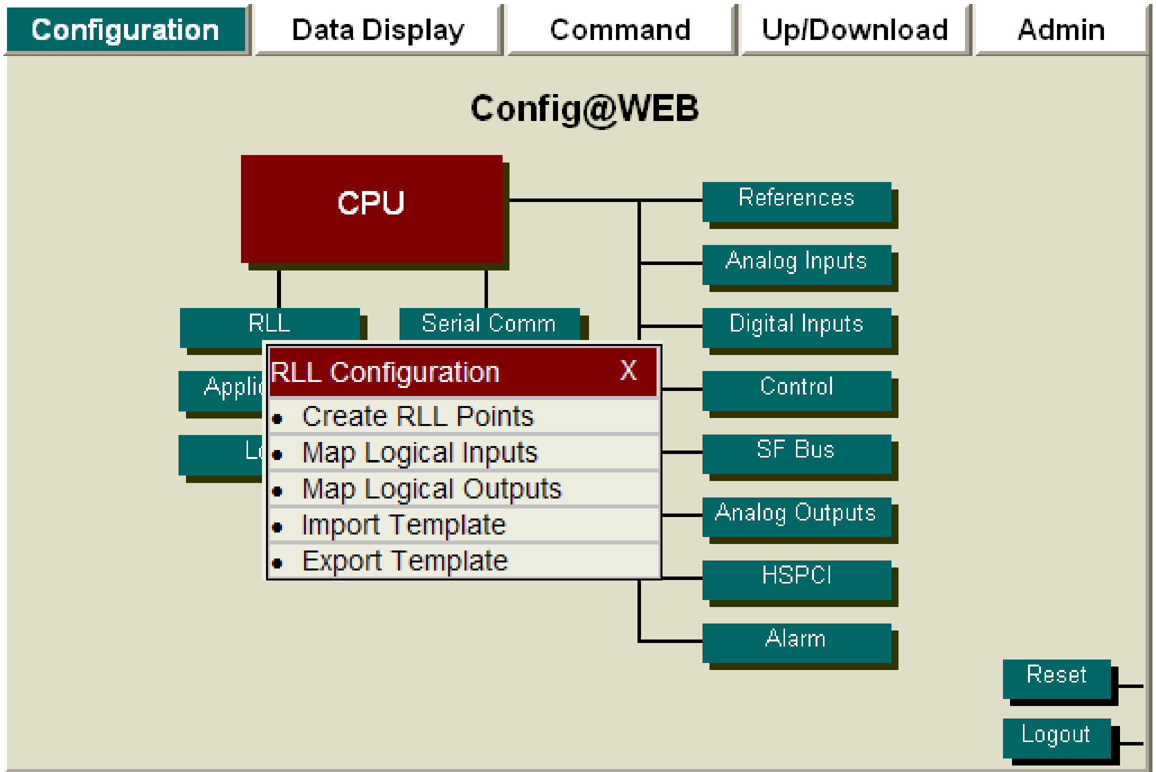
See the Data Display chapter for GPS Display information.

2.19 RLL Configuration

ISaGRAF PRO is a program for Telvent 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 following manual for further information:

config@WEB Relay Ladder Logic Manual

Figure 2-83 RLL Configuration



2.20 Applications Configuration

Please refer to the config@WEB Applications manual.

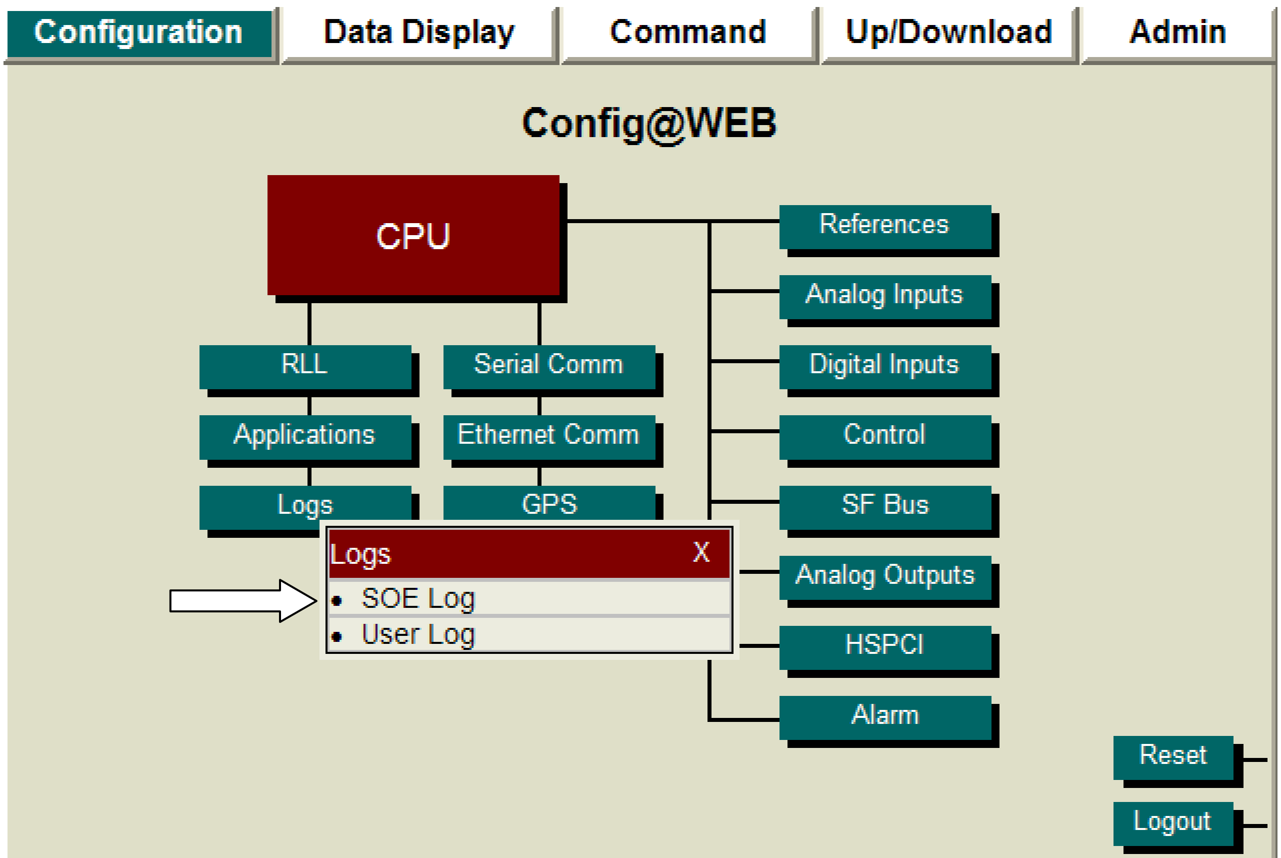
2.21 Logs

2.21.1 SOE Log

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

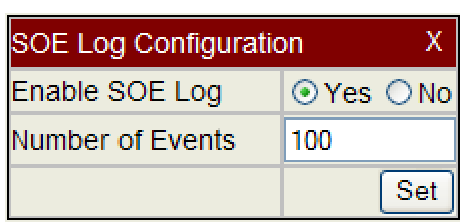
Click on Logs, then click on SOE Log as shown below.

Figure 2-84 Selecting 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.

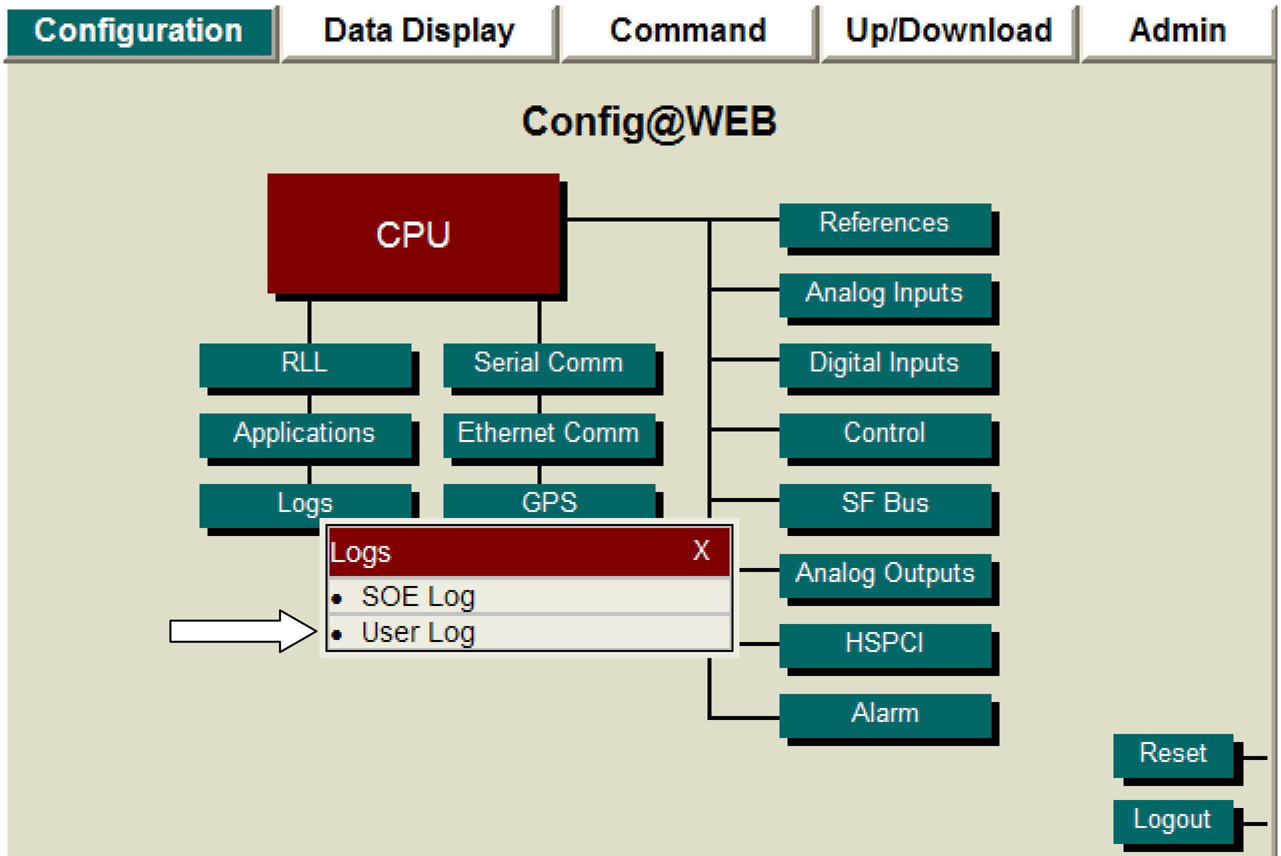


2.21.2 User Log

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

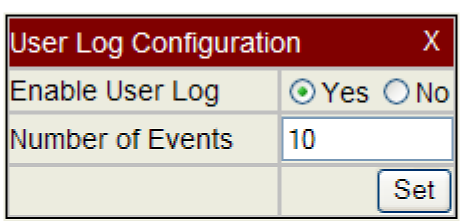
Click on Logs, then click on User Log as shown below.

Figure 2-85 Selecting SOE Log



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.

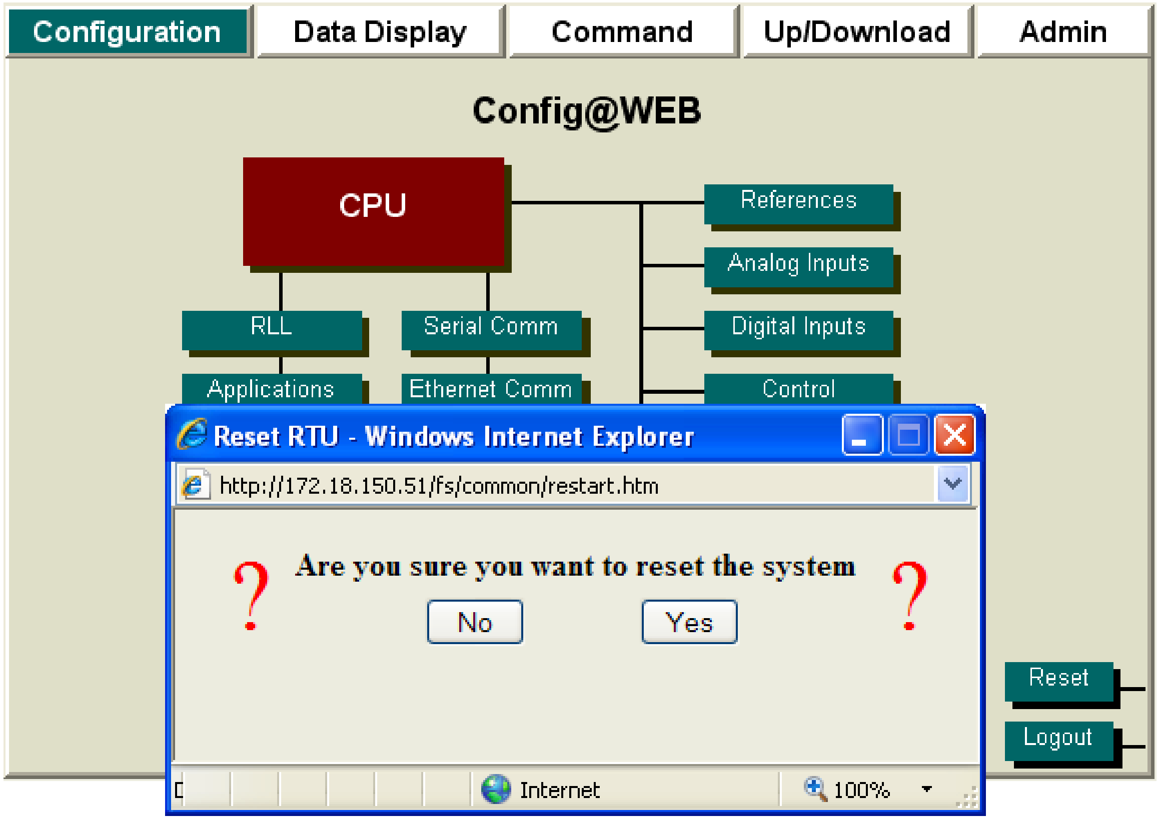
Click “Set” to submit the new setting; Click “X” to dismiss the User Log Configuration.



2.22 Reset

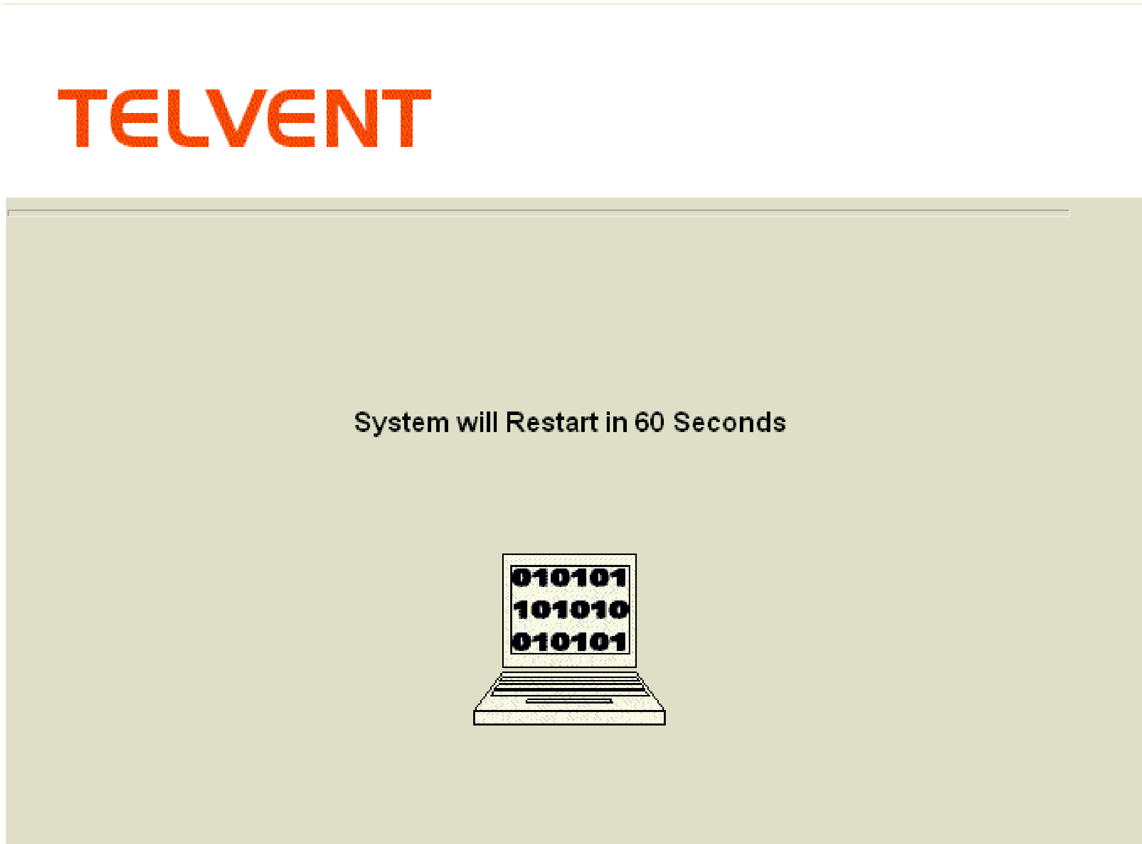
Click Reset to reset the system. Click Yes on the Warning dialog box.

Figure 2-86 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.

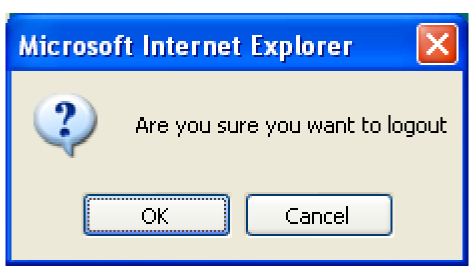
Figure 2-87 Reset



2.23 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 2-88 Logging Out



CHAPTER 3

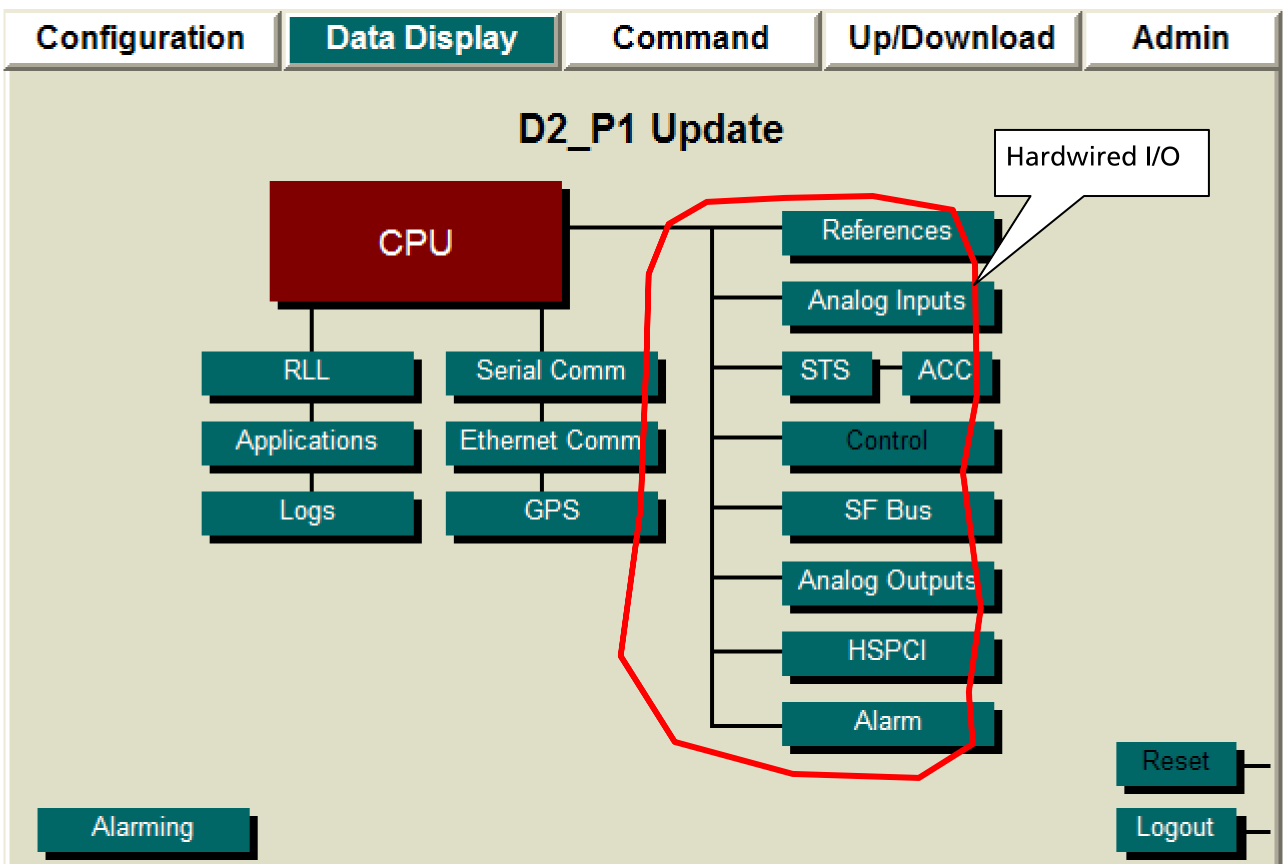
Data Display

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.

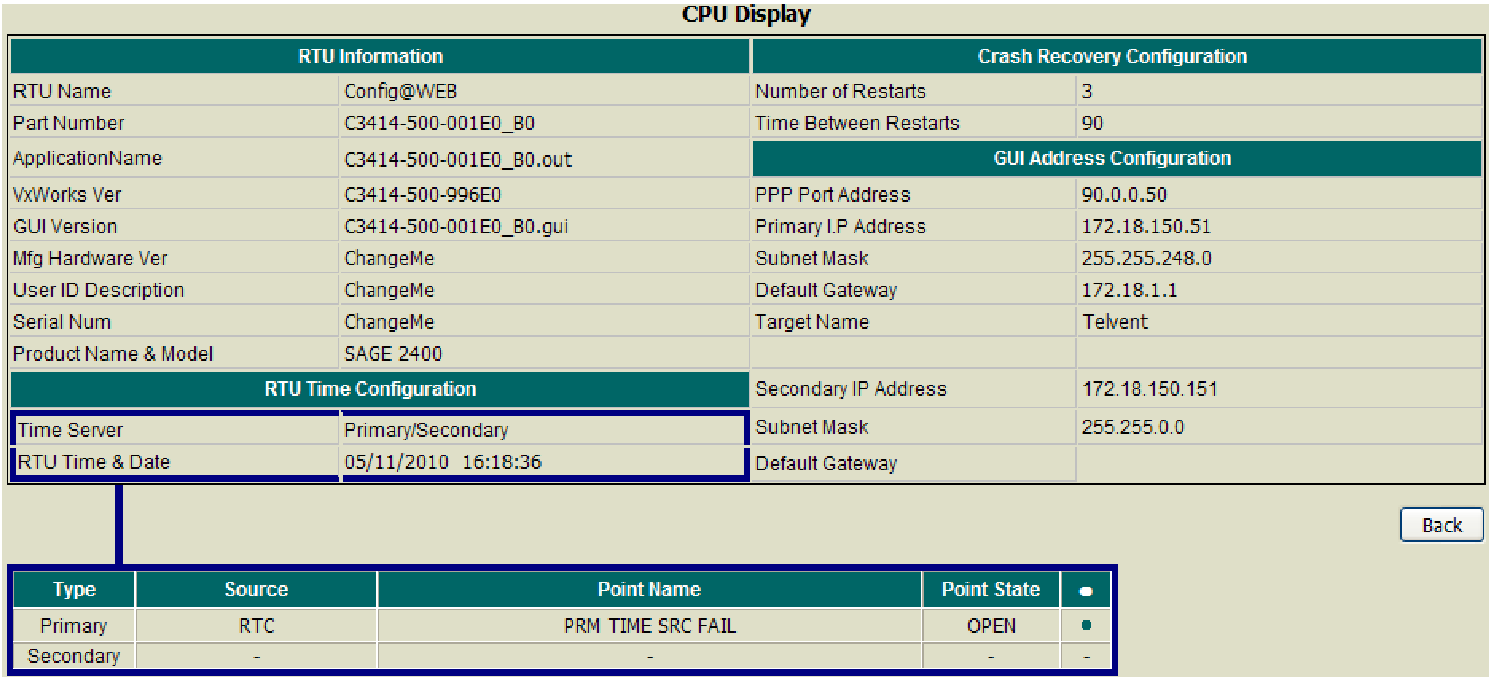
Figure 3-1 Data Display



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



RTU Information

RTU Name	The name of this RTU as selected in Configuration
Part Number	Firmware Part Number assigned by Telvent (for DNP, Var 242 – Device Mfg software ver))
Application Name	File name of the firmware
VxWorks Ver	VxWorks Version number assigned by Telvent
GUI Version	Version number assigned by Telvent
Mfg. Hardware Ver	User defined information (for DNP, Var 243 – Device Mfg hardware ver)
ID Code	User defined information (for DNP, Var 246 - User assigned ID code / num)
Serial Num	User defined information (for DNP, Var 248 – Device serial number)
Product Name & Model	The RTU hardware (for DNP, Var 250 – Device mfg prod name & model)

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.
●	A red dot indicates the point is CLOSED (failed); a green dot indicates the point is OPEN (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 Telvent. See the appendices.
Primary I.P. Address	Primary I.P. Address of this RTU
Subnet Mask	Subnet Mask of this RTU
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.
Target Name	Network server name of the RTU (the network server that resolves this name to the I.P. address is the DNS server)
Secondary I.P. Address	I.P. Address used by the secondary Ethernet port

Subnet Mask	Subnet Mask used by the secondary Ethernet port
Default Gateway	Default Gateway used by the secondary Ethernet port

Navigation

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

3.1.1 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 3-3 Internal Status Points Mapped to a DNPR Master

DNPR Binary Inputs Display

Port # : 1 Port Name : Port 1

Page1 of 1 Go To Go

Point	Device Name	Point Name	Assigned Class	Point Status	Point State	
0	RTU Internal Status	PRM TIME SRC FAIL	1		OPEN	
1	RTU Internal Status	SEC TIME SRC FAIL	1		CLOSE	
2	RTU Internal Status	RUN	1		CLOSE	
3	RTU Internal Status	TIME SRC FAIL	1		OPEN	
4	RTU Internal Status	IED FAIL	1		CLOSE	
5	RTU Internal Status	LOCAL	1		OPEN	
6	RTU Internal Status	LOGGED IN	1		CLOSE	
7	RTU Internal Status	CONFIG CHG	1		OPEN	
8	RTU Internal Status	RLL RUN	1		OPEN	
9	RTU Internal Status	ETHERNET LINK	1		CLOSE	
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

Back

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.

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

3.2 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.

3.3 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.

Figure 3-4 References Display for SAGE 2X00

References Display

Point	Point Name	Point Status	Point Value
1	bb_gnd_ref		0.000
2	bb_+5.0V_REF		5.000
3	bb_+4.5V_ref		4.500
4	bb_-4.5V_ref		-4.498
5	bb_temp_ref		73.212
6	bb_dc_in		25.154
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Back

Figure 3-5 References Display for SAGE 1X50

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 3-6 References Display for SAGE C3830

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

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

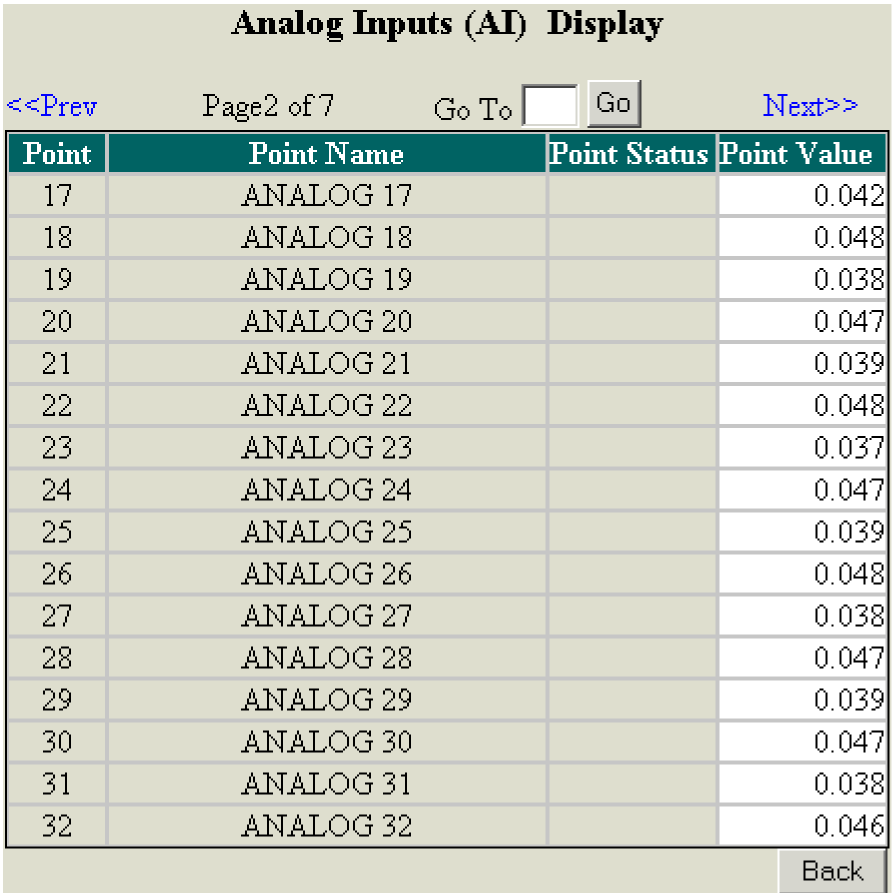
Click the Back button to go back to the Data Display screen.

3.4 Analog Inputs Data Display

From the Data Display screen, click Analog Inputs to view the DC analog inputs. The inputs are shown in Figure 3-7 and are in the following order:

- Baseboard inputs
- Analog expansion bus inputs.

Figure 3-7 Analog Inputs (AI) Display



Analog Inputs (AI) Display

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Point	Point Name	Point Status	Point Value
17	ANALOG 17		0.042
18	ANALOG 18		0.048
19	ANALOG 19		0.038
20	ANALOG 20		0.047
21	ANALOG 21		0.039
22	ANALOG 22		0.048
23	ANALOG 23		0.037
24	ANALOG 24		0.047
25	ANALOG 25		0.039
26	ANALOG 26		0.048
27	ANALOG 27		0.038
28	ANALOG 28		0.047
29	ANALOG 29		0.039
30	ANALOG 30		0.047
31	ANALOG 31		0.038
32	ANALOG 32		0.046

Back

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:

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

See section 3.2

Point Value

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

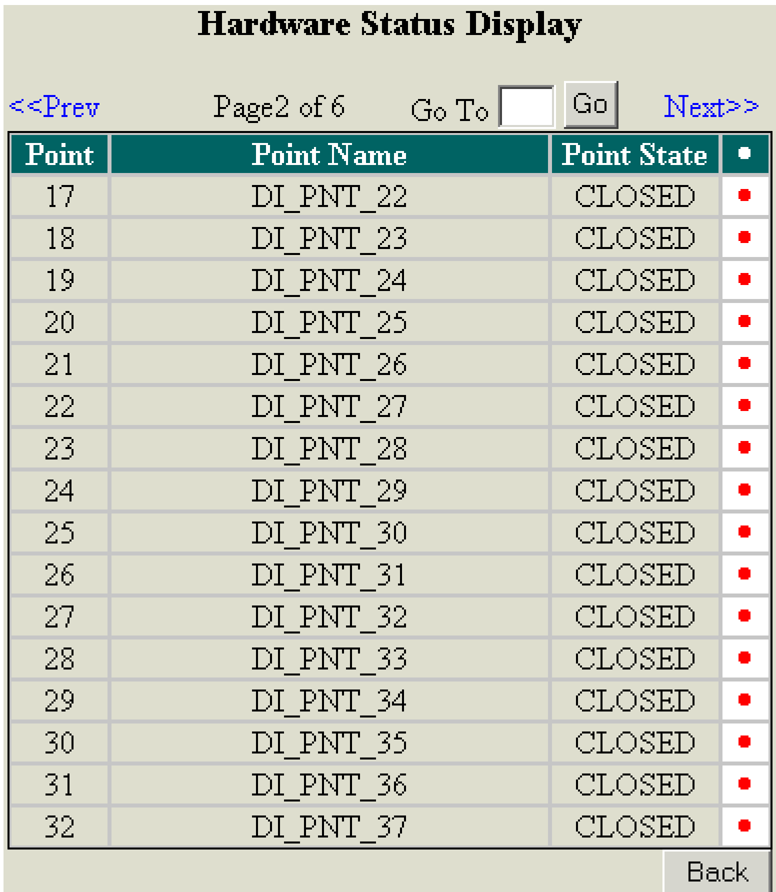
Navigation

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.

3.5 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) and a green dot for OPEN and a red dot for CLOSED.

Figure 3-8 Hardware Status Display


Hardware Status Display

<<Prev Page2 of 6 Go To [ ] Go Next>>

Point	Point Name	Point State	•
17	DI_PNT_22	CLOSED	•
18	DI_PNT_23	CLOSED	•
19	DI_PNT_24	CLOSED	•
20	DI_PNT_25	CLOSED	•
21	DI_PNT_26	CLOSED	•
22	DI_PNT_27	CLOSED	•
23	DI_PNT_28	CLOSED	•
24	DI_PNT_29	CLOSED	•
25	DI_PNT_30	CLOSED	•
26	DI_PNT_31	CLOSED	•
27	DI_PNT_32	CLOSED	•
28	DI_PNT_33	CLOSED	•
29	DI_PNT_34	CLOSED	•
30	DI_PNT_35	CLOSED	•
31	DI_PNT_36	CLOSED	•
32	DI_PNT_37	CLOSED	•

Back

Point

The point number.

Point Name

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

Point State

This will be either CLOSED or OPENED.

●

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

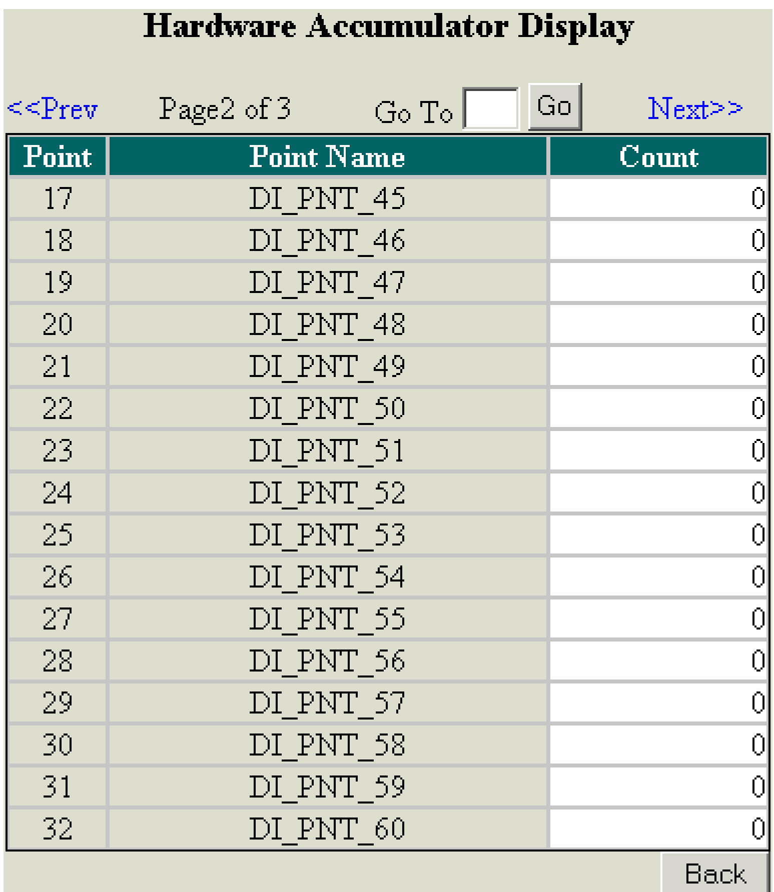
Navigation

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 Data Display screen.

3.6 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 returned to the MTU depending on the protocol being used.

Figure 3-9 Hardware Accumulator Display



Hardware Accumulator Display

<<Prev Page2 of 3 Go To [ ] Go Next>>

Point	Point Name	Count
17	DI_PNT_45	0
18	DI_PNT_46	0
19	DI_PNT_47	0
20	DI_PNT_48	0
21	DI_PNT_49	0
22	DI_PNT_50	0
23	DI_PNT_51	0
24	DI_PNT_52	0
25	DI_PNT_53	0
26	DI_PNT_54	0
27	DI_PNT_55	0
28	DI_PNT_56	0
29	DI_PNT_57	0
30	DI_PNT_58	0
31	DI_PNT_59	0
32	DI_PNT_60	0

Back

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

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.

3.7 Control Data Display

There is no Data Display for Control.

3.8 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.

Figure 3-10 Special Function Bus Data Display

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	NONE on BUS 3	-
Select 4	NONE	NONE on BUS 4	-
Select 5	NONE	-	-
Select 6	NONE	-	-
Select 7	NONE	-	-
Select 8	NONE	-	-

Back

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.

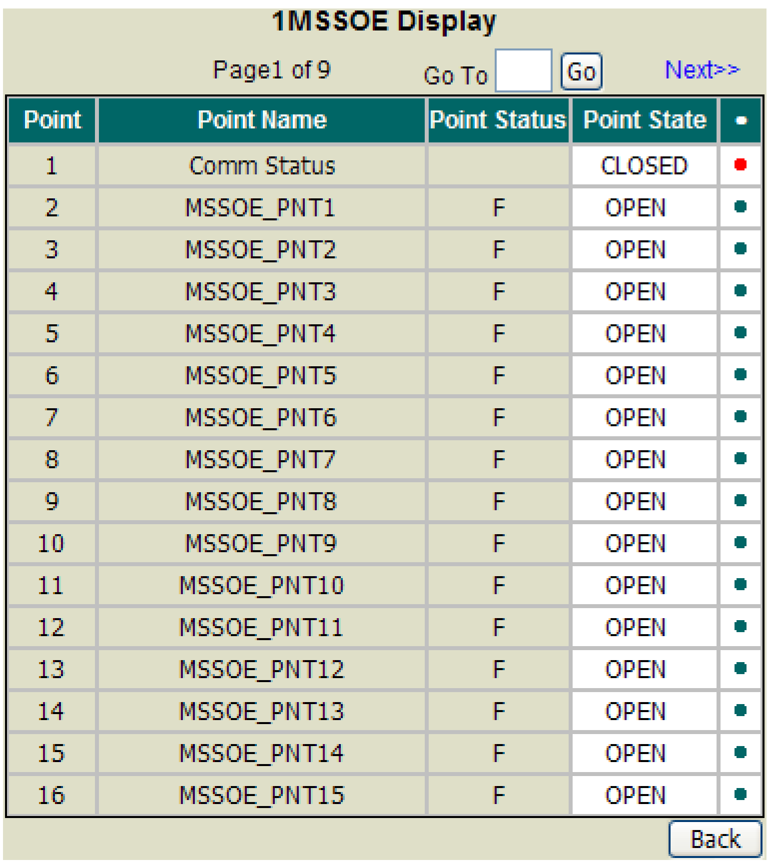
Navigation

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

3.8.1 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.

Figure 3-11 1MSSOE Display



1MSSOE Display

Page1 of 9 Go To [ ] Go Next>>

Point	Point Name	Point Status	Point State	•
1	Comm Status		CLOSED	•
2	MSSOE_PNT1	F	OPEN	•
3	MSSOE_PNT2	F	OPEN	•
4	MSSOE_PNT3	F	OPEN	•
5	MSSOE_PNT4	F	OPEN	•
6	MSSOE_PNT5	F	OPEN	•
7	MSSOE_PNT6	F	OPEN	•
8	MSSOE_PNT7	F	OPEN	•
9	MSSOE_PNT8	F	OPEN	•
10	MSSOE_PNT9	F	OPEN	•
11	MSSOE_PNT10	F	OPEN	•
12	MSSOE_PNT11	F	OPEN	•
13	MSSOE_PNT12	F	OPEN	•
14	MSSOE_PNT13	F	OPEN	•
15	MSSOE_PNT14	F	OPEN	•
16	MSSOE_PNT15	F	OPEN	•

Back

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 3.2

Point State

This will be either CLOSED or OPEN.

●

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

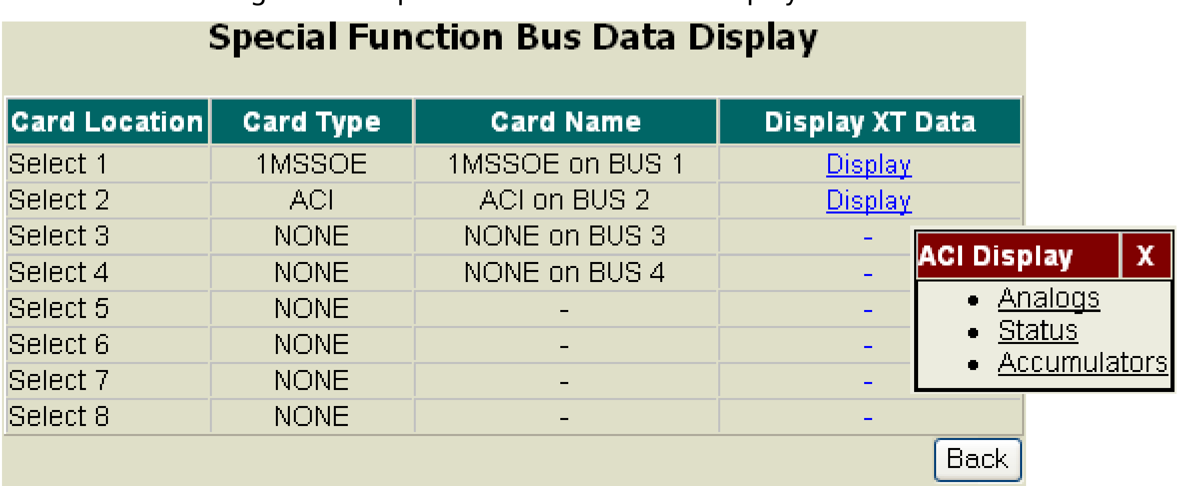
Navigation

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.

3.8.2 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.

Figure 3-12 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.

3.8.2.1 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.

Figure 3-13 ACI Analog Display

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

Point

The point number.

Point Name

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

Point Status

See section 3.2

Point Value

Displays the point value in engineering units.

Navigation

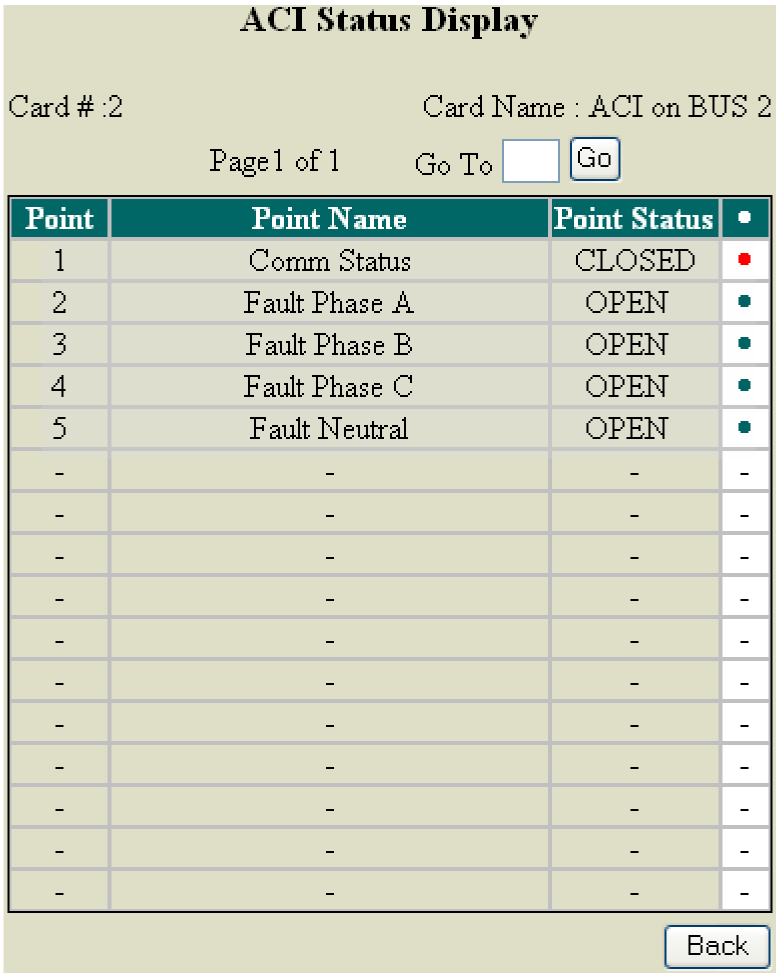
Click <<Prev to navigate to the previous 16 points, if applicable. Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click Next>> to go to the next 16 points, if applicable. Click the Back button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

3.8.2.2 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.

Figure 3-14 ACI Status Display



Point

The point number.

Point Name

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

Point State

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

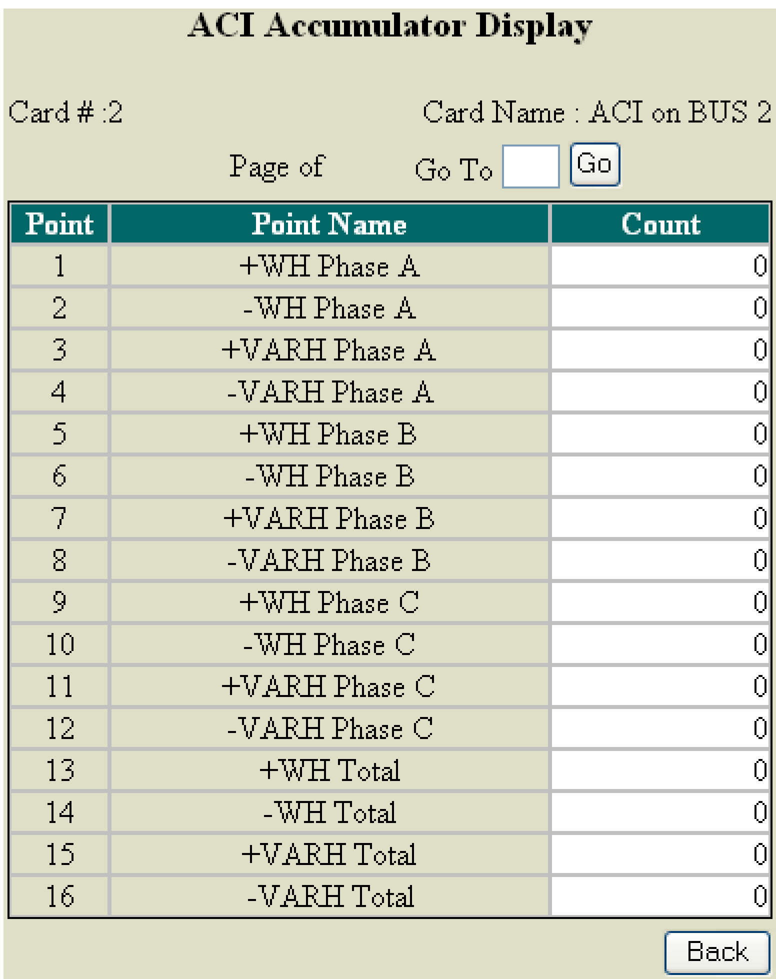
Page *n* of *n* tells you which page (of a total number of pages) you are on. Go to a specific page by typing in the page number, then click the Go button. Click the Back button to go back to the Special Function Bus Data Display screen.

3.8.2.3 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.

Figure 3-15 ACI Accumulator Display



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

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.

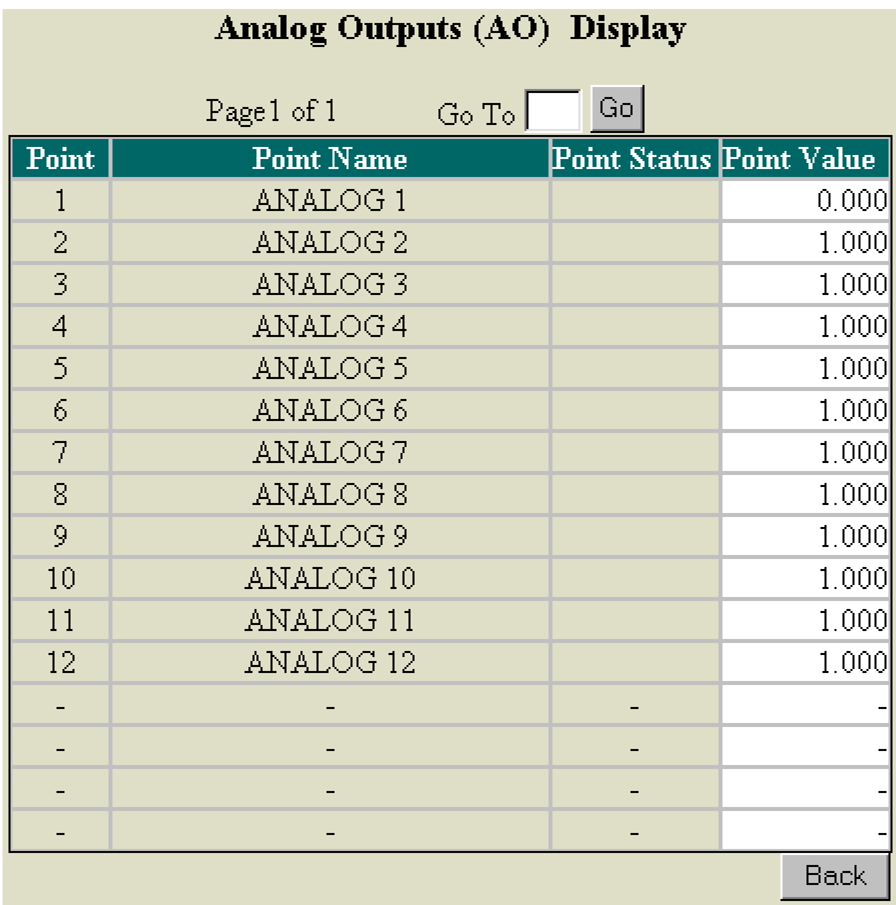
Navigation

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.

3.9 Analog Outputs Data Display

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

Figure 3-16 Analog Outputs (AO) Display



Analog Outputs (AO) Display

Page 1 of 1 Go To Go

Point	Point Name	Point Status	Point Value
1	ANALOG 1		0.000
2	ANALOG 2		1.000
3	ANALOG 3		1.000
4	ANALOG 4		1.000
5	ANALOG 5		1.000
6	ANALOG 6		1.000
7	ANALOG 7		1.000
8	ANALOG 8		1.000
9	ANALOG 9		1.000
10	ANALOG 10		1.000
11	ANALOG 11		1.000
12	ANALOG 12		1.000
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Back

Point

The physical point number.

Point Name

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

Point Status

See section 3.2

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.

3.10 HSPCI Data Display

HSPCI is not supported.

Figure 3-17 HSPCI Message

3.11 Alarm Data Display

When you click on Alarms, you will get a screen similar to the screen below.

Figure 3-18 Alarms Display

Alarms Display

Point	Device Name	Point Name	Point Status	Point State	●	Alarm State	●
1	Hardware DI	DI_PNT_7		OPEN	●	OPEN	●
2	Hardware DI	DI_PNT_11		OPEN	●	OPEN	●

Back

Point

The physical point number of the alarm.

Device Name

The name of the device from which the status point originates.

Point Name

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

Point Status

See Section 3.2

Point State

This is the input to the Alarm. This will be either CLOSE or OPEN.

●

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

Alarm State

This is the output of the Alarm. This will be either CLOSE or OPEN.

●

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

Navigation

Click Back to return to the previous screen.

3.12 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.

Figure 3-19 Display Communication Port Data

Display Communication Port Data

Port Number	RTS	DTR	Name	Protocol	Comm Counters	Display Port Data
Port #1	K	K	Series V to Master	Series V	View	Port Data
Port #2	K	K	Port 2	DNPM	View	Port Data
Port #3	K	K	Port 3	Series V	View	Port Data
Port #4	K	K	Port 4	None	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

Back

Port Number

The physical port number.

RTS and DTR

Request To Send and Data Terminal Ready.

"K" represents Keyed (Radio/Modem).

The RTU firmware asserts/deasserts the signal according to the protocol timing configuration. See Figure 3-20. Typically used as a Radio/Modem key output (Default Setting).

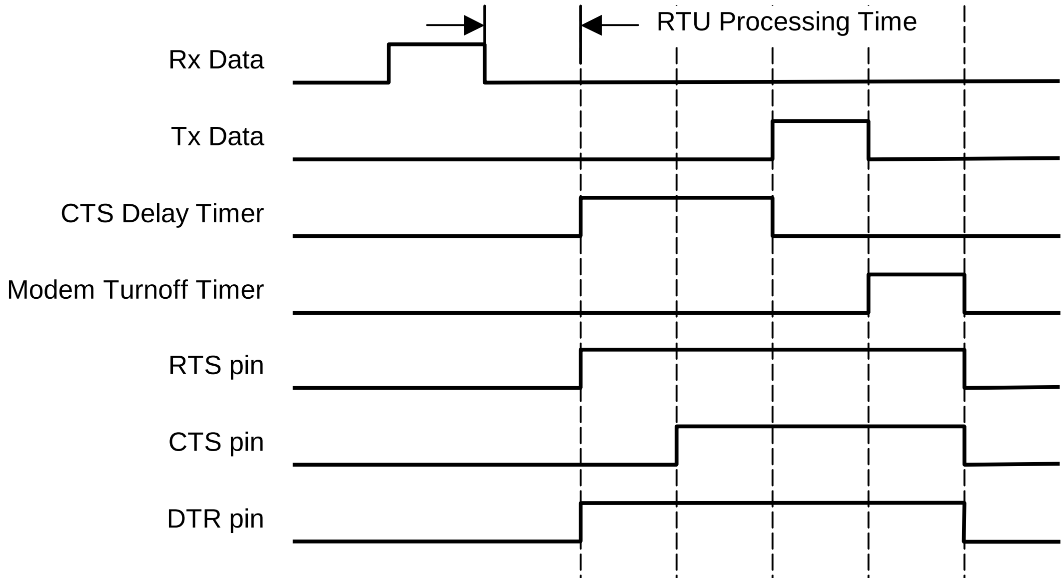
"H" represents Positive RS232 Voltage.

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.

"L" represents Negative RS232 Voltage.

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

Figure 3-20 Communications Timing Diagram



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.

Comm Counters

Click the View button to see the communications counters for the port of interest.

Display Port Data

Click the Port Data button to see port data.

Navigation

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

3.12.1 Internal COMM Status Points

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

Figure 3-21 DNPM COMM Status Point

DNPM Status Inputs Display

Port # : 2 Port Name : Port 2
IED # : 1 IED Name : DNPM_IED_1

Page1 of 1 Go To [ ] Go

Point	Point Name	Point Status	Point State	•
-1	COMM_STS		CLOSED	•
0	IED_STS 0	F	OPEN	•
1	IED_STS 1	F	OPEN	•
2	IED_STS 2	F	OPEN	•
3	IED_STS 3	F	OPEN	•
4	IED_STS 4	F	OPEN	•
5	IED_STS 5	F	OPEN	•
6	IED_STS 6	F	OPEN	•
7	IED_STS 7	F	OPEN	•
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Back

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.

3.12.2 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.

DNPR Binary Inputs Display

Port # : 3 Port Name : Port 3

Page1 of 1 Go To [ ] Go

Point	Device Name	Point Name	Assigned Class	Point Status	Point State	•
0	RTU Internal Status	PRM TIME SRC FAIL	1		OPEN	•
	Global Freeze	Glbl Frz Lockout	1		OPEN	•
	Global Freeze	Glbl Frz Event	1		OPEN	•
3	RTU Internal Status	TIME SRC FAIL	1		OPEN	•

Global Freeze Points

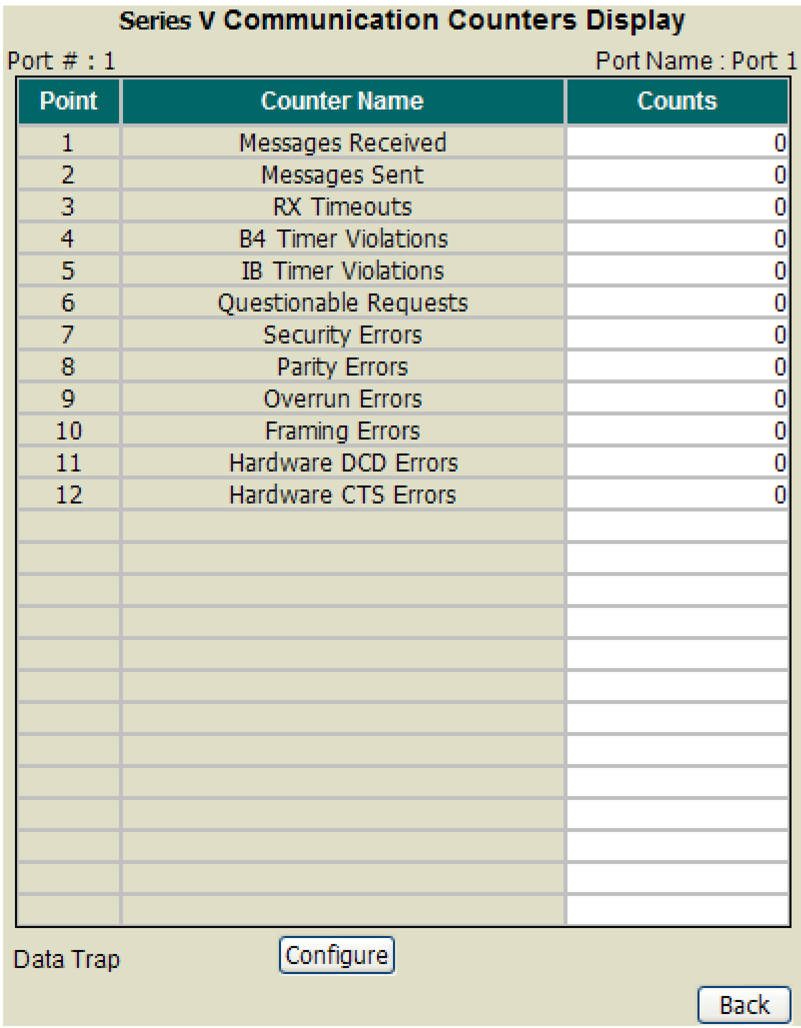
Back

3.12.3 Comm Counters

3.12.3.1 Series 5 Example

Click the View button under Comm Counters for S5R. The Communication Counters Display screen is dynamic and will be continually updated. This screen is provided for troubleshooting communications.

Figure 3-22 S5R Communication Counters Display



Point Number

A logical point number for reference only.

Counter Name

The following counters are monitored:

Messages Received

This indicates the cumulative number of received messages since the last reset or power-up.

Messages Sent

This indicates the cumulative number of transmitted messages since the last reset or power-up.

RX Timeouts

This indicates the cumulative number of times that no response was received since the last reset or power-up. This count can be affected by the setting of the Rx Timeout in configuration.

B4 Timer Violations

This indicates the cumulative number of B4 Timer violations. This count can be affected by the setting of the B4 Time in configuration.

IB Timer Violations

This indicates the cumulative number of Interbyte timer violations since the last reset or power-up. This count can be affected by the setting of the Interbyte Time in configuration.

Questionable Requests

This indicates the cumulative number of questionable requests since the last reset or power-up.

Security Errors

This indicates the cumulative number of security errors since the last reset or power-up.

Parity Errors

This indicates the cumulative number of parity errors since the last reset or power-up.

Overrun Errors

This indicates the cumulative number of overrun errors since the last reset or power-up.

Framing Errors

This indicates the cumulative number of received bytes with framing errors since the last reset or power-up. This can be affected by parity and MTO.

Hardware DCD Errors

This indicates the cumulative number of DCD errors since the last reset or power-up.

Hardware CTS Errors

This indicates the cumulative number of CTS errors since the last reset or power-up.

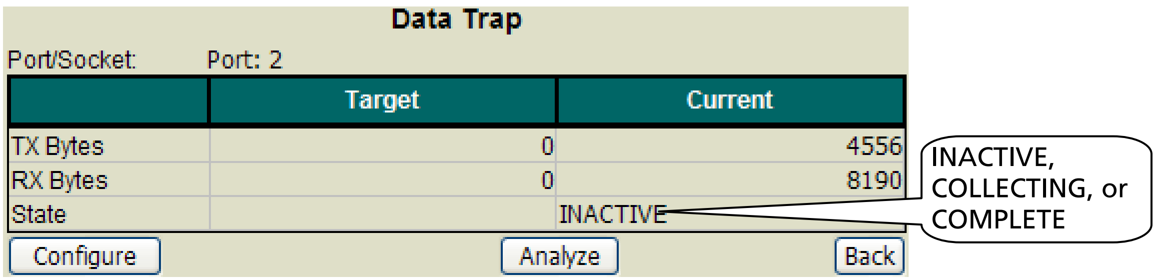
Counts

The counts for each type of Counter.

Data Trap

When you click on Configure for Data Trap, you get the following display.

Figure 3-23 Data Trap Screen



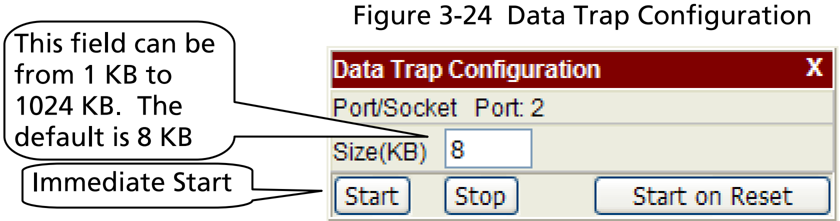
The Data Trap function is always in one of three states, “INACTIVE”, “COLLECTING”” or “COMPLETE”. Configure or Analyze will stop an active collection of data. Data collection can be started and other GUI functions can be performed while the data is being collected.

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 3-24 Data Trap Configuration



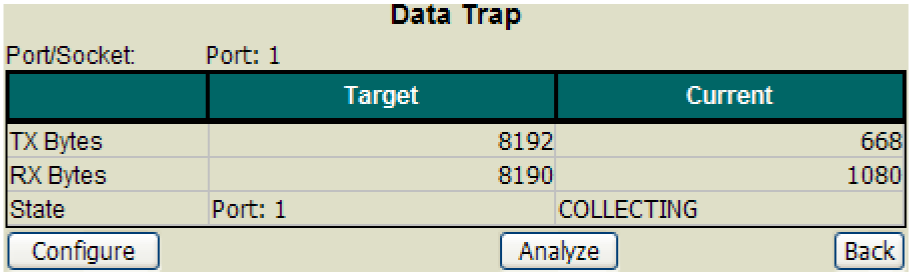
If you use the “Start on Reset” function, after the next reset of the RTU and for only that reset, the Data Trap function will be started with this configuration before any communications is initiated by the RTU. This will allow the user to capture startup sequences (initialization opcodes, deadband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

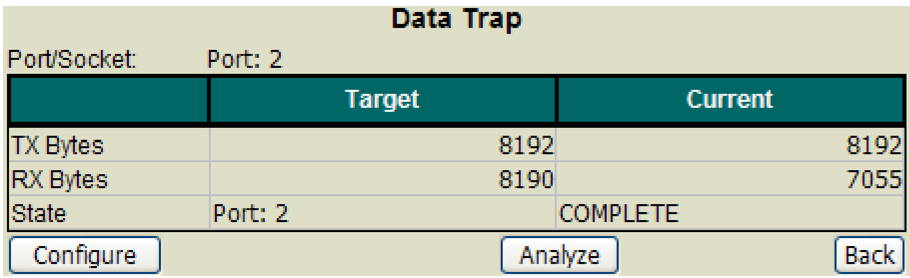
Data Trap will stay in the Collecting state until either of the Target values is reached or the user manually stops the collection.

Figure 3-25 Data Trap COLLECTING



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

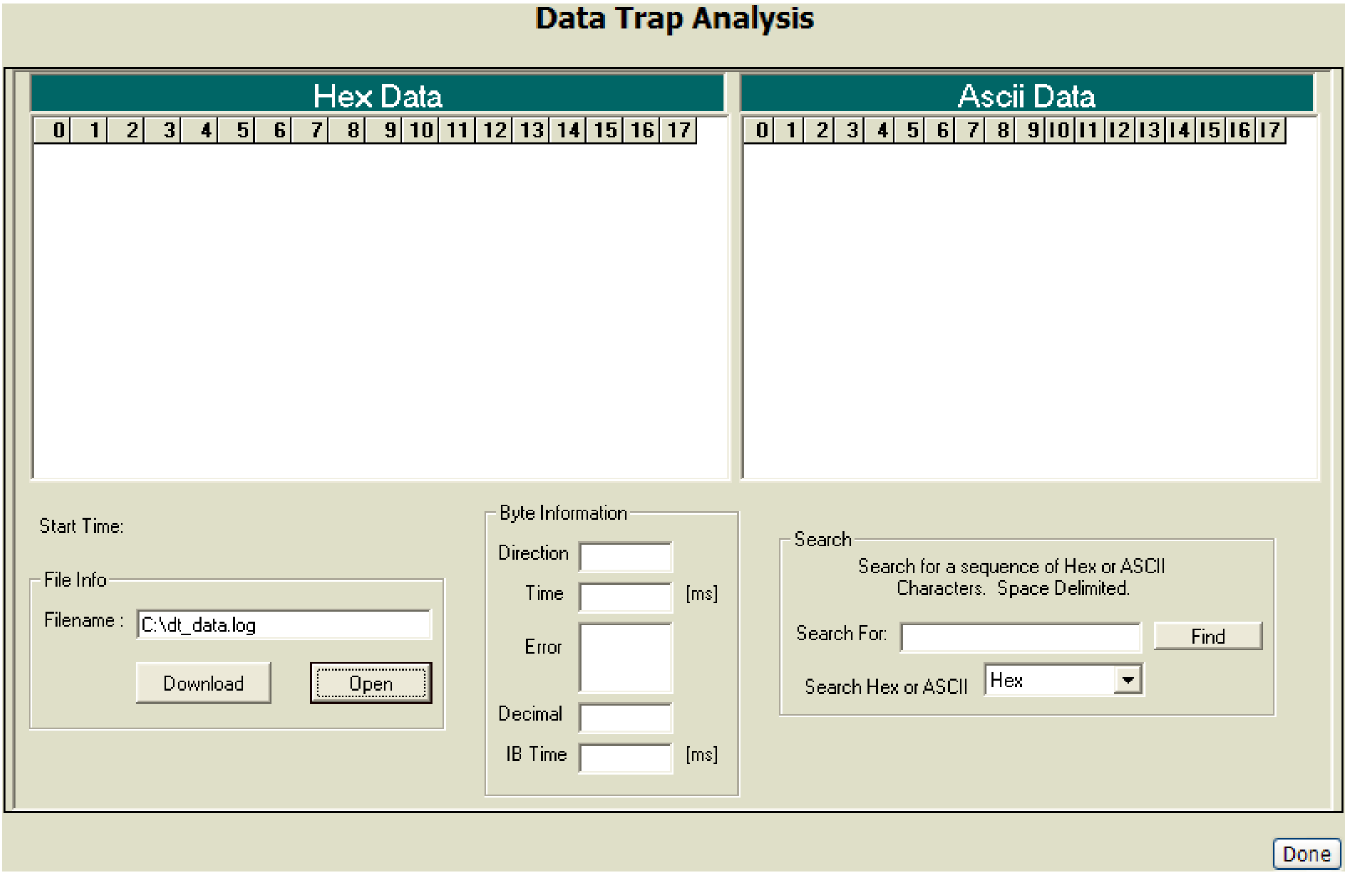
Figure 3-26 Data Trap COMPLETE



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

Click Analyze. If you have never executed a Data Trap analysis before, you will get blank fields under Hex Data and ASCII Data as shown below. The reason why you don't immediately see the results is because the program does not do a real time presentation. The program creates a file with a default name of dt_data.log.

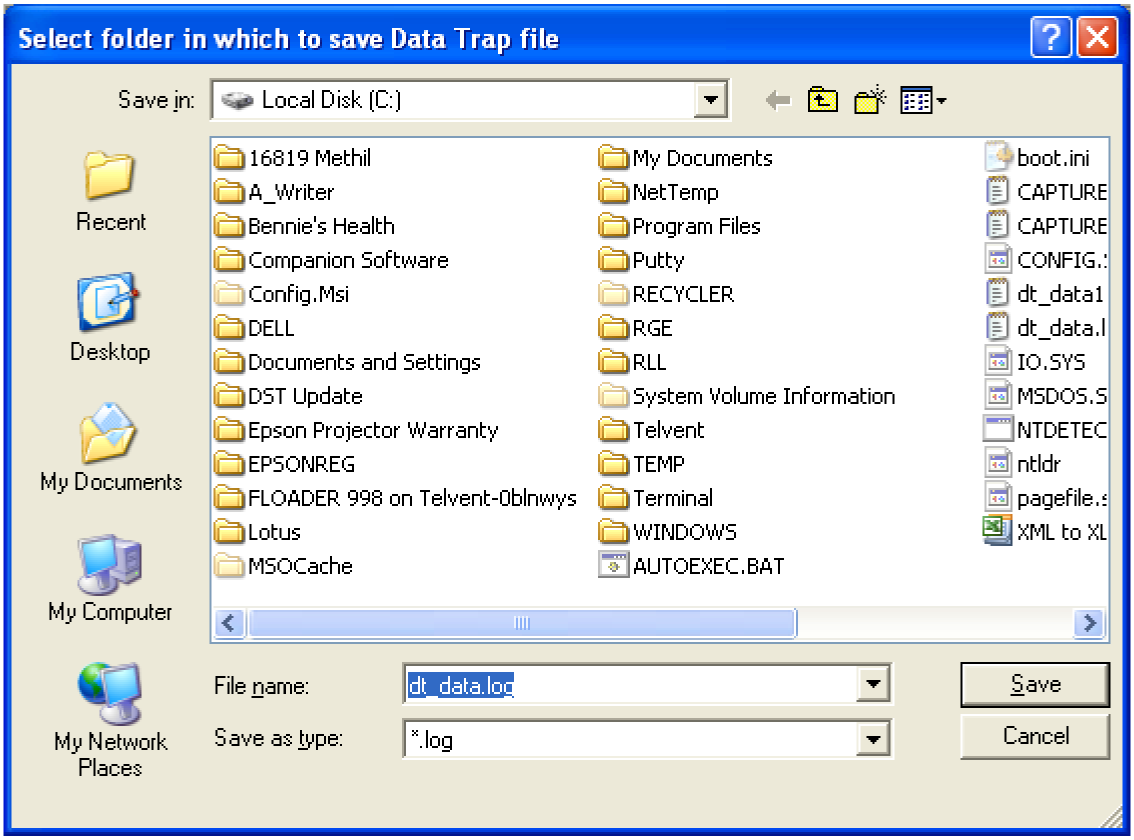
Figure 3-27 Initial Data Trap Analysis Window



To see the results of the analysis, click Download to get the following download window, then click Save.

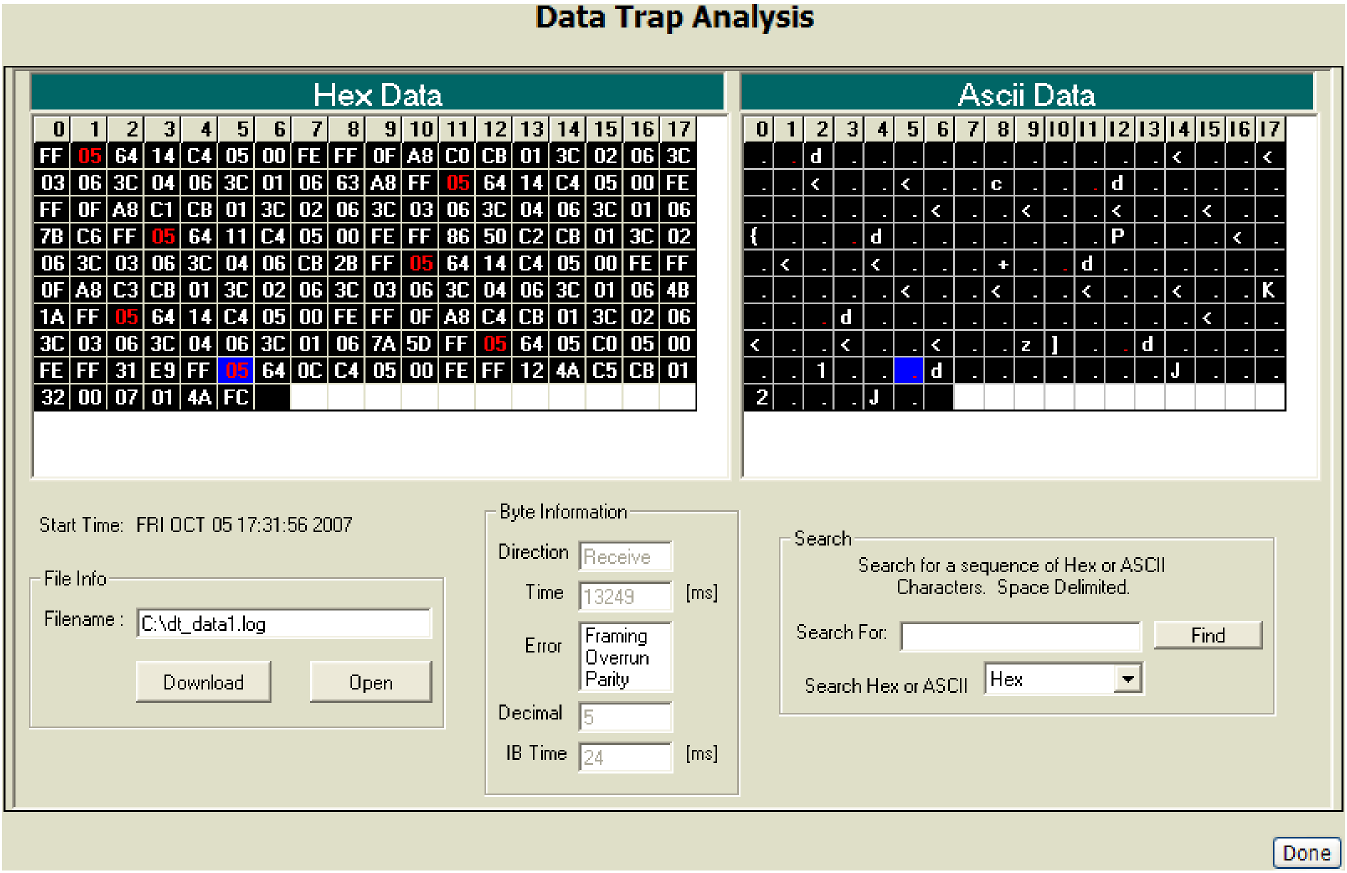
Note: You are responsible for keeping track of the port number and protocol that a log file represents. You may want to name the file to keep track of this. Example: Port4_SEL.log.

Figure 3-28 Download Window



The Data Trap Analysis window will return. Now click Open (you will get another window like above, only it will be for Open). The Data Trap Analysis window will be similar to the one below.

Figure 3-29 Data Trap Analysis Window



Hex data bytes are on the left, ASCII data bytes are on the right. Each block is a byte of data.

When you click in a block, the selected block will turn to a blue background, which simply means it's been selected. White text with black background (34) means the block is part of a Receive string. Black text with white background (A5) means the block is part of a Transmit string.

Further information about each byte may be found under the heading Byte Information. Here you will see (once again) if the block is Transmit or Receive, the Time in milliseconds from the beginning of the sample, and the error codes, as follows:

Framing

Overrun

Parity

Further, the blocks (bytes) that represent errors will be in red (05) against a black background.

The Decimal field reveals the decimal equivalent of the Hex/ASCII byte. IB Time is the Interbyte time before each byte.

On the right-hand side of the window, you may search for a particular byte pattern in either Hex of ASCII.

Note: By default, the program reads the dt_data.log file from your PC. If you want to read, or save to, another named file, you must specify.

Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Back button to return to the previous screen.

3.12.3.2 2179 Example

Click the View button under Comm Counters for 2179. The Communication Counters Display screen is dynamic and will be continually updated. This screen is provided for troubleshooting communications.

Figure 3-30 2179 Communications Counters Display

2179 Communication Counters Display

Port # : 2 Port Name : Port 2

Point	Counter Name	Counts
1	Attempts	0
2	Good Replies	0
3	No Replies	0
4	RX Timeouts	0
5	CRC Errors	0
6	Framing Errors	0
7	Overruns	0
8	Parity Errors	0

Data Trap Configure

IED Comm Counters View

Reset Comm Counters Reset

Back

Point Number

A logical point number for reference only.

Counter Name

The following counters are monitored:

Attempts

This indicates the cumulative number of transmitted messages since the last reset or power-up.

Good Replies

This indicates the cumulative number of transmitted messages that received a response since the last reset or power-up. This count can be affected by the Rx timeout delay value selected.

No Replies

This indicates the cumulative number of transmitted messages that did not receive a response since the last reset or power-up. This count can be affected by the Rx timeout delay value selected.

RX Timeouts

This indicates the cumulative number of times that no response was received since the last reset or power-up. This count can be affected by the setting of the Rx Timeout in configuration.

CRC Errors

This indicates the cumulative number of received messages with CRC errors since the last reset or power-up. This can be affected by parity and MTO.

Framing Errors

This indicates the cumulative number of framing errors since the last reset or power-up. This can be affected by parity.

Overruns

This indicates the cumulative number of over-run errors since the last reset or power-up.

Parity Errors

This indicates the cumulative number of parity errors since the last reset or power-up.

Counts

The counts for each type of Counter.

Data Trap

See Section 3.12.3.1

IED Comm Counters

Click this button to see individual comm. counters for each IED as shown below.

2179 IED Comm Counters Display

Port # : 2 Port Name : Port 2

IED #	IED Name	Messages Sent	Valid Replies	No Replys	Timeouts	Security Errors	Framing Errors	Overrun Errors	Parity Errors
1	2179_IED_1	0	0	0	0	0	0	0	0
2	2179_IED_2	0	0	0	0	0	0	0	0

Done

IED #

The number of the IED

IED Name

The name of the IED

Messages Sent

Messages sent to this IED since the last reset or since the last time the counters were cleared.

Valid Replies

Valid messages received from this IED since the last reset or since the last time the counters were cleared.

No Replies

The number of no replies from this IED since the last reset or since the last time the counters were cleared.

Timeouts

The number of timeouts from this IED since the last reset or since the last time the counters were cleared.

Security Errors

The number of security errors from this IED since the last reset or since the last time the counters were cleared.

Framing Errors

The number of framing errors from this IED since the last reset or since the last time the counters were cleared.

Overrun Errors

The number of overrun errors from this IED since the last reset or since the last time the counters were cleared.

Parity Errors

The number of parity errors from this IED since the last reset or since the last time the counters were cleared.

Reset Comm Counters

Click this button to reset all comm. counters.

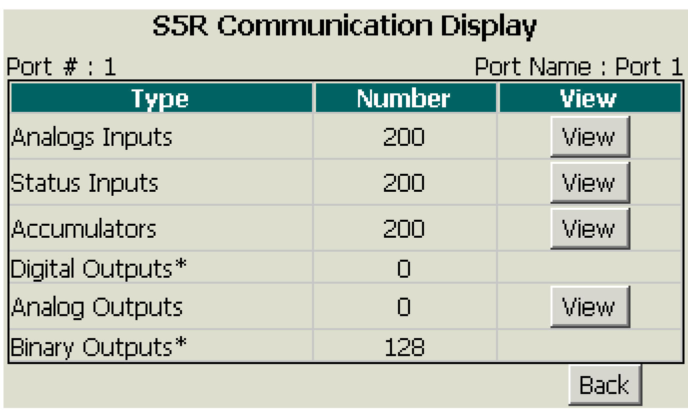
Navigation

Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Back button to return to the previous screen.

3.12.4 Display Port Data, Series 5 Example

From the Display Communication Port Data screen, click on Port Data for the S5R. You will get the screen shown in Figure 3-31.

Figure 3-31 S5R Communication Display



Type

The type of point.

Number

The quantity of each data type as configured in the RTU.

View

The View button allows you to view the current point values.

Navigation

Port # : *n* tells you which port you are looking at. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click the Back button to go back to the Data Display screen.

3.12.4.1 Analogs Inputs, Series 5 Example

From the S5R Communication Display screen, click on View for Analog Inputs.

Figure 3-32 Port Data

S5R Communication Display

Port # : 3 Port Name : Port 3

Type	Number	View
Analogs Inputs	200	View
Status Inputs	200	View
Accumulators	98	View
Digital Outputs*	0	
Analog Outputs	0	View
Binary Outputs*	96	

Back

The inputs are shown in Figure 3-33.

Figure 3-33 Analog Inputs (AI) Display

S5R Analog Inputs Display

Port # : 4 Port Name : Port_4

Page1 of 1 Go To Go

Point	Device Name	Point Name	Deadband	Point Status	Point Value	Point Counts
0	Hardware Analogs	ANALOG 1	7		2.931	1172
1	Hardware Analogs	ANALOG 2	7		0.000	0
2	Hardware Analogs	ANALOG 3	7		0.000	0
3	Hardware Analogs	ANALOG 4	7		0.000	0
4	Hardware Analogs	ANALOG 5	7		0.000	0
5	Hardware Analogs	ANALOG 6	7		0.000	0
6	Hardware Analogs	ANALOG 7	7		0.000	0
7	Hardware Analogs	ANALOG 8	7		0.000	0
8	PoleCat 1	IED_ANALOG 0	7		0.000	0
9	PoleCat 1	IED_ANALOG 1	7		5.213	104
10	PoleCat 1	IED_ANALOG 2	7		-5.203	-104
11	PoleCat 1	IED_ANALOG 3	7		-6.250	-125
12	PoleCat 1	IED_ANALOG 4	7		-6.250	-125
13	PoleCat 1	IED_ANALOG 5	7		-6.250	-125
14	PoleCat 1	IED_ANALOG 6	7		-6.250	-125
15	PoleCat 1	IED_ANALOG 7	7		-6.250	-125

Back

Point

The protocol point number the value is being returned as.

Device Name

The device from which the point originates.

Point Name

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

Deadband

The deadband, which may be downloaded from the Master Station, is used to determine the analog counts that must change from the last reported counts before the point is marked to be reported. Exceptions are reported to the Master Station on the next valid scan for this point. At reset, all deadbands are assigned a value of 7.

Point Status

See Section 3.2.

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:

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 scale factors assigned during Configuration.

Point Counts

The counts to be returned to the Master Station based on the current configuration of the point.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.4.2 Status Inputs, Series 5 Example

Click Status on the Port Data Display to display the Series 5 Status inputs. The display is continually updated to show the present input state.

Figure 3-34 Status Display

S5R Status Inputs Display

Port # : 3 Port Name : Port 3

Page1 of 13 Go To [ ] Go Next>>

Point	Device Name	Point Name	Point Status	Point State	
0	Hardware DI	DI_PNT_1		CLOSE	
1	Hardware DI	DI_PNT_2		OPEN	
2	Hardware DI	DI_PNT_3		OPEN	
3	Hardware DI	DI_PNT_4		OPEN	
4	Hardware DI	DI_PNT_5		OPEN	
5	Hardware DI	DI_PNT_6		OPEN	
6	Hardware DI	DI_PNT_7		OPEN	
7	Hardware DI	DI_PNT_8		OPEN	
8	Hardware DI	DI_PNT_9		OPEN	
9	Hardware DI	DI_PNT_10		OPEN	
10	Hardware DI	DI_PNT_11		OPEN	
11	Hardware DI	DI_PNT_12		OPEN	
12	Hardware DI	DI_PNT_13		OPEN	
13	Hardware DI	DI_PNT_14		OPEN	
14	Hardware DI	DI_PNT_15		OPEN	
15	Hardware DI	DI_PNT_16		OPEN	

Back

Point

The protocol point number the state is being returned as.

Device Name

The name of the device from which the status point originates.

Point Name

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

Point Status

See section 3.2

Point State

This will be either CLOSE 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. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.4.3 Accumulators Inputs, Series 5 Example

Click Accumulators on the Port Data Display to display the Series 5 Accumulator inputs.

Figure 3-35 Accumulator Display

Series V(M) Accumulator Inputs Display

Port # : 4 Port Name : Port 4

IED # : 1 IED Name : SVM_IED_1

Page1 of 3 Go To Go Next>>

Point	Point Name	Point Status	Count
0	IED_ACC 0	F	0
1	IED_ACC 1	F	0
2	IED_ACC 2	F	0
3	IED_ACC 3	F	0
4	IED_ACC 4	F	0
5	IED_ACC 5	F	0
6	IED_ACC 6	F	0
7	IED_ACC 7	F	0
8	IED_ACC 8	F	0
9	IED_ACC 9	F	0
10	IED_ACC 10	F	0
11	IED_ACC 11	F	0
12	IED_ACC 12	F	0
13	IED_ACC 13	F	0
14	IED_ACC 14	F	0
15	IED_ACC 15	F	0

Back

Point

The protocol point number the value is being returned as.

Point Name

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

Point Status

See section 3.2

Count

The count of the accumulator at the time the Master asks for a freeze.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.4.3. Digital Outputs, Series 5 Example

Click Analog Outputs on the Port Data Display to display the Series 5 analog outputs.

Figure 3-36 Digital Outputs Display

Series V Digital Outputs Display

Port # : 5 Port Name : Port 5

Page1 of 1 Go To Go

Pnt	Device Name	Point Name	Point Status	Point State	●
0	ISaGRAF_IF	RLL_DO 0	U	OPEN	●
1	ISaGRAF_IF	RLL_DO 1	U	OPEN	●
2	ISaGRAF_IF	RLL_DO 2	U	OPEN	●
3	ISaGRAF_IF	RLL_DO 3	U	OPEN	●
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Back

Point

The protocol point number as it is written from the MTU.

Device Name

The name of the device from which the point originates.

Point Name

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

Point Status

See section 3.2

Point State

This will be either CLOSE or OPEN.

●

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

3.12.4.4 Analog Outputs, Series 5 Example

Click Analog Outputs on the Port Data Display to display the Series 5 analog outputs.

Figure 3-37 Analog Outputs Display

S5R Analog Outputs Display

Port # : 9 Port Name : Port9

Page1 of 2 Go To Go Next>>

Point	Device Name	Point Name	Point Status	Point Value	Point Counts
0	Base Board AO	ANA_OUT 1		-10.000	0
1	Base Board AO	ANA_OUT 2		-5.000	0
2	Base Board AO	ANA_OUT 3		-5.000	0
3	Base Board AO	ANA_OUT 4		-5.000	0
4	Base Board AO	ANA_OUT 5		-5.000	0
5	Base Board AO	ANA_OUT 6		-5.000	0
6	Base Board AO	ANA_OUT 7		-5.000	0
7	Base Board AO	ANA_OUT 8		-5.000	0
8	Base Board AO	ANA_OUT 9	F	-5.000	0
9	Base Board AO	ANA_OUT 10	F	-5.000	0
10	Base Board AO	ANA_OUT 11	F	-5.000	0
11	Base Board AO	ANA_OUT 12	F	-5.000	0
12	No Device	Spare		0.000	0
13	No Device	Spare		0.000	0
14	No Device	Spare		0.000	0
15	No Device	Spare		0.000	0

Back

Point

The protocol point number as it is written from the MTU.

Device Name

The name of the device from which the point originates.

Point Name

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

Point Status

See section 3.2

Point Value

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

Point Counts

The last raw count value sent from the RTU.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.4.5 Binary Outputs, Series 5 Example

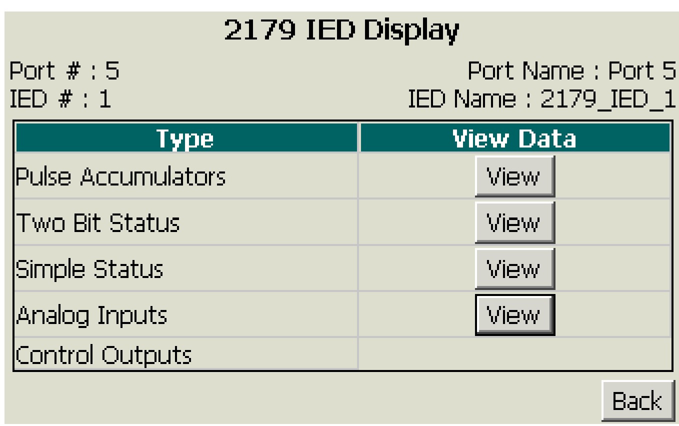
The current state of Binary Outputs are not viewable.

3.12.5 2179 Example

3.12.5.1 Pulse Accumulators, 2179 Example

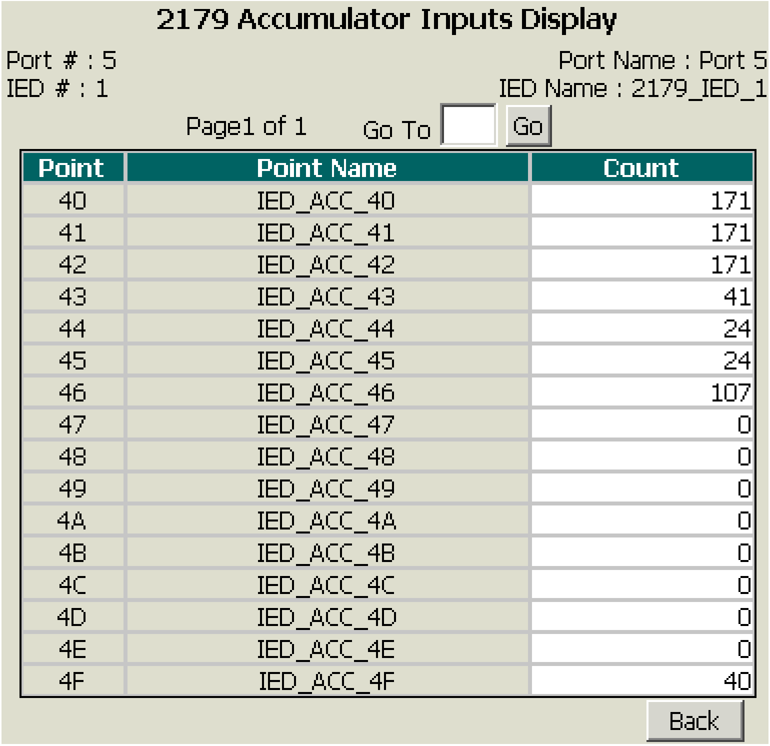
From the 2179 IED Display screen, click on View for Pulse Accumulators. The panel as shown in Figure 3-38 will appear. From this panel, you make the selection of what data type to display.

Figure 3-38 Port Data



Click View on the Pulse Accumulator row to Display the Accumulator Inputs. The inputs are shown in Figure 3-39.

Figure 3-39 2179 Accumulator Inputs Display



2179 Accumulator Inputs Display

Port # : 5 Port Name : Port 5
IED # : 1 IED Name : 2179_IED_1

Page1 of 1 Go To Go

Point	Point Name	Count
40	IED_ACC_40	171
41	IED_ACC_41	171
42	IED_ACC_42	171
43	IED_ACC_43	41
44	IED_ACC_44	24
45	IED_ACC_45	24
46	IED_ACC_46	107
47	IED_ACC_47	0
48	IED_ACC_48	0
49	IED_ACC_49	0
4A	IED_ACC_4A	0
4B	IED_ACC_4B	0
4C	IED_ACC_4C	0
4D	IED_ACC_4D	0
4E	IED_ACC_4E	0
4F	IED_ACC_4F	40

Back

Point

The point number.

Point Name

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

Count

The counts coming from the IED based on the current configuration of the point.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.5.2 Two Bit Status, 2179 Example

Click View on the Two Bit Status row on the Port Data Display to display the 2179 two bit status inputs. The display is continually updated to show the present input state.

Figure 3-40 2179 Two Bit Status Display

2179 Two Bit Status Inputs Display

Port # : 5 Port Name : Port 5
IED # : 1 IED Name : 2179_IED_1

Page1 of 1 Go To Go

Point	Point Name	Point Status	Point State	•
0-0	IED_MCD_00-0		CLOSED	•
0-1	IED_MCD_00-1		CLOSED	•
0-2	IED_MCD_00-2		CLOSED	•
0-3	IED_MCD_00-3		OPEN	•
0-4	IED_MCD_00-4		OPEN	•
0-5	IED_MCD_00-5		OPEN	•
0-6	IED_MCD_00-6		OPEN	•
0-7	IED_MCD_00-7		OPEN	•
1-0	IED_MCD_01-0		CLOSED	•
1-1	IED_MCD_01-1		CLOSED	•
1-2	IED_MCD_01-2		CLOSED	•
1-3	IED_MCD_01-3		OPEN	•
1-4	IED_MCD_01-4		OPEN	•
1-5	IED_MCD_01-5		OPEN	•
1-6	IED_MCD_01-6		OPEN	•
1-7	IED_MCD_01-7		OPEN	•

Back

Point

The point number of the change bit.

Point Name

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

Point Status

See section 3.2

Point State

This is the state of the status bit. This will be either CLOSED or OPEN.

●

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

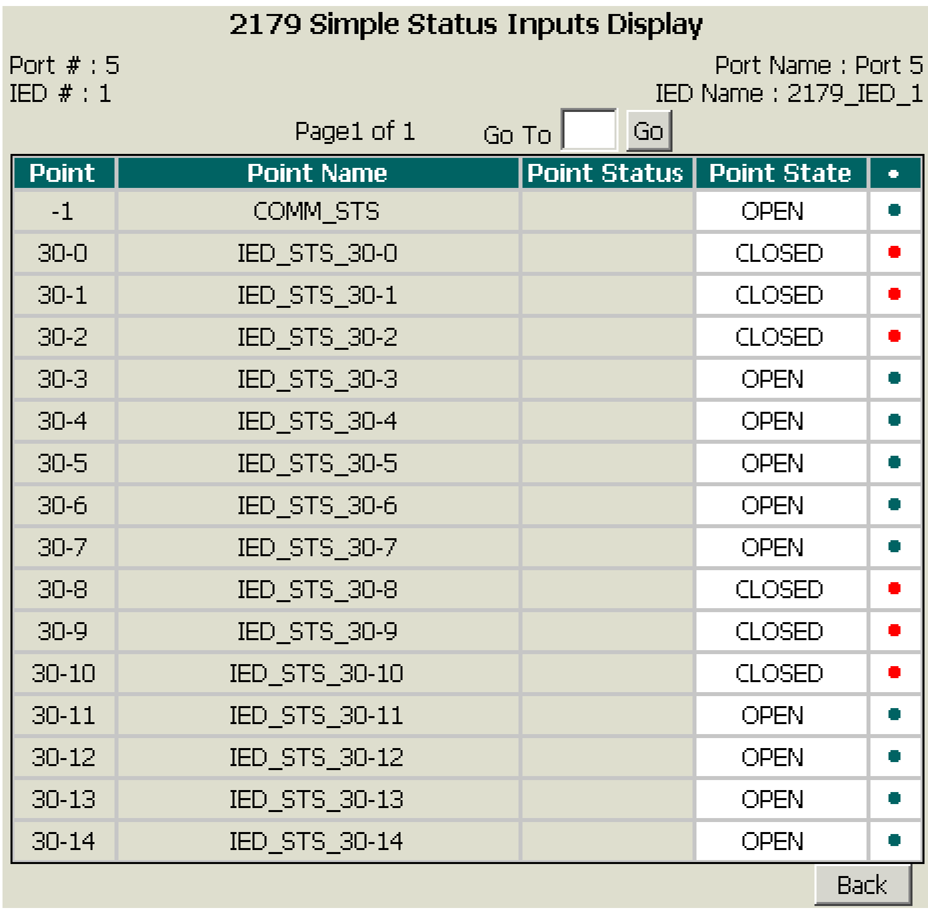
Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.5.3 Simple Status, 2179 Example

Click View on the Simple Status row on the Port Data Display to display the 2179 Simple Status inputs. The display is continually updated to show the present input state.

Figure 3-41 2179 Simple Status Display



2179 Simple Status Inputs Display

Port # : 5 Port Name : Port 5
IED # : 1 IED Name : 2179_IED_1

Page1 of 1 Go To Go

Point	Point Name	Point Status	Point State	•
-1	COMM_STS		OPEN	•
30-0	IED_STS_30-0		CLOSED	•
30-1	IED_STS_30-1		CLOSED	•
30-2	IED_STS_30-2		CLOSED	•
30-3	IED_STS_30-3		OPEN	•
30-4	IED_STS_30-4		OPEN	•
30-5	IED_STS_30-5		OPEN	•
30-6	IED_STS_30-6		OPEN	•
30-7	IED_STS_30-7		OPEN	•
30-8	IED_STS_30-8		CLOSED	•
30-9	IED_STS_30-9		CLOSED	•
30-10	IED_STS_30-10		CLOSED	•
30-11	IED_STS_30-11		OPEN	•
30-12	IED_STS_30-12		OPEN	•
30-13	IED_STS_30-13		OPEN	•
30-14	IED_STS_30-14		OPEN	•

Back

Point

The point number.

Point Name

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

Point Status

See section 3.2

Point State

This will be either CLOSED or OPEN.

●

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

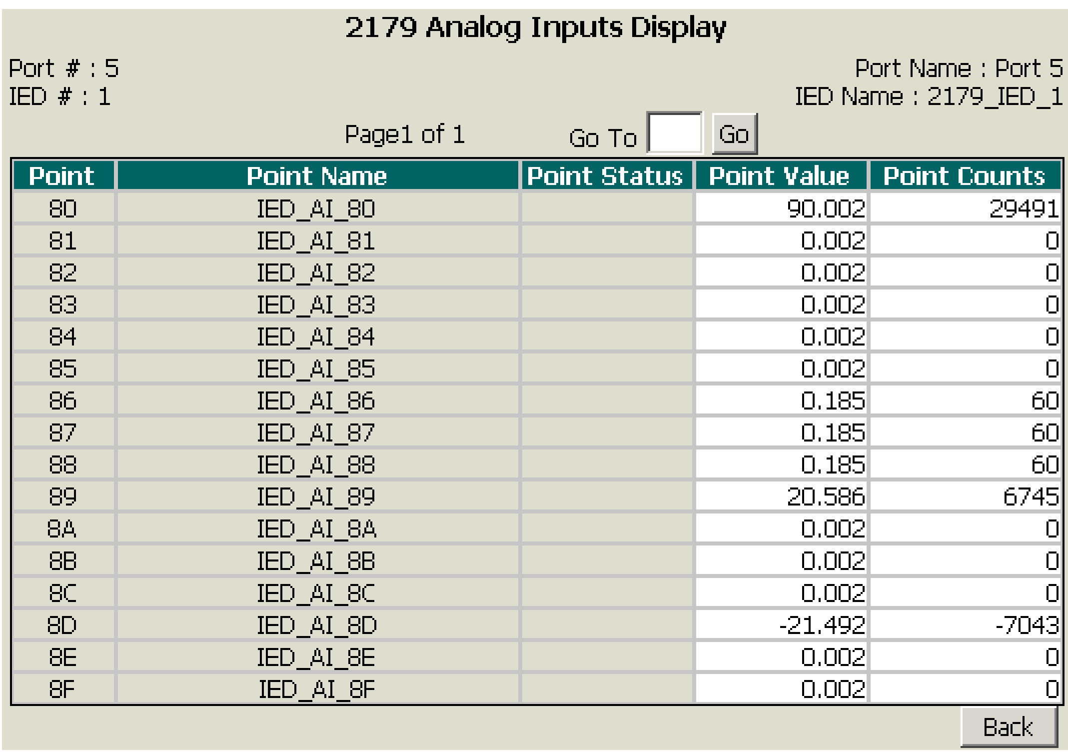
Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.5.4 Analog Inputs, 2179 Example

Click View on the Analog Inputs row on the Port Data Display to display the 2179 analog inputs.

Figure 3-42 2179 Analog Inputs Display



2179 Analog Inputs Display

Port # : 5 Port Name : Port 5
IED # : 1 IED Name : 2179_IED_1

Page1 of 1 Go To Go

Point	Point Name	Point Status	Point Value	Point Counts
80	IED_AI_80		90.002	29491
81	IED_AI_81		0.002	0
82	IED_AI_82		0.002	0
83	IED_AI_83		0.002	0
84	IED_AI_84		0.002	0
85	IED_AI_85		0.002	0
86	IED_AI_86		0.185	60
87	IED_AI_87		0.185	60
88	IED_AI_88		0.185	60
89	IED_AI_89		20.586	6745
8A	IED_AI_8A		0.002	0
8B	IED_AI_8B		0.002	0
8C	IED_AI_8C		0.002	0
8D	IED_AI_8D		-21.492	-7043
8E	IED_AI_8E		0.002	0
8F	IED_AI_8F		0.002	0

Back

Point

The point number.

Point Name

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

Point Status

See section 3.2

Point Value

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

Point Counts

The raw value being returned from the IED.

Navigation

Click <<Prev to navigate to the previous 16 points, if applicable. Port # : *n* tells you which port you are looking at. 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. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click Next>> to go to the next 16 points, if applicable. Click the Back button to go back to the Data Display screen.

3.12.5.5 Control Outputs, 2179 Example

The present state of Control Outputs is not viewable.

3.13 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.

Figure 3-43 Display Ethernet Communication Port Data

Display Communication Port Data

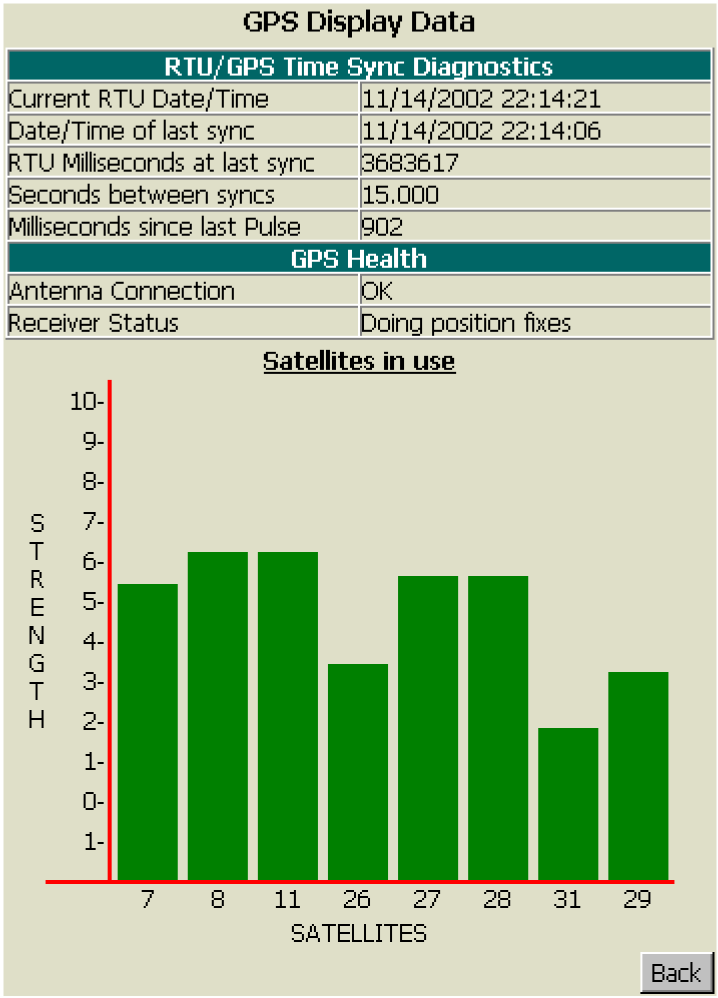
Socket Number	Name	Protocol	Comm Counters	Display Port Data
Socket # 1	Socket 1	DNPR	View	Port Data
Socket # 2	Socket 2	DNPM	View	Port Data
Socket # 3	Socket 3	None	View	Port Data
Socket # 4	Socket 4	None	View	Port Data
Socket # 5	Socket 5	None	View	Port Data
Socket # 6	Socket 6	None	View	Port Data
Socket # 7	Socket 7	None	View	Port Data
Socket # 8	Socket 8	None	View	Port Data

Back

3.14 GPS Data Display

Under Display Data tab, click GPS. The GPS Display should look similar to Figure 3-44 if you have enabled the GPS as explained in the Configuration chapter.

Figure 3-44 GPS Display



GPS Display Data

RTU/GPS Time Sync Diagnostics	
Current RTU Date/Time	11/14/2002 22:14:21
Date/Time of last sync	11/14/2002 22:14:06
RTU Milliseconds at last sync	3683617
Seconds between syncs	15.000
Milliseconds since last Pulse	902
GPS Health	
Antenna Connection	OK
Receiver Status	Doing position fixes

3.14.1 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.

3.14.2 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 3-44 to Figure 3-45. The possible messages are

"OK"
"Short or open"

Receiver Status

Reports the Receiver Status. Compare Figure 3-44 to Figure 3-45. 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"

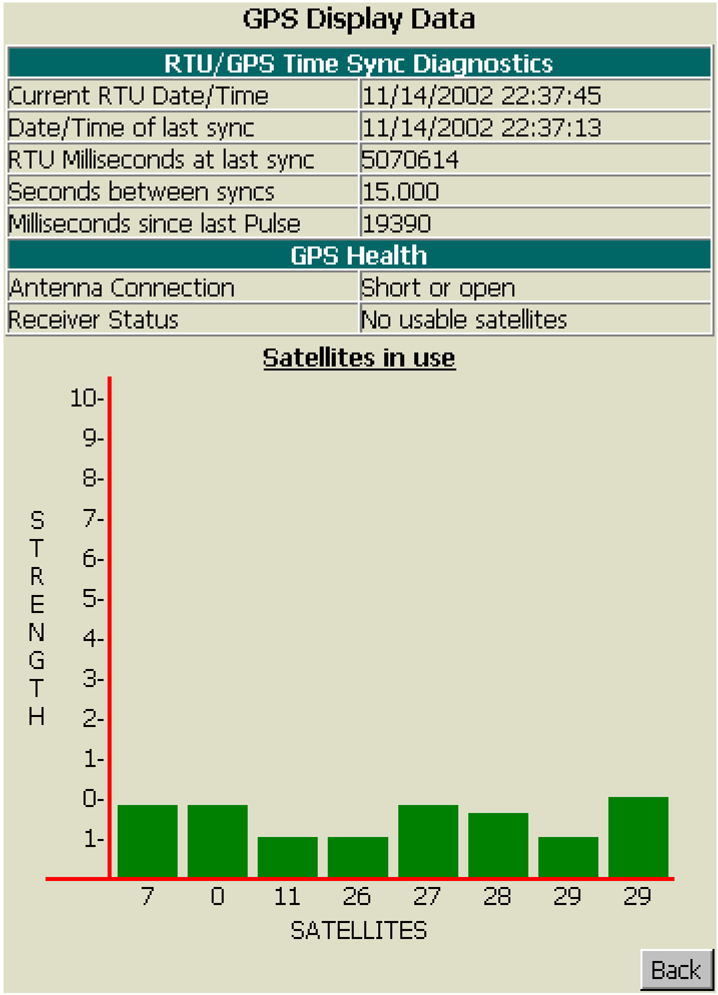
Satellites in use

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 3-45 GPS Display With Antenna Disconnected



3.15 RLL Data Display

Please see the following manual for further information:

config@WEB Relay Ladder Logic Manual, Part # S2200-AAA-00003

3.16 Applications Data Display

Please refer to the config@WEB Applications manual.

3.17 Logs

3.17.1 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 3-46 SOE Log Display

Sequence Of Events Log

Event	Date/Time		Device Name	Point Name	State
1	07/23/2007	07:38:22.591	RTU Internal Status	CONFIG CHG	1
2	07/23/2007	07:38:00.271	RTU Internal Status	LOGGED IN	1
3	07/23/2007	06:58:54.001	RTU Internal Status	RLL RUN	1
4	07/23/2007	06:58:54.001	RTU Internal Status	IED FAIL	1
5	07/23/2007	06:58:54.000	RTU Internal Status	TIME SRC FAIL	0
6	07/23/2007	06:58:54.000	RTU Internal Status	PRM TIME SRC FAIL	0
7	07/23/2007	06:23:04.044	RTU Internal Status	LOGGED IN	1
8	07/20/2007	12:55:40.642	RTU Internal Status	LOGGED IN	0
9	07/20/2007	12:53:59.327	RTU Internal Status	LOGGED IN	1
10	07/20/2007	12:39:47.001	RTU Internal Status	RLL RUN	1
11	07/20/2007	12:39:47.001	RTU Internal Status	IED FAIL	1
12	07/20/2007	12:39:47.000	RTU Internal Status	TIME SRC FAIL	0
13	07/20/2007	12:39:47.000	RTU Internal Status	PRM TIME SRC FAIL	0
14	07/20/2007	12:36:25.500	DNPM_IED_1 Sta49	COMM_STS	1
15	07/20/2007	12:15:51.053	RTU Internal Status	LOGGED IN	0
16	07/20/2007	11:41:28.894	RTU Internal Status	LOGGED IN	1
17	07/20/2007	11:18:56.217	RTU Internal Status	ETHERNET LINK	1
18	07/20/2007	11:17:58.860	DNPM_IED_1 Sta49	IED_STS 47	1
19	07/20/2007	11:17:58.860	DNPM_IED_1 Sta49	IED_STS 46	1

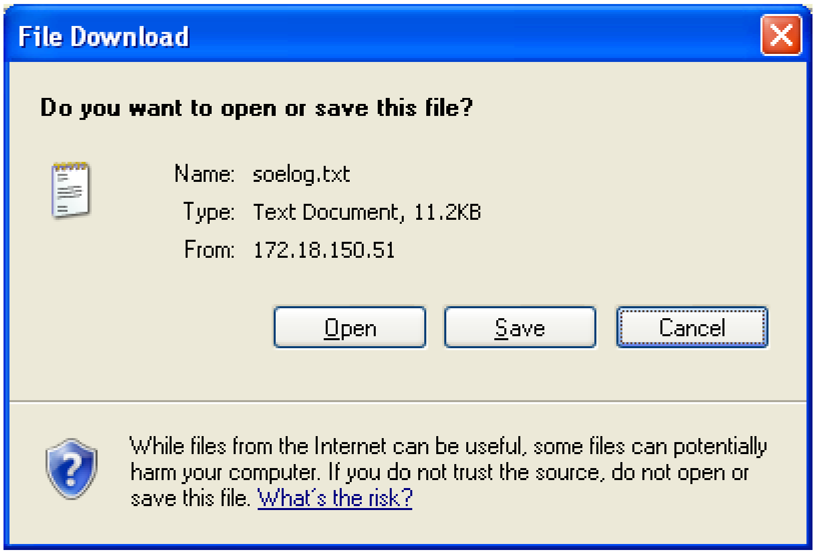
Download Back

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.

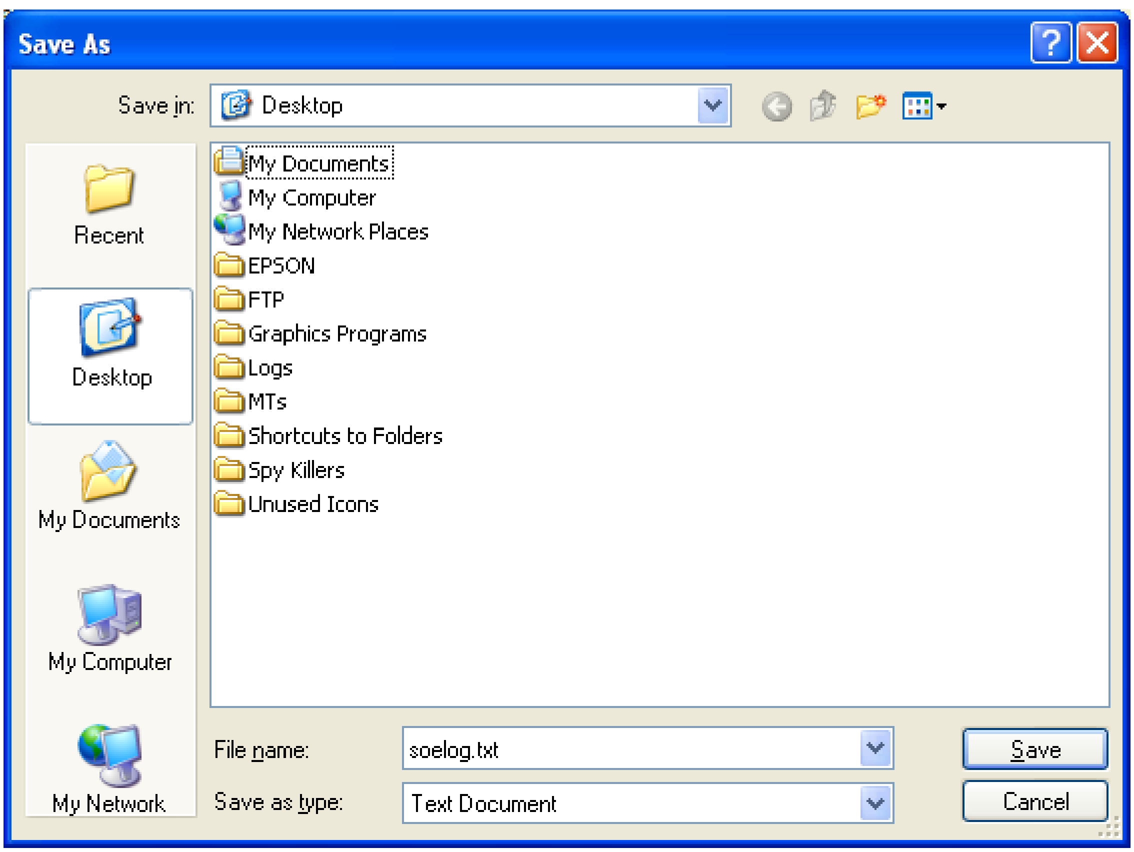
You will be given the choice of opening the log, or saving the log as shown below.

Figure 3-47 File Download



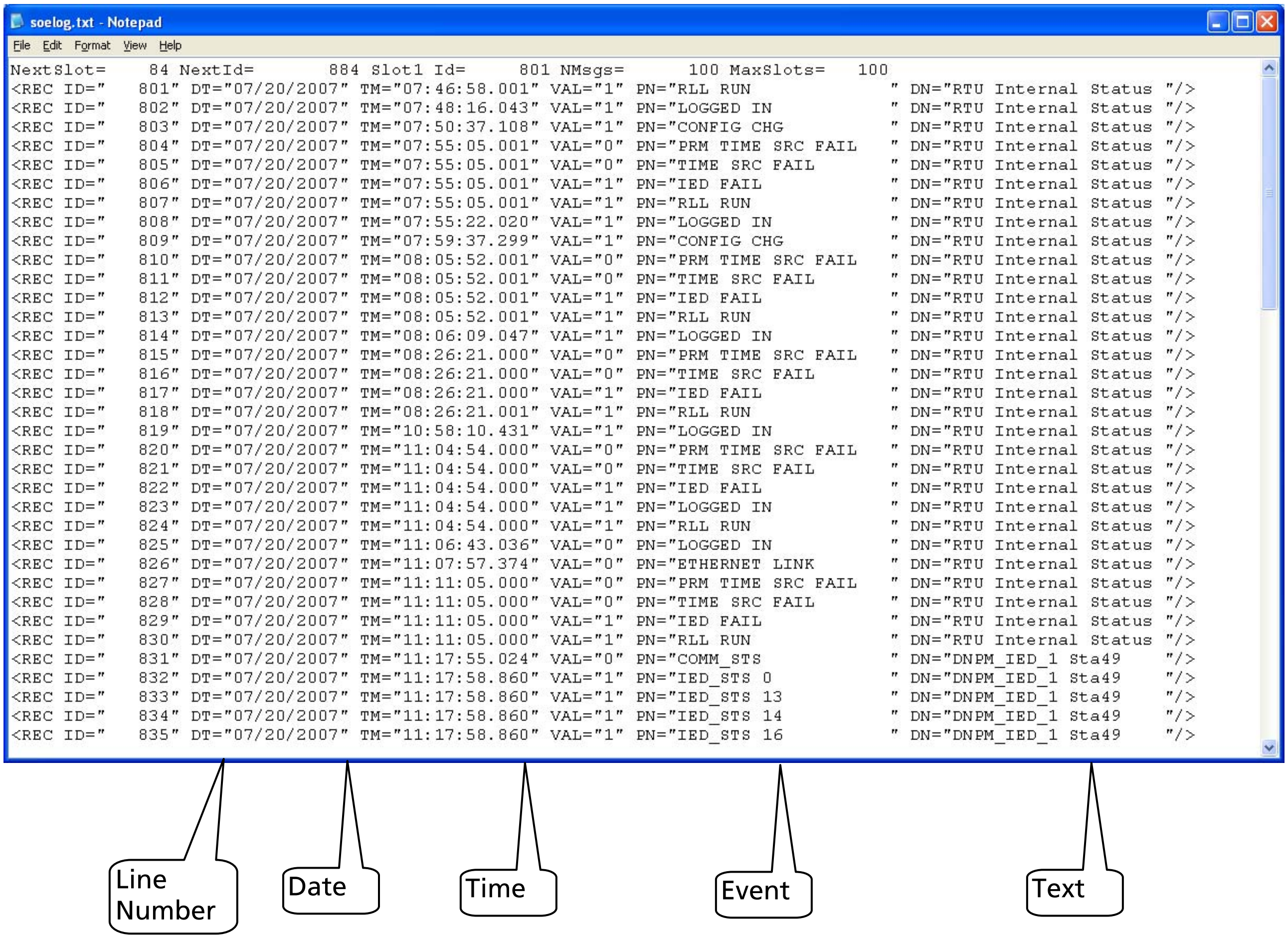
If you save the file, you will get a dialog box as shown.

Figure 3-48 Save As



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

Figure 3-49 SOE log File

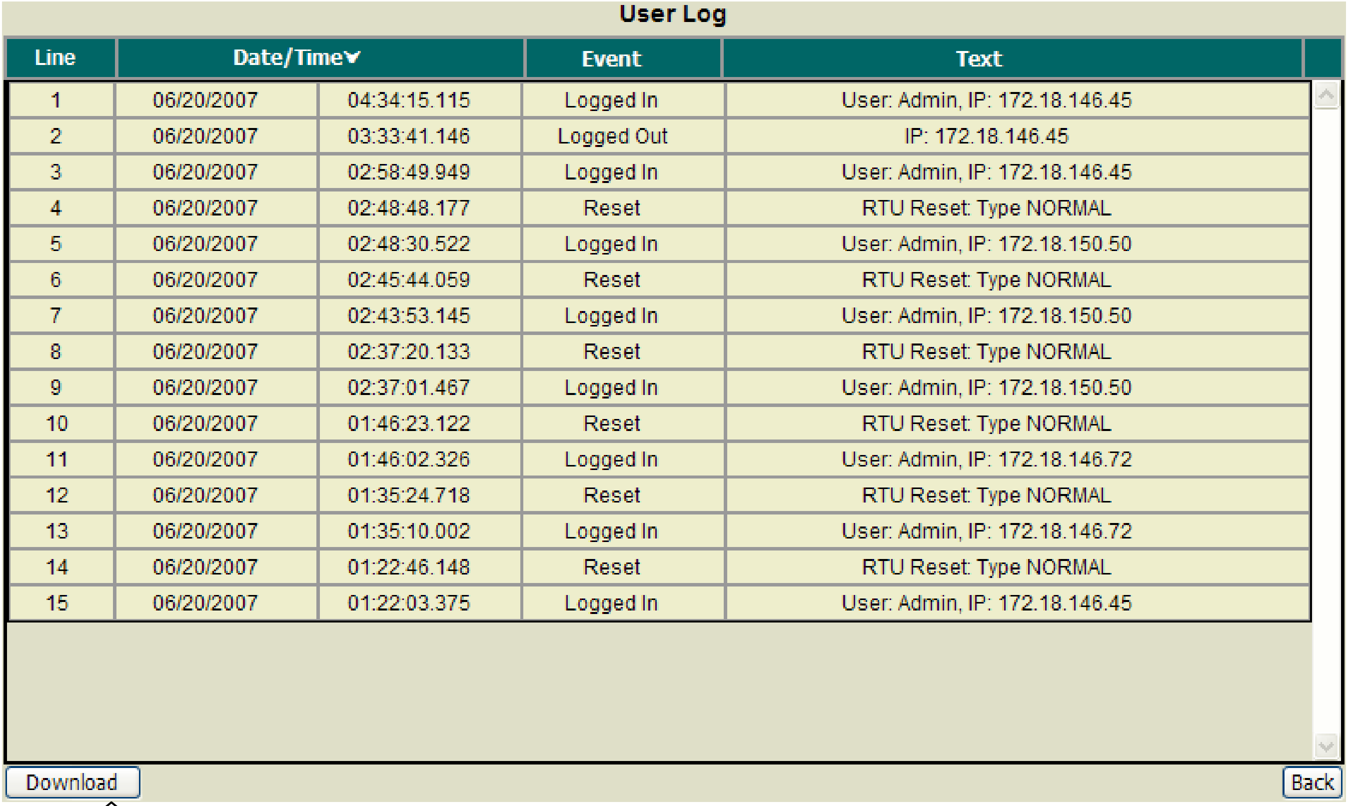


```
soelog.txt - Notepad
File Edit Format View Help
NextSlot=    84 NextId=       884 Slot1 Id=      801 NMsgs=      100 MaxSlots=   100
<REC ID="    801" DT="07/20/2007" TM="07:46:58.001" VAL="1" PN="RLL RUN              " DN="RTU Internal Status "/>
<REC ID="    802" DT="07/20/2007" TM="07:48:16.043" 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    "/>
```

3.17.2 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 3-50 User Log Display


User Log

Line	Date/Time		Event	Text
1	06/20/2007	04:34:15.115	Logged In	User: Admin, IP: 172.18.146.45
2	06/20/2007	03:33:41.146	Logged Out	IP: 172.18.146.45
3	06/20/2007	02:58:49.949	Logged In	User: Admin, IP: 172.18.146.45
4	06/20/2007	02:48:48.177	Reset	RTU Reset: Type NORMAL
5	06/20/2007	02:48:30.522	Logged In	User: Admin, IP: 172.18.150.50
6	06/20/2007	02:45:44.059	Reset	RTU Reset: Type NORMAL
7	06/20/2007	02:43:53.145	Logged In	User: Admin, IP: 172.18.150.50
8	06/20/2007	02:37:20.133	Reset	RTU Reset: Type NORMAL
9	06/20/2007	02:37:01.467	Logged In	User: Admin, IP: 172.18.150.50
10	06/20/2007	01:46:23.122	Reset	RTU Reset: Type NORMAL
11	06/20/2007	01:46:02.326	Logged In	User: Admin, IP: 172.18.146.72
12	06/20/2007	01:35:24.718	Reset	RTU Reset: Type NORMAL
13	06/20/2007	01:35:10.002	Logged In	User: Admin, IP: 172.18.146.72
14	06/20/2007	01:22:46.148	Reset	RTU Reset: Type NORMAL
15	06/20/2007	01:22:03.375	Logged In	User: Admin, IP: 172.18.146.45

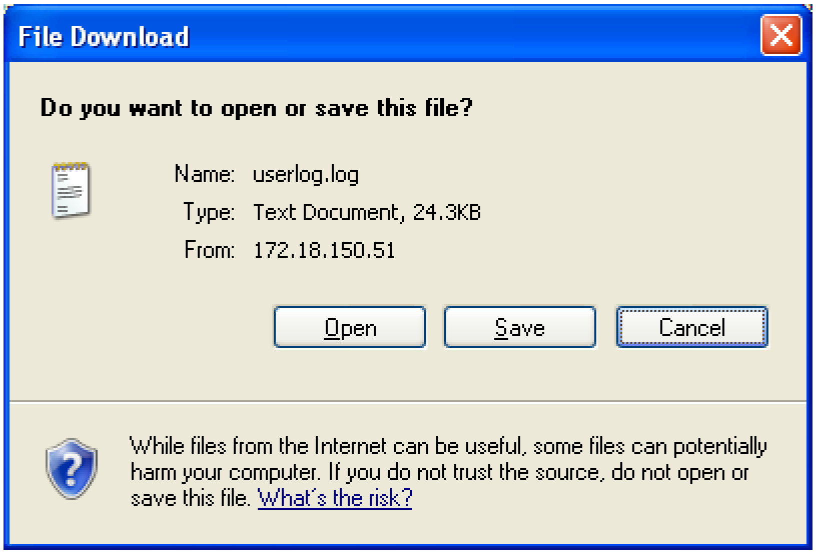
Download

Back

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

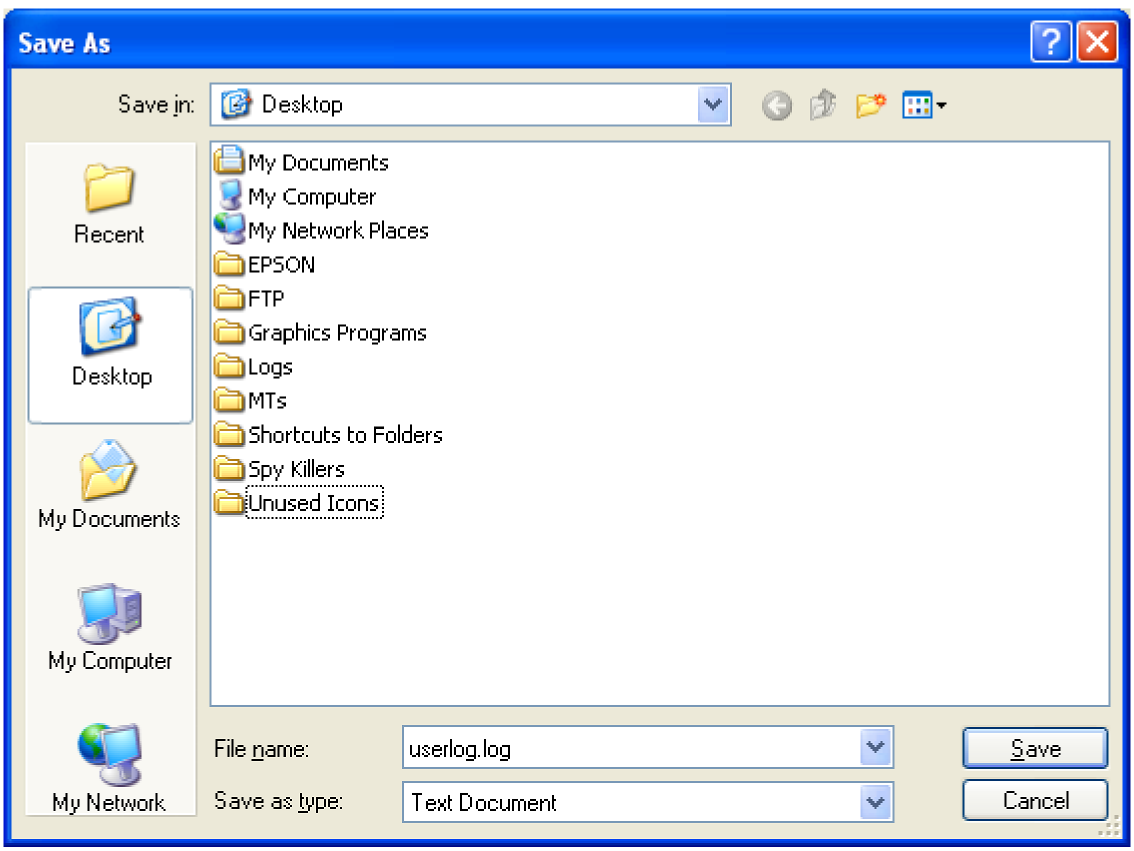
You will be given the choice of opening the log, or saving the log as shown below.

Figure 3-51 File Download



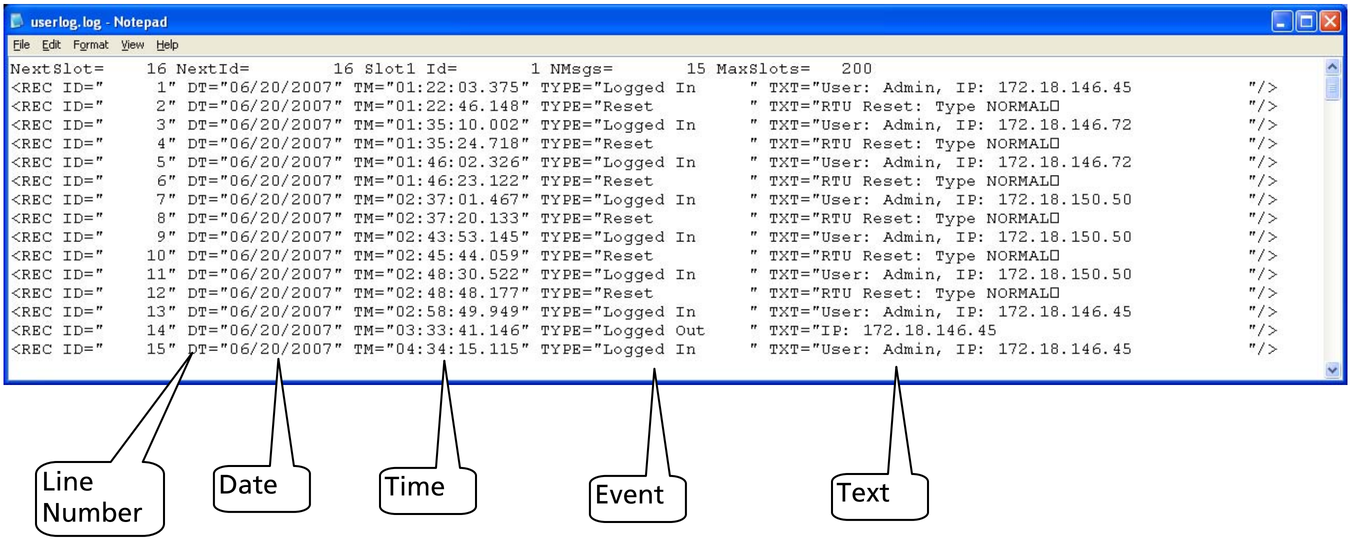
If you save the file, you will get a dialog box as shown.

Figure 3-52 Save As



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

Figure 3-53 User.log File



userlog.log - Notepad

File Edit Format View Help

```
NextSlot=     16 NextId=        16 Slot1 Id=       1 NMsgs=       15 MaxSlots=   200
<REC ID="     1" DT="06/20/2007" TM="01:22:03.375" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.146.45           "/>
<REC ID="     2" DT="06/20/2007" TM="01:22:46.148" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="     3" DT="06/20/2007" TM="01:35:10.002" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.146.72           "/>
<REC ID="     4" DT="06/20/2007" TM="01:35:24.718" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="     5" DT="06/20/2007" TM="01:46:02.326" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.146.72           "/>
<REC ID="     6" DT="06/20/2007" TM="01:46:23.122" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="     7" DT="06/20/2007" TM="02:37:01.467" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.150.50           "/>
<REC ID="     8" DT="06/20/2007" TM="02:37:20.133" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="     9" DT="06/20/2007" TM="02:43:53.145" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.150.50           "/>
<REC ID="    10" DT="06/20/2007" TM="02:45:44.059" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="    11" DT="06/20/2007" TM="02:48:30.522" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.150.50           "/>
<REC ID="    12" DT="06/20/2007" TM="02:48:48.177" TYPE="Reset         " TXT="RTU Reset: Type NORMAL□                  "/>
<REC ID="    13" DT="06/20/2007" TM="02:58:49.949" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.146.45           "/>
<REC ID="    14" DT="06/20/2007" TM="03:33:41.146" TYPE="Logged Out    " TXT="IP: 172.18.146.45                        "/>
<REC ID="    15" DT="06/20/2007" TM="04:34:15.115" TYPE="Logged In     " TXT="User: Admin, IP: 172.18.146.45           "/>
```

3.17.3 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 Sytem Log Display as they are happening.

Figure 3-54 System Log Display

System Log

ID	Date/Time▼		Task	Function	Message
8483	11/06/2011	04:00:46	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
8482	11/06/2011	04:00:46	Startup	startup	Time since last restart: 431 days, 14 Hrs 23 Min 27 Secs
8481	11/06/2011	04:00:46	Startup	startup	RTU App starting at: 11/06/2011 04:00:46
8480	11/06/2011	04:00:46	Startup	m1_uif	System Log File detected at startup
8488	11/05/2011	23:11:59	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
8487	11/05/2011	23:11:59	Startup	inCrashMode	WARNING: Restart time window(90 secs) violated 1 times (Max=3)
8486	11/05/2011	23:11:59	Startup	startup	Time since last restart: 0 days, 1 Hrs 39 Min 29 Secs
8485	11/05/2011	23:11:59	Startup	startup	RTU App starting at: 11/05/2011 23:11:59
8484	11/05/2011	23:11:59	Startup	m1_uif	System Log File detected at startup
8553	11/15/2010	08:17:23	CAL		Missing Analog point number 1, ID -1
8552	11/15/2010	08:17:23	CAL		Missing Analog point number 0, ID -1
8551	11/15/2010	08:17:02	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
8550	11/15/2010	08:17:02	Startup	startup	Time since last restart: 0 days, 0 Hrs 31 Min 0 Secs
8549	11/15/2010	08:17:02	Startup	startup	RTU App starting at: 11/15/2010 08:17:02
8548	11/15/2010	08:17:02	Startup	m1_uif	System Log File detected at startup
8547	11/15/2010	07:46:23	CAL		Missing Analog point number 1, ID -1
8546	11/15/2010	07:46:23	CAL		Missing Analog point number 0, ID -1
8545	11/15/2010	07:46:02	dnpRouteUdp	dnpRoute	No repeated Ports, exiting task
8544	11/15/2010	07:46:02	Startup	startup	Time since last restart: 0 days, 0 Hrs 14 Min 22 Secs

Download Back

3.17.4 Alarming

Please see the Alarming chapter in the Applications manual.

3.17.5 Annunciator

Please see the Annunciator chapter in the Applications manual.

CHAPTER 4

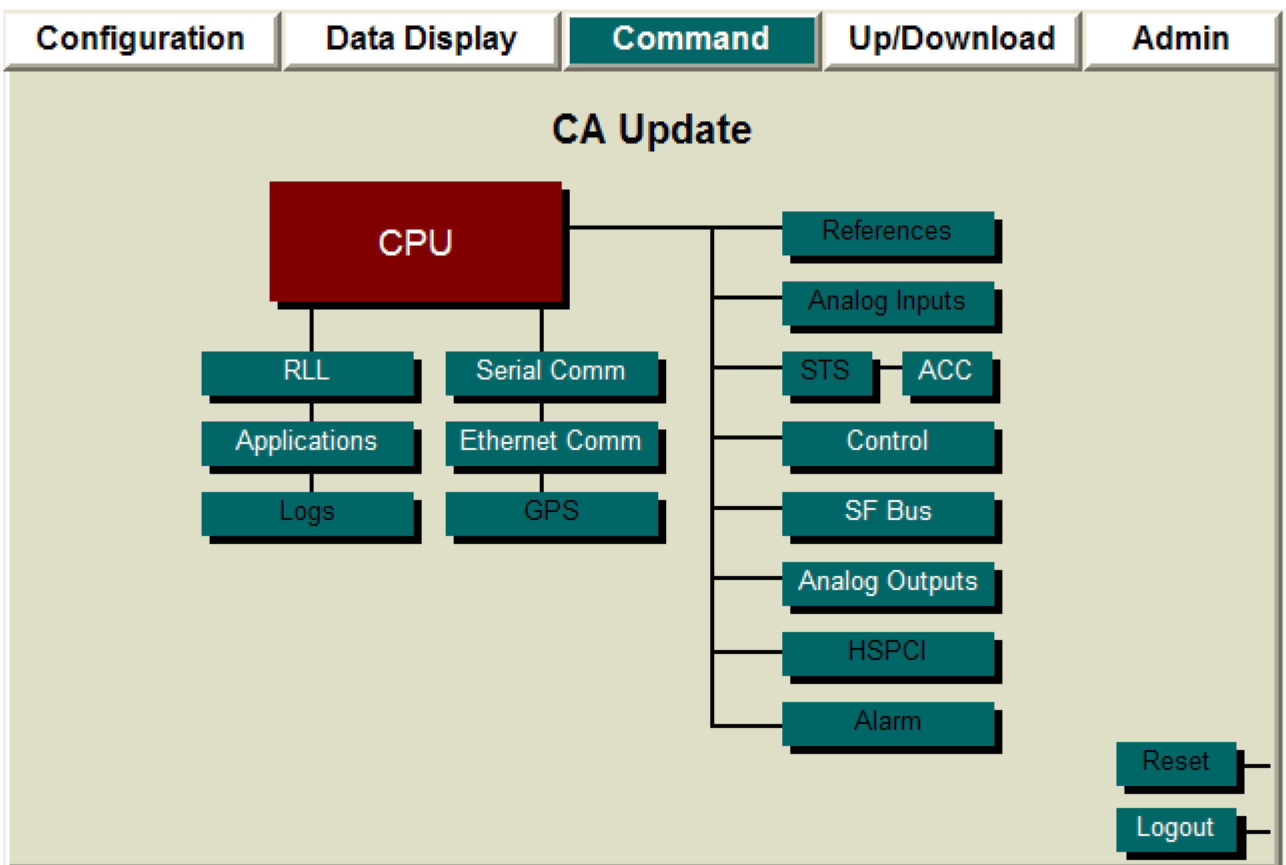
Command Output

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.

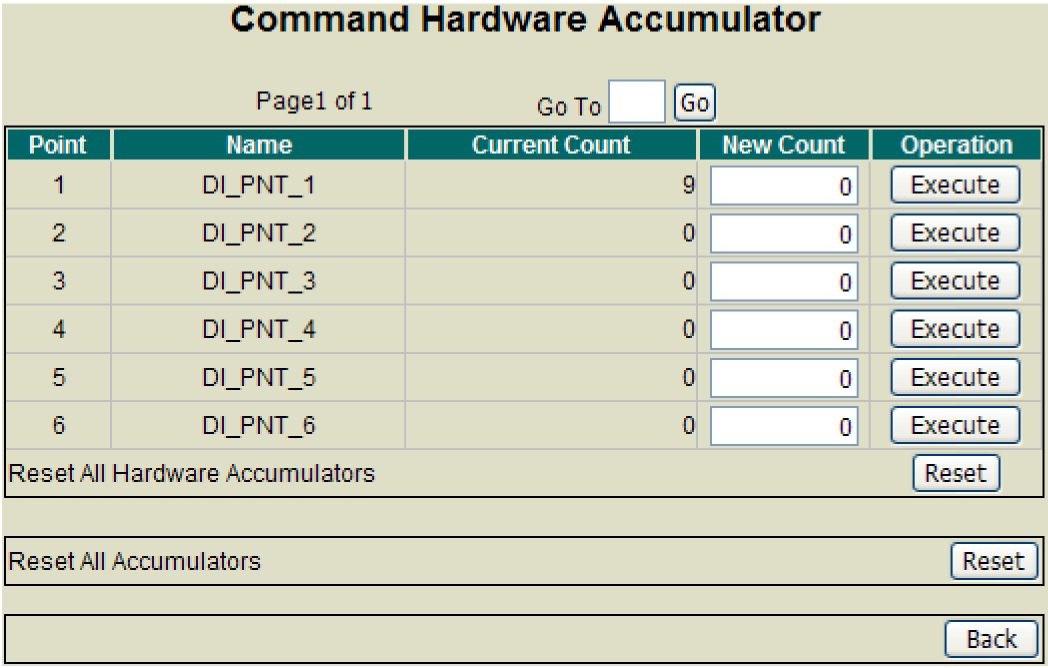
Figure 4-1 Command Screen



4.1 Command ACC

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.

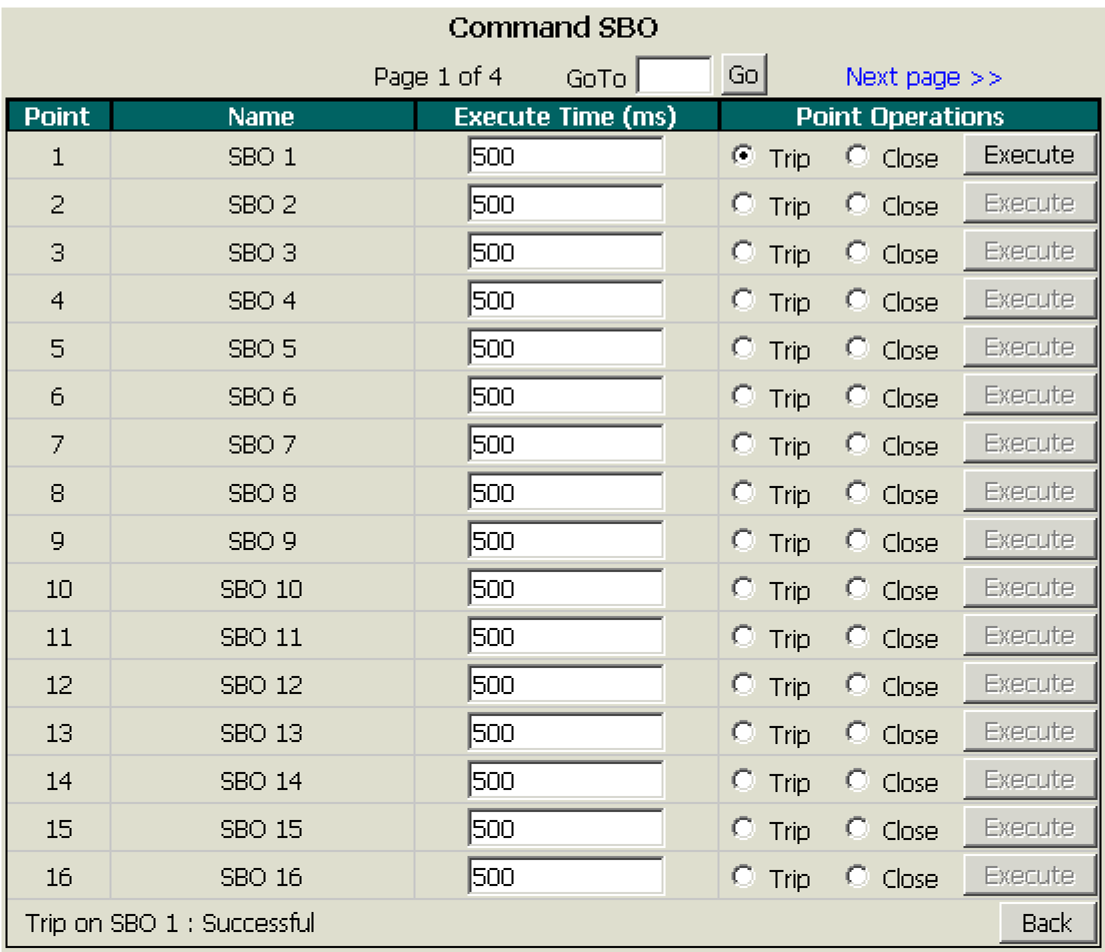
Navigation

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.

4.2 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



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
5	SBO 5	500	Trip	Close	Execute
6	SBO 6	500	Trip	Close	Execute
7	SBO 7	500	Trip	Close	Execute
8	SBO 8	500	Trip	Close	Execute
9	SBO 9	500	Trip	Close	Execute
10	SBO 10	500	Trip	Close	Execute
11	SBO 11	500	Trip	Close	Execute
12	SBO 12	500	Trip	Close	Execute
13	SBO 13	500	Trip	Close	Execute
14	SBO 14	500	Trip	Close	Execute
15	SBO 15	500	Trip	Close	Execute
16	SBO 16	500	Trip	Close	Execute

Trip on SBO 1 : Successful 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

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.

Page 1 of 1 GoTo Go

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

Open on DO_PNT 1 : Successful 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

Command Analog Outputs (AO)

Page1 of 1 Go To [ ] Go

Point	Name	Range	Value	Operation
1	ANA_OUT 1	-10.000 to 10.000	-10.000	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

ANA_OUT 1 : Success Back

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.

4.5 Alarm Command

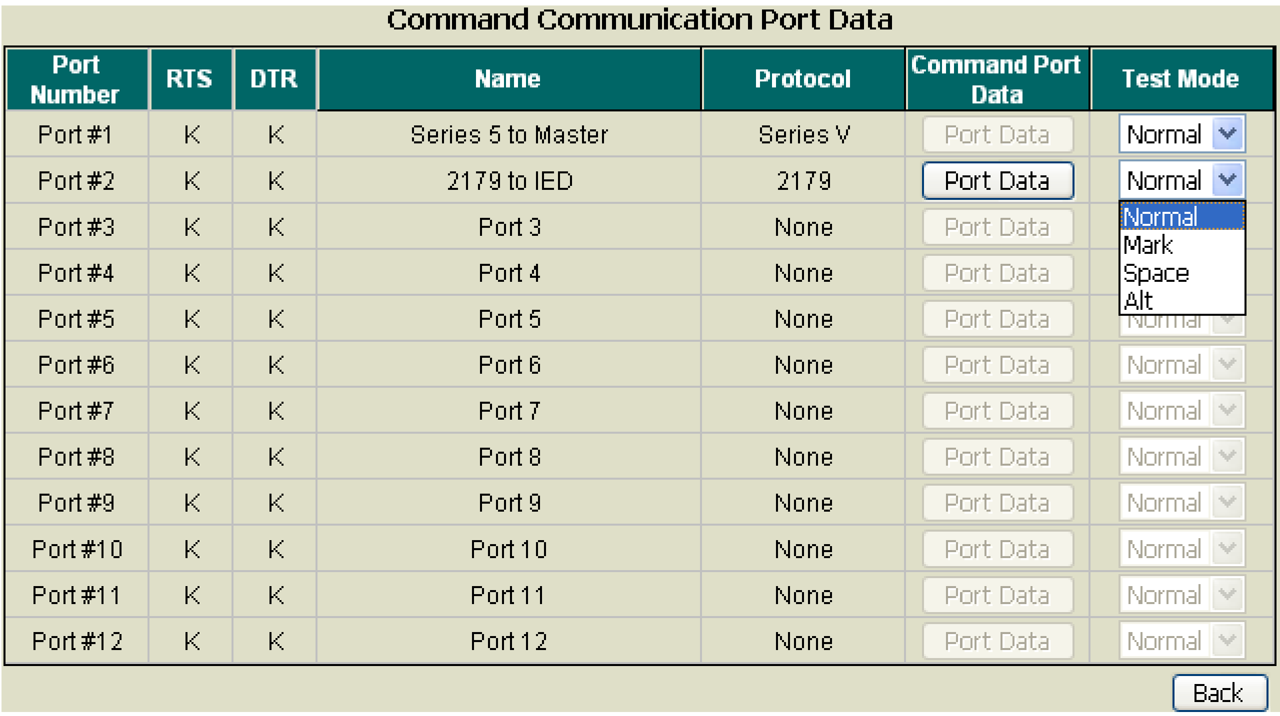
Note: This feature not presently supported.

4.6 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 subremote port, then the Command Port Data button will be active.

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	Series 5 to Master	Series V	Port Data	Normal
Port #2	K	K	2179 to IED	2179	Port Data	Normal
Port #3	K	K	Port 3	None	Port Data	Normal
Port #4	K	K	Port 4	None	Port Data	Mark
Port #5	K	K	Port 5	None	Port Data	Space Alt
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

Back

Port Number

The physical port number.

RTS and DTR

Request To Send and Data Terminal Ready.

"K" represents Keyed (Radio/Modem).

The RTU firmware asserts/deasserts the signal according to the protocol timing configuration. See Figure 4-7. Typically used as a Radio/Modem key output (Default Setting).

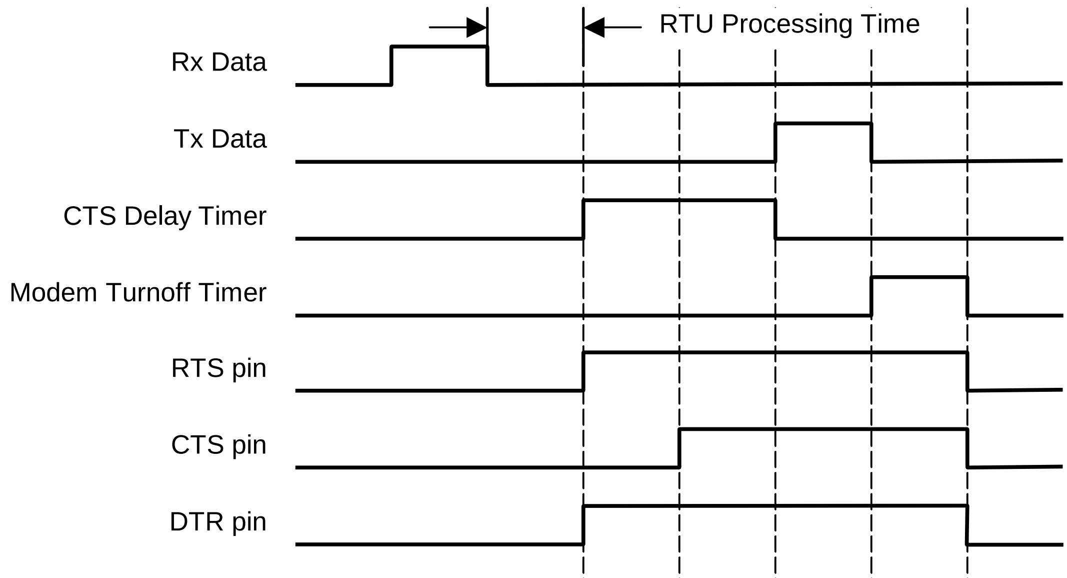
"H" represents Positive RS232 Voltage.

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.

"L" represents Negative RS232 Voltage.

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

Figure 4-7 Communications Timing Diagram



Name

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

Protocol

The protocol assigned (if any) during configuration.

Command Port Data

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 subremote port, then the Command Port Data button will be active. Please see the following section 4.6.1 Command Port Data.

Test Mode

Test Mode is active for any port that has been assigned a protocol. The four modes are shown in the drop-down menu in Figure 4-6. To test the port, select either Mark, Space, or Alt. Please see the Maintenance chapter of the S2X00 manual for the details of Test Mode.

Navigation

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

4.6.1 Command Port Data

From the Command Communication Port Data screen, under Command Port Data, click the Port Data button. In this example, we use a 2179 port that has four IEDs configured on it. You will get a screen similar to Figure 4-8.

Figure 4-8 Port Data

2179 IED Command

Port # : 6 Port Name : Port 6

IED #	IED Name	IED Address	On Scan	Device Type	Message Timers(ms)	Slave Data
1	2179_IED_1	1	Y	Standard	TBM-150, SOT-500, AOT-3500	Command
2	2179_IED_2	2	Y	Standard	TBM-150, SOT-500, AOT-3500	Command
3	2179_IED_3	3	Y	Standard	TBM-150, SOT-500, AOT-3500	Command
4	2179_IED_4	4	Y	Standard	TBM-150, SOT-500, AOT-3500	Command

Back

IED #

The IED number on this port.

IED Name

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

IED Address

The IED Address assigned during configuration.

On Scan

Tells you whether or not the IED is being scanned by the RTU. Yes is Y, No is N.

Device Type

Tells you the Device Type. In the case of 2179, this column could be Standard, as in the example, or Energyline.

Message Timers(ms)

TBM means Time Between Messages, SOT means Select to Operate Time, and AOT means After Operate Time. A number follows each acronym. That number is the time in milliseconds selected during Configuration of the IED.

Slave Data

The Slave Data column has a Command button. Please see section 4.6.1.1 Command Slave Data below for further instructions.

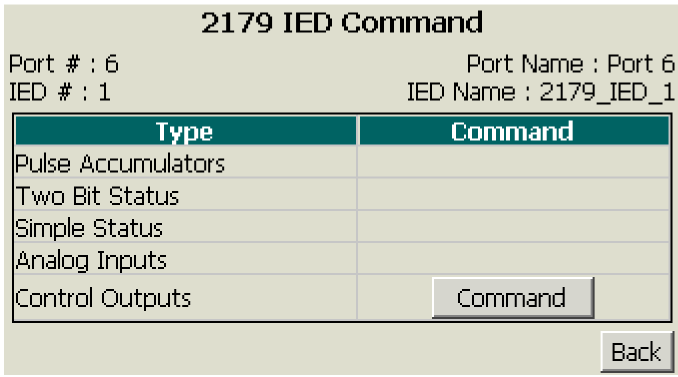
Navigation

Port # : *n* tells you which port you are looking at. Port Name : *name* tells you the name you assigned during configuration (or the default name). Click the Back button to go back to the Data Display screen.

4.6.1.1 Command Slave Data

From the 2179 IED Command screen, click Command under the Slave Data column. You will get a screen similar to Figure 4-9.

Figure 4-9 IED Command



The only command available is Control Outputs. The command gives you a screen similar to Figure 4-10. From this screen you may exercise various Outputs within the IED.

Type

The types of points which may be available.

Command

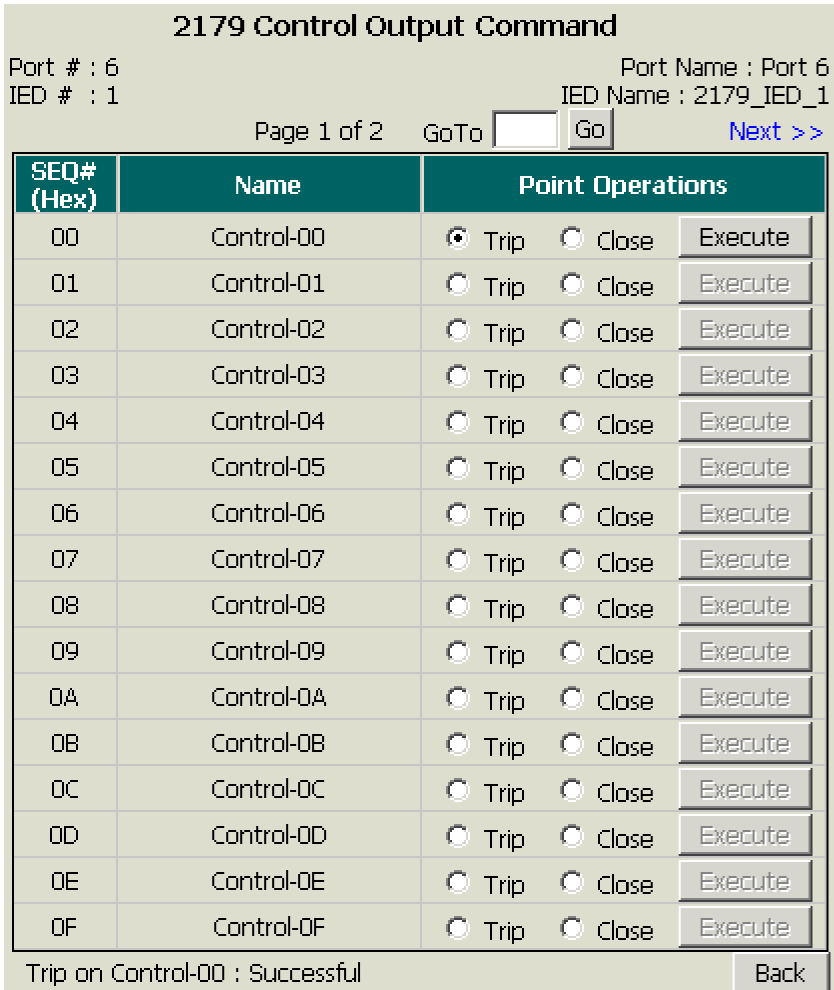
There will be a Command button in the row of the point-type which is appropriate for command. Inappropriate points for command will not have the Command Button in that row. Please see Figure 4-10 and the text that follows the figure for more information

Navigation

Port # : *n* tells you which port you are looking at. Port Name : *name* tells you the name you assigned during configuration (or the default name). IED # : *n* tells you which IED you are looking at. IED Name : *name* tells you the name you assigned during configuration (or the default name). Click the Back button to go back to the IED Command screen.

Click the Command button under Command to get the Control Output Command screen as shown in Figure 4-10. You may choose either Trip or Close for any Control. Click the Execute button to execute.

Figure 4-10 Control Output Command



2179 Control Output Command

Port # : 6 Port Name : Port 6
IED # : 1 IED Name : 2179_IED_1
Page 1 of 2 GoTo Go Next >>

SEQ# (Hex)	Name	Point Operations		
00	Control-00	Trip	Close	Execute
01	Control-01	Trip	Close	Execute
02	Control-02	Trip	Close	Execute
03	Control-03	Trip	Close	Execute
04	Control-04	Trip	Close	Execute
05	Control-05	Trip	Close	Execute
06	Control-06	Trip	Close	Execute
07	Control-07	Trip	Close	Execute
08	Control-08	Trip	Close	Execute
09	Control-09	Trip	Close	Execute
0A	Control-0A	Trip	Close	Execute
0B	Control-0B	Trip	Close	Execute
0C	Control-0C	Trip	Close	Execute
0D	Control-0D	Trip	Close	Execute
0E	Control-0E	Trip	Close	Execute
0F	Control-0F	Trip	Close	Execute

Trip on Control-00 : Successful Back

SEQ# (Hex)

This hex number is the number used by the IED vendor to tag the control. See the IED vendor's documentation.

Name

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

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

Port # : *n* tells you which port you are looking at. Port Name : *name* tells you the name you assigned during configuration (or the default name). IED # : *n* tells you which IED you are looking at. IED Name : *name* tells you the name you assigned during configuration (or the default name). Click the Back button to go back to the IED Command screen.

4.7 Ethernet Command

Please refer to the specific protocol in the config@WEB Protocols Manual.

4.8 RLL Command

Please see the following manual for further information:

config@WEB Relay Ladder Logic Manual, Part # S2200-AAA-00003

4.9 Applications Command

Please see the following manual for Applications Commands that are supported.

config@WEB Applications Manual, Part # S2200-AAA-00006

CHAPTER 5

Upload/Download

This chapter tells you how to Upload and Download files to/from the RTU. The purpose for Upload/Download is to obtain an archive of the RTU's files, or to update the RTU's files.

Other chapters cover Configuration, Data Display, Command, and Administration. See the appendices for hardware User Interface connections. See Chapter 1 for Comm Port Configuration, Point Mapping, and Scaling.

Note: When the Upload/Download is being used for the first time, certain necessary files will be loaded onto your computer. You can see a list of these files in the IE Settings appendix.

5.1 Introduction

The Upload/Download feature allows you to Get from the RTU or Send to the RTU all the associated files for the following functions:

GUI	The collection of many types of files making up the RTU's configuration display
Application	The firmware
Configuration	The collection of XML files making up the RTU's configuration
Operating System	This is the third-party OS called VxWorks that all RTU programs run on.
Templates	Templates are protocol/IED specific. They are files that allow you to copy a particular setup for an IED, save the file, then load that setup file (template) into another RTU for the same IED.

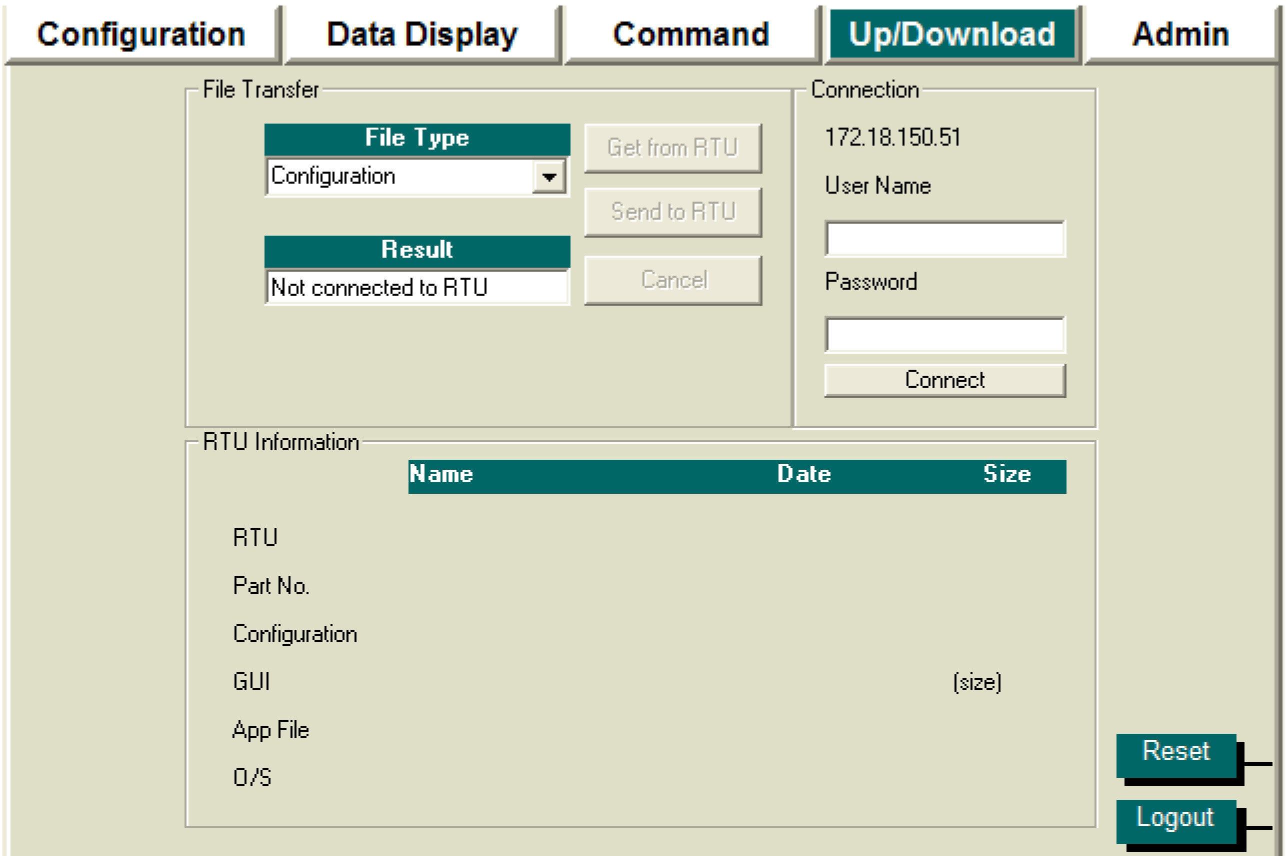
Note 1: Your main interest in Up/Download is to back up your Configuration. However, it is prudent to back up all data (GUI, Application, and Configuration). When Uploading and Downloading these files, always follow the sequence of **G**UI, **A**pplication, then **C**onfiguration. An easy way to remember the sequence is with the acronym **GAC**.

Note 2: This chapter does not cover the details of firmware upgrade. Complete instructions for firmware upgrade can be found in the zip file containing the new firmware. The latest firmware and documentation is on the Customer Website. See Accessing the Customer Website appendix.

5.2 Getting Files From the RTU

Click on the Up/Download tab from the main page. A screen similar to Figure 5-1 will appear. The functions are explained below.

Figure 5-1 Up/Download Screen



Note: You must login to the Up/Download Screen

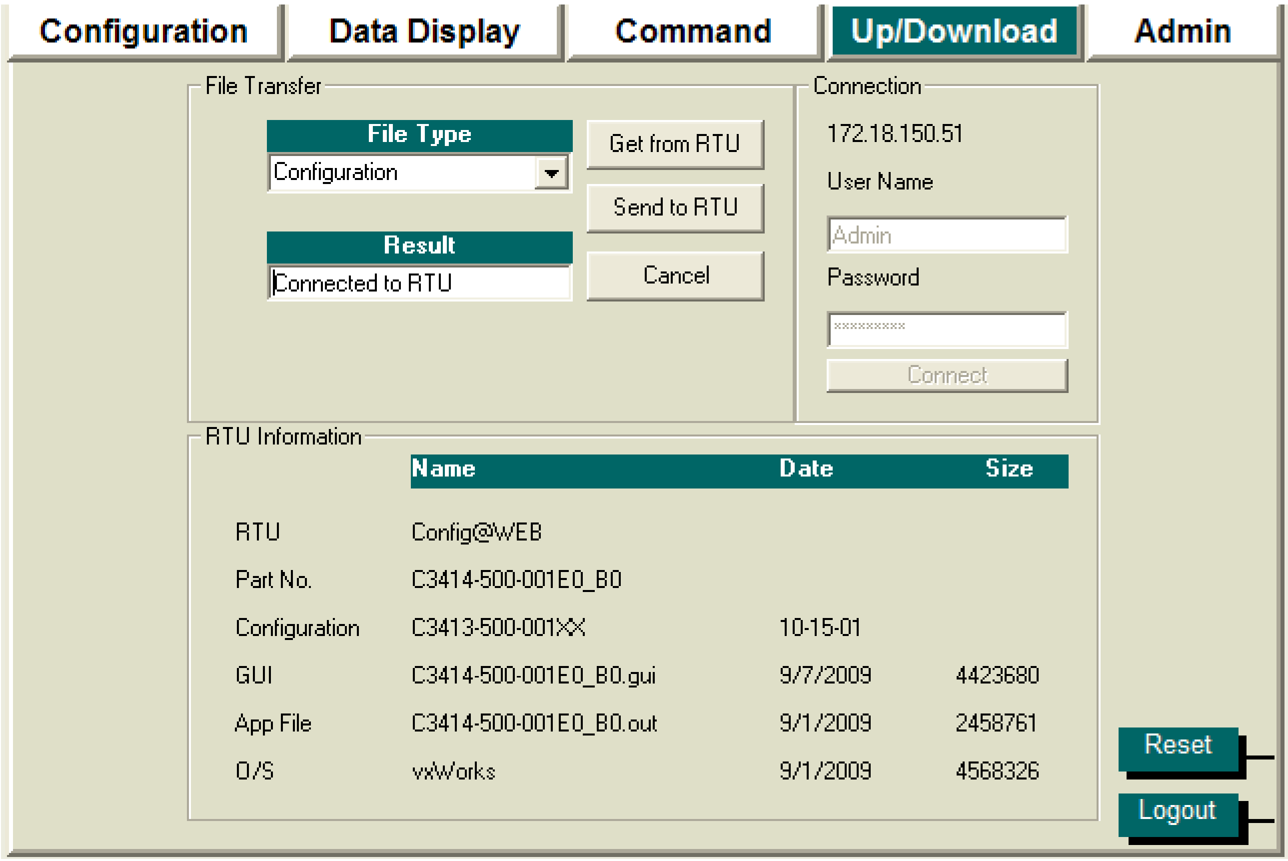
User Name

Any valid User Name with Up/Download privilege. (See Ch 6 Administration)

Password

Password corresponding to said User Name.

Figure 5-2 Up/Download Screen after logging in



File Transfers

File Type (drop-down menu)

Configuration	The collection of XML files making up the RTU's configuration
Application	The firmware
GUI	The collection of many types of files making up the RTU's configuration display
Operating System	VxWorks (may contain other files)
Templates	Files used to transfer IED configurations

Get from RTU (button)

Get file(s) from the RTU.

Send to RTU (button)

Send file(s) to the RTU.

Cancel (button)

Cancel the GET operation.

Connection

The IP address of your RTU.

RTU Information

RTU
The RTU name assigned under Configuration/CPU/RTU Name.

Part No.
The part number assigned to the firmware by Telvent.

Configuration
The Configuration name assigned by Telvent.

GUI
The GUI name and version number assigned by Telvent.

App File
The Application file name assigned by Telvent.

O/S
The operating system.

Navigation

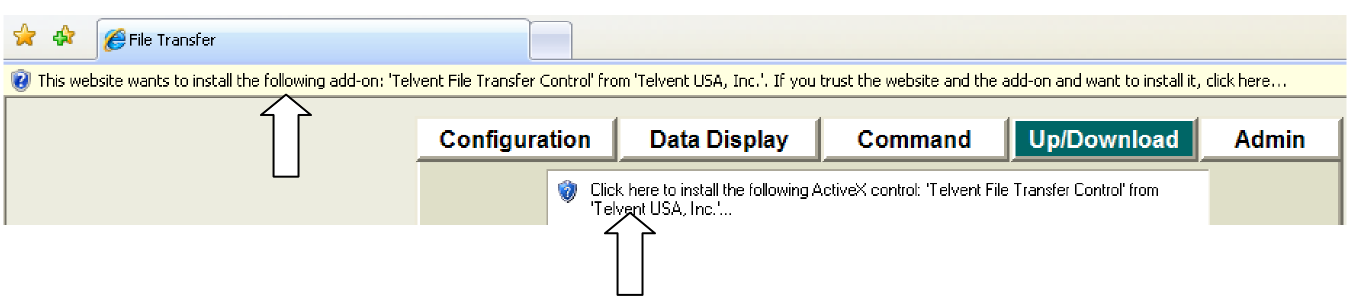
Click Reset to reset the RTU. Click Logout to log out of the interface. Click any other tab to move to another RTU function.

5.2.1 Running Up/Download for the First Time

Note: Be sure to set security setting properly as detailed in Appendix A, Internet Explorer Settings.

The first time you run Up/Download (or after installing a new version of firmware), your PC will load a FileXfer.CAB file. This is a large file, so there will be a short delay. You will get a series of Security Warnings as shown below. (To save space, the entire screen is not shown.)

Figure 5-3 Security Warning 1



If you click either area as shown above, you will get the following message.

Figure 5-4 Security Message 2

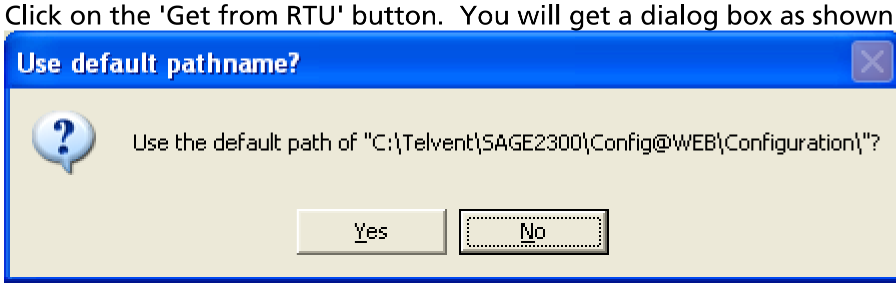
If you click on "Install ActiveX Control..." as shown above, you will get the warning shown below. Click on the Install button to complete the ActiveX installation.

Figure 5-5 Security Message 3

5.2.2 Get Procedure

The following steps will guide you in getting the files from the RTU to your PC or laptop.

1. Click on the File Type drop-down menu and select Configuration.
2. Click on the 'Get from RTU' button. You will get a dialog box as shown below:



3. The dialog box shows you the default path as follows:

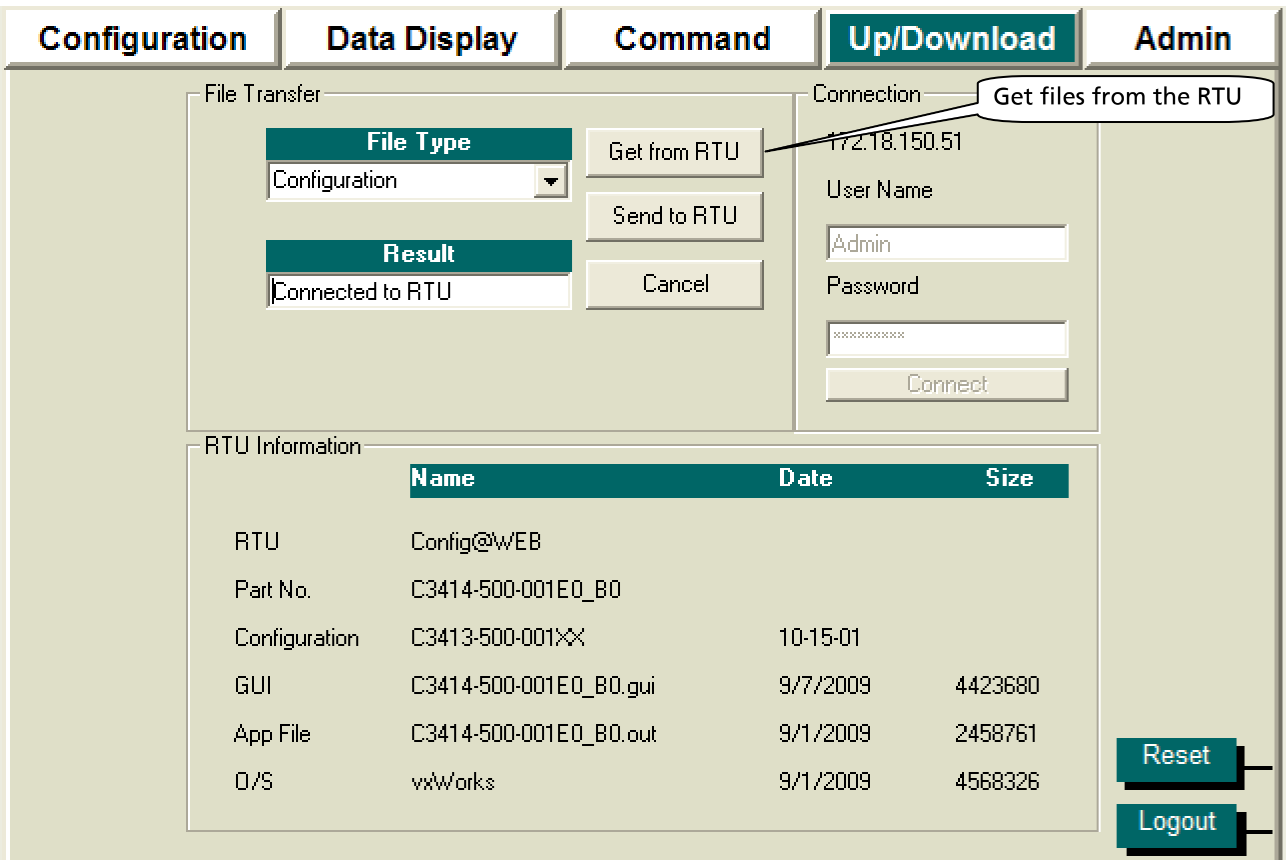
   c:\Telvent\<rtutype>\<rtuname>\Configuration\

   where RTU type would be SAGE2300, SAGE1310, etc. and the RTU name will be the name that was entered in the configuration. Note that the path structure will contain the RTU name without any spaces. It is strongly recommended to use the default path for ease of upload/download.
4. Click Yes if you want to use the default path.

5. If you click No, you will have to supply your own path, or navigate to a folder of your choice.
6. Click Save.
7. Repeat steps 1. through 6. for the other file types, if needed. Notice that the path name varies with the file type name.
8. During file transfer there may be some long pauses. This is normal.
9. When finished, your PC should contain the following directory structure with all of the RTU files:

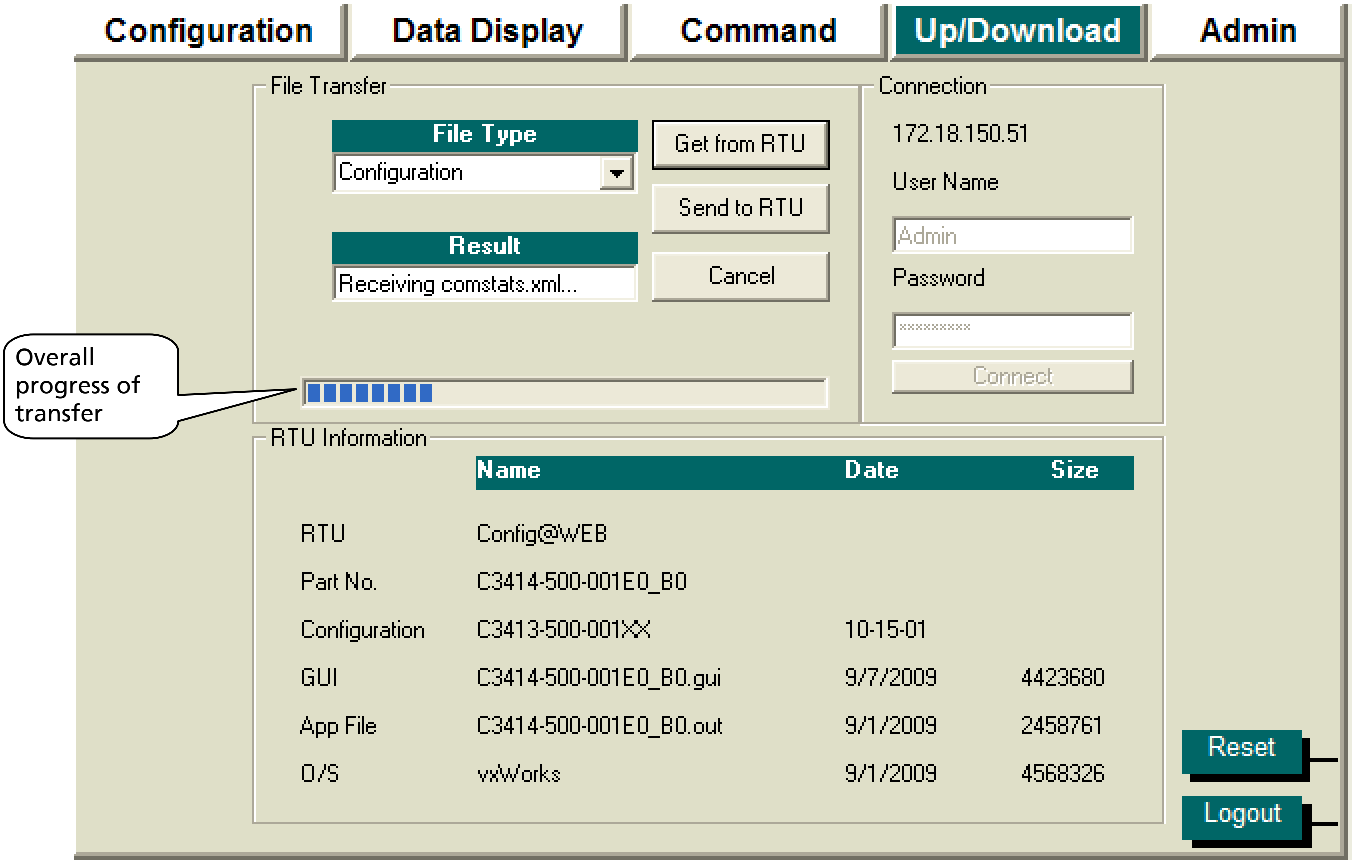
   c:\Telvent\<rtutype>\<rtuname>\application
   \configuration
   \GUI
   \OperatingSystem
   \Templates

Figure 5-6 Configuration Download to PC

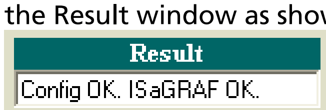


10. Click Yes for the default path or choose your own path.
11. You will see a total progress bar incrementing to the right as the file(s) are transferred to your PC. When the download is finished, the Result window will say OK.

Figure 5-7 Download to PC in Progress



12. In the case of Configuration, if the transfer is successful, you will get a message in the Result window as shown below:



13. Inspect your file structure with Windows Explorer or through My Computer. You should have a folder that looks like Figure 5-8. You will have a SAGE*nnnn* folder depending on your particular config@WEB RTU.

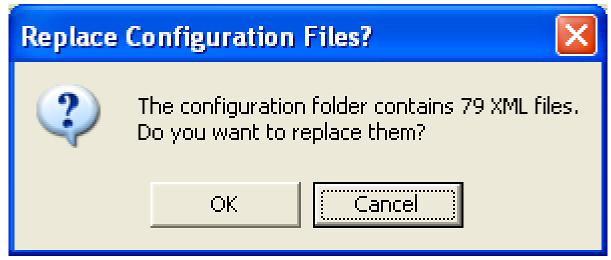
Figure 5-8 Checking the Download

5.3 Sending Files to the RTU

The most common files you might want to send from your PC to the RTU are the configuration files. If the downloaded configuration is the same firmware version as the present firmware in the RTU, the process is straightforward. If you are saving a configuration on your PC while you upgrade your firmware from Telvent's customer website (see Appendix C), then you must follow the procedure explained in a document on the website.

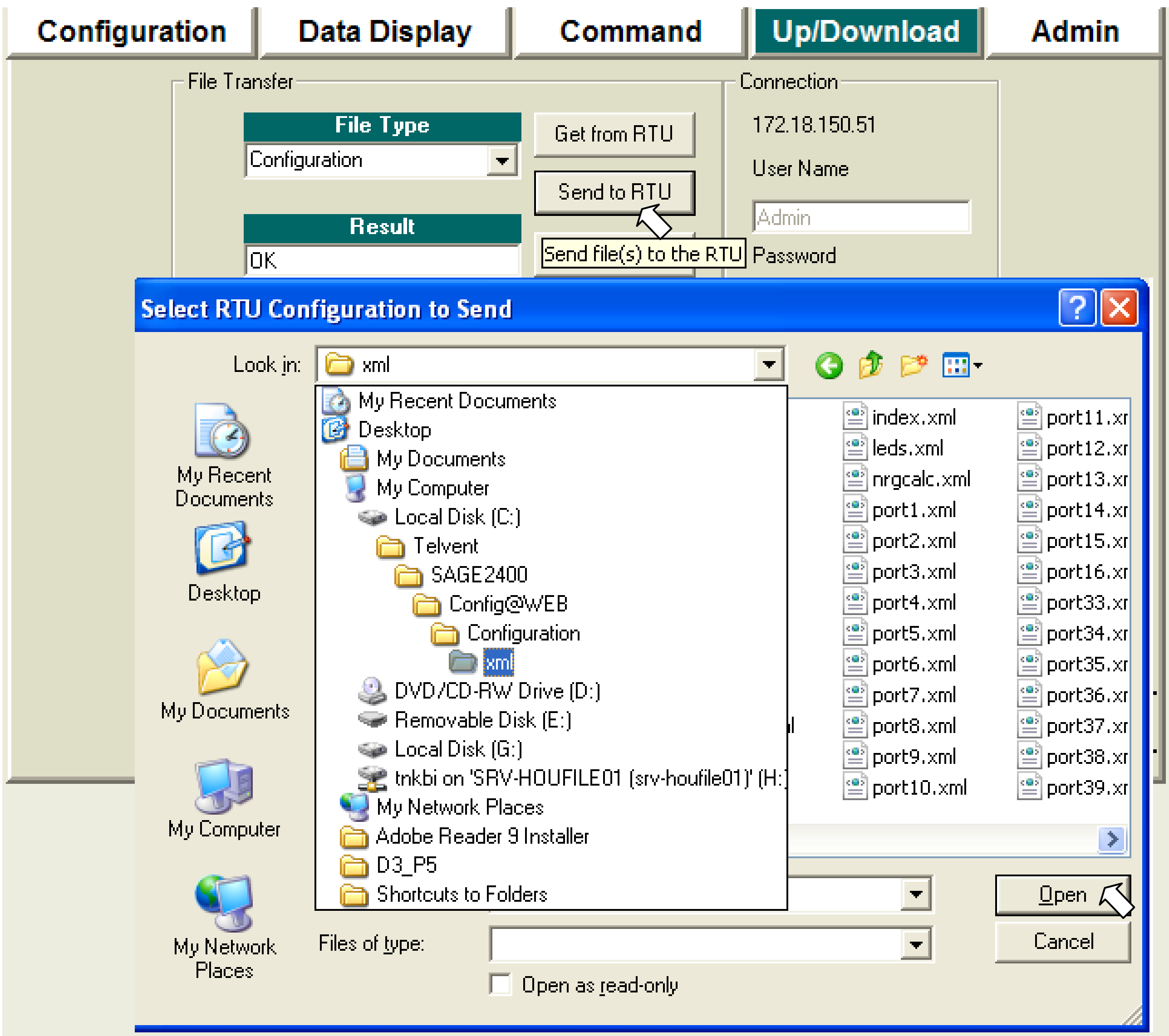
The following steps will guide you in sending (as an example) the configuration files from your PC or laptop to the RTU.

1. Click on the File Type drop-down menu and select ‘Configuration’.
2. Click the 'Send to RTU' button. A navigation window will appear.
3. Navigate your way to the XML folder under the Configuration folder.
4. Click Open.
5. As shown, a prompt will appear showing you the file(s) that you are about to replace.



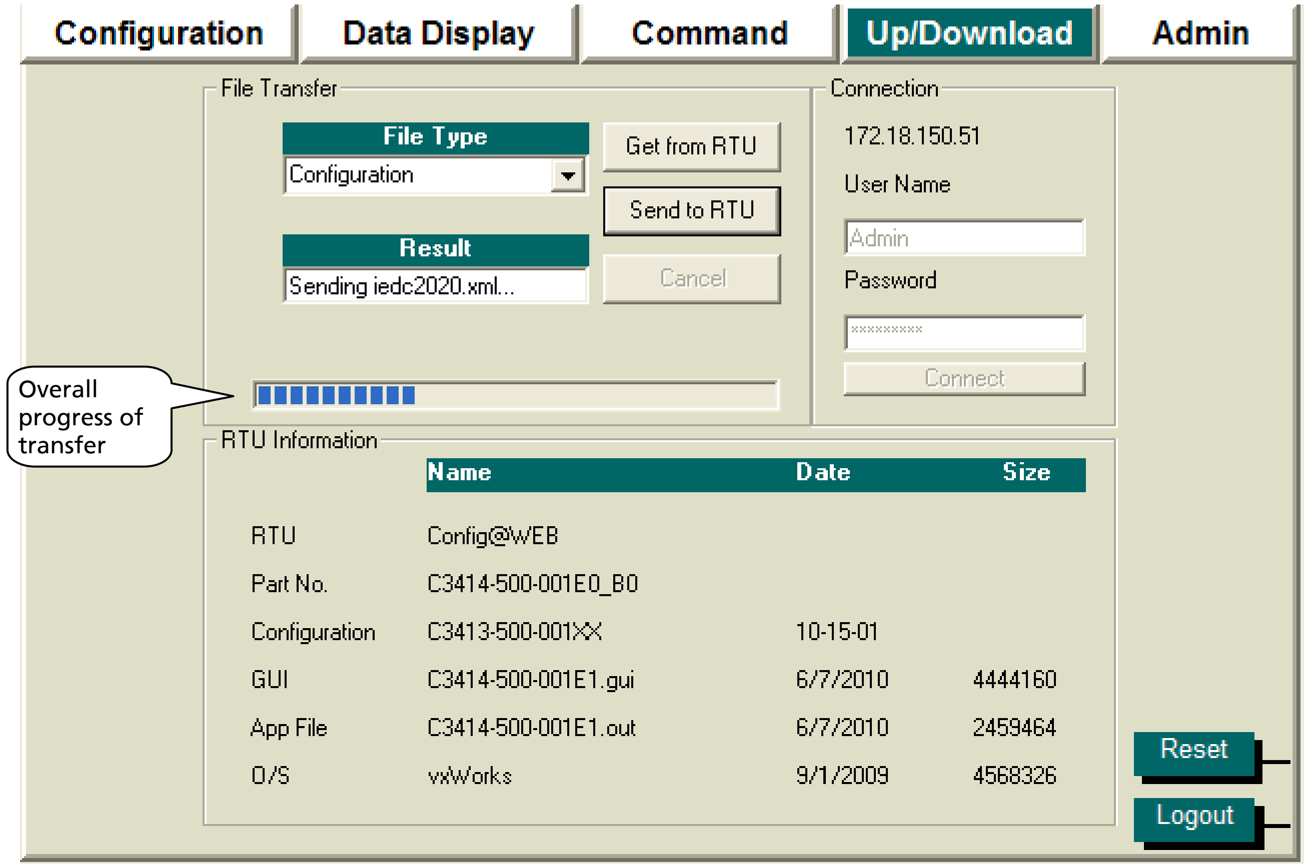
6. Click OK to replace, or Cancel to abort the Send command.

Figure 5-9 Configuration Download to RTU



7. You will see a total progress bar incrementing to the right as the file(s) are transferred to your RTU. When the transfer is finished, the Result window will say OK.

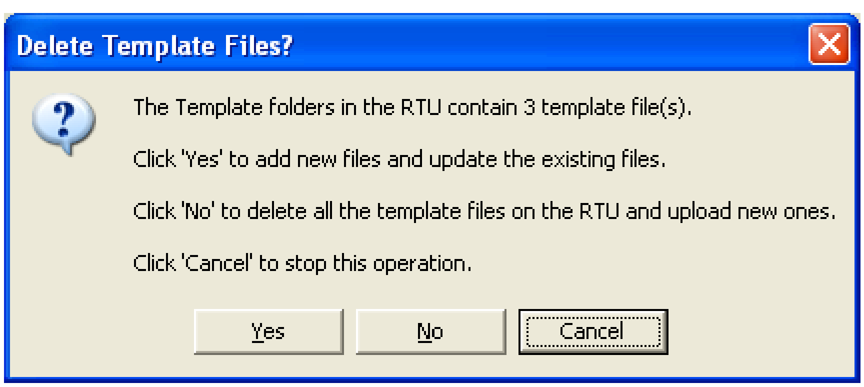
Figure 5-10 Download to RTU in Progress



Note: If you are sending GUI, Application, and Configuration to the RTU, be sure to refresh the browser before sending Configuration.

When sending Templates to the RTU, you have the choice to retain templates that are already in the RTU and add to them, or delete the templates that are already there. You will get the following message:

Figure 5-11 Delete Template Files Message



Note: You must reset the target RTU before the new configuration becomes active.

CHAPTER 6

Administration

This chapter tells you how to set up Usernames and Passwords on the RTU. Other chapters cover Configuration, Data Display, Command, and Upload/Download. See the appendices for hardware User Interface connections. See Chapter 1 for Comm Port Configuration, Point Mapping, and Scaling.

Note: The number of concurrent login sessions is limited to five (5). Concurrent logins are a useful technique for viewing the results of an action (usually in Command mode) in the Display mode. Analysis is facilitated if the user sets up two windows on his PC, one for Command login, one for Display login.

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).

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 6-1. Click Login.

Figure 6-1 Logging in

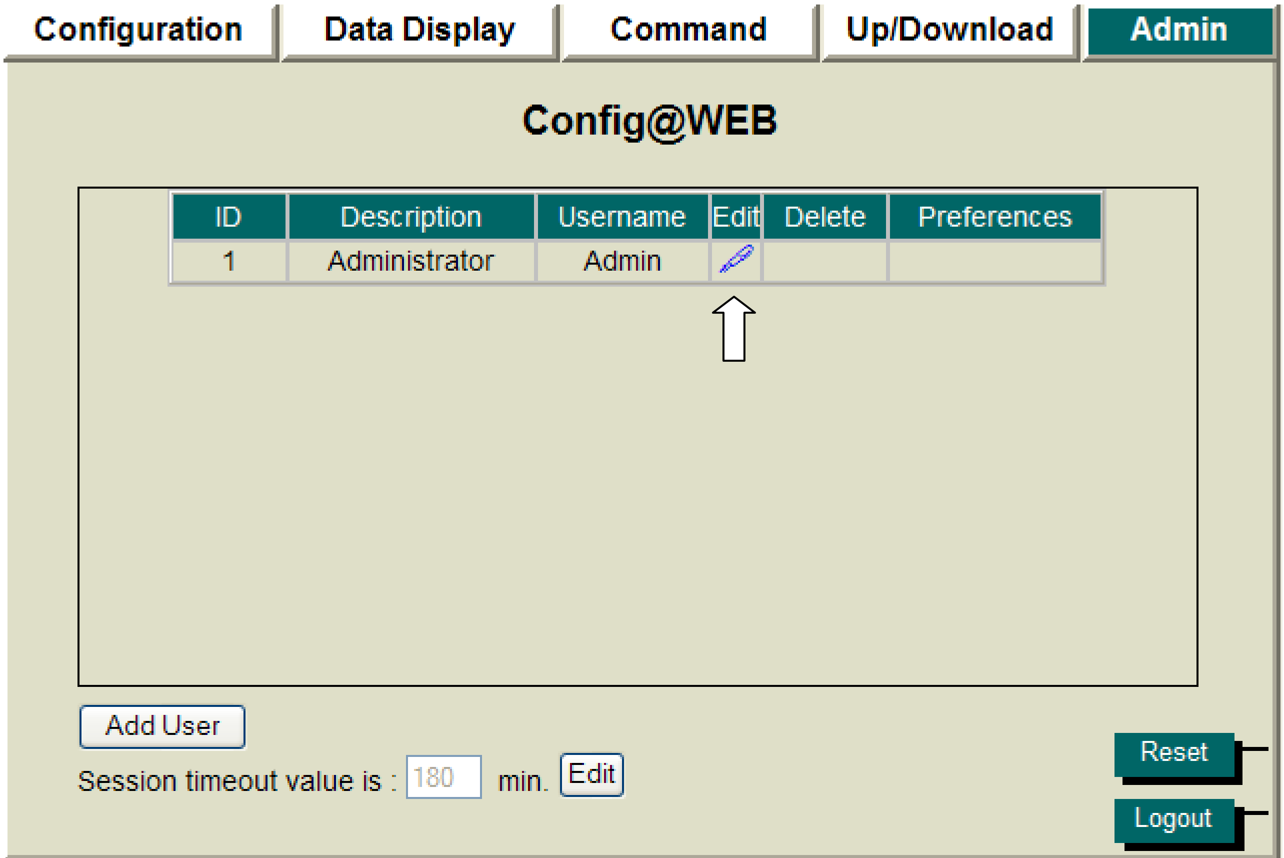
If you login incorrectly, you will get a screen as follows.

Figure 6-2 Screen for Incorrect Login

After logging in correctly, click the Admin tab. The Admin screen should look like Figure 6-3.

Note: The Admin account is a special account. It cannot be deleted. However, both the Username and Password can be changed.

Figure 6-3 The Admin Screen



Click the Edit icon as shown in Figure 6-9. As an Administrator, the first thing you might want to do is change the generic Username and/or Password for the Administrator. If you type in an improper username, you will get the following message:

Note: Spaces and some special characters are not allowed in the Username or Password. The allowed characters are shown in the Information box shown below.

Figure 6-4 Error Message for Improper Username

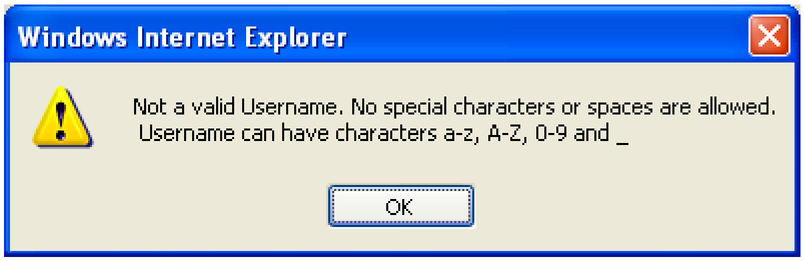


Figure 6-5 Error Message for Improper Password

Figure 6-6 Error Message for Improper Password

Figure 6-7 Error Message for Improper Password

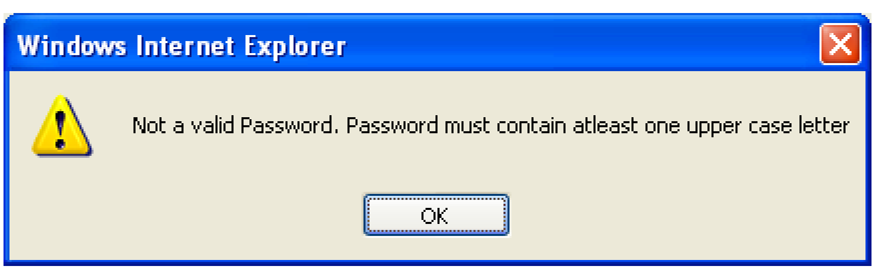
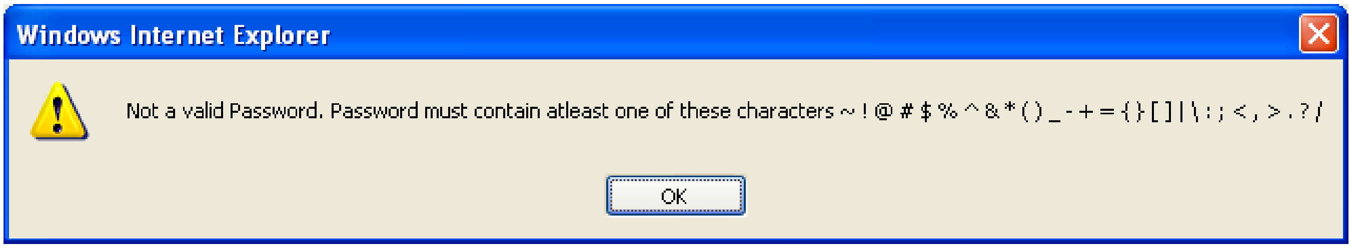


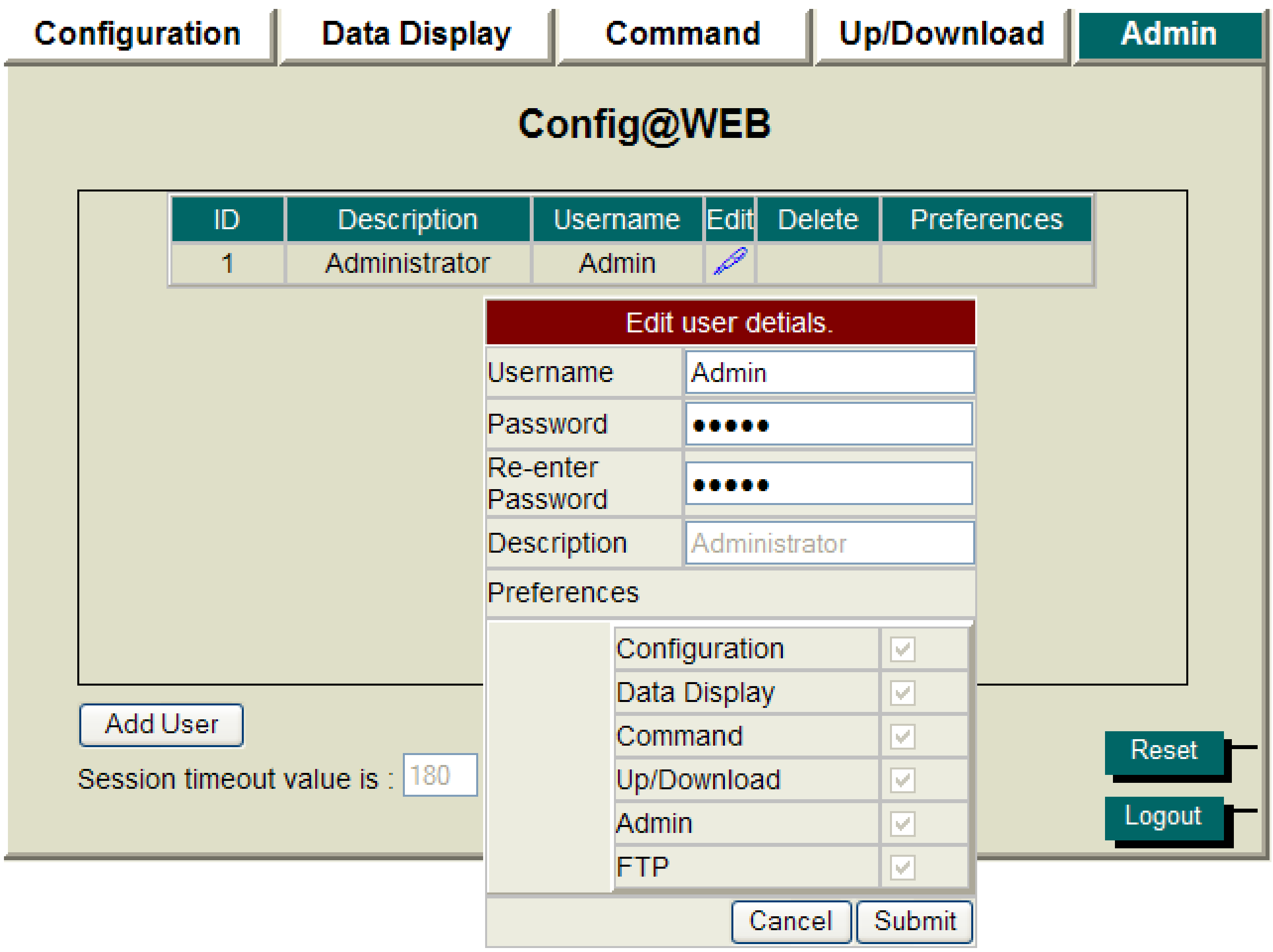
Figure 6-8 Error Message for Improper Password



After you change the password and/or username for the Administrator, click Submit.

Note: The Admin account is a special account. It cannot be deleted. However, both the Username and Password can be changed.

Figure 6-9 Edit User Screen

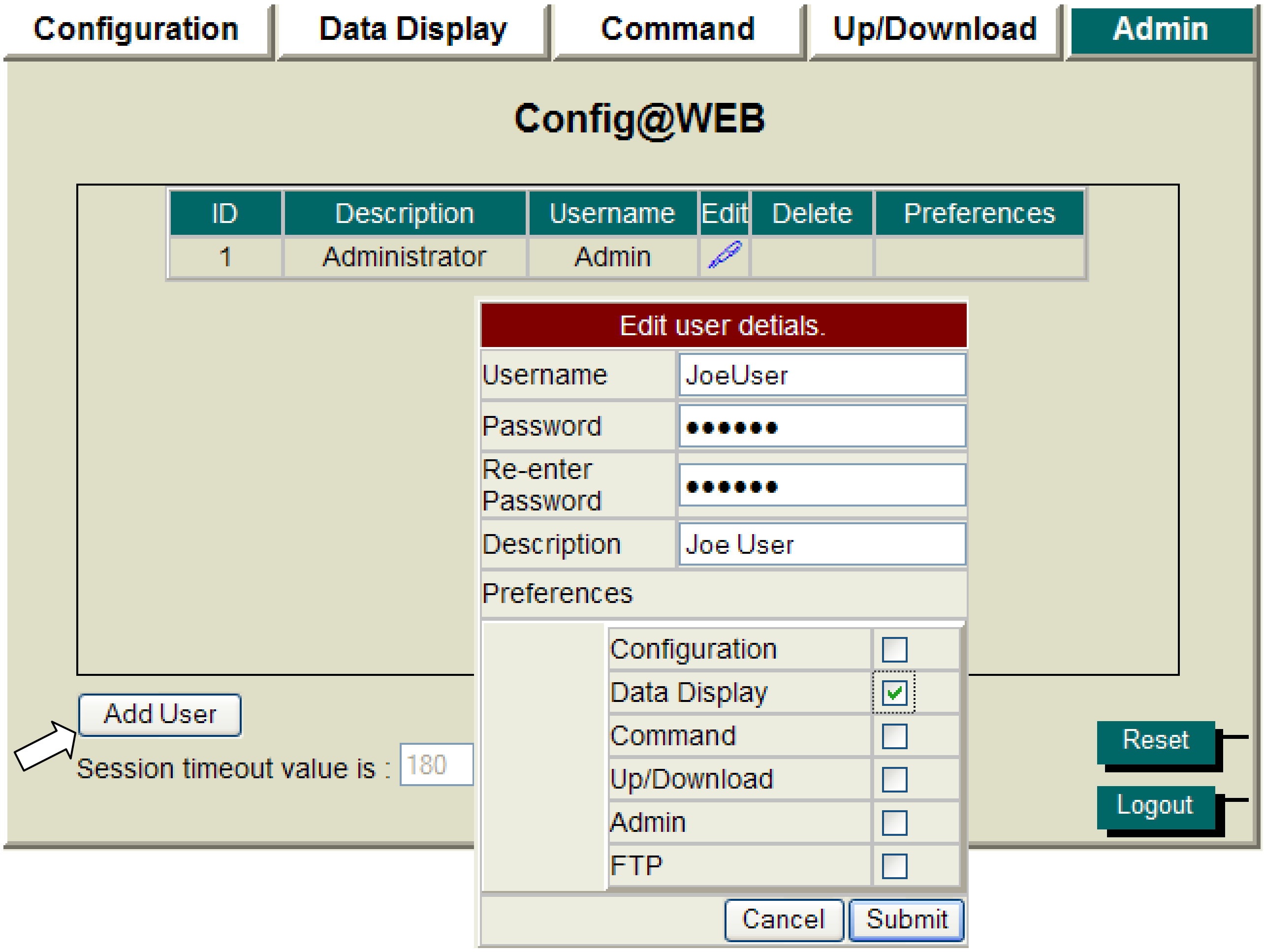


Note: For security reasons, Passwords are never visible.

As Administrator, you can add users by clicking on the Add User button, as shown in Figure 6-10. In the example, Joe User was given Display privileges only.

Warning: The Administrator can create a user that has all the privileges of the Administrator. Such a user could login and change the Password of the Administrator.

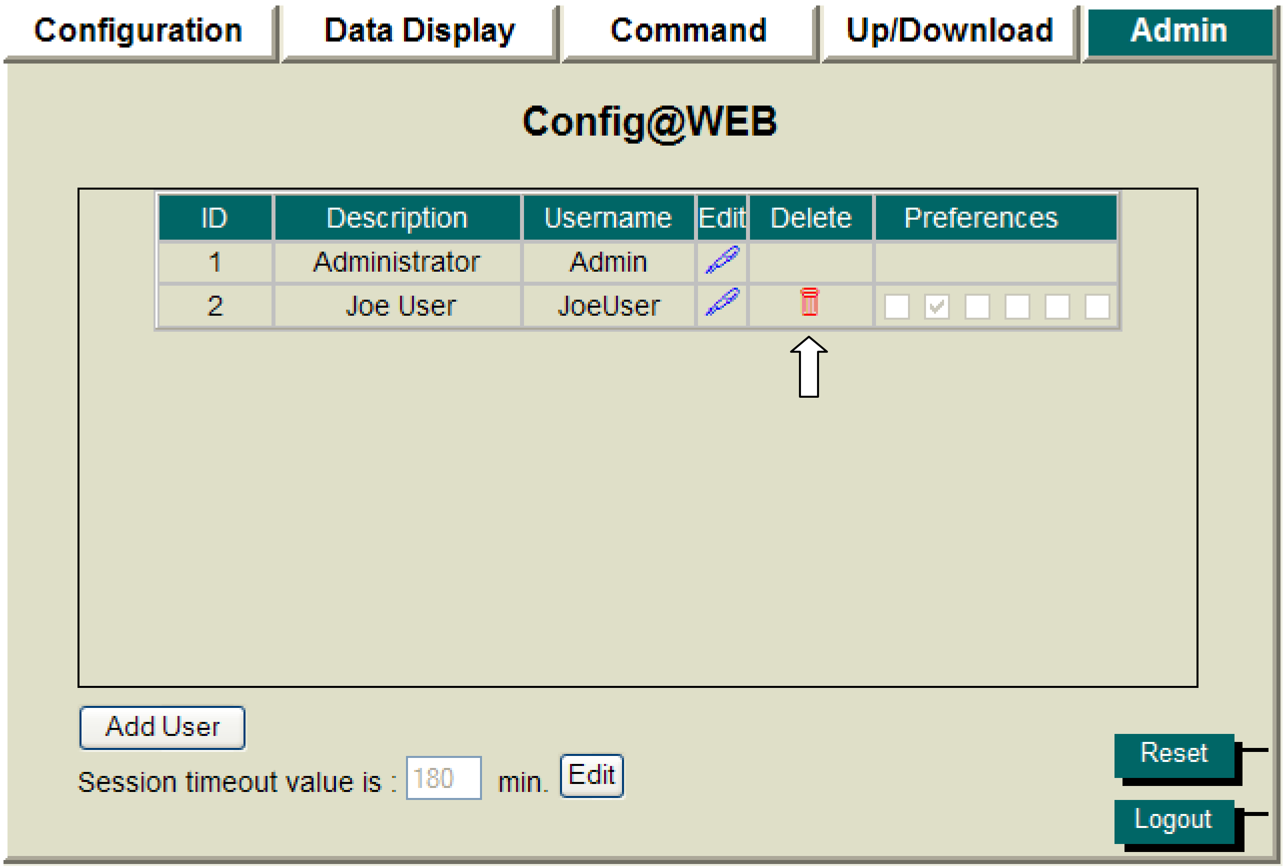
Figure 6-10 Adding a User



Note that the Administrator can check boxes in the above display that grants privileges that correspond to tabs, plus FTP. FTP is an acronym for File Transfer Protocol. FTP privileges allow a user to move files into or out of the RTU using an FTP program.

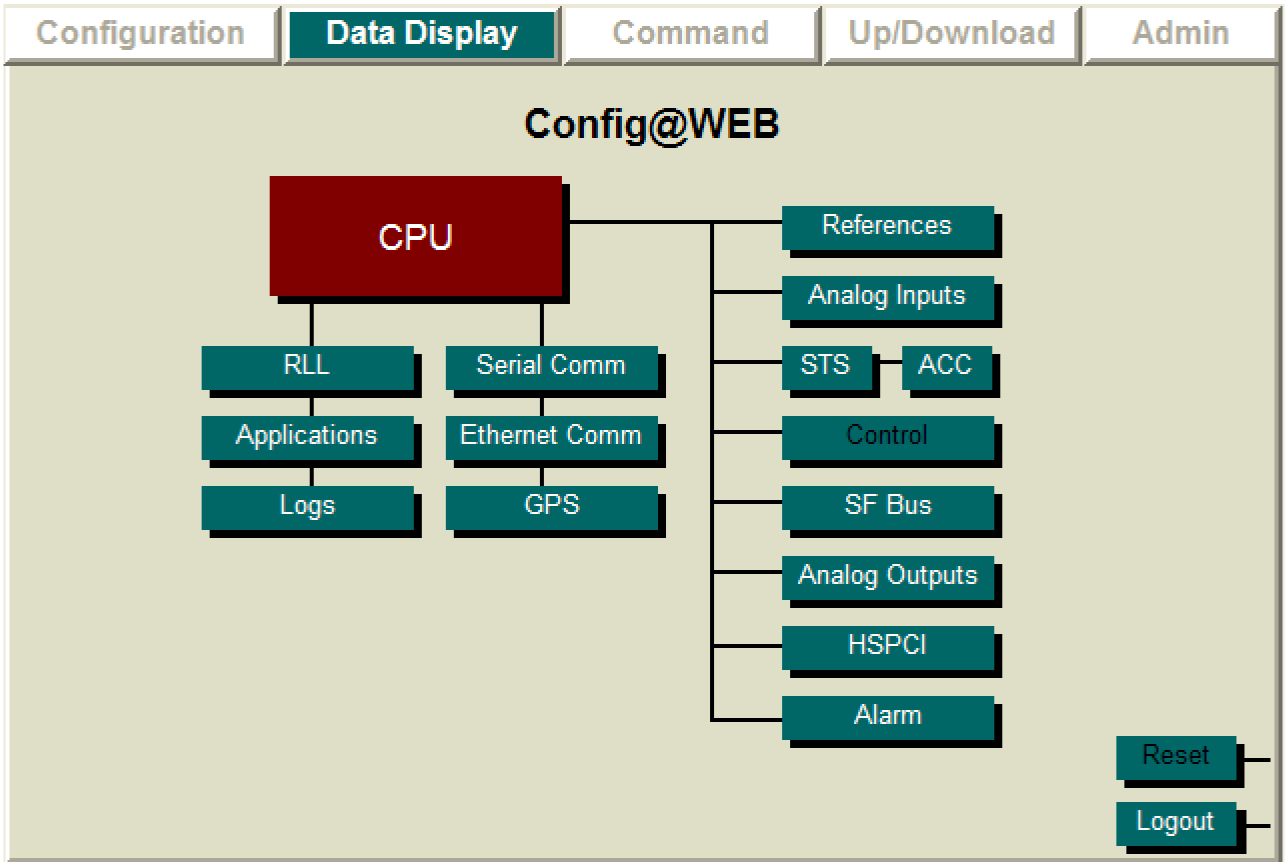
When you click Submit, the new Admin screen will look like Figure 6-11. Notice that the Administrator can delete the Joe User account any time by clicking on the trash can.

Figure 6-11 Admin Screen



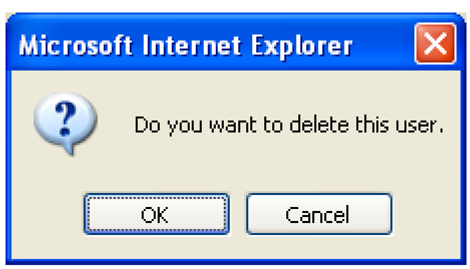
When the Administrator created the Joe User account shown above, only Data Display privileges were granted. The screen below shows the results of the Joe User login. Notice that all tabs except the Data Display tab are grayed out.

Figure 6-12 Joe User Login



The new user that you added may be easily deleted by logging in as Administrator, then clicking on the trashcan icon, as shown in Figure 6-11. When you click on the trashcan to delete a user, you will get a warning message as shown in Figure 6-13.

Figure 6-13 Deleting a User

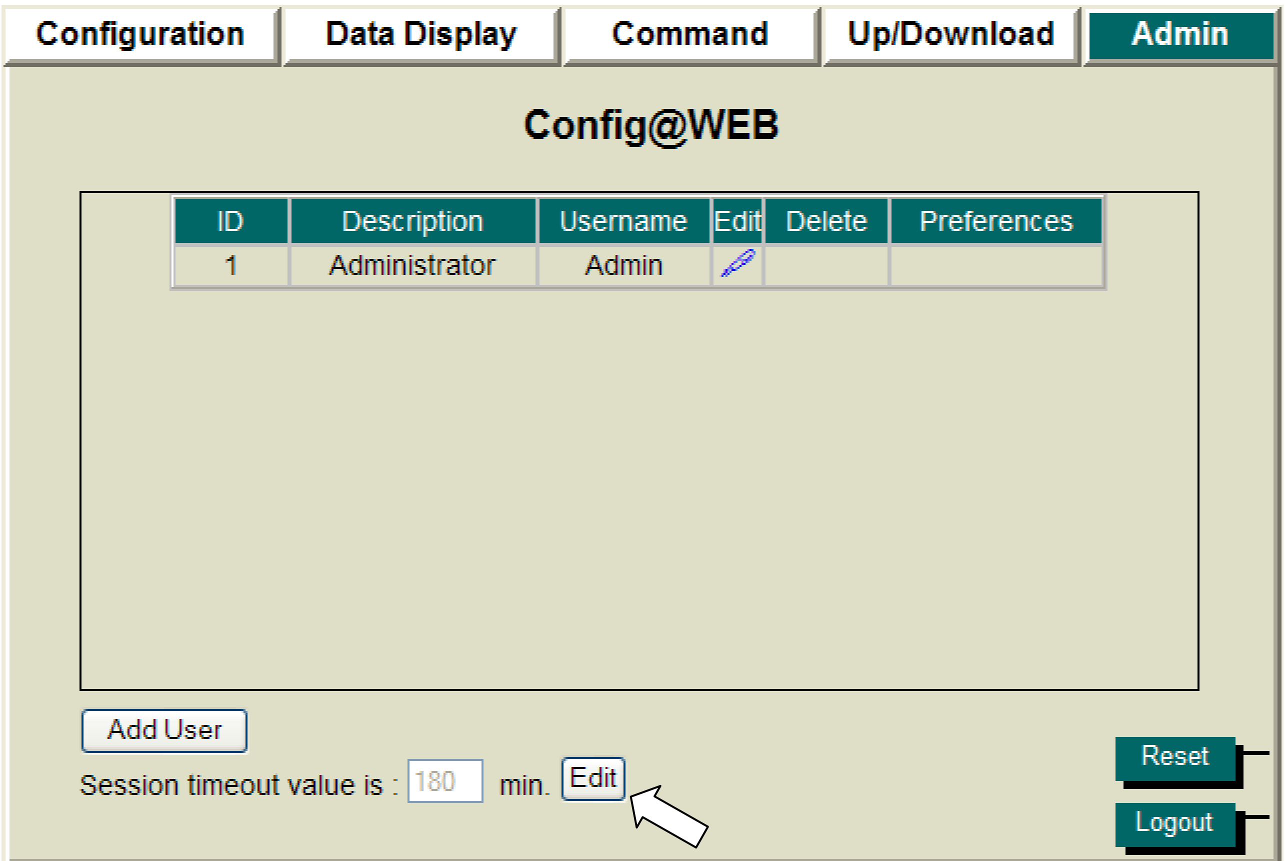


The resultant screen looks like Figure 6-14.

There is also a function in the Admin screen to change the Session timeout, as shown. 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 shown in the Session timeout value below, the session will be automatically logged out. The Administrator can change the Session timeout by clicking on Edit.

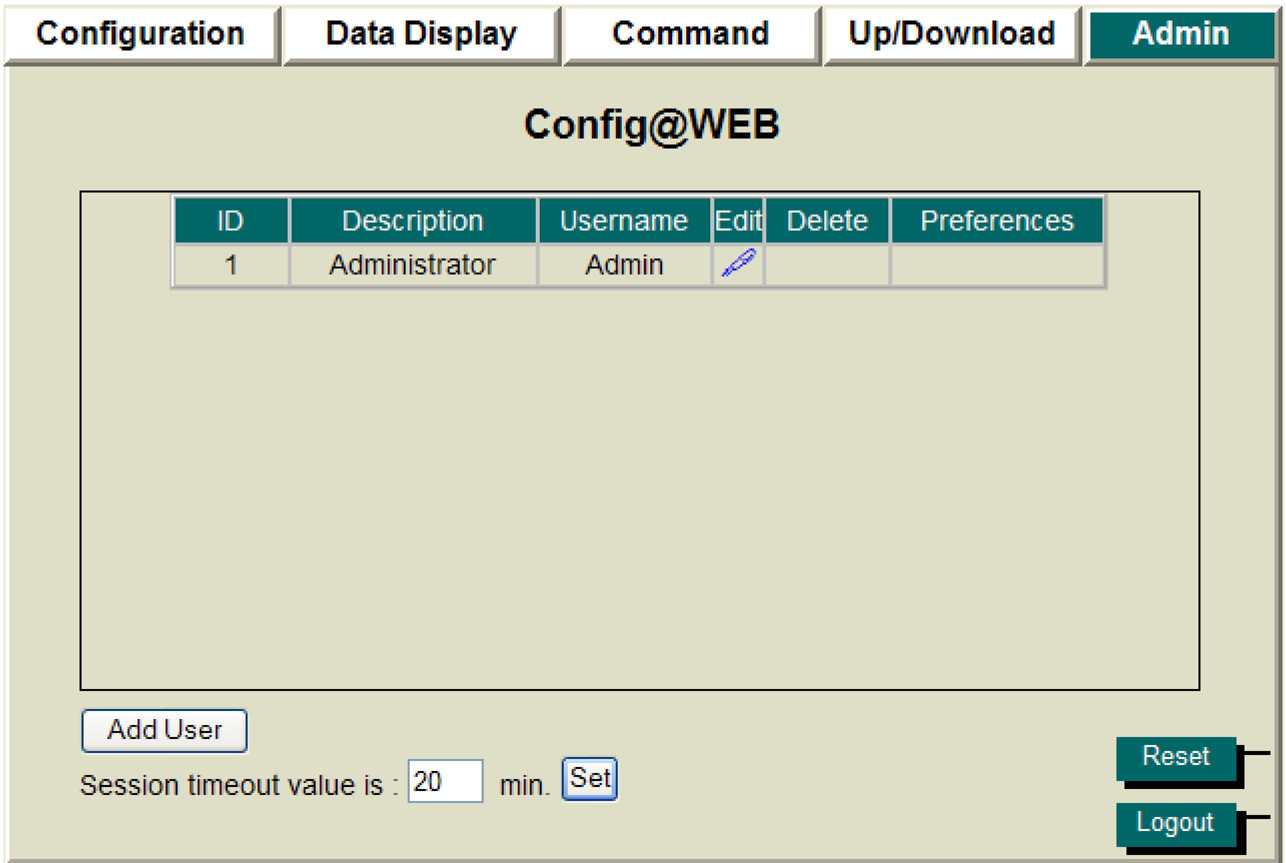
Warning: If you are configuring points and the session times out, any configuration changes that have not been submitted will be lost. Be sure to submit all changes in a timely manner.

Figure 6-14 Admin Screen After Deleting User



The resulting screen looks like Figure 6-15. When you place your cursor in the editing window, you will see a range (at the bottom left of your screen) of 5 to 180 minutes. Enter the new timeout value and click the Set button. The new timeout value will not take effect until you reset the RTU.

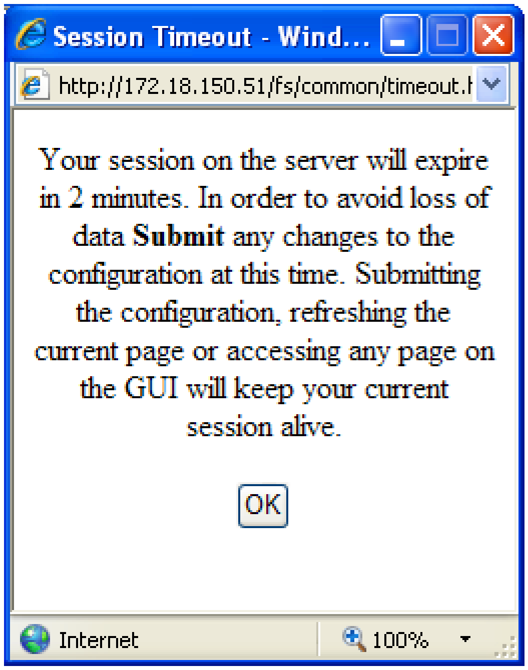
Figure 6-15 Editing Timeout Value



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 6-16 Session Timeout Warning Message

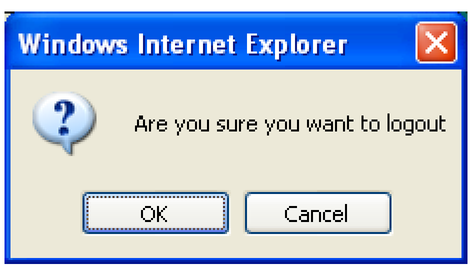


When a Session times out, the Login screen looks as shown below.

Figure 6-17 Timed Out Login

When you are ready to Logout, click the Logout button. You will get a warning window as shown below.

Figure 6-18 Logout Warning



When you click OK, you will be logged out.

APPENDIX A

Internet Explorer Settings

A.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 **Compatiblity 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.

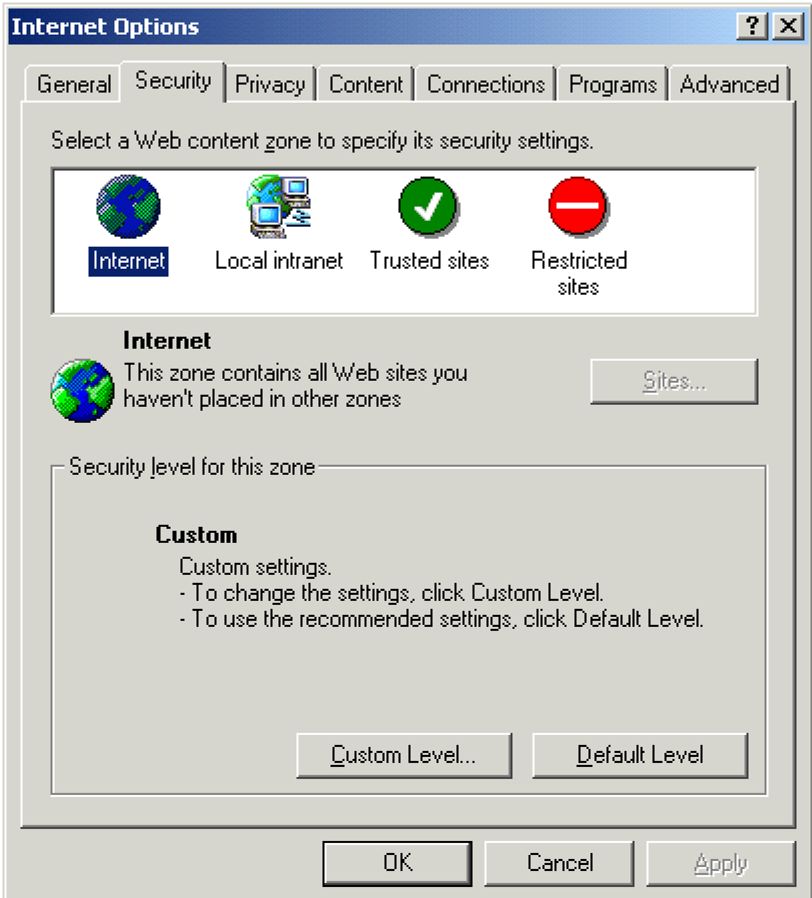
A.2 Internet Security Options

The config@WEB GUI Interface uses ActiveX controls in its operation. These signed controls must be installed on your PC before the GUI will be able to Up/Download files to the RTU and display Datatrap data. If you do not have privileges to change these settings, your IT department may have to install the controls for you. The following steps show how to access these settings on your PC.

1. Login as administrator
2. Launch IE
3. Select the Tools drop-down menu
4. Select Internet Options
5. Click Security tab
6. Click the "Internet" icon
7. Click the Default Level button to get a baseline setup
8. Click Custom Level

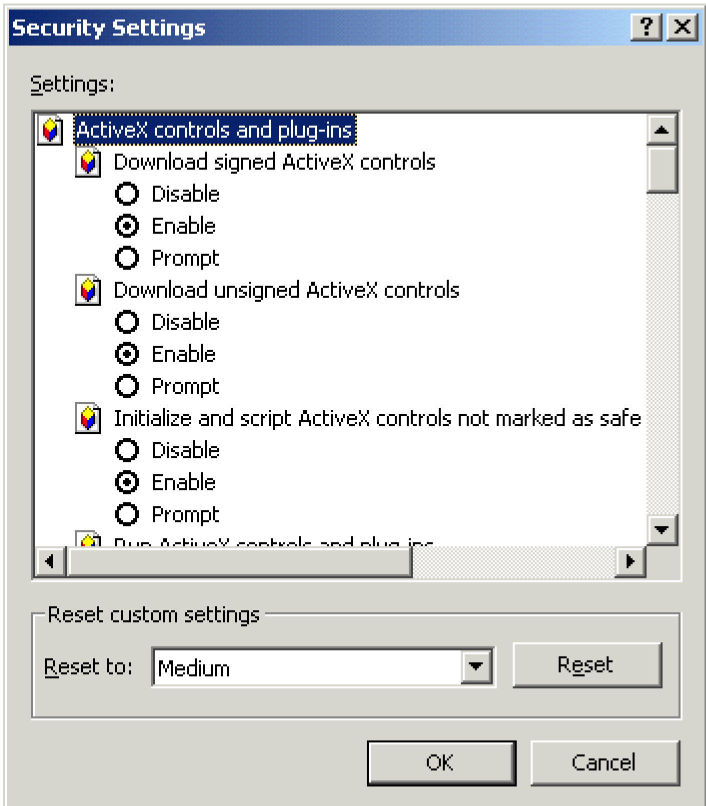
See Section A.6 for a list of the packaged files that need to be installed on your PC for all of the functions of the GUI to work.

Figure A-1 Internet Options Security Tab



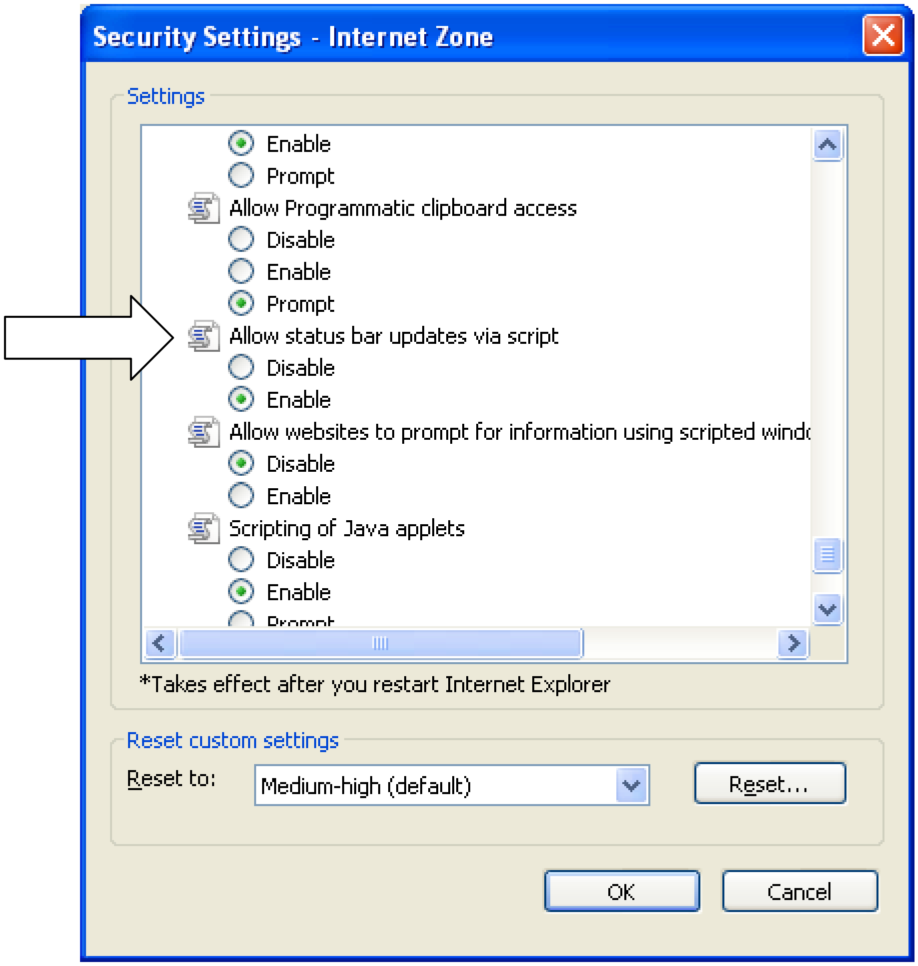
All Security Setting for ActiveX must be set to either Prompt or Enable, as shown below. Click OK at the end.

Figure A-2 Custom Level Settings



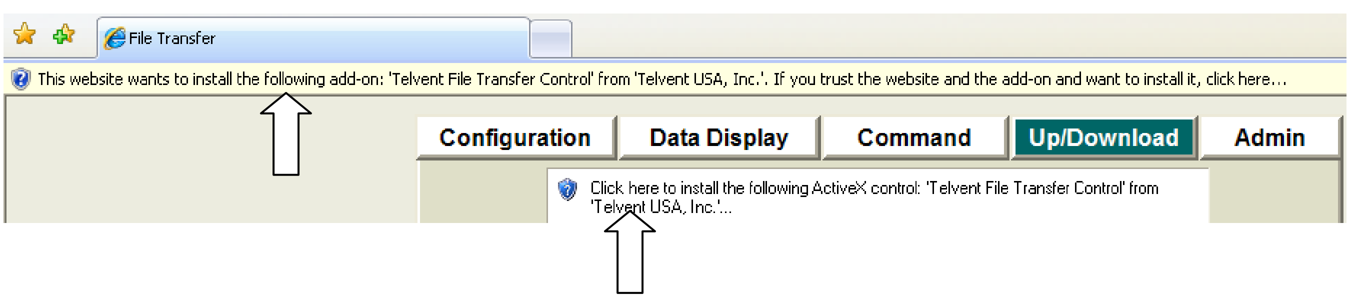
Note: If using IE7, select Enable for "Allow status bar updates via script", as shown below.

Figure A-3 Status Bar Updates



The first time you run Up/Download, you must be logged in as administrator. You will get a a series of Security Warning as shown below. (To save space, the entire screen is not shown.)

Figure A-4 Security Warning 1



If you click either area as shown above, you will get the following message.

Figure A-5 Security Message 2

If you click on "Install ActiveX Control…" as shown above, you will get the warning shown below. Click on the Install button to complete the ActiveX installation.

Figure A-6 Security Message 3

A.3 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 menus, then select Internet Options. From the Internet Options dialog box, click the Privacy tab. Set the slider bar for Medium High and click OK, as shown in Figure A-7.

Figure A-7 Setting Medium High Privacy for Cookies

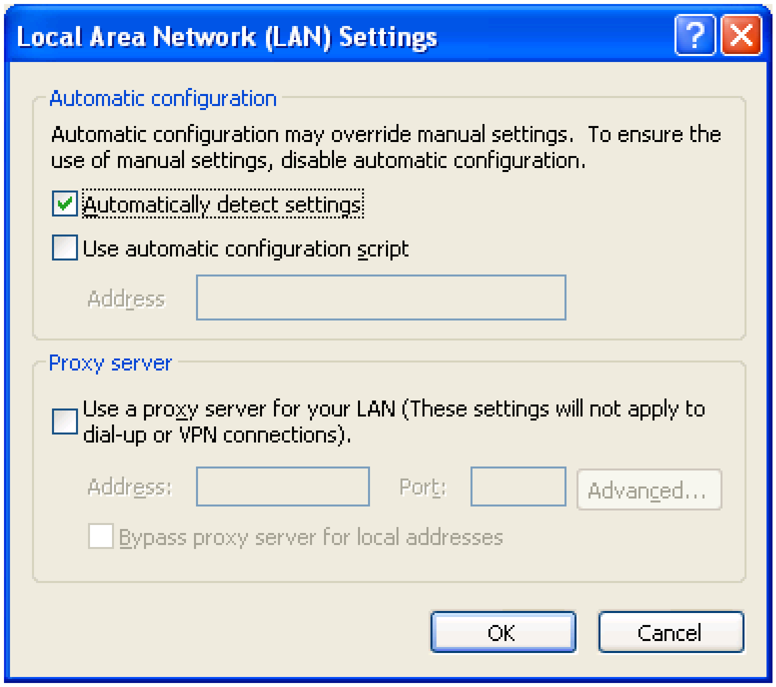
A.4 Connections Options

Click the Connections tab. You will get a screen similar to Figure A-8.

Figure A-8 Connections Tab

From the Connections tab, click LAN Setting. Make sure that you check "Automatically detect setting," as shown in Figure A-9. Do not check "Use a proxy server… "

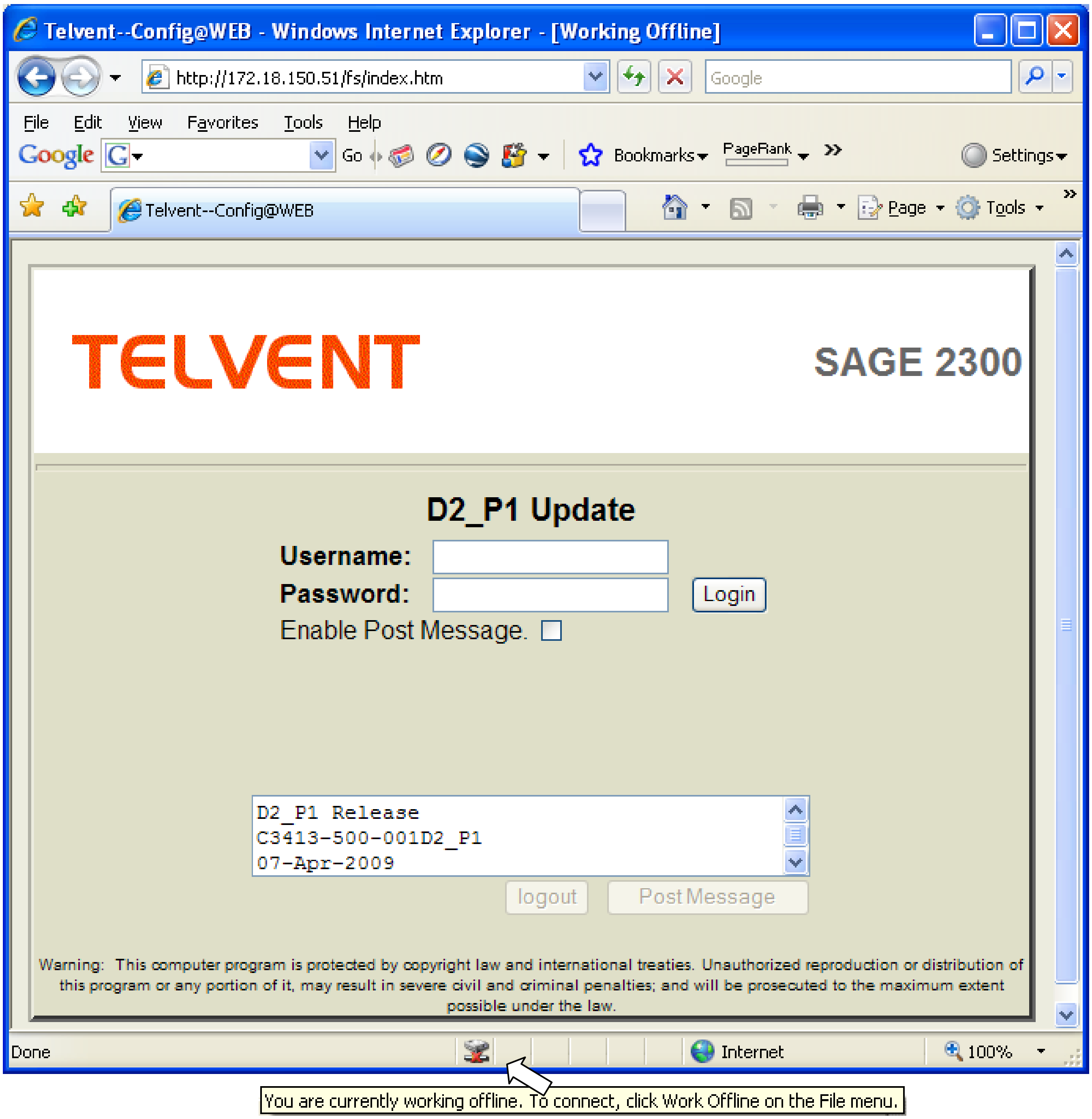
Figure A-9 LAN Settings



A.5 Working Online

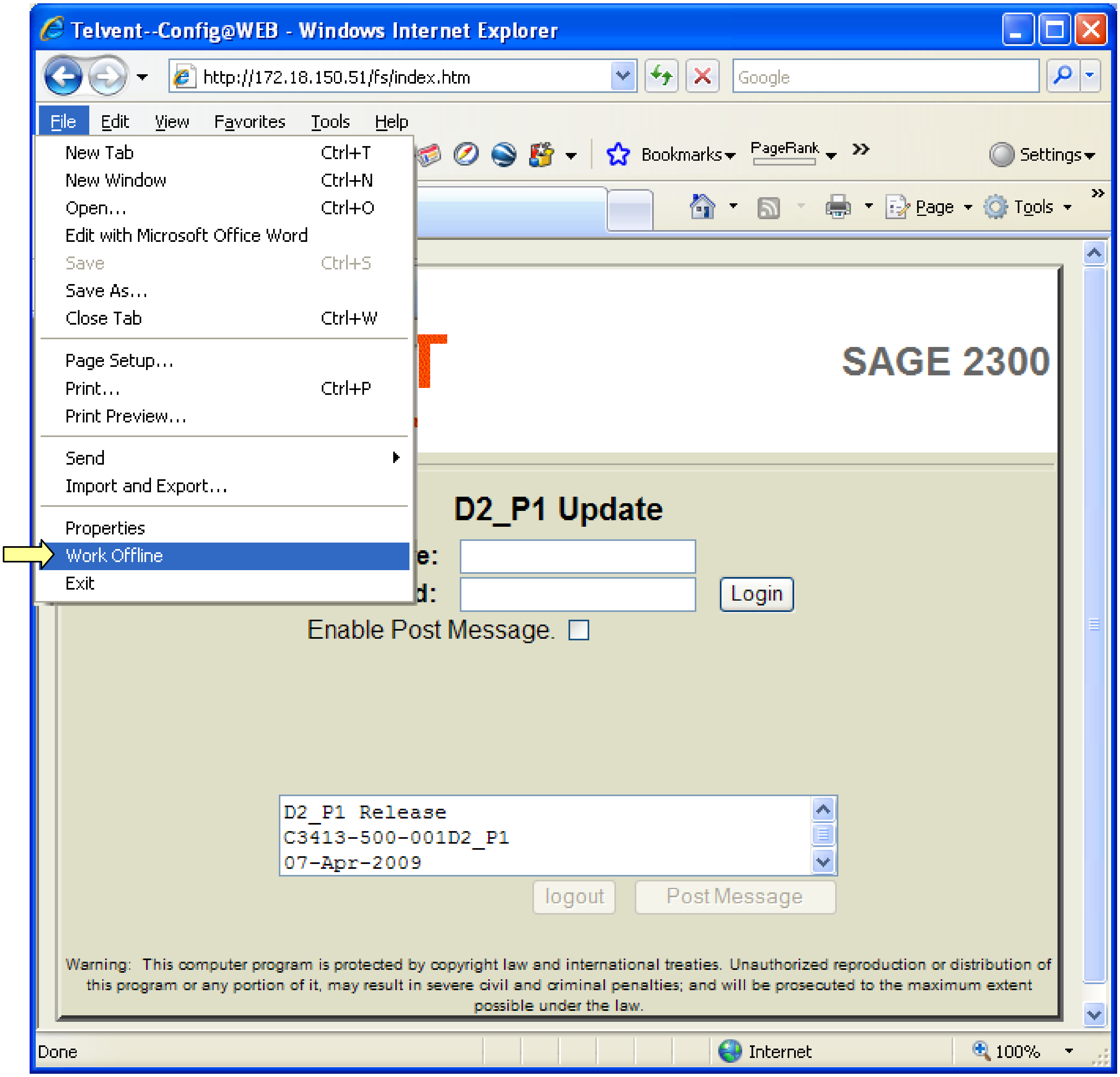
When Internet Explorer is running, watch for a "Working Offline" icon at the bottom right of the window as shown in Figure A-10. The existence of this icon means that IE is showing cached pages and NOT showing the live connection over the Ethernet cable, whether it's a direct connect (crossover cable), or a LAN connect. If you see the icon, you must take action.

Figure A-10 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 A-11.

Figure A-11 Unchecking Work Offline



A.6 Downloaded Files

The following Package Files are provided as part of the GUI file to support the Up/Download and Data Trap Analysis functions.

Table A-1 Telvent Supplied and Signed Package Files

Package File	Files installed	Version	Install Folder
FileXfer.CAB	fileXfer.ocx	2.8.0.2	IE addons folder.
	XceedFtp.dll	1.1.6461.0	System Folder
HexViewer.CAB	HexViewer..ocx	1.0.0.3	IE addons folder.

Table A-2 Microsoft Supplied and Signed Package Files

Package File	Files installed	Version	Install Folder
VBRun60.cab	ADVPACK.DLL	4.71.1015.0	Systems Folder
	asycfilt.dll	2.40.4275.1	"
	comcat.dll	4.71.1460.1	"
	msvbvm60.dll	6.0.97.82	"
	oleaut32.dll	2.40.4275.1	"
	olepro32.dll	5.0.4275.1	"
	stdole2.tlb	2.40.4275.1	"
	W95INF16.DLL	4.71.704.0	"
	W95INF32.DLL	4.71.16.0	"
ComDlg32.cab	Comdlg32.ocx	6.1.97.82	"
MSComCtl.cab	MSComCtl.ocx	6.1.97.82	"
MsFlxGrd.cab	MsFlxGrd.ocx	6.1.97.82	"
Msinet.cab	Msinet.ocx	6.1.97.82	"

APPENDIX B

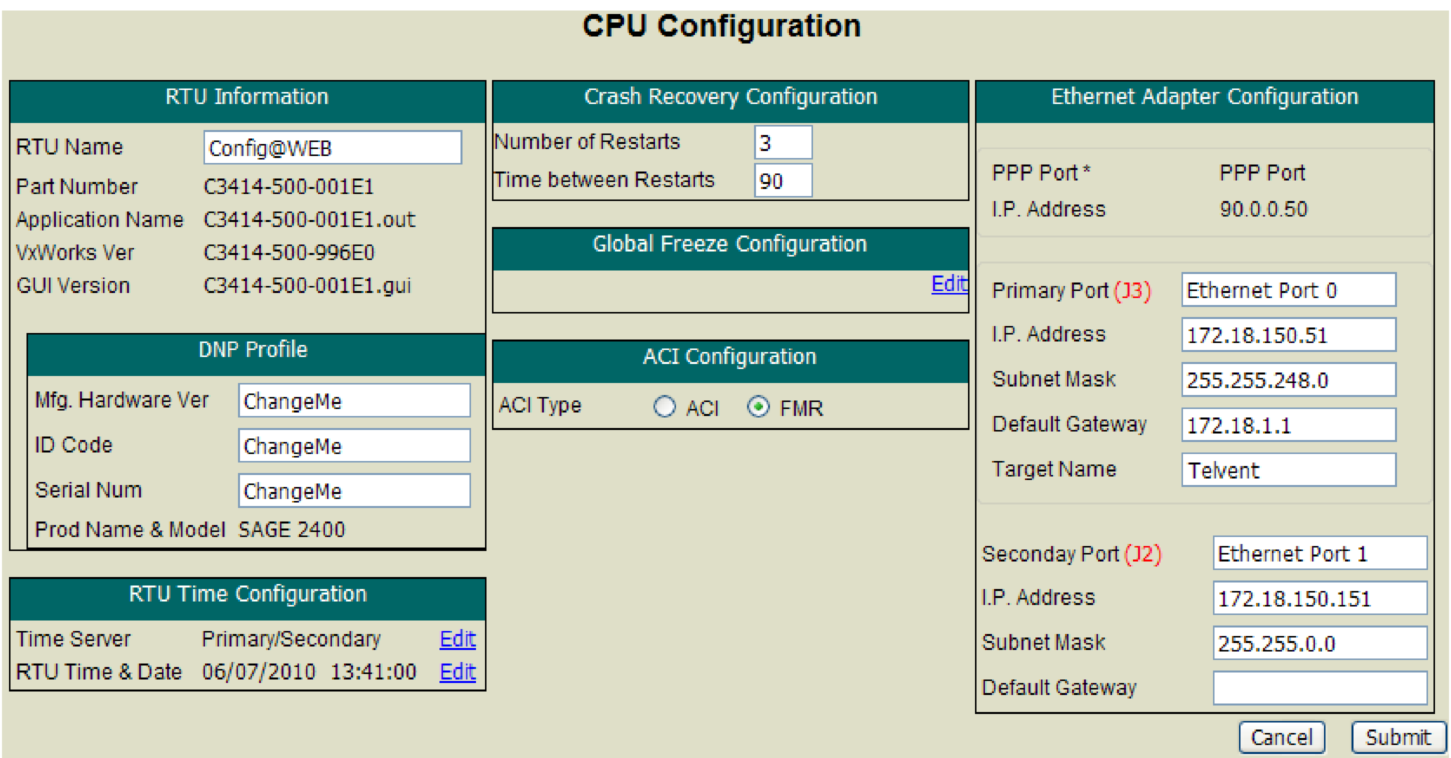
Crash Recovery & Safe Mode

B.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 B-1 and the field explanations below the figure.

Figure B-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.

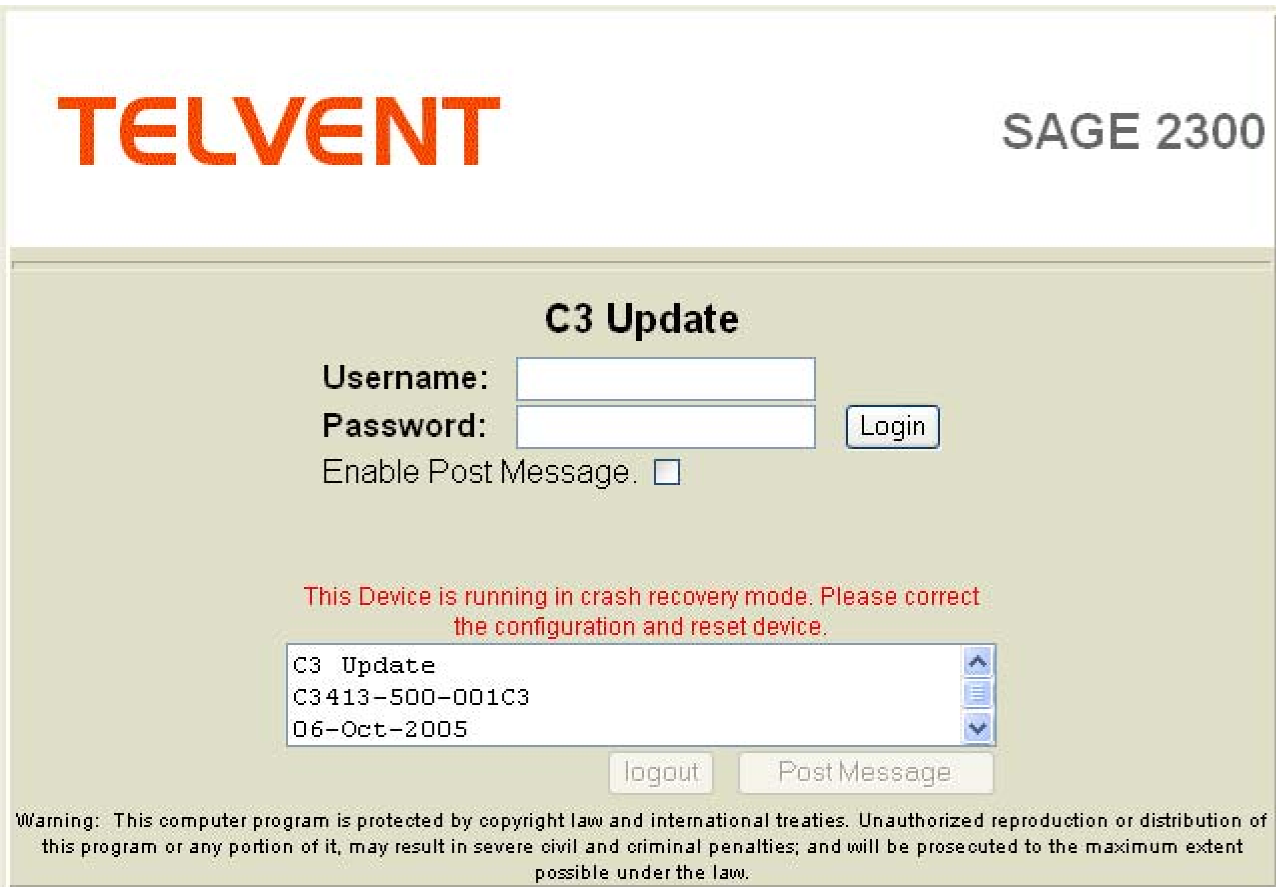
Time between Restarts If crash happens in shorter time, it is logged as a restart. Works best under normal conditions if the user accepts the default value.

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 B-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.

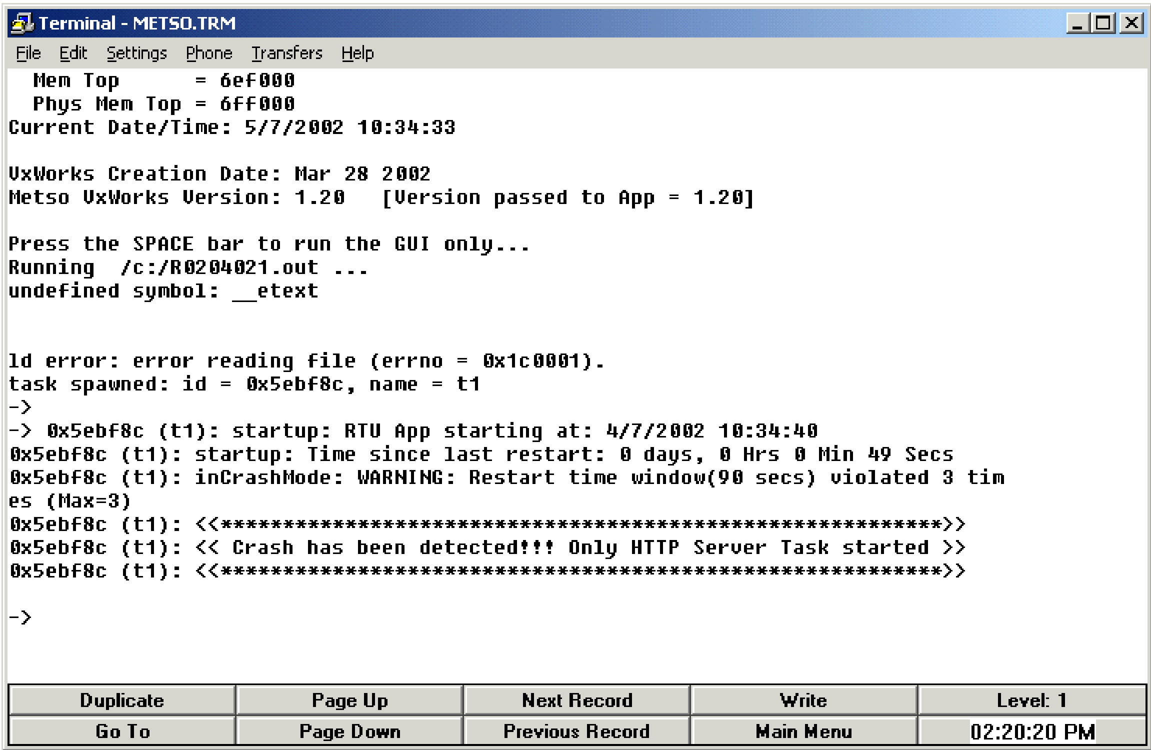
Figure B-2 Running in Crash Recovery Mode



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 B-3.

Figure B-3 Console Monitoring Crash Recovery Mode



B.2 Crash Recovery by Uploading a Safe Configuration

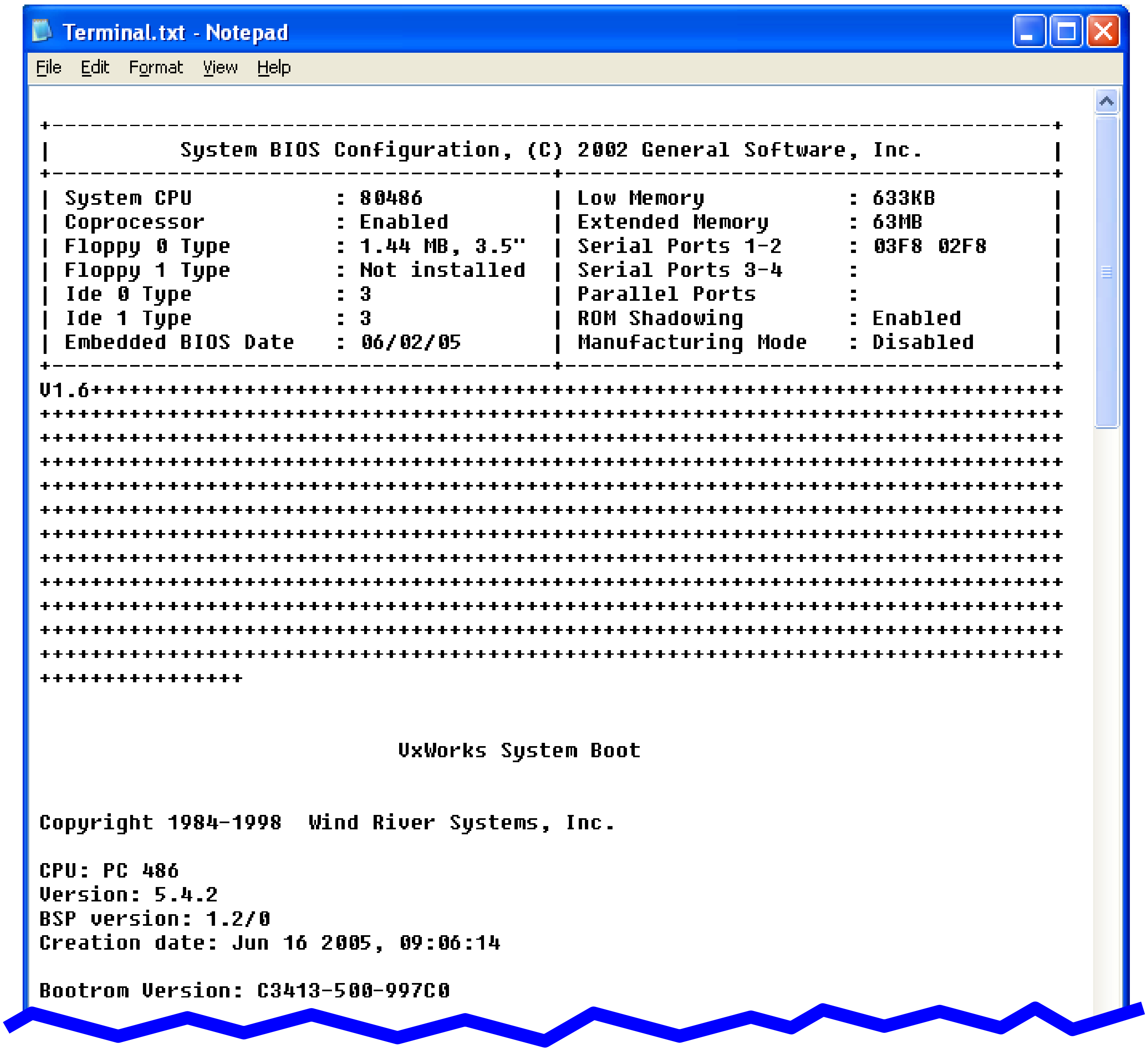
But what if you can't remember the last configuration that worked? The answer is, once you get a configuration that works, you should download it and store it in a safe place. If a bad configuration drives the RTU into crash recovery, upload the safe configuration and reboot. See the Upload/Download chapter.

B.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. During the early part of bootup, press the spacebar when the following message appears. You must be quick because there is only a two second window to do this.

Figure B-4 Beginning of Bootup




```
+------------------------------------------------------------------------------+
|          System BIOS Configuration, (C) 2002 General Software, Inc.          |
+---------------------------------------+--------------------------------------+
| System CPU           : 80486          | Low Memory           : 633KB         |
| Coprocessor          : Enabled        | Extended Memory      : 63MB          |
| Floppy 0 Type        : 1.44 MB, 3.5"  | Serial Ports 1-2     : 03F8 02F8     |
| Floppy 1 Type        : Not installed  | Serial Ports 3-4     :               |
| Ide 0 Type           : 3              | Parallel Ports       :               |
| Ide 1 Type           : 3              | ROM Shadowing        : Enabled       |
| Embedded BIOS Date   : 06/02/05       | Manufacturing Mode   : Disabled      |
+---------------------------------------+--------------------------------------+
V1.6++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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++++++++++++++++


                            VxWorks System Boot


Copyright 1984-1998  Wind River Systems, Inc.

CPU: PC 486
Version: 5.4.2
BSP version: 1.2/0
Creation date: Jun 16 2005, 09:06:14

Bootrom Version: C3413-500-997C0
```
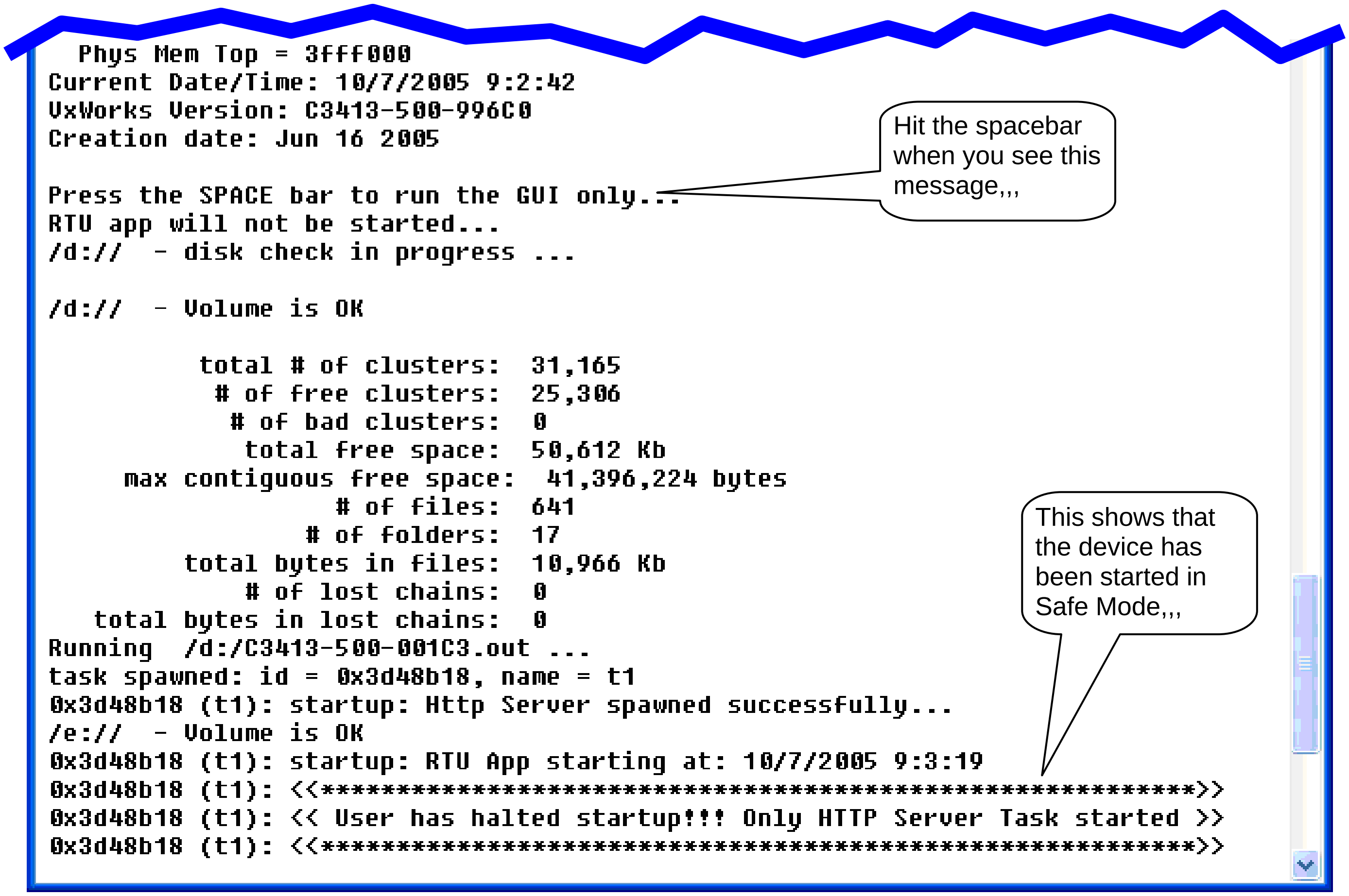
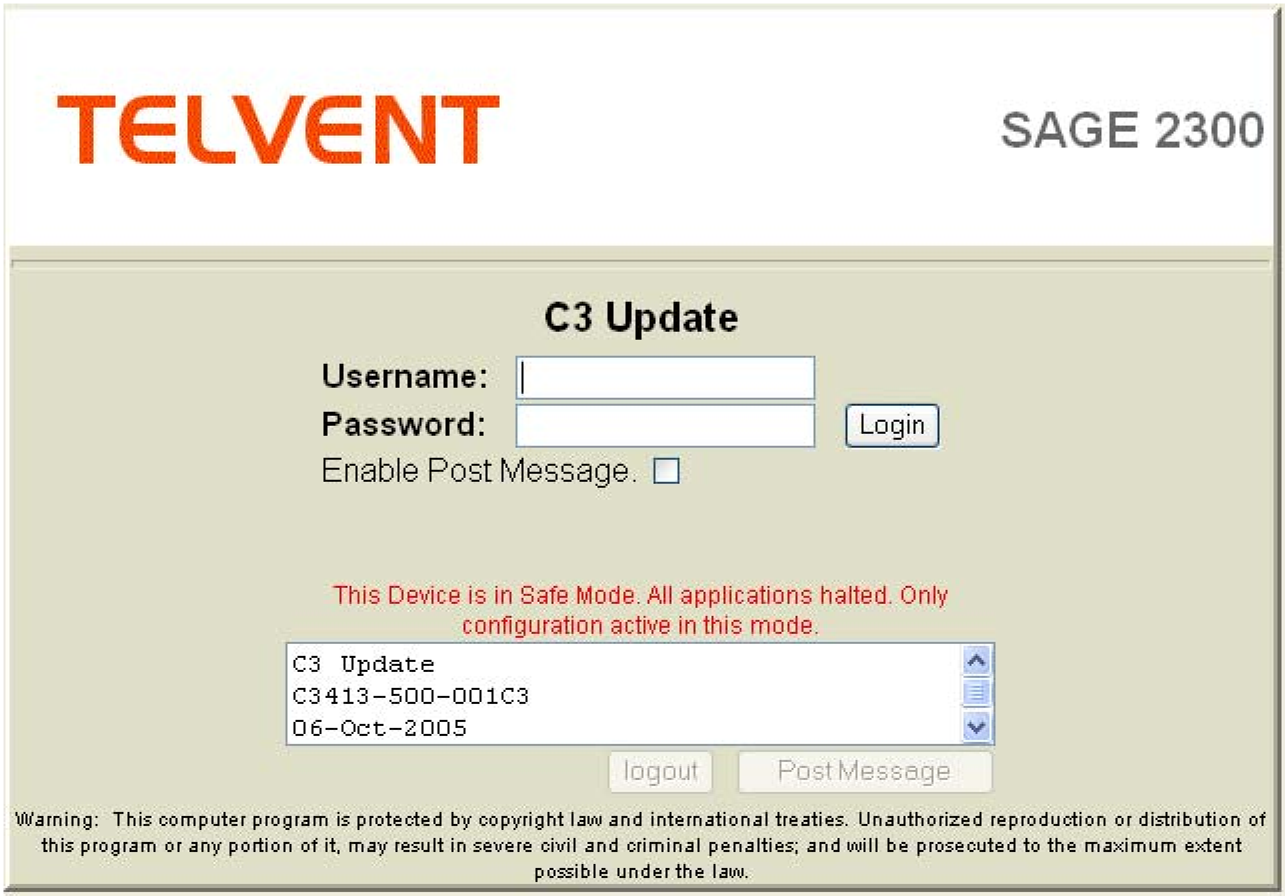

Figure B-5 Hitting Spacebar and Results



```
  Phys Mem Top = 3fff000
Current Date/Time: 10/7/2005 9:2:42
VxWorks Version: C3413-500-996C0
Creation date: Jun 16 2005

Press the SPACE bar to run the GUI only...
RTU app will not be started...
/d://  - disk check in progress ...

/d://  - Volume is OK

          total # of clusters:  31,165
           # of free clusters:  25,306
            # of bad clusters:  0
             total free space:  50,612 Kb
     max contiguous free space:  41,396,224 bytes
                   # of files:  641
                 # of folders:  17
         total bytes in files:  10,966 Kb
             # of lost chains:  0
   total bytes in lost chains:  0
Running  /d:/C3413-500-001C3.out ...
task spawned: id = 0x3d48b18, name = t1
0x3d48b18 (t1): startup: Http Server spawned successfully...
/e://  - Volume is OK
0x3d48b18 (t1): startup: RTU App starting at: 10/7/2005 9:3:19
0x3d48b18 (t1): <<***********************************************************>>
0x3d48b18 (t1): << User has halted startup!!! Only HTTP Server Task started >>
0x3d48b18 (t1): <<***********************************************************>>
```

The results of starting up in Safe Mode are shown below. Other screens beyond Login are marked with the Safe Mode message.

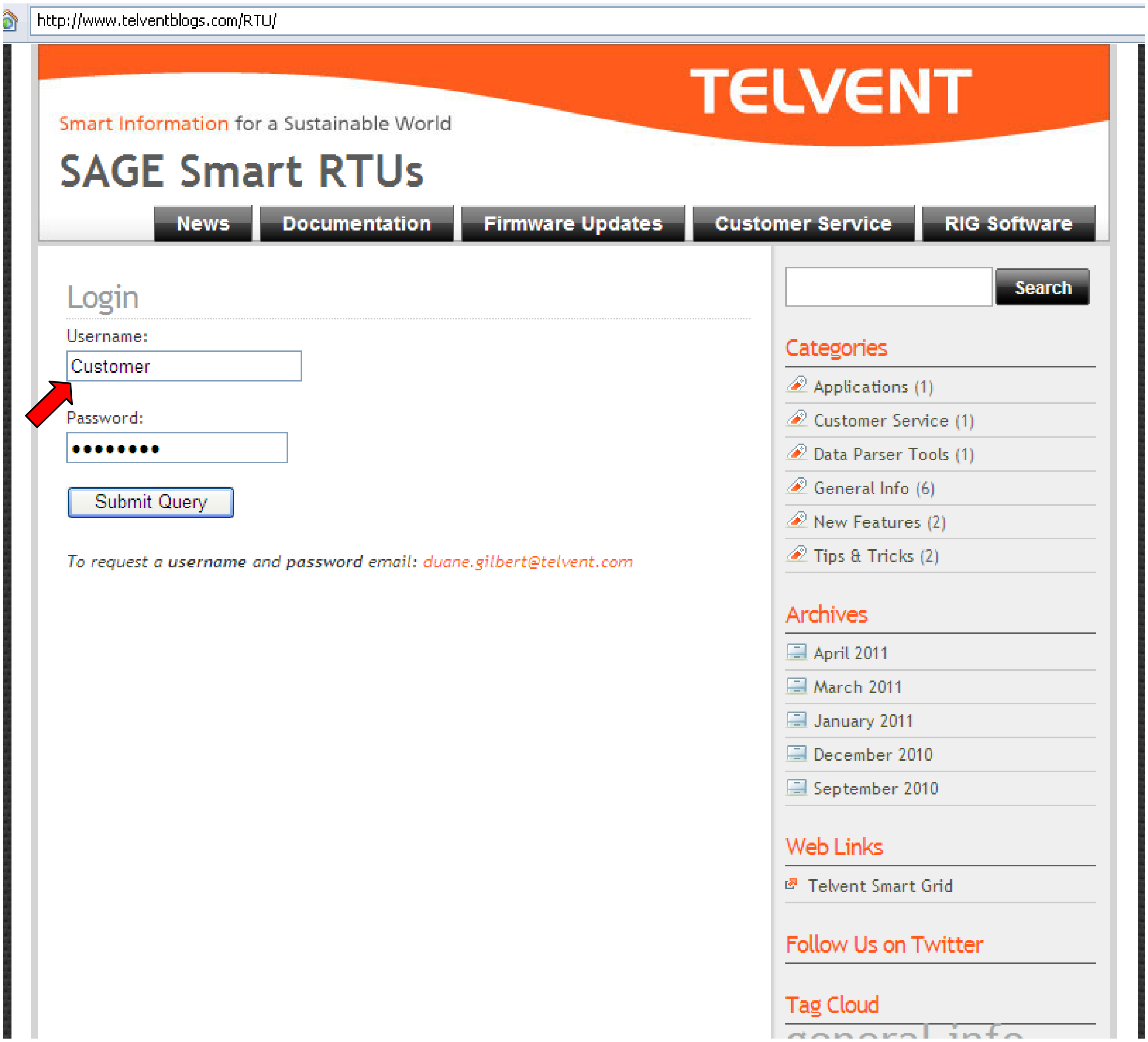
Figure B-6 Safe Mode



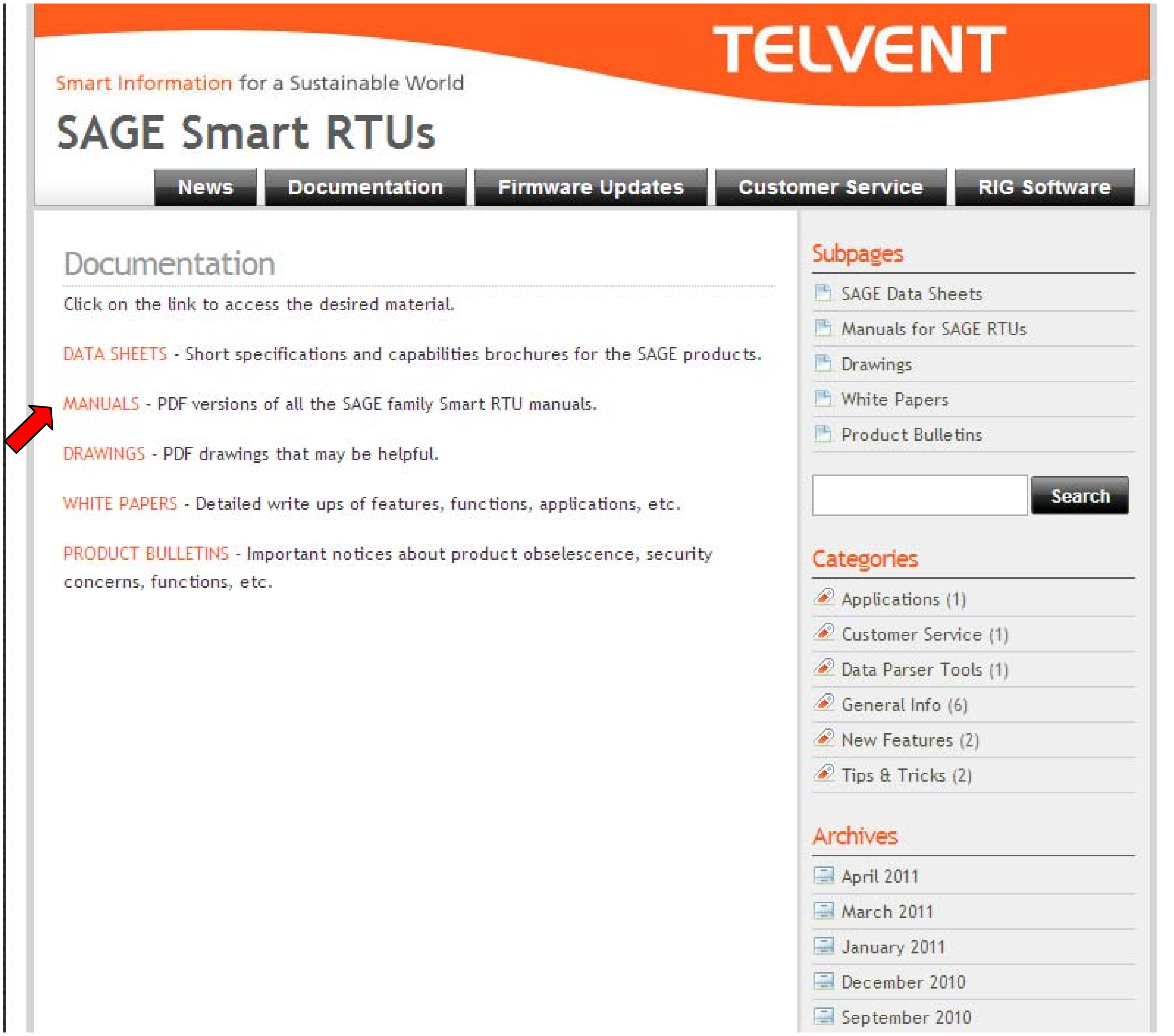
APPENDIX C

Accessing The Customer Website

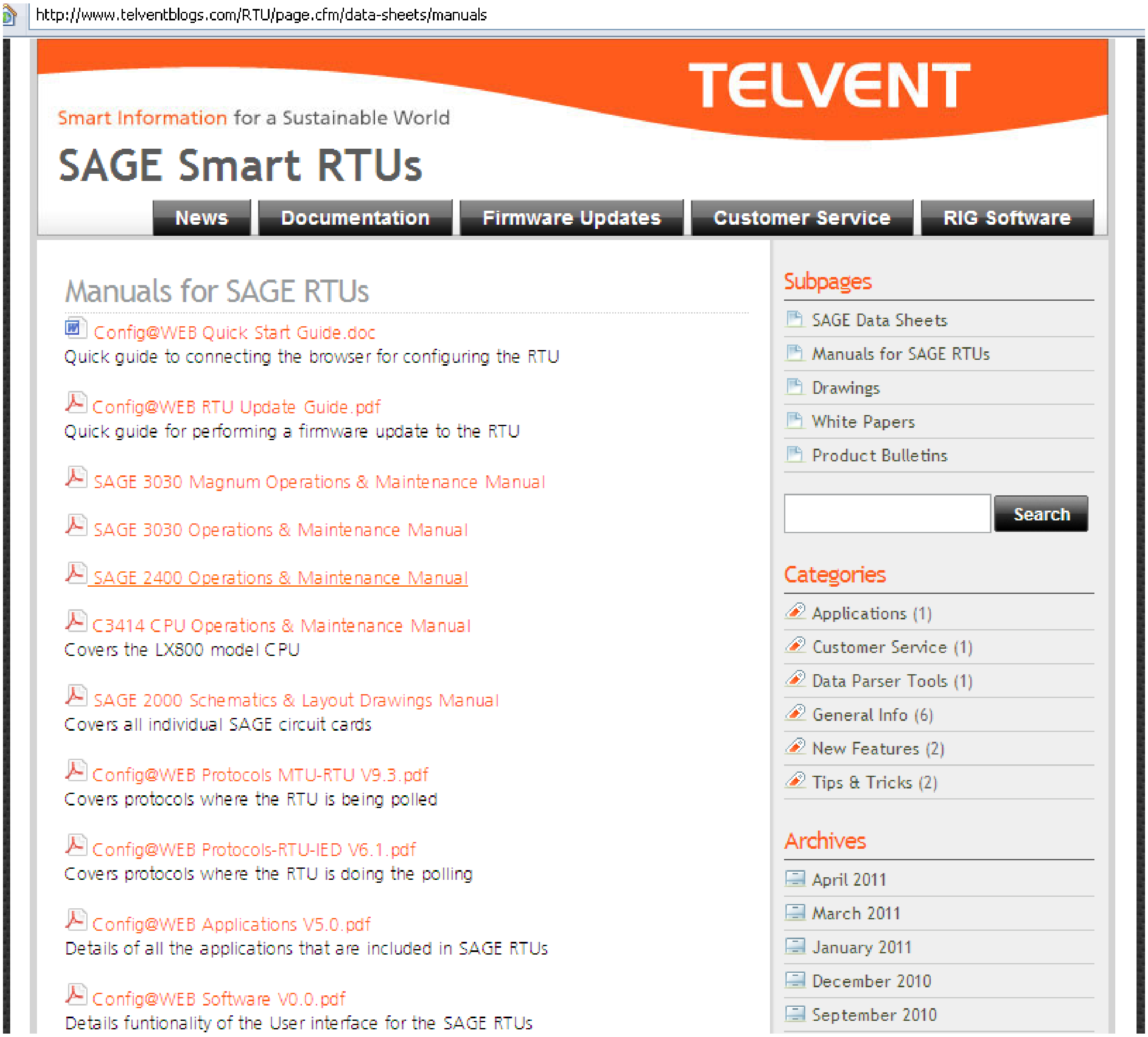
Use your browser to go to the Telvent RTU website (http://www.telventblogs.com/RTU/) and type in Username and Password. If you have not registered for this website, contact Telvent RTU Support.



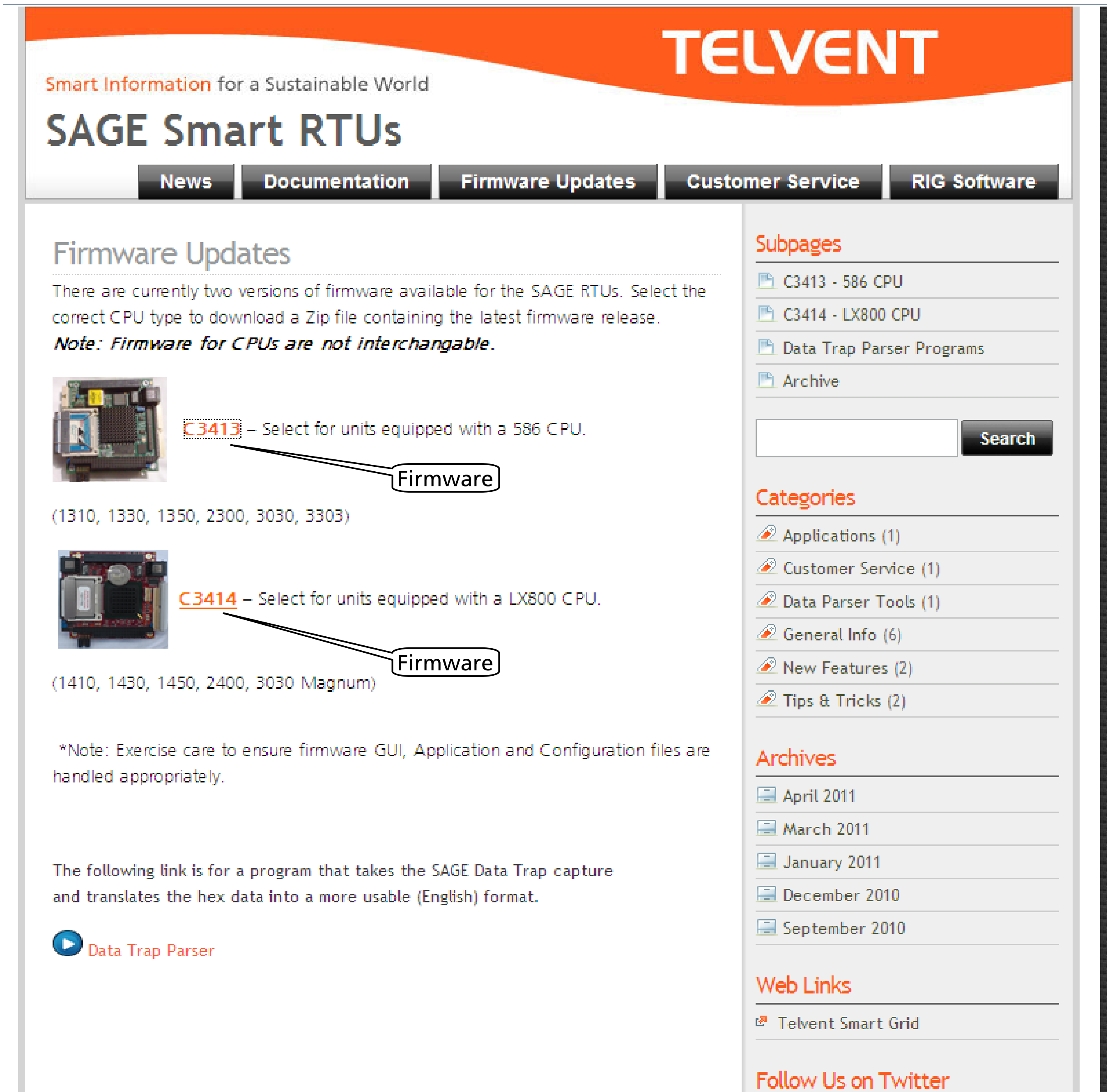
After logging in click on the 'Documentation' tab for general Documentation.



Click on 'Manuals' to Download RTU Manuals.



You may also Download the latest firmware by Clicking on the 'Firmware Updates' tab. This is the Firmware page. Please note that there are two sets of firmware for the RTUs, one for the 586 CPU (C3413) and one for the latest LX-800 CPU (C3414).



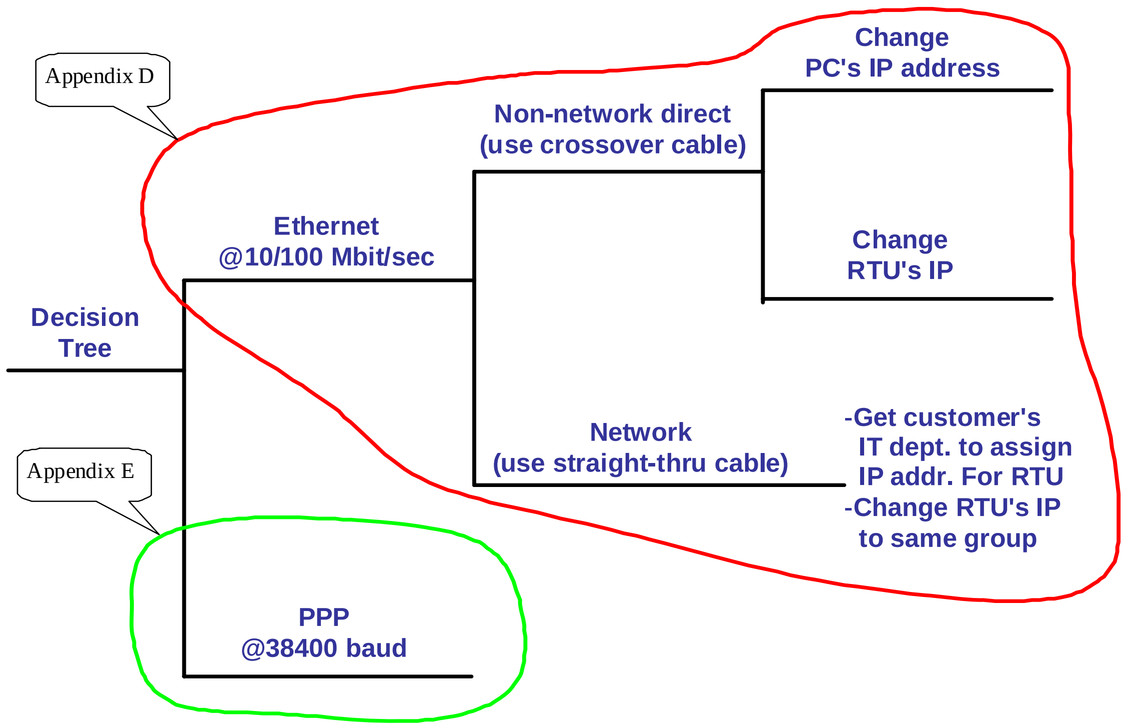
APPENDIX D

Ethernet Connection

D.1 Where Do You Start?

Let's start with the basics: You have a Windows PC and a config@WEB RTU. Figure D-1 shows the possible combinations of your situation.

Figure D-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.

D.1.1 Non-Network Ethernet Communication With RTU

- You need an Ethernet Crossover Cable (supplied with each RTU)

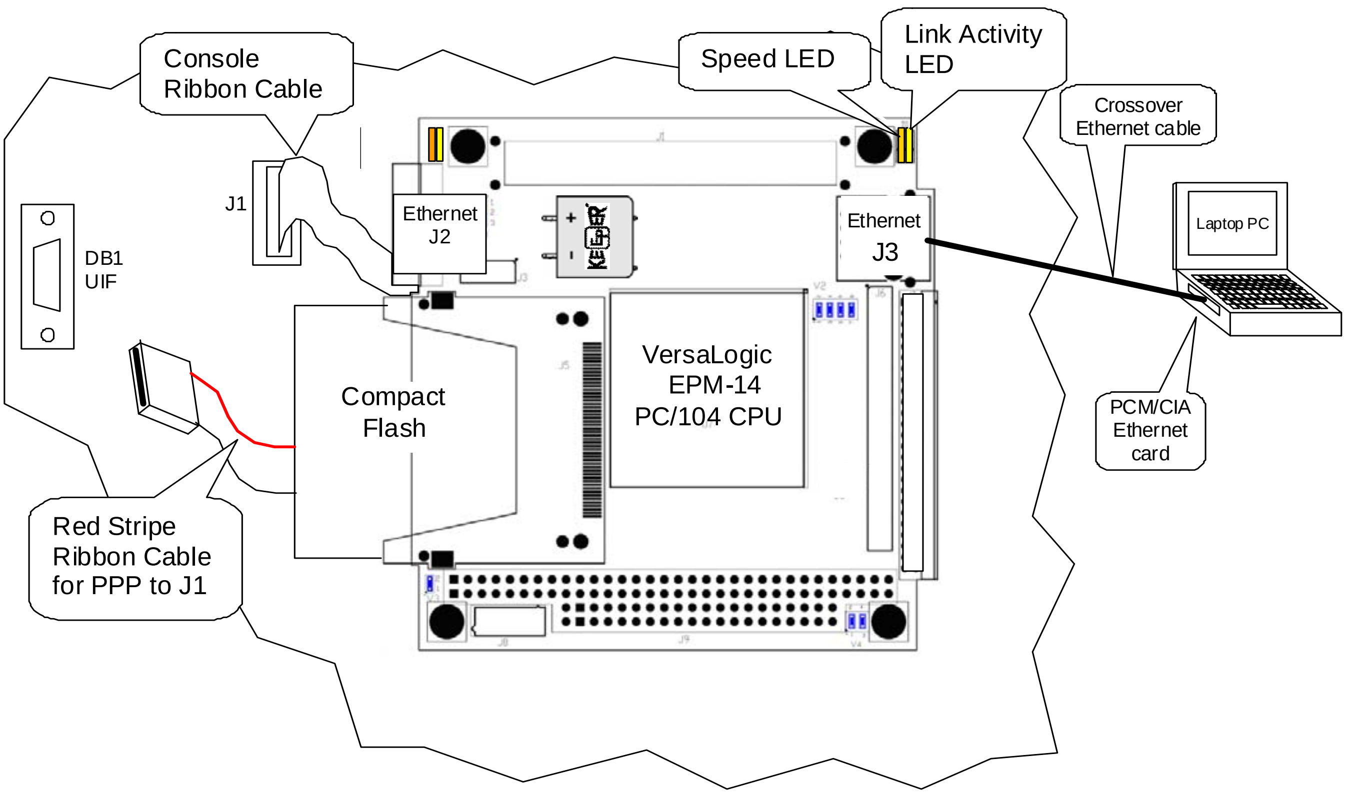
- You need a PC with a static IP address and automatic dialup turned off (see later in this appendix)
- You need to have both RTU and the PC have IP addresses within the same group (you can change either the RTU IP address or the PC IP address). If you change the PC IP address, record the old setup so 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.

D.1.1.1 Physical Setup

The physical connection is straightforward, as shown in Figure D-2 and Figure D-3

Figure D-2 Connecting Directly to Ethernet



Link/Activity LED

ON	Active Ethernet cable plugged into J3. No Tx/Rx data activity.
OFF	Cable not plugged into J3. Cable not plugged into active hub.
BLINKING	Active Ethernet cable plugged into J3. Tx or Rx data activity detected on the cable.

Speed LED

ON	100baseT (Fast) detected on Ethernet cable.
OFF	10BaseT (Slow) detected on Ethernet cable.

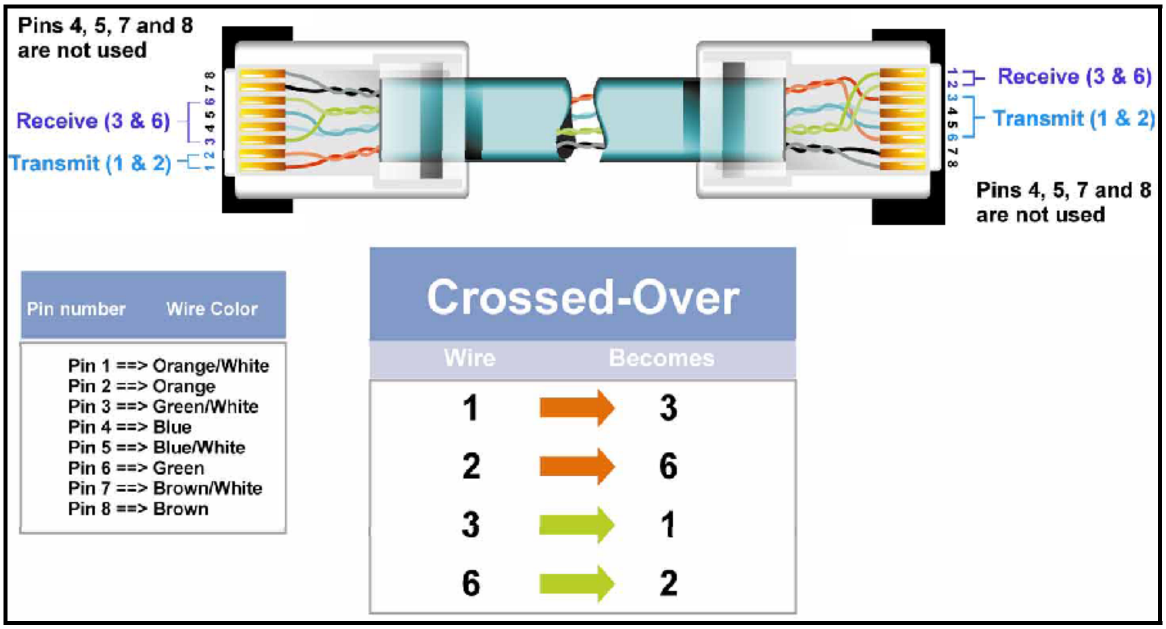
Power/Run LED

ON	Either booting up or in Safe Mode / Crash Recovery Mode
BLINKING	Normal CPU running mode

Compact Flash Access LED – Not Applicable for C3414 CPU

FLASHES	CPU is accessing the Compact Flash memory

Figure D-3 Crossover Ethernet Cable



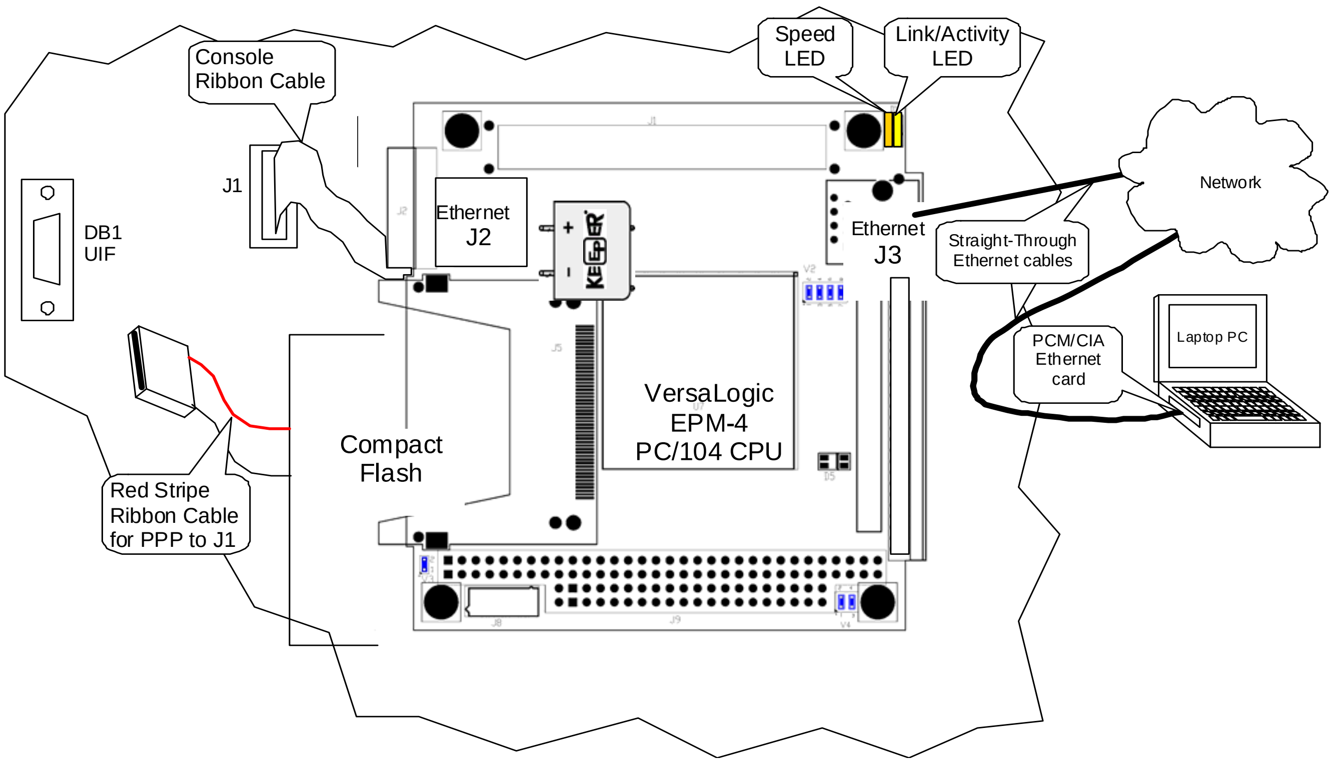
D.1.2 Network Ethernet Communication With RTU

- 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

D.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 D-4.

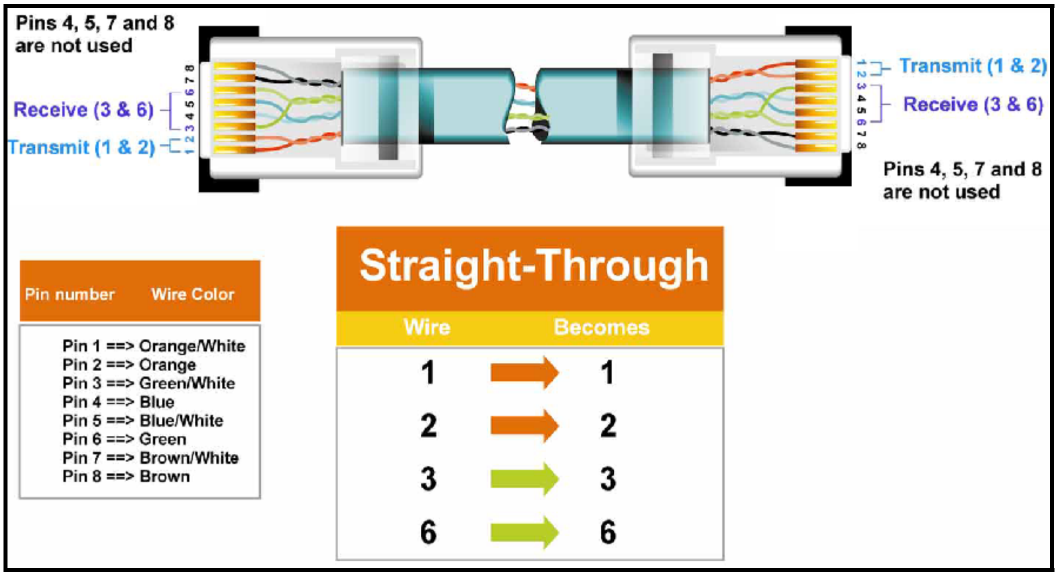
Figure D-4 Connecting to Ethernet Network



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.

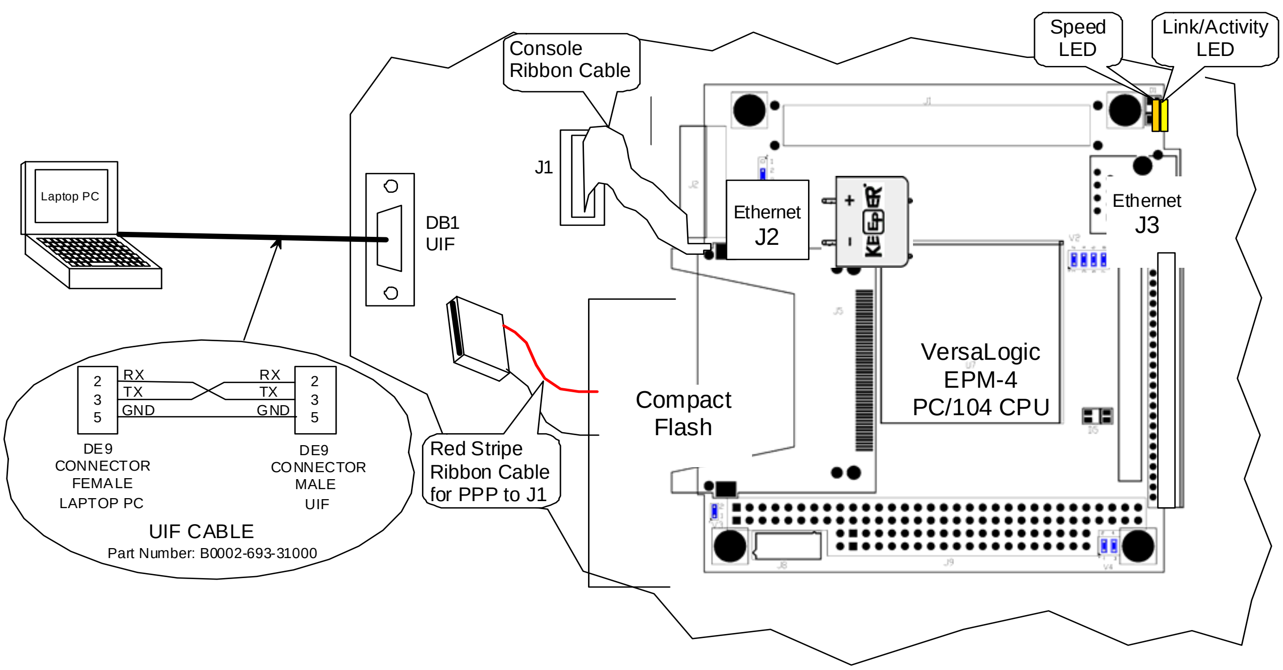
Figure D-5 Straight-Through Ethernet Cable



D.2 How to Find/Change Your RTU's IP Address

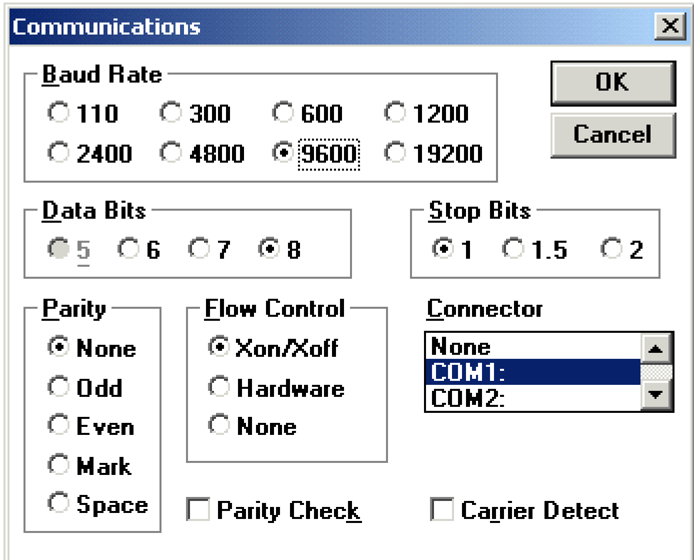
If you do not know the IP address of your RTU, you may ask the RTU "whoru" (who are you) from the console. It's easy to talk to the CPU card through the console. Set the ribbon cable on the card as shown in Figure D-6. Connect a three-wire null modem cable between your PC and DB1 on the RTU. Use any 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 D-6 Talking to the RTU Through the Console



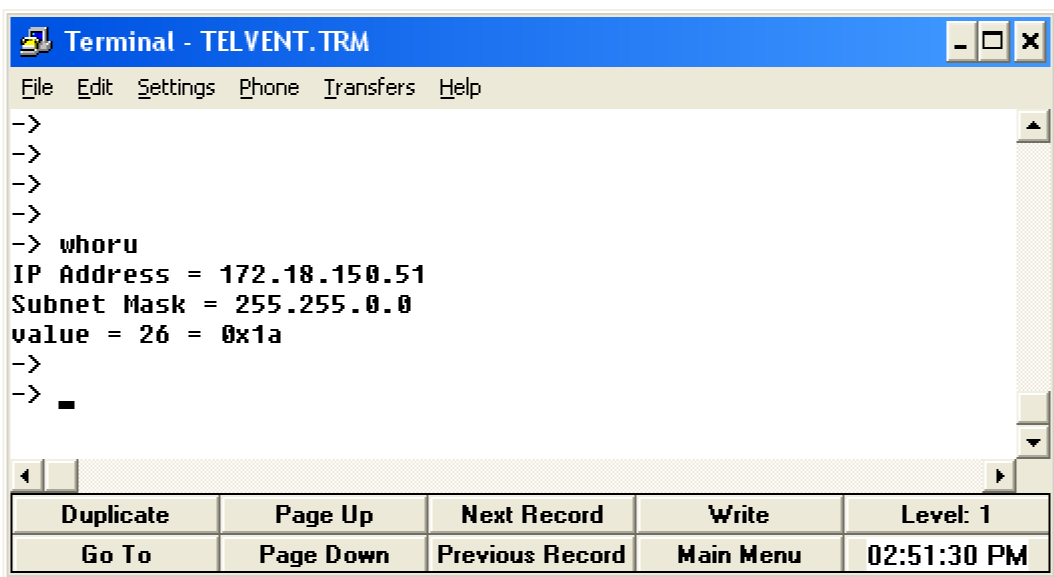
Set communication parameters on the terminal emulation program as shown in Figure D-7.

Figure D-7 Terminal Emulation Communication Parameters



Hit Enter a few times until you get a prompt, then type "whoru" as shown in Figure D-8.

Figure D-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 not 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.

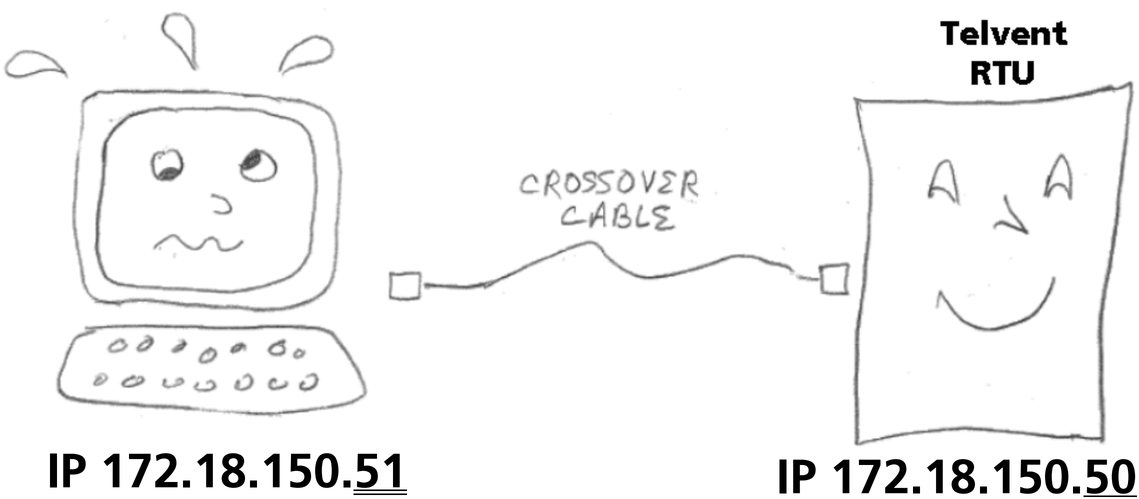
As an example, the following command sets the IP address to 172.18.150.100 and the subnet mask to 255.255.255.0.

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.

D.3 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.



If you decide to change your PC's IP address, keep these points in mind:

- Telvent 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.

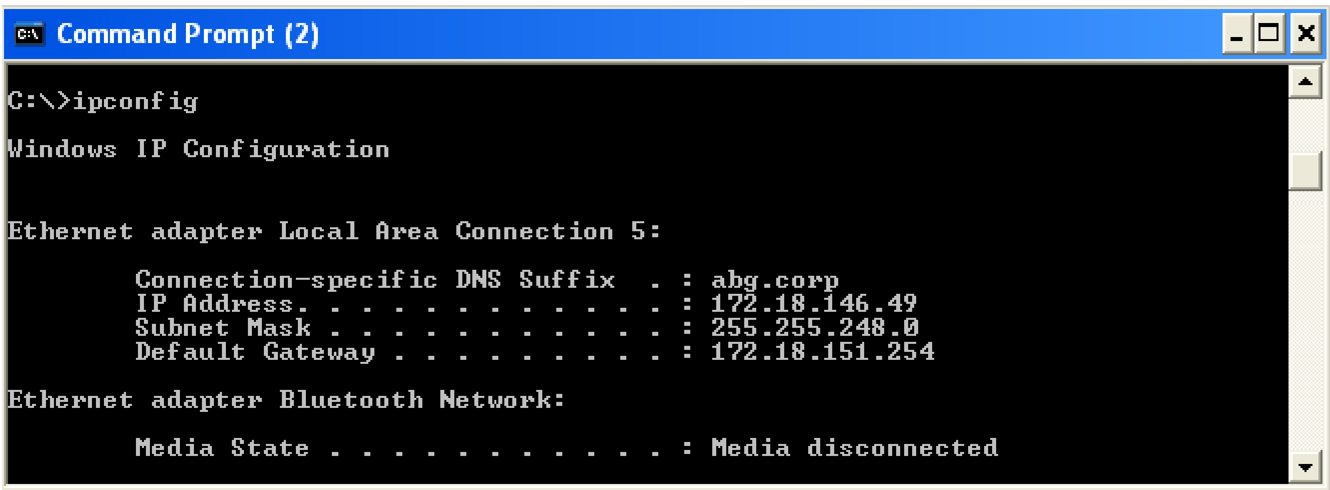
D.3.1 Windows XP Pro and Vista

D.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

Example:

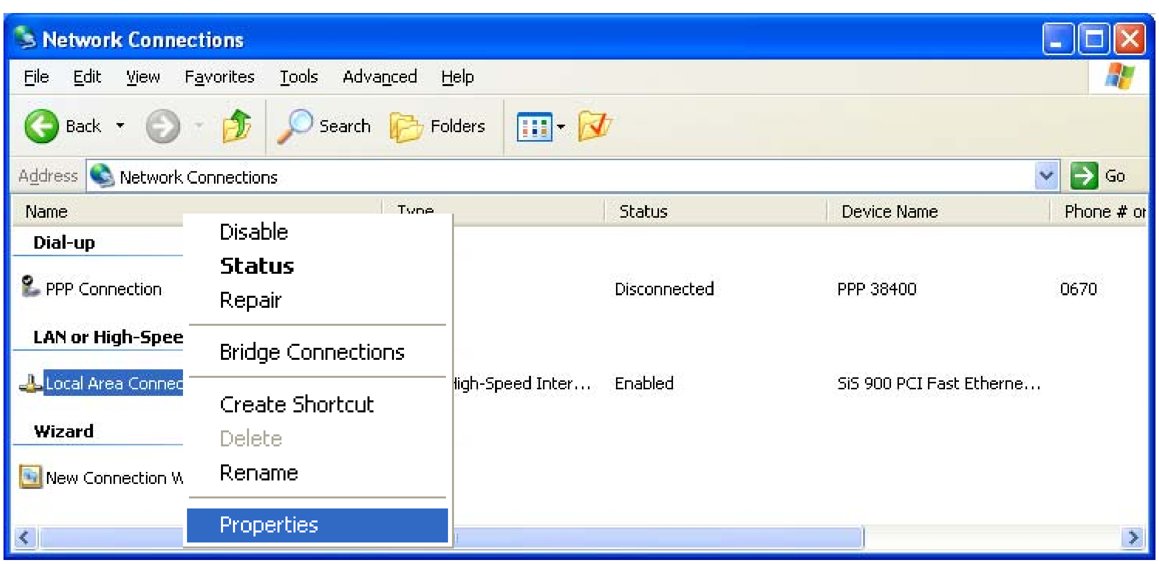


D.3.1.2 Setting Up the Alternate Connection

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.

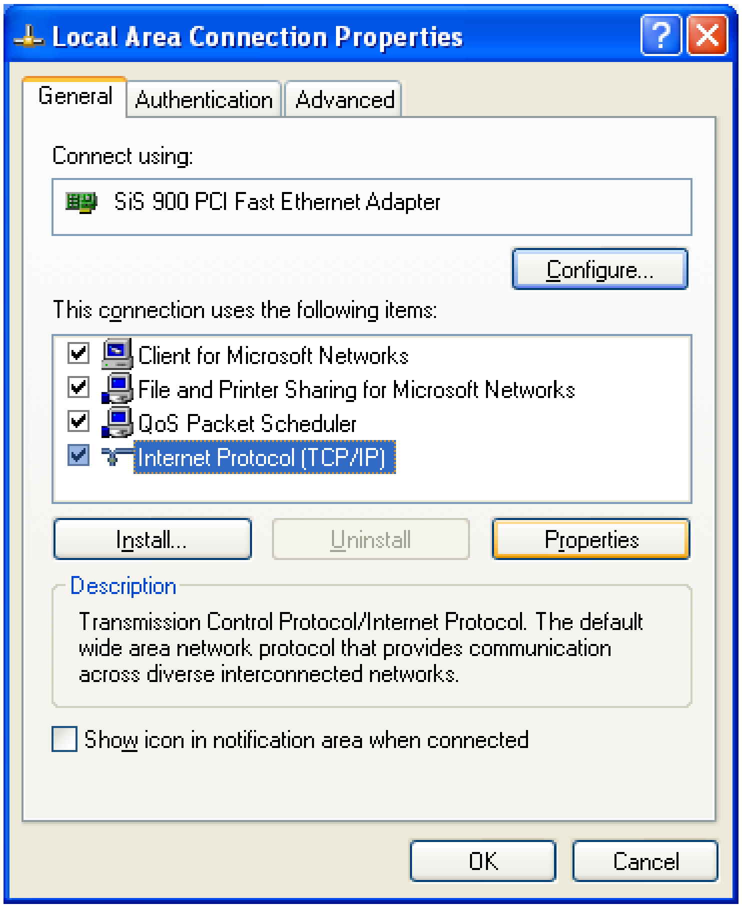
From the Control Panel, right-click on Local Area Connection and select Properties as shown below.

Figure D-9 Right-Click on Local Area Connection



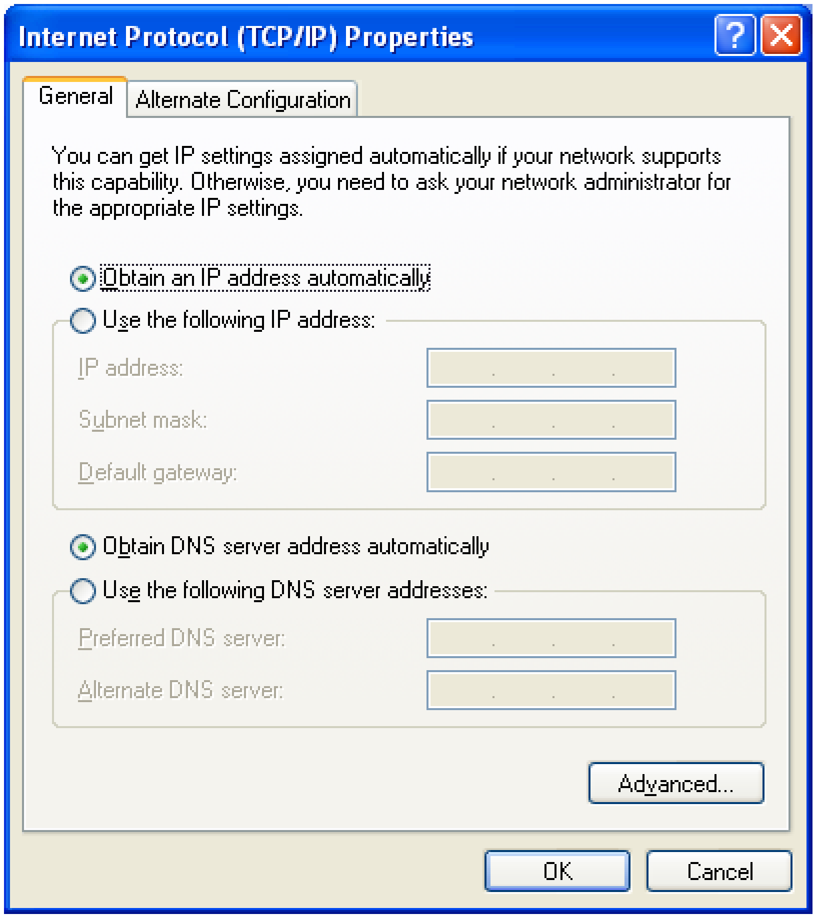
Select Internet Protocol (TCP/IP) and click on the Properties button as shown below.

Figure D-10 TCP/IP Properties



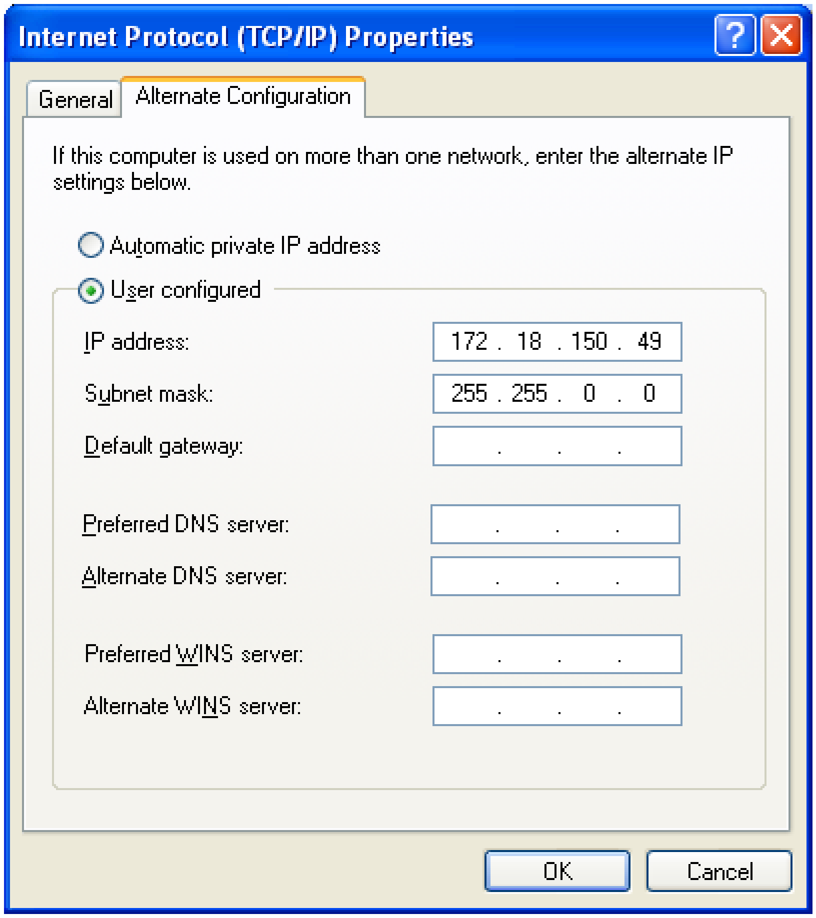
You computer will probably be set for "Obtain an IP address automatically", as shown below. If so, click on the Alternate Configuration tab.

Figure D-11 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 D-12 Alternate Configuration



D.4 Network, PC, & RTU Notes

D.4.1 IP Address & Network Classifications

IP addresses are 32 bits divided into 4 bytes

Networks are classified into three sizes:

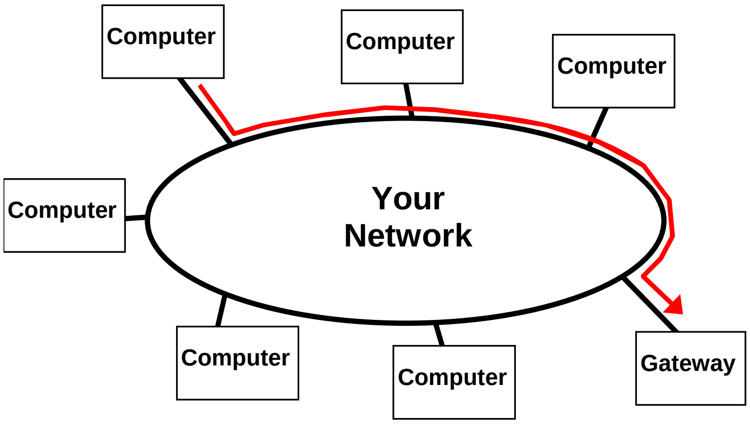
Class	1st Byte	2nd Byte	3rd Byte	4th Byte	Subnet Mask
A	1 – 126	PCs	PCs	PCs	255.0.0.0
B	128 – 191	Network	PCs	PCs	255.255.0.0
C	192 – 223	Network	Network	PCs	255.255.255.0

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)

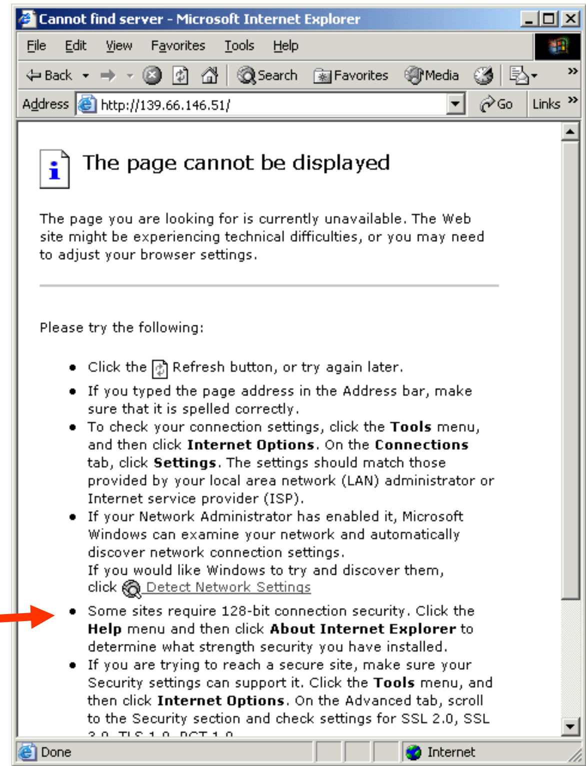
Example: 172.18.150.51 = Class B network, 1st two bytes for network location, last two bytes for individual nodes; Mask = 255.255.0.0

D.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):

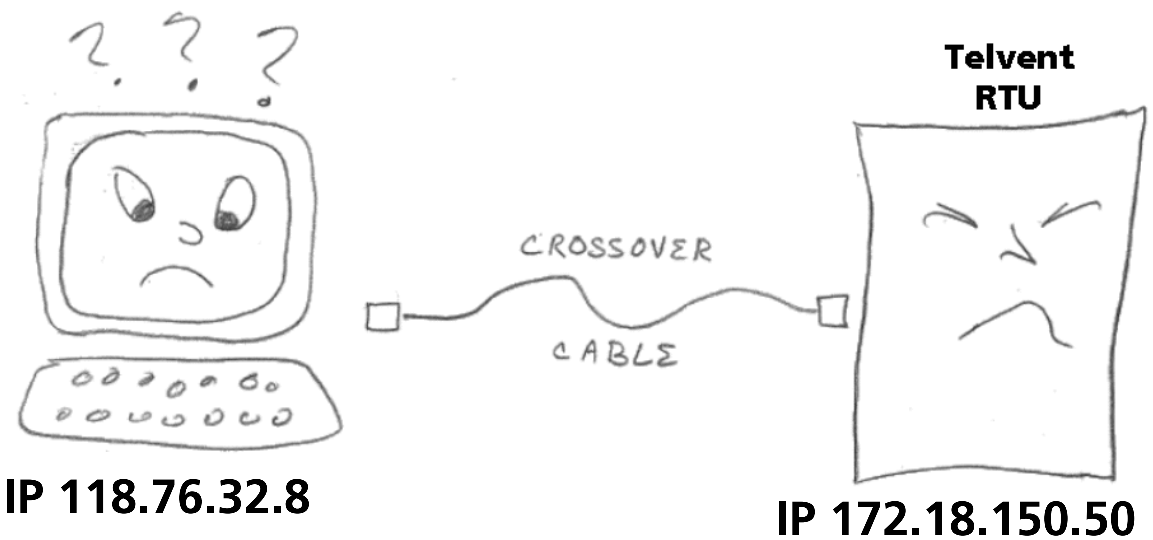


If for any reason the gateway is not available, your computer will not be able to find the address. You will get an IE page like this:



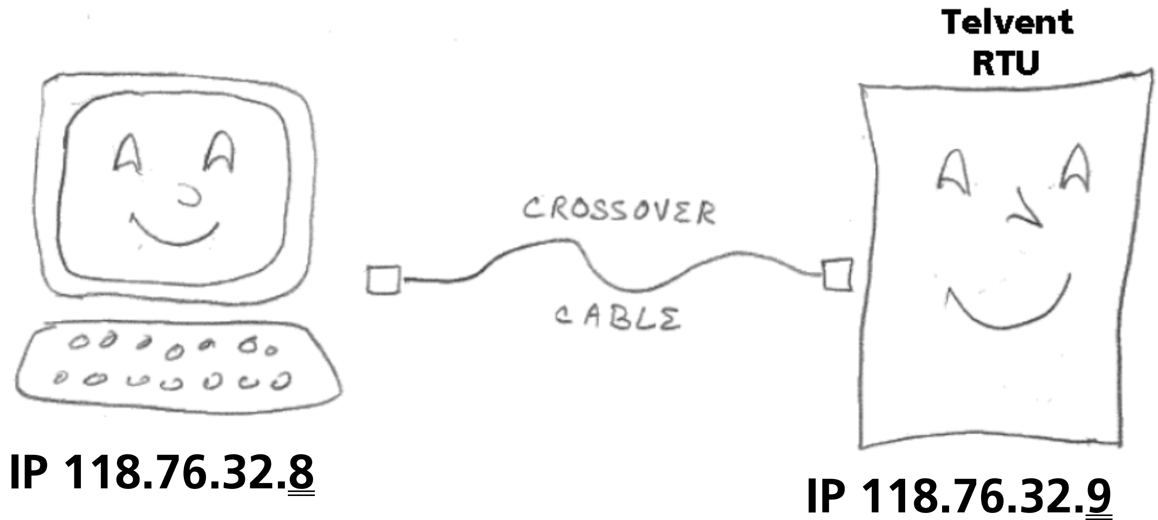
D.4.3 IP Address Mismatch

This is the same analogy as your computer trying to connect directly to a Telvent config@WEB RTU when they have different 1st bytes in their IP addresses:



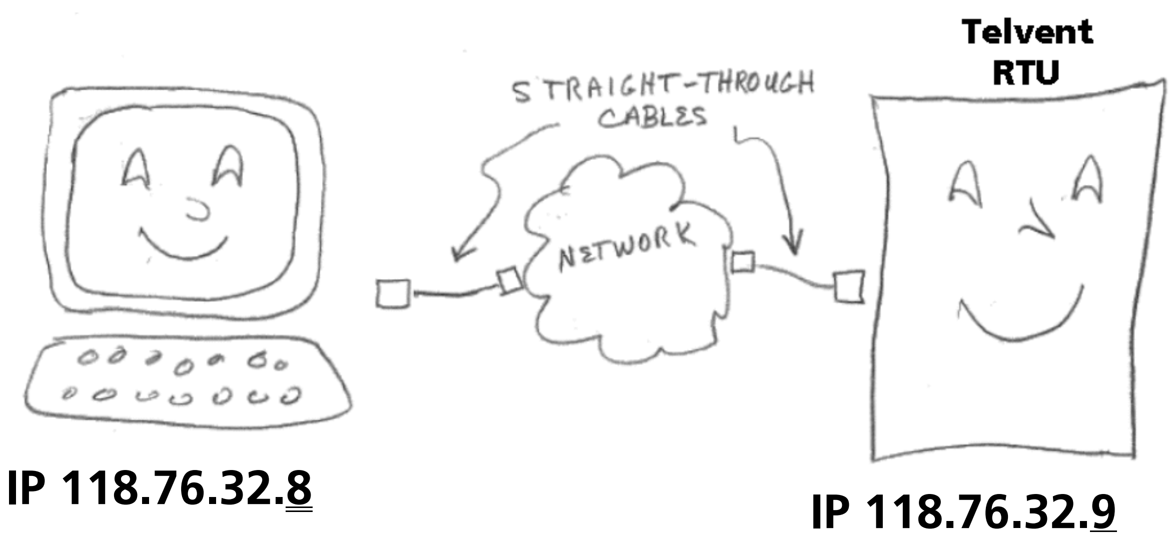
D.4.4 IP Address Non-network Match

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 Telvent RTUs. If and when you graduate your RTU operation to a network, your RTUs will be ready.



D.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.



APPENDIX E

PPP Connection

E.1 General PC Requirements

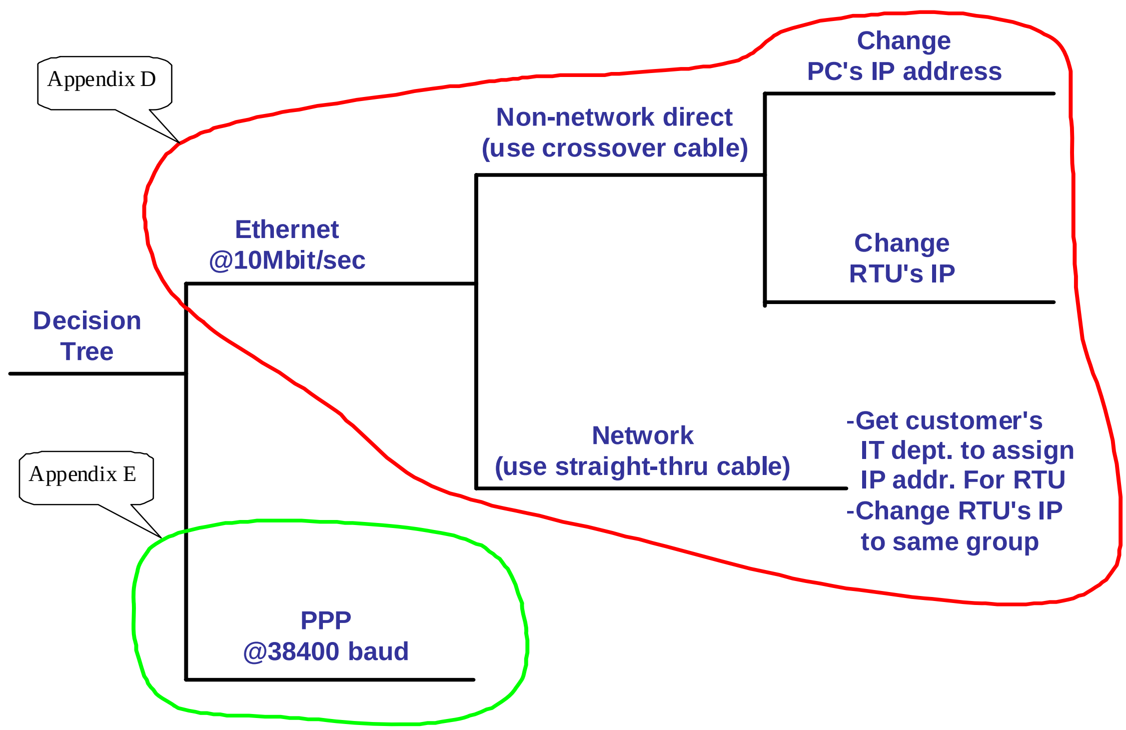
- All software that's necessary to connect to Telvent RTUs comes with Windows XP (at the present time, PPP has been verified only for Windows XP Pro).
- Internet Explorer 6.0 or higher.

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.

E.2 Where Do You Start?

Let's start with the basics: You have a Windows PC and a config@WEB RTU. Figure E-1 shows the possible combinations of your situation.

Figure E-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 Appendix D if you are interested in the Ethernet connection.

E.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

E.4 Physical Connection

PPP uses the User Interface Port (UIF), as shown in Figure E-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).

Figure E-2 User Interface and UIF Cable

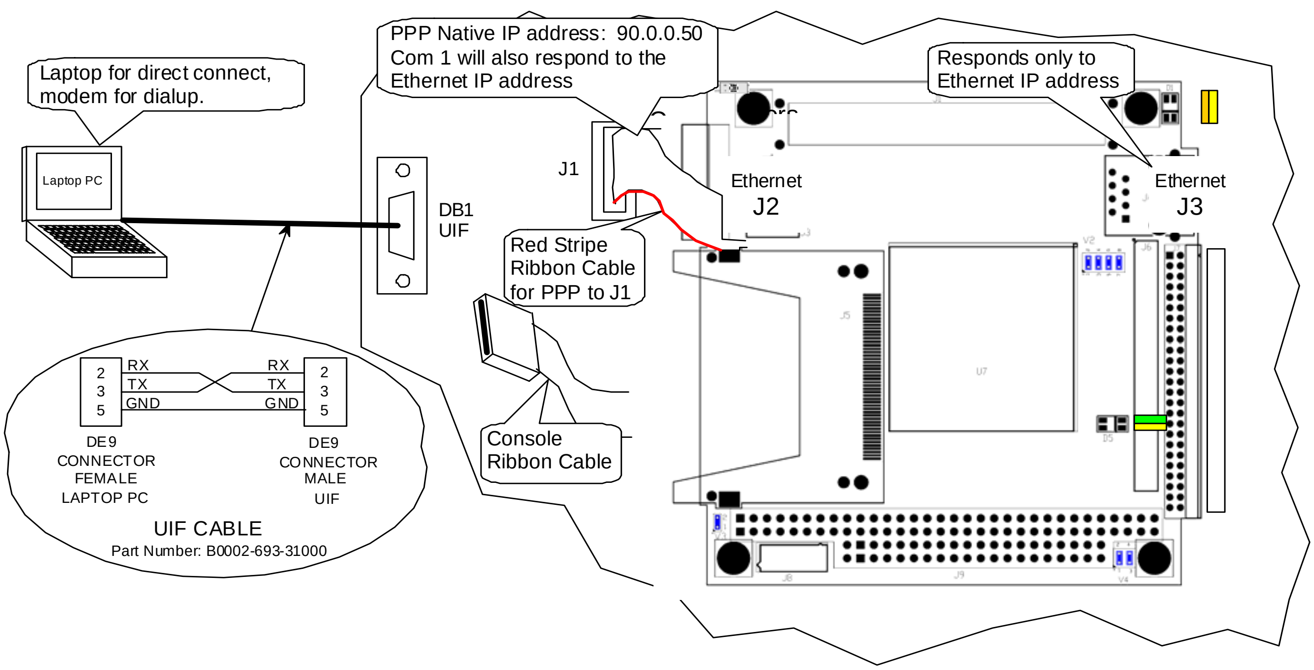


Table E-1 PPP & Console Connector Pin-outs

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

E.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.

E.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.

E.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.

E.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.

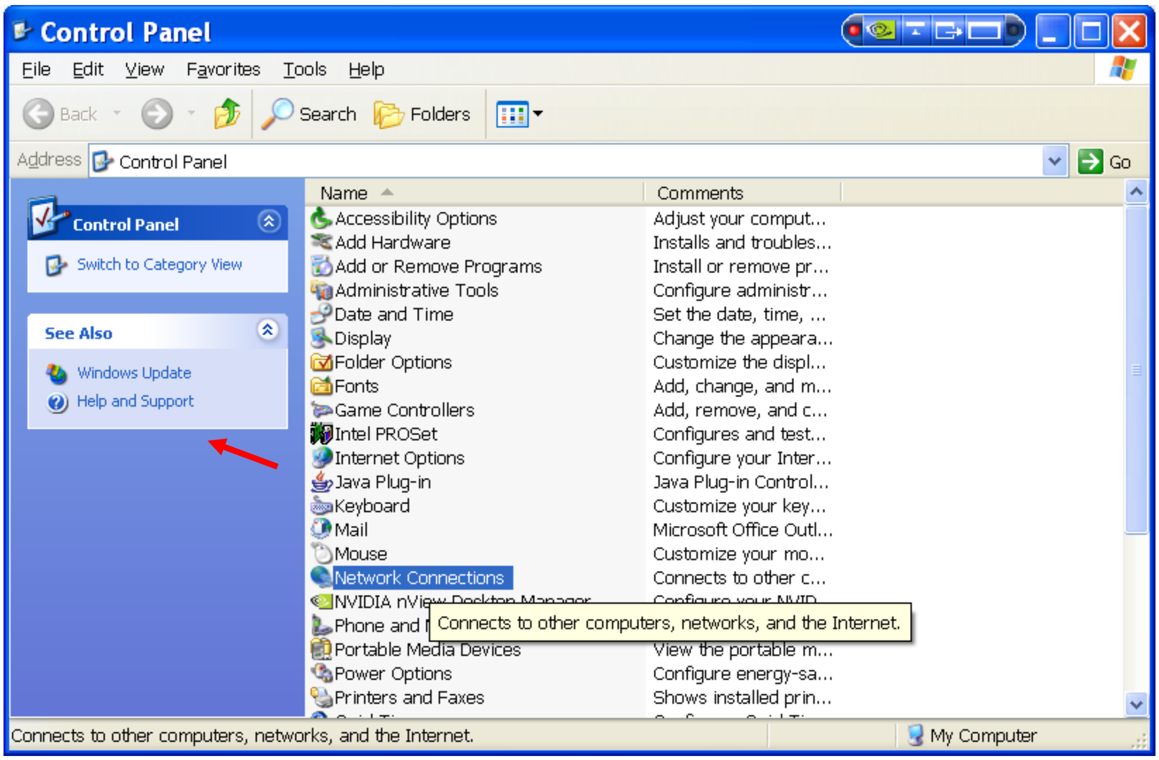
Note: Even though the above settings are for a Hayes-compatible modem, consult your modem's documentation to verify the correct command needed to accomplish what the above settings do.

E.6 Creating a Dialup PPP Network Connection for XP

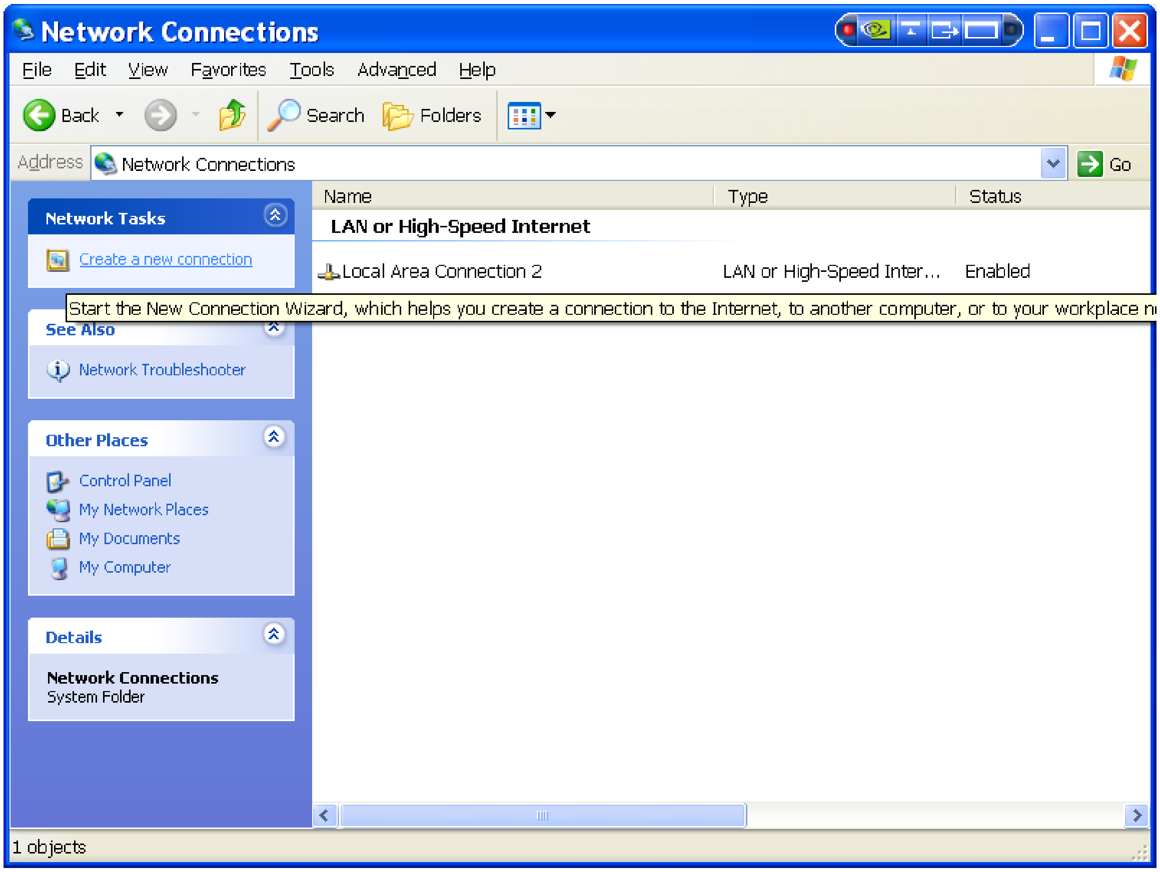
Note: before attempting any PPP connections, disconnect your computer from your LAN to avoid DNS server conflicts. When you finish your PPP session, you may reconnect your LAN.

Note: Use a three-wire null modem cable.

In the Control Panel, double-click on the Network Connections icon:



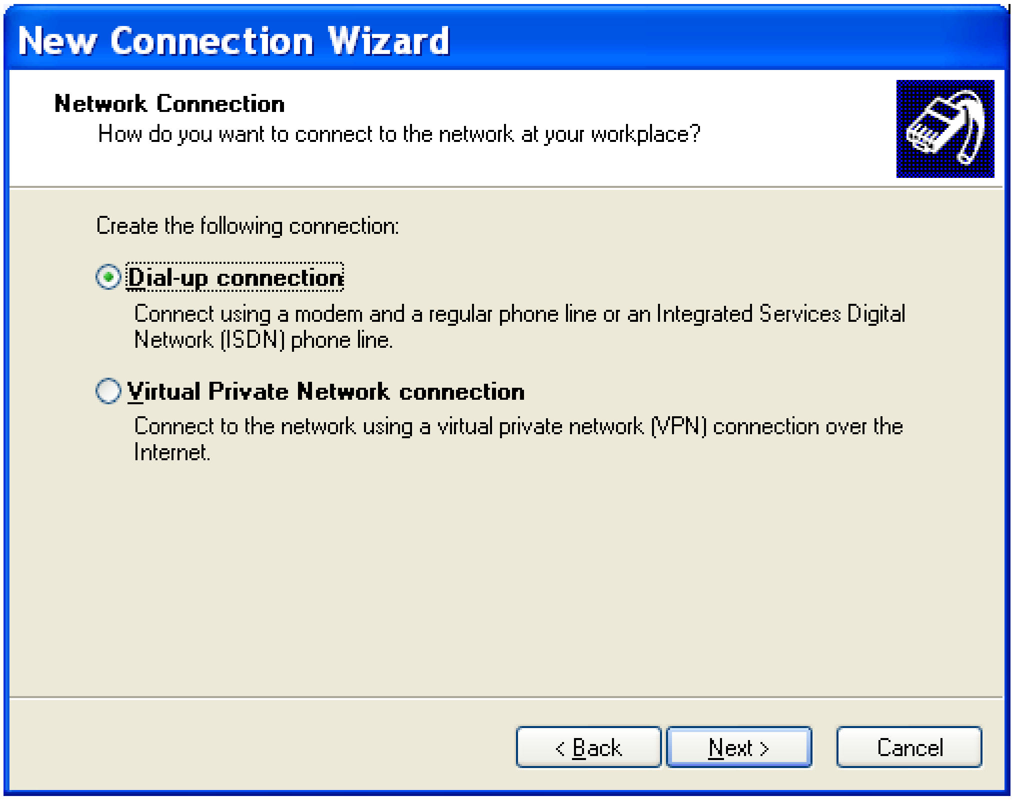
Click on the "Create a new connection" link:



The Connection Wizard will start, presenting the following window. Click “Next”.

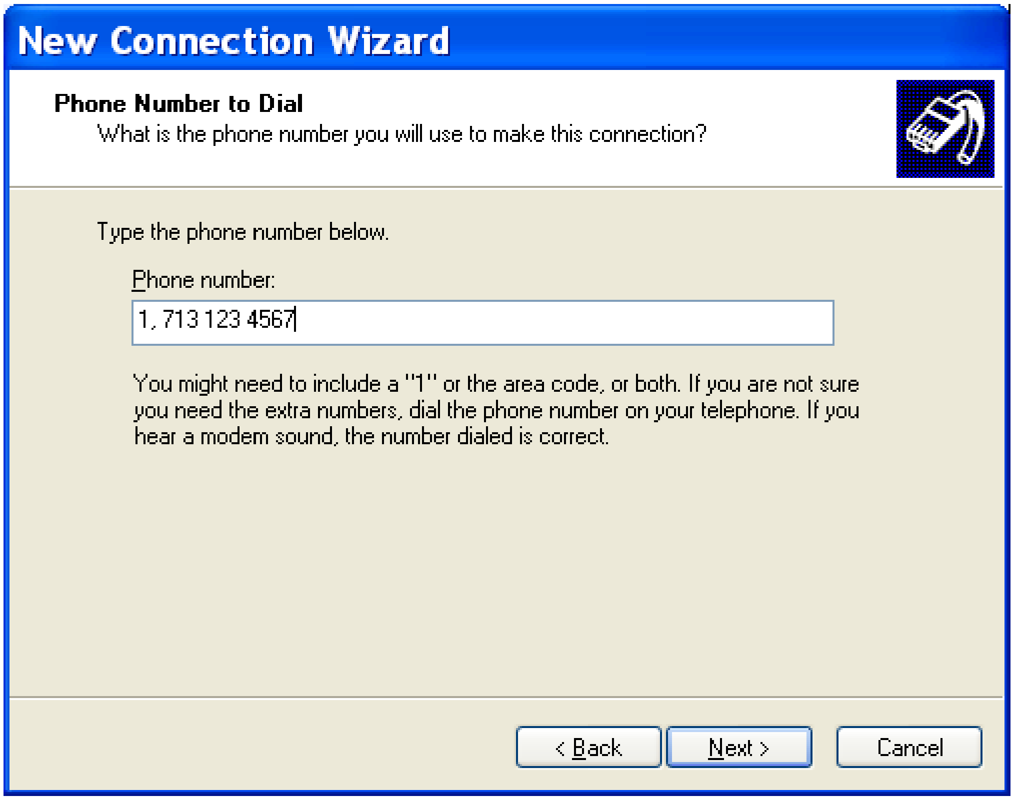
For Network Connection Type, pick “Connect to the network at my workplace”, then click “Next”.

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".

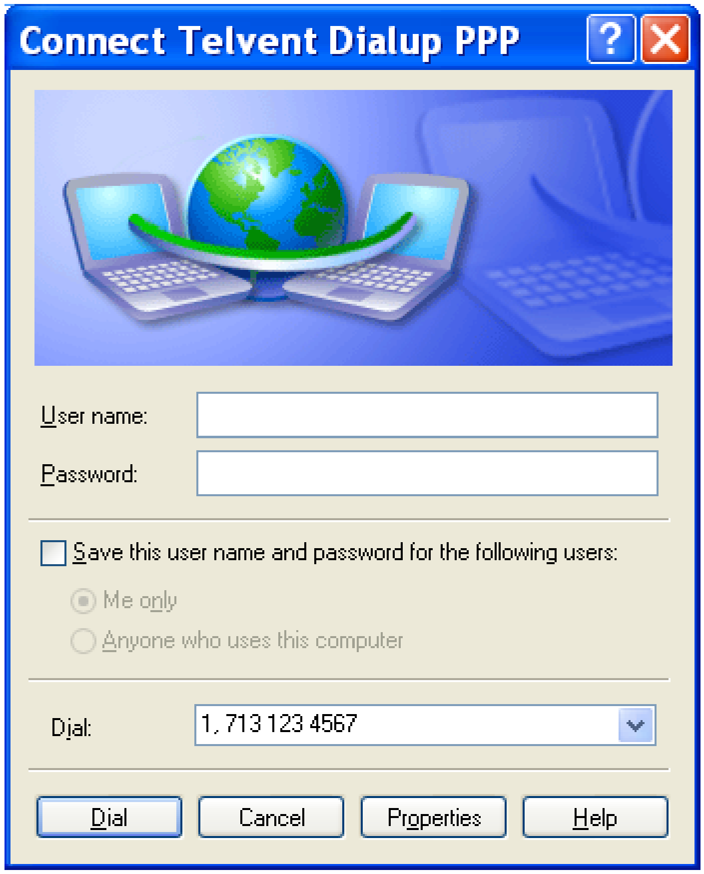
Enter the phone number of the remote modem site. Enter any special dial parameters here. For example, a comma pauses dialing for 2 seconds. Click “Next”.



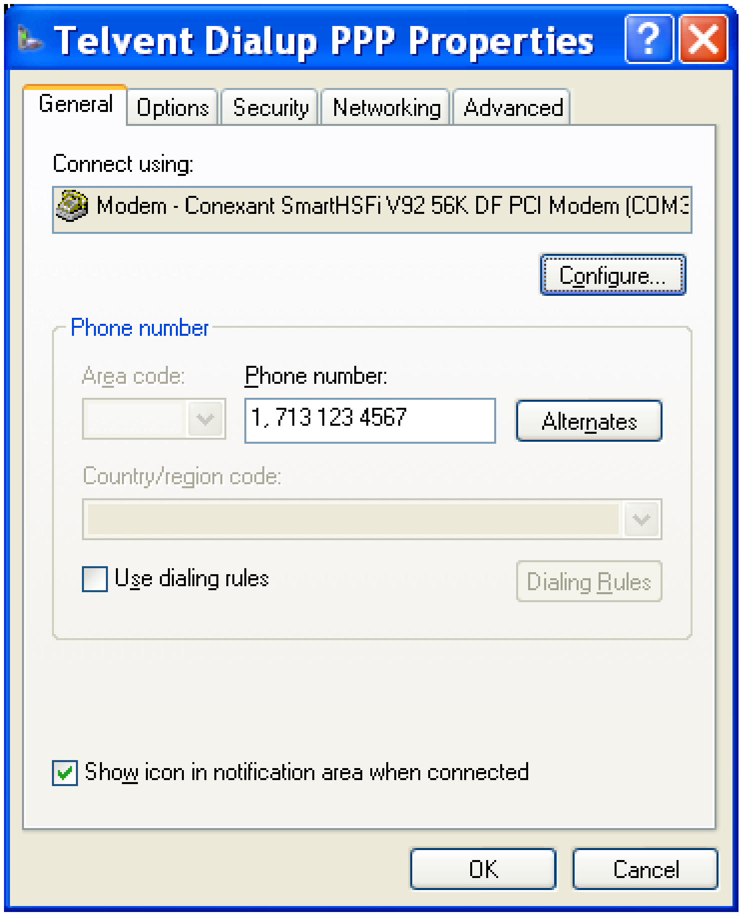
Make this connection available for “Anyone’s Use”, if desired. Otherwise, this connection will only be available to the current user.

Before completing the Connection Wizard, check the "Add a shortcut to this connection to my desktop" box. Click "Finish".

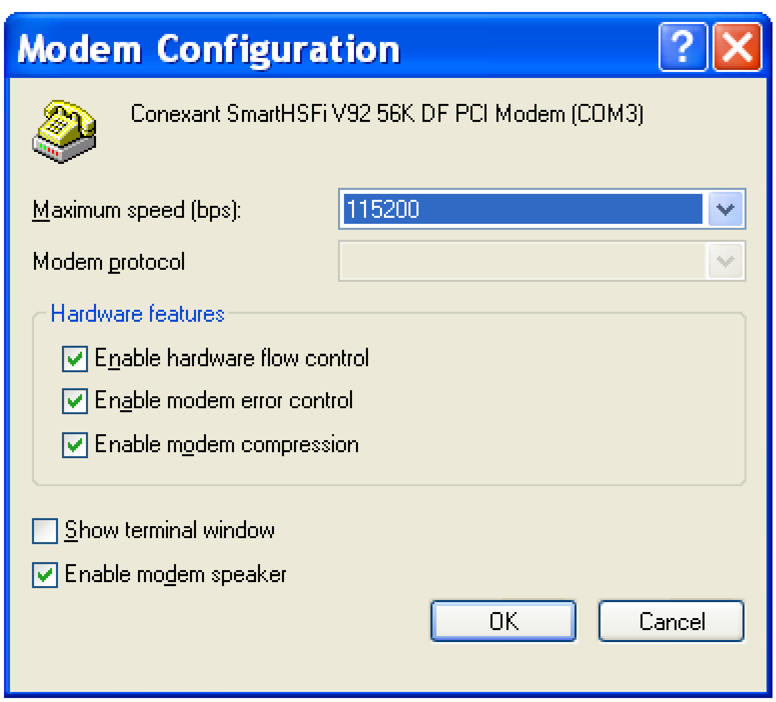
When the Connection Wizard completes, the following window will appear. Click "Properties".



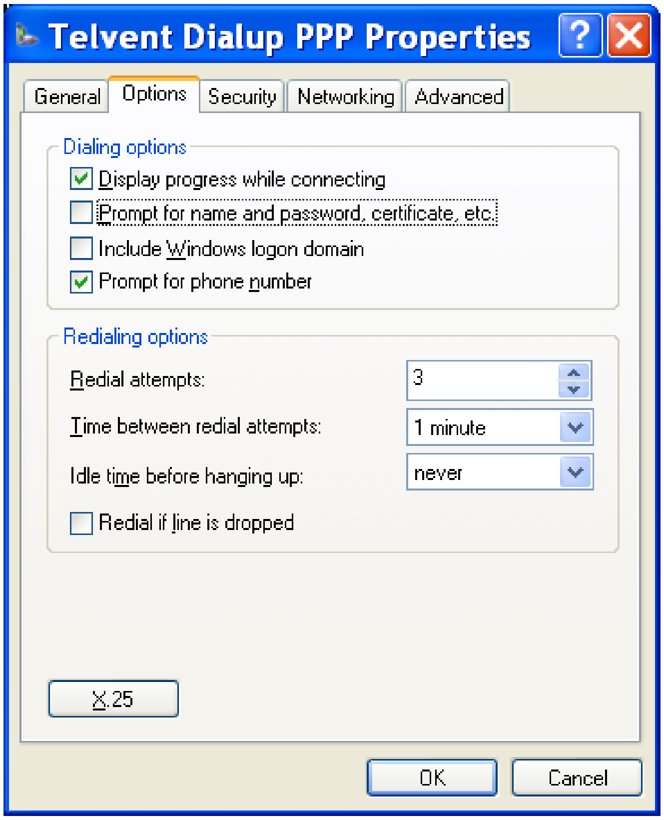
The following window will appear. The modem for this PC should be present in the "Connect using:" field. Click "Configure".



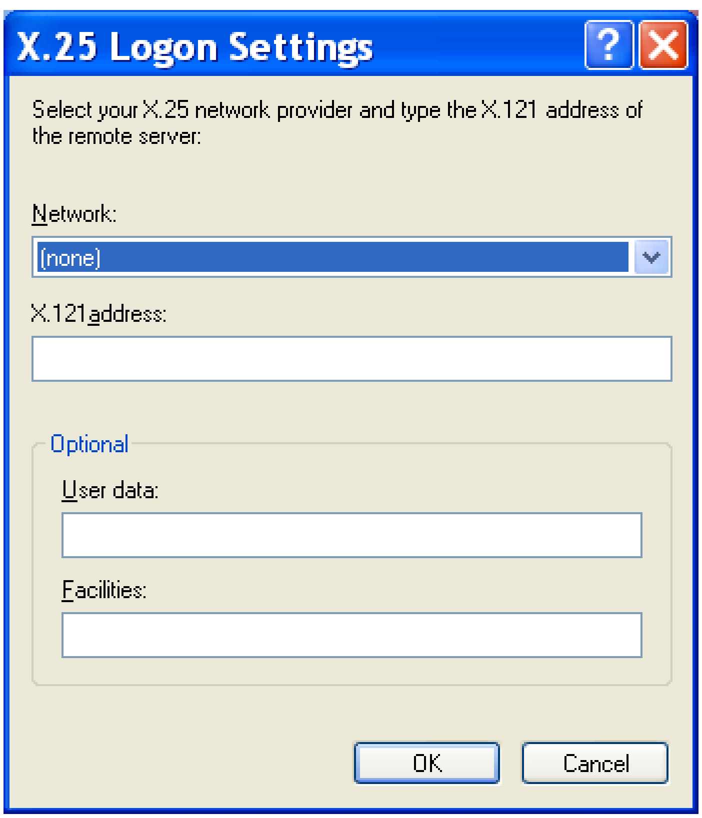
Make sure the settings for the modem on your PC match these. Click "OK".



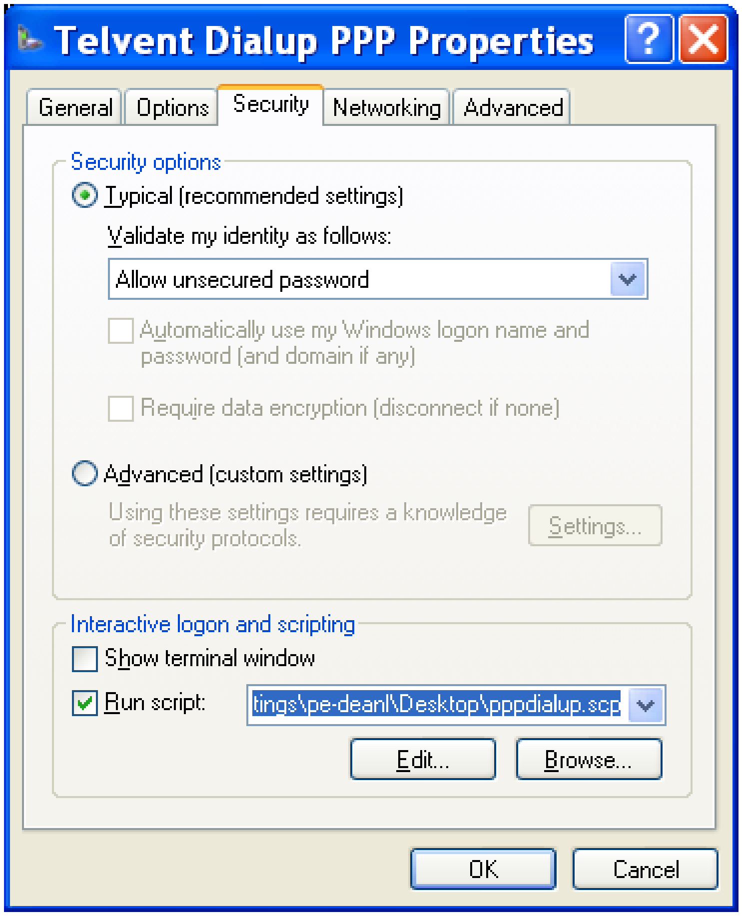
Click on the "Options" tab. Make sure the "Prompt for name and password, certificate, etc." checkbox is UNCHECKED. At the bottom of the window, click on the "X.25" button.



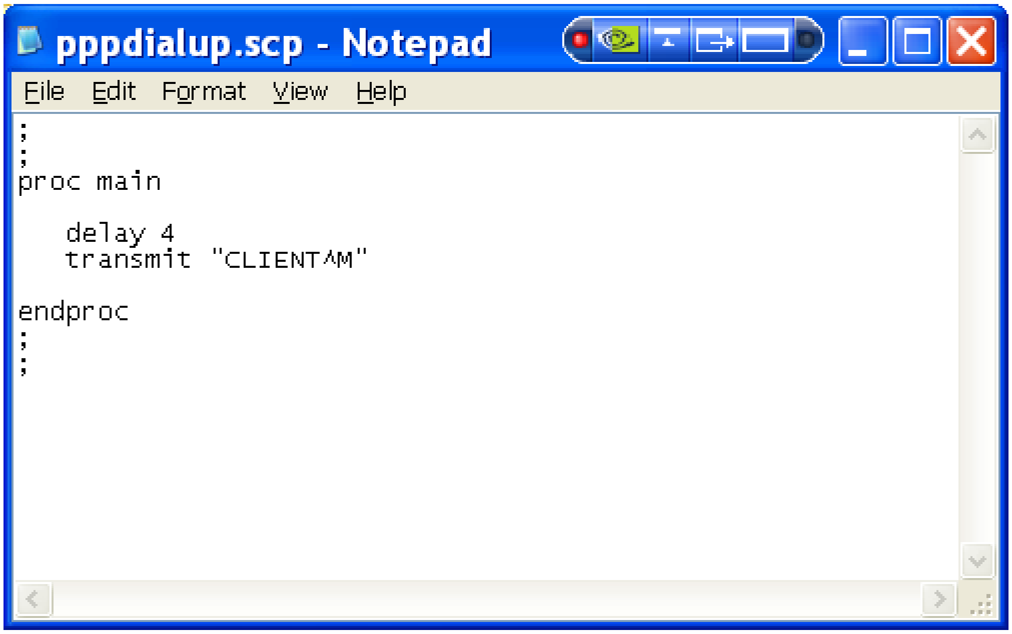
Make sure the settings on this window match these. Click "OK".



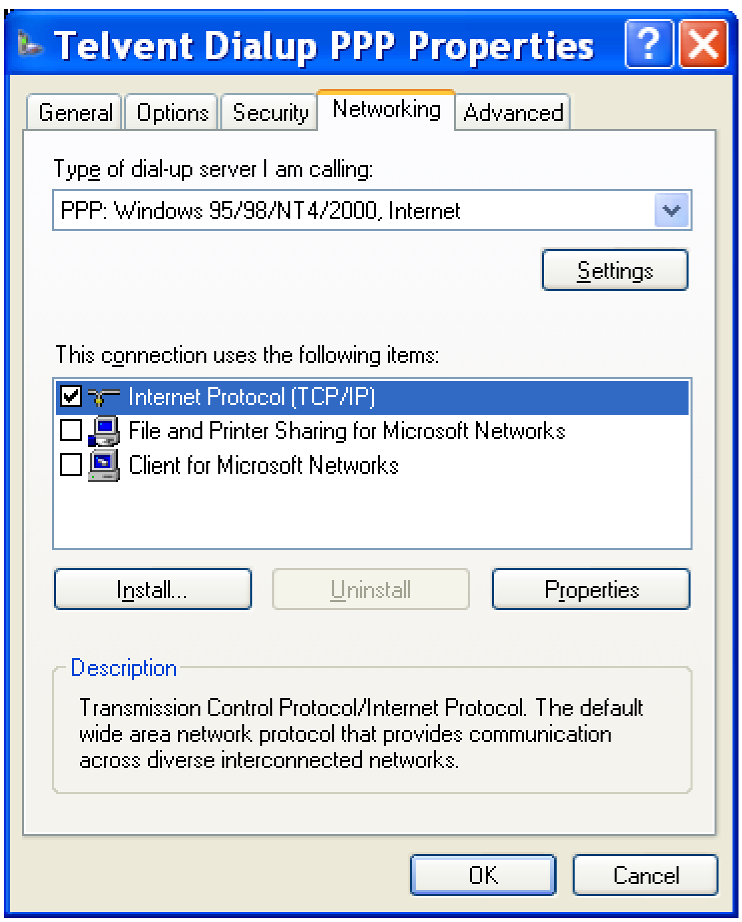
Click on the "Security" tab. In the "Security options" area make sure the settings on your PC match these. In the Interactive logon and scripting area, make sure the "Run script" checkbox is CHECKED. Click on the "Edit" button to create the script required to handshake with the remote RTU. Once the script 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.



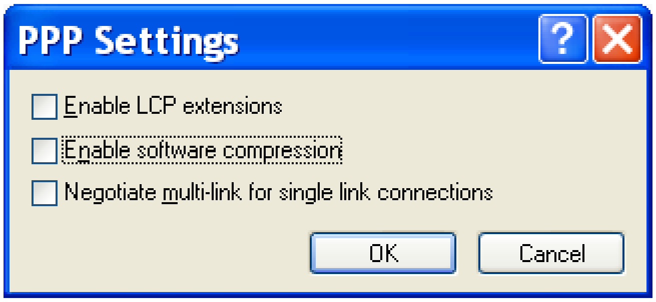
Create and save the script to any safe location on your PC. The contents of the script should contain the following.



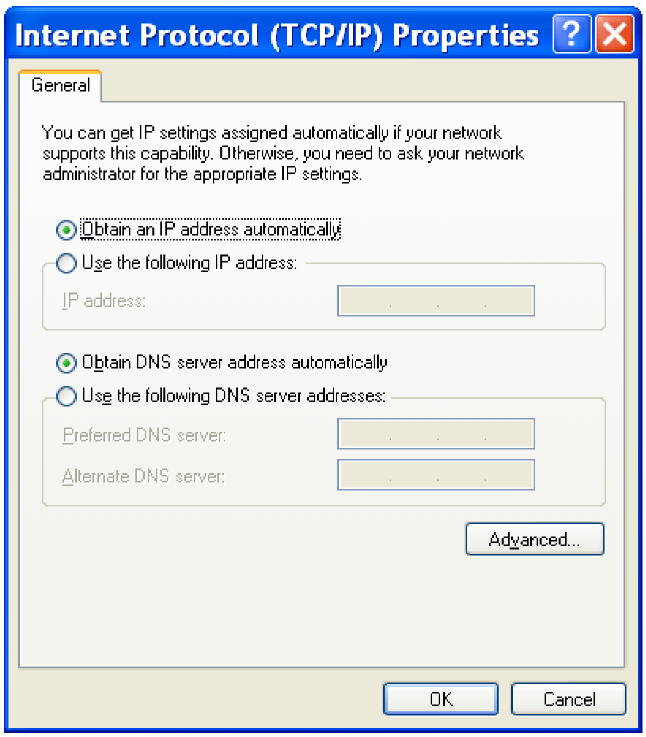
Click on the "Networking" tab. The "Type of dial-up server" field should be PPP. In the "This connection uses the following items:" area, make sure only Internet Protocol (TCP/IP)" is selected (checkbox is CHECKED). Click the "Settings" button.



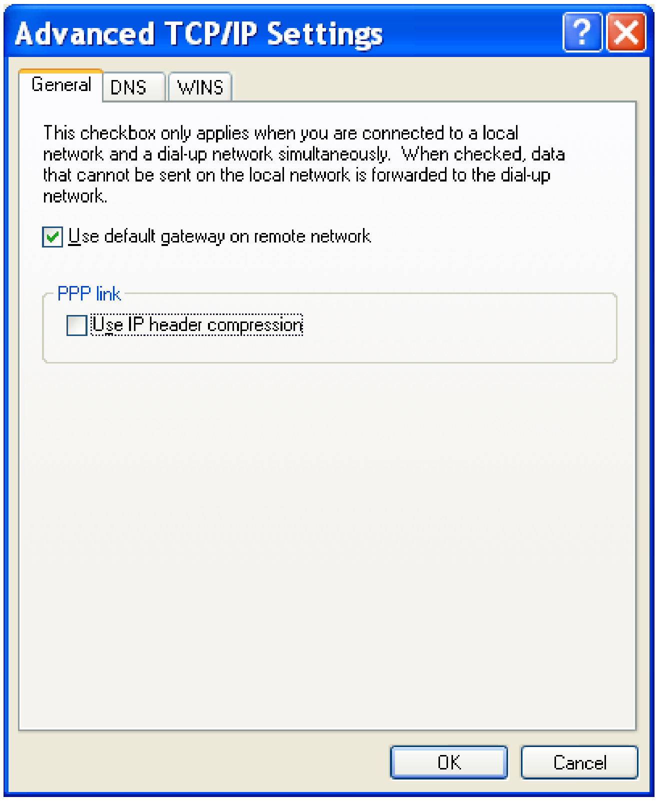
In the PPP Settings window, make sure all of the items are UNCHECKED. Click "OK".



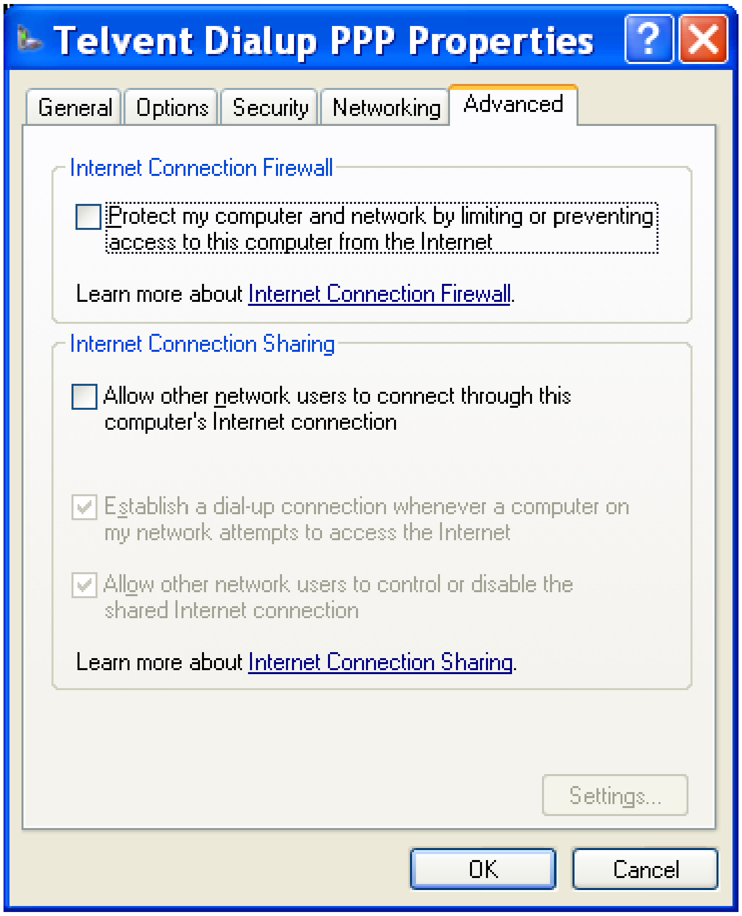
Click on the "Internet Protocol (TCP/IP)" item, and click on the "Properties" button. Click on the "Obtain an IP address automatically" and "Obtain DNS server address automatically" radio buttons are selected. Click on the "Advanced…" button.



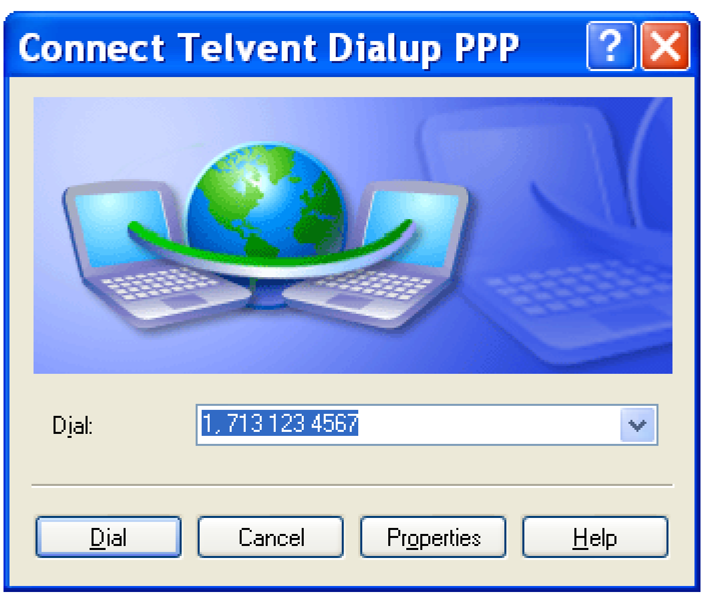
Select the “General” tab if not already selected. Select the “Use default gateway on remote network” checkbox (CHECKED). In the “PPP link” area, make sure the “Use IP header compression” checkbox is UNCHECKED. Click OK. (No changes to the DNS and WINS tabs are required)



Click on the "Advanced" tab. Change the settings if necessary to match the following. Click "OK".



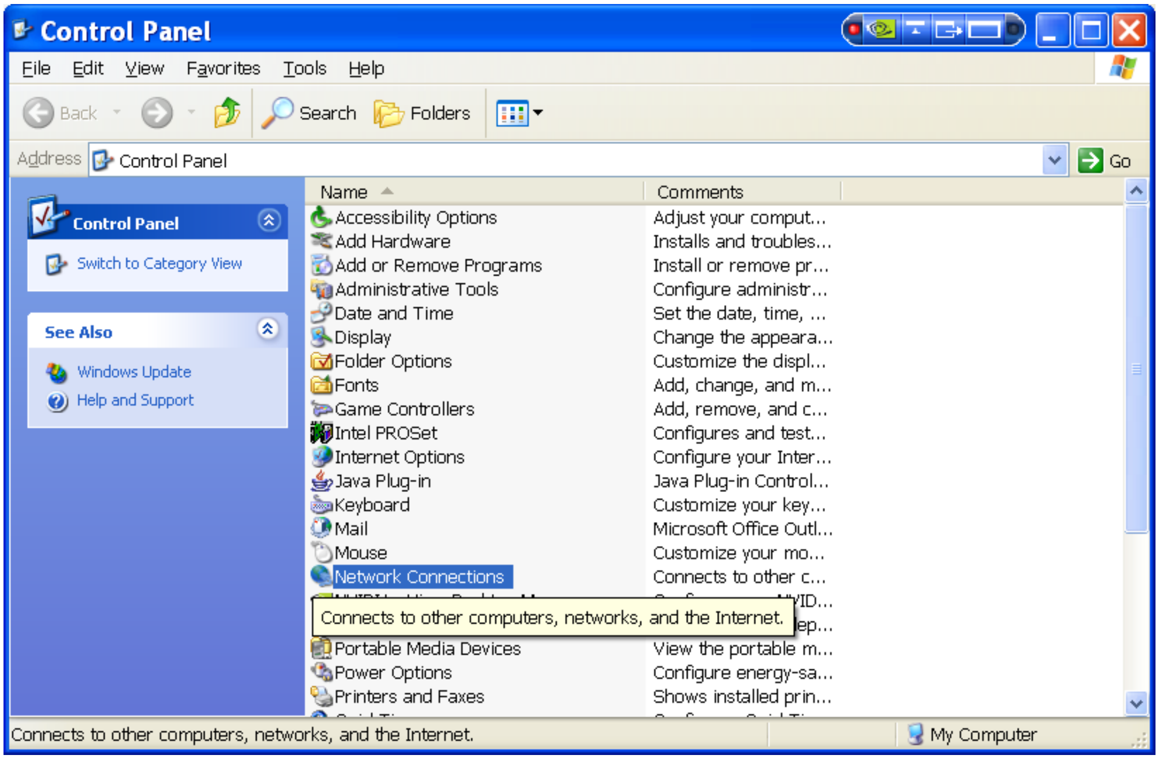
The Dialup Network Connection window will now appear as shown:



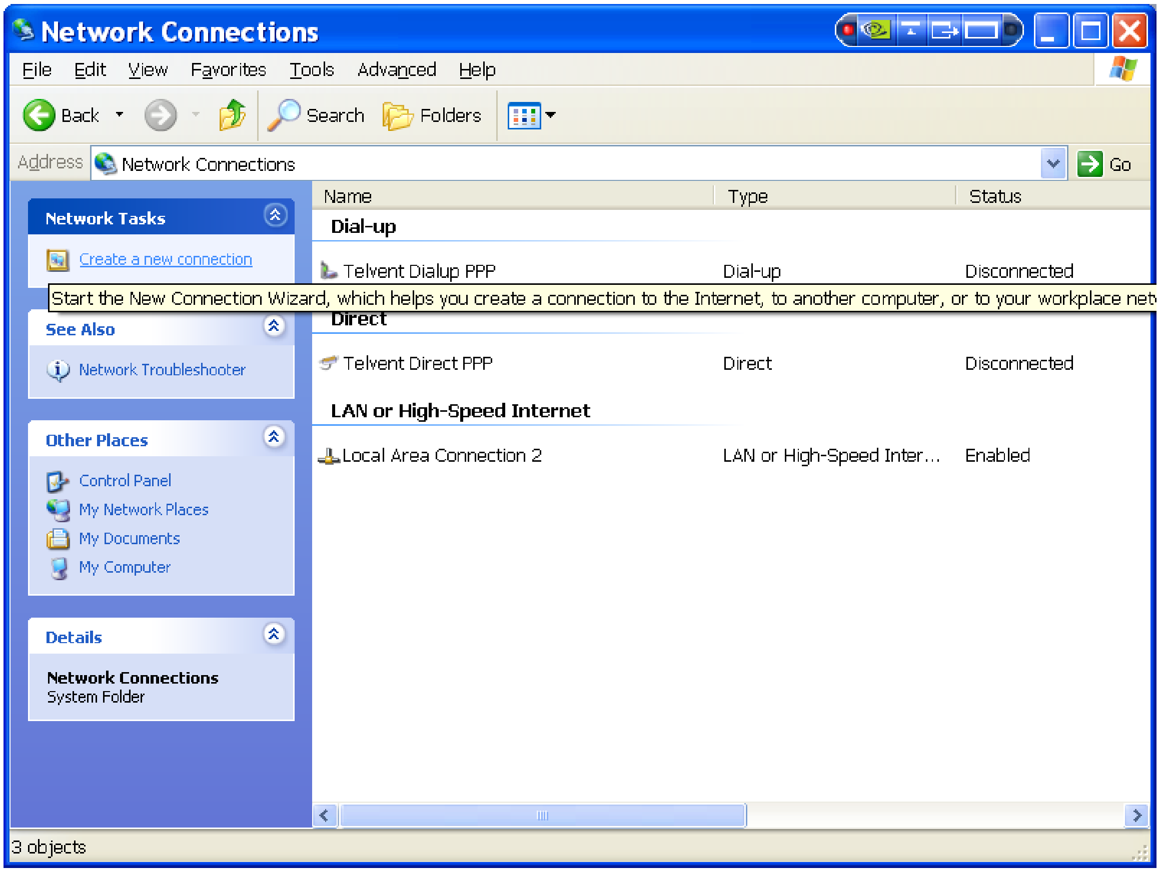
Dialup Network Connection setup is complete. Click on the Dial button to initiate the call.

E.7 Creating a Direct Serial Network Connection for XP

In the Control Panel, double-click on the Network Connections icon:



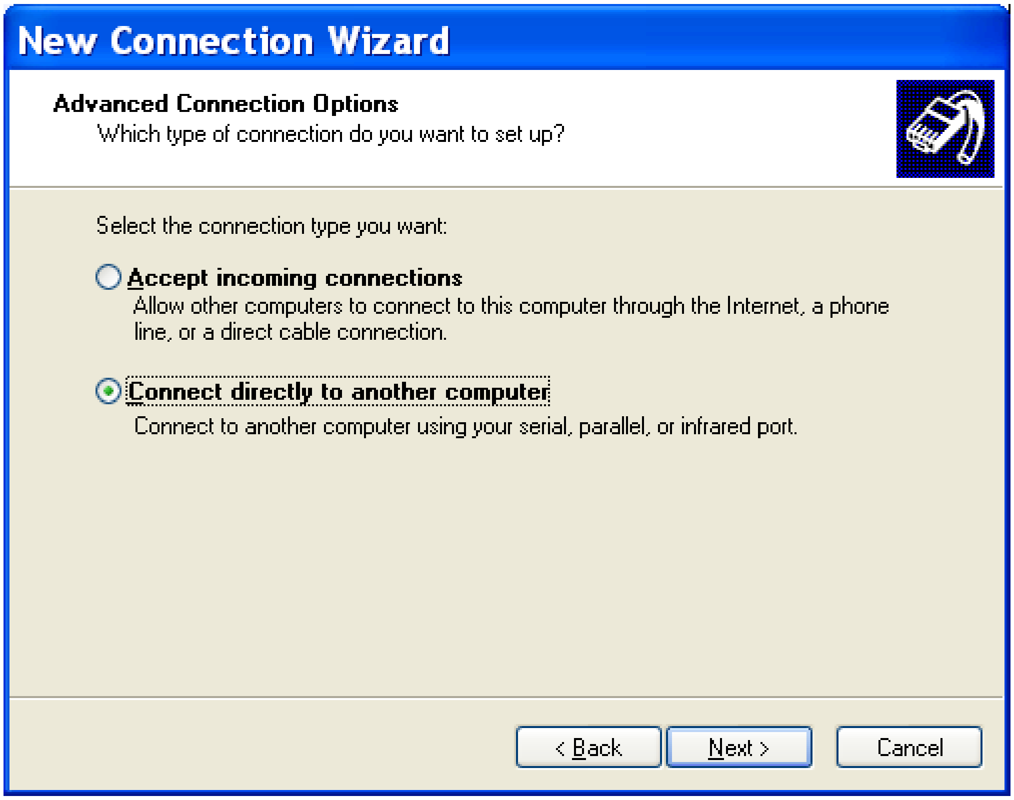
Click on the "Create a new connection" link:



The Connection Wizard will start, presenting the following window. Click "Next".

For Network Connection Type, pick "Set up an advanced connection", then click "Next".

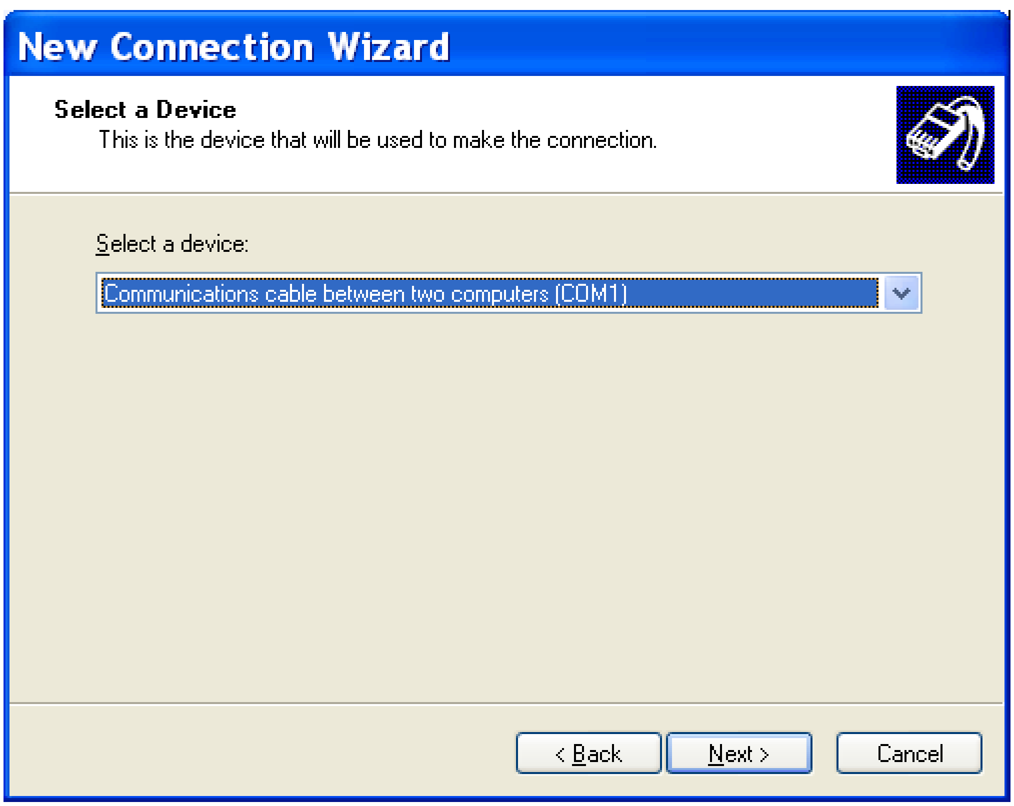
Select "Connect directly to another computer". Click "Next".



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”.

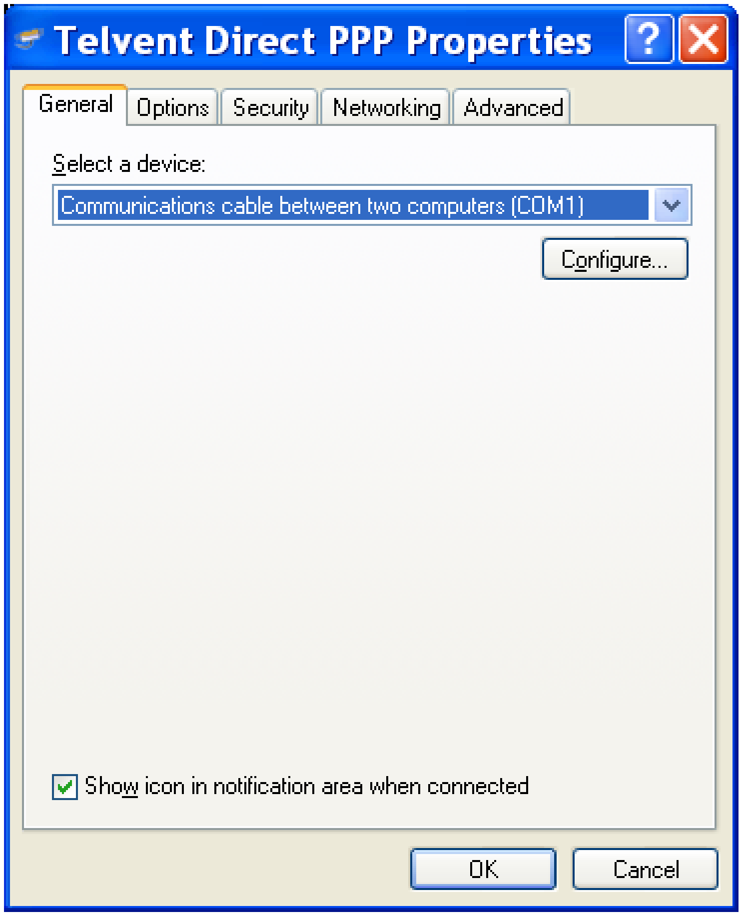


Make this connection available for "Anyone's Use", if desired. Otherwise, this connection will only be available to the current user.

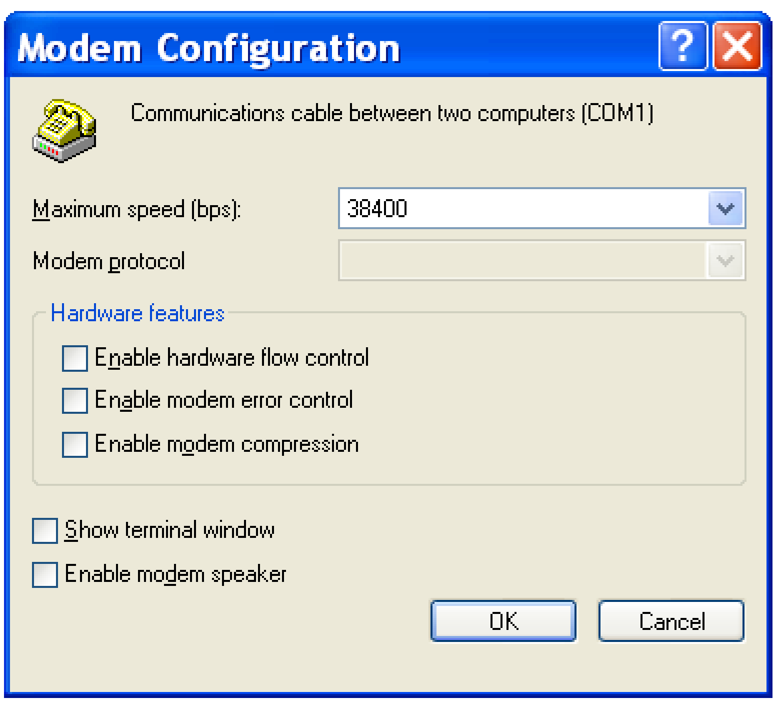
Before completing the Connection Wizard, check the "Add a shortcut to this connection to my desktop" box. Click "Finish".

When the Connection Wizard completes, the following window will appear. Click "Properties".

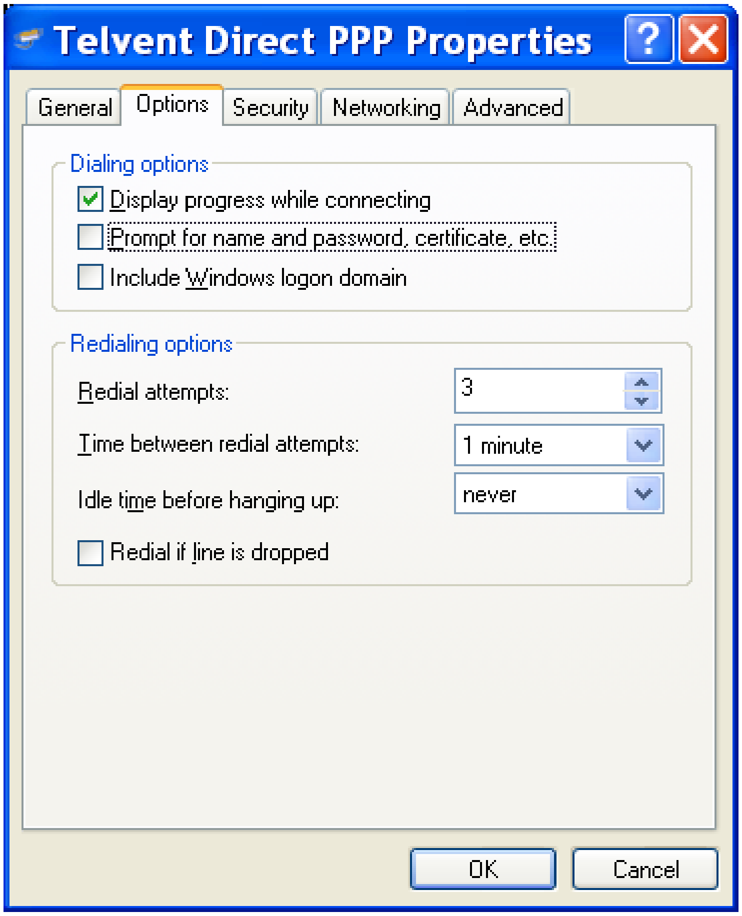
The following window will appear. The serial port selected in the setup should be present in the device field. Click "Configure".



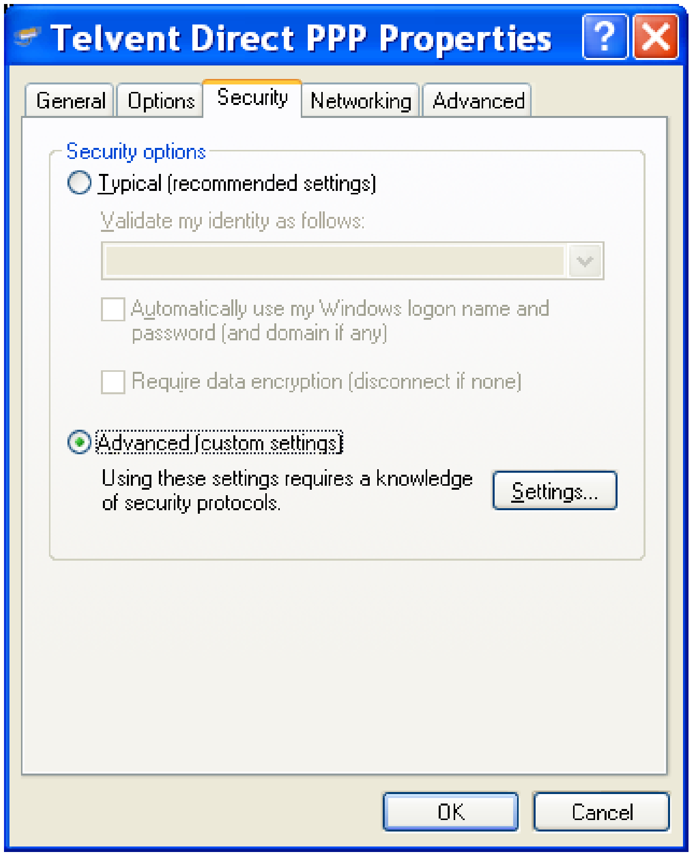
Set the Maximum speed to 38400 bps, and UNCHECK all check boxes. Click "OK".



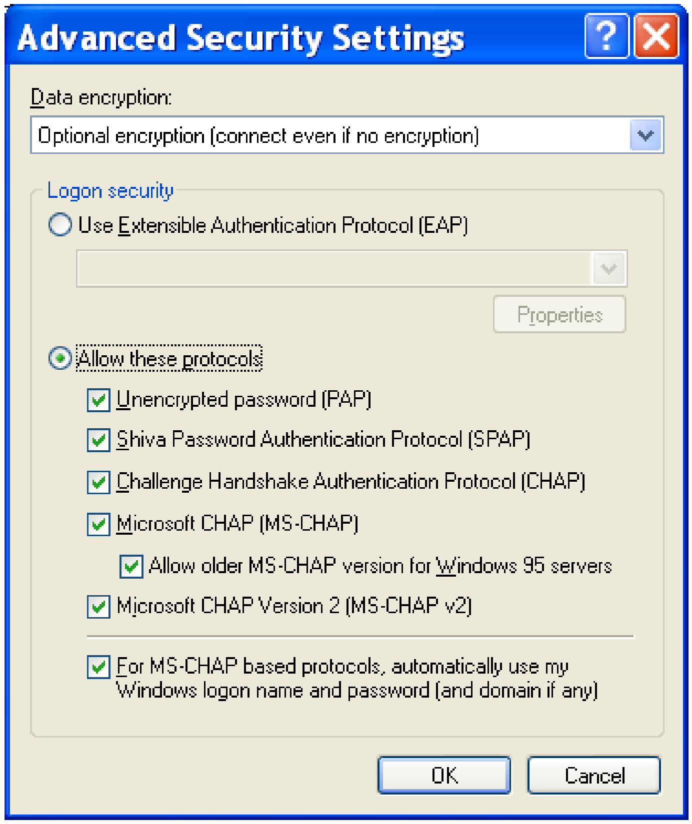
Click on the “Options” tab. Make sure the “Prompt for name and password, certificate, etc.” checkbox is UNCHECKED.



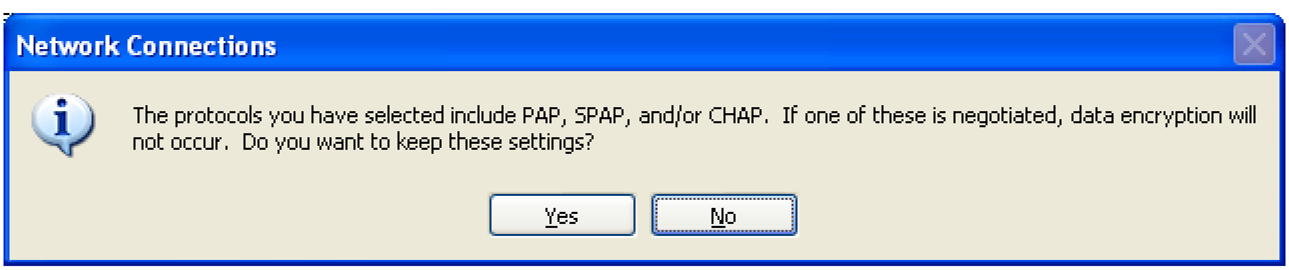
Click on the “Security” tab. In the “Security options” area select the “Advanced (custom settings) radio button. Click the “Settings…” button.



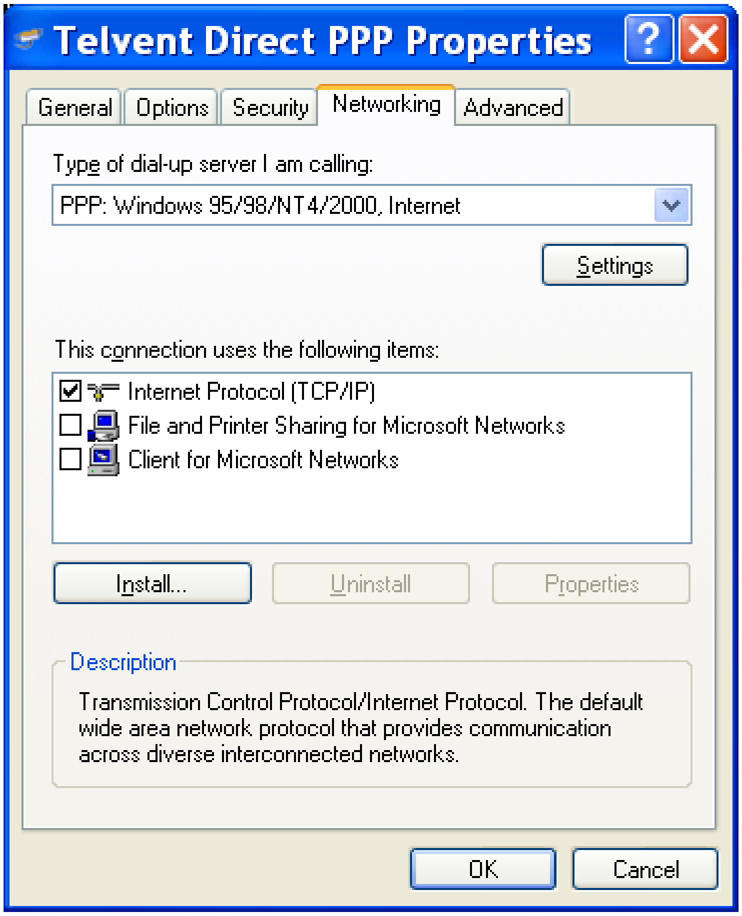
In the "Data encryption" field pull-down menu, select "Optional encryption (connect even if no encryption)". In the "Logon security" area, select the "Allow these protocols" radio button, and CHECK all the checkboxes as shown. Click OK.



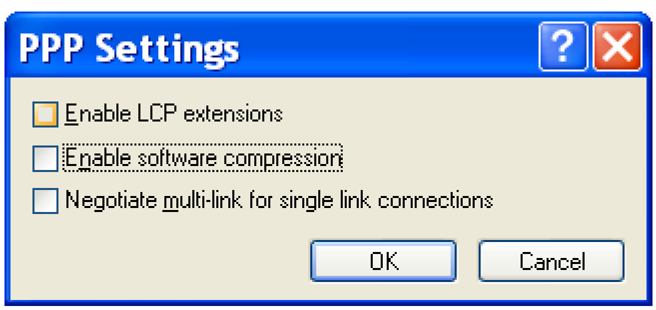
If a warning box comes up as shown, click Yes.



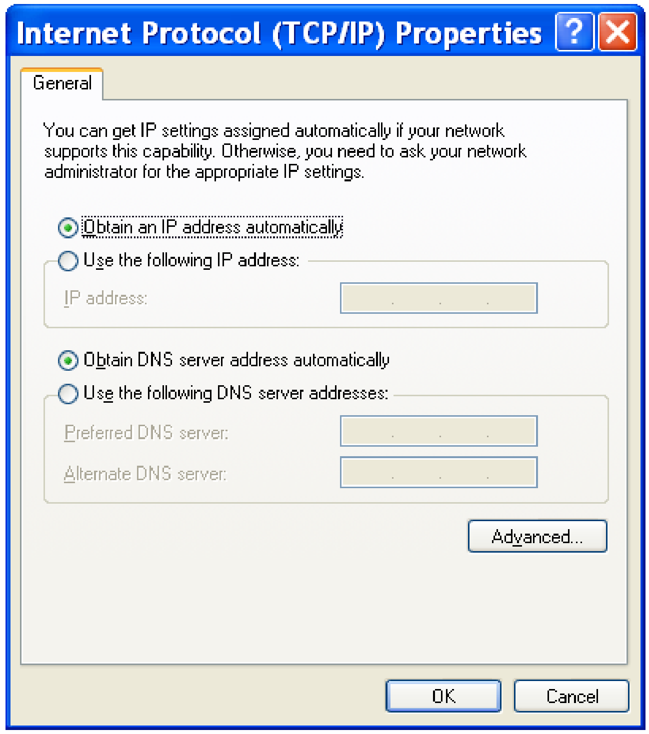
Click on the “Networking” tab. The “Type of dial-up server” field should be PPP. In the “This connection uses the following items:” area, uncheck everything that can be unchecked except Internet Protocol (TCP/IP)”, which should be checked.. Click the “Settings” button.



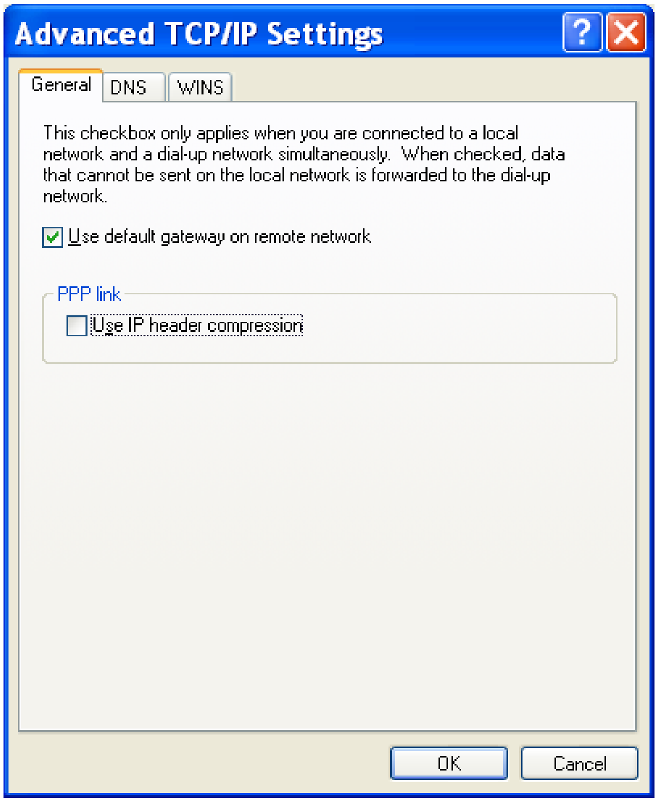
In the PPP Settings window, make sure all of the items are UNCHECKED. Click “OK”.



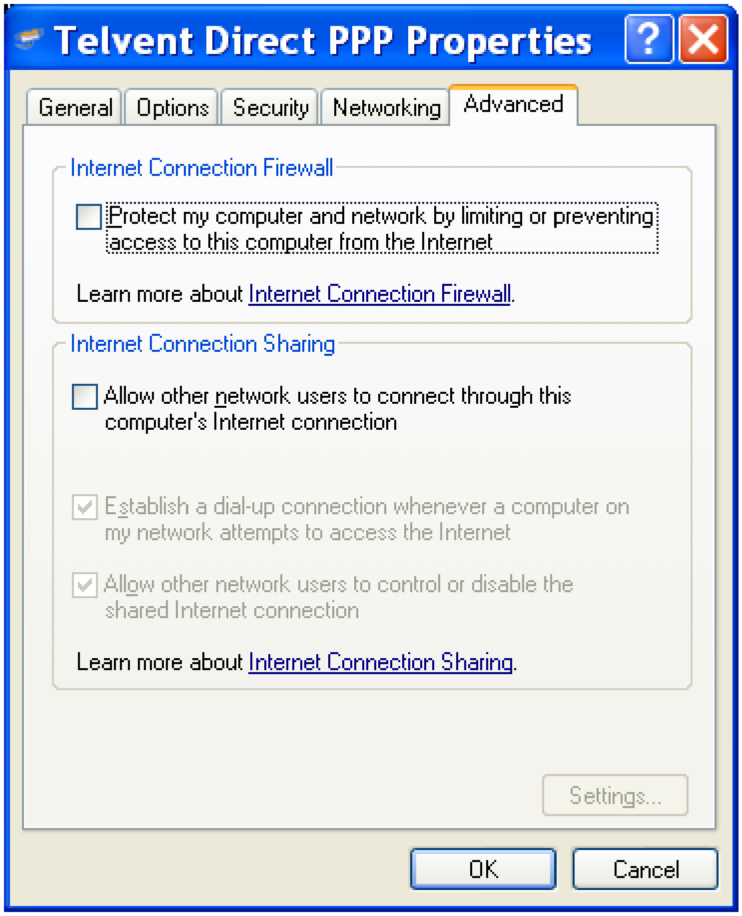
Click on the “Internet Protocol (TCP/IP)” item, and click on the “Properties” button. Click on the “Obtain an IP address automatically” and “Obtain DNS server address automatically” radio buttons are selected. Click on the “Advanced…” button.



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.

APPENDIX F

Console Commands

F.1 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

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" (upcase 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
```

Commonly used “cmd” command not listed in help

```
reboot                          Reboot the RTU
```

F.2 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.

```
-> setip "172.18.1%0.51:fffff800"
OK.
value = 4 = 0x4
-> reboot

(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
```

Accidentally entered IP address with an illegal character. Once you hit Enter, you are stuck. Go ahead and reboot, as shown.

```
[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
[VxWorks Boot]: p
```

Type "p" to verify the incorrect IP address

```
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

[VxWorks Boot]: c
```

Change boot parameters one step at a time by entering “c”

```
'.' = clear field;  '-' = go to previous field;  ^D = quit

boot device          : ata=0,00
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): password
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.
value = 4 = 0x4
-> reboot
```

After normal bootup, you must now do setip again using the correct IP, then reboot again

After bootup, whoru to verify correct IP address.

```
-> whoru
IP Address = 172.18.150.51
Subnet Mask = 255.255.248.0
value = 28 = 0x1c
->
```

F.3 Checking Task Status

Typing the lowercase l 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 F-1 Checking Task Status

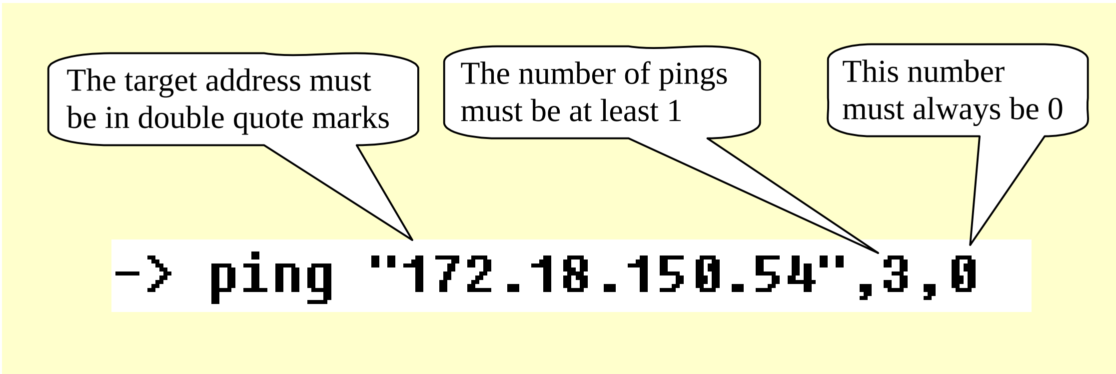
COM1 - PuTTY

```
->
-> 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
```

F.4 Pinging From The RTU

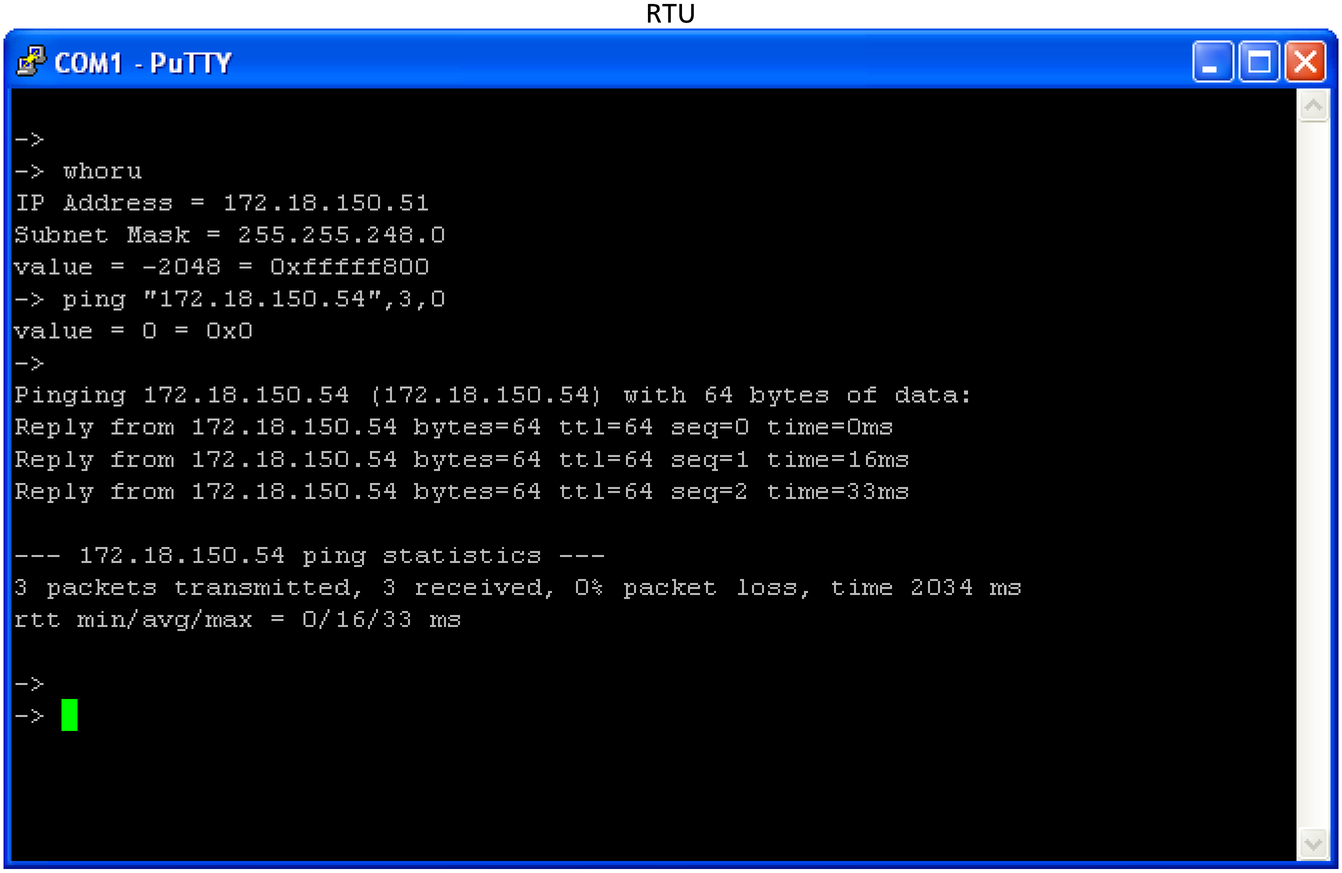
It has always been possible to ping the RTU from a device if you know the RTUs I.P. address. The RTU itself is now capable of sending a ping over TCP/IP with a console command. This function is useful if you want to check TCP/IP communication integrity directly from the RTU to any TCP/IP address compatible with the IP address range. See the syntax rules below.

Figure F-2 Ping Syntax Rules



The following figure shows the result of a ping

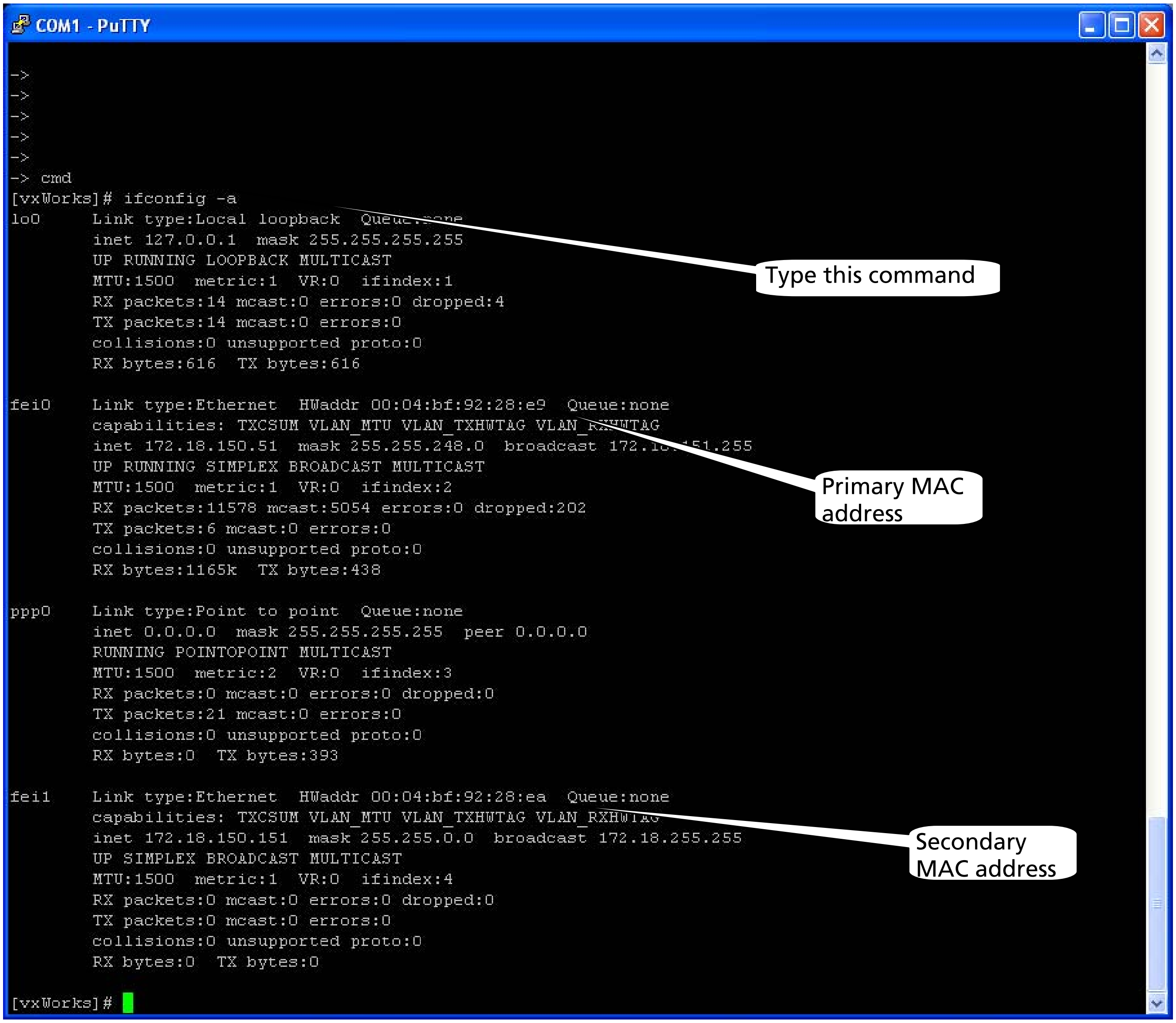
Figure F-3 Pinging From Within The RTU



F.5 Finding the RTU's MAC Address

Enter the command shown below to retrieve the MAC address of the Ethernet circuits on the CPU card.

Figure F-4 Finding the CPU Card's MAC Address



Note: Secondary Ethernet (fei1) is displayed only if the device has been configured via the Gui / Application firmware.

F.6 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 erroer 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 F-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 F-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 F-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 F-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 F-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 F-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

APPENDIX G

Glossary

A/D	Analog to Digital
AC	Alternating Current
ACI	AC Input
ADC	Analog to Digital Converter
AI	Analog Input, also AIN
ANSI	American National Standards Institute
AO	Analog Output, also AOUT
ASCI	Asynchronous Serial Communications Interface
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
AWG	American Wire Gauge
baud	Modem speed in Bits Per Second
bps	Bits Per Second
bridge	A network device capable of connecting networks that use similar protocols
C	Celsius or the programming language C
CEB	Communication Expansion Board
check-back	Hardware/Software method of control output protection
CCITT	Comité Consultatif Internationale de Télégraphique et Téléphonique
CMOS	Complementary Metal Oxide Semiconductor
COMM	Communication, also COM
COS	Change of State
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check; a method for error checking that detects randomly occurring single and multiple bit errors and is widely accepted for the detection of "burst" errors encountered in communication networks.
CTS	Clear To Send
DAC	Digital to Analog Converter
dBm	Decibels relative to 1mW
DC	Direct Current
debounce	Filtering of contact closure noise
DHCP	Dynamic Host Configuration Protocol – often used to refer to the network server that performs this function
DI	Digital Input
DFT	Discreet Fourier Transform
DMA	Direct Memory Access
DMM	Digital Multimeter
DNS	Domain Naming Service – often used to refer to the network server that performs this function
DO	Digital Output

DSP	Digital Signal Processor
DTR	Data Terminal Ready
DVM	Digital Volt Meter
EIA	Electronic Industries Association
EEPROM	Electrically Erasable Programmable Read Only Memory
EPLD	Electrically Programmable Logic Device
EPROM	Erasable Programmable Read Only Memory
Ethernet	A broadcast networking technology that can use several different physical media, including twisted pair cable and coaxial cable. TCP/IP is commonly used with Ethernet networks.
FB	Function Block – an element is the Function Block Diagram graphical language
FBD	Function Block Diagram graphical language – one of the IEC 61131-3 programming languages
FC	Flow Chart graphical language – one of the IEC 61131-3 programming languages
FF	Flip-Flop
FIFO	First In First Out
FIP	Fieldbus implementation based on French standard
firmware	Program held in ROM or Flash memory
Flash Memory	A type of non-volatile storage device similar to EEPROM
FMR	Feeder Management Remote
FMS	Feeder Management System
form A	Relay contact, single throw, normally open
form C	Relay contact, double throw
FRF	Full Range Factor; a method used for analog scaling; $\text{FRF} = \frac{\text{Data Value} - \text{Data Min}}{\text{Data Max} - \text{Data Min}}$
FS	Full Scale
FTP	File Transfer Protocol – A TCP/IP application used for transferring files from one system to another
GPS	Global Positioning System
GUI	Graphical User Interface
H	Hexadecimal (base 16), as in XXXXh
HEX	Hexadecimal (base 16), as in XXXXh
HDLC	High-level Data Link Control
HSPCI	High Speed Pulse Counter Input
Hz	Hertz, frequency in cycles per second
I/O	Input/Output
ID	Identification
IEC	International Electro-technical Commission
IED	Intelligent Electronic Device
IEEE	Institute of Electrical and Electronic Engineers
IL	Instruction List language – one of the IEC 61131-3 programming languages
ISA	Instrument Society of America
ISO	International Standards Organization
ISP	Integrated Software Project – Fieldbus implementation using existing IEC standards
ITU	Intelligent Terminal Unit
JEDEC	Joint Electronic Device Engineering Council

k	Kilo - kB is kilobytes, kV is kilovolts, etc.
KHz	Kilo Hertz
LAN	Local Area Network
LCD	Liquid Crystal Display
LD	Ladder Diagram graphical language – one of the IEC 61131-3 programming languages
LED	Light Emitting Diode
LRC	Longitudinal Redundancy Check; uses both "horizontal" and "vertical" parity bits to detect errors in the messages between the Master and the RTUs. This technique is also known as Geometric Coding.
LSB	Least Significant Bit
mA	Milliampere
MAP	Manufacturing Automation Protocol
MEB	Memory Expansion Bus (also, Memory Expansion Board)
MHz	Megahertz
MMI	Man Machine Interface
MMS	Manufacturing Message Specification
MSB	Most Significant Bit
msec	Millisecond
MTU	Master Terminal Unit, also Master Station
MUX	Multiplexer
NC contact	Normally Closed relay contact
NEMA	National Electrical Manufacturers Association
NO contact	Normally Open relay contact
O/S or OS	Operating System
OSI	Open Systems Interconnection
oz	Ounce
PC	Power Converter, also Personal Computer
PCI	Pulse Counter Input
PF	Power Factor
PID	Three term controller, proportional, integral, derivative closed-loop control algorithm
PLD	Programmable Logic Device
PLC	Programmable Logic Controller
POU	Program Organization Unit
PPP	Point-to-Point Protocol – A TCP/IP protocol that provides host-to-host network and router-to-router connections. Can be used to provide a serial line connection between two machines.
pps	Pulses Per Second
PWR	Power
RAM	Random Access Memory
RLL	Relay Ladder Logic
ROM	Read Only Memory
router	A device that connects LANs into an internetwork and routes traffic between them
RS232C	EIA Serial data communications standard
RST	Reset
RTOS	Real Time Operating System
RTS	Request To Send
RTU	Remote Terminal Unit

Rx	Receive
SAP	Substation Automation Platform
SBO	Select Before Operate
SCC	Serial Communications Controller
SCADA	Supervisory Control And Data Acquisition
SCTO	Soft Carrier Turn Off
SDLC	Synchronous Data Link Control
SEB	Surge Protection Expansion Board
SFB	Sequential Function Block – one of the IEC 61131-3 programming languages
SFB	Special Function Bus
SFC	Sequential Function Chart graphical language
SOE	Sequence of Events
ST	Structured Text language – one of the IEC 61131-3 programming languages
STS	Status
SWC	Surge Withstand Capability, IEEE C37.90a 1978
TCP/IP	Transmission Control Protocol/Internet Protocol
Tx	Transmit
UART	Universal Asynchronous Receiver Transmitter
UIF	User Interface Function
USART	Universal Synchronous Asynchronous Receiver Transmitter
msec	Microsecond
UVPROM	Ultraviolet erasable Programmable Read Only Memory
VAC	Volts Alternating Current
VAR	Volt-Amperes Reactive
VARH	VAR Hours
VDC	Volts Direct Current
VxWorks	Real Time Operating System made by Wind River for embedded computer systems
W	Watt
Watchdog Timer	Circuit that resets CPU if it fails to execute program
WH	Watt Hours
XB	Expansion Board
XML	Extensible Markup Language – The method used be Telvent for the storing and retrieval of config@WEB RTU data. The data is stored in the form of a series of XML files (files with an XML extension).
XT	External Termination (panel, module or assembly)

APPENDIX I

Index