config@WEB Applications Manual

S2200-AAA-00006 V8.2

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config@WEB Applications Manual

For Reference Only

Manual No. S2200-AAA-00006

Rev	Date	Description	ECO #	Technical Review	Admin. Approval
0.0	08-18-06	Initial Release	N/A		
1.0	03-12-07	Updated for C9 firmware	11633		
2.0	08-06-07	Updated for CA_P2 firmware	11671		
3.0	06-02-08	Updated for CD firmware	11711		
4.0	10-08-08	Updated for D0 firmware	11747		
5.0		Updated for D1_P2 Firmware			
6.0	10-25-11	Updated for G1 firmware			
7.0	10-08-12	Updated for Secure firmware	N/A		
8.1	07-25-17	Updated for Schneider Electric Template and All Screenshots. Added MCD Application. Updated Automatic Section Task to match current functionality. Updated Alarming & Annunciator app sections.	N/A	Chris Kerr	Chris Kerr,- Manager, RTU S/W Engineering
8.2	01-29-19	Added FTP Push App, Data Trap App	N/A	Chris Kerr	Chris Kerr, SAGE Offer Manager

1 Alarming

1.1 Introduction

The Alarming application allows the user to select points that are monitored and displayed when the points change to a defined condition.

Analog and Status points may be configured for use with the application.

A special display is used to look at the point currently in alarm. Points displayed on this page may be in either acknowledged or unacknowledged state. Points are acknowledged on this page. Individual points, a page of points, or all points may be acknowledged at once. A maximum of 16 points are displayed on this page. If more than 16 points are in alarm, multiple pages may be displayed. In this case, every page of the display will contain 16 points, with the last page always being filled regardless of whether the number of points being in alarm is divisible by 16. Only the current condition is displayed on this page (no history).

If Unacknowledged analog points are in the high alarm condition, the State will flash HIGH (Red). When the point is in the low alarm condition, the State will flash LOW (Blue). When the point is acknowledged in the High or Low condition, the flashing will stop.

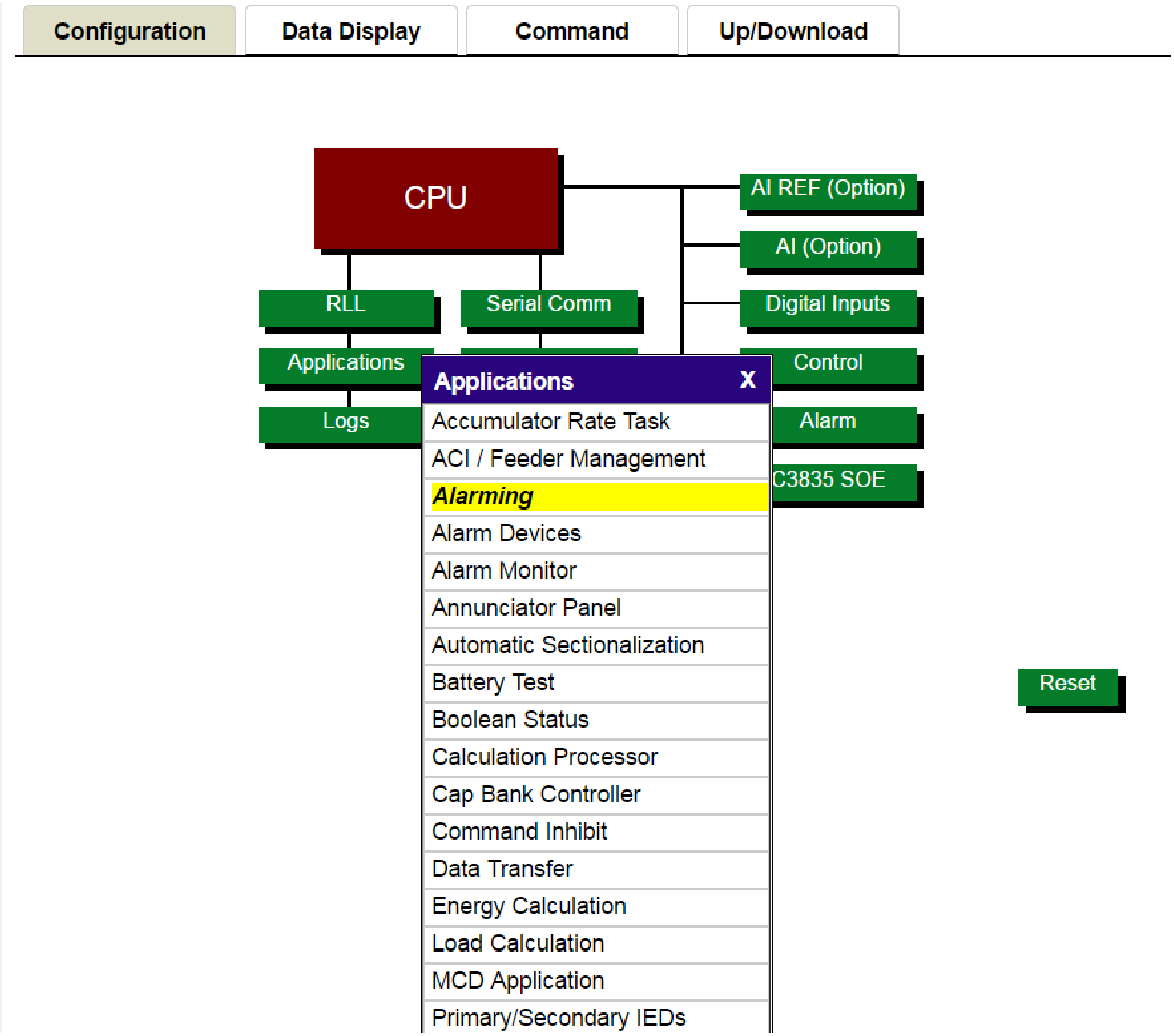
When the analog returns to normal, flashing NORMAL (Black) is displayed. When the point is acknowledged, it is removed from the display.

For status points in the alarm condition, the State will flash ALARM in red. When the point is acknowledged in the alarm condition, the flashing will stop.

When the status point returns to normal, flashing NORMAL (Black) is displayed. When the point is acknowledged, it is removed from the display.

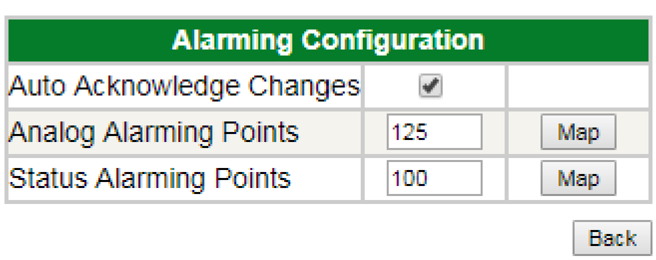
To begin the configuration process, select the Application as shown below.

Figure 1-1 Applications Configuration Popup



1.2 Configuration

Figure 1-2 Alarming Configuration



Auto Acknowledge Changes

This option will cause the alarming application to only show points which are currently in alarm. If this option is not set, points which are in alarm or points which are unacknowledged (either from going into or out of alarm) will be shown.

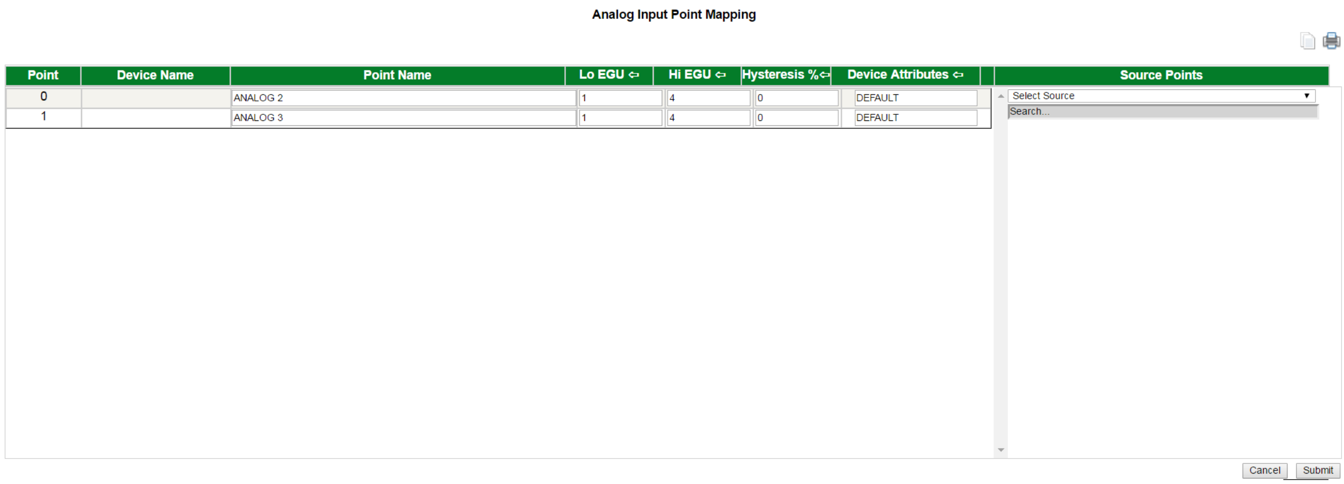
Maximum Alarming Points

The Application allows the user to configure up to 512 analog and 1024 status points.

1.2.1 Configuring Analog Alarming Points

The example below shows configuration of two analog alarming points.

Figure 1-3 Analog Input Point Mapping



Point

This is the logical point number

Device Name

The Device Name of the source point.

Point Name

Select the point from the Source Points drop-down list.

Lo EGU

Set the Engineering Units for the Low alarm state. An analog input going below this value causes the point to go into an low alarm state.

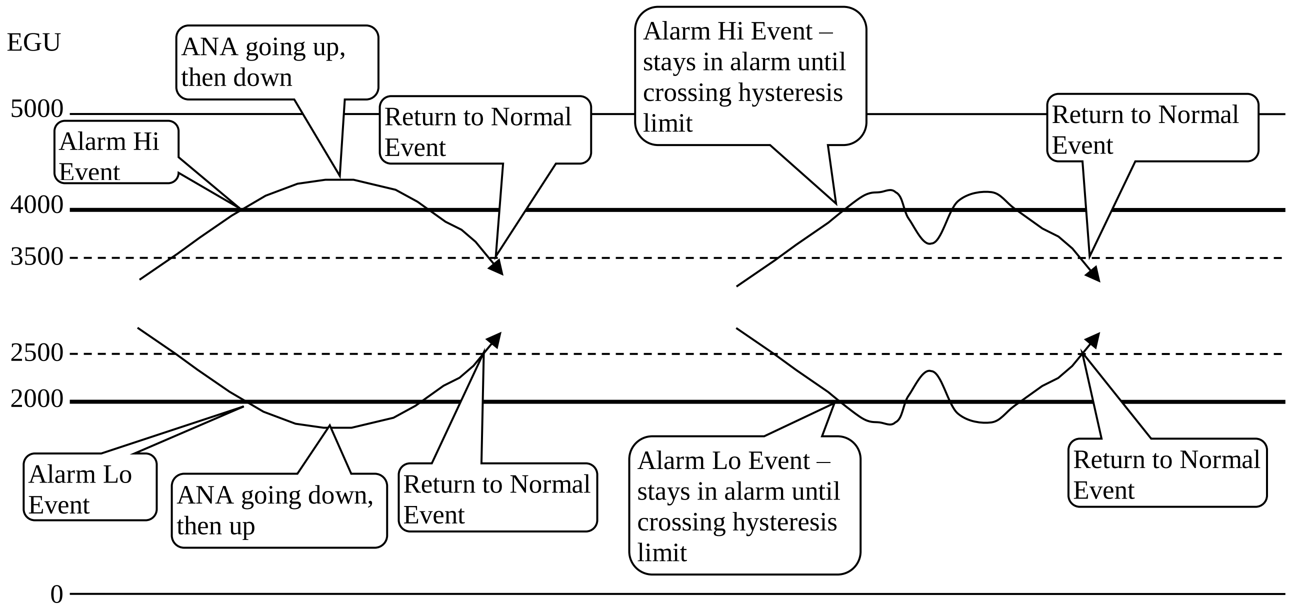
Hi EGU

Set the Engineering Units for the High alarm state. An analog input going above this value causes the point to go into a high alarm state.

Hysteresis %

Set the Hysteresis (in % of full scale) to the desired level. Hysteresis means that when an analog point is in the alarm state, it won't reset to Normal until the analog moves towards the Normal limit plus the hysteresis value. An example is shown below. The alarm limits are set at 4000 EGU Hi, 2000 EGU Lo, with a Hysteresis of 10%.

Figure 1-4 Hysteresis Action

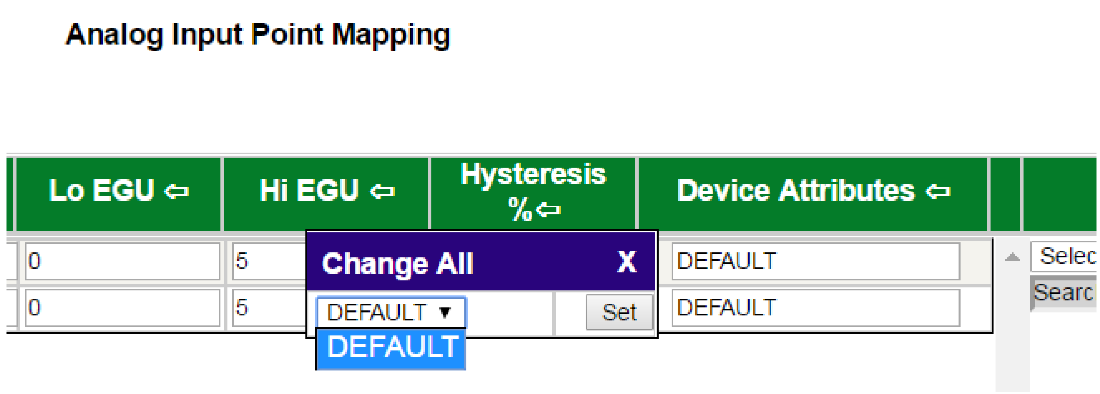


Device Attributes

If you have created profiles in the Alarm Devices application, you can now apply those profiles to the points you are configuring for alarm. When you left-click your cursor into the Device Attributes header or a field beneath the header, a box will appear as shown.

You may select from the profiles you created with the Alarm Devices application (see the chapter for Alarm Devices).

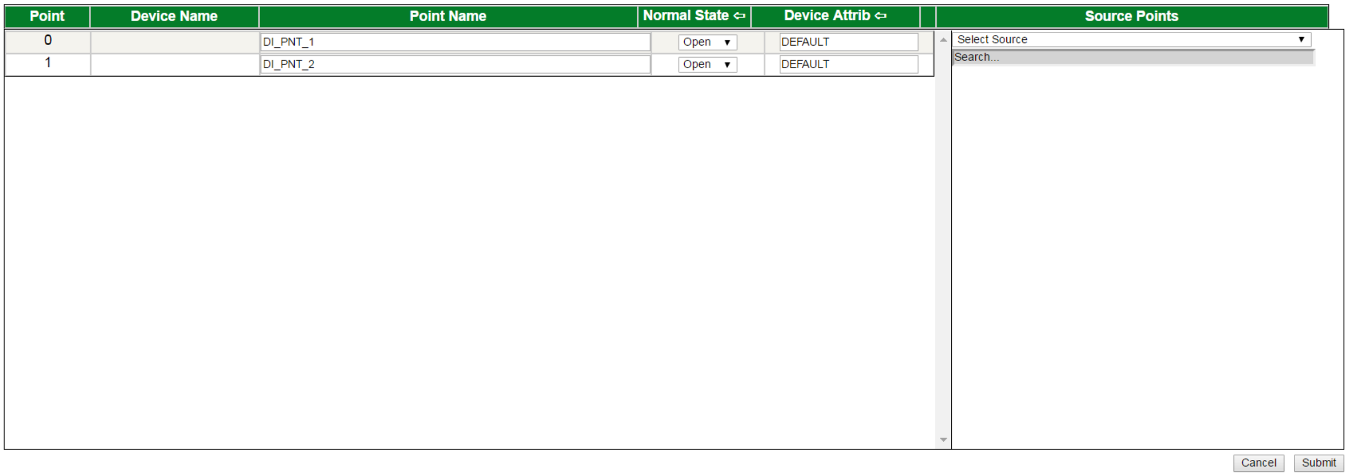
Figure 1-5 Choosing Device Attributes



1.2.2 Configuring Status Alarming Points

The example below shows configuration of two Status alarming points.

Figure 1-6 Configuring DI Alarming Points



Point
This is the logical point number

Device Name
The Device Name of the source point.

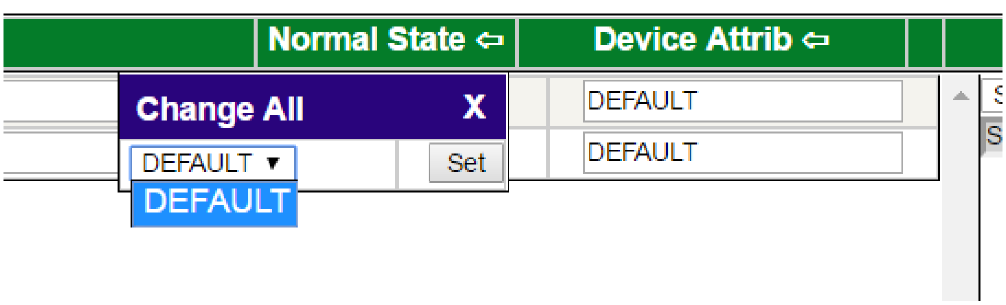
Point Name
Select the points from the Source Points drop-down list.

Normal State
Select either Normally Open or Normally Closed. The alarm will be triggered by the opposite state.

Device Attributes
If you have created profiles in the Alarm Devices application, you can now apply those profiles to the points you are configuring for alarm. When you left-click your cursor into the Device Attributes header or a field beneath the header, a box will appear as shown.

You may select from the profiles you created with the Alarm Devices application (see the chapter for Alarm Devices).

Figure 1-7 Choosing Device Attributes

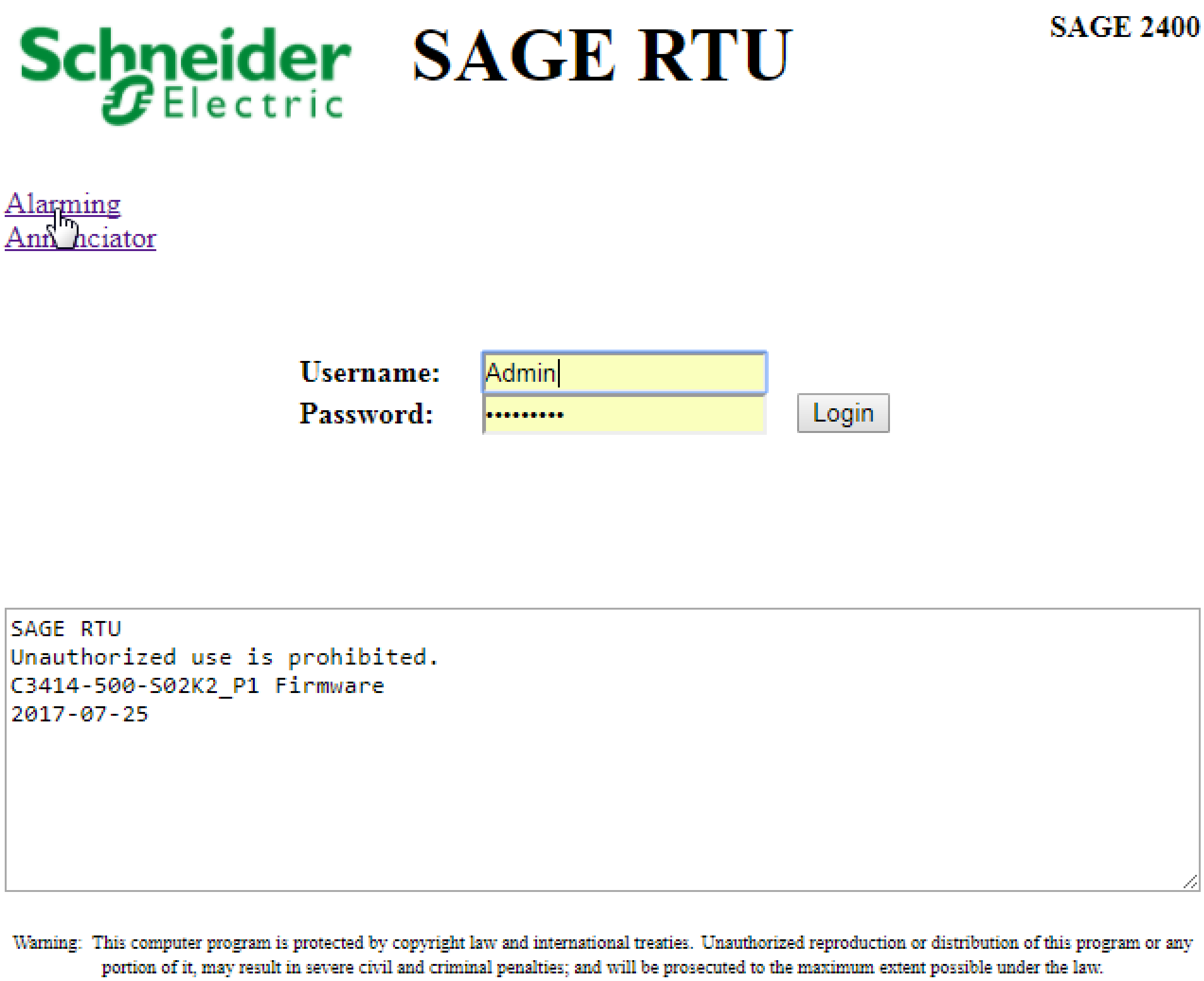


1.3 Data Display

Beginning with C3414-500-S02K2 firmware, the user may view the Alarming data by clicking on the Alarming link on the RTU Login Page or by pointing your web browser directly to the webpage http://172.18.150.50/fs/display/summalarmlog.htm

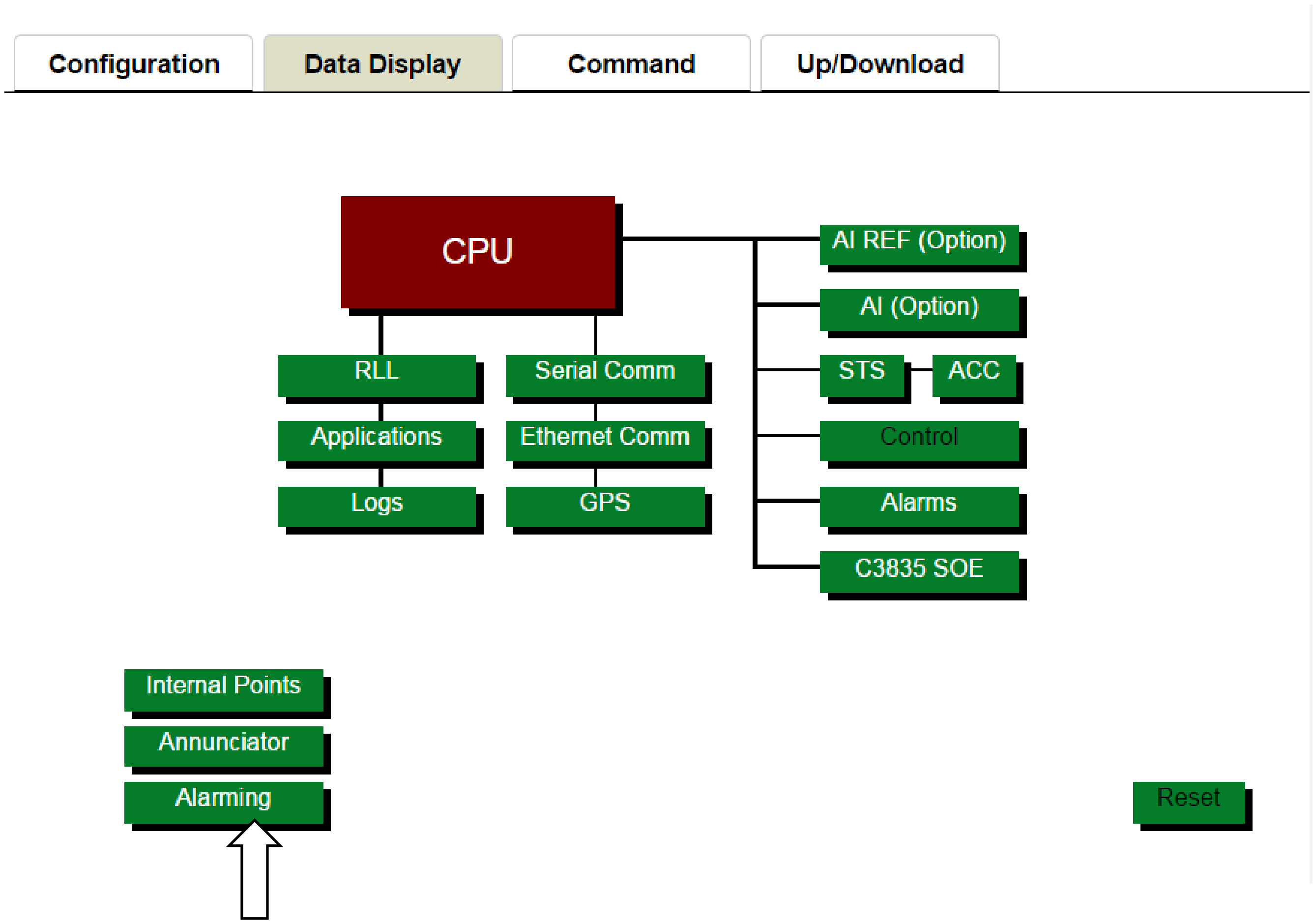
Where 172.18.150.50 is the IP of your RTU.

Figure 1-8: Click Alarming from Login Page



The display for application begins as shown in the example below. Click on the box at the lower left.

Figure 1-9 Display Alarming



The following example shows all four points in alarm.

Figure 1-10 Summary Alarm Log

Summary Alarm Log

Total Alarms: 17 Filter: ○ Status ○ Analog ◉ Both Filter Alarms: 17

Date/Time ▼		Device Name	Point Name	Value	State
2009/09/05	05:33:13.252	SEL Dev Port 5	Check IED Cfg Mismatch	OPEN	ALARM
2009/09/05	05:33:13.252	SEL Dev Port 5	Check IED Cfg Error	OPEN	ALARM
2009/09/05	05:33:13.252	RTU Internal Status	LOGIN FAILURE	OPEN	ALARM
2009/09/05	05:33:13.252	RTU Internal Status	LOCAL	OPEN	ALARM
2009/09/05	05:33:13.252	RTU Internal Status	RUN	OPEN	ALARM
2009/09/05	05:33:13.252	RTU Internal Status	SEC TIME SRC FAIL	OPEN	ALARM
2009/09/05	05:33:16.043	RTU Internal Analog	UTC_CORRECT	60.000	HIGH
2009/09/05	05:33:16.043	RTU Internal Analog	MONTH	7.000	HIGH
2009/09/05	05:34:06.934	Blue Pillar	Socket 1 New Connection	OPEN	ALARM
2009/09/05	05:34:09.164	Blue Pillar	Socket 1 COMM Status (Data Link)	OPEN	ALARM
2009/09/05	05:34:09.461	Blue Pillar	Socket 1 COMM Status (App Layer)	OPEN	ALARM
2017/07/24	17:48:15.986	RTU Internal Analog	DAY	25.000	HIGH
2017/07/24	19:56:34.967	References	bb_temp_ref	76.532	HIGH
2017/07/25	12:01:49.514	RTU Internal Status	LOGGED IN	OPEN	ALARM
2017/07/25	12:31:01.096	RTU Internal Analog	MINS	37.000	HIGH
2017/07/25	12:37:39.089	DNPM_IED_1	COMM_STS	OPEN	ALARM

Ack All Freeze Ack Page

Page 1 of 2 Go To Go > Back

Total Alarms

The Total Alarms value is the total number of analog and status points in the alarm state.

Filter Alarms

The Filter Alarms value is the total number of points in the alarm state that satisfy the currently selected filter. If there are 2 analogs and 3 status points in alarm, the Total Alarms value displayed will be 5. If the Status filter is selected, the Filter Alarms value is 3. If the Analog filter is selected, the Filter Alarms value will be 2. If the Both filter is selected, the Filter Alarms value will be 5.

Filter

You may choose to display only Status, only Analog, or both.

Go To

If there are more alarms than can be displayed on one page, "Go To" allows you to navigate to the appropriate page and Next and Prev are available for use.

Date/Time (Up/Down sortable)

Lists date and time of alarm event.

Device Name (Up/Down sortable)

The Device Name of the source point.

Point Name (Up/Down sortable)

The name of the source point is displayed.

Value (Up/Down sortable)

For Analog points, the current value in Engineering Units is displayed. For Status points, Open or Closed is displayed.

State

This column describes the state of the mapped point{s}. To acknowledge a single point, place the cursor over the flashing State value and left click. The attributes of the alarm (colors and words) are determined by the configuration in Alarm Devices. Please see Alarm Devices chapter.

Ack All

Acknowledges all points in alarm regardless of whether they are displayed. Confirmation is required for this function.

Ack Page

Same as above, but only the points displayed on the present page will be acknowledged.

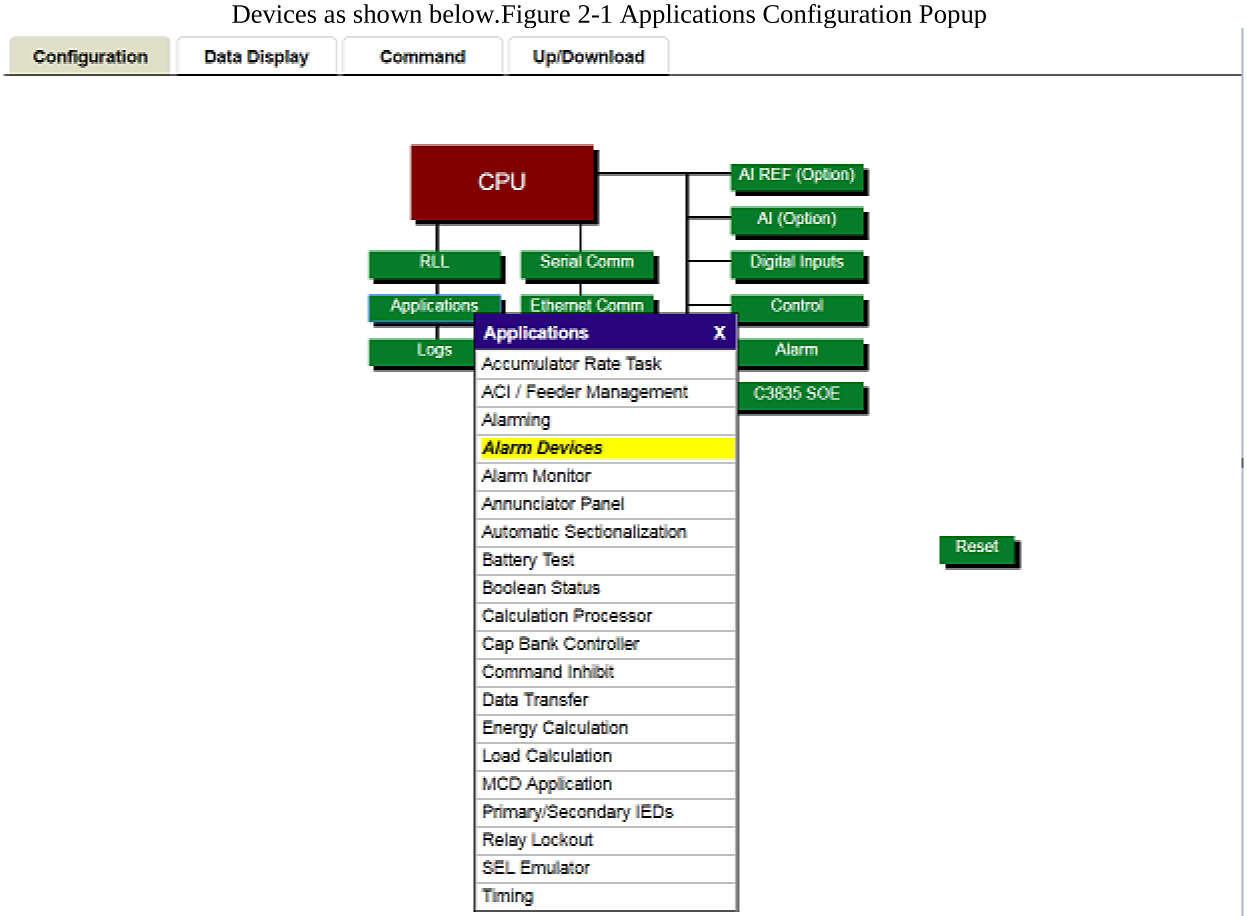
Freeze and Unfreeze

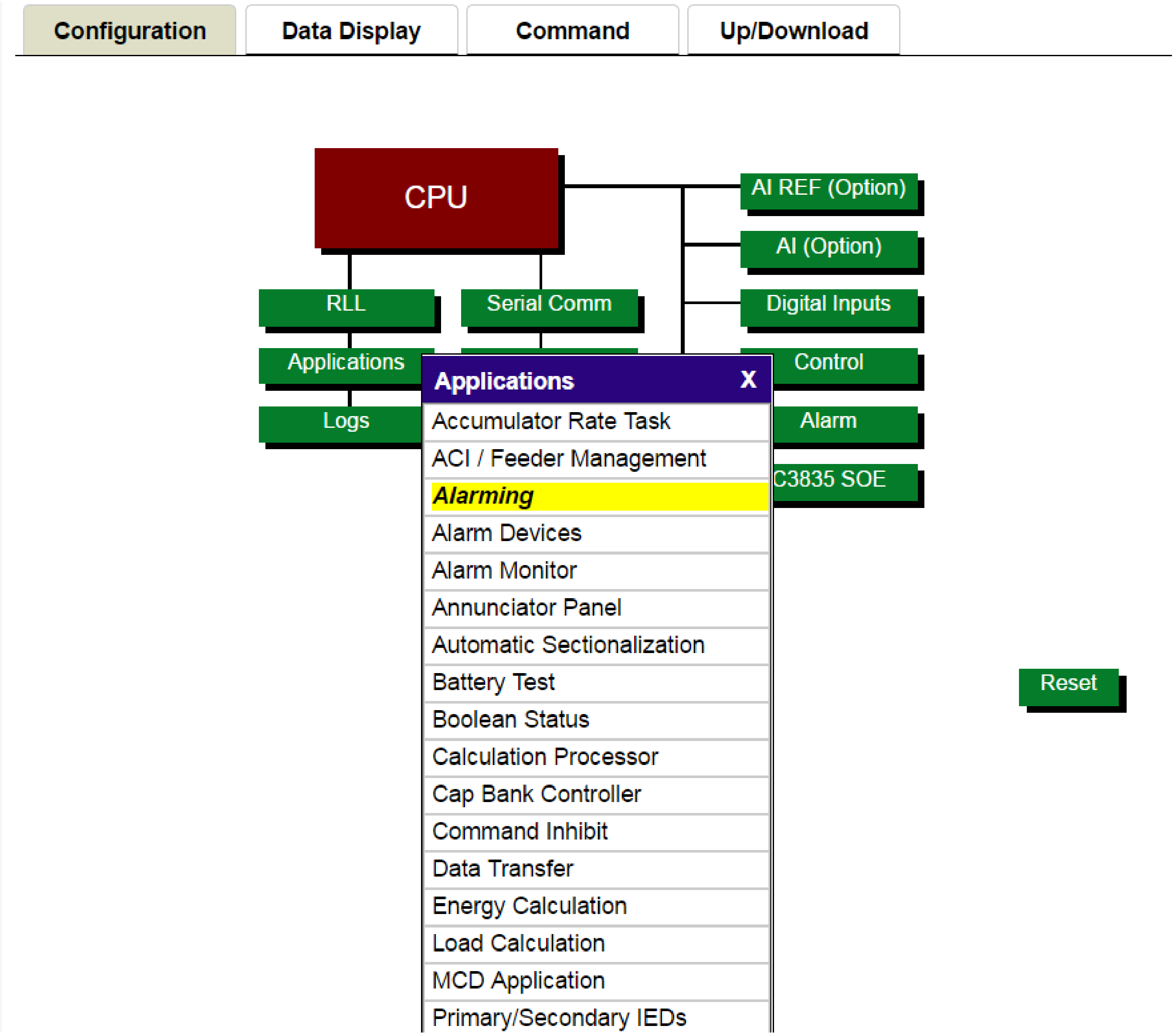
The Freeze button freezes the screen, which means no more changes will be displayed. Any alarms detected while in freeze mode will be queued and displayed when the display is unfrozen. The Unfreeze button resumes normal operation.

2 Alarm Devices

2.1 Introduction

The Alarm Devices application is used to set colors and styles for the alarm monitoring system. Select the Alarm Devices as shown below.Figure 2-1 Applications Configuration Popup




Configuration
Data Display
Command
Up/Download
CPU
RLL
Serial Comm
Applications
Logs
AI REF (Option)
AI (Option)
Digital Inputs
Control
Alarm
C3835 SOE
Reset
Applications
X
Accumulator Rate Task
ACI / Feeder Management
Alarming
Alarm Devices
Alarm Monitor
Annunciator Panel
Automatic Sectionalization
Battery Test
Boolean Status
Calculation Processor
Cap Bank Controller
Command Inhibit
Data Transfer
Energy Calculation
Load Calculation
MCD Application
Primary/Secondary IEDs

2.2 Configuration

In the following example, we create two profiles for each of two analog points and two status points.

Figure 2-2 Alarm Devices Configuration

Alarming Device Profiles

Analog Alarming Profiles	2	Config
Status Alarming Profiles	2	Config

Back

You cannot create less than one profile or more than 32 profiles. The first profile is named DEFAULT, as shown below. You may change the name of the first profile as well as the names of the additional.

Figure 2-3 Automatic Alarm Device Profile Names (Analog)

Pnt Name	Configure
DEFAULT	Conf
DEV_TYPE_ANA_2	Conf

Back Submit

In the following example, the names have been changed for clarity.

Figure 2-4 Renamed Alarm Device Profile Names (Analog)

Pnt Name	Configure
ANA Alarm Profile 1	Conf
ANA Alarm Profile 2	Conf

Back Submit

And so forth for the Status names.

Figure 2-5 Renamed Alarm Device Profile Names (Status)

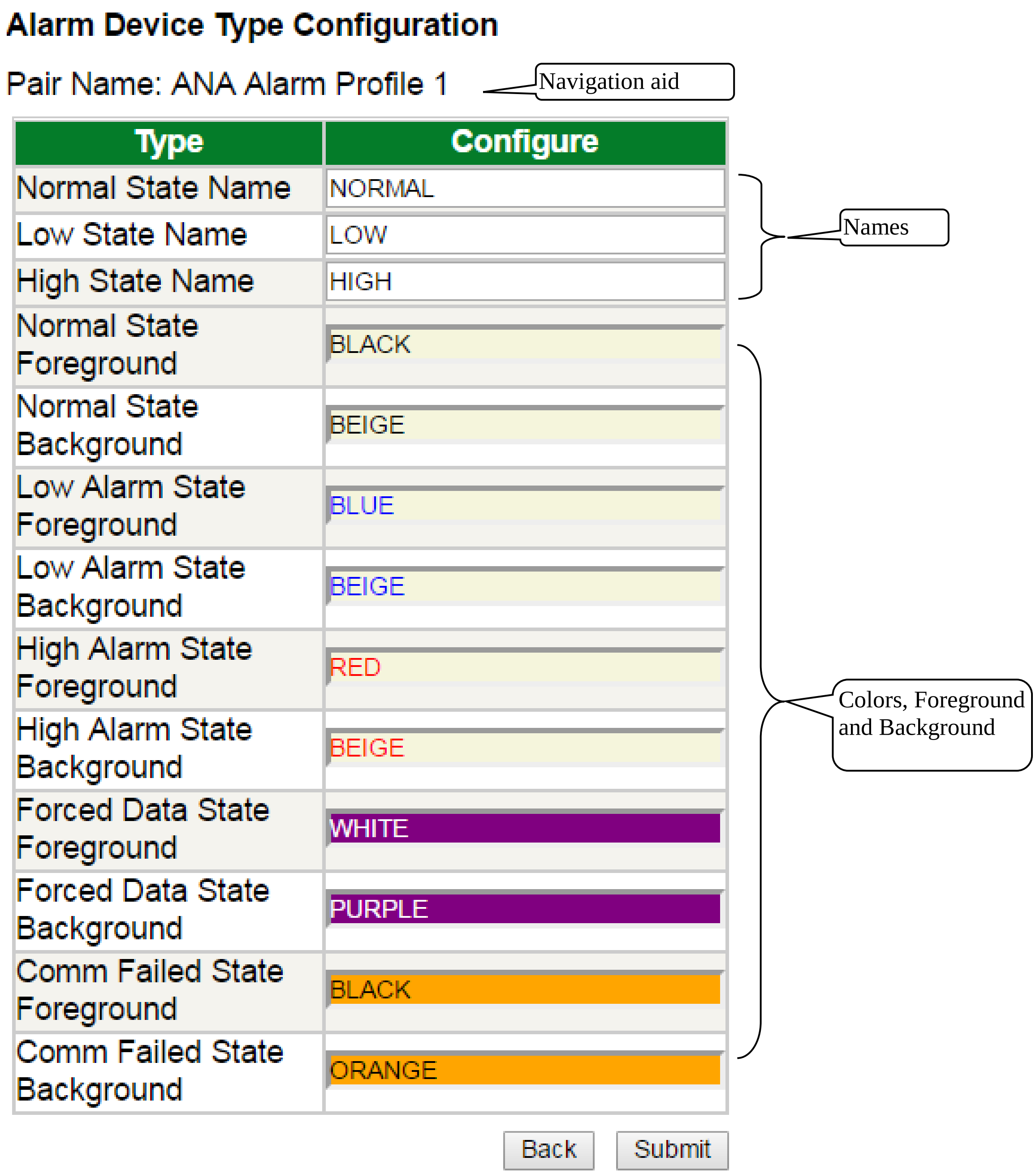
Pnt Name	Configure
STS Alarm Profile 1	Conf
STS Alarm Profile 2	Conf

Back Submit

2.2.1 Analog Configuration

When you click Conf for a profile configuration, for instance, ANA Alarm Profile 1, you will get a screen similar to below. Notice that the name you gave the profile is part of the screen.

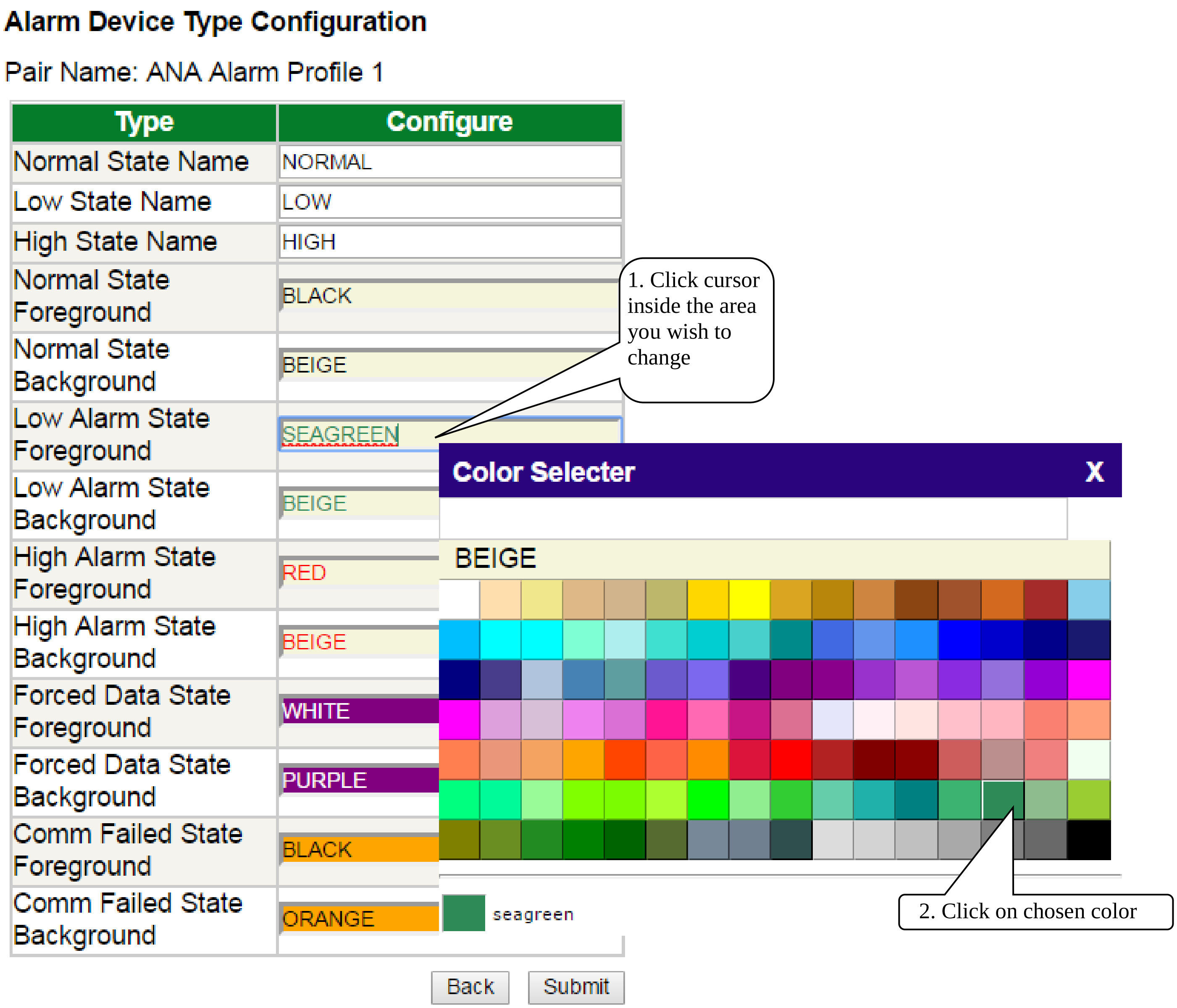
Figure 2-6 Analog Alarm Device Type Configuration



Note: Forced Data State refers to a feature not yet implemented.

The following example shows how to change a default Alarm Device Type Configuration

Figure 2-7 Analog Alarm Device Type Configuration

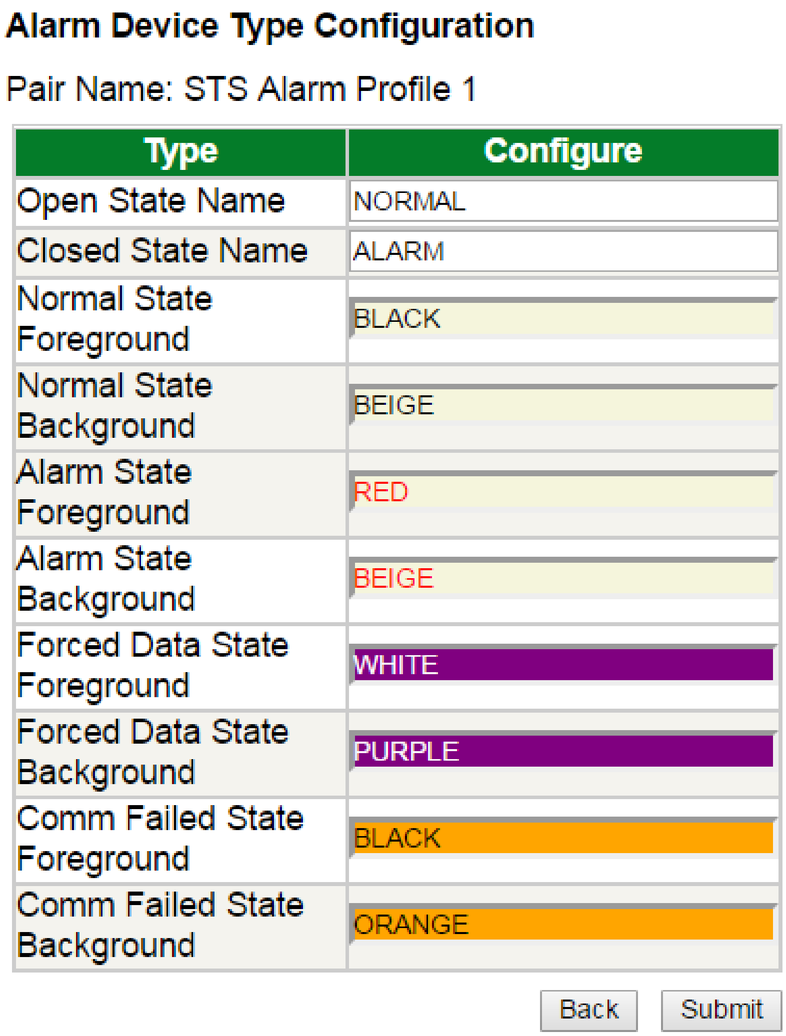


Note: Forced Data State refers to a feature not yet implemented.

2.2.2 Status Configuration

The Status configuration steps are the same as the Analog, with necessary differences as shown.

Figure 2-8 Status Alarm Device Type Configuration



Note: Forced Data State refers to a feature not yet implemented.

Note: Comm Failed State does not refer to the Comm Status from a port, but to any of the status's coming from an IED that show up as failed. This feature has not yet been implemented.

The port Comm Status point may be mapped as a status alarm, but its profile is treated as any other status point.

2.3 Applying Device Type Profiles to Alarms

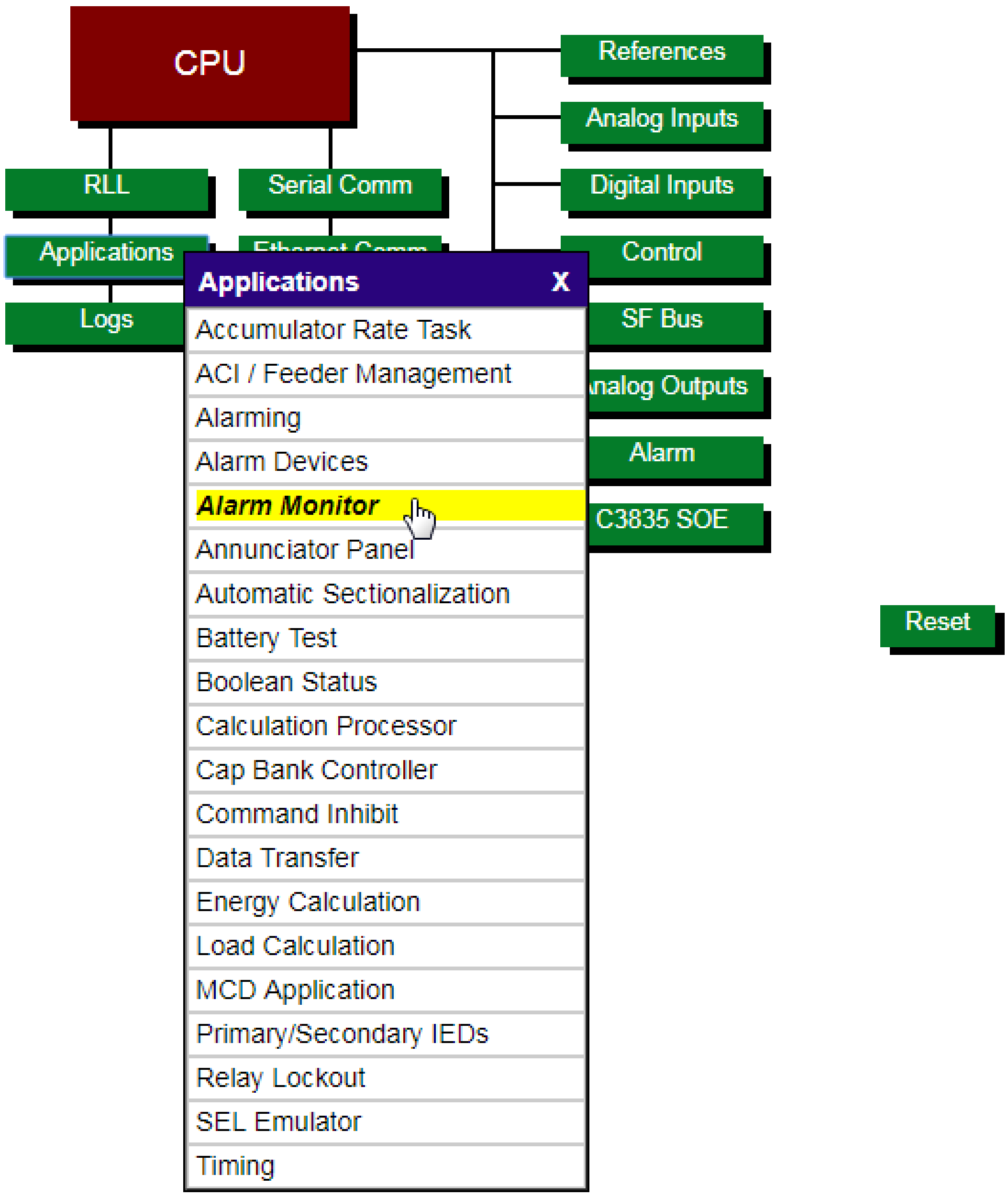
The attributes of the profiles that are set up in this application may be selected as a Device Attribute for each type of alarm (see the Alarming chapter).

3 Alarm Monitor

3.1 Introduction

The Alarm Monitor application is to be used in conjunction with the Alarming application to operate digital outputs based on the results of logic equations involving status alarm points and analog alarm points. When status points are assigned to the Alarming function, they are set in Alarm or Normal states, depending on the alarm criteria. When analog points are assigned to the Alarming function, they are periodically tested against alarm limits and are set in High, Low or Normal alarm states. The resulting alarm states are used as inputs to the Alarm Monitor function.

Figure 3-1 Applications Configuration Popup



3.2 Configuration

Figure 3-2 Alarm Monitor Configuration

Alarm Monitor Configuration

Interval for Equation Evaluation	10	(sec.)
Number of Control Equations	1	Configure

Back

When the Alarm Monitor application is selected from the Applications list on the RTU Configuration page, the Alarm Monitor Configuration page is presented. On this page, the user determines how often the application is to be run by entering a number of seconds in the Interval for Equation Evaluation field. The number of control equations is set in the Number of Control Equations field.

When the user clicks on Configure, the following screen will be shown.

Figure 3-3 Alarm Monitor Equations List

Alarm Monitor Equations List

Eqn. #	Result Name	Number of Inputs	Enable	Edit	Config
1	CTL_EQU 1	3	Yes		Conf

Done

Click on the Edit icon to allow editing of the equation.

Figure 3-4 Editing the Alarm Monitor Equations List.

Alarm Monitor Equations List

Eqn. #	Result Name	Number of Inputs	Enable	Edit	Config
1	CTL_EQU 1	3	Yes	✗ ✓	Conf

Done

With the above screen, you may change the name of the equation, set the number of inputs (2 to 15), and enable or disable the equation. Click the checkmark to save your changes, or the X to discard changes. After you save or discard, you may click Conf to configure the equation as shown below.

Figure 3-5 Initial Equation Definition

Equation Definition

Eqn # 1 Result Name : CTL_EQU 1

Input #	Device Name	Point Name	Function	Type	Flag	T/F
0	-	-	-	DOUT	-	Set
1	-	-	-	STS	ALM	True
2	-	-	OR	STS	ALM	True

Map DOUT Map ANA Map STS Back Submit

As shown below, you must map points to make the Alarm Monitor work.

Figure 3-6 Equation Definition with Mapped Points

Equation Definition

Eqn # 2 Result Name : CTL_EQU 2

Input #	Device Name	Point Name	Function	Type	Flag	T/F
0	Data Transfer (DO-DI)	DXF_DO_DI_ALL GENERATORS	-	DOUT	-	Set ▼
1	Hardware DI	RTU Stop/Start Generators	-	STS ▼	CUR ▼	True ▼
2	Hardware DI	RTU Open/Close Intertie	AND ▼	STS ▼	ALM ▼	True ▼

Map DOUT | Map ANA | Map STS | Back | Submit

Function
Select either OR or AND.

Type
DOUT is the only type of output point allowed. Select either STS or ANA for the input points.

Flag
Select either ACK (acknowledge), ALM (alarm), or CUR (current value) according to the tables below.

T/F
Select either Set or Clear for the DOUT point. Select either True or False for the input points according to the tables below.

Note: Status and Analog input points may be mixed.

Table 3-1 Status Truth Table

	T/F = TRUE	T/F = FALSE
ACK	The status point has an unacknowledged change	The status point alarm is acknowledged
ALM	The status point is in the Alarm state	The status point is in the Normal state
CUR	The current state (open or closed) is to be used as input	The negation of the current state is used

Table 3-2 Analog Truth Table

	T/F = TRUE	T/F = FALSE
ACK	The analog point has an unacknowledged change in alarm state	The analog alarm is acknowledged
HI	The analog value exceeds the High alarm limit	The analog is NOT High
LOW	The analog value is below the Low alarm limit	The analog is NOT Low
ALM	The analog is in alarm (either Hi or Lo)	The analog is in its Normal state

The equation is evaluated in the order in which the parameters are defined. For example if the inputs are:

A OR B AND C

The result of ORing parameters A and B is ANDed with parameter C, i.e., treated as (A OR B) AND C. See the example below.

Equation Definition

Eqn # 1 Result Name : CTL_EQU 1

Input #	Device Name	Point Name	Function	Type	Flag	T/F
0	Data Transfer (DO-DI)	DXF_DO_DI_ERS MODE	-	DOUT	-	Set
1	Hardware DI	A RTU Stop/Start Generators	-	STS	CUR	True
2	Hardware DI	B RTU Open/Close Intertie	OR	STS	ALM	True
3	Hardware DI	C RTU Stop/Run EILS Mode	AND	STS	ALM	True

Map DOUT Map ANA Map STS Back Submit

Below is a more complicated example. This one is configured with the same logic as above (A OR B AND C), but it uses Analogs that are in Alarm. Analogs 2, 3, and 4 were setup under the Alarming application as shown below.

Equation Definition

Eqn # 3 Result Name : CTL_EQU 3

Input #	Device Name	Point Name	Function	Type	Flag	T/F
0	Data Transfer (DO-DI)	DXF_DO_DI_ALL GENERATORS	-	DOUT	-	Set
1	SEL_RELAY_1	A_PH_AMPS	-	ANA	ALM	True
2	SEL_RELAY_1	B_PH_AMPS	OR	ANA	ALM	True
3	SEL_RELAY_1	C_PH_AMPS	OR	ANA	ALM	True

Map DOUT Map ANA Map STS Back Submit

Analog Input Point Mapping

Point	Device Name	Point Name	Lo EGU ⇦	Hi EGU ⇦	Hysteresis %⇦	Device Attributes ⇦
7	SEL_RELAY_1	A_PH_AMPS	100	500	2	DEFAULT
8	SEL_RELAY_1	B_PH_AMPS	100	500	2	DEFAULT
9	SEL_RELAY_1	C_PH_AMPS	100	500	2	DEFAULT

The Alarm logs verify that either Analogs 2, 3, or 4 are in Alarm.

Summary Alarm Log

Total Alarms: 16 Filter: Status Analog Both Filter Alarms: 5

Date/Time		Device Name	Point Name	Value	State
2017/07/25	16:39:34.406	SEL Dev Port 5	C_PH_AMPS	0.000	LOW
2017/07/25	16:39:34.406	RTU Internal Analog	UTC_CORRECT	60.000	HIGH
2017/07/25	16:39:34.406	RTU Internal Analog	HOURS	17.000	HIGH
2017/07/25	16:39:34.406	RTU Internal Analog	DAY	25.000	HIGH
2017/07/25	16:39:34.406	RTU Internal Analog	MONTH	7.000	HIGH

Ack All Freeze Ack Page

Page 1 of 1 Go To Go Back

Then the following equation is set up. If Status 1 is true, OR both Analog 1 and 2 are in alarm, then DOUT will be set.

Equation Definition

Eqn # 3 Result Name : CTL_EQU 3

Input #	Device Name	Point Name	Function	Type	Flag	T/F
0	Data Transfer (DO-DI)	DXF_DO_DI_ALL GENERATORS	-	DOUT	-	Set
1	SEL_RELAY_1	**A** A_PH_AMPS	-	ANA	ALM	True
2	SEL_RELAY_1	**B** B_PH_AMPS	OR	ANA	ALM	True
3	SEL_RELAY_1	**C** C_PH_AMPS	OR	ANA	ALM	True

Map DOUT | Map ANA | Map STS | Back | Submit

When we look at the Display for Alarm Monitor, we see that this is exactly what happens.

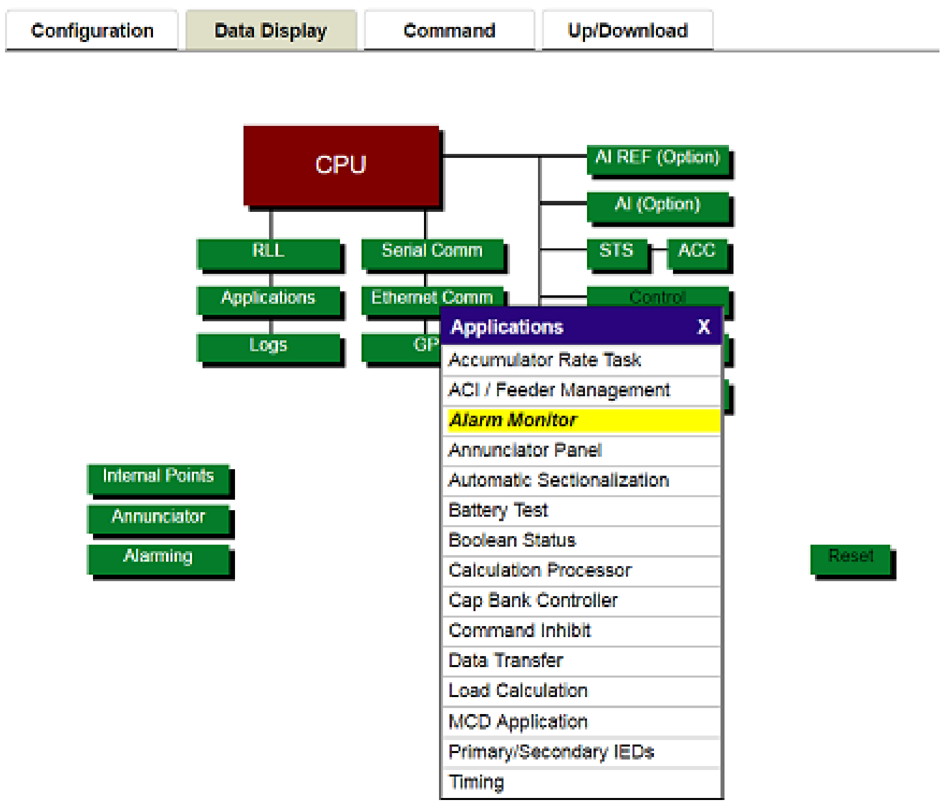
Alarm Monitor Display

Equ # : 3 Equation Name: CTL_EQU 3

Operand	Device Name	Point Name	Type	Flag	Func	State	Qual
1	SEL Dev Port 5	A_PH_AMPS	ANA	ALM		FALSE	
2	SEL Dev Port 5	B_PH_AMPS	ANA	ALM	OR	FALSE	
3	SEL Dev Port 5	C_PH_AMPS	ANA	ALM	OR	TRUE	
4	Data Transfer	DXF_DO_DI_ALL GENERATORS	DOUT	SET	=	SET	

3.3 Display

Figure 3-7 Alarm Monitor Display



When the Alarm Monitor function is selected from the Applications list on the Data Display page, the Alarm Monitor Display list is presented. This display shows whether equations are enabled or disabled and allows the user to select a particular equation for display. When the View button is clicked, the Alarm Monitor Display page is presented as shown.

Figure 3-8 Alarm Monitor Display

Alarm Monitor Display

EQU #	Equation Name	Enabled	Equation Data
1	CTL_EQU 1	Y	View

Back

On the Alarm Monitor Display page, the states of the inputs and output of a selected control equation are displayed. The display lists the device name and point name of each parameter, its data type and the flag and logic function that was selected in the configuration process and the current state. For input points, the State is either TRUE or FALSE, based on the selected alarm state and the setting of the T/F flag in the configuration. For example, if the ALM (alarm) state of an analog input was set up with T/F = FALSE, the State field will show TRUE if the analog is in its Normal state, or FALSE if it is in alarm (either high or low). The state of the digital output point is shown as SET or CLEAR. The data quality is shown in the Qual column. Note that if any input point is marked as Failed (F), the logic equation is not evaluated and the digital output point is left unchanged.

Figure 3-9 Alarm Monitor Display

Alarm Monitor Display

Equ # : 3 Equation Name: CTL_EQU 3

Operand	Device Name	Point Name	Type	Flag	Func	State	Qual
1	SEL Dev Port 5	A_PH_AMPS	ANA	ALM		FALSE	
2	SEL Dev Port 5	B_PH_AMPS	ANA	ALM	OR	FALSE	
3	SEL Dev Port 5	C_PH_AMPS	ANA	ALM	OR	TRUE	
4	Data Transfer	DXF_DO_DI_ALL GENERATORS	DOUT	SET	=	SET	

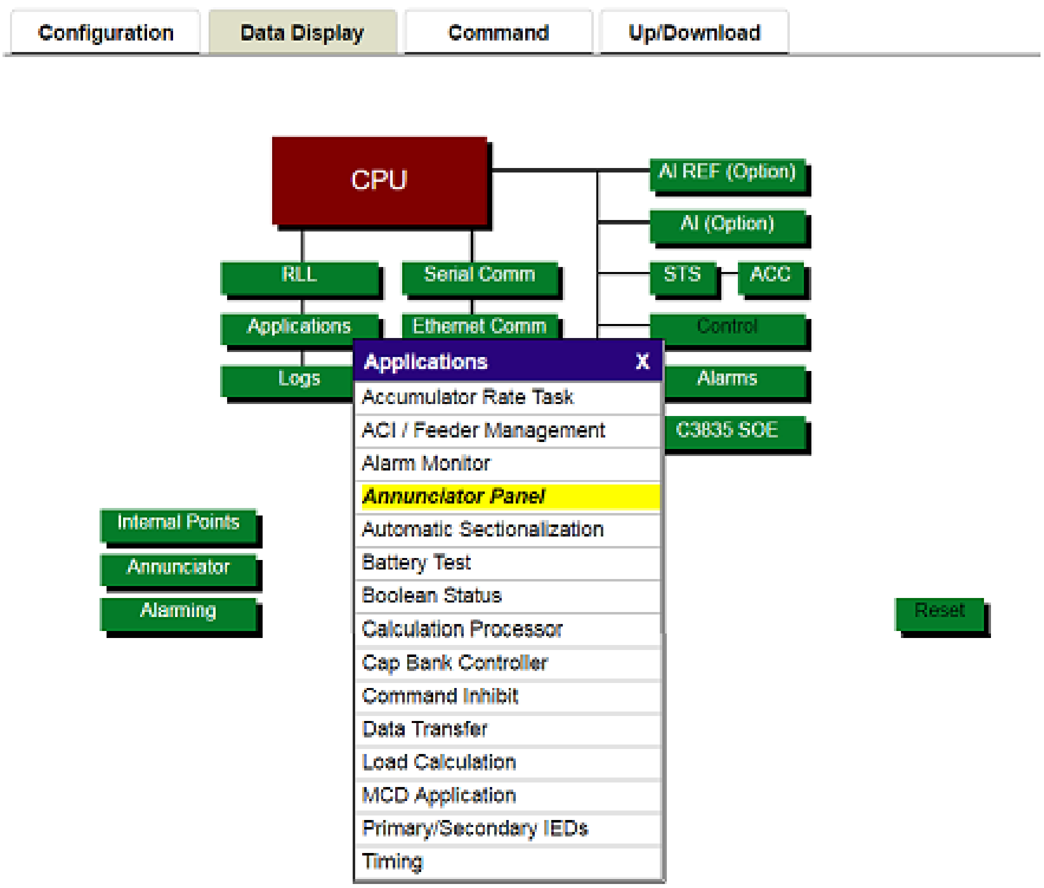
4 Annunciator Panel

4.1 Introduction

Note: All points that will be used in Annunciator Panel must be mapped into the Alarming database first, or the Annunciator Panel will not run. Please go to the Alarming Chapter and complete this step before proceeding.

The purpose of the Annunciator Panel application is to be able to set up an interactive Annunciator Panel under the Display tab. The Annunciator Panel application is comprised of 30 Window Panes or Cells. Each cell can monitor up to 16 different points. What makes the Annunciator Panel unique is the ability to monitor analog points based on configured alarm limits for each analog point. Please refer to the Alarming Chapter to complete this step.

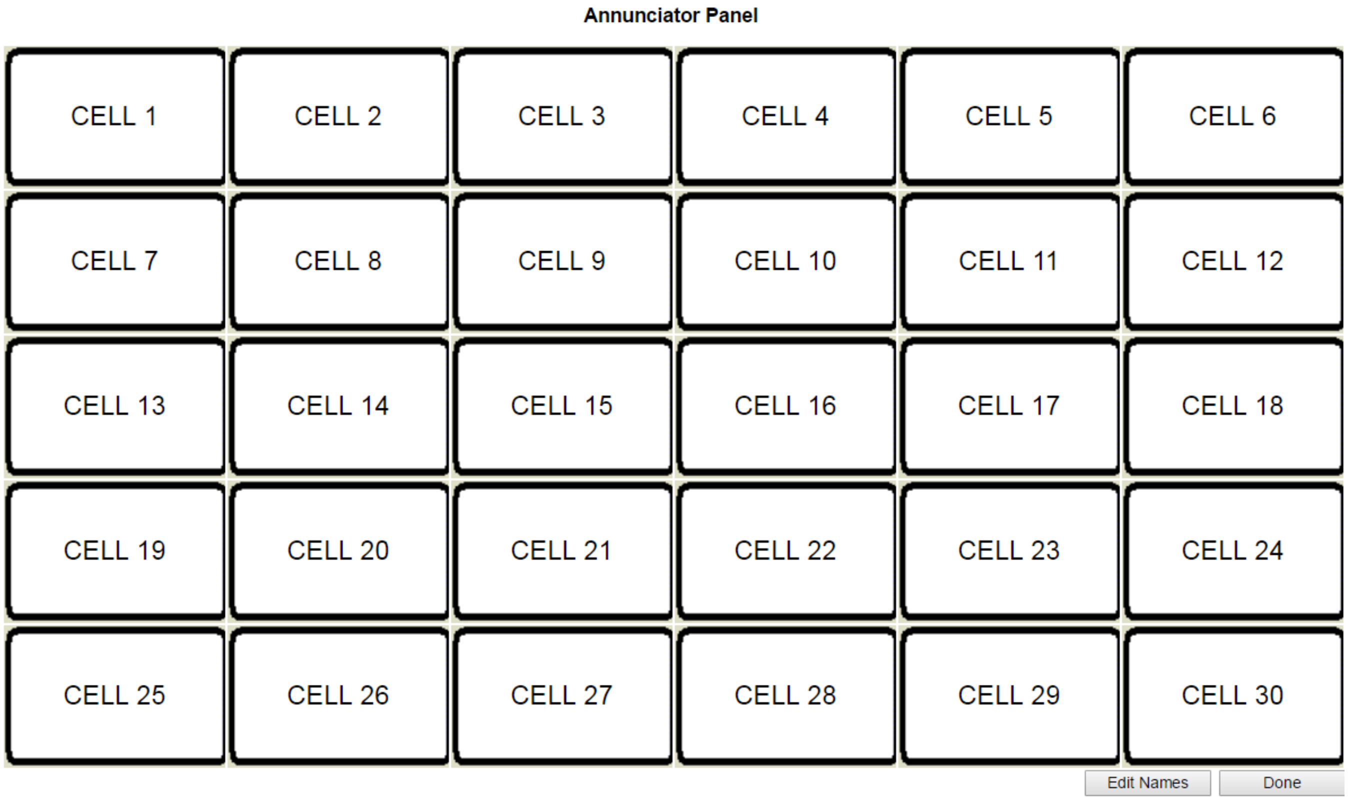
When you click on the Applications block, the screen shown in Figure 4-1 will appear. Annunciator Panel is explained in the following sections Figure 4-1 Applications Configuration Popup



4.2 Configuration

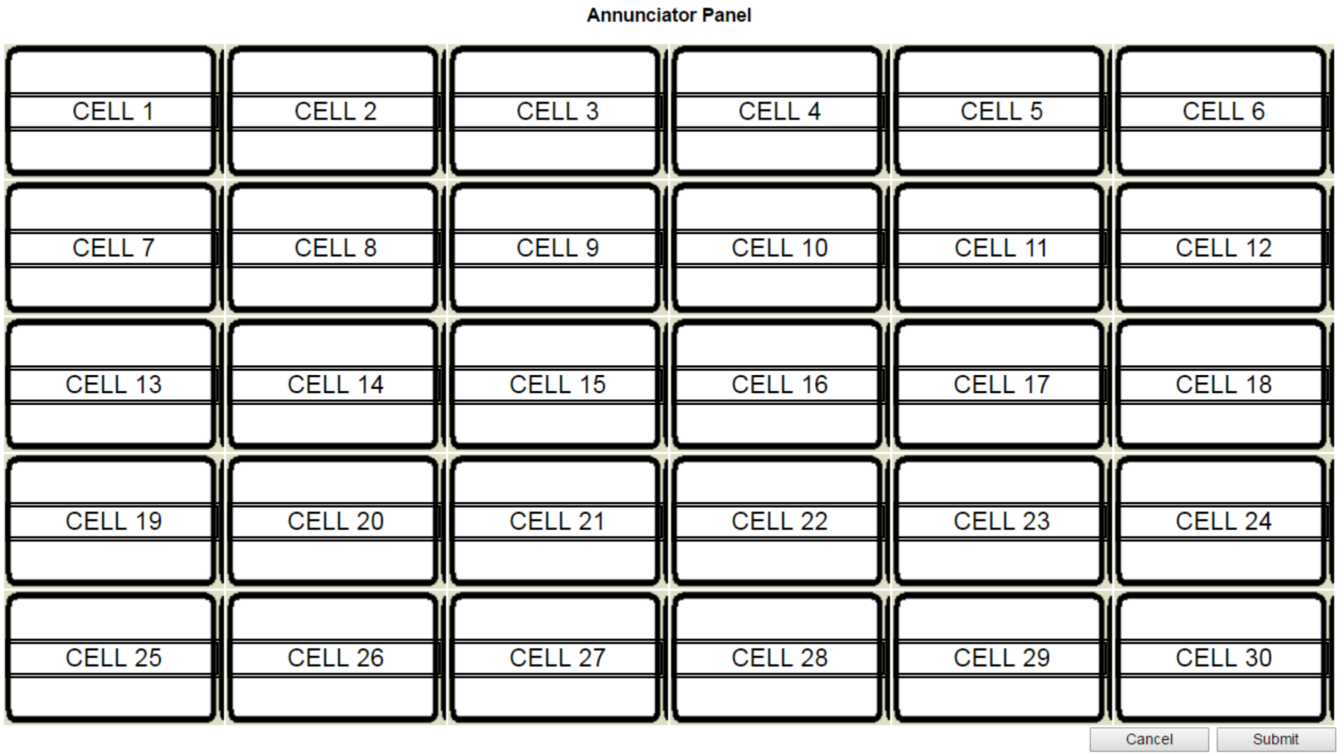
When you click on Annunciator Panel, the following screen will appear.

Figure 4-2 Annunciator Panel Configuration



As you can see, the Annunciator Panel is comprised of 30 individual Window panes. To change the name of any pane, click on the Edit Names button. The resultant screen can be found below.

Figure 4-3 Editing Names in Annunciator Panel



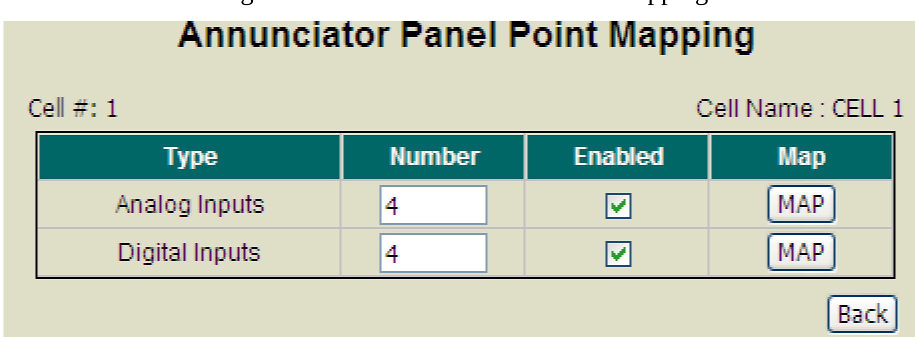
4.2.1 Editing Cell Names

When you see a screen similar to the one above, you can edit the Cell name, to a maximum of 45 characters. When you are finished editing the names, press the Submit button to save the changes. Click the Cancel button to discard all changes.

4.2.2 Configuring a Cell

To tie points to a Cell, you need to drill down into a Cell by clicking on a Cell name. The following mapping screen will appear. (Note: No cell configuration can be made while the Edit Page for Cell Names is still active)

Figure 4-4 Annunciator Panel Point Mapping



As seen in the figure above, you have the option of mapping in analog and digital inputs. A total of 16 points may be mapped in each Cell.

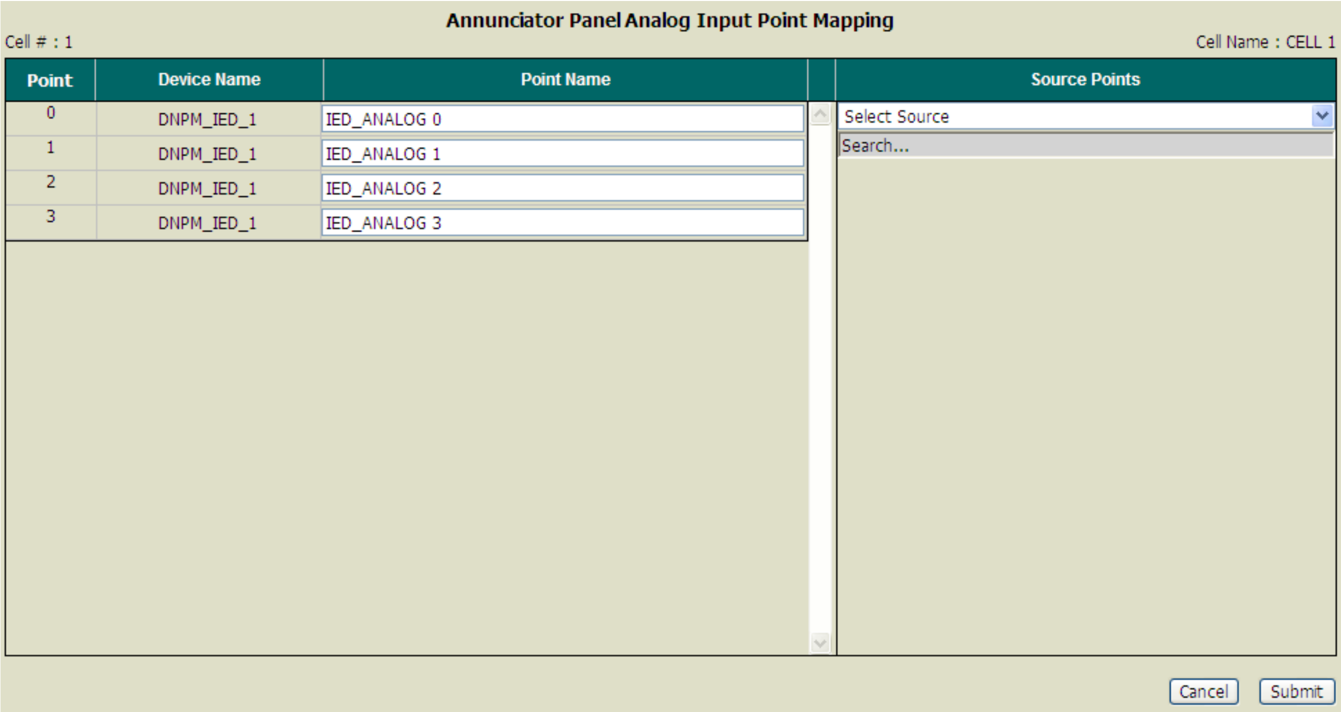
Click on the Enabled check box for the point type to be included in this Cell's configuration. If both data types are to be used, click on the Enabled check box for both to start.

4.2.3 Analog Input Point Mapping

Click on the Map button for Analog Inputs.

The screen below is the Analog Input Point Mapping Page.

Figure 4-5 Annunciator Panel Analog Input Point Mapping



Point
This is the point number.

Device Name
This is where the source point originates

Point Name
The source point mapped from the source device.

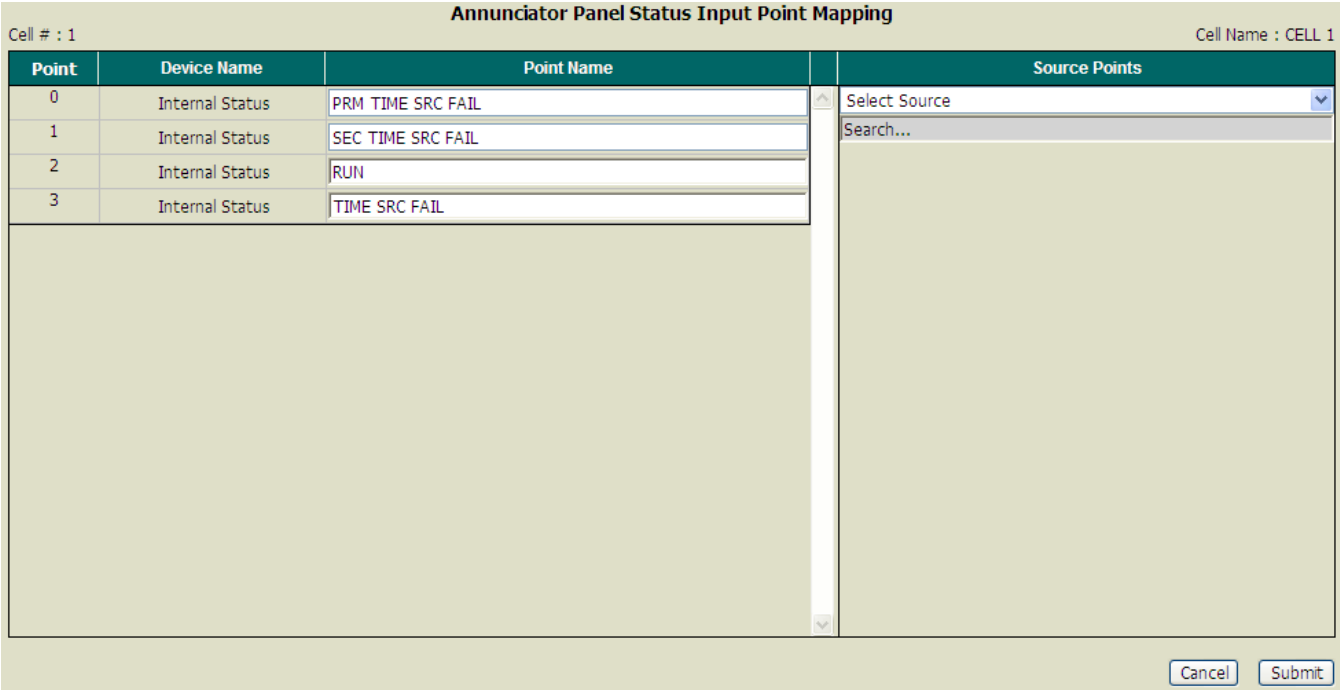
Click Submit when you are done mapping, or Cancel to discard the changes.

4.2.4 Digital Input Point Mapping

Click on the Map button for Digital Inputs.

The screen below is the Digital Input Point Mapping Page.

Figure 4-6 Annunciator Panel Status Input Point Mapping



Point
This is the point number.

Device Name
This is where the source point originates

Point Name
The source point mapped from the source device.

Click Submit when you are done mapping, or Cancel to discard the changes.

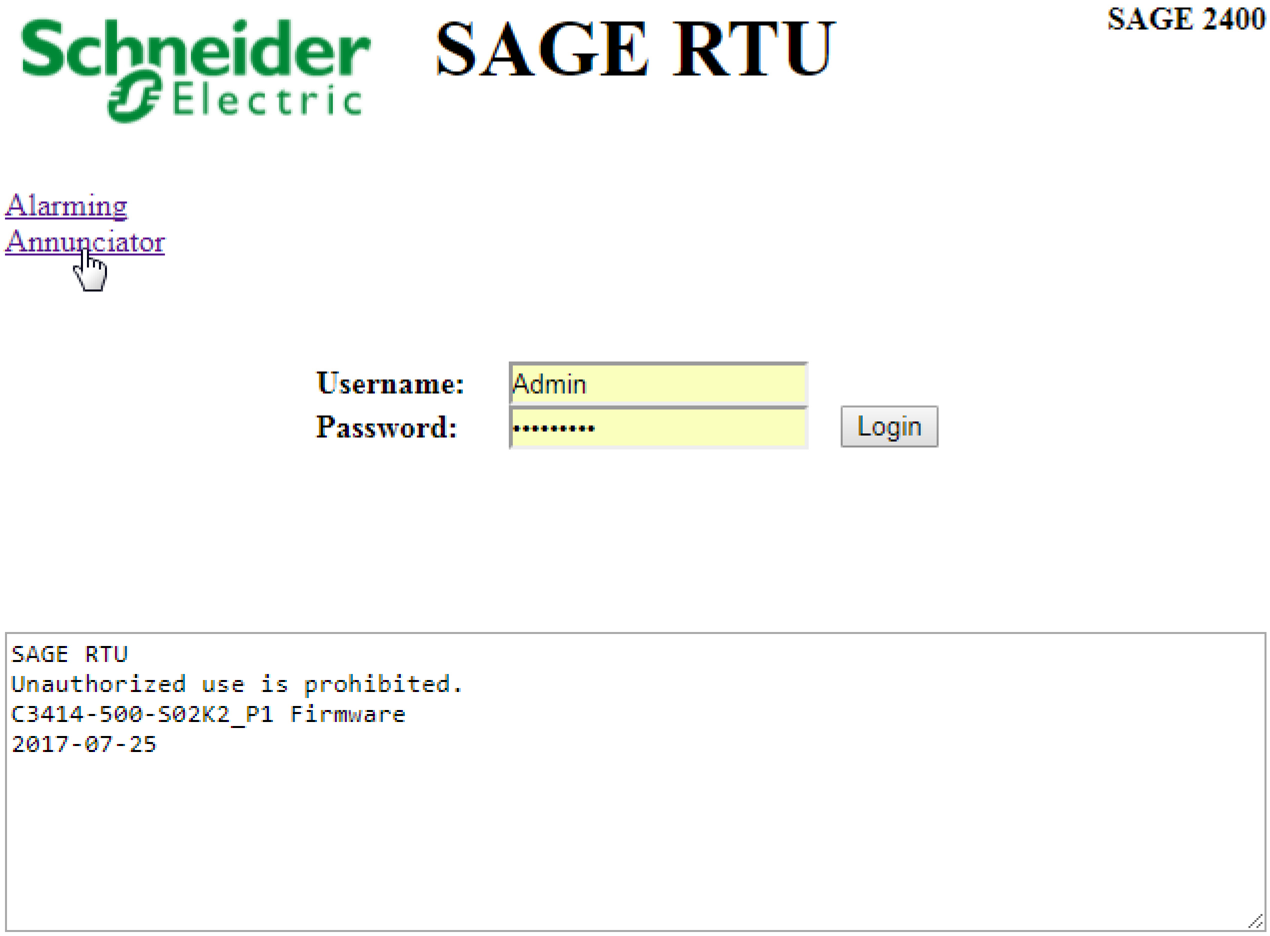
When the configuration is complete at the Annunciator Panel Point Mapping page, click the Back button. When the Annunciator Panel Page appears, click the Done button to submit all changes

Note: No configuration changes will take effect until an RTU reset.

4.3 Display
Beginning with C3414-500-S02K2 firmware, the user may view the Annunciator data by clicking on the Annunciator link on the RTU Login Page or by pointing your web browser directly to the webpage http://172.18.150.50/fs/display/anunctor.htm

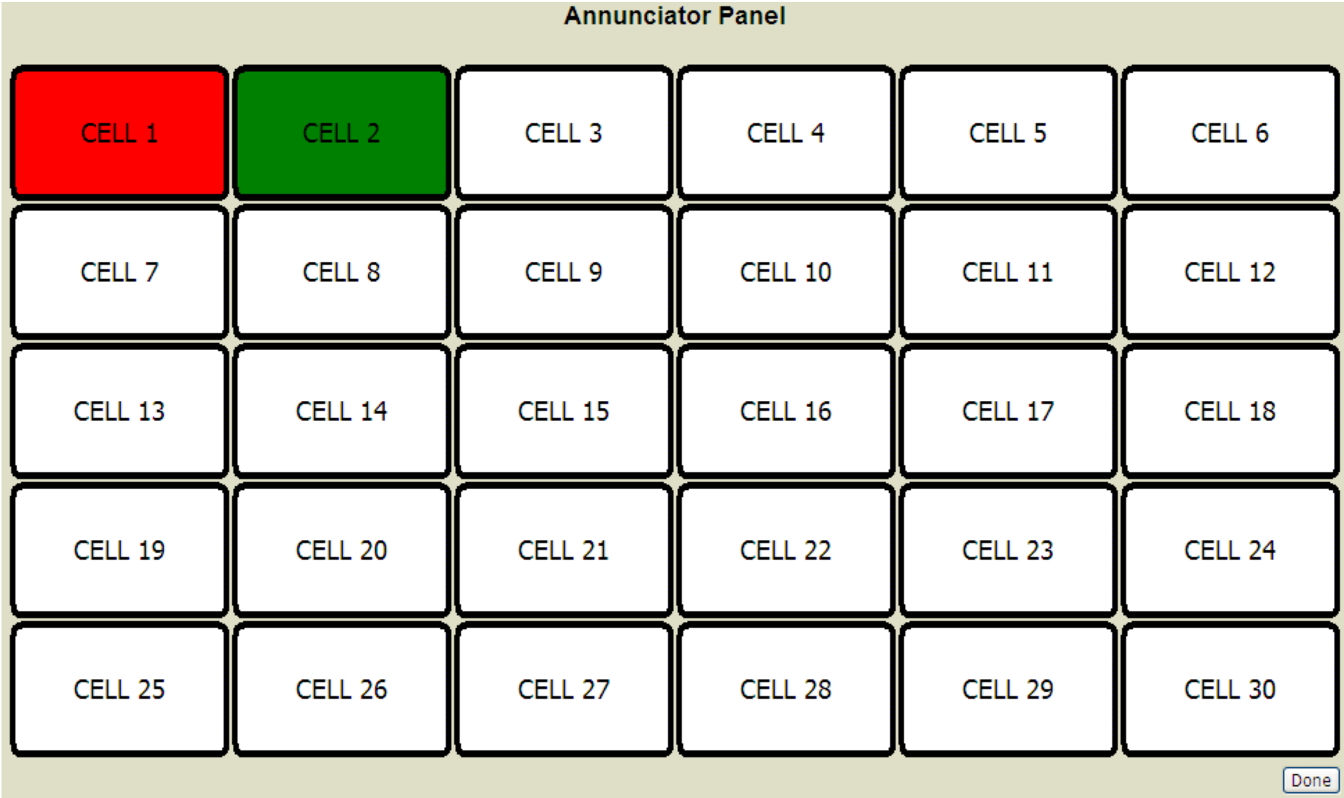
Where 172.18.150.50 is the IP of your RTU.

Figure 4-7: Click Annunciator on Login Page



When Annunciator Panel is selected under the Display tab, the following screen will appear.

Figure 4-8 Annunciator Panel Display



This page is an upper level view of all 30 Cells that make up the Annunciator Panel. In this view any of the Cells can be in one of five possible states:

White: No alarm points are defined in this cell.

Green: All points are in a normal or non-alarm state.

Flashing Green: A point or point(s) has returned to a normal state from an alarm state.

Red: One or more points is in an alarm state, but the alarms have been acknowledged

Flashing Red: One or more point is in an alarm state, with alarms being unacknowledged.

Click on a Cell Name to drill down and view the points associated with that specific Cell.

Figure 4-9 Annunciator Panel Summary

Alarming
Annunciator

Annunciator Panel Summary

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Cell #: 2

Cell Name : Internal Indications

Point	Alarm Time	Device Name	Point Name	Value	Alarm State
1	2017/07/25 16:39:31.220	RTU Internal Status	LOCAL	OPEN	ALARM
2	2017/07/25 16:39:31.220	RTU Internal Status	CONFIG CHG	OPEN	ALARM
3	- -	RTU Internal Status	IED FAIL	OPEN	NORMAL
4	2017/07/25 17:08:39.084	RTU Internal Status	RTU POINTS FORCED	CLOSED	ALARM
5	- -	RTU Internal Status	MAX LOGIN FAILURES EXCEEDED	OPEN	NORMAL
6	- -	RTU Internal Status	NEW USERS FILE RECEIVED	OPEN	NORMAL
7	- -	RTU Internal Status	NEW CONFIG FILE RECEIVED	OPEN	NORMAL
8	- -	RTU Internal Status	NEW FIRMWARE FILE RECEIVED	OPEN	NORMAL
9	- -	RTU Internal Analog	YEAR	2017.000	NORMAL
10	2017/07/25 16:39:34.406	RTU Internal Analog	MONTH	7.000	HIGH
11	2017/07/25 16:39:34.406	RTU Internal Analog	DAY	25.000	HIGH
12	2017/07/25 16:39:34.406	RTU Internal Analog	HOURS	17.000	HIGH
13	- -	RTU Internal Analog	MINS	27.000	NORMAL
14	2017/07/25 17:27:00.415	RTU Internal Analog	SECS	11.000	LOW
15	2017/07/25 16:39:34.406	RTU Internal Analog	UTC_CORRECT	60.000	HIGH
16	- -	NO DEVICE	SPARE	-	-

Back

At the top of the screen is an Annunciator Panel Summary, which serves as a mini Annunciator Panel. This is a direct reflection of the 30 Cells which make up the Annunciator Panel. You can jump to any Cell using this Summary window by clicking on that Cell Number.

Cell

This provides a visual cue of the Cell which is currently being displayed

Cell Name

The name chosen or default name accepted during configuration.

Point

The point number of the Digital or Analog Input point being monitored. Regardless of the number of points defined in a Cell, a table of 16 possible inputs will be displayed.

Alarm Time

The Date and Time the point in question went into an alarm condition. This field can be flashing if the alarm for the point has not been acknowledged.

Device Name

This is where the source point originates

Point Name

The source point mapped from the source device.

Value

The current value. For an Analog Input it will be an EGU, where a Digital Input would display its current state.

Alarm State

This field will Display a message based on the Alarming Configuration chosen for the Point (see the Alarming Devices Chapter). The message can change based on if the point is in a normal state or an alarm state. If the message is flashing in this field, an acknowledgement is required by the user. This is accomplished by clicking on the field for that specific point.

5 Automatic Sectionalization

5.1 Introduction

Note: Certain modes of the AST (Automatic Sectionalization Task) relies on the ACI subsystem to detect faults, therefore, correct configuration of ACI is mandatory. Refer to the ACI section of either the SAGE 2X00 or the SAGE 1X50 manual.

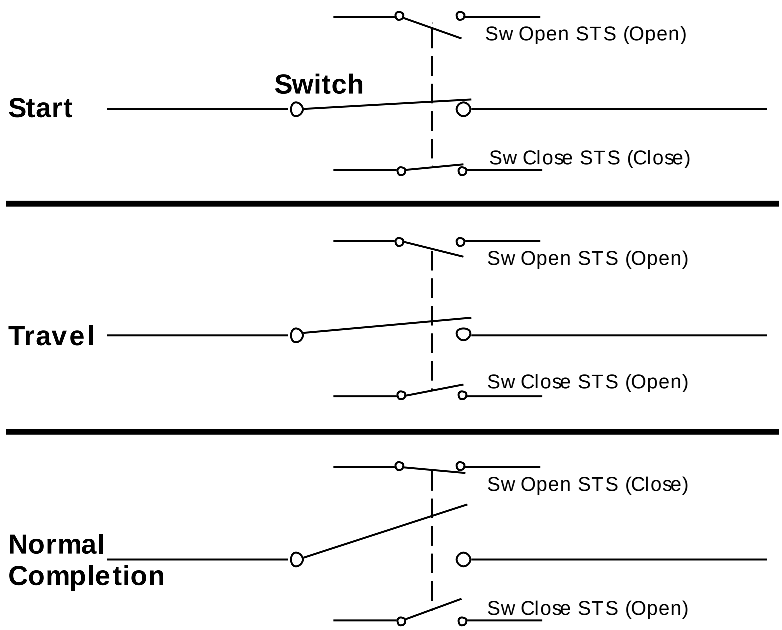
5.2 Theory of Operation

The Auto-Sectionalizing Task (AST) will monitor for the occurrence of fault event notifications from the ACI (AC Analog) task. The AST will count the number of fault events within a specified time frame, and if the count exceeds a prescribed number, the AST will start the Switch Open Delay Timer. When the Switch Open Delay Timer expires, the AST will verify that:

1) The Remote/Local Status is in ‘Remote’;
2) The Operation Override Status is ‘de-asserted’;
3) The SCADA Disable Status is ‘Enabled’; and
4) The bus is ‘dead’ before a command is issued to open the line switch.

The figure below shows the three normal states of a line switch controlled by the AST.

Figure 5-1 Normal States of Switch Controlled by AST



5.3 Configuration

When you click on the Applications block, the screen shown in Figure 4-1 will appear. is explained in the following sections.

Figure 5-2 Applications

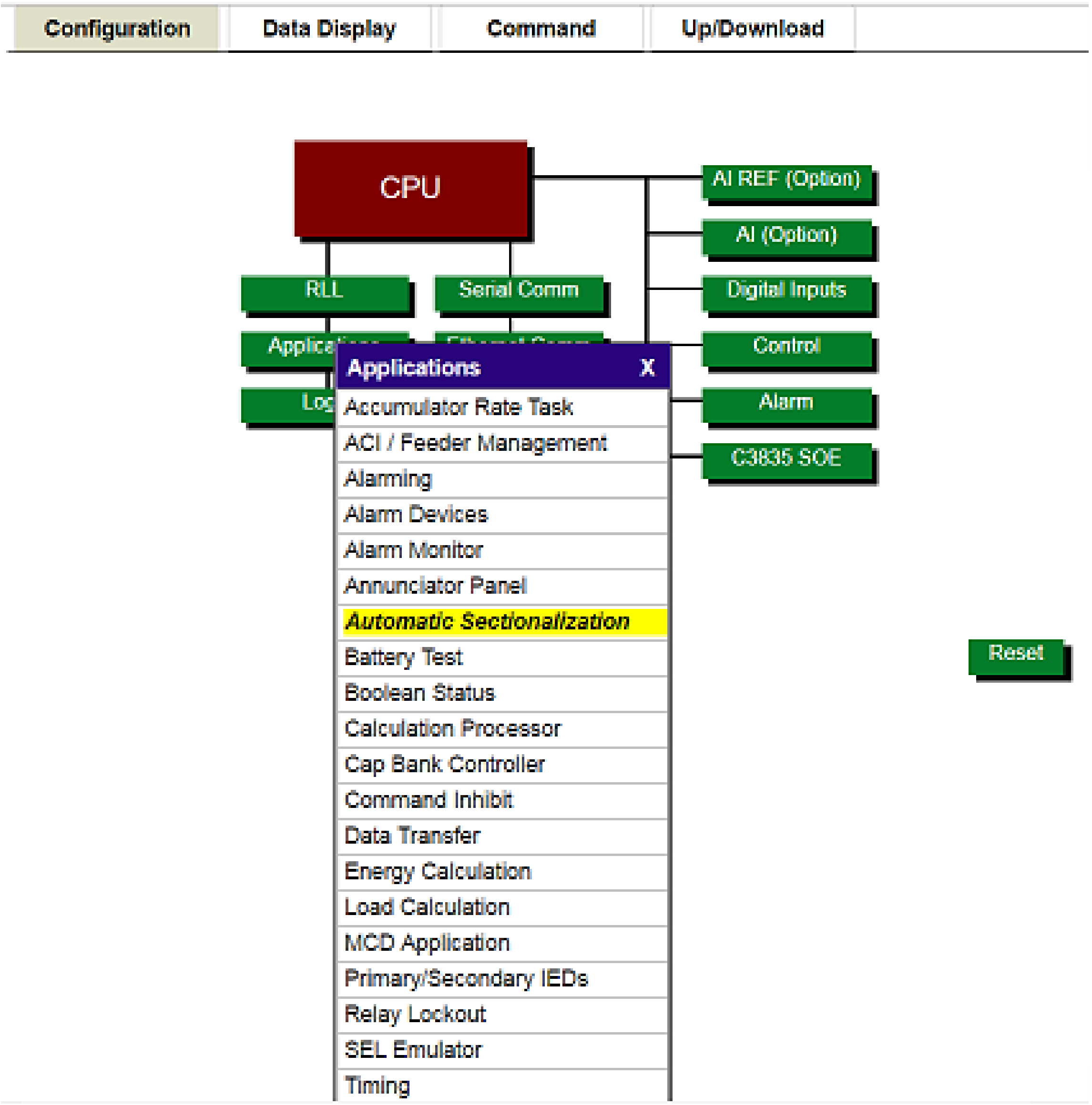
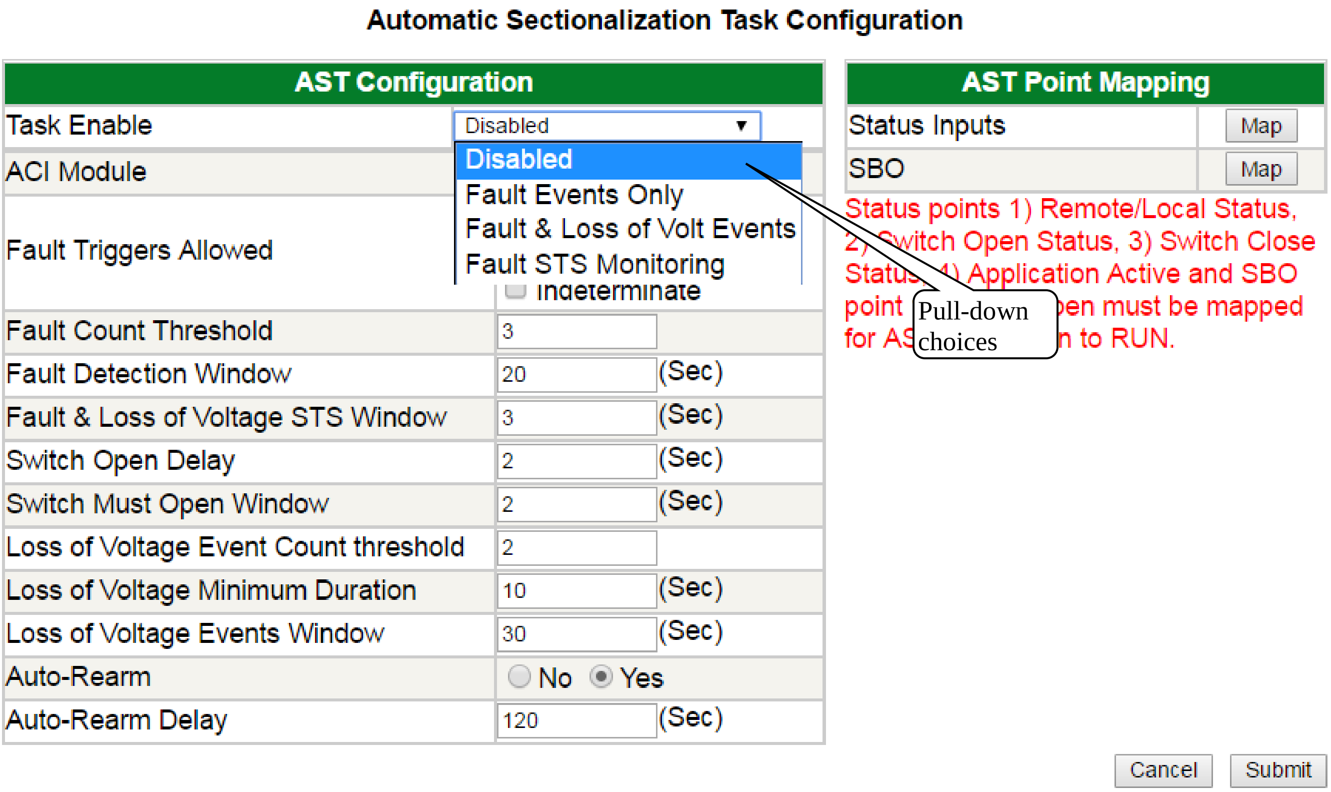


Figure 5-3 Task Configuration



5.3.1 AST Configuration

Task Enable

- **Disabled**

No AST points will be declared in the RTU's database and the application will not run.

- **Fault Events Only**

The original AST design only operated in this mode – it was either Enabled or Disabled. The AST listened for fault event notifications from the ACI task. The user can specify which ACI card it is listening to for fault events if it is executing on a Sage 2400, else it is fixed at #1 if the RTU is a Sage 1450.

When the "first fault event" is detected, a timer containing the **Fault Detection Window** time starts decrementing, and the number of subsequent fault events to trigger the operation of the sectionalizing switch must be received by the AST task before this timer expires. If the timer expires before the requisite number of fault events is tallied, the received fault count is zeroed and any fault event subsequently received is now treated as a "first fault event" and the timer is restarted.

If the tallied number of fault events matches the **Fault Count Threshold**, the AST prepares to operate the sectionalizing switch by first waiting the amount of time prescribed in the **Switch Open Delay**. At the end of this delay time, if the AST detects that there is no voltage present (Dead Bus), the AST sends the command to operate the sectionalizing switch. Once this command is sent, the switch "must open" within the time specified by the **Switch Must Open**

Window or else the AST is placed into the error state where it stays until the error condition is corrected. The AST switch can be mapped by the user to any SBO point within the RTU database.

The AST can filter fault events based on direction of the fault. The fault direction information is provided by the ACI task. The ACI task will try to determine if the fault is upstream from the RTU (Reverse) or downstream from the RTU (Forward), and if it cannot determine the direction, the fault event direction is marked as indeterminate. The user can select which of these fault events the AST will "hear" and tally.

- **Fault & Loss of Voltage Events**

This revision adds a mode of operation where the AST can also use Loss of Voltage events to trigger operation of the sectionalizing switch. The idea is that some installations may have ACI installations with PTs but no CTs, or may have no ACI hardware installed at all, preventing the AST from receiving any fault event notifications. In these cases, the AST can use Loss of Voltage profiles that match the operating characteristics of the substation breaker to determine that a "fault event" caused the Loss of Voltage, tally these Loss of Voltage events, and trigger the operation of the sectionalizing switch. Additionally, function of the previous mentioned Loss of Voltage indication and Criteria Met revisions were retained as well. The user specifies the requisite number of Loss of Voltage events required in the **Loss of Voltage Event Count threshold**. These Loss of Voltage events must last the **Loss of Voltage Minimum Duration** before they are validated, and the requisite number of Loss of Voltage events must be detected within the **Loss of Voltage Events Window** to trigger the AST to operate the sectionalizing switch. Once triggered, the AST operates the same as the **Fault Events Only** and **Criteria Met** modes, depending on the state of the **Application Active** status indication. The **AST Criteria Met** and the new **Loss of Voltage Pickup** status indications are set so that the SCADA master can scan this information.

In the case where an ACI is present and has PTs to measure voltages, the AST gets phase voltage information from the ACI task directly.

In the case where there is no ACI present, the Loss of Voltage indication must be mapped and the AST will get voltage information from this indication.

The Loss of Volt Events mode effectively layers the Loss of Voltage event detection on top of the Fault Events Only mode, so it can also hear fault and trigger off fault events in this mode. This was done so the customer can specify a single configuration for their technicians to install, with minimal differences in the configuration to make it easier to manage them.

- **Fault STS Monitoring**

This revision adds a mode of operation where the AST monitors fault event notifications from the ACI task normally, but disables the normal tallying, and operation of the sectionalizing switch. Additional managed STS points were provided to latch the fault event phase and direction information for the SCADA master to scan. The state of these latched fault indications is retained until power is restored to the bus. There are seven latched STS indications managed by the AST – Phase A/B/C Forward fault indications, Phase A/B/C Reverse fault indications, and a Neutral fault indication (Forward or Reverse).

ACI Module (1 – 8)

Enter the number of the ACI module from which the AST will wait for notification of fault events. The default is 1. The user can specify which ACI card it is listening to for fault events if it is executing on a Sage 2400, else it is fixed at #1 if the RTU is a Sage 1450.

Fault Triggers

- **Forward**

Triggers on faults downstream (towards load)

- **Reverse**

  Triggers on faults upstream (towards generator)

- **Indeterminate**

  Triggers on faults whose direction cannot be determined

Fault Count Threshold (1 – 10)

Enter the number of fault events the AST must detect within the Fault Detection Window before the AST will command the line switch to open. The default is 3.

Fault Detection Window (1 – 240)

Enter the length of the time (in seconds) in which the AST must detect the number of fault events specified in the Fault Count Threshold before it will start the Switch Open Delay timer. The default is 20.

Switch Open Delay (0 – 30)

Enter the length of the time (in seconds) the AST will wait before commanding the line switch to open once the AST has validated the conditions required to open the line switch. The default is 2.

Fault & Voltage Loss Window (1 – 5)

The AST can either rely on the ACI subsystem to detect loss of voltage, or it can use a status point to indicate a loss of voltage has occurred. Mapping the Loss of Voltage Status Point instructs the AST that the ACI is not monitoring for loss of voltage, and to use the LOV Status Point to indicate such. The default is 3.

This timer is used to measure two functions, and is only used if the corresponding Loss of Voltage Status Point is mapped.

Enter the length of time required that either a fault event must occur after the AST detects the Loss of Voltage or when the Loss of Voltage Status must occur after a fault event. The fault event and the loss of voltage events can be asynchronous, but both must occur within this window for the AST to consider a fault event valid. If the Loss of Voltage indication arrives and the fault event does not arrive within this time period, the AST considers this to mean that power has been lost on the line and stops looking for fault events. If the fault event occurs and the loss of voltage indication does not arrive within this time window, the AST refuses to consider the fault event as valid as the line is still “hot”.

If the Loss of Voltage STS point is not mapped, entering a value in this field has no effect on the AST operation.

Switch Open Window (1 – 30)

Enter the length of time in which the AST must detect that the switch has opened after being commanded to do so. If the Application Active STS is ‘Set’ and the switch does not open within this time period after being commanded open, the AST enters the Error State, and will halt monitoring for fault events until the switch is repaired and the AST is reset through the recycling of the Application Active STS point or through SCADA commanding the AST Activate SBO ‘Open’ and then ‘Close’. If the Application Active STS is ‘Reset’, the AST will not look at the Switch Open Window timer. The default is 2.

Loss of Voltage Event Count threshold

The ability of the AST to use Loss of Voltage detection to trigger the operation of the sectionalizing switch was added to the AST Task. In addition to counting fault events, the AST will count **Loss of Voltage** events to exceed the **Loss of Voltage Event Count Threshold**. The **Loss of Voltage Pickup** is set whenever the requisite number of **Loss Of Voltage** events lasting the **Loss of Voltage Minimum Duration** time has occurred within the **Loss of Voltage Events Window** time, triggering the AST to open the sectionalizing switch. This indication is reset when the AST has detected the sectionalizing switch has been closed and power is restored to the bus.

Loss of Voltage Minimum Duration

The minimum time in which a loss of voltage status point must be active to be confirmed as a loss of voltage event.

Loss of Voltage Events Window

The maximum time in which the threshold of qualifying loss of voltage events must occur before the sectionalizing switch will operate to isolate the fault.

Auto-Rearm

The last revision to date, adds the ability for the AST to reset itself from the ERROR state should it detect that the error conditions have been corrected. This eliminates the need for manually toggling the Application Active status indication or sending the Trip-Close sequence through SCADA to the AST Activate SBO point. The default is Auto-Rearm = YES, but the user can set this to NO to force either manual or SCADA intervention to reset the AST from the ERROR state.

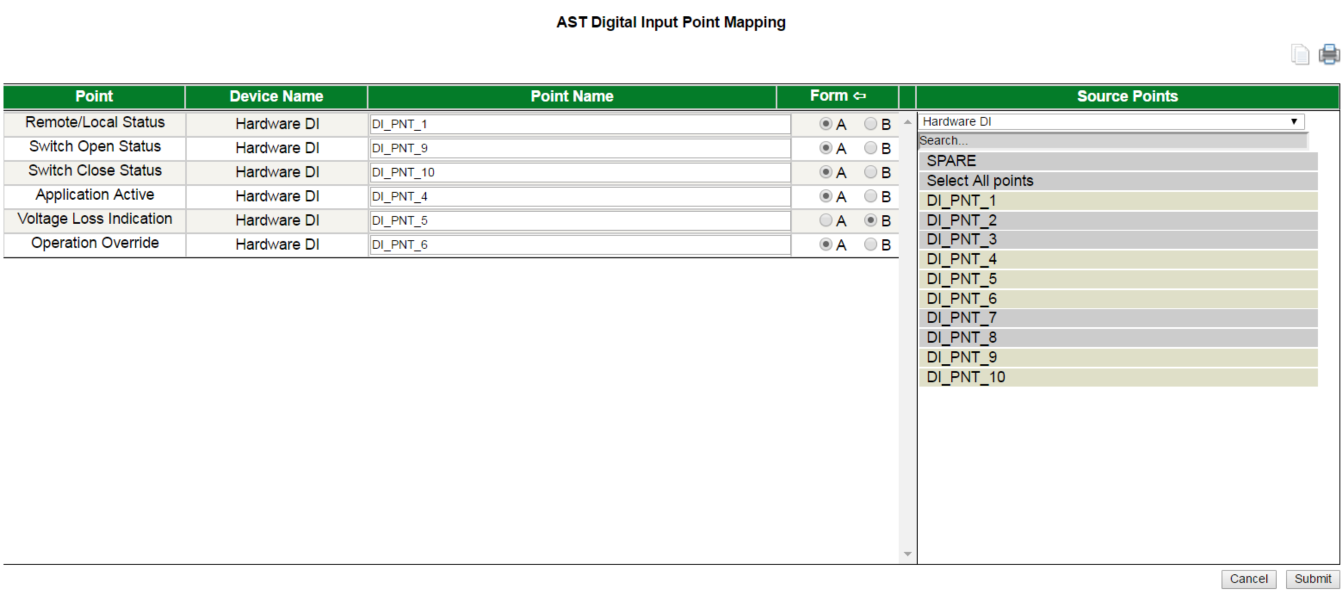
Auto-Rearm Delay

The Auto-Rearm Delay is provided so the user can specify a countdown period between when all error conditions have been corrected and when the AST is reset to the normal operating state.

5.3.2 AST Point Mapping

5.3.2.1 Status Inputs

Figure 5-4 AST Status Input Point Mapping



Point

The point name. The name is fixed. The meaning of the name is as follows:

- **Remote/Local Status (Default is Form A) – Required Point**

This status point monitors the state of the Remote/Local switch. If Form A, the Remote/Local switch is considered in Local if the STS point is asserted, and conversely, if Form B, it is considered in Local if de-asserted. An indication of Local will inhibit the AST from monitoring for events and will not attempt to open the switch.

- **Switch Open Status (Default is Form A) – Required Point**

This point signals that the sectionalizing switch is open if asserted. If the optional **Switch Close Status** point (described next) is also mapped, the AST can not only detect the switch state of Open or Closed, but also a switch travel error condition where the switch is not open but not closed either, and then manage the internal **Switch Travel Error** status point appropriately. If the optional Switch Close Status point is not mapped, the AST only reports the switch state as Open or Closed.

If using both the Switch Open Status and the Switch Close Status, then “Not Open” is the “normal” indication, so if this point is marked as Form A, “OFF = Not Open” and “ON = Open”. If marked Form B, “ON = Not Open” and “OFF = Open”.

If not using the optional **Switch Close Status**, then “Closed” is the “normal” indication, so if this point is marked as Form A, “OFF = Closed” and “ON = Open”. If marked Form B, “OFF = Open” and “ON = Closed”.

- **Switch Close Status (Default is Form A)**

This point signals that the line switch is closed if asserted. The Open and Close STS points are exclusive-OR’d, and should never be both asserted at the same time. However, when the switch is commanded from Closed to Open, both points may appear de-asserted for a brief period, in which case the switch position is considered to be in the ‘Travel’ position, but must eventually proceed to Open.

- **Application Active (Default is Form A)**

This STS point prevents the sectionalizing switch from opening if it is ‘Reset’, and allows it to open if it is ‘Set’. In the event the sectionalizing switch is prevented from operating due to this STS point being ‘Reset’, the Automatic Sectionalizing Task will simply ‘Set’ the ‘AST Criteria met’ STS point, clear all timers, and go into a wait state. The AST Application will wait to see if one of two things occurs: 1) The sectionalizing switch is opened remotely or locally which will disable the AST Application or 2) Monitor for a hot phase which will rearm the AST Application.

This is a dual function indication, it must be mapped to an indication reflecting the desired mode of operation, either Active or Inactive, to perform its primary function. Active means the AST task is actively monitoring for fault events and can operate the sectionalizing switch if triggered. Inactive means the AST task is suspended from monitoring for faults and operating the switch until the Application Active indication is placed into the Active mode.

The second function of this point is to provide the user the ability to reset the AST task from the Error state, where it remains if an erroneous condition regarding the sectionalizing switch position or operation has been detected. Once the erroneous switch condition has been corrected, toggling this indication from Active-Inactive-Active will reset the AST task to resume monitoring for fault events. If the error condition has not been removed, the AST will immediately detect the error condition and revert to the Error state again.

“Inactive” is the “normal” state so if marked Form A, “OFF = Inactive” and “ON = Active”. If marked Form B, “ON = Inactive” and “OFF = Active”.

- **Voltage Loss Indication (Default is Form B)**

This is an optional point that if mapped, an indication through a discrete STS point when the ACI task cannot be configured to provide this information. If it is mapped, the AST will use this indication point to determine if there is a Loss of Voltage on the bus. If this indication point is not mapped the AST will obtain the Loss of Voltage information from the ACI task.

Voltage Present is the “normal” indication, so if this point is marked as Form A, “OFF = Voltage Present” and “ON = Loss of Voltage”. If marked as Form B, “ON = Voltage Present” and “OFF = Loss of Voltage”.

- **Operation Override (Default is Form A)**

This is an optional point that if mapped, will inhibit the AST from monitoring for fault events if it is ever asserted. It is used if there are additional constraints needed to inhibit the AST besides the Remote/Local switch. “Not override” is the “normal” state, so if marked Form A, “OFF = Not Override” and “ON = Override”. If marked Form B, “ON = Not Override” and “OFF = Override”.

Device Name
The name of the device of the source point.

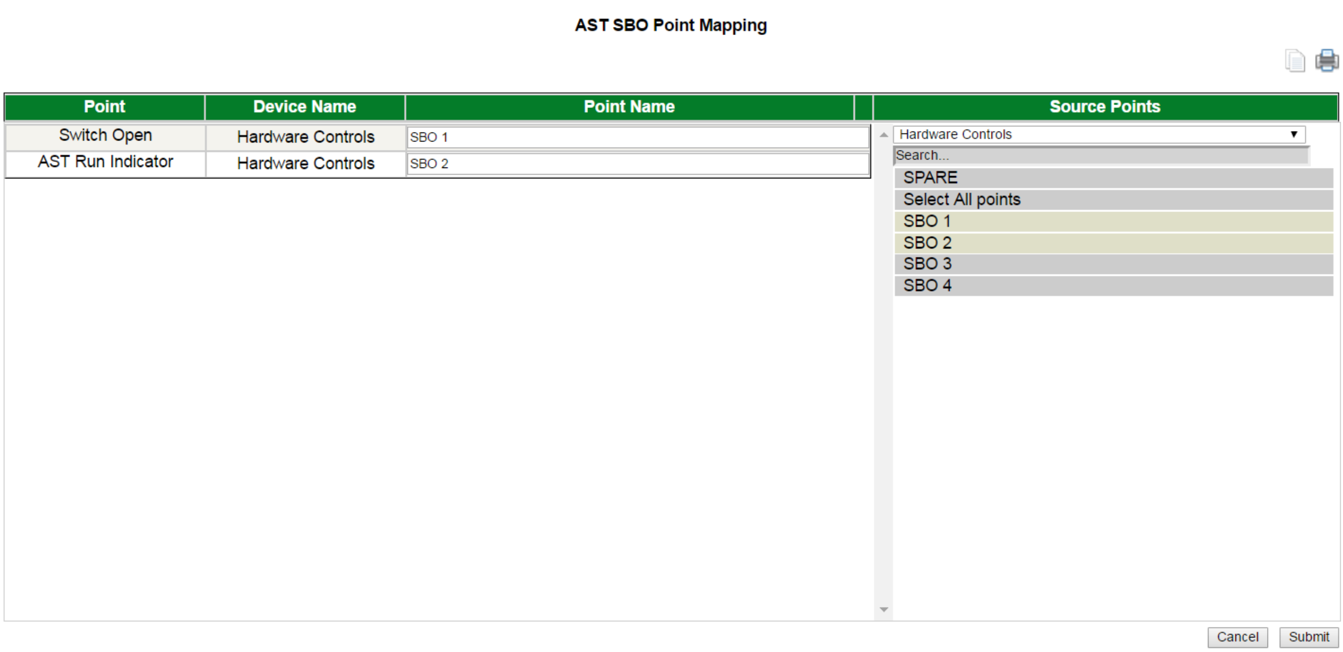
Point Name
The mapped point name.

Form
Click either Form A (SPST-NO) or Form B (SPST-NC)

Source Points
The points used to map to the application.

5.3.2.2 SBO

Figure 5-5 AST SBO Point Mapping



Point
The point name. The name is fixed. The meaning of the name is as follows:

- **Switch Open – Required Point**

This point causes the line switch to open. This point must be mapped to an existing SBO control point for the AST to run.

- **AST Run Indicator**

This is an optional point. If a local lamp is desired to indicate that the AST is currently monitoring for fault events, this SBO point will be commanded Closed, and will be commanded Open when the AST is not monitoring for fault events.

Device Name
The name of the device of the source point.

Point Name
The mapped point name.

Source Points
The points used to map to the application.

5.4 Display

Figure 5-6 Auto-Sectionalizing Display

Auto-Sectionalizing Display

Application Status	
Task State	ACTIVE
Remote/Local State	REMOTE
Switch State	CLOSED
Violations	
Last Operation	AST RESET
Time Remaining	
Fault Detection Window (sec)	0
Loss of Voltage Duration (sec)	0
Loss of Voltage Event Window (sec)	0
Switch Open Delay (sec)	0
Switch Open Timer (sec)	0
Faults Detected	0
Loss of Voltage Events Detected	0
Auto Re-Arm Timer	0

AST Status Points.		
Point	Point Name	State
1	Run Status	Armed
2	Switch Command	Normal
3	Switch Open Error	Normal
4	Switch Fault	Normal
5	Switch Travel Error	Normal
6	Global Error	Normal
7	SCADA Disable	Enabled
8	Fault Pickup	Normal
9	Loss of Voltage Pickup	Normal
10	Phase A Fault	Normal
11	Phase B Fault	Normal
12	Phase C Fault	Normal
13	Neutral Fault	Normal
14	Phase A Backfeed OC	Normal
15	Phase B Backfeed OC	Normal
16	Phase C Backfeed OC	Normal
17	Phase A Voltage Loss	Normal
18	Phase B Voltage Loss	Normal
19	Phase C Voltage Loss	Normal
20	AST Criteria Met	No

AST Status Mapping				
Point	Device Name	Point Name	Status	State
Remote/Local Status	RTU Internal Status	LOCAL		OPEN
Switch Open Status	Hardware DI	DI_PNT_4		OPEN
Switch Close Status	Hardware DI	DI_PNT_4		CLOSE
Application Active	Hardware DI	DI_PNT_7		CLOSE
Voltage Loss Indication	Hardware DI	DI_PNT_8		OPEN
Operation Override	SPARE	SPARE		OPEN

Done

5.4.1 Application Status

Task State

Indicates the current operational state of the AST. The possible values of this field are:

Inactive – The AST Application is not monitoring for faults in this state

Active – The AST Application is monitoring for faults in this state

Validating – The Fault Detection Window timer is counting down in this state

Waiting on Timer – The Switch Open Delay timer is counting down in this state

Opening – The AST Application is commanding the sectionalizing switch to open in this state

Lock Out – The AST Application will enter this state after it has successfully commanded the sectionalizing switch to open

AST Criteria Met Wait - The AST Application will enter this state when AST Criteria Met STS is 'Set', but the Application Active STS is 'Reset'

Fault Monitor – The AST application only asserts persistent fault STS points in this state.

Remote/Local Status

Indicates the state of the Remote/Local switch. The possible values of this field are: 'REMOTE' or 'LOCAL'. When the Remote/Local switch is in the 'LOCAL' position, the AST Application will NOT monitor for faults.

Switch State

Indicates the current switch position.

- **OPEN**

  Only the switch Open Status is closed.

- **CLOSED**

  Only the switch Close Status is closed.

- **TRAVEL**

  Neither the switch Open or switch Close Status point is closed.

- **FAILED**

  Both the switch Open and switch Close Status point are closed.

Violations

Indicates the reason for the AST entering ERROR STATE. The possible values of this field are:

SWITCH IS OPEN – The AST Application will enter this Error State when the sectionalizing switch has been opened while the AST Criteria Met STS was 'RESET'.

SWITCH IN TRAVEL POSN – The AST Application will enter this Error State when it detects the Open and Close Status for the sectionalizing switch are both open.

UNABLE TO OPEN SWITCH – The AST Application will enter this Error State when the sectionalizing switch was commanded open by the AST Application but a change was not detected after the Switch Open Window had expired.

Last Operation

Indicates the last action the AST has performed. The possible values of this field are:

NO ACTION – This message will appear when no action has been performed since the last RTU reset.

FAULT WIN TIMEOUT – This message will appear when the number of faults detected during the Fault Detection Window did not meet the configured Fault Count Threshold.

SWITCH OPENED – This message will appear when the AST Application has successfully commanded the sectionalizing switch to open.

AST RESET – This message will appear when the AST Application Run Status has changed from Disabled to Armed.

DISABLED ON ERROR - This message will appear when one of the following errors are asserted: Switch Open Error, Switch Fault, or Switch Travel Error.

HOT PHASE – This message will appear when the AST Application could not assert the AST Criteria Met STS due to a hot phase being detected. If the ACI is used to detect loss of voltage, the AST Application will fill in what phase was detected to be above the configured Deadline Voltage. If a Loss of Voltage status point is being used, the AST Application will display HOT PHASE ABC.

Time Remaining

- **Fault Detection Window (sec)**

  Indicates the time remaining in seconds in the current Fault Detection Window.

- **Loss of Voltage Duration (sec)**

  Indicates the time remaining in the current Loss of Voltage Detection Window.

- **Loss of Voltage Event Window (sec)**

  Indicates the time remaining is seconds until the time window in which all the requisite Loss of Voltage Events must be validated before the sectionalizing switch will be commanded to open.

- **Switch Open Delay (sec)**

  Indicates the time remaining in seconds before the switch will be commanded open.

- **Switch Open Timer (sec)**

  Indicates the time remaining in seconds to receive the indications that the sectionalizing switch has opened. If the indications that the sectionalizing switch have not been received by this time, the AST application falls into the error state.

Faults Detected

Indicates the current number of detected fault events within the current Fault Detection Window.

Loss of Voltage Events Detected

Indicates the current number of detected Loss of Voltage Events within the current Loss of Voltage Event Window.

Auto Re-Arm Timer

Indicates the time remaining in seconds until the AST application exits the error state and re-arms for Fault/Loss of Voltage Event detection. The AST must be set to Auto Re-Arm on the configuration page.

5.4.2 AST Status Points

These are the STS points that the AST actively maintains, and are available for mapping into communications protocols or other applications.

5.4.2.1 Point

The number of the point

5.4.2.2 Point Name

Run Status

Asserted when the AST is actively monitoring for fault events.

De-asserted when any of the following conditions are true: 1) Remote/Local Switch is in the Local position 2) SCADA Disable is asserted by the SCADA Master 3) Operation Override status point is asserted 4) Switch Open Error, Switch Fault, or Switch Travel Error is asserted 5) The Sectionalizing switch is open 6) AST Criteria Met status point is asserted.

Switch Command

Asserted when the AST has issued the command to open the switch.

Switch Open Error

Asserted when the sectionalizing switch has been opened while the AST Criteria Met STS was 'RESET'. This error can be cleared by locally recycling the Application Active STS or by the SCADA Master sending a 'Trip' then a 'Close' to the AST Activate SBO.

Switch Fault

Asserted when the sectionalizing switch was commanded open by the AST Application but a change was not detected after the Switch Open Window had expired. This error can be cleared by locally recycling the Application Active STS or by the SCADA Master sending a 'Trip' then a 'Close' to the AST Activate SBO.

Switch Travel Error

Asserted when the AST has determined the switch is stuck in the TRAVEL position after being commanded to open. This error can be cleared by locally recycling the Application Active STS or by the SCADA Master sending a 'Trip' then a 'Close' to the AST Activate SBO.

Global Error

Asserted when any one of the previous three errors occurs.

SCADA Disable

Asserted when the AST has been commanded to the DISABLED state by the SCADA Master sending a 'Trip' to the AST Activate SBO. Any switch error that occurs while SCADA Disable is asserted cannot be cleared by recycling the Application Active STS point; as the system will ignore any changes until SCADA Disable is de-asserted. De-asserted when the AST has been commanded to the ENABLED state by the SCADA Master sending a 'Close' to the AST Activate SBO. The state of the SCADA Disable point (Enabled or Disabled) is saved during a reset and restored upon power up.

Fault Pickup

Asserted when the Fault Detection Window timer is started, and de-asserted when the Fault Detection Window expires or the AST issues the command to OPEN the switch.

Loss of Voltage Pickup

Asserted when the Loss of Voltage Detection Window timer is started, and de-asserted when the Loss of Voltage Detection Window expires or the AST issues the command to OPEN the switch.

Phase A Fault
Asserted when the AST receives notification of a fault event on Phase A of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase B Fault
Asserted when the AST receives notification of a fault event on Phase B of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase C Fault
Asserted when the AST receives notification of a fault event on Phase C of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Neutral Fault
Asserted when the AST receives notification of a fault event on Neutral line of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase A Backfeed OC
Asserted when the AST receives notification of a reverse over-current fault event on Phase A of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase B Backfeed OC
Asserted when the AST receives notification of a reverse over-current fault event on Phase B of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase C Backfeed OC
Asserted when the AST receives notification of a reverse over-current fault event on Phase C of the feeder. Remains asserted while power is removed from the feeder. De-asserted when the power is restored on the feeder.

Phase A Voltage Loss
When using AC Voltage inputs to the ACI, this status point indicates loss of voltage on phase A. This point is asserted as long as Phase A Voltage is below the configured Deadline Voltage. When using the Loss-of-Voltage status point, all three STS points are "closed" when the LOV STS point indicates voltage loss.

Phase B Voltage Loss
When using AC Voltage inputs to the ACI, this status point indicates loss of voltage on phase B. This point is asserted as long as Phase B Voltage is below the configured Deadline Voltage. When using the Loss-of-Voltage status point, all three STS points are "closed" when the LOV STS point indicates voltage loss.

Phase C Voltage Loss
When using AC Voltage inputs to the ACI, this status point indicates loss of voltage on phase C. This point is asserted as long as Phase C Voltage is below the configured Deadline Voltage. When using the Loss-of-Voltage status point, all three STS points are "closed" when the LOV STS point indicates voltage loss.

AST Criteria Met
This STS point shows that all the conditions required for the AST to open the sectionalizing switch were met. When all the conditions are met, this point is ‘Set’ whether the switch was actually opened or not. AST Criteria Met will be ‘Reset’ when a hot phase is detected. Reasons for not opening are the ‘Application Active’ STS point was not ‘Set’, or there was a hardware problem with the switch.

5.4.2.3 State

Indicates the current state of each STS point.

5.4.3 AST Status Mapping

Point

Fixed name to indicate how the AST is going to use the mapped STS points.

Device Name

The name of the device of the source point.

Point Name

The mapped point name.

Status

The current health of the STS point.

State

The current state of the STS point.

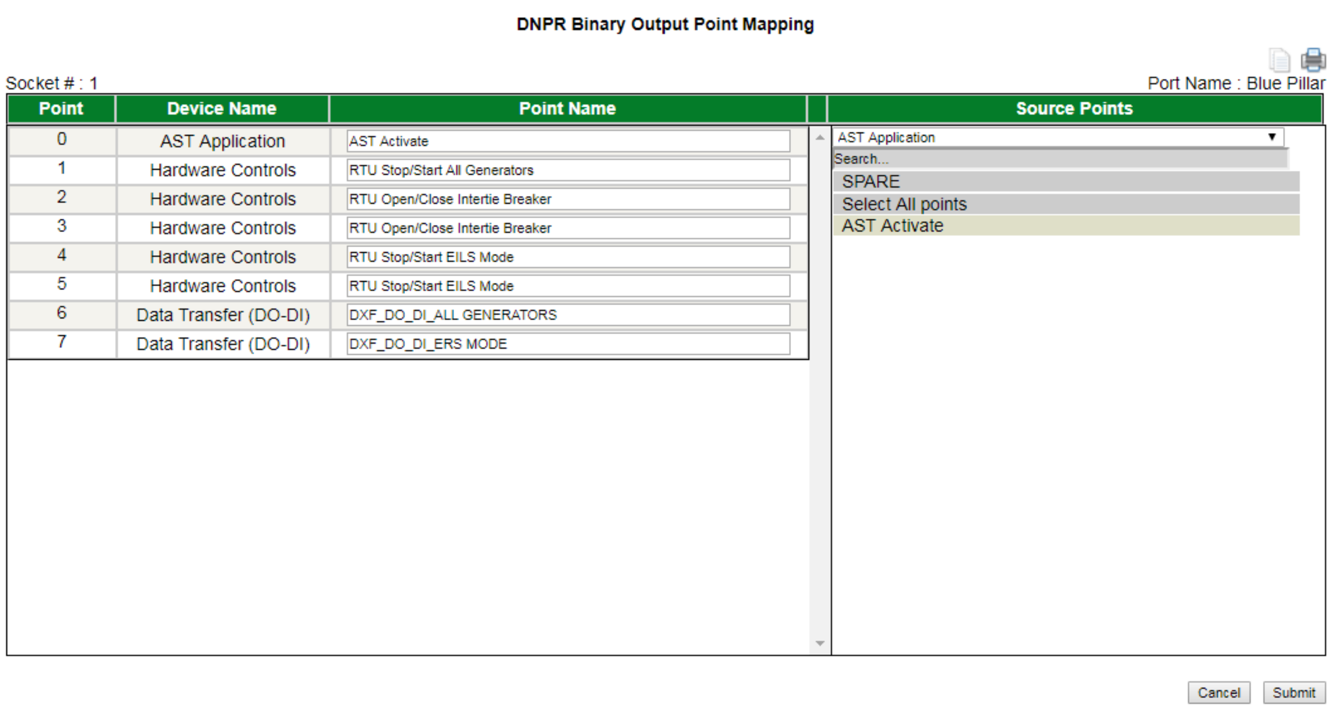
5.4.4 AST SBO Point

This is an SBO point that the AST actively maintains, and is available for mapping into communications protocols or other applications

AST Activate

An SBO Point that can be mapped to a SCADA Master. Sending a 'Trip' to this point will disable the AST Application from running. Sending a 'Close' to this point will enable the AST Application to run when the conditions to de-assert the AST Run Status are not true.

Figure 5-7 AST Activate Point Mapped to a Master



6 Battery Test

6.1 Introduction and Configuration

The Battery Test Application allows a user to schedule a periodic load test on the RTU backup battery. It also can perform the load test on demand, either through manual initiation or through SCADA. The Battery Test Application reports the Test results, current state, and if a test is currently running via it's Status points, and logs the results of each test into a log file that can be viewed on it's display page.

Note 1: For a 24 V battery, the user must provide a 5 ohm, 100 watt load. At 24 volts DC, such a load will draw 4.8 amps. It is up to the user to insert an interposing relay if the RTU's SBOs are rated for less current.

Note 2: This application also requires a status point to monitor the health of the AC input.Figure 6-1 Application Configuration Popup

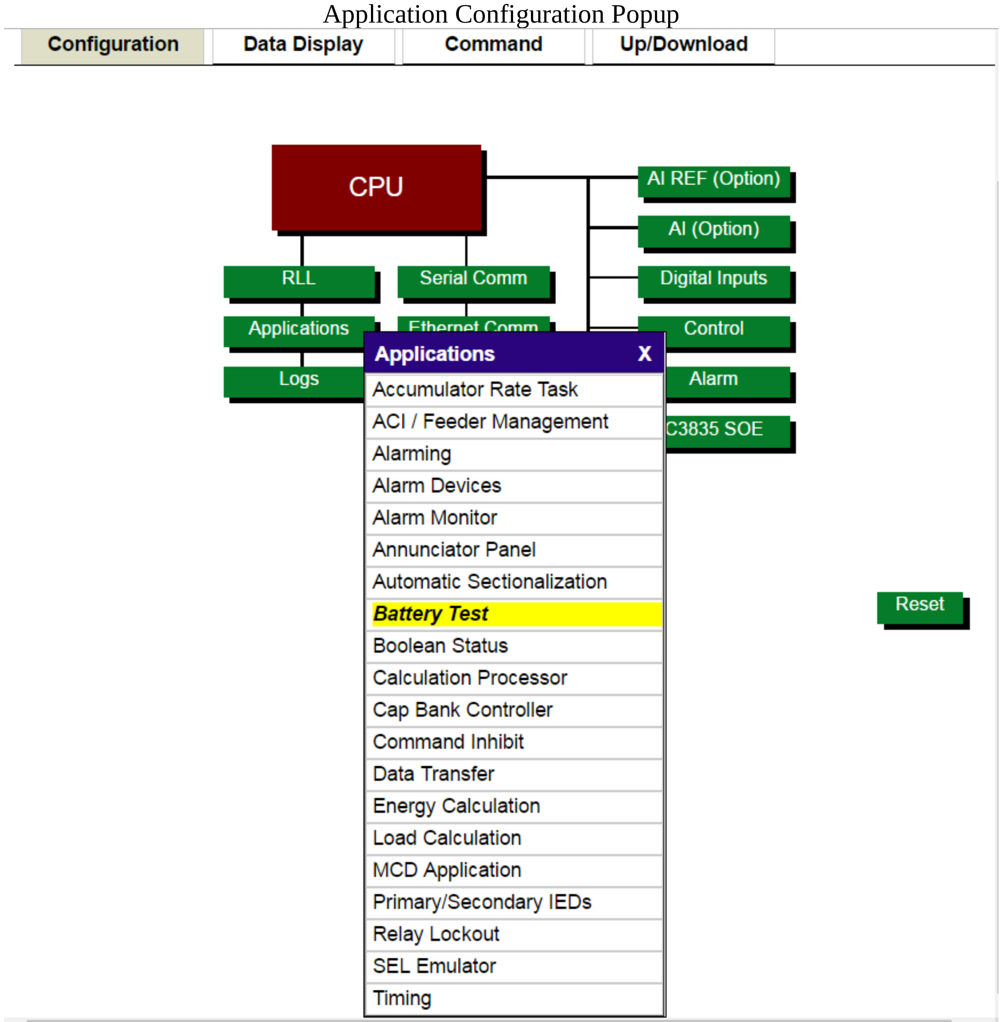


Figure 6-2 Battery Test Configuration

Battery Test Configuration

Test Configuration		
Task Enable	Disabled ▾	
Battery Pretest Minimum Level	23	
Battery Load Test Level	21	
Test Time	10	(Sec)
Recharge Wait Period	15	(Sec)
Battery Recharge Minimum Level	23	
Test Repetition Rate	7	(Days)

Point Mapping	
Analog Input	Map
Status Input	Map
SBO	Map

Cancel Submit

6.1.1 Test Configuration

Task Enable

Setting this field to Enabled allows the Battery Test function to create and manage its database STS and SBO points, await a command to initiate a battery test either manually, through SCADA, as well as from a user defined schedule.

Battery Pretest Minimum Level (7 to 26)

This is the minimum level in Volts that the battery voltage must be above before a battery test will be allowed. If a battery test is commanded and the battery voltage is below this level, the Battery Test Application will mark the test as failed in the log, and set the 'Test Result' STS point to 'Closed'. The default is 25.

Battery Load Test Level (7 to 26)

This is the minimum voltage that the battery must maintain during the test. If the battery voltage drops below this level during the test, the Battery Test Application will mark the test as failed in the log, and set the 'Test Result' STS point to 'Closed'. The default is 21.

Test Time (1 to 60)

This is the length of time (in seconds) that the 'Test Load' SBO point is closed. See SBO Mapping for a description of the 'Test Load' SBO point. The default is 10.

Recharge Wait Period (1 to 240)

After the test load is removed, the battery voltage waits this amount of time (in seconds) before measuring the battery voltage to see if it is above the Battery Recharge Minimum Level. If the battery voltage is below this level, the Battery Test Application will mark the test as failed in the log, and set the 'Test Result' STS point to 'Closed'. The default is 15.

Battery Recharge Minimum Level (7 to 26)

This is the voltage the battery is expected to return to (to pass the test) after the Recharge Wait period. Default is 23.

Test Repetition Rate (0 to 90)

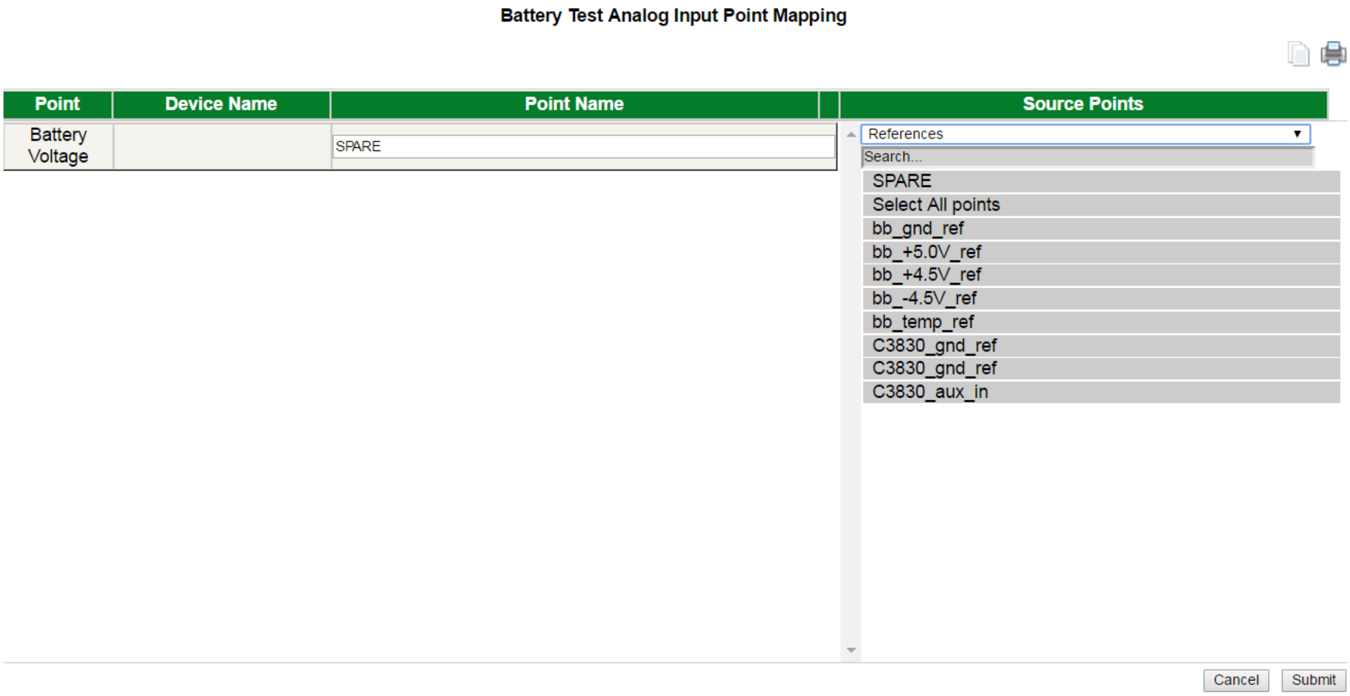
This is the number of days that the test will be repeated. This is the 'schedule' that is followed when the Scheduler is activated. When the RTU boots up, if a Test Repetition Rate is configured, the Scheduler is activated with this schedule by default. The default is 7.

6.1.2 Point Mapping

Analog Input

Clicking on this button allows the user to map any DC analog source point to be used as the 'Battery Voltage'. Since this point is mapped, the scaling must be set at the source's configuration screen.

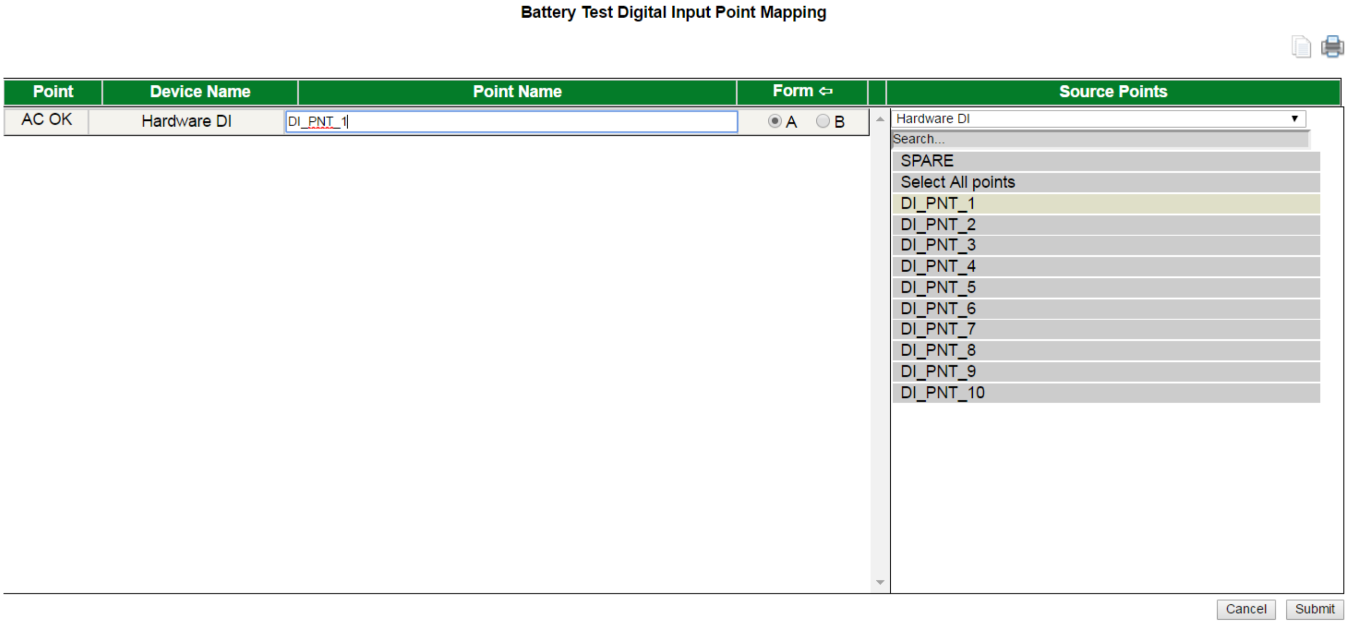
Figure 6-3 Battery Test Analog Input Point Mapping



Status Input

Clicking on this button allows the user to map any STS source point to be used as the 'AC OK' indication, which means that the AC power supply is present. If AC power is not present, the RTU is likely running off the battery and testing it is not a good idea at this time. At any time during a battery test, if the 'AC OK' STS point indicates loss of AC, then the battery test is cancelled and the Battery Test Application will mark the test as failed in the log, and set the 'Test Result' STS point to 'Closed'.

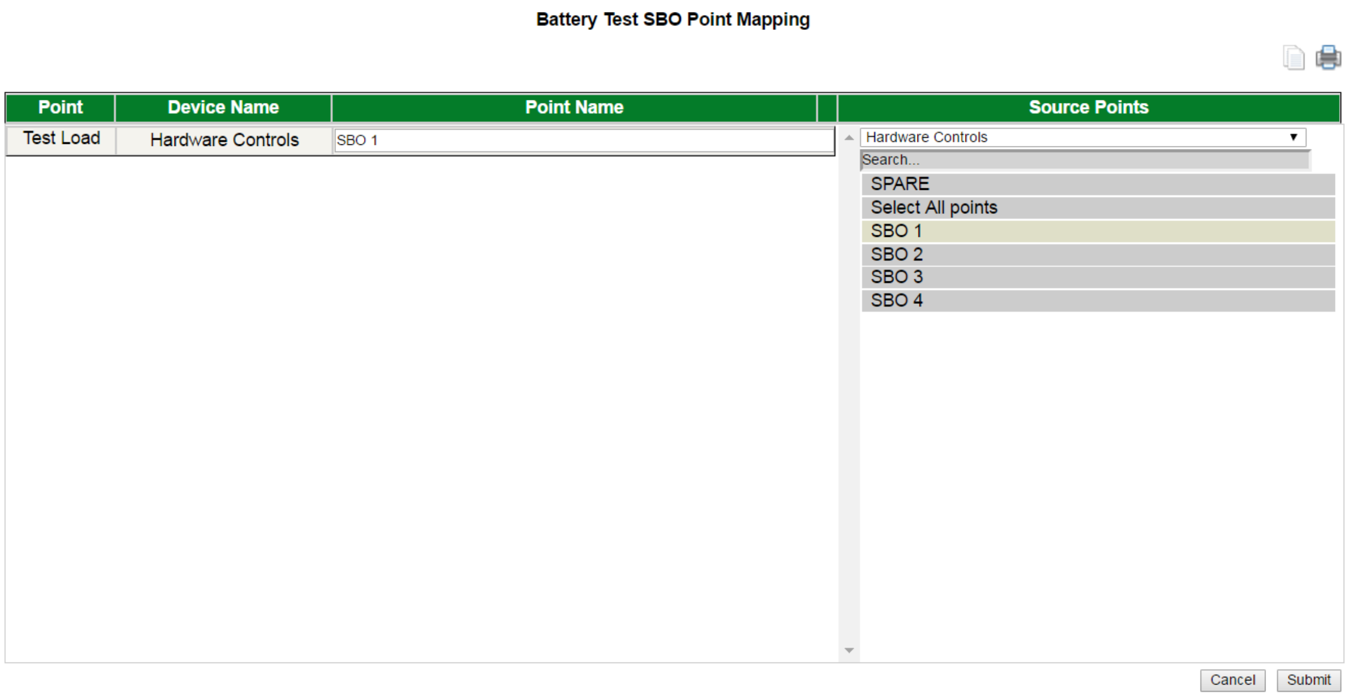
Figure 6-4 Battery Test Status Input Point Mapping



SBO

Clicking on this button allows the user to map any SBO source point to be used as the switch that closes the test load circuit.

Figure 6-5 Battery Test SBO Point Mapping



6.2 Points Configuration Mapped to Master

The following is an example of how a user might map points back to a DNP Master for monitoring and control. For clarity, only the points associated with Battery Test are mapped to the Master.

Figure 6-6 Points Mapped to Master

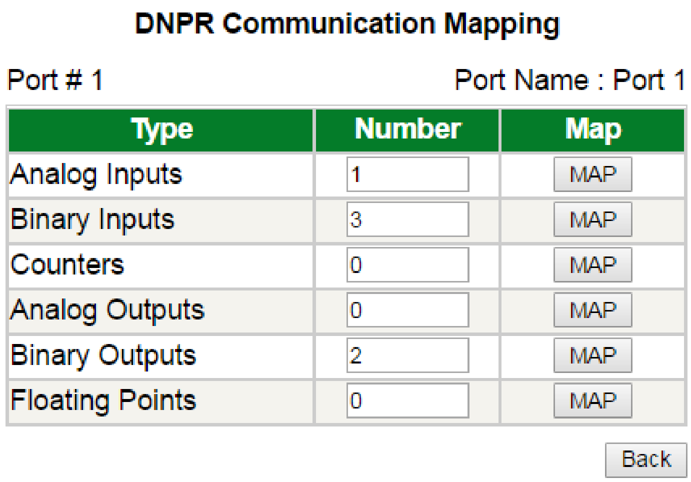
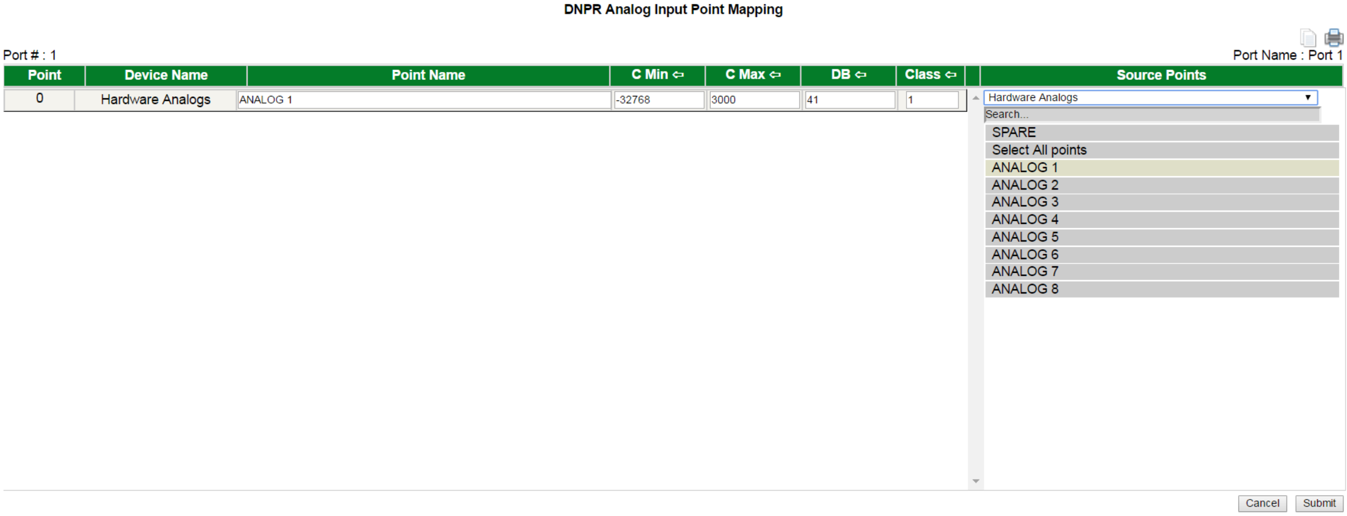
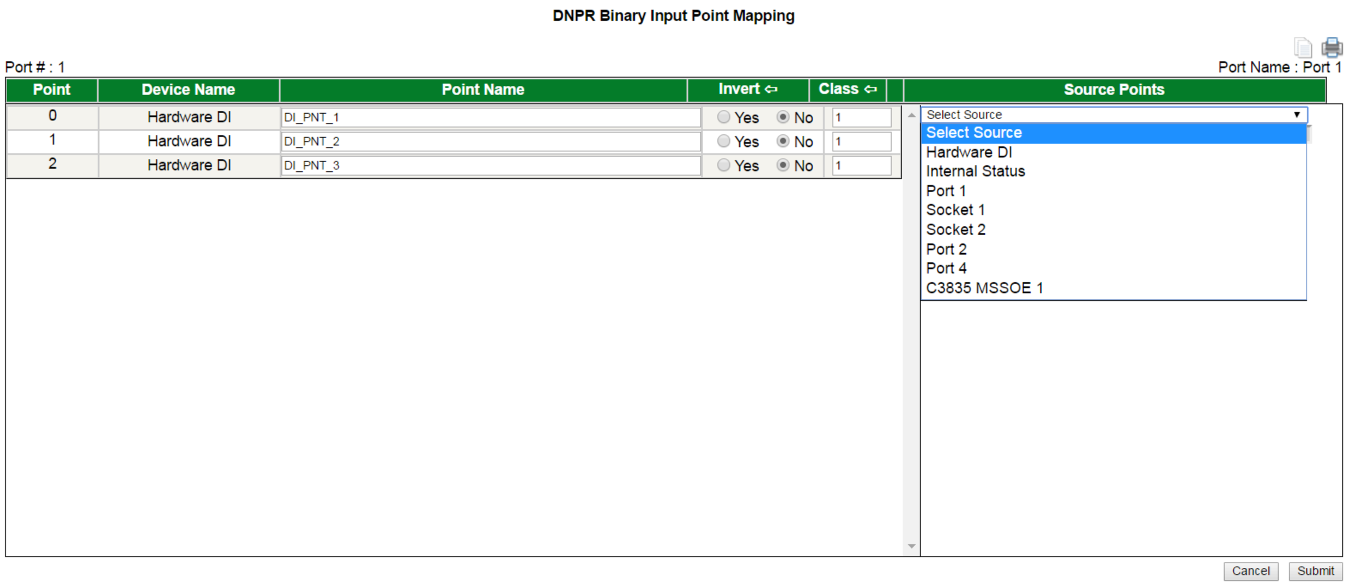


Figure 6-7 Analog Inputs



Mapping the analog point (above) that monitors the battery is optional. The program can still be controlled from the Master without this point.

Figure 6-8 Status Points



The status points shown above are created by the program.

Test Result

If the last battery test result was successful, this STS point is ‘Open’ indicating the test passed. A failed test is indicated by this STS point being ‘Closed’.

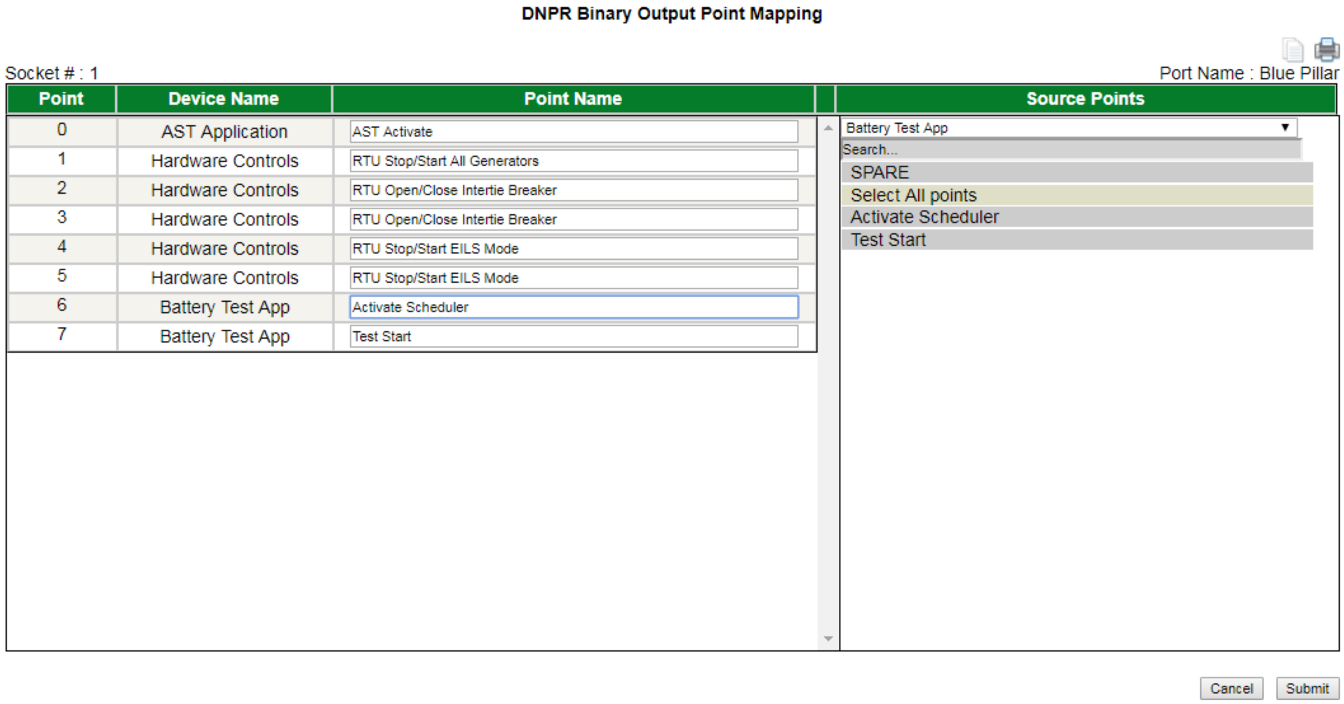
Scheduler Enabled

If the scheduler is enabled, this STS point indicates such by being ‘Closed’. ‘Open’ indicates the scheduler is disabled.

Test In Progress

If a test is currently in progress, this STS point is ‘Closed’, otherwise, it is ‘Open’.

Figure 6-9 SBO Points



The SBO points shown above are created by the program.

The SBO points allow the Master to initiate a test or activate the schedule by sending the above SBO points.

Activate Scheduler

Sending a ‘Trip’ to this SBO point de-activates the scheduler and sending a ‘Close’ to this SBO point activates the scheduler.

Test Start

Sending a ‘Close’ to this SBO point initiates a battery test. Sending a ‘Trip’ to this SBO point cancels any battery test in progress.

6.3 Display

Battery Test Display is shown below. The screen capture was during a manually initiated test.

Figure 6-10 Battery Test Display

Battery Test Display

Current Battery Voltage	25.5

Scheduler Status	
Scheduler	Enabled
	Disable

Test Details.	
Test Status	Completed
Last Test Result	PASS
Elapsed Time	0
Remaining Time	0
Time to Next Test	6 day(s), 23:59:49
	Start Test

Battery Test History

Date/Time ▼	Initiator	Voltages			Result
		Pretest	Load Test	Recharge	
07/25/2017 20:24:36	Manually	25.5	25.5	25.5	PASS
07/25/2017 20:24:05	Manually	24.0	0.0	0.0	FAILED - Pretest Voltage
07/25/2017 20:23:28	Manually	0.0	0.0	0.0	FAILED - Pretest Voltage
07/25/2017 20:23:09	Manually	0.0	0.0	0.0	FAILED - AC not OK

Done

Current Battery Voltage

The current battery voltage derived from the Analog value mapped during Analog Input configuration of the Battery Test.

Scheduler Status

Scheduler - Can either display Enabled or Disabled.

Enable/Disable button - When the Scheduler is Enabled, the Enable/Disable button in this field will say Disable. To Disable the Scheduler from the Display Screen, press the Disable button, and the button will change to an Enable button while also changing the status of the Scheduler to Disabled.

A status point called Battery Test Task -> Scheduler Enabled is created by the RTU and can be mapped into a Slave protocol. This point is by default set as 1 or closed when the scheduler is running.

Test Details

Test Status

One of three messages will appear in this field:

-Completed

-Test in Progress

-No Test Performed Yet

Last Test Result

This field will be populated from the previous test result which can be found in the Battery Test History section below.

Elapsed Time

This counter is comprised of the Test Time plus the Recharge Wait Period entered during the Battery Test configuration. This counter will always count up from zero.

Remaining Time

This counter is comprised of the Test Time plus the Recharge Wait Period entered during the Battery Test configuration. This counter will always count down to zero.

Time to Next Test

This field will reflect the value entered in the Test Repetition Rate during the Battery Test configuration. It will display a timer counting down to the next scheduled test.

Note: This field will be reset whenever a test is initiated (Manually, by SCADA, or Scheduled) regardless of the test result. Also Disabling then Enabling the Scheduler will reset the field back to the Test Repetition Rate value stored during configuration.

Battery Test History

Date/Time (Up/Down sortable)

This field will show the Date and Time when a test was initiated.

Initiator

This field will show how the battery test was initiated. There are three possible messages which can be displayed:

-Manually

-SCADA

-Scheduler

Voltages

-Pretest: This is the battery voltage the second before a test is initiated

-Load Test: This is the battery voltage the second before the load is disconnected from the battery.

-Recharge: This is the battery voltage after the Recharge Wait Period has expired.

Note: All Voltage fields will be populated for a test only if the test result is PASS. So if a test fails due to the Load Test Voltage not meeting the required Load Test level set during the configuration, then only the Pretest Voltage and Load Test Voltage field will be populated, while the Recharge Voltage field will be 0.0

Result

The possible results are as follows:

When the Test Result Status point is mapped into a Slave protocol, a 1 or Close means the test failed. 0 or Open indicates that the latest battery test has passed.

PASS
Failed – User Terminated
Failed – SCADA Terminated
Failed – Pretest Voltage
Failed – Load Test Voltage
Failed – Recharge Voltage
Failed – AC not OK

6.3.1 Display of Points Mapped to Master

The following is an example of displaying the Battery Test points that have been mapped to the master. For clarity, only the Battery Test points are shown. Notice that the SBOs do not have a display.

Figure 6-11 Displaying the Status Points to the Master

DNPR Binary Input Point Mapping

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name	Invert	Class
0	Battery Test App	Test Result	Yes / No	1
1	Battery Test App	Scheduler Enabled	Yes / No	1
2	Battery Test App	Test In Progress	Yes / No	1
3		SPARE	Yes / No	1
4		SPARE	Yes / No	1

Source Points: Battery Test App
Search...
SPARE
Select All points
Test Result
Scheduler Enabled
Test In Progress

Figure 6-12: Battery Test Points Mapped to DNPR

DNP (R) Digital Input (DI) Display

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name	Assigned Class	Status	Value
0	Battery Test Task	Test Result	1		CLOSE
1	Battery Test Task	Scheduler Enabled	1		CLOSE
2	Battery Test Task	Test In Progress	1		OPEN
3	No Device	Spare	1	F	OPEN
4	No Device	Spare	1	F	OPEN

Page 1of 1 Go To Go Done

Legend

Figure 6-13: Mapping Battery Status App Controls to Master

DNPR Binary Output Point Mapping

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name
0	Battery Test App	Activate Scheduler
1	Battery Test App	Test Start
2		SPARE

Source Points: Battery Test App
Search...
SPARE
Select All points
Activate Scheduler
Test Start

Figure 6-14: Battery Test Binary Output Display Page

DNP (R) Binary Outputs (BO) Display

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name	Status	Value
0	Battery Test Task	Activate Scheduler	U	OPEN
1	Battery Test Task	Test Start		CLOSE
2	No Device	Spare	F	OPEN

Page 1of 1 Go To [ ] Go Done

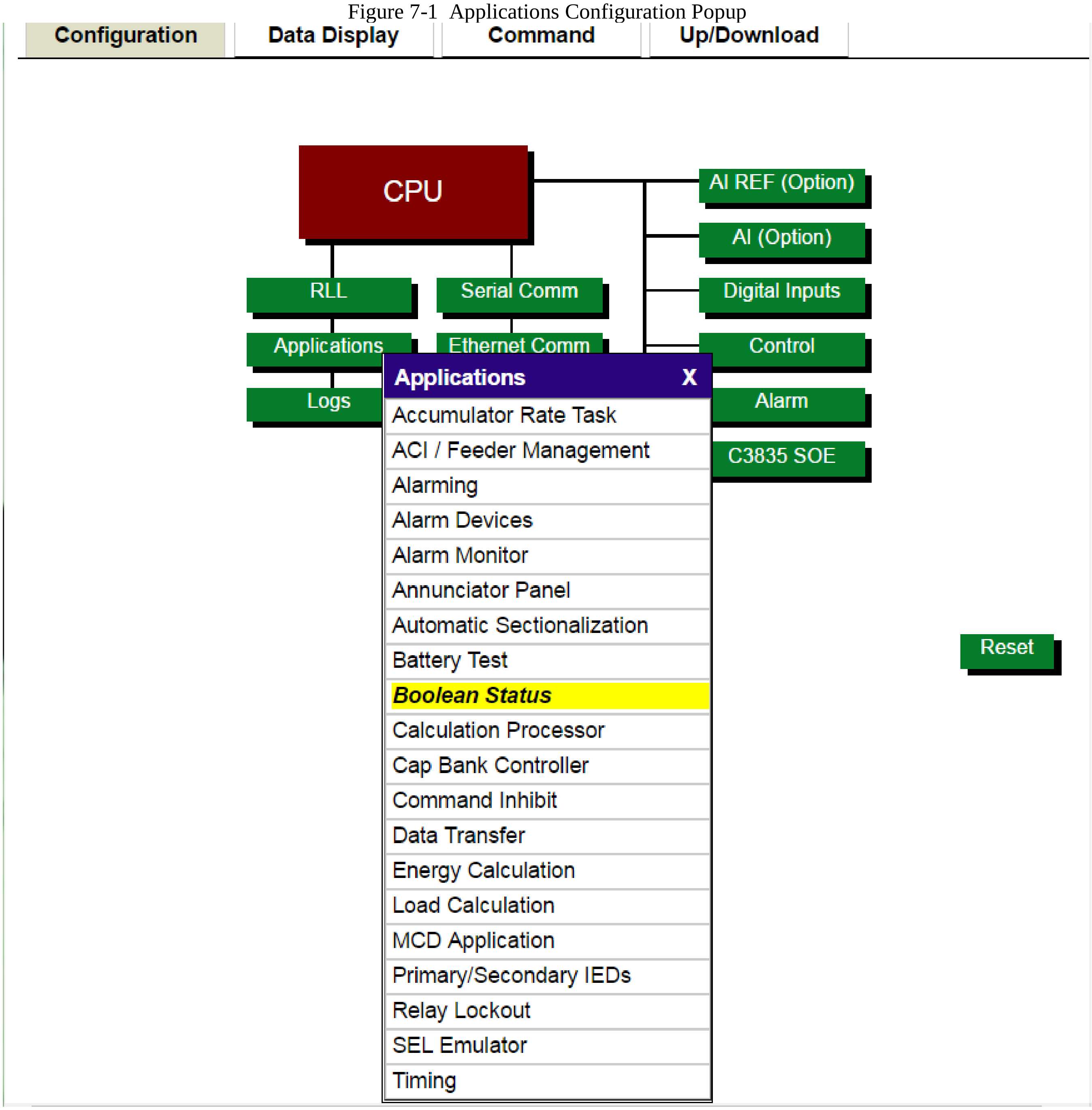
Legend

7 Boolean Status

7.1 Introduction

When you click on the Applications block, the screen shown in Figure 4-1 will appear. Boolean Status is explained in the following sections.

Figure 7-1 Applications Configuration Popup



=

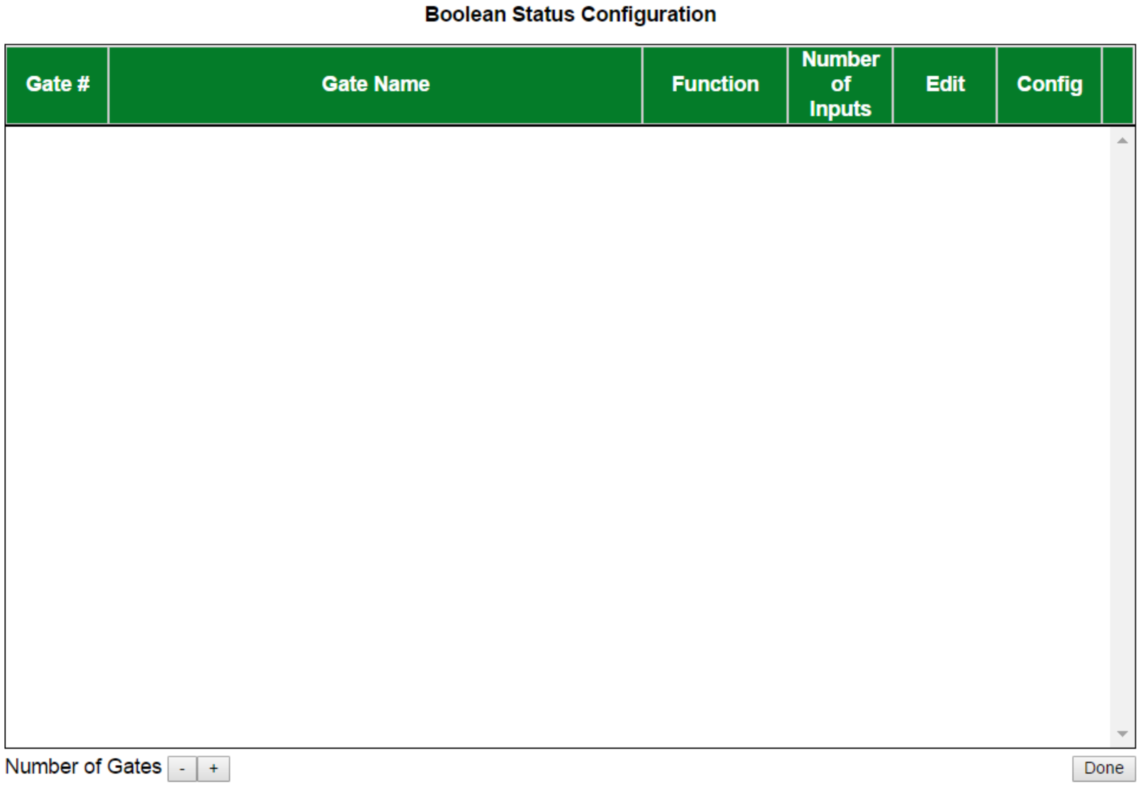
7.2 Configuration

The config@WEB interface program can perform simple logic functions such as AND, OR, NAND, NOR, and XOR. These simple functions can be combined in parallel and series constructs for more complex applications. This application is not meant to replace config@WEB ISaGRAF, which is far more capable.

Begin by selecting the Boolean Status Function from the Applications menu as shown above.

The initial Boolean Status Configuration box looks as shown below. You must click the plus sign as shown to begin with the first gate.

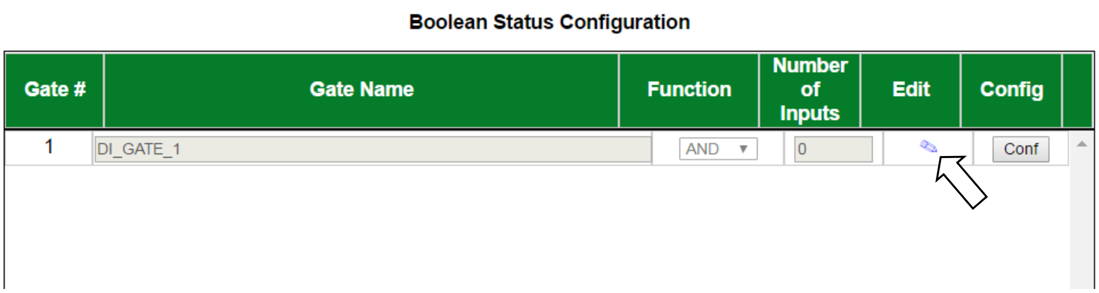
Figure 7-2 Boolean Status Configuration



7.2.1 AND Gate Creation Example

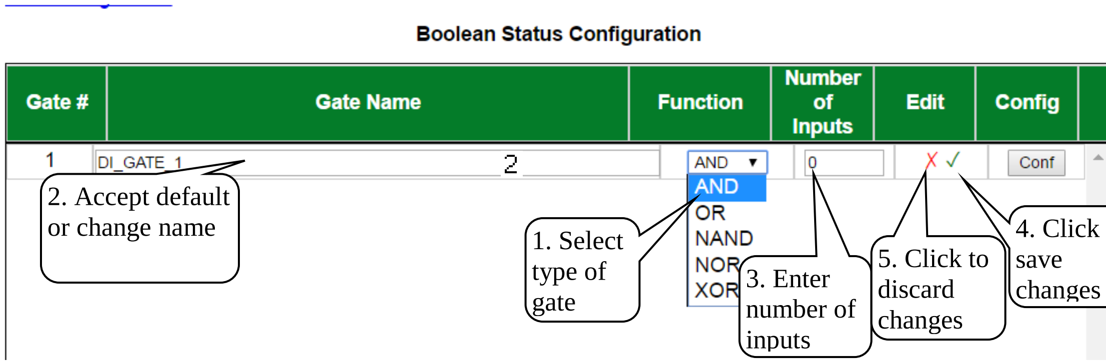
To create a logic gate, you first have to add a gate by clicking on the [+] button as shown above, then clicking on the Edit symbol as shown below.

Figure 7-3 Boolean Status Configuration



The result will be as shown below. Follow the numbered instructions.

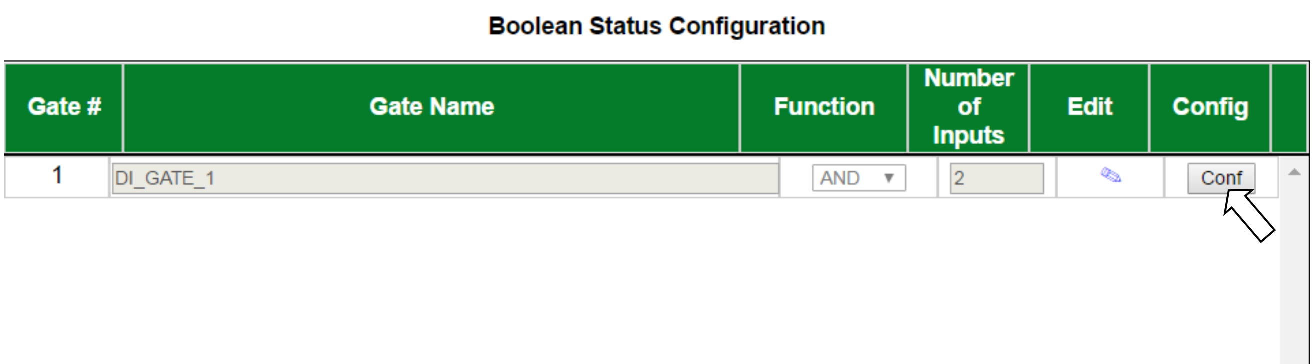
Figure 7-4 Boolean Status Edit



At this point, you can change the name of the gate, change the type of gate (Function), and change the Number of Inputs, as shown above. Notice when you put your cursor in the Number of Inputs field, the allowable range is shown at the bottom left of your screen. You cannot have less than two inputs for an active AND gate, as shown in the example. If you wish to keep a gate in the list but deactivate it, put 0 for the Number of Inputs.

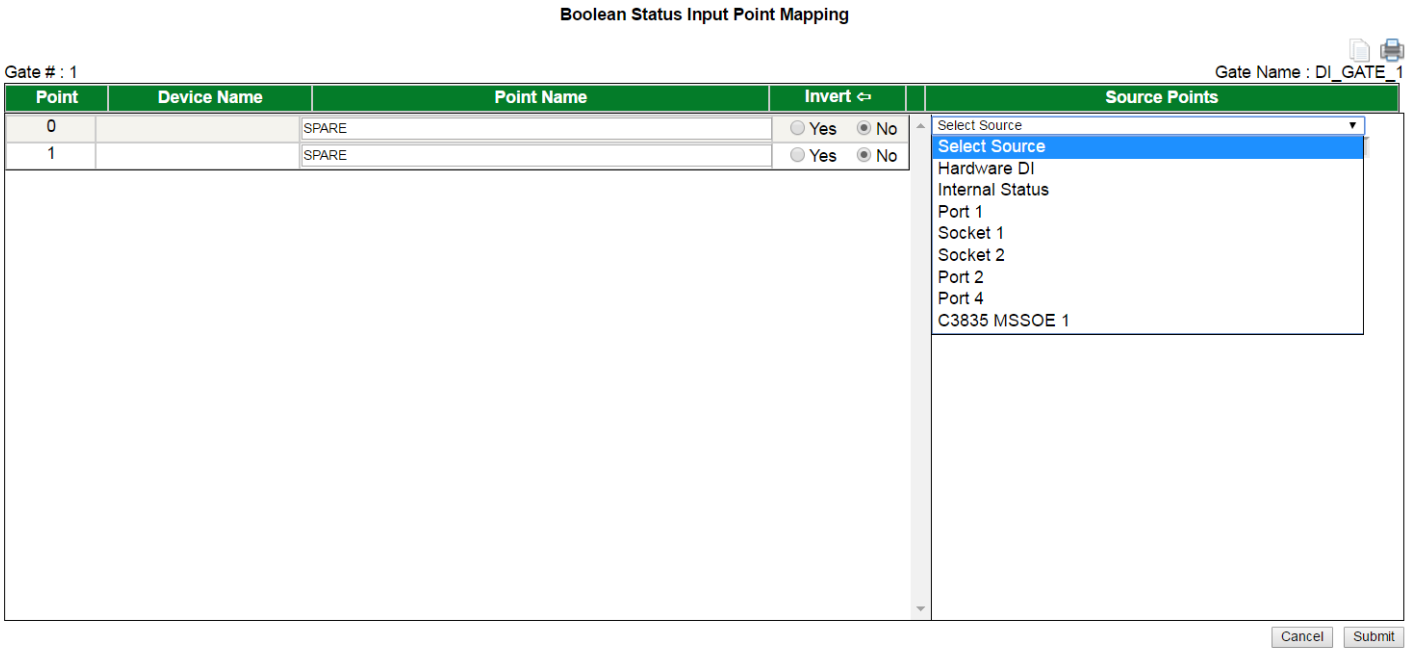
After you save your changes (step 4. above), the screen will appear as shown below.

Figure 7-5 Boolean Status Configure Inputs



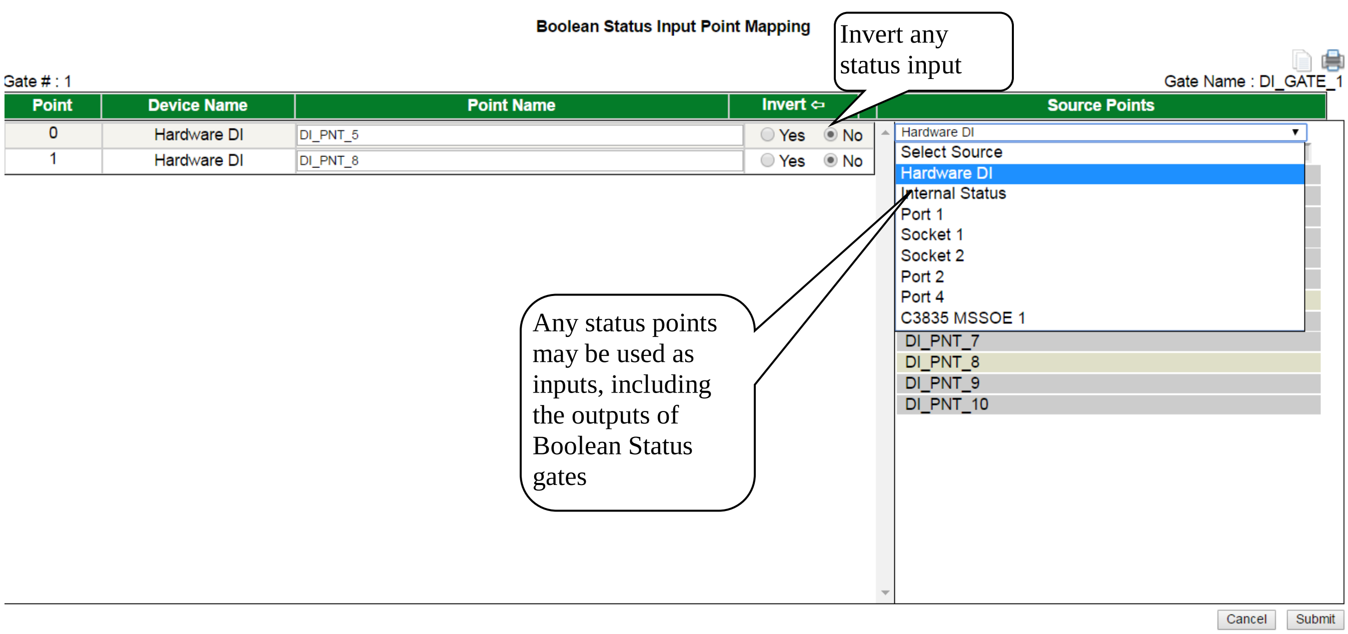
Click the Conf button on the above screen to get the screen below.

Figure 7-6 Boolean Status Input Mapping



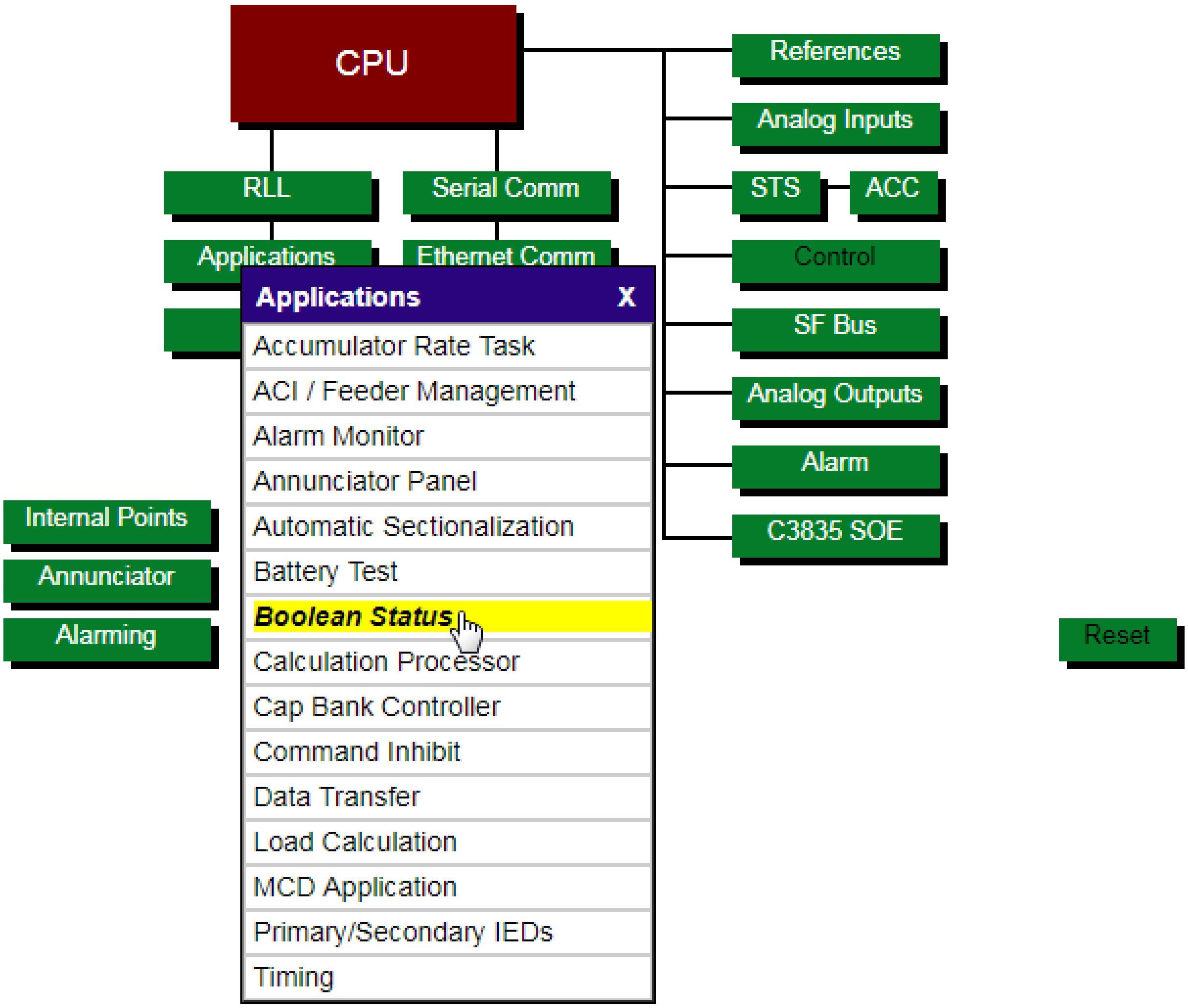
The inputs to the gate must now be mapped. Any status point, including the output of other gates, may be used in the Boolean Status Mapping. Also, notice that the input status point to any gate may be inverted.

Figure 7-7 Point Mapping



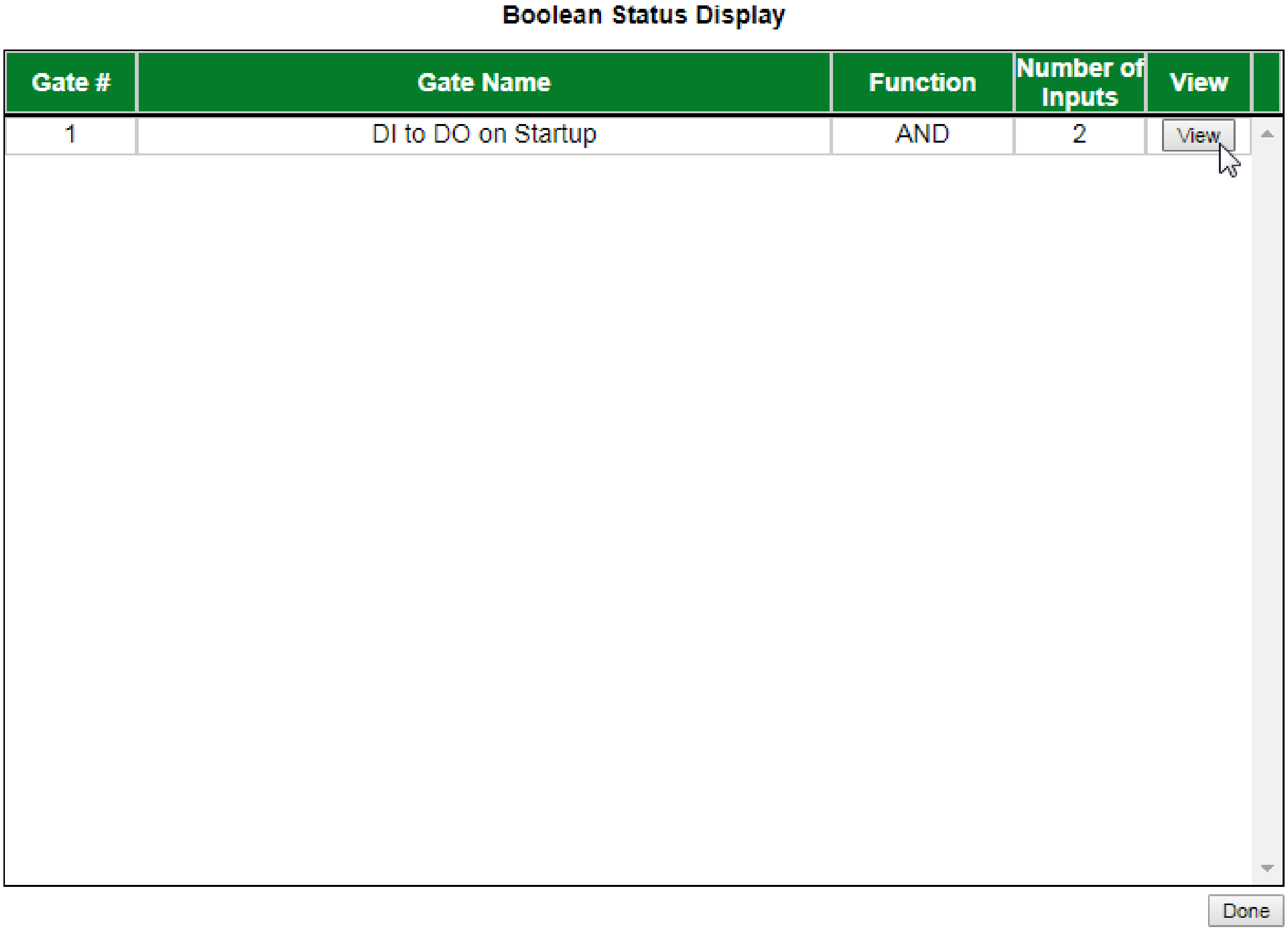
Once the mapping is submitted and the RTU reset, we can display the results of the Boolean Status configuration under the Display tab.

Figure 7-8 Display Applications Popup



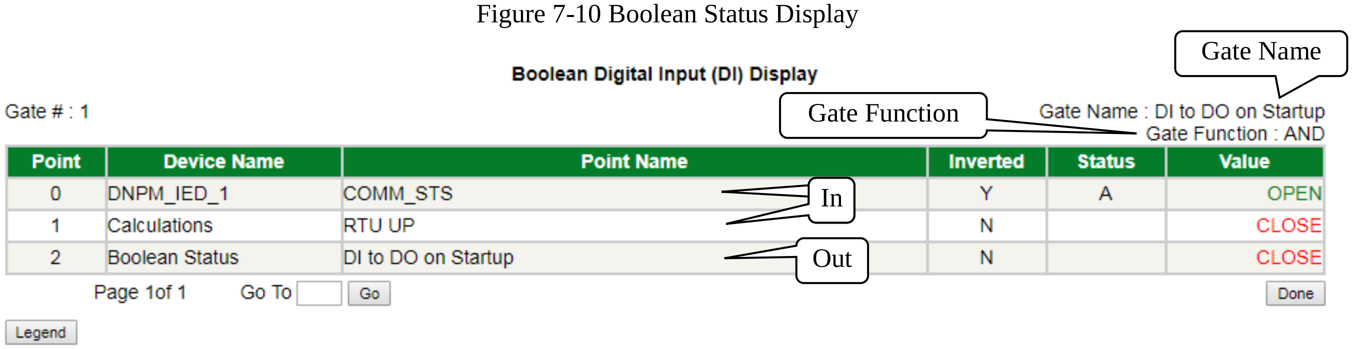
Click the View button as shown below.

Figure 7-9: Show Point Info



The Boolean Status Display shows the inputs to the gate and the output of the gate, along with the point state for all input/output.

Figure 7-10 Boolean Status Display



AND, OR, and NAND gates can have up to fifteen inputs. NOR and XOR gate can have only two inputs. Zero (0) inputs on any gate disconnects that gate (makes it inactive).

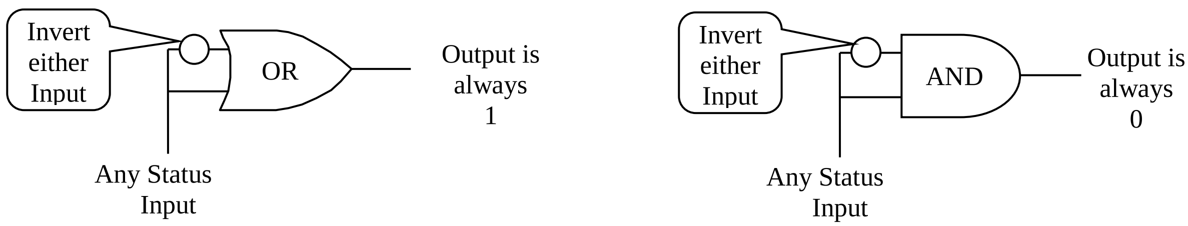
7.2.2 Tips and Tricks

You can build a complicated logic block with the Boolean Status application by combining logic gates in parallel and series. If you attempt to combine gates into complex structures, it would help to draw a diagram.

You may add gates as needed up to a total of 128.

You may have a need for a constant Low (0) and/or a constant Hi (1). A simple way to make such inputs is to construct the following gates. Their outputs stay constant regardless of input changes.

Figure 7-11 Creating a High (1) or Low (0)



7.2.3 Logic Drawings and Truth Tables

AND Gate

The AND gate is so named because, if 0 is called "false" and 1 is called "true," the gate acts in the same way as the logical "and" operator. The following illustration and table show the circuit symbol and logic combinations for an AND gate. (In the symbol, the input terminals are at left and the output terminal is at right.) The output is "true" when both inputs are "true." Otherwise, the output is "false."

Figure 7-12 AND Gate Schematic

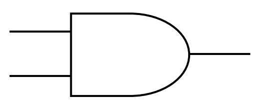


Table 7-1 AND Gate Truth Table

Input 1	Input 2	Output
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

The OR gate gets its name from the fact that it behaves after the fashion of the logical inclusive "or." The output is "true" if either or both of the inputs are "true." If both inputs are "false," then the output is "false."

Figure 7-13 OR Gate Schematic

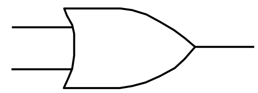


Table 7-2 OR Gate Truth Table

Input 1	**Input 2**	**Output**
0	0	0
0	1	1
1	0	1
1	1	1

NAND Gate

The NAND gate operates as an AND gate followed by a NOT gate. It acts in the manner of the logical operation "and" followed by negation. The output is "false" if both inputs are "true." Otherwise, the output is "true."

Figure 7-14 NAND Gate Schematic

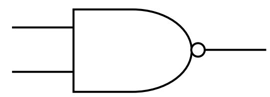


Table 7-3 NAND Gate Truth Table

Input 1	**Input 2**	**Output**
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate

The NOR gate is a combination OR gate followed by an inverter. Its output is "true" if both inputs are "false." Otherwise, the output is "false."

Figure 7-15 NOR Gate Schematic

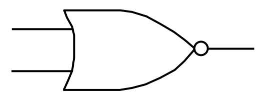


Table 7-4 NOR Gate Truth Table

Input 1	**Input 2**	**Output**
0	0	1
0	1	0
1	0	0
1	1	0

XOR Gate

The XOR (exclusive-OR) gate acts in the same way as the logical "either/or." The output is "true" if either, but not both, of the inputs are "true." The output is "false" if both inputs are "false" or if both inputs are "true." Another way of looking at this circuit is to observe that the output is 1 if the inputs are different, but 0 if the inputs are the same.

Figure 7-16 XOR Gate Schematic

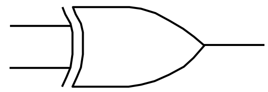


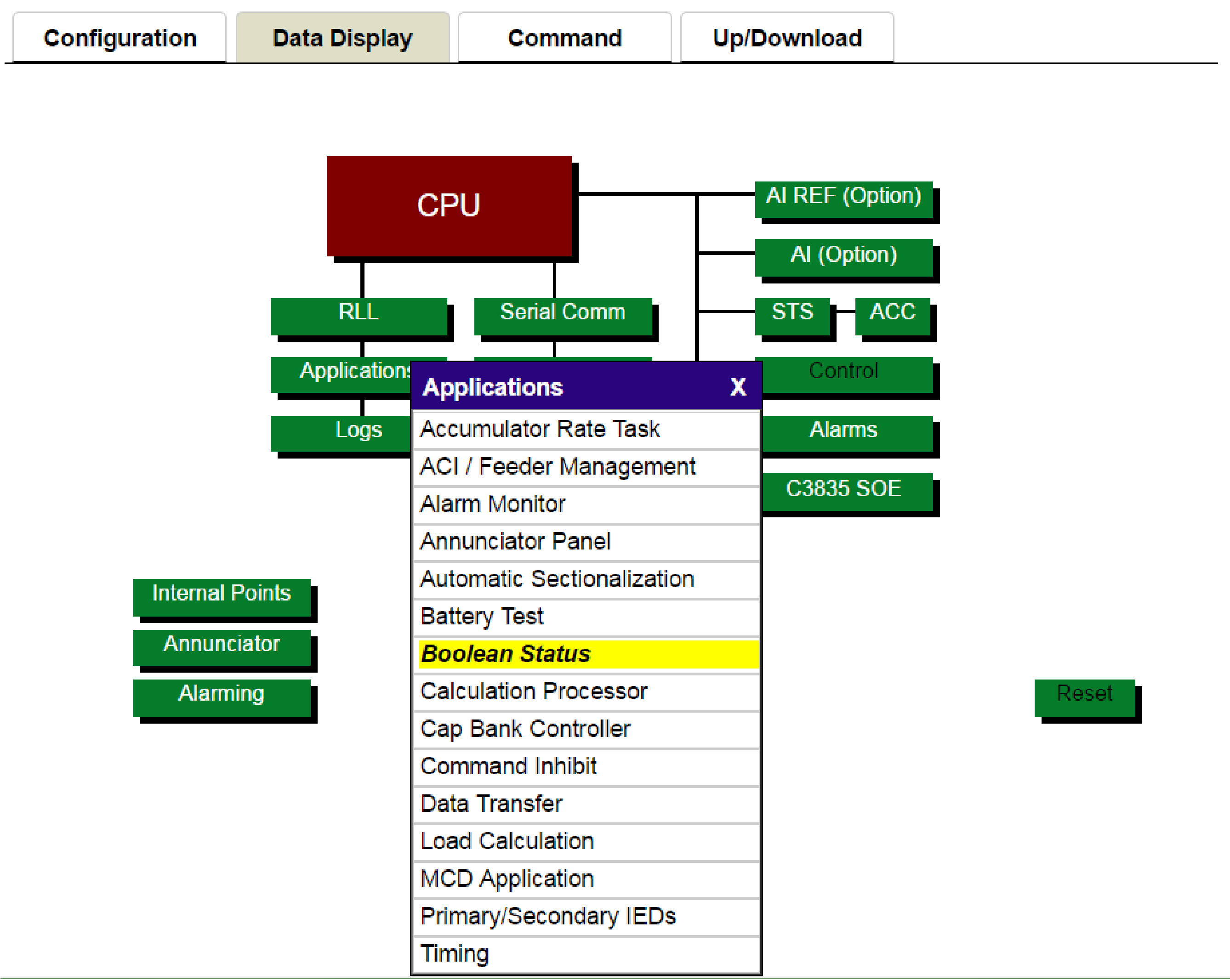
Table 7-5 XOR Gate Truth Table

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

7.3 Display

Under the Display tab, click Applications, then select Boolean Status as shown below.

Figure 7-17 Applications Display Popup



The Boolean Status Display shows whatever was configured. In the example below, there is one 2-input AND gate. Click on the View button.

Figure 7-18 Choose a Gate to Display

Boolean Status Display

Gate #	Gate Name	Function	Number of Inputs	View
1	DI_GATE_1	AND	2	View

Done

The resulting display is as shown below.

Figure 7-19 Boolean Status Display

Boolean Digital Input (DI) Display

Gate # : 1

Gate Name : DI to DO on Startup
Gate Function : AND

Point	Device Name	Point Name	Inverted	Status	Value
0	DNPM_IED_1	COMM_STS	Y	A	OPEN
1	Calculations	RTU UP	N		CLOSE
2	Boolean Status	DI to DO on Startup	N		CLOSE

Page 1of 1 Go To Go Done

Legend

Point
Logical point number.

Device Name
The origin of the point.

Point Name
The name of the point assigned during configuration.

Inverted
Designated whether or not the point was inverted during configuration. Y for Yes, N for No.

Point Status

Please see config@WEB Secure Software Users Guide. Or click on the Legend Button below the Table.

Point State

Indicates that point is either a logical 0 or a logical 1. A green OPEN indicates a logical 0. A red CLOSE indicates a logical 1.

Navigation

Gate # : *n* tells you which gate you are on. Function tells you the type of gate. Gate Name tells you the name of the gate, which was either a default name or the name assigned during configuration. Back allows you to go to the previous display.

8 Calculations Processor

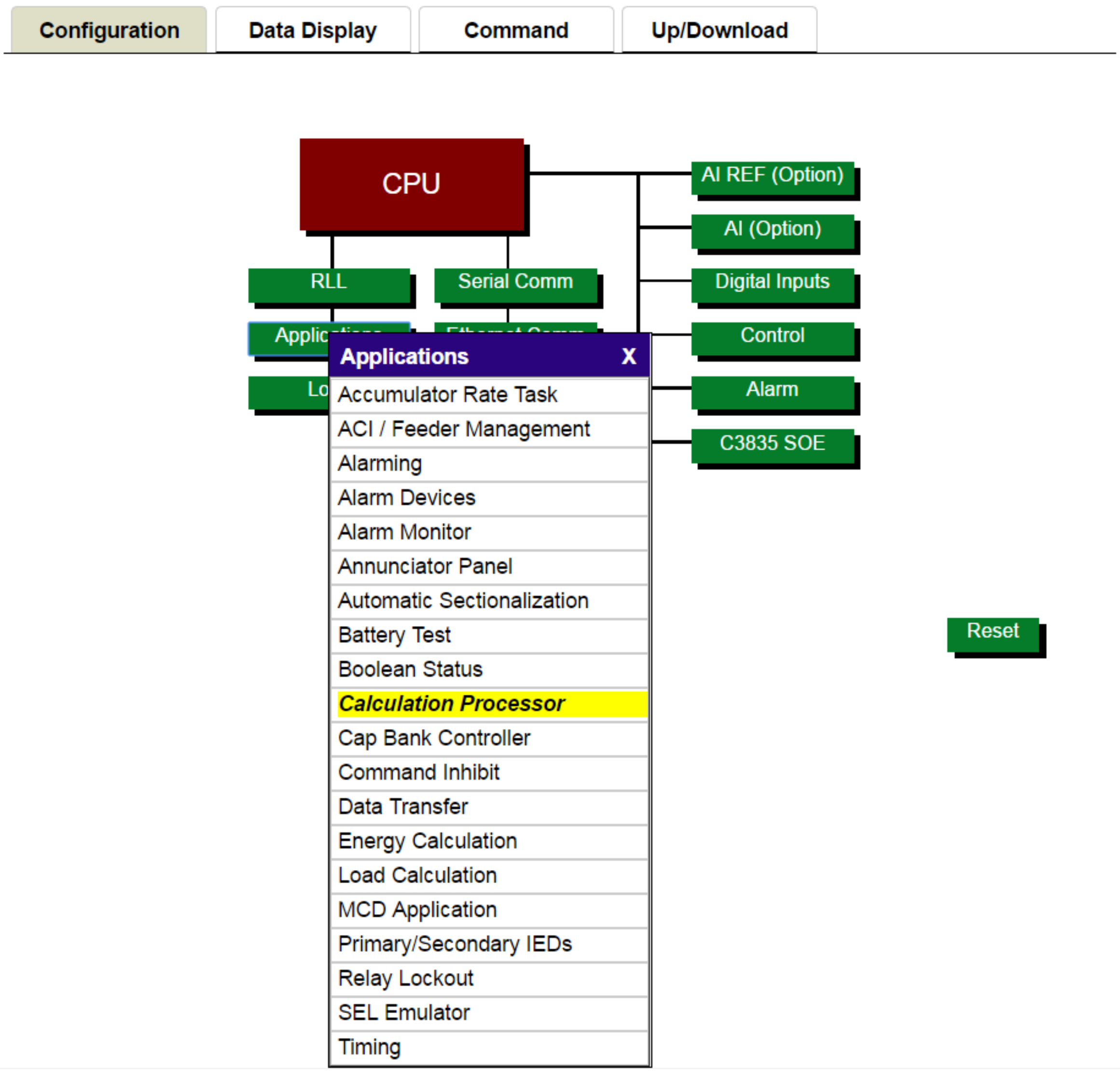
8.1 Introduction

This is an application that allows you to manipulate analogs, accumulators, floating points, and constants with arithmetic operations that you configure.

8.2 Configuration

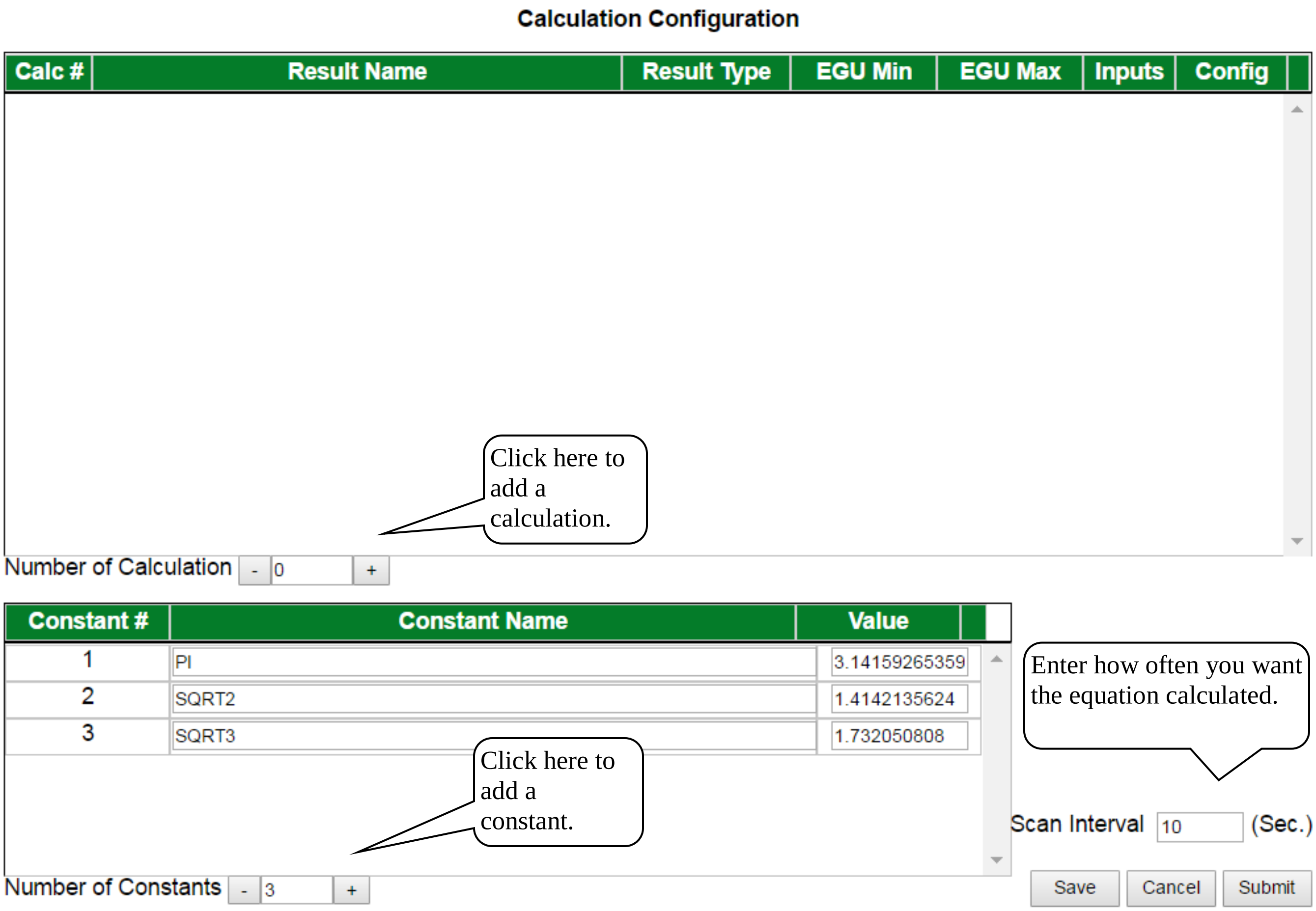
When you click on the Applications block, the screen shown in Figure 4-1 will appear. Calculation Processor is explained in the following sections.

Figure 8-1 Applications Configuration Popup

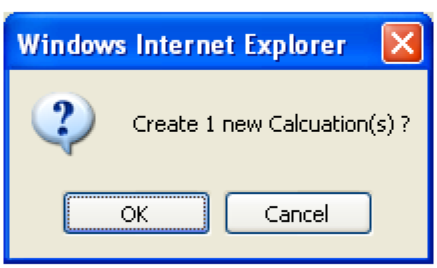


When you click on Calculation Processor above, you get the Configuration screen shown below.

Figure 8-2 Configuration



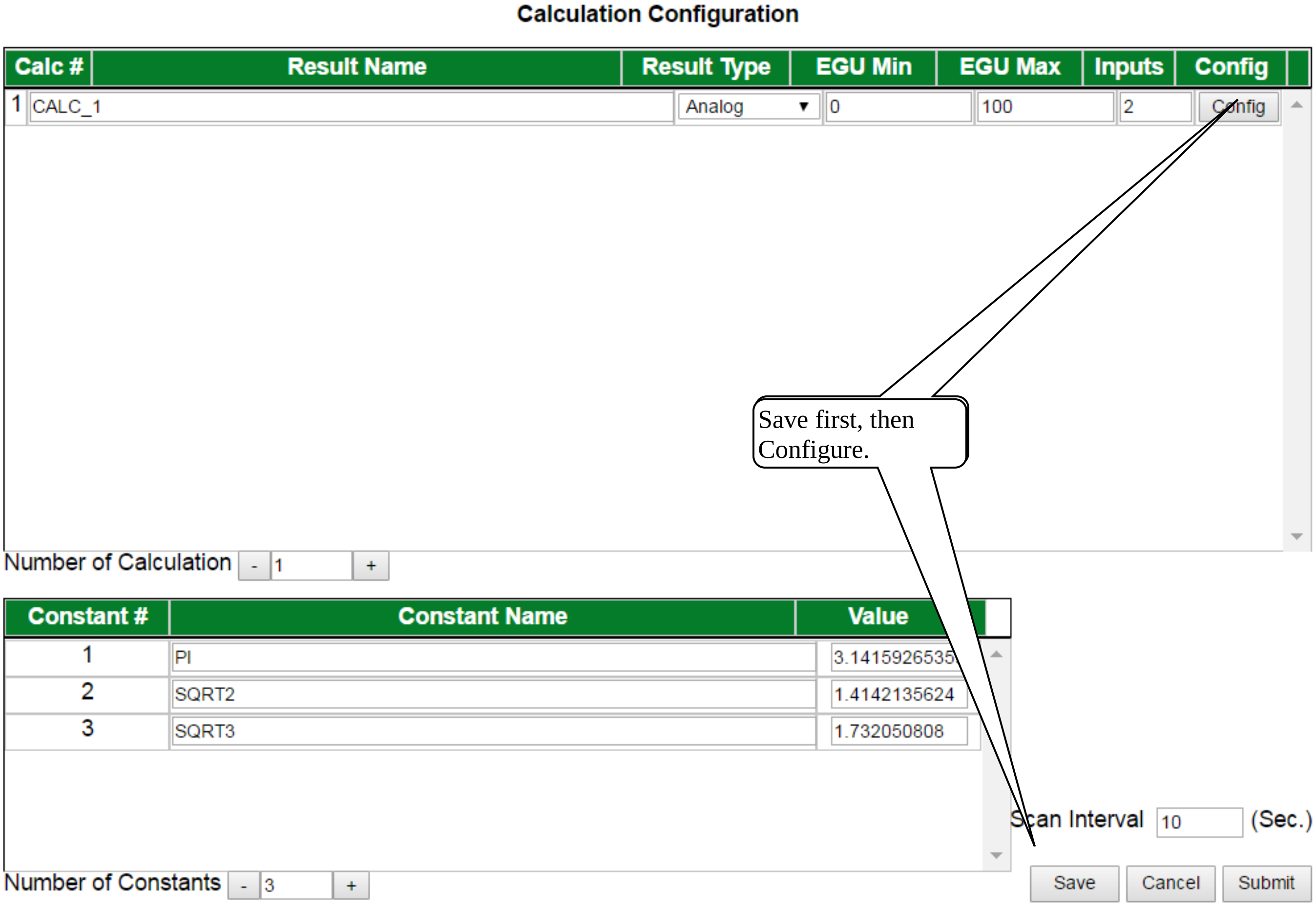
Notice that there are no calculations defined, but three constants are already generated by default. You may add your own constants by clicking on the + sign for Number of Constants. The initial screen above has zero Number of Calculations. You must click on the + sign for Number of Calculations to add a calculation. In each case, you will get a dialog box as shown below.



The maximum number of Calculations is 1024. The maximum number of Constants is 999.

When you create a new calculation, you must click on the Save button before you can configure the calculation, as shown below.

Figure 8-3 Saving a New Calculation



8.2.1 Calculations

Add/Delete Calculations

To add a calculation to be configured, click on the (+) where it says Number of Calculation. This will add one calculation to the calculation list. To add more than one calculation at time, enter in the desired number of calculations you wish to configure in the entry box next to Number of Calculation. A message box will appear asking if you want to add ‘X’ number of calculations. Click Ok to accept or click Cancel to discard the changes.

To delete a calculation, click on the (-) where it says Number of Calculation. This will delete the last calculation from the calculation list. To delete more than one calculation, enter the desired number of calculations you wish to maintain in the entry box next to Number of Calculation. A message box will appear asking if you want to delete ‘X’ number of calculations. Click Ok to accept or click Cancel to discard the changes.

Add/Delete Constants

To add a constant to be configured, click on the (+) where it says Number of Constants. This will add one constant to the constants list. To add more than one constant at time, enter in the desired number of constants you wish to configure in the entry box next to Number of Constants. A message box will appear asking if you want to add ‘X’ number of constants. Click Ok to accept or click Cancel to discard the changes.

To delete a constant, click on the (-) where it says Number of Constants. This will delete one calculation from the constants list. Doing this will always result in the last constant in the constants list being deleted. To delete more than one constant, enter the desired number of constants you wish to maintain in the entry box next to Number of Constants. A message box will appear asking if you want to delete 'X' number of constants. Click Ok to accept or click Cancel to discard the changes.

Scan Interval (Sec.)

This is the number of seconds between calculations

8.2.2 Configuring the Parameters of a Calculation

Once you add the number of calculations you wish to configure, you can begin to configure the parameters for each calculation.

Calc

The physical number of the calculation

Result Name

You may accept the default name or type in a name of your choice.

Result Type

From the drop-down menu, select Analog, Binary, Accumulator, or Floating Point.

EGU Min

Enter the Minimum Engineering Units

EGU Max

Enter the Maximum Engineering Units

Inputs Config

Enter the number of inputs for the calculation

After you are satisfied with the parameters of the calculation, you must press the Save button at the bottom of the page before proceeding to configure any calculation.

8.2.3 Configuring a Constant

Once you add the number of constants you wish to configure, you can begin to configure the value for each constant.

Constant Name

You may accept the default name or type in a name of your choice.

Value

This is where you enter in a value for the constant you create

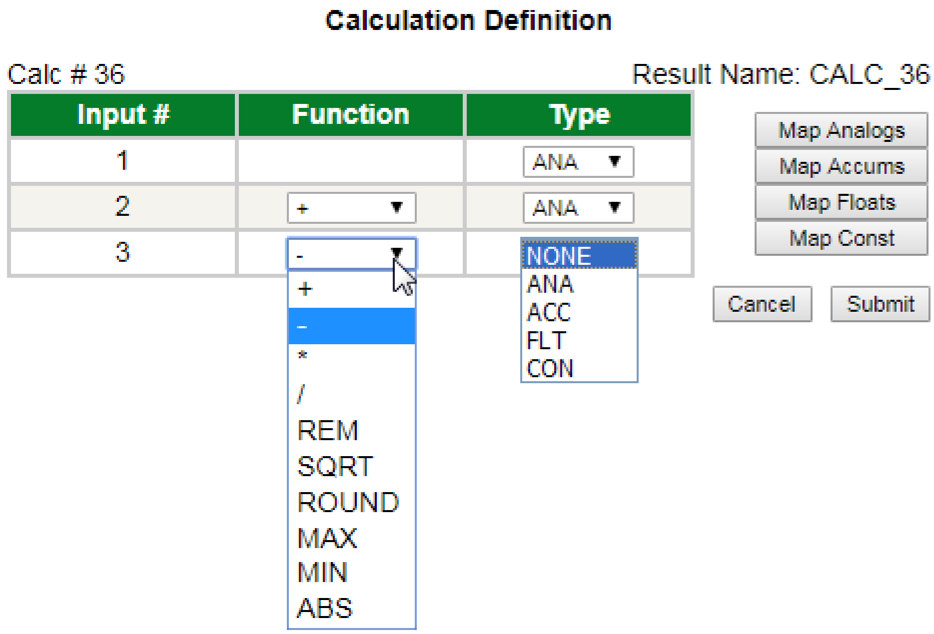
After you are satisfied with the parameters of the constants, you must press the Save button at the bottom of the page.

Note: Any changes made on the configuration page will require you to press the Save button at the bottom of the page before proceeding further.

8.2.4 Configuring a Calculation

Click the Config button for the calculation you wish to configure. The initial Calculation Definition screen is shown below. This example shows four inputs defined for the calculation. You must select types of input for your calculation as well as the type of operation you wish to perform.

Figure 8-4 Calculation Definition



Input

This is the physical Input number.

Function

The Function is the type of operation you want to perform between points. In the illustration above, for instance, physical point # 1 and physical point # 2 will be added. If you click on the drop down box for Function for Input 2 or 3, you can see **+** (Addition), **--** (Subtraction), and **ROUND** (Rounds value to the nearest integer) is available. For the last function the list of available functions grows to include ***** (Multiply), **/** (Divide), **SQRT** (Square Root), and **REM** (Remainder Function: Stores the remainder from a division as the result), **MAX** returns the maximum of the values mapped into the function, **MIN** returns the minimum of the values mapped into the function, and **ABS** returns the Absolute value of the result of the calculations performed in the function.

There is a greater than (>) function which is not seen, that is only available when the result type is set to Binary. It can only be configured to compare two inputs, and the result (binary point) will be closed when Input #1 is greater than Input #2.

Type

This is the type of point which will be mapped into the calculation.

ANA Analog Input

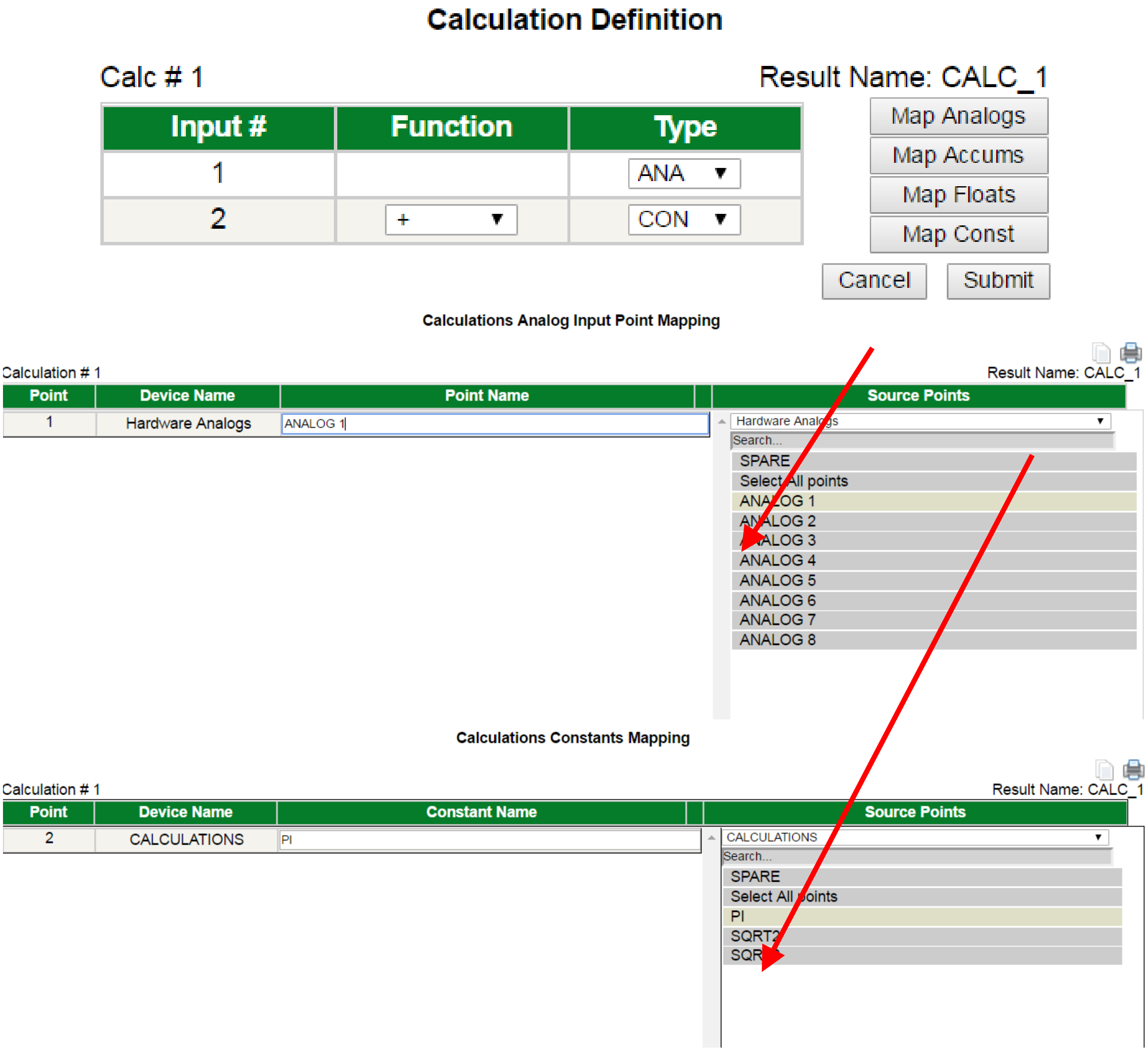
ACC Accumulator

FLT Floating Point

CON Constant

As an example, we choose the + (plus) operation, Hardware Analog 1 for the first type of point, and the constant Pi for the second type as follows. The next step is to Map the ANA and the CON.

Figure 8-5 Calculation Definition and Mapping



8.2.5 Mapping Analogs

Point

This references the Input # from the calculation. In the example, the analog was the first input type, so the Point number is 1.

Device Name

This is where the source point originates

Point Name

The source point mapped from the source device.

Click Submit when you are done mapping, or Cancel to discard the changes.

Note: Pressing Map Accums or Map Floats will display the same type of Point Mapping screen as Map Analogs.

8.2.6 Mapping Constants

From the Calculations Definition page, click on the Map Const button to enter the Constants Mapping Page.

Point

This references the Input # from the calculation. In the example, the constant was the second input type, so the Point number is 2.

Device Name

This is where the source point originates

Point Name

The source point mapped from the source device.

Click Submit when you are done mapping, or Cancel to discard the changes.

Back at the Calculation Definition page, all Functions and Types have been defined and mapped, so click on the Submit button to save the calculation definition. Doing this will send the application back to the Calculation Configuration page. Clicking the Back button will discard any changes made.

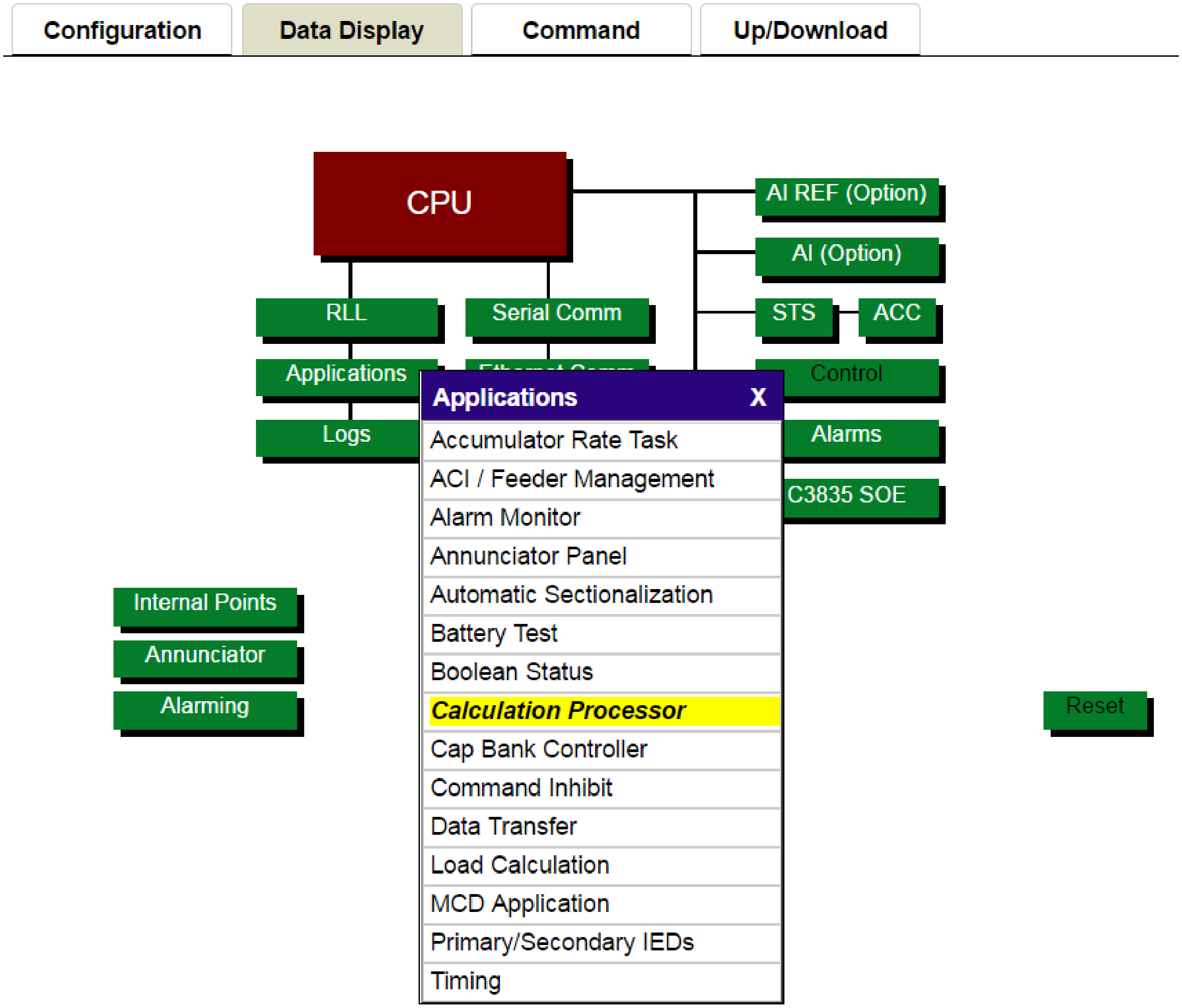
When all calculations have been properly defined, click on the Submit button at the bottom of the Calculation Configuration page.

No configuration changes will take effect until an RTU reset.

8.3 Display

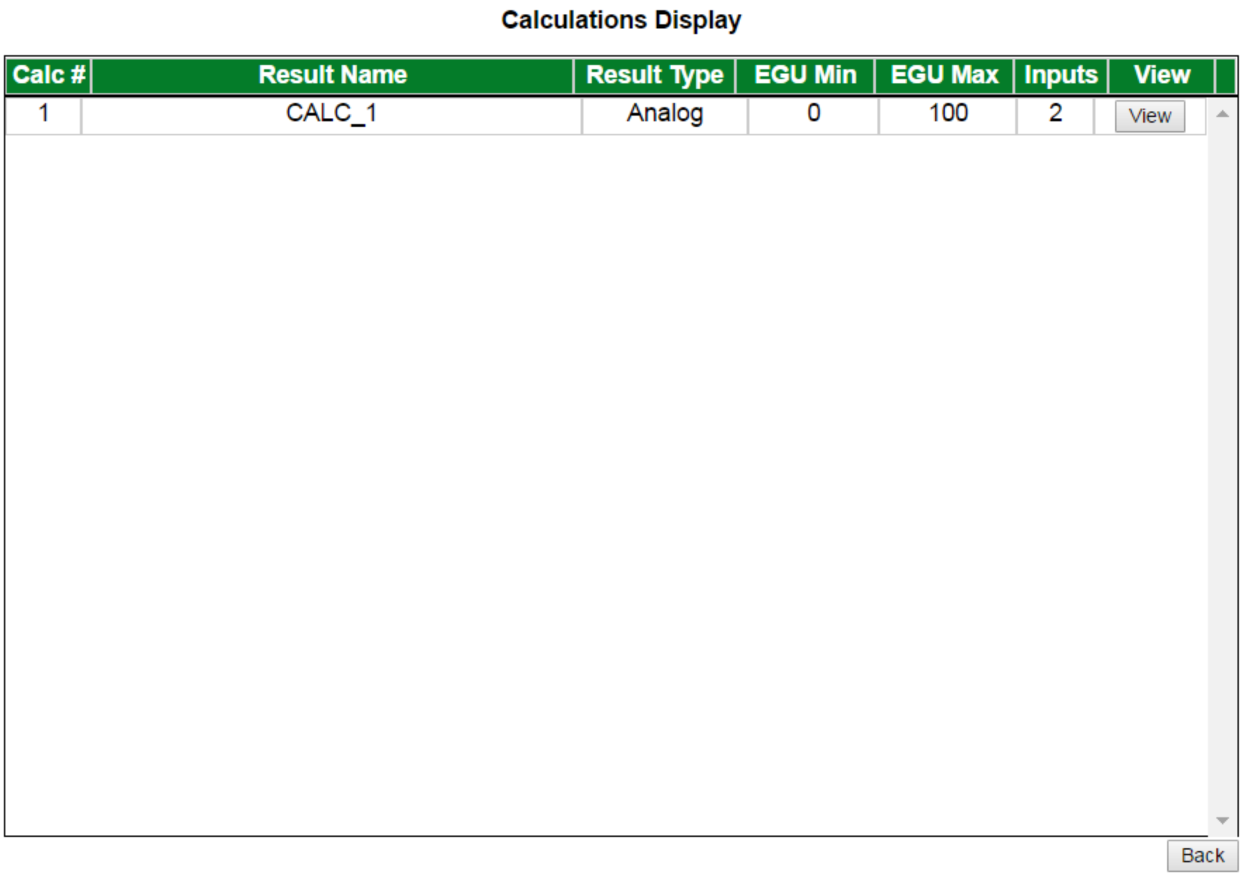
Under the Display tab, choose Calculations from the Applications menu.

Figure 8-6 Data Display



The next screen will appear.

Figure 8-7 Calculations Display



Calc
The physical number of the calculation

Result Name
The name chosen or default name accepted during configuration.

View
Click the View button for any calculation to view the result.

This is the display of CALC_1.

Figure 8-8 Calculation Display

Calculation Display

Calc # : 1 Result Name: CALC_1

Operand	Device Name	Point Name	Type	Function	Value	Quality
1	Hardware Analogs	ANALOG 1	ANA		2047.00000	
2	Calculations	PI	CON	+	3.14159	
3	Calculations	CALC_1	ANA	=	2050.14159	
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-

Back

Calc #:
This is a visual cue to tell the Calculation number which was chosen to be displayed from the Calculation Display page.

Result Name
The name chosen or default name accepted during configuration.

Operand
This is the Input # from the configuration. The last Operand is always the result of the calculation.

Device Name
This is where the source point originates.

Point Name
The source point mapped from the source device.

Type
The input type chosen during configuration.

Function
The type of operation chosen during configuration.

Value
The value of the input type.

Quality

This field displays the health of the source points being utilized in the calculation.

F = Failed or Offline. If any of the inputs to a calculation are failed or offline, the result will also be marked as Failed.

Figure 8-9: Failed Calculation

Calculation Display

Calc # : 1

Result Name: RTU UP

Operand	Device Name	Point Name	Type	Function	Value	Quality
1	RTU Internal Accumulator	UPTIME	ACC		13763.00000	F
2	Calculations	OneTwenty	CON	>	300.00000	
3	Calculations	RTU UP	STS	=	1.00000	F
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-
-	-	-	-		-	-

Back

9 Capacitor Bank Controller

9.1 Introduction

The Capacitor Bank Controller (CBC) application's threshold settings are available for direct modification in Engineering Units through the config@WEB User Interface.

A configurable "voltage rise" parameter is used as the validation criterion for bank selection. A bank is selected if the present bus voltage combined with the bank voltage rise does not exceed the bus voltage constraints.

One of two status points is designated for use as an individual bank "activate/deactivate" point. Note that either this point will be used or the CBC will provide a pseudo SBO control point in the RTU's database for this purpose. The other status point provides a mechanism for a bank "local/remote" switch such that a bank could be temporarily removed from the CBC's control without intervention from the Host system.

CBC mapped points for volts, amps, and VARs are analog input points already configured in the RTU database. Engineering units Max and Min must be defined for these analog inputs so that the CBC application can scale them for comparison to thresholds defined in the configuration.

Changes to the CBC configuration do not take effect until the next reset.

9.2 Configuration

Click on the Applications Block on the Configuration page.

Figure 9-1 Applications Configuration Popup

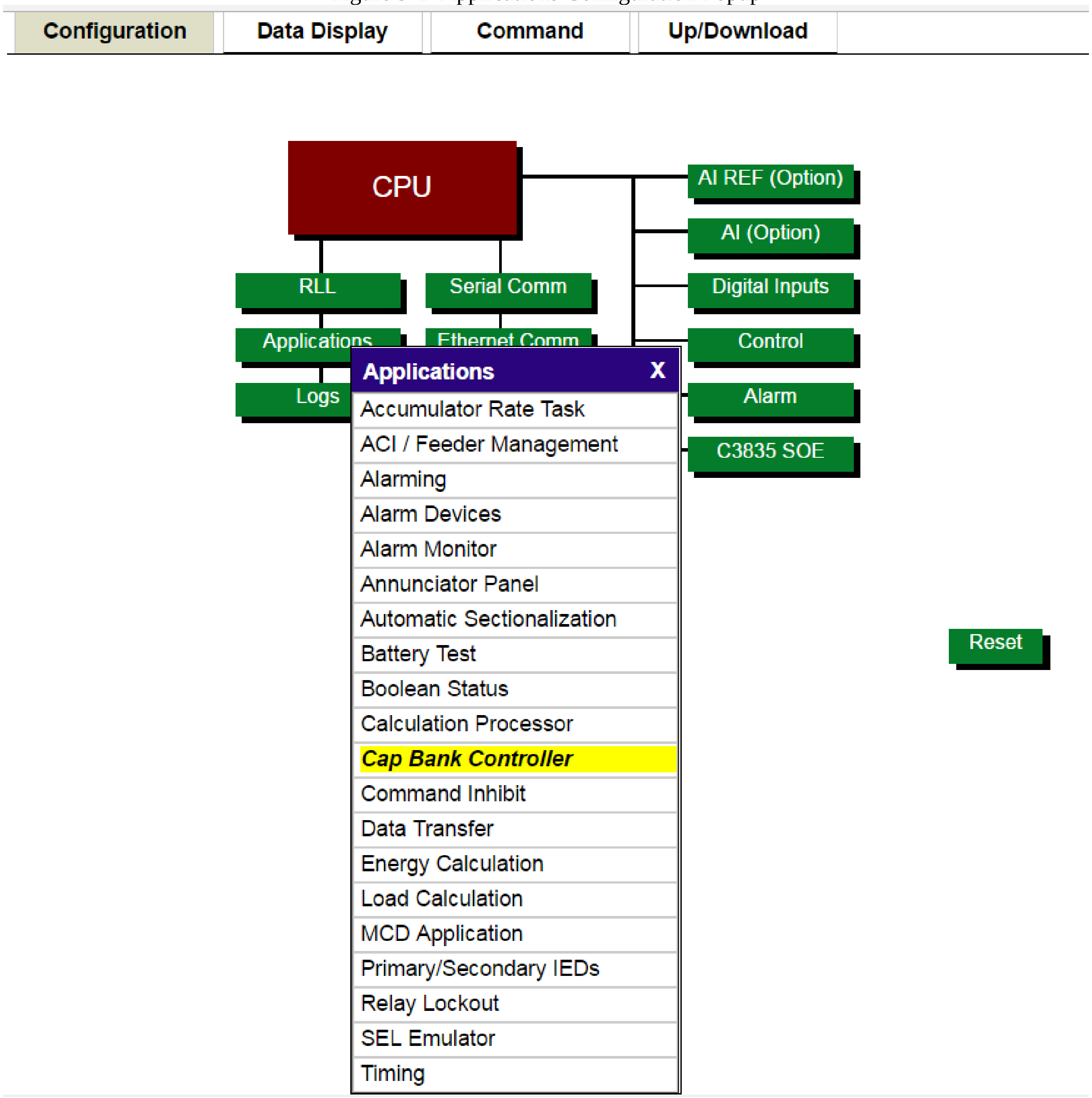


Figure 9-2 Capacitor Bank Controller Configuration

Capacitor Bank Controller Configuration

CBC Configuration		
Task Enabled	○ Yes ◉ No	
High Voltage Threshold	7300	(Trip)
Low Voltage Threshold	7000	(Close)
High Current Threshold	1200	(Close)
Low Current Threshold	10	(Trip)
Reactive Power Upper Threshold	1200000	(Close)
Reactive Power Lower Threshold	-1200000	(Trip)
Reactive Power Imbalance Threshold	2000000	
High Current Deadband (No reactive sensing)	100	
Time Between Operations	1	(Min)
Switch Operation Window	15	(Sec)
Switch Operation Retries	0	
VARs Delta Delay Time	0	(Sec)
Dead Bus Voltage	1300	(V)
Bank Discharge Time	1	(Min)
Event Validation Time	60	(Sec)
Operation Reversal on Bank Failure?	◉ Yes ○ No	
Reactive Power Imbalance Duration	40	(Sec)

Bank Configuration			
	Bank 1	Bank 2	Bank 3
Bank Enabled	Yes ▾	Yes ▾	Yes ▾
Bank Voltage Rise	100	100	100
Bank Reactive Power Rating	113000	113000	113000
Reactive Power Phase Failure Threshold	90000	90000	90000
Maximum Allowable Daily Operations	8	8	8

Point Mapping	
Analog Inputs	Map
Status Inputs	Map
SBO	Map

Cancel Submit

9.2.1 CBC Configuration

Task Enabled

Enter Yes to enable the CBC task.

High Voltage Threshold (Trip)

Enter the higher voltage boundary above which the voltage must rise to activate the CBC event validation algorithm. Default is 7300.

Low Voltage Threshold (Close)

Enter the lower voltage boundary below which the voltage must fall to activate the CBC event validation algorithm. For the CBC, an event is not a fault but a steady-state operation of the system in violation of a threshold value. Default is 7000.

High Current Threshold (Close)

Enter the upper current boundary above which the current must rise to activate the CBC event validation algorithm. Default is 1200.

Low Current Threshold (Trip)

Enter the lower current boundary below which the current must drop to activate the CBC event validation algorithm. Default is 10.

Reactive Power Upper Threshold

Enter the upper reactive power boundary, in VARs, above which the reactive power must rise to activate the CBC event validation algorithm.

Reactive Power Lower Threshold

Enter the lower reactive power boundary, in VARs, below which the reactive power must drop to activate the CBC event validation algorithm.

Reactive Power Imbalance Threshold

Enter the magnitude, in VARs, of the reactive power imbalance magnitude that must exist before the CBC will begin reactive sensing using the total three phase reactive power rather than the individual phase reactive power. These criteria will be used to validate the use of individual phase or total three phase reactive power sensing. Enter -1 to disable the total three-phase/individual phase reactive power sensing switchover logic feature.

High Current Deadband (No reactive sensing)

Enter the current deadband magnitude, in amperes, to define the decrease in current required to re-enable reactive power sensing after a close operation is performed based on the high current threshold. When a high current violation triggers a close operation, reactive power sensing will be ignored subsequent to the successful operation.

When this occurs and as long as the CBC is operating in this state, the "NO REACTIVE" text string will be displayed above the "SINGLE / TOTAL" reactive power mode of operation. (See the Data Display section.)

After such an event, this threshold defines when reactive power sensing will be re-enabled by mandating that the current value decrease a significant amount below the high current threshold before reactive power sensing is re-enabled. When reactive power sensing is re-enabled, the "NO REACTIVE" text string will disappear. (See the Data Display section.) Entering zero for the High Current Deadband can disable this entire feature.

Time Between Operations

Enter the time, in minutes, for the CBC application to wait after an operation before attempting another operation.

Dead Bus Voltage

Enter the voltage below which the CBC is to consider the bus as offline. Any operations planned by the CBC will be canceled if the bus voltage on any phase falls below this value.

Switch Operation Window

This field specifies how long the CBC application waits before checking whether a commanded bank switch operation succeeded or not. This delay is provided to allow time for the switch indications from an IED to make their way back to the RTU through SCADA. The CBC application waits this amount of time after a commanded bank operation before examining the bank switch STS state to determine if the switch operated properly.

Switch Operation Retries

This field specifies how many times the CBC application will try to command a bank switch operation if the first operation is not successful.

VARs Delta Delay Time

This field specifies how long the CBC application waits before checking whether a commanded bank switch operation corrects the measured VARs by at least the Bank Reactive Power Rating. This delay is provided to allow time for the measured VARs from an IED to make their way back to the RTU through SCADA. The CBC application waits this amount of time after a commanded bank operation before examining the new VARs reading to determine if the capacitor bank is operating properly.

Bank Discharge Time

Enter the capacitor bank discharge time, in minutes, such that the bank will be able to fully discharge once it is disconnected from the network. During this time period the CBC will not attempt to perform any operation.

Event Validation Time

Enter the time, in seconds, over which one phase must be in violation of an operating threshold in order to be considered a valid event. Once the event validation time has expired, and the phase is still in violation, the CBC application will attempt corrective measures.

Operation Reversal on Bank Failure?

Click Yes to enable the CBC application to reverse an operation if the reactive power on one or more phases of the bus does not change the minimum amount specified by the "reactive power phase failure threshold" for that bank. Furthermore, the CBC will flag the bank for phase failure and disable the bank for any future use until re-enabled through SBO control by the user. This feature is recommended as it allows the CBC to remove a failed bank and continue operating until the bank can be serviced.

Reactive Power Imbalance Duration

Enter the duration, in seconds, for a relative reactive power imbalance condition to exist before the CBC will begin using total three phase reactive power for the reactive power sensing thresholds. If the CBC is configured to maintain a status point for this condition (refer to Reactive Imbalance Detected"), the status point will be set. This same duration will also be used to validate the use of individual phase reactive thresholds once the relative reactive power balance condition is restored. If the CBC is configured to maintain a status point for this condition (refer to Reactive Imbalance Detected"), the status point will be correspondingly cleared. Also refer to "Reactive Imbalance Detected" and "Reactive Power Imbalance Threshold".

9.2.2 Bank Configuration

Bank Enabled

Enter Yes to allow the CBC application access to this bank and allocate points in the RTU's database. If No is entered, then all other parameters on this menu will be ignored and the bank will not be used by the CBC application. Because the banks are examined in numerical order, any and all banks following the first disabled bank will be ignored. Changes do not take effect until the next reset.

Bank Voltage Rise

Enter the typical increase of voltage associated with connecting this capacitor bank to the network. This value will also be assumed to be the voltage decrease encountered when removing a bank from a network.

Bank Reactive Power Rating

This is the magnitude of the rating of the cap bank in VARs. Capacitive VARs is implied.

Reactive Power Phase Failure Threshold

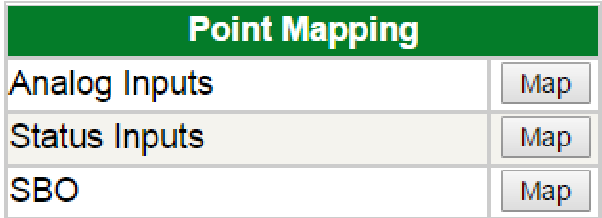
Enter in the minimal amount of change that must be realized from a capacitor bank. This value will be used to determine whether or not one (or more) phase of the bank has failed. Immediately after a close operation, the CBC will measure the reactive power and compare it to the value measured before the control. If the two values do not differ by the reactive power phase failure threshold, the bank will be disabled and could be disconnected from the network -- depending on the configuration of the CBC application. This concept has no meaning for an open operation and therefore a comparison of the reactive power before and after an open operation is not made.

Maximum Allowable Daily Operations

Enter the maximum quantity of bank operations that the CBC application can perform to this bank over the course of a 24 hour period. If this value is reached, the bank will not be used by the CBC until the 24 hour period has elapsed.

9.2.3 Point Mapping

Figure 9-3 Point Mapping



9.2.3.1 Analog Inputs

Map the analog monitoring points for volts, amps, VARs, and total VARs for all three phases.

Figure 9-4 CBC Analog Input Point Mapping

Point

The name of the point. This name is fixed.

Device Name

The name of the device from which the point was mapped.

Point Name

This is the name of the mapped point.

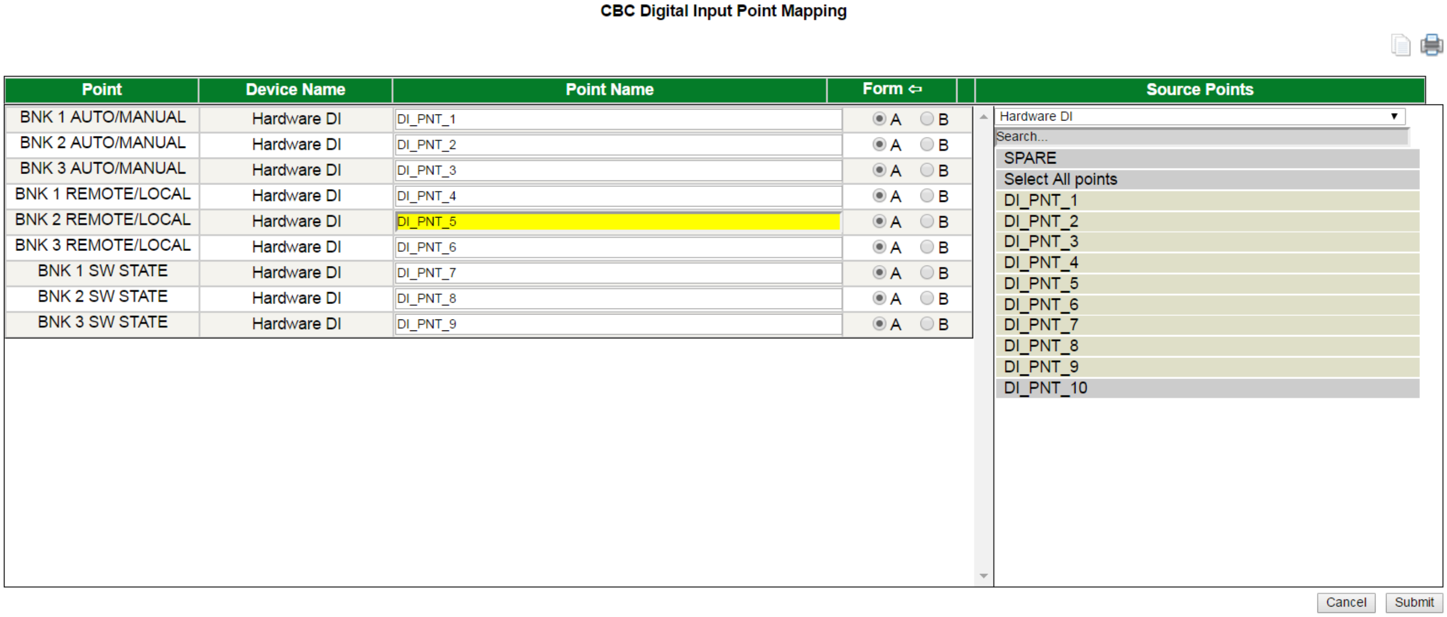
Source Points

The source of the mapping points.

9.2.3.2 Status Inputs

Map the status points for each bank for Remote/Local and Switch State.

Figure 9-5 CBC Status Input Point Mapping



Point

The name of the point. This name is fixed. The meaning of the each name is as follows.

- **BNK *n* AUTO/MANUAL**

This is the RTU point connected to the bank Auto/Manual switch. The role of such a switch is to provide the user with a mechanism by which banks can be temporarily disconnected for maintenance without intervention from the Host systems. Not mapping this point will disable this function for this bank.

- **BNK *n* REM/LOC**

This is the RTU point connected to the bank local/remote switch. The role of such a switch is to provide the user with a mechanism by which banks can be temporarily disconnected for maintenance without intervention from the Host systems. Not mapping this point will disable this function for this bank. Disabling this function will effectively place the bank in the "remote" state.

- **BNK *n* SW STATE**

This is the RTU point connected to the bank switch. The purpose of this point is to indicate whether or not the capacitor bank is connected to the network.

Device Name
The name of the device from which the point was mapped.

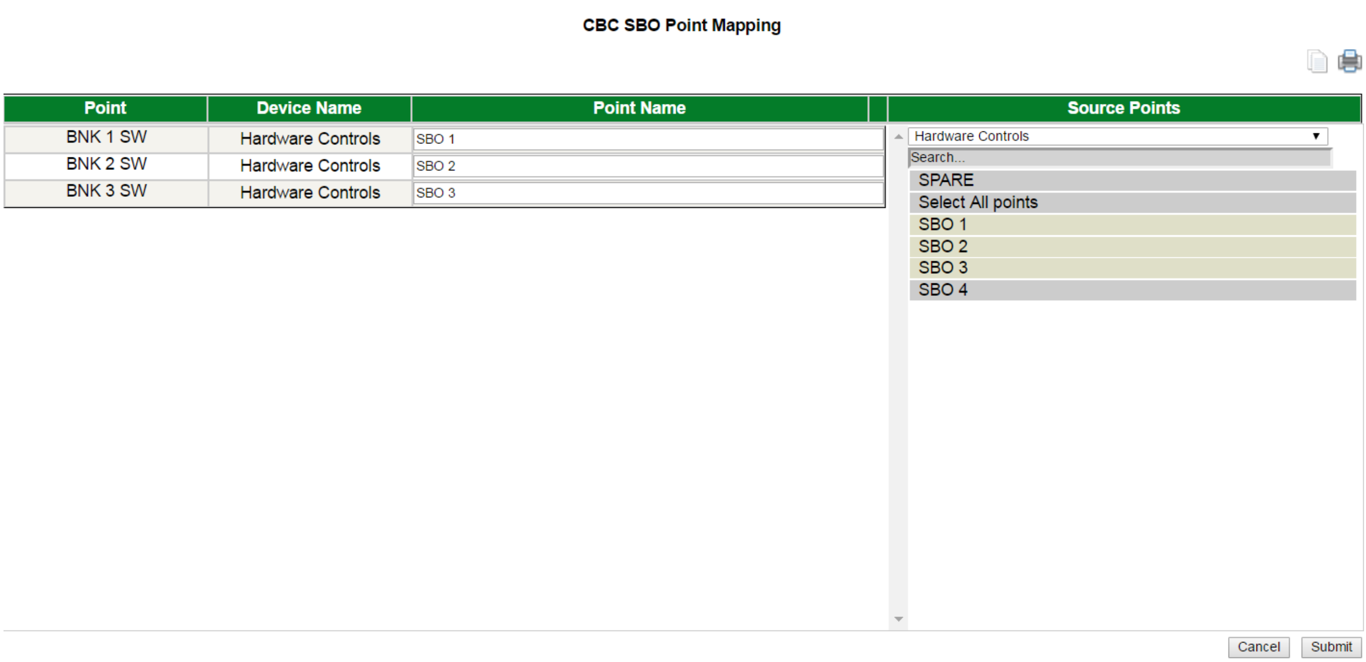
Point Name
This is the name of the mapped point.

Form
You must choose the form of the point mapped: Form A (SPST-NO) or Form B (SPST-NC).

Source Points
The source of the mapping points.

9.2.3.3 SBO
Map the SBOs to be used for CBC switching.

Figure 9-6 CBC SBO Point Mapping



Point
The name of the point. This name is fixed.

Device Name
The name of the device from which the point was mapped.

Point Name
This is the name of the mapped point.

Source Points
The source of the mapping points.

9.3 Data Display

Under the Data Display tab, click on Applications, then select Cap Bank Controller.

Figure 9-7 CBC Data Display

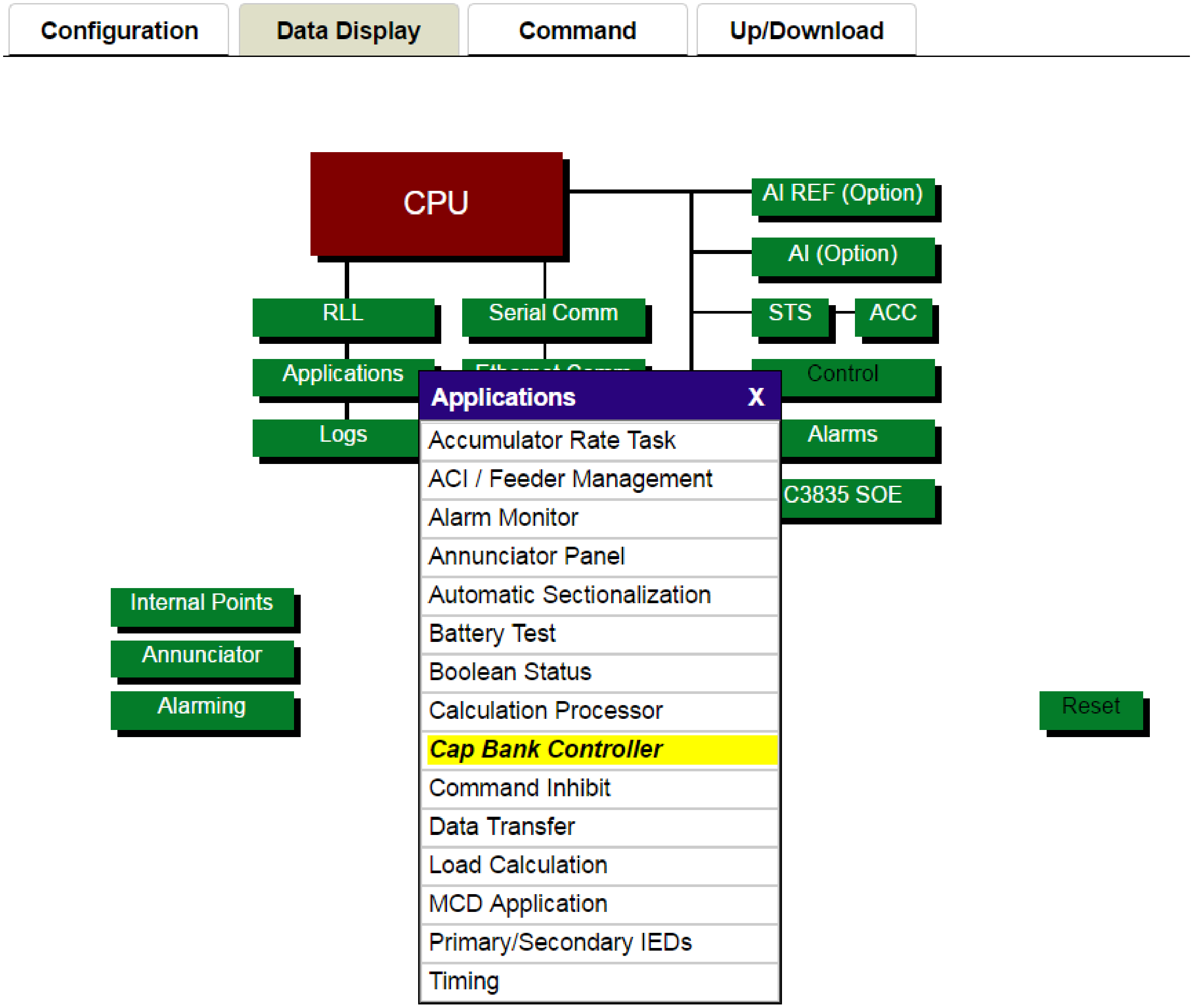


Figure 9-8 Capacitor Bank Controller Display

Capacitor Bank Controller Display

Application Status				
Application Status	RUNNING		**Phase**	**Violations**
Event Validation Timer (s)	0		**A**	
Time Between Operations (s)	0		**B**	
Reactive Power Balance/Imbalance Time (Sec)	0	SINGLE	**C**	

Intended Operation	Bank	SBO	Presently	Violations	Phase
NONE					
Actual Operation					
CANCELLED			O.K.		

Capacitor Bank Data

Bank	Status	Number of Operations		Comments	L/R
		Today	Total		
1	OPEN	0	0	AUTOMATIC	REMOTE
2	OPEN	0	0	AUTOMATIC	REMOTE
3	OPEN	0	0	AUTOMATIC	REMOTE

Phase	Volts	Amps	Vars
A	7200.000	900.000	1100000.000
B	7200.000	900.000	1100000.000
C	7200.000	900.000	1100000.000

Done

9.3.1 Application Status

Application Status

This field denotes the operational status of the CBC application. The following possible messages could appear here:

- **RUNNING** - The CBC application is active and is operating normally
- **INACTIVE** - The CBC application has been deactivated and will not perform any operations to the system.

Event Validation Timer(s)

The present value for the EVT, in seconds, is displayed here. Once the configured limit is reached, the CBC will calculate a solution and immediately implement it. Timers count down to zero.

Time Between Operation(s)

The present value for the TBO timer, in seconds, is displayed here. Once the configured limit is reached, the CBC will proceed with the search for a constraint violation. If the CBC is configured to remove a failed bank from the network, it will validate the need for such an operation immediately upon expiration of this timer. Timers count down to zero.

Reactive Power Balance/Imbalance Time (Sec)

The present value of the "Reactive Power Imbalance Duration" timer is displayed here for diagnostic purposes. This timer will be non zero when the CBC application is timing the transition to either total or individual phase reactive power monitoring. The present monitoring mode used by the CBC application is shown by the SINGLE / TOTAL display immediately to the right of the timer value. SINGLE represents individual phase reactive power monitoring while TOTAL represents total three phase reactive power sensing. Timers count down to zero.

Phase A, B, C

This field depicts the reason for the action about to be taken by the CBC application listed by phase. The possible reasons are:

- **Violations**

- **UV** - The bus has experienced a consistent under voltage event for the time period specified by the "Event Validation Timer".
- **OV** - The bus has experienced a consistent over voltage event for the time period specified by the "Event Validation Timer".
- **UQ** - The bus has experienced a consistent excess of negative reactive power for the time period specified by the "Event Validation Timer". Here, negative reactive power is reactive power delivered to the network by the load.
- **OQ** - The bus has experienced a consistent excess of positive reactive power for the time period specified by the "Event Validation Timer".
- **UC** - The bus has experienced a consistent under current event for the time period specified by the "Event Validation Timer".
- **OC** - The bus has experienced a consistent over current event for the time period specified by the "Event Validation Timer".

Intended Operation

This field denotes the last intended operation, if any, planned by the CBC application. The following messages could appear in this field:

NONE - No operation is planned by the CBC application
CLOSE - The CBC intended to close the bank as indicated by the "Bank" field
OPEN - The CBC intended to open the bank as indicated by the "Bank" field

- **Bank**

This field represents the target bank for operation when the INTENDED OPERATION field indicates an impending operation.

- **SBO**

This field indicates the SBO point that the CBC will operate. This point number should correspond to the SBO point number for that bank as configured in the "Edit Capacitor Bank Controller Setup" menu.

- **Presently**

This field indicates the bank's present connective state as seen by the CBC application. The word "closed" in this field represents a bank that is connected to the network. A combination of diagnostic messages might also be displayed in this and the "comments" column depending on the success of an operation.

- **O.K**. - The operation was performed without incident.
- **NO BANKS ENABLED** - No banks are enabled for use by the CBC application.
- **ALL BANKS CLOSED** - The CBC cannot perform a close operation because all available banks are presently connected to the network.
- **ALL BANKS OPEN** - The CBC could not perform an open operation because all available banks are presently disconnected from the network.

- **BANK UNAVAILABLE** - The CBC deems that an operation is necessary, yet no banks are available for its use.
- **V RISE VIOLATED** - In searching for a solution, the CBC was unable to find a bank such that the voltage constraints could be satisfied.
- **BANK FAILURE** - The CBC has either detected a phase failure or a hardware switching malfunctions for this bank.

- **Violations**

This field depicts the reason for the action about to be taken by the CBC application. The possible reasons are:

- **UV** - The bus has experienced a consistent under voltage event for the time period specified by the "Event Validation Timer".
- **OV** - The bus has experienced a consistent over voltage event for the time period specified by the "Event Validation Timer".
- **UQ** - The bus has experienced a consistent excess of negative reactive power for the time period specified by the "Event Validation Timer". Here, negative reactive power is reactive power delivered to the network by the load.
- **OQ** - The bus has experienced a consistent excess of positive reactive power for the time period specified by the "Event Validation Timer".
- **UC** - The bus has experienced a consistent under current event for the time period specified by the "Event Validation Timer".
- **OC** - The bus has experienced a consistent over current event for the time period specified by the "Event Validation Timer".

- **Phase**

This field indicates the corresponding phase upon which the violation alluded to in the "Violation" field took place. The possible values in this field are:

- **A** – The violation occurred on Phase A.
- **B** – The violation occurred on Phase B.
- **C** – The violation occurred on Phase C.

Actual Operation

This field denotes the last actual operation, if any, planned by the CBC application. The following messages could appear in this field.

- **NONE** – No operation was performed by the CBC application.
- **CLOSE** – The CBC closed the bank as indicated by the "Bank" field.
- **OPEN** – The CBC opened the bank as indicated by the "Bank" field.
- **CANCELED** – The CBC encountered some sort of difficulty and did not perform an operation. The "Presently" and "Comments" fields should be consulted for more diagnostic information.

- **Bank**

This field represents the bank on which the ACTUAL OPERATION was performed.

- **SBO**

This field displays “DEVICE: POINT NAME” that the CBC operated.

- **Presently**

This field displays the same possible messages as the “Intended Operations/Presently” field, with the possible addition of “DEADBUS PRESENT” message.

- **Violations**

This field depicts the reason for the action taken by the CBC application. The possible reasons are:

- **UV** - The bus has experienced a consistent under voltage event for the time period specified by the "Event Validation Timer".
- **OV** - The bus has experienced a consistent over voltage event for the time period specified by the "Event Validation Timer".
- **UQ** - The bus has experienced a consistent excess of negative reactive power for the time period specified by the "Event Validation Timer". Here, negative reactive power is reactive power delivered to the network by the load.
- **OQ** - The bus has experienced a consistent excess of positive reactive power for the time period specified by the "Event Validation Timer".
- **UC** - The bus has experienced a consistent under current event for the time period specified by the "Event Validation Timer".
- **OC** - The bus has experienced a consistent over current event for the time period specified by the "Event Validation Timer".

- **Phase**

This field indicates the corresponding phase upon which the violation alluded to in the "Violation" field took place. The possible values in this field are:

- **A** – The violation occurred on Phase A.
- **B** – The violation occurred on Phase B.
- **C** – The violation occurred on Phase C.

9.3.2 Capacitor Bank Data

The Capacitor Bank Data section provides the user with a historical account of the different capacitor banks.

Bank

This field denotes the bank under discussion.

Status

This field denotes the present status of the capacitor bank. It can have one of two possible values.

- OPEN - The CBC perceives the bank is disconnected from the network.
- CLOSED - The CBC perceives the bank is connected to the network.

Number Of Operations Today

This field informs the user of the number of state changes that have occurred to this bank in a 24 hour period. A 24 hour period is defined as ranging from Midnight of one day to Midnight of the next day.

Number Of Operations Total

This field informs the user of the number of state changes that have occurred to this bank. This counter will eventually reset once the maximum amount of changes has occurred. For a sixteen bit number, the maximum amount of changes is 65535.

Comments

This field provides the user with some additional information that may aid in the interpretation of the data in other fields. Some typical messages that might appear are as follows:

- O.K. – This bank is perceived by the CBC to be operating in a normal and acceptable mode.
- DAILY LIMIT REACHED – The reason for the "DISABLED" status in the "Status" field is due to the fact that the maximum amount of daily operations has been achieved.
- PHASE FAILURE – The reason for the "FAILED" status in the "Status" field is due to the fact that the resultant change in reactive power when this bank was energized did not meet the threshold value specified by the "Reactive Power Phase Failure Threshold".
- SWITCH FAILURE – The CBC has determined that the bank switch failed to operate.
- DIASABLED BY USER – The user has disabled this bank from future use.
- PLACED INTO MANUAL – Local/Remote statuses in LOCAL position.
- AUTOMATIC – Local/Remote statuses in REMOTE position.

L/R

The local/remote field provides the user with the status of the bank, if so configured. The possible values are:

- LOCAL – The bank cannot be operated by the CBC at this time.
- REMOTE – The bank could be operated by the CBC at any time.

Volts, Amps, VARs for All Phases

This box presents the instantaneous values for all three phases.

9.4 CBC Timing Graphs

Figure 9-9 Close Operation Timing

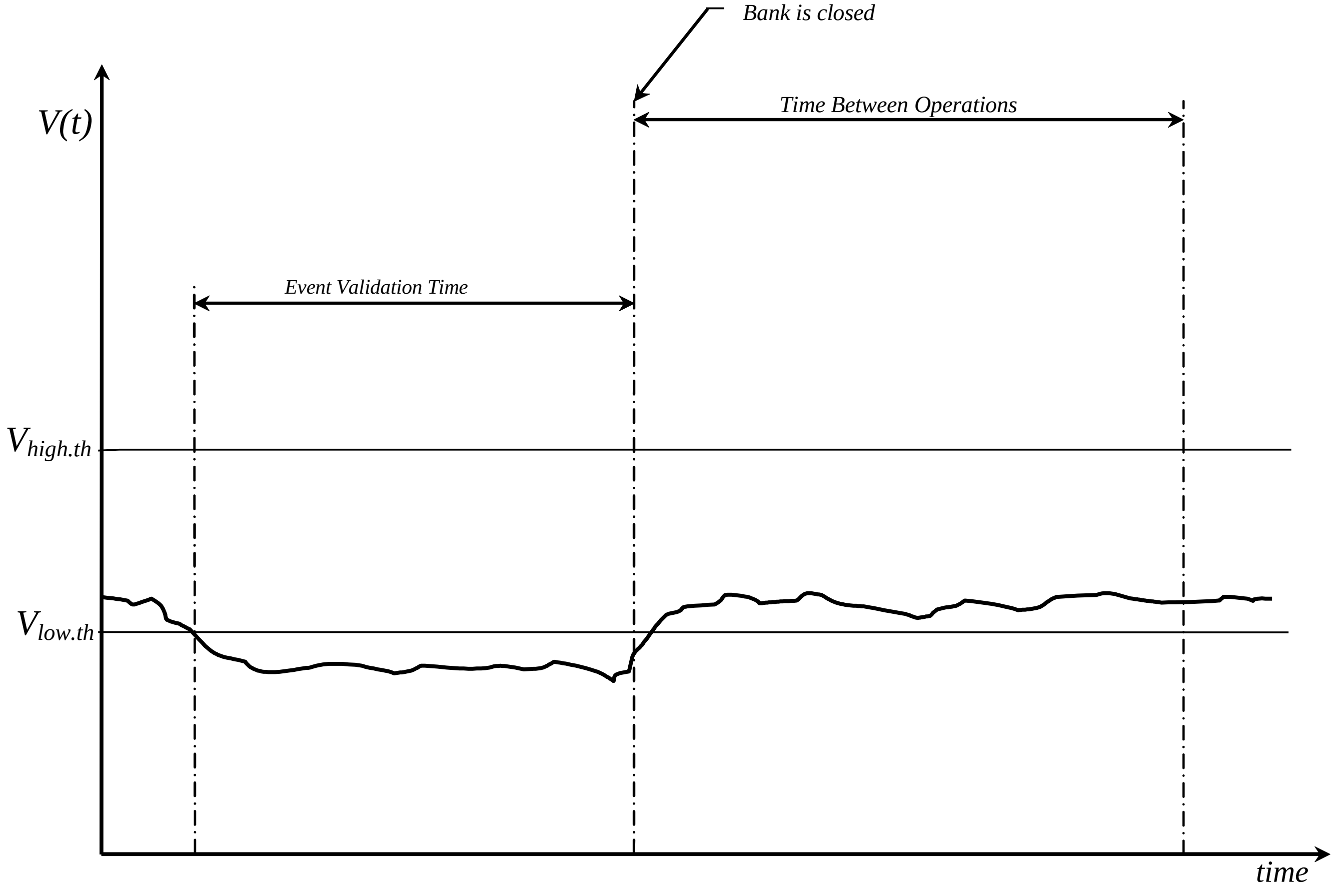


Figure 9-10 Open Operation Timing

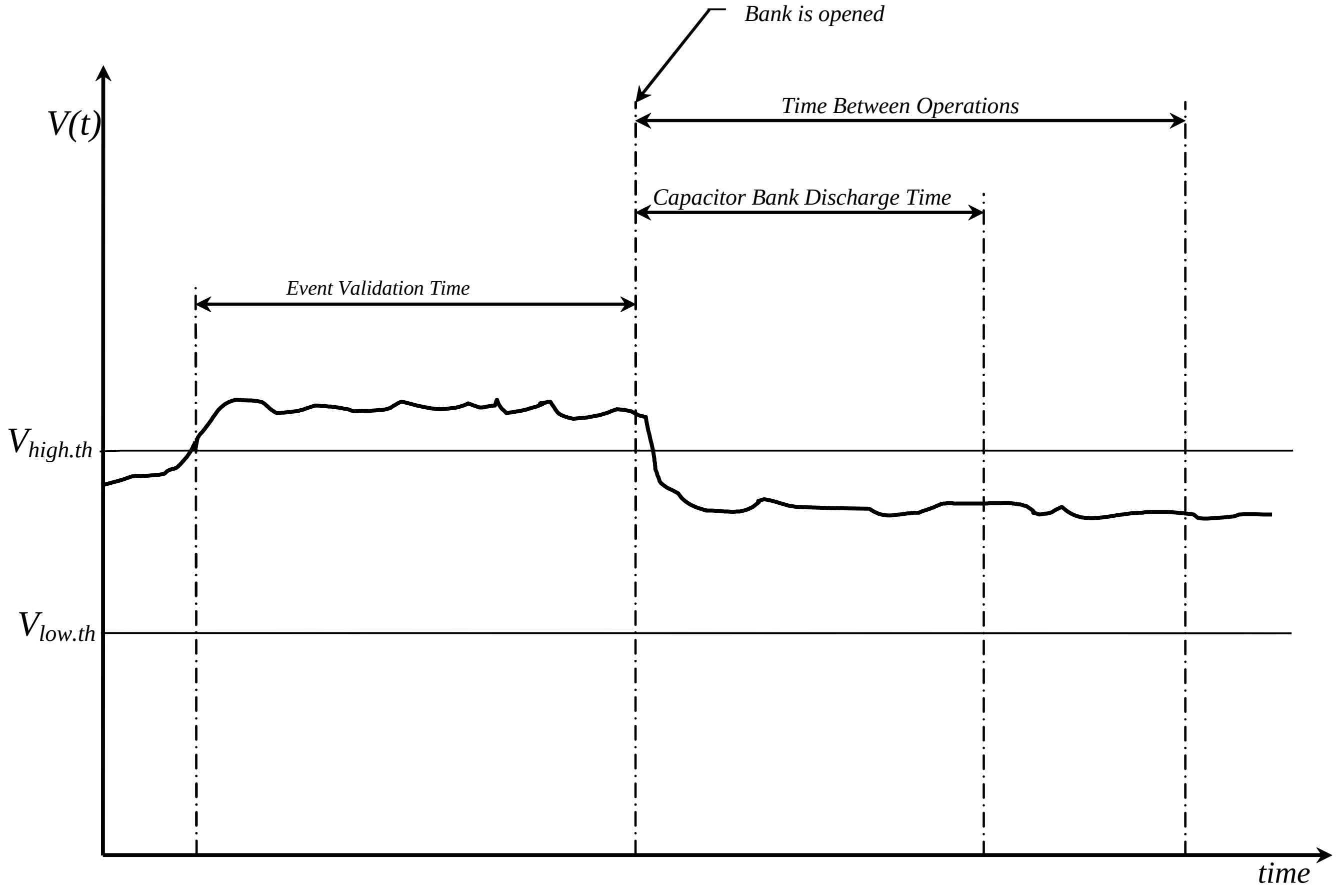
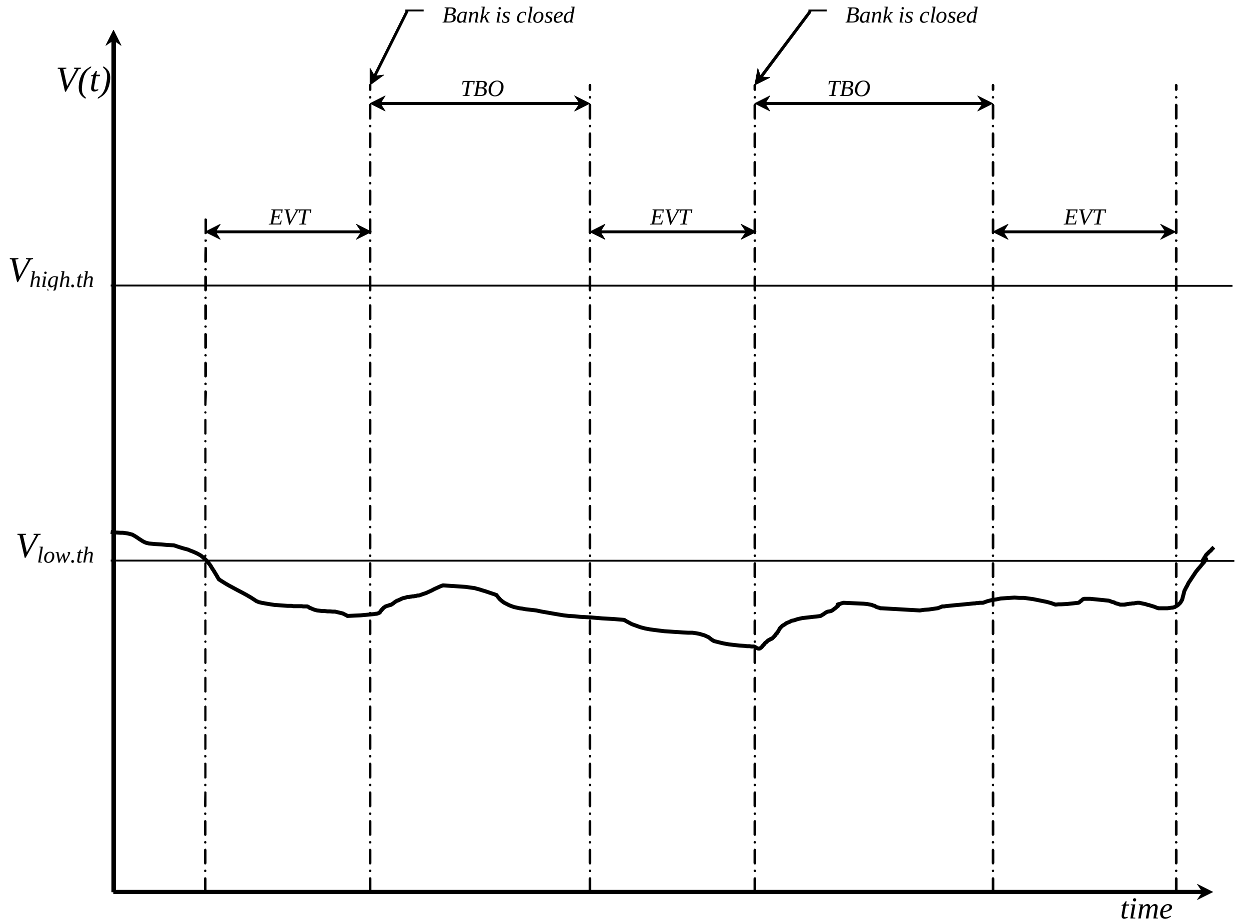


Figure 9-11 highlights the successive operation timing with the modified timing parameters.

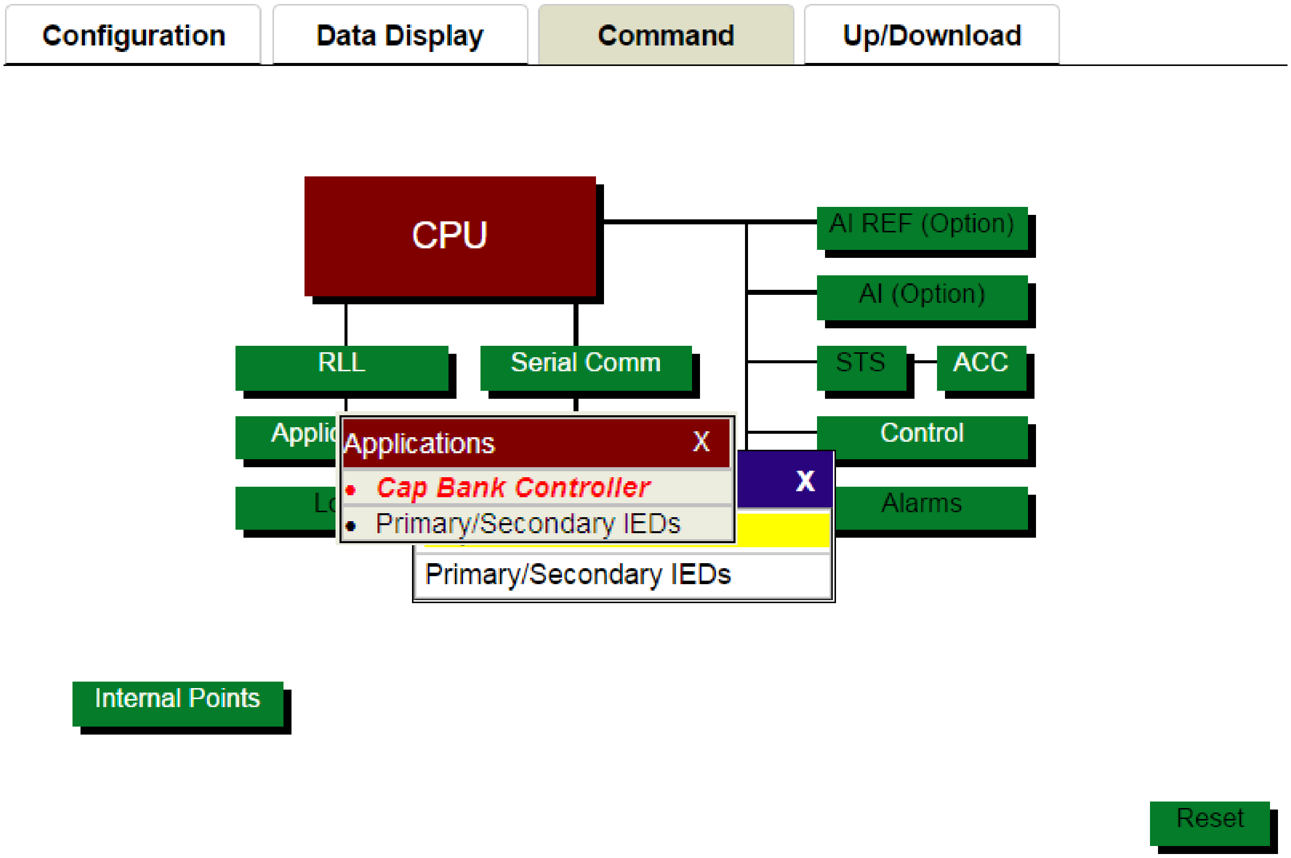
Figure 9-11 Successive Operation Timing



9.5 Command

Click the Command tab, then click Applications, then click Cap Bank Controller as shown below.

Figure 9-12 CBC Commands



Under the proper input conditions, the CBC program will allow local command of the functions shown in the figure below.

Figure 9-13 CBC SBO Outputs Command

Capacitor Bank Controller Controls Command

Point #	Name	Point Operations
0	CBC Activate	Trip Close Execute
1	Bank 1 De/Activate	Trip Close Execute
2	Bank 2 De/Activate	Trip Close Execute
3	Bank 3 De/Activate	Trip Close Execute

Status :

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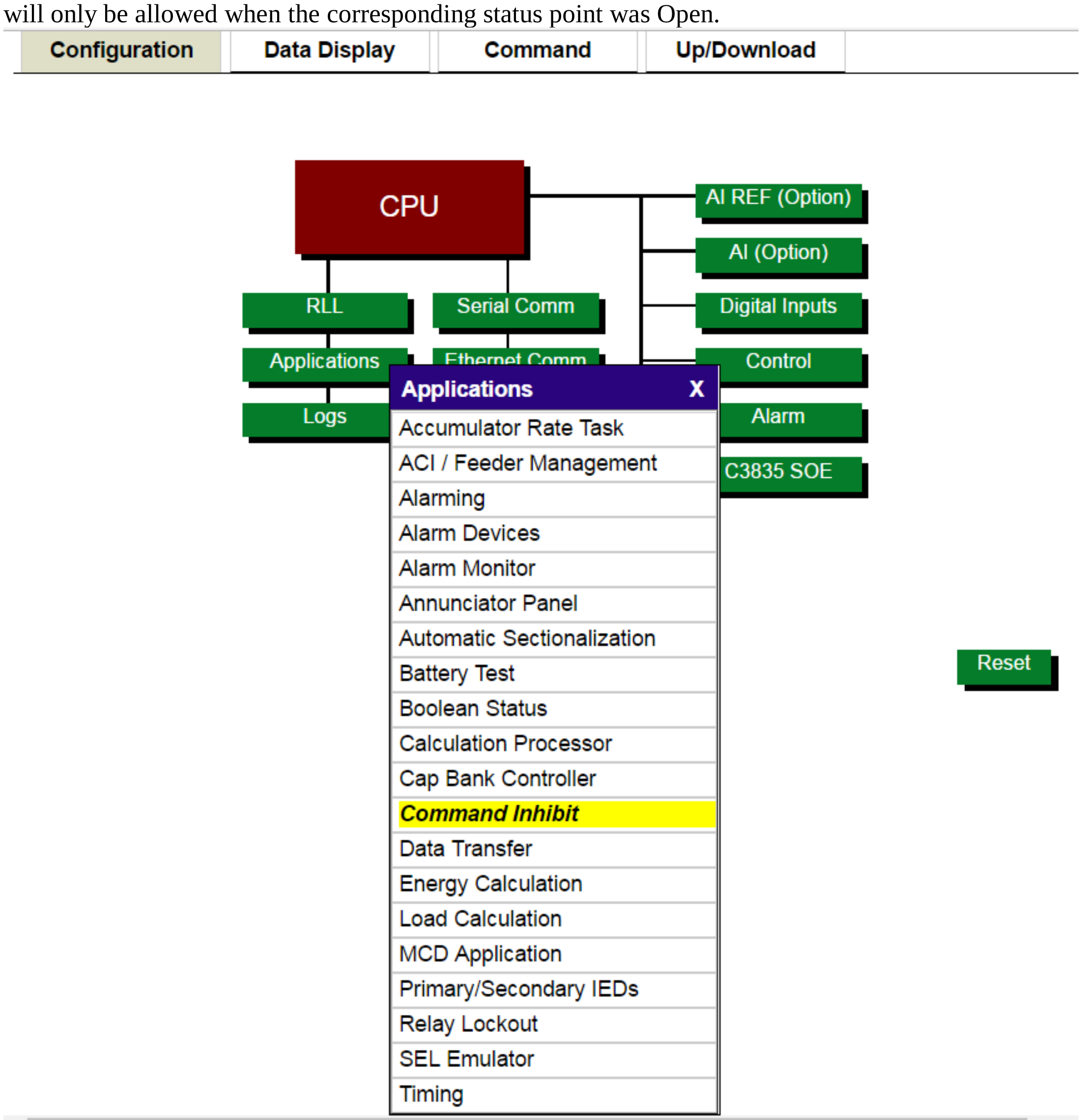
10 Command Inhibit

10.1 Introduction

This application features the ability to have a STS point determine whether a SBO point, Digital Output point or Analog Output point can be commanded. For example, if a certain STS is associated with an SBO point, having that STS point 'set' would inhibit all commanding of that SBO point. The SBO operation will only be allowed when the corresponding status point was Open.



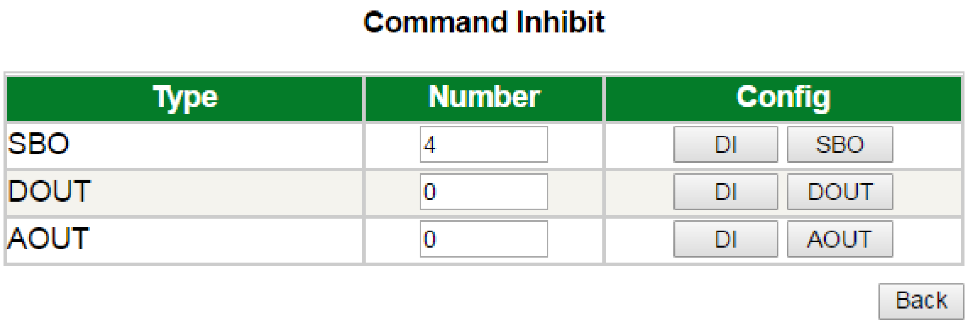
the STS point is 'reset'.

Figure 10-1 Selecting Command Inhibit

10.2 Command Inhibit Configuration

The configuration screen below shows the three different types of Outputs which can be inhibited by mapped digital inputs.

Figure 10-2 Command Inhibit Configuration



Type

SBO, Digital Output (DOUT), Analog Output (AOUT).

Number (0 to 256)

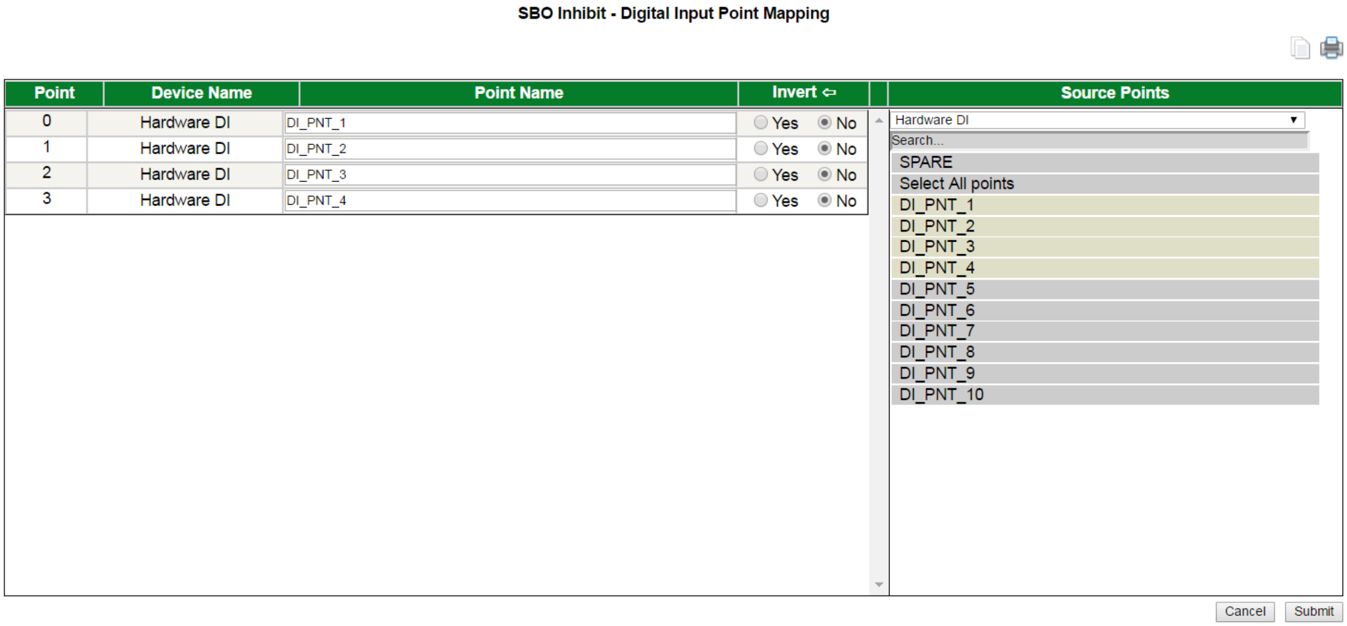
Enter the desired number of STS points to be associated with each of the control output points.

Config

- **DI**

The ‘DI’ button allows the user to map the desired STS point to be used in the association. The STS point to be mapped can be taken from any of the currently existing STS points in the ‘Source Points’ list. The state of the STS point that will inhibit the operation can be inverted by selecting the ‘Yes’ radio buttons. Inverting a STS point will cause that STS point to be considered ‘set’ if state of the STS point is ‘open’, and likewise, the STS point will be considered ‘reset’ if the state of the STS point is ‘closed’.

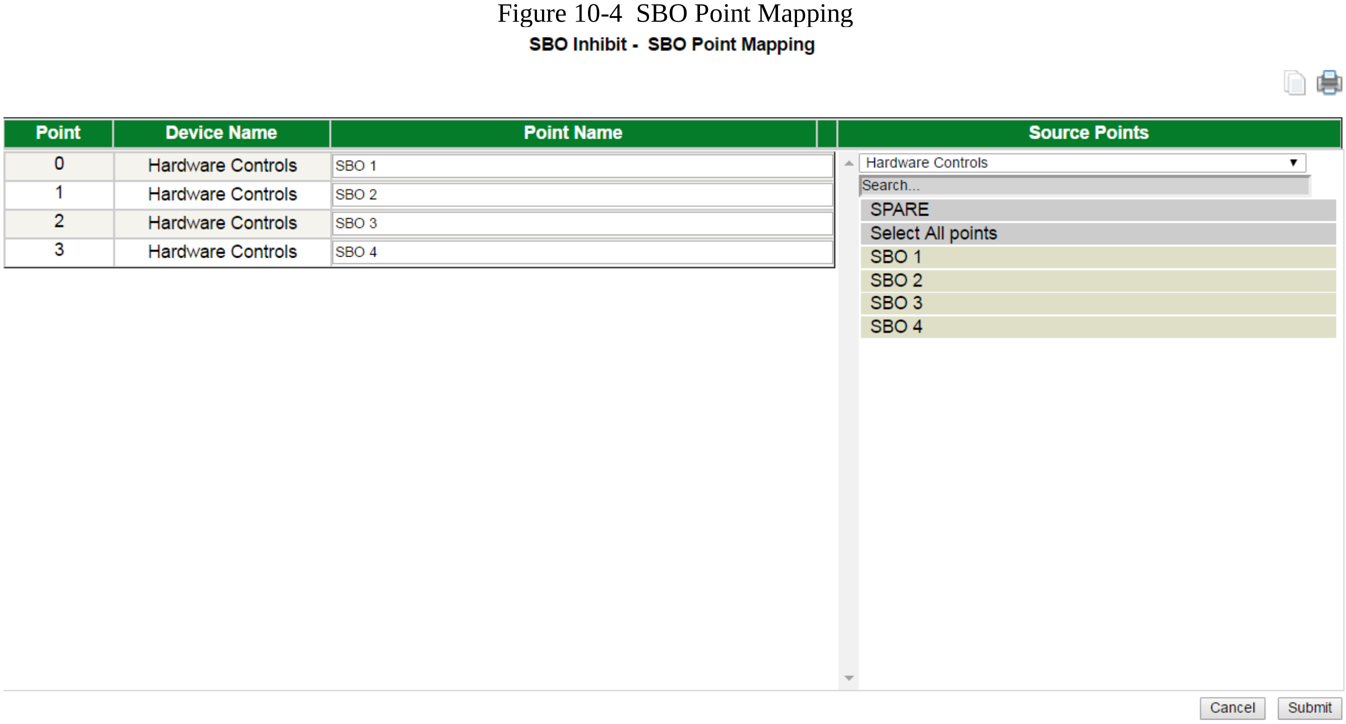
Figure 10-3 DI Point Mapping



- **SBO (or DOUT or AOUT)**

The SBO (or DOUT or AOUT) button allows the user to map the contol point to be used in the association. There is always a single STS point associated with each control point.

Figure 10-4 SBO Point Mapping



The ‘Point’ number on the STS Point Mapping screen correlates to the same ‘Point’ number on the SBO Point Mapping screen. For example, STS point number 0 on the STS Point Mapping screen inhibits the operation of SBO point number 0 on the SBO Point Mapping screen, STS point #1 inhibits SBO point #1, etc.

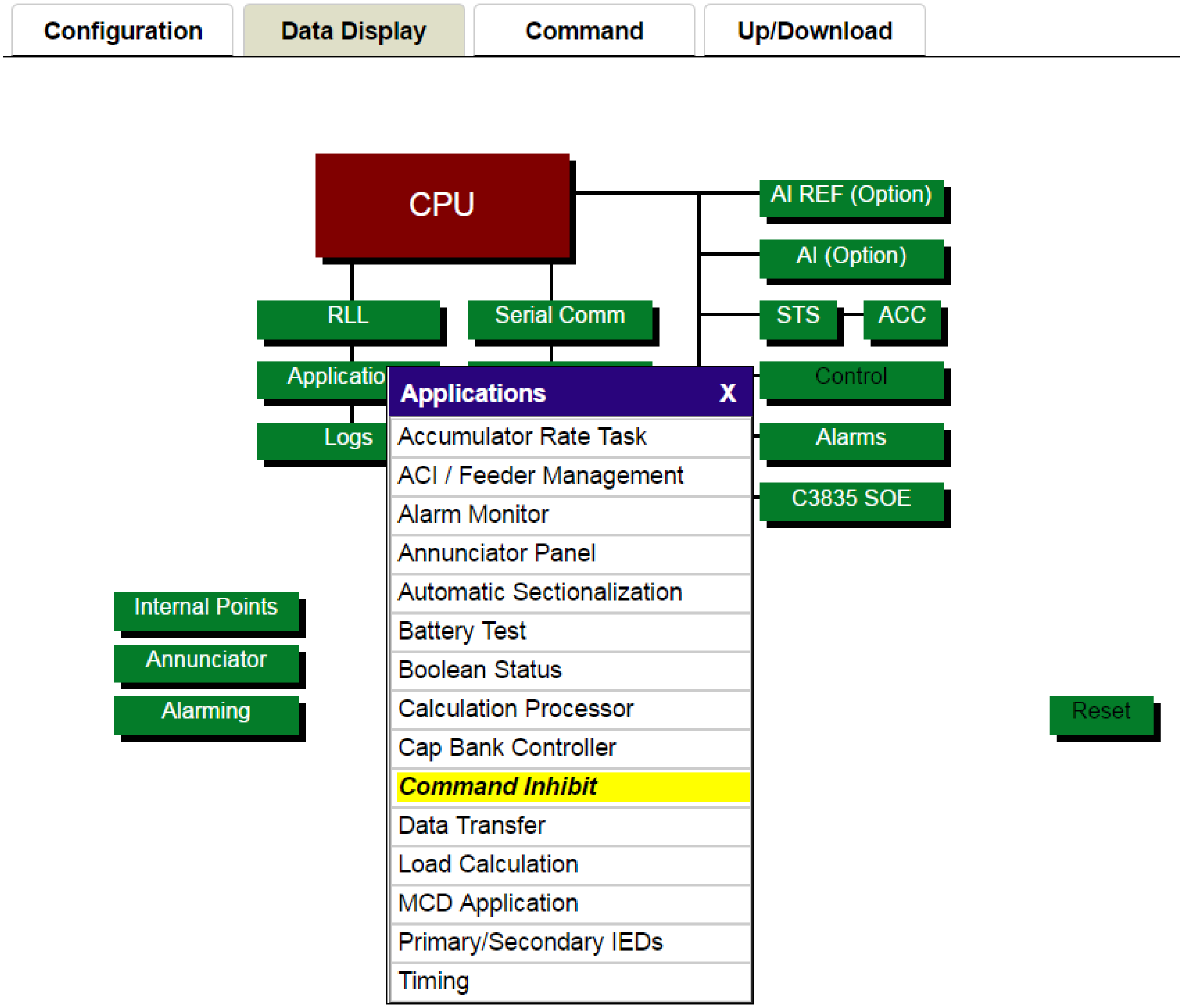
If an SBO point operation is inhibited by an associated STS point, the CTLR task returns a "Select Checkback Fail" error code to the calling task, which is converted to the appropriate communications protocol-specific error code.

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

10.3 Command Inhibit Display

To display the Command Inhibit function, click on Data Display, then Command Inhibit as shown below.

Figure 10-5 Command Inhibit Display



The Command Inhibit Display Screen is shown below.

Figure 10-6 Display of Command Inhibit Point Type

Command Inhibit

Type	Number	Display
SBO	4	View
DOUT	0	View
AOUT	0	View

Back

Type

SBO, Digital Output (DOUT), Analog Output (AOUT).

Number

The number of inhibit pairs configured for each type.

Display

Click the View button to see the current state of each inhibit pair configured.

Click View for the point type of interest (in this example, SBO) to get the screen shown below.

Figure 10-7 SBO Command Inhibit Display

SBO Command Inhibit Display

Point	Control Device	Control Name	Inhibited	Inhibit Device	Inhibit Point	Quality	Value
1	Hardware Controls	RTU Stop/Start All Generators	N	RTU Internal Status	LOCAL		OPEN
2	Hardware Controls	RTU Open/Close Intertie Breaker	N	RTU Internal Status	LOCAL		OPEN
3	Hardware Controls	RTU Stop/Start EILS Mode	N	RTU Internal Status	LOCAL		OPEN
4	Hardware Controls	Spare	N	RTU Internal Status	LOCAL		OPEN
5	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-

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When a command is inhibited by the Command Inhibit task, a log is entered into the System Log as shown below.

Figure 10-8: System Log Message on Command Inhibit

System Log

ID	Date/Time ▼		Task	Function	Message
47047	07/26/2017	18:32:09	DAC	m1x_dac	AOUT "ANA_OUT 1" inhibited by STS "LOCAL"!
47046	07/26/2017	18:31:33	CTLR	proc_sbo	Blocked SBO TRIP (LOCAL) Hardware Controls - RTU Stop/Start All Generat

Point

The point number of the inhibit pair.

Control Device

The Source Device where the (SBO, DO, AO) originates.

Control Name

The (SBO, DO, AO) chosen to be inhibited if the constraints are met.

Inhibited

Y = Yes - Inhibited

N = No - Not Inhibited

Inhibit Device

The Source Device where the Digital Input point originates.

Inhibit Point

The Digital Input point that, when ‘set’, will inhibit the (SBO,DO, AO) point.

Quality

A flag that shows the state of the Digital Input point. This field is blank when the point is online or ‘F’ when the point is offline or failed.

Value

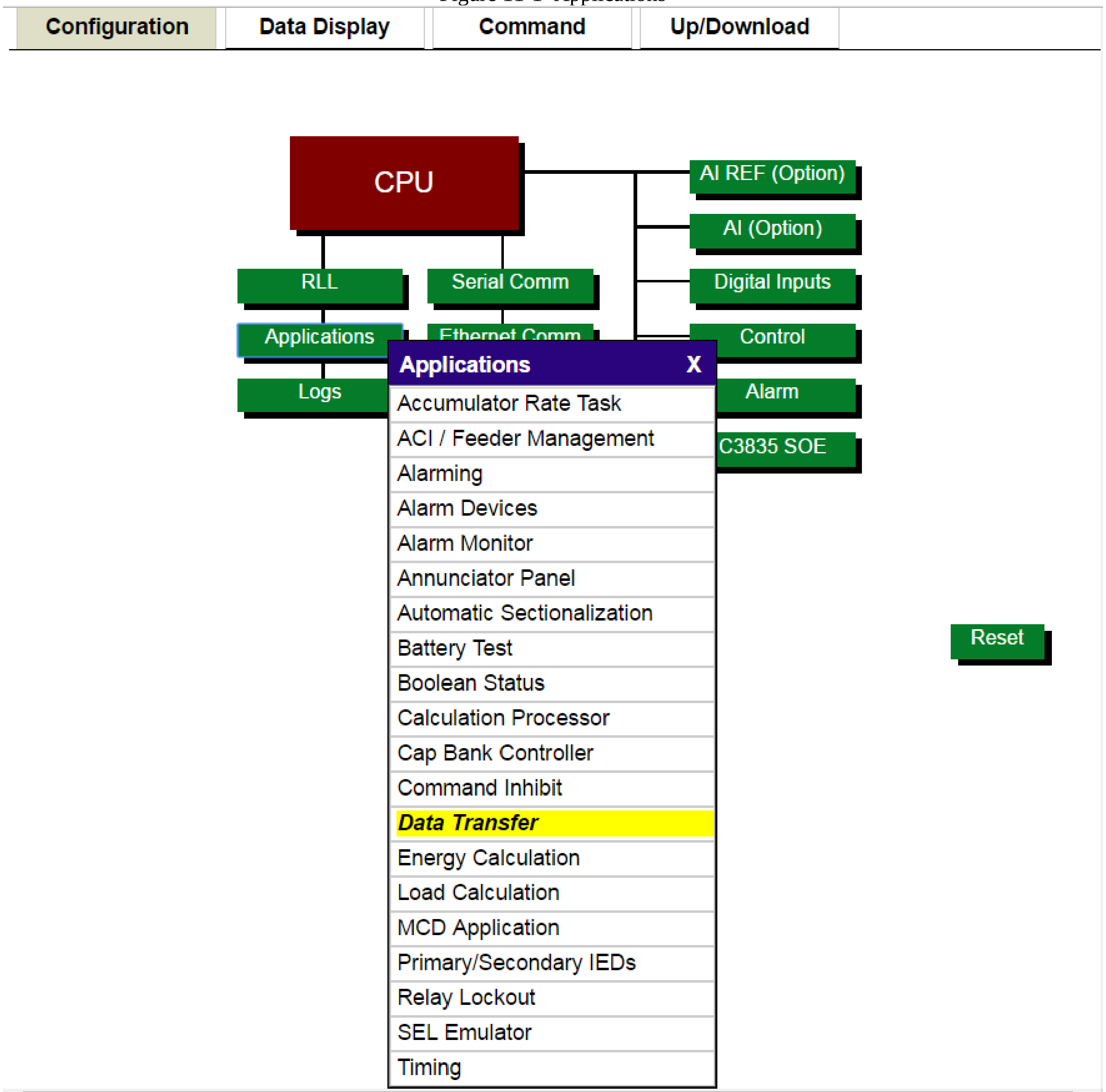
The current state of the Digital Input point.

11 Data Transfer

11.1 Introduction

When you click on the Applications block, the screen shown in below will appear.

Figure 11-1 Applications



Data Transfer is a function that allows transfer of points from one type to another type. This function allows two masters connected to the RTU to communicate regardless of protocol. As an example, Master 1 sends an AO to the RTU that represents a certain power level that it wants Master 2 to generate. The RTU converts the AO to an AI, which Master 2 can read and follow. Notice that the entire process is transparent to the RTU because it relies on point mapping, which is inherent to config@WEB. In using this function, all points referenced are pseudo and do not require or disturb the physical points in any way.

11.2 Configuration

The main Data Transfer screen is shown below. The number of transfer points in each field is limited to 2048.

Figure 11-2 Data Transfer Config

Data Transfer

Type	Number	Config
AO to AI	0	AO-AI
DO to DI	0	DO-DI
AO to Float	0	AO-FLT
AO to ACC	0	AO-ACC
AI to ACC	0	AI-ACC
AI to AO	0	AI AO
DI to DO	13	DI DO
AI32 to ACC	0	AI32-ACC
DI to AI	0	DI-AI

Back

11.2.1 AO to AI

When you click the AO-AI box under, you get a Configuration screen as shown below.

Figure 11-3 Analog Output to Analog Input Configuration

Analog Output to Analog Input Configuration

Point #	Name	C Min	C Max	EGU Min	EGU Max	Rate
0	DXF_AO_ANA_0	-2000	2000	-2000	2000	10
1	DXF_AO_ANA_1	-2000	2000	-2000	2000	10
2	DXF_AO_ANA_2	-2000	2000	-2000	2000	10
3	DXF_AO_ANA_3	-2000	2000	-2000	2000	10

Cancel Submit

Point

The logical point number.

Name

The name of the point to be converted. You may change this or accept the default.

C Min

Enter the Min count number. All entries in this column may be changed at once by clicking on the header.

C Max

Enter the Max count number. All entries in this column may be changed at once by clicking on the header.

EGU Min

Enter a minimum engineering unit value for the point. All entries in this column may be changed at once by clicking on the header.

EGU Max

Enter a maximum engineering unit value for the point. All entries in this column may be changed at once by clicking on the header.

Rate

Enter a time period in seconds at which to perform the conversion. I.E., the default of "10" will convert from AO to AI once every 10 seconds.

Navigation

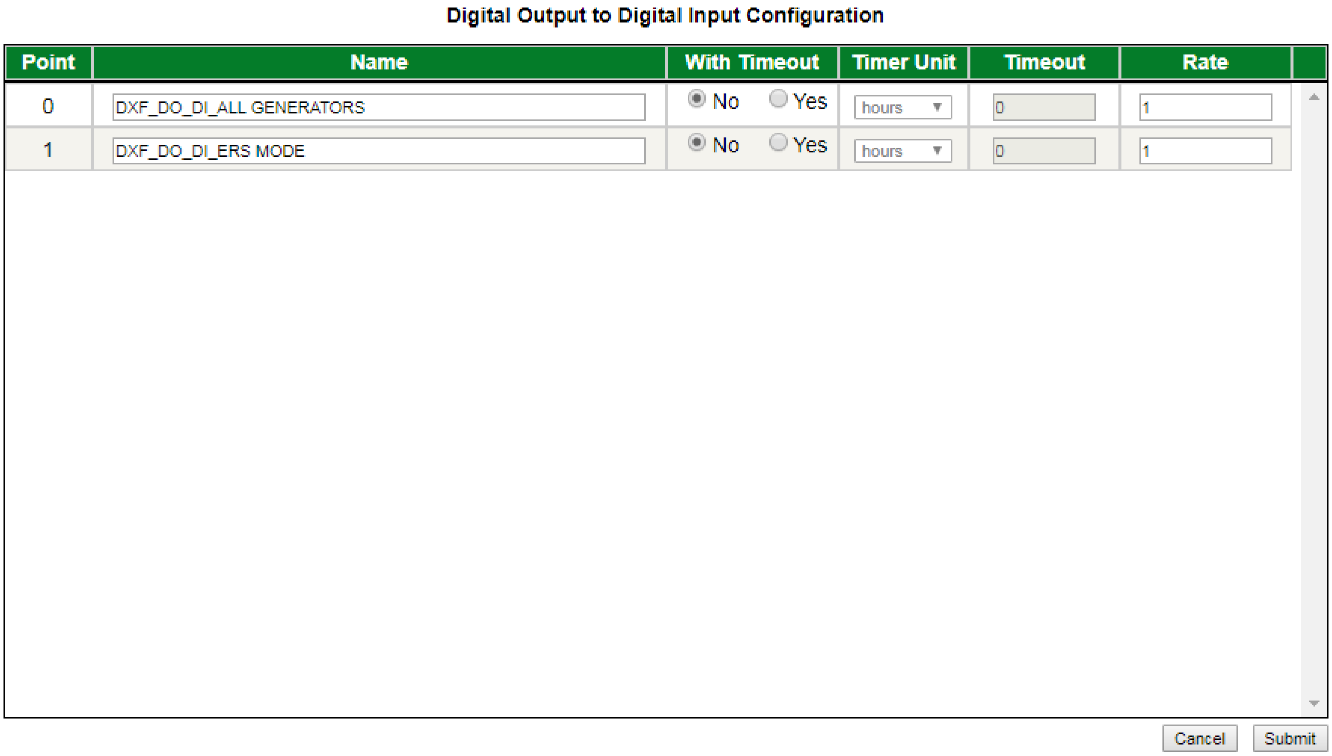
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.2 DO to DI

When you click the DO-DI box, you get a Configuration screen as shown below.

Figure 11-4 Digital Output to Digital Input Configuration



Point
The logical point number.

Name
The name of the point to be converted. You may change this or accept the default.

With Timeout
Click Yes if you want the point to be reset after the specified timeout period.

Timer Unit
Click the drop-down menu to select hours, minutes, or seconds for the time unit for Timeout.

Timeout
Enter the number of time units for Timeout.

Rate
Enter a time period in seconds at which to perform the conversion. I.E., the default of "10" will convert from DO to DI once every 10 seconds.

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.

11.2.3 AO to Float

When you click the AO-Float box under, you get a Configuration screen as shown below. There are two AO sources listed because one 32-bit floating point is comprised of two 16-bit integer AOs.

The AO to Float transfer function is used to move a 32-bit IEEE-754 format floating point number from two 16-bit integer Analog Output points to a RTU floating point database point. The analog output named in the LO column is the least significant 16 bits of mantissa and the analog output point named in the HI column is the most significant 7 bits of the mantissa, exponent of 8 bits and a sign bit. Typically, the two AO inputs are mapped to MTU to RTU protocol analog output points.

Figure 11-5 Analog Output to Floating Point Configuration

Analog Output to Floating Point Configuration

Point	FLT Point Name	AO 1 Name (LO)	AO 2 Name (HI)	Rate
0	DXF_AO_FLT 0	DXF_AO_FLT 0-1	DXF_AO_FLT 0-2	10
1	DXF_AO_FLT 1	DXF_AO_FLT 1-1	DXF_AO_FLT 1-2	10
2	DXF_AO_FLT 2	DXF_AO_FLT 2-1	DXF_AO_FLT 2-2	10
3	DXF_AO_FLT 3	DXF_AO_FLT 3-1	DXF_AO_FLT 3-2	10

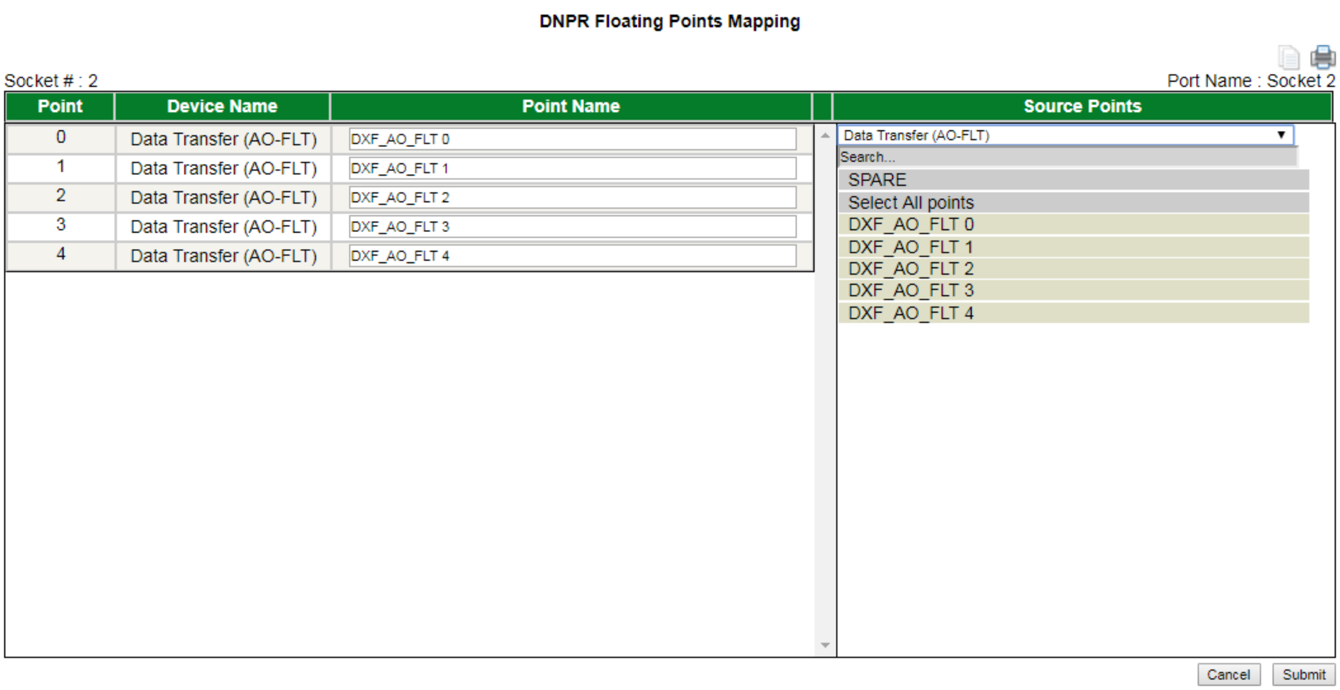
Point

The logical point number.

FLT Point Name

The name of the resultant floating point. You may change this or accept the default. This value can be mapped to a protocol or application as needed by the user's desired application.

Figure 11-6: Map the Resulting Floating Point to a Protocol



AO 1 Name (LO)

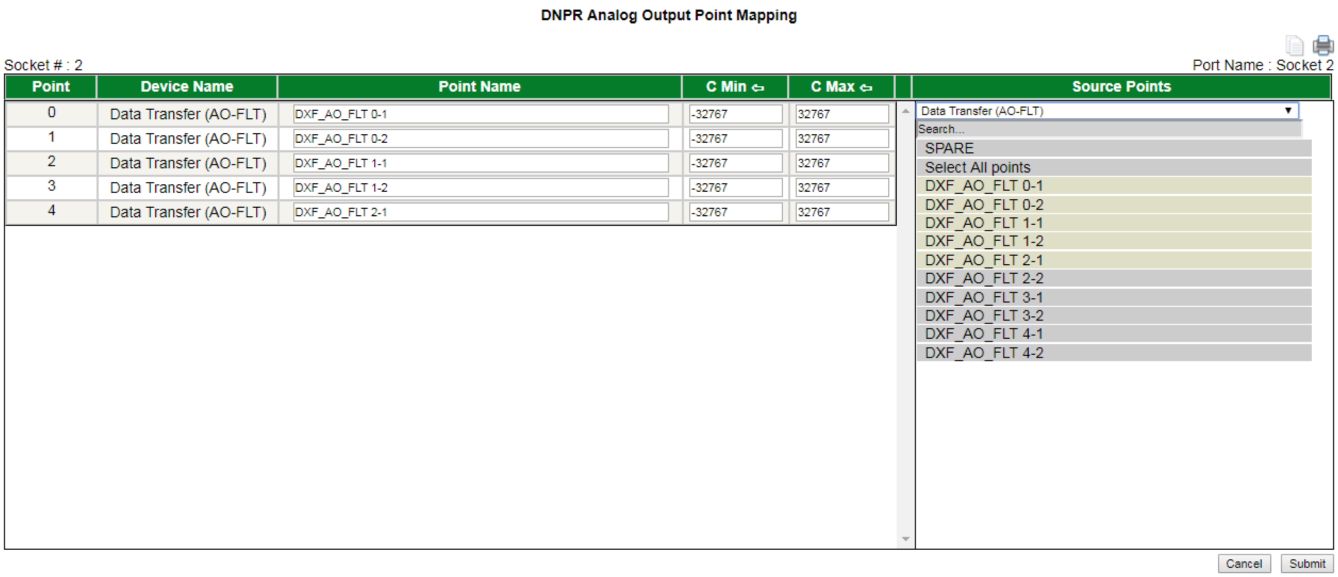
The name of the least significant bits of the mantissa of the AO to be converted. You may change this name or accept the default.

AO 2 Name (HI)

The name of the most significant bits of the mantissa, exponent and sign bit of the 16-bit AO to be converted. You may change this name or accept the default.

The user will map the source Analog Output points to a protocol or application which can manage the AO values which will be translated to the Floating point value.

Figure 11-7: Map the Source Analog Output Values



DNPR Analog Output Point Mapping

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name	C Min ⇔	C Max ⇔
0	Data Transfer (AO-FLT)	DXF_AO_FLT 0-1	-32767	32767
1	Data Transfer (AO-FLT)	DXF_AO_FLT 0-2	-32767	32767
2	Data Transfer (AO-FLT)	DXF_AO_FLT 1-1	-32767	32767
3	Data Transfer (AO-FLT)	DXF_AO_FLT 1-2	-32767	32767
4	Data Transfer (AO-FLT)	DXF_AO_FLT 2-1	-32767	32767

Source Points

Data Transfer (AO-FLT)

Search...

SPARE

Select All points

DXF_AO_FLT 0-1

DXF_AO_FLT 0-2

DXF_AO_FLT 1-1

DXF_AO_FLT 1-2

DXF_AO_FLT 2-1

DXF_AO_FLT 2-2

DXF_AO_FLT 3-1

DXF_AO_FLT 3-2

DXF_AO_FLT 4-1

DXF_AO_FLT 4-2

Cancel Submit

Rate

Enter a time period in seconds at which to perform the conversion. The default of "10" will convert once every 10 seconds.

Navigation

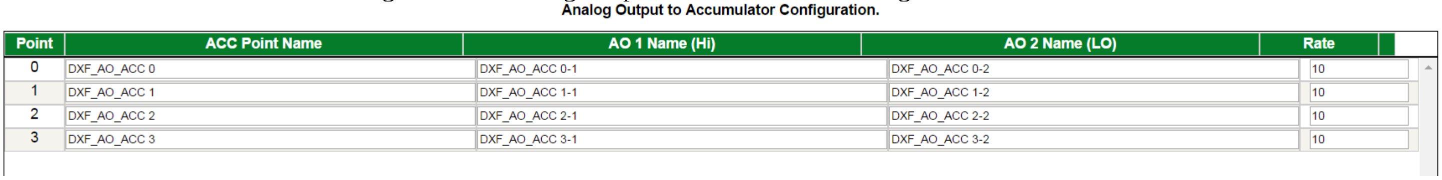
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.4 AO to ACC

When you click the AO-ACC box, you get a Configuration screen as shown below. There are two AO sources listed because one 32-bit Accumulator point is comprised of two 16-bit AOs.

Figure 11-8 Analog Output to Accumulator Configuration



Analog Output to Accumulator Configuration.

Point	ACC Point Name	AO 1 Name (Hi)	AO 2 Name (LO)	Rate
0	DXF_AO_ACC 0	DXF_AO_ACC 0-1	DXF_AO_ACC 0-2	10
1	DXF_AO_ACC 1	DXF_AO_ACC 1-1	DXF_AO_ACC 1-2	10
2	DXF_AO_ACC 2	DXF_AO_ACC 2-1	DXF_AO_ACC 2-2	10
3	DXF_AO_ACC 3	DXF_AO_ACC 3-1	DXF_AO_ACC 3-2	10

Point

The logical point number.

ACC Point Name

The name of the resultant accumulator point. You may change this or accept the default.

AO 1 Name (Hi)
The name of the high byte to be converted. You may change this or accept the default.

AO 2 Name (LO)
The name of the low byte to be converted. You may change this or accept the default.

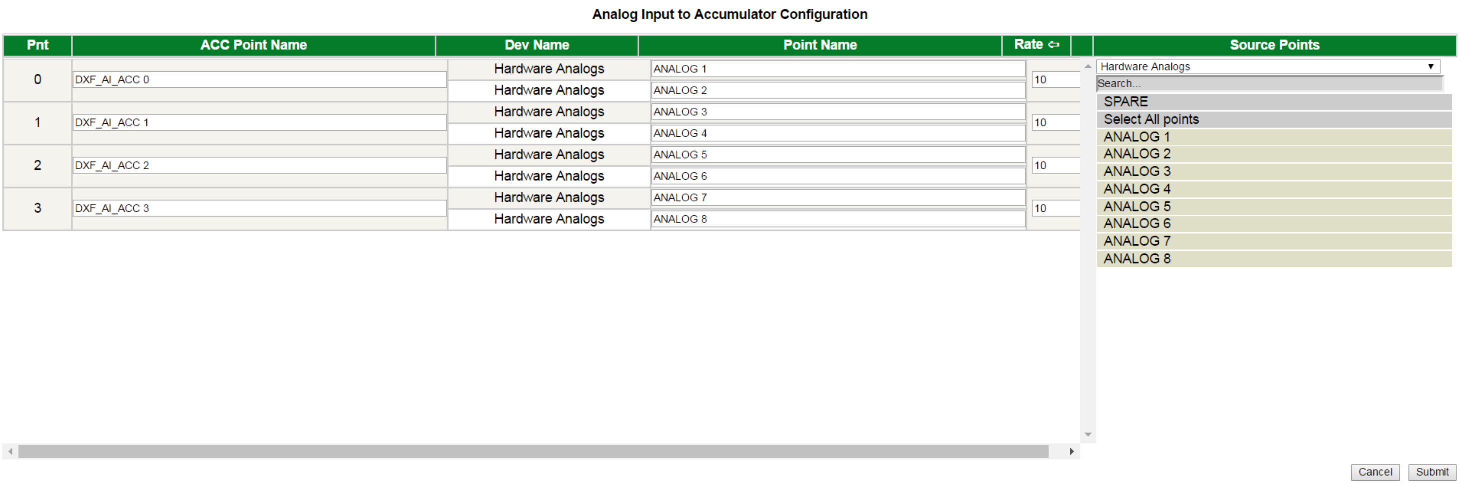
Rate
Enter a time period in seconds at which to perform the conversion. I.E., the default of “10” will convert once every 10 seconds.

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.

11.2.5 AI to ACC
When you click the AI-ACC box, you get a Configuration screen as shown below. You must select two AI sources for every ACC point you wish to create because one 32-bit Accumulator point is comprised of two 16-bit AIs.

Figure 11-9 Analog Input to Accumulator Configuration



Pnt
The logical point number.

ACC Point Name
The name of the resultant accumulator point. You may change this or accept the default.

Dev Name
The name of the device from which the point originated.

Point Name
The name of the AI points to be converted. The Analog value in the top box becomes the High Word in the 32-bit ACC.

Rate
Enter a time period in seconds at which to perform the conversion. I.E., the default of “10” will convert once every 10 seconds.

Source Points

Select AI points to transfer.

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.

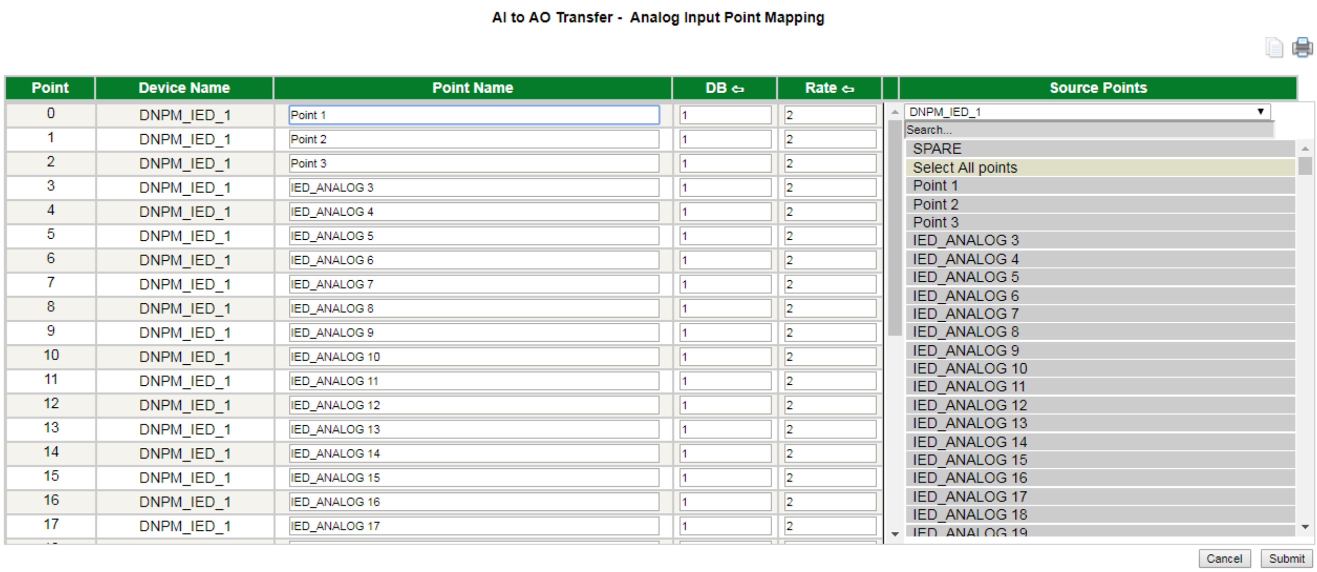
11.2.6 AI to AO

The AI to AO transfer is mapped in two parts; AI mapping, and AO mapping.

11.2.6.1 AI Mapping

When you click the AI box the AI to AO, you get a Configuration screen as shown below.

Figure 11-10 AI Configuration



Point

The logical point number.

Device Name

The name of the device from which the point originated. This is derived from the Source Points on the right of the screen.

Point Name

The name of the point to be converted. This is derived from the Source Points on the right of the screen.

DB

This is the deadband. The conversion will not take place if the AI does not change beyond the deadband count from one conversion to the next. A zero deadband implies that the point will convert every time.

Rate

Enter a time period in seconds at which to perform the conversion. I.E., the default of "1" will convert once every 1 second.

Source Points

From the drop-down list, select the source device and the source points to be used in the conversion.

Navigation

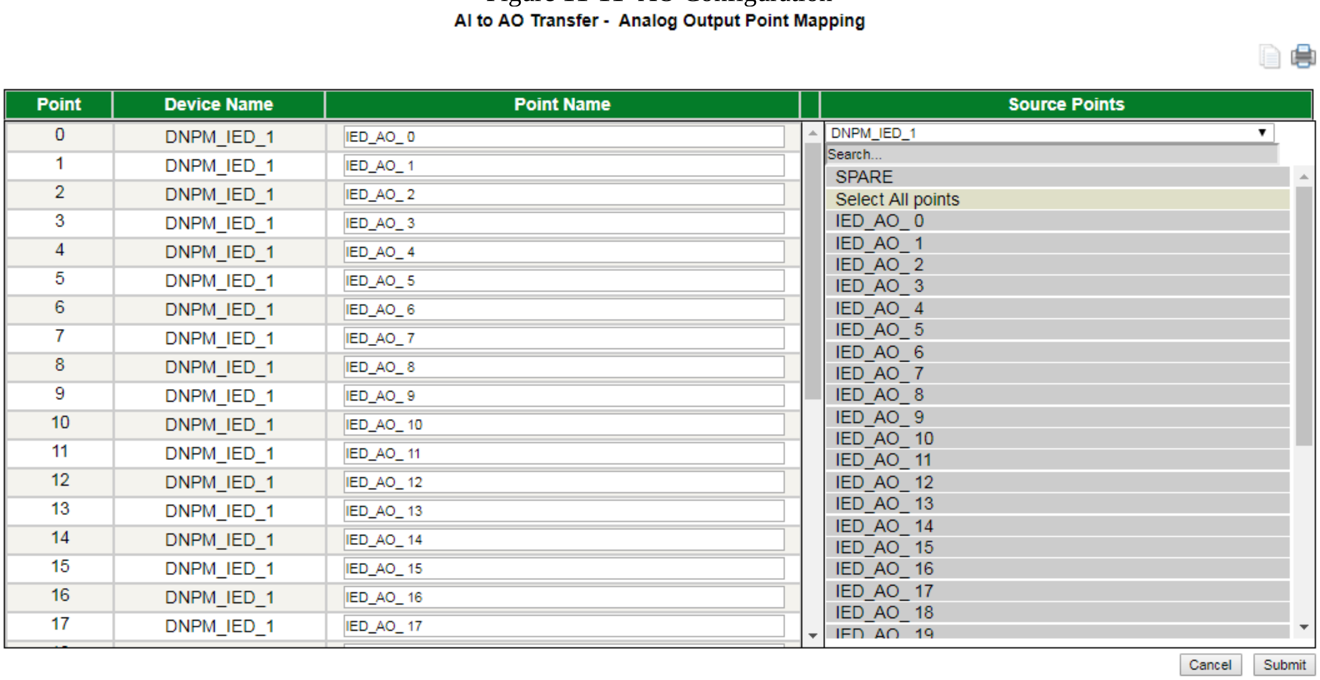
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.6.2 AO Mapping

When you click the AO box the AI to AO, you get a Configuration screen as shown below.

Figure 11-11 AO Configuration



Point

The logical point number.

Device Name

The name of the device from which the point originated. This is derived from the Source Points on the right of the screen.

Point Name

The name of the point to be converted. This is derived from the Source Points on the right of the screen.

Source Points

From the drop-down list, select the source device and the source points to be used in the conversion.

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.

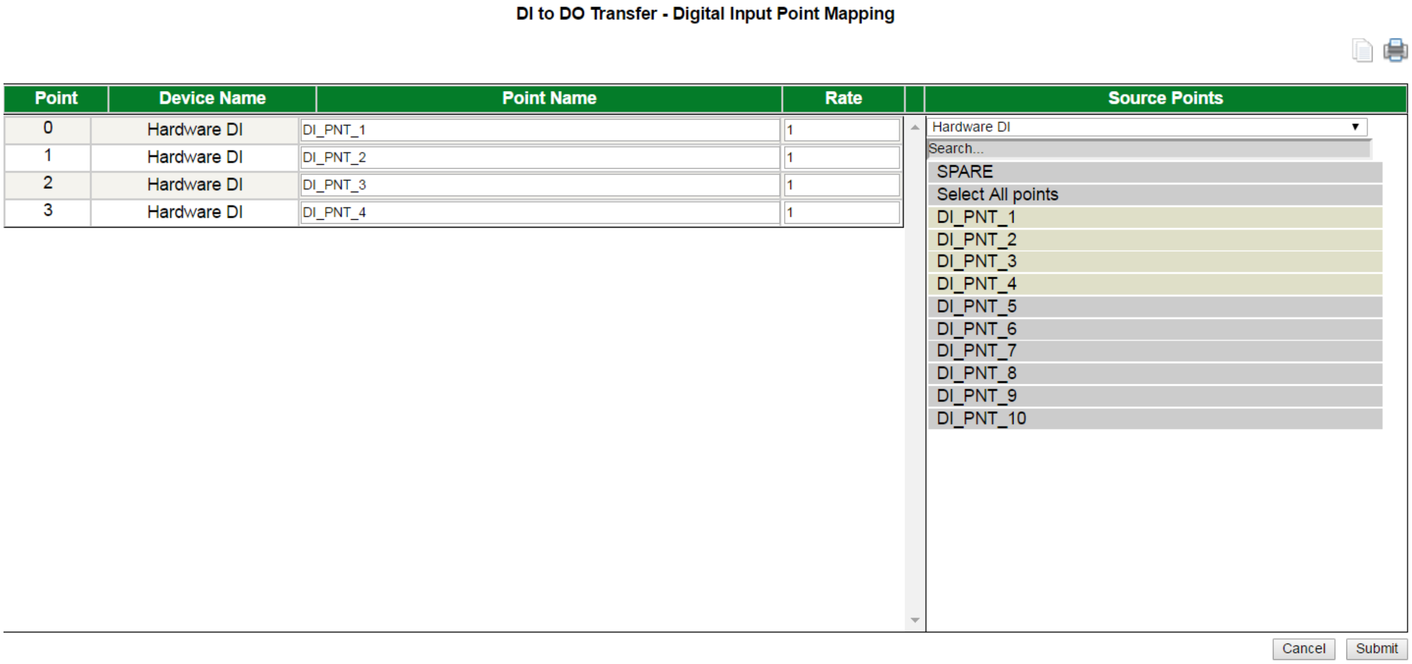
11.2.7 DI to DO

The DI to DO transfer is mapped in two parts; DI mapping, and DO mapping.

11.2.7.1 DI Mapping

When you click the DI box the DI to DO, you get a Configuration screen as shown below.

Figure 11-12 DI Configuration



Point

The logical point number.

Device Name

The name of the device from which the point originated. This is derived from the Source Points on the right of the screen.

Point Name

The name of the point to be converted. This is derived from the Source Points on the right of the screen.

Rate

Enter a time period in seconds at which to perform the conversion. I.E., the default of "1" will convert once every 1 second.

Source Points

From the drop-down list, select the source device and the source points to be used in the conversion.

Navigation

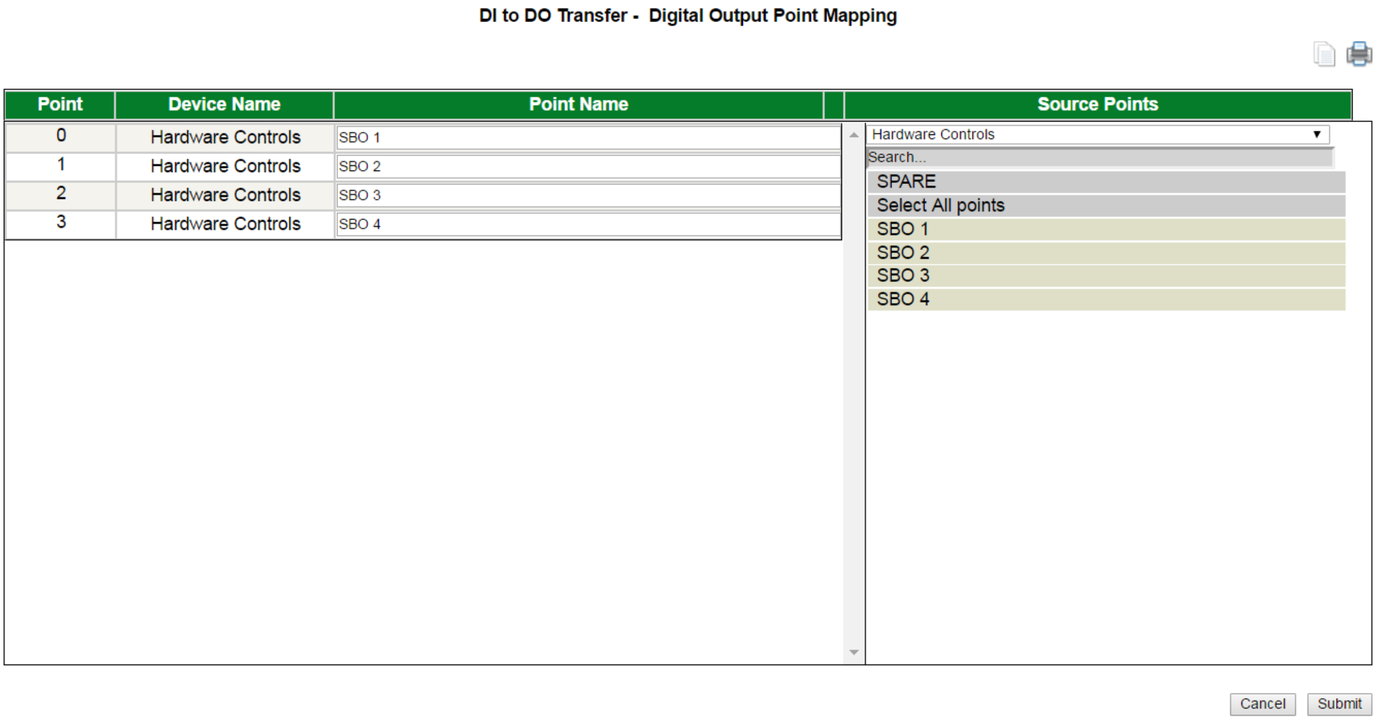
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.7.2 DO Mapping

When you click the DO box the DI to DO, you get a Configuration screen as shown below.

Figure 11-13 DO Configuration



Point

The logical point number.

Device Name

The name of the device from which the point originated. This is derived from the Source Points on the right of the screen.

Point Name

The name of the point to be converted. This is derived from the Source Points on the right of the screen.

Source Points

From the drop-down list, select the source device and the source points to be used in the conversion.

Navigation

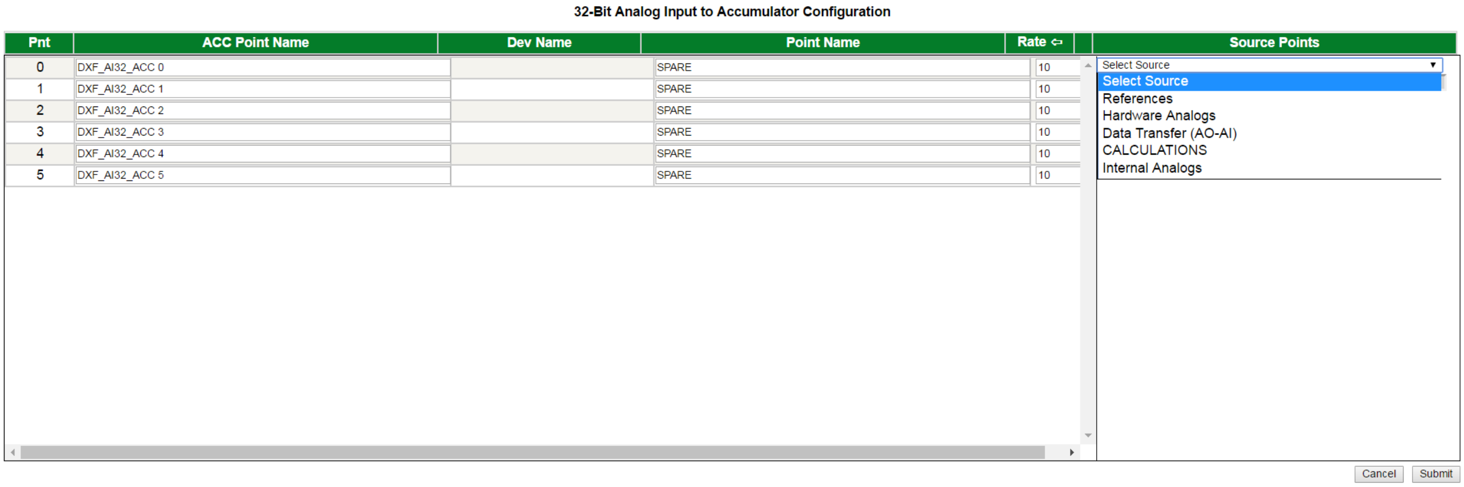
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.8 AI32 to ACC

When you click the AI32-ACC box, you get a Configuration screen as shown below. You must select a 32-bit AI source for every ACC point you wish to create because the result will be a 32-bit ACC. If you use less than 32-bit analogs, the 32-bit ACC will never fill.

Figure 11-14 32-Bit Analog Input to Accumulator Configuration



Pnt
The logical point number.

ACC Point Name
This is the default name of the created ACC point. You may accept the default, or rename it.

Device Name
The name of the device from which the AI point originated. This is derived from the Source Points on the right of the screen.

Point Name
The name of the point to be converted. This is derived from the Source Points on the right of the screen.

Rate
This is the conversion rate per second.

Source Points
From the drop-down list, select the source device and the source points to be used in the conversion. To use the full capacity of the created ACC, select 32-bit analogs.

Navigation

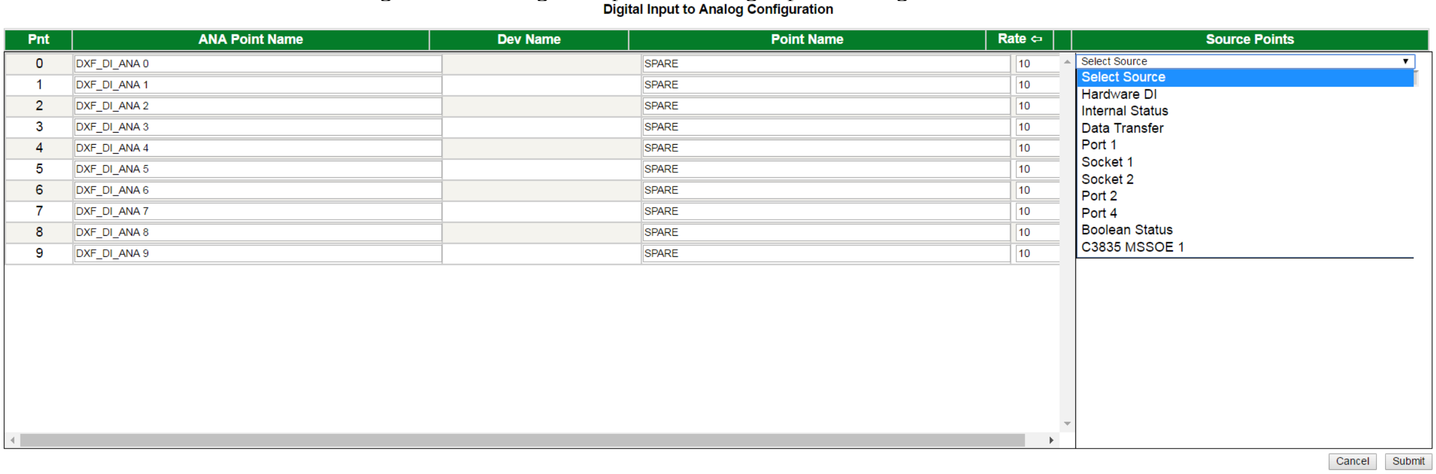
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

11.2.9 DI to AI

When you click the DI-AI box Data Transfer, you get a Configuration screen as shown below. The mapped digital inputs are moved to analog input points. The analog input value will be set to 1 or 0 according to the state of the digital input point.

Figure 11-15 Digital Input to Analog Input Configuration



Pnt

The logical point number.

ANA Point Name

The name of the resultant analog input point. You may change this or accept the default.

Dev Name

The name of the device from which the point originated.

Point Name

The name of the Digital Input point to be converted. This is derived from the Source Points on the right of the screen.

Rate

Enter a time period in seconds at which to perform the conversion. I.E., the default of “10” will convert once every 10 seconds.

11.3 Data Display

The main Data Transfer Display screen is shown below.

Figure 11-16 Data Transfer Display

Data Transfer Display

Type	Number	View
AO to AI	2	AO-AI
DO to DI	2	DO-DI
AO to Float	2	AO-FLT
AO to ACC	2	AO-ACC
AI to ACC	2	AI-ACC
AI to AO	2	AI-AO
DI to DO	2	DI-DO
AI32 to ACC	2	AI32-ACC
DI to AI	2	DI-AI

Back

11.3.1 AO to AI

The AO to AI Display Screen is shown below. Explanations of the fields are shown below.

Figure 11-17 AO to AI Display

Data Transfer AO to Analog Inputs (AI) Display

Point	Device Name	Point Name	Status	Value	Counts
0	Data Transfer	LPS01 DXF_AO_ANA_01		-32767.000	-32767
1	Data Transfer	LPS02 DXF_AO_ANA_02		-32767.000	-32767
2	Data Transfer	LPS03 DXF_AO_ANA_03		-32767.000	-32767
3	Data Transfer	LPS04 DXF_AO_ANA_04		-32767.000	-32767
4	Data Transfer	LPS05 DXF_AO_ANA_05		-32767.000	-32767
5	Data Transfer	LPS06 DXF_AO_ANA_06		-32767.000	-32767
6	Data Transfer	LPS07 DXF_AO_ANA_07		-32767.000	-32767
7	Data Transfer	LPS08 DXF_AO_ANA_08		-32767.000	-32767
8	Data Transfer	LPS09 DXF_AO_ANA_09		-32767.000	-32767
9	Data Transfer	LPS10 DXF_AO_ANA_10		-32767.000	-32767
10	Data Transfer	LPS11 DXF_AO_ANA_11		-32767.000	-32767
11	Data Transfer	LPS12 DXF_AO_ANA_12		-32767.000	-32767
12	Data Transfer	LPS13 DXF_AO_ANA_13		-32767.000	-32767
13	Data Transfer	LPS14 DXF_AO_ANA_14		-32767.000	-32767
14	Data Transfer	LPS15 DXF_AO_ANA_15		-32767.000	-32767
15	Data Transfer	LPS16 DXF_AO_ANA_16		-32767.000	-32767

Page 1of 2 Go To Go > Done

Legend

Point

The logical point number.

Device Name

This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags.

Value
For Analog points, the current value in Engineering Units is displayed.

For Status points, Open or Closed is displayed.

Counts
Please see config@WEB Secure Software Users Guide, Section 2.16.5 Point Scaling Principles & Examples for a full explanation of Counts and what they mean.

11.3.2 DO to DI

The screen below shows the Digital Output to Digital Input Display page.

Figure 11-18 DO to DI Transfer Display

Data Transfer DO to Digital Input (DI) Display

Point	Device Name	Point Name	Status	Value
0	Data Transfer	DXF_DO_DI_ALL GENERATORS		OPEN
1	Data Transfer	DXF_DO_DI_ERS MODE		OPEN

Page 1of 1 Go To [ ] Go Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value
The state of the point. Open or Closed

11.3.3 AO to Float

Analog Output to Floating Point Analog Display page.

Figure 11-19 AO to Float Display

Data Transfer AO to Floating Point Inputs Display

Point	Device Name	Point Name	Status	Value
0	Data Transfer	DXF_AO_FLT 0		0.000
1	Data Transfer	DXF_AO_FLT 1		0.000
2	Data Transfer	DXF_AO_FLT 2		0.000
3	Data Transfer	DXF_AO_FLT 3		0.000
4	Data Transfer	DXF_AO_FLT 4		0.000

Page 1of 1 Go To [ ] Go Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value
The value of the resultant Floating Point type point in Engineering Units.

11.3.4 AO to ACC

Figure 11-20: Display of AO to Accumulator Points

Data Transfer AO to Accumulator (ACC) Display

Point	Device Name	Point Name	Status	Value
0	Data Transfer	DXF_AO_ACC 0		0
1	Data Transfer	DXF_AO_ACC 1		0

Page 1of 1 Go To [ ] Go Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status

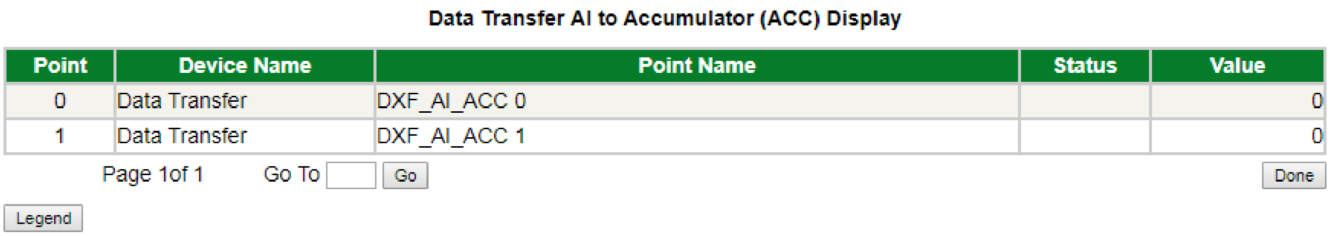
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value

The value of the resultant Accumulator points.

11.3.5 AI to ACC

Figure 11-21: Display of AI to ACC



Data Transfer AI to Accumulator (ACC) Display

Point	Device Name	Point Name	Status	Value
0	Data Transfer	DXF_AI_ACC 0		0
1	Data Transfer	DXF_AI_ACC 1		0

Point

The logical point number.

Device Name

This will always be Data Transfer.

Point Name

The name of the point output point that was configured previously.

Status

Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value

The value of the resultant Accumulator points.

11.3.6 AI to AO

Figure 11-22: AI to AO Data Display Page

Data Transfer AI to Analog Output (AO) Display

Point	Device Name	Point Name	Status	Value	Counts
0	Hardware AO	ANA_OUT 1	F	-5.000	0
1	Hardware AO	ANA_OUT 2	F	-5.000	0
2	Hardware AO	ANA_OUT 3	F	-5.000	0
3	Hardware AO	ANA_OUT 4	F	-5.000	0
4	DNPM_IED_1	IED_AO_ 0		100.000	32767
5	DNPM_IED_1	IED_AO_ 1		100.000	32767
6	DNPM_IED_1	IED_AO_ 2		100.000	32767
7	DNPM_IED_1	IED_AO_ 3		100.000	32767
8	DNPM_IED_1	IED_AO_ 4		100.000	32767
9	DNPM_IED_1	IED_AO_ 5		100.000	32767
10	DNPM_IED_1	IED_AO_ 6		100.000	32767
11	DNPM_IED_1	IED_AO_ 7		100.000	32767
12	DNPM_IED_1	IED_AO_ 8		100.000	32767
13	DNPM_IED_1	IED_AO_ 9		100.000	32767
14	DNPM_IED_1	IED_AO_ 10		100.000	32767
15	DNPM_IED_1	IED_AO_ 11		100.000	32767

Page 1of 3 Go To [ ] Go > Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value
The value of the resultant Analog Output points.

Counts
Please see config@WEB Secure Software Users Guide, Section 2.16.5 Point Scaling Principles & Examples for a full explanation of Counts and what they mean.

11.3.7 DI to DO

Figure 11-23: DI to DO Display Page

Data Transfer DI to Digital Outputs (DO) Display

Port Name :

Point	Device Name	Point Name	Status	Value
0	DNPM_IED_1	IED_BO 0	F	OPEN
1	DNPM_IED_1	IED_BO 1	F	OPEN
2	DNPM_IED_1	IED_BO 2	F	OPEN

Page 1of 1 Go To Go Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status
Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value
The value of the resultant Digital Output points. Open or Closed

11.3.8 AI32 to ACC

Figure 11-24: AI32 to ACC Display Page

Data Transfer AI32 to Accumulator (ACC) Display

Point	Device Name	Point Name	Status	Value
0	Data Transfer	DXF_AI32_ACC 0		11294
1	Data Transfer	DXF_AI32_ACC 1		32767

Page 1of 1 Go To Go Done

Legend

Point
The logical point number.

Device Name
This will always be Data Transfer.

Point Name
The name of the point output point that was configured previously.

Status

Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, the Legend button will display a list of flags which could be displayed.

Value

The value of the resultant Accumulator points.

11.3.9 DI to AI

Figure 11-25: DI to AI Data Display Screen

Data Transfer DI to Analog Inputs (AI) Display

Point	Device Name	Point Name	Status	Value	Counts
0	Data Transfer	DXF_DI_ANA ALL GENERATORS		1.000	0
1	Data Transfer	DXF_DI_ANA ERS MODE		0.000	0

Page 1of 1 Go To [ ] Go Done

Legend

Point

The logical point number.

Device Name

This will always be Data Transfer.

Point Name

The name of the point output point that was configured previously.

Status

Please see config@WEB Secure Software Users Guide, Section 3.2 for a full list of flags. Also, Click on Legend to see a list of the possible Status Flags.

Value

For Analog points, the current value in Engineering Units is displayed.

Counts

Please see config@WEB Secure Software Users Guide, Section 2.16.5 Point Scaling Principles & Examples for a full explanation of Counts and what they mean.

12 Data Trap

12.1 Data Trap Application (New Application)

Starting with C3414-500-S02K3 firmware, click on the Data Trap Application from the Applications Display Box. The Data Trap application is used to capture protocol data from up to five ports or sockets simultaneously. You can also configure the data trap application from the protocol display page.

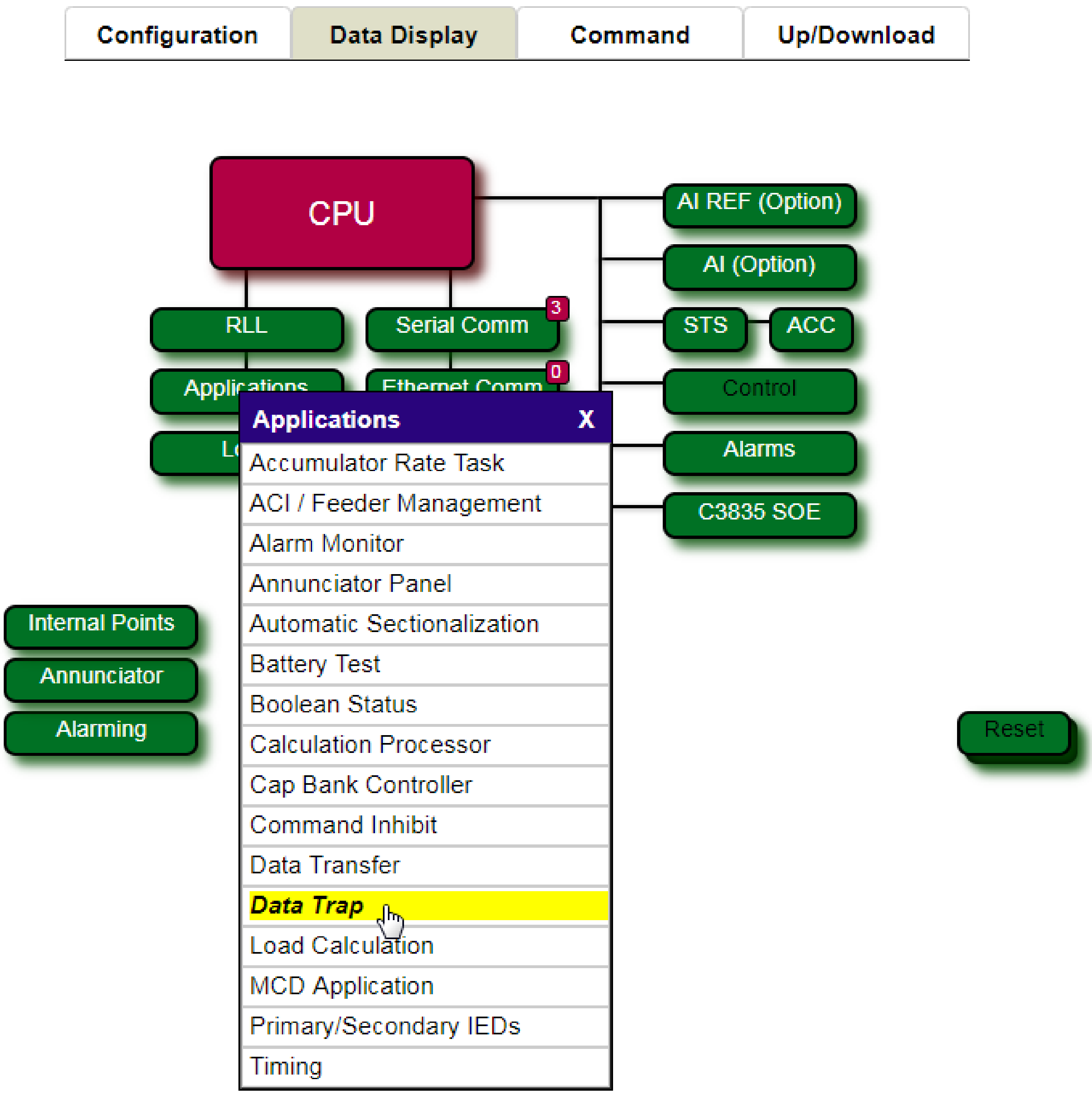
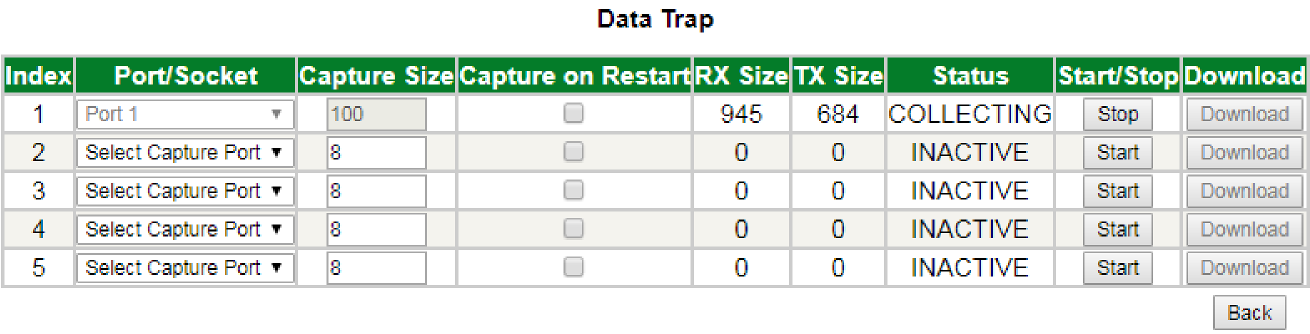


Figure 12-1: Data Trap Application Setup



Data Trap

Index	Port/Socket	Capture Size	Capture on Restart	RX Size	TX Size	Status	Start/Stop	Download
1	Port 1	100	☐	945	684	COLLECTING	Stop	Download
2	Select Capture Port	8	☐	0	0	INACTIVE	Start	Download
3	Select Capture Port	8	☐	0	0	INACTIVE	Start	Download
4	Select Capture Port	8	☐	0	0	INACTIVE	Start	Download
5	Select Capture Port	8	☐	0	0	INACTIVE	Start	Download

Back

Index
The instance of protocol capture.

Port / Socket
Select the Serial Port or Ethernet Socket in which to capture the protocol data transmitted and received by the interface. You may configure up to 5 simultaneous data trap instances.

Capture Size
The number of kilobytes of transmit / receive data to capture to the file. The default value of 8 kB translates to about 30 seconds of capture on standard scan type 2 DNP traffic.

Capture on Restart
Start the data trap on this port on startup after rebooting the RTU. Useful for troubleshooting protocol initialization problems.

RX Size
A running counter of the number of bytes captured on this port by the application.

TX Size
A running counter of the number of bytes captured on this port by the application.

Status
The capture status of the application. INACTIVE for captures not started. COLLECTING for running captures. COMPLETE for finished captures.

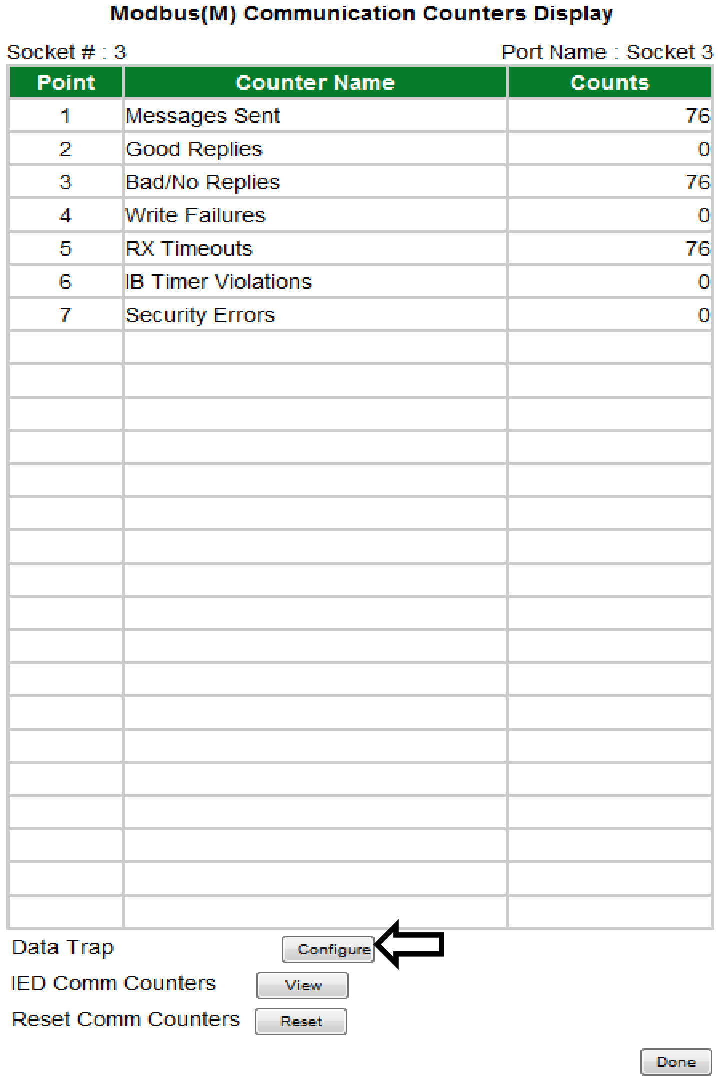
Start / Stop
Manually start and stop the data trap on this port. Stopping the capture keeps the already captured bytes in the capture file.

Download
Save the capture file to your PC. Use the Protolyzer application on your PC to analyze the data trap files in a readable format for troubleshooting. Protolyzer can be downloaded in the Tools tab here:

https://www.sage-rtu.com/downloads.html

12.2 Data Trap (Legacy Application)

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



Modbus(M) Communication Counters Display

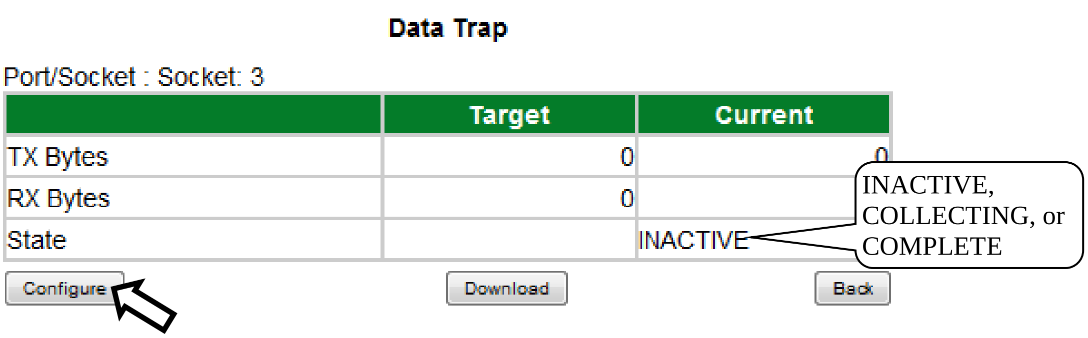
Socket # : 3 Port Name : Socket 3

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

Figure 12-2 Data Trap Example

When you click on Configure for Data Trap, you get the display shown in Figure 12-3.

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



Data Trap

Port/Socket : Socket: 3

	Target	Current
TX Bytes	0	0
RX Bytes	0	
State		INACTIVE

Figure 12-3 Data Trap

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

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

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

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

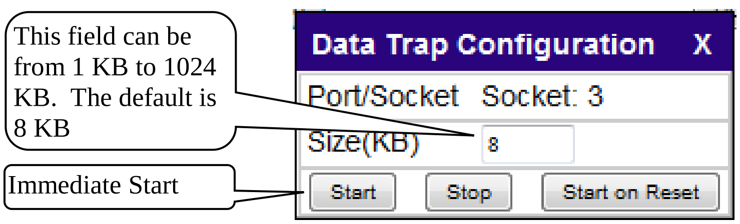


Figure 12-4 Data Trap Configuration

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

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

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

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

Data Trap

Port/Socket : Socket: 3

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

Configure Download Back

Figure 12-5 Data Trap COLLECTING

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

Data Trap

Port/Socket : Port: 3

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

Configure Download Back

Figure 12-6 Data Trap COMPLETE

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

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

https://www.sage-rtu.com/downloads.html

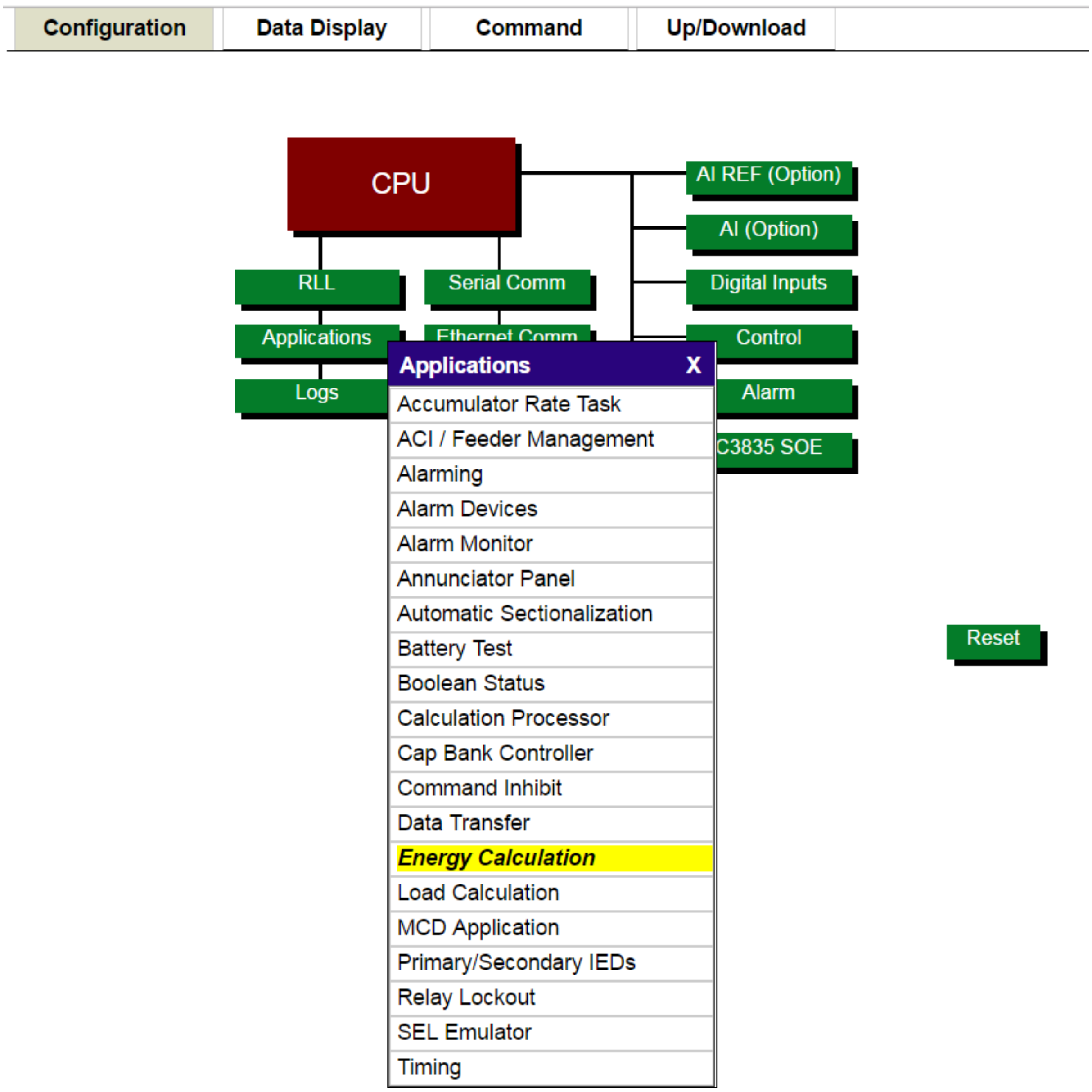
13 Energy Calculation

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.

13.1 Introduction

When you click on the Applications block, the screen shown in Figure 13-1 will appear. is explained in the following sections.

Figure 13-1 Applications



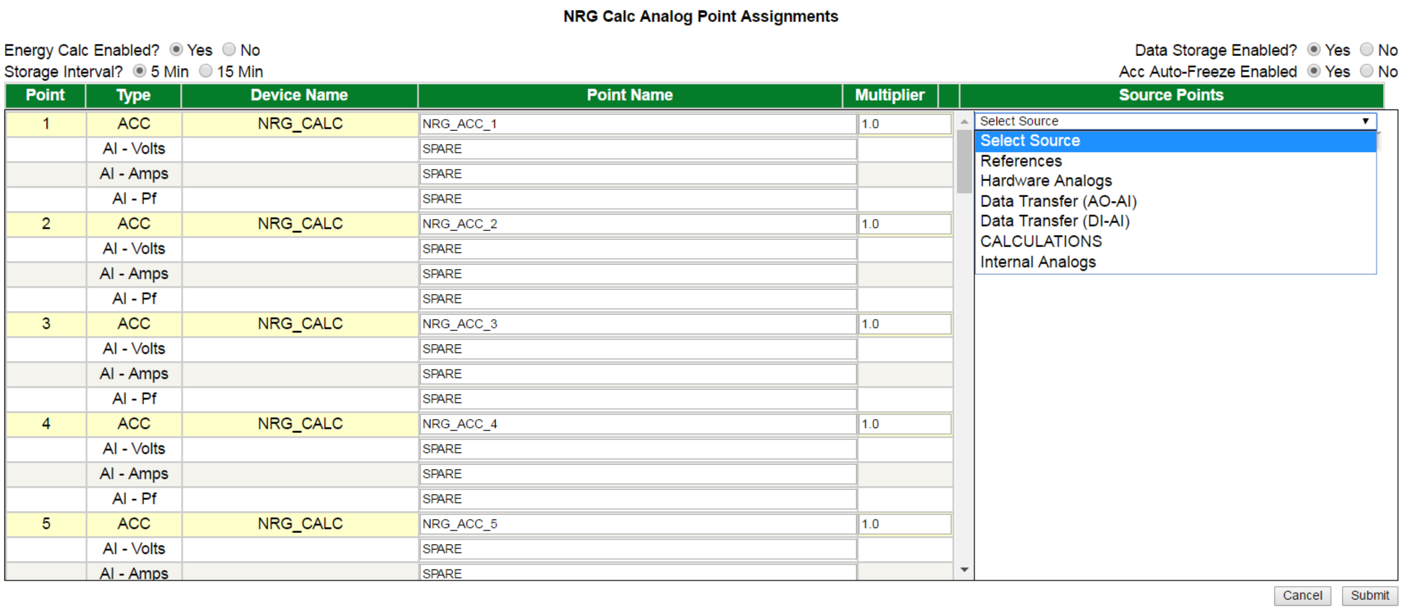
13.2 Configuration

The Energy (NRG) Calc application allows the RTU to calculate power based on analog inputs for volts and amps. The resulting power calculations are then represented as accumulators points, which may then be mapped to a master station. No calculation will be done, and no accumulator will be created, unless both AI-Volts and AI-Amps analogs are present for a given point channel. Power factor calculations are performed if the AI-Pf analog is populated. If it is not, the program assumes a power factor of 1.

The Multiplier for every channel allows you to scale the final calculation.

In the event of communication loss to the master station, Data Storage Enable stores the calculated values on the RTU. At a convenient time, the data may be recalled through console commands.

Figure 13-2 NRG Calc Analog Point Assignments



Procedure:

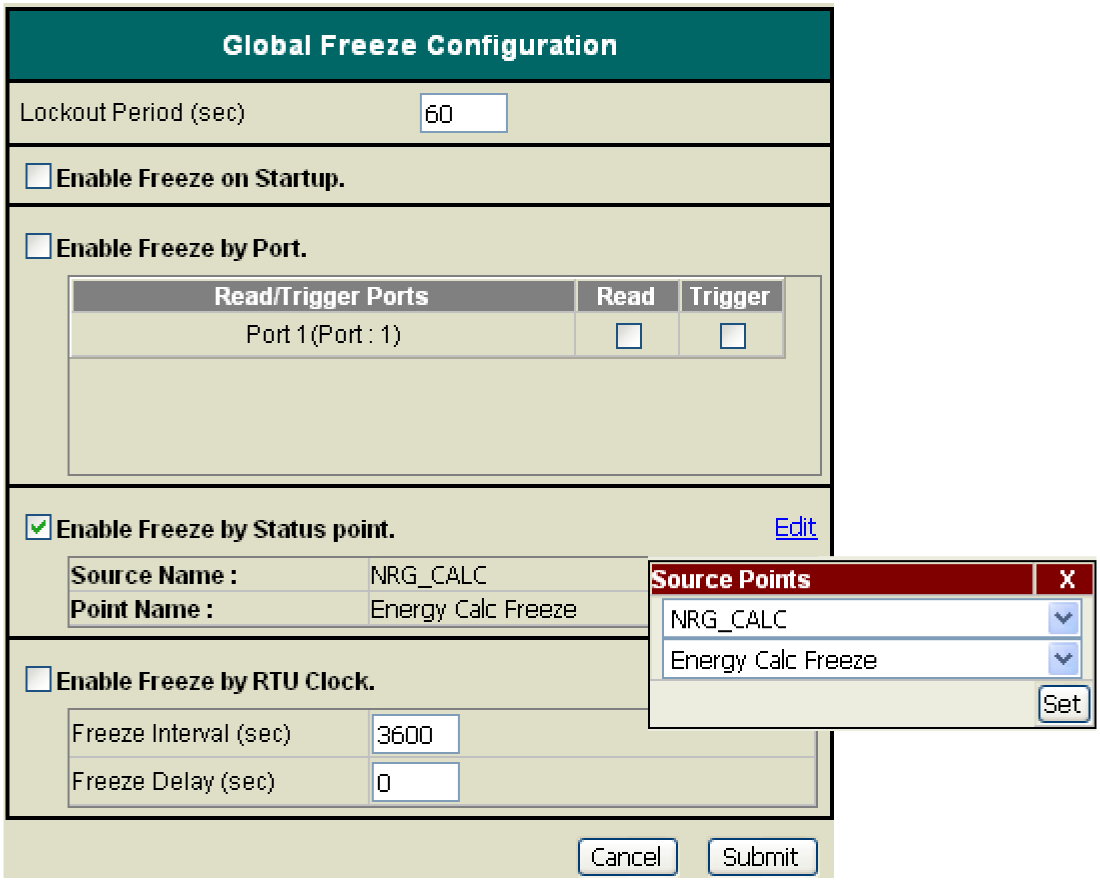
1. At the CONFIGURATION screen click the “Applications” button, then select “Energy Calculation” from the list of applications to enter into the “NRG Calc Ana Point Assignments” window.
2. Click the Yes button to enable the NRG CALC to run.
3. Click 5-min button for 5-minute ACC update period or 15-min button for 15 minute ACC update period.
4. Click Yes to enable data storage if desired.
5. Click Yes to enable auto-freeze if desired.
6. Edit Point Name for each Accumulator.
7. Map Analog points from Source Points pull-down menu. You must map at least Volts and Amps analogs, or no calculations will be performed. If the Power Factor analog is not mapped, the default of unity (+1.0) is used.
8. Edit Multiplier field to change scaling
   (e.g., Watts = 1, Kilo = 0.001, Mega = 0.000001).
9. Submit.
10. If Acc Auto-Freeze Enabled, go to Global Freeze Configuration screen in CPU block as shown below.

13.2.1.1 Global Freeze Configuration

1. Check Enable Freeze By Status point, click edit to bring up Source Points box.
2. Select “NRG_CALC” in select source pull-down menu.

3. Select "Energy Calc Freeze" in select point pull-down menu.

Figure 13-3 Global Freeze Configuration



To view acc data and rates on console (see example in Console section):

1. Type "print_nrg_accs 1 <enter>" to display NRGCALC accumulator data.
2. Type "print_nrg_accs 2 <enter>" to display incremental accumulator data.
3. Type "print_nrg_accs 3 <enter>" to display instantaneous rate data.

To dump NRGCALC storage data on console (see example in Console section):

1. Type "nrg_stats <enter>". Follow suggested command or,…
2. Enable text capture on terminal emulator.
3. Type "dump_nrg_data <enter> to dump all data.

13.3 Console

13.3.1 View ACC Data and Rates

print_nrg_accs 1

0x3eda51c (tShell): Display Accums...

0x3eda51c (tShell): 1:1193 2:2387 3:0 4:0

0x3eda51c (tShell): 5:0 6:0 7:0 8:0

0x3eda51c (tShell): 9:0 10:0 11:0 12:0

0x3eda51c (tShell): 13:0 14:0 15:0 16:0

0x3eda51c (tShell): 17:0 18:0 19:0 20:0

0x3eda51c (tShell): 21:0 22:0 23:0 24:0

0x3eda51c (tShell): 25:0 26:0 27:0 28:0

0x3eda51c (tShell): 29:0 30:0 31:0 32:0

value = 32 = 0x20 = ' '

-> print_nrg_accs 2

0x3eda51c (tShell): Display temporary accs...

0x3eda51c (tShell): 1:29.656 2:59.441 3:0.000 4:0.000

0x3eda51c (tShell): 5:0.000 6:0.000 7:0.000 8:0.000

0x3eda51c (tShell): 9:0.000 10:0.000 11:0.000 12:0.000

0x3eda51c (tShell): 13:0.000 14:0.000 15:0.000 16:0.000

0x3eda51c (tShell): 17:0.000 18:0.000 19:0.000 20:0.000

0x3eda51c (tShell): 21:0.000 22:0.000 23:0.000 24:0.000

0x3eda51c (tShell): 25:0.000 26:0.000 27:0.000 28:0.000

0x3eda51c (tShell): 29:0.000 30:0.000 31:0.000 32:0.000

value = 32 = 0x20 = ' '

-> print_nrg_accs 3

0x3eda51c (tShell): Display instantaneous rates...

0x3eda51c (tShell): 1:400.13017 2:800.26033 3:0.00000 4:0.00000

0x3eda51c (tShell): 5:0.00000 6:0.00000 7:0.00000 8:0.00000

0x3eda51c (tShell): 9:0.00000 10:0.00000 11:0.00000 12:0.00000

0x3eda51c (tShell): 13:0.00000 14:0.00000 15:0.00000 16:0.00000

0x3eda51c (tShell): 17:0.00000 18:0.00000 19:0.00000 20:0.00000

0x3eda51c (tShell): 21:0.00000 22:0.00000 23:0.00000 24:0.00000

0x3eda51c (tShell): 25:0.00000 26:0.00000 27:0.00000 28:0.00000

0x3eda51c (tShell): 29:0.00000 30:0.00000 31:0.00000 32:0.00000

value = 32 = 0x20 = ' '

->

13.3.2 Dump NRGCALC Storage Data

nrg_stats

0x3eda51c (tShell): NRGCALC Storage size: 2304   Last written sequence num: 237

0x3eda51c (tShell): Use 'dump_nrg_data 237 <enter>' command to dump data.

value = 32 = 0x20 = ' '

-> dump_nrg_data 237

Jul 18 2005, 11:50:00.000, 00001,
00000000004, 00000000009, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 11:55:00.000, 00002,
00000000026, 00000000053, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:00:00.000, 00003,
00000000059, 00000000120, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:05:00.000, 00004,
00000000092, 00000000186, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:10:00.000, 00005,
00000000126, 00000000253, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:15:00.000, 00006,
00000000159, 00000000320, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:20:00.000, 00007,
00000000192, 00000000386, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:25:00.000, 00008,
00000000226, 00000000453, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

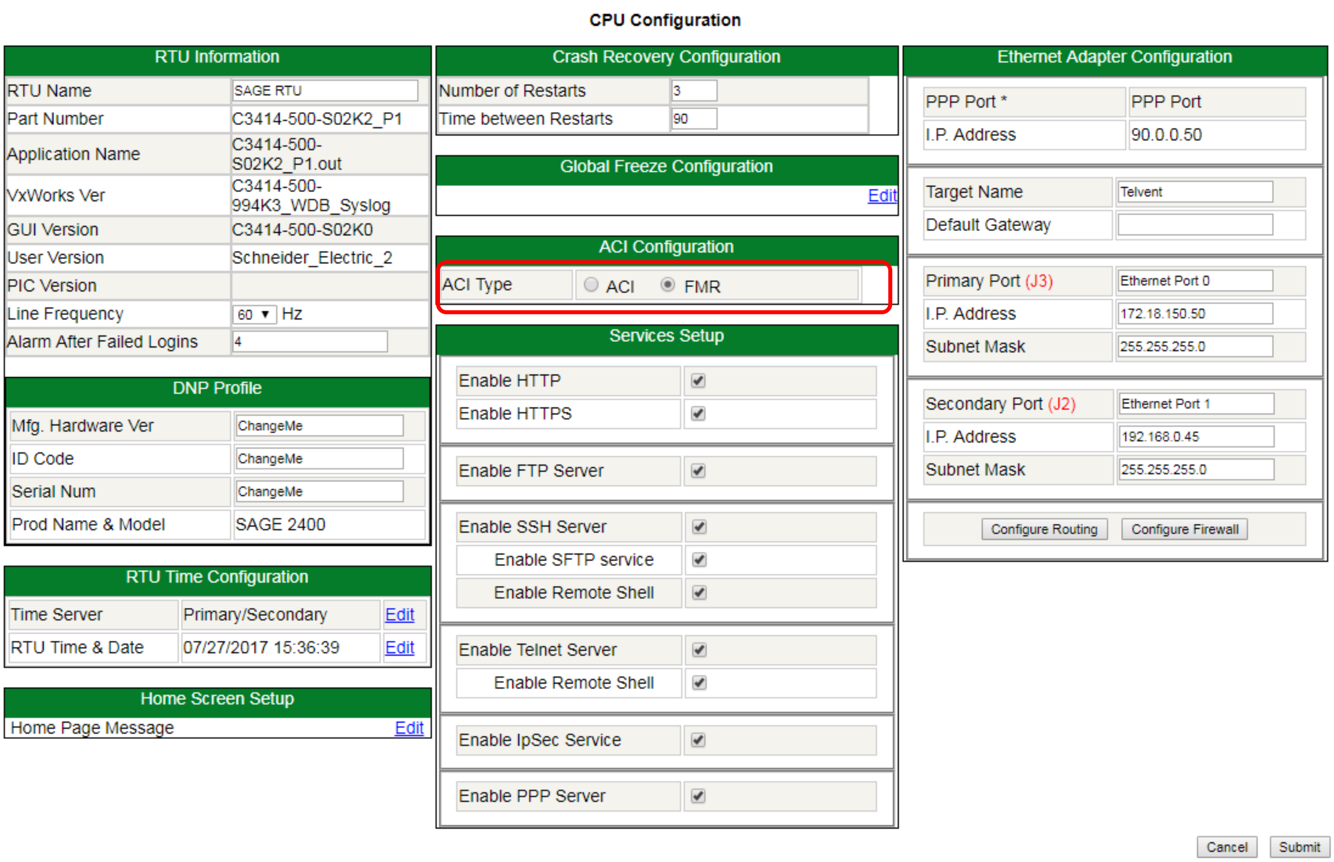
```
Jul 18 2005, 12:30:00.000, 00009,
00000000259, 00000000520, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

Jul 18 2005, 12:35:00.000, 00010,
00000000292, 00000000586, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000, 00000000000, 00000000000, 00000000000, 00000000000,
00000000000, 00000000000,

End of Data

value = 19 = 0x13

->
```

14 Feeder Management

14.1 Introduction

SAGE ACI technology now comes in two flavors: Feeder Management, and ACI. You may choose one of these techniques in the CPU block as shown below.

Figure 14-1 Choosing Either ACI or FMR



14.1.1 Specifications for Hardware Analog Subsystem

14.1.1.1 AC Analog Inputs (ACI)

The AC analog subsystem (built-in for SAGE 1250/1350 and C3244-A00-00001 ACI module for SAGE 2200/2300/2400) provides six AC analog inputs which are typically configured as three voltage/current pairs for monitoring a 3-phase circuit. The DSP (Digital Signal Processor) samples each analog input at 16 times each cycle and calculates the fundamental frequency phasors and true RMS quantities. These values are used to detect faults and to compute real and reactive power.

14.1.1.2 Reported Values

The measured and calculated quantities provided by the AC analog subsystem include:

- Phase voltage, phase current, and neutral current (fundamental and true RMS)
- Fault current (up to 20x nominal full scale)
- VA, Watts, VARS, bidirectional WH and VARH both total and each phase
- Power factor
- Calculated harmonic components (2nd through 7th)
- Voltage quality data (Sag/Swell)
- Frequency

14.1.1.3 Accuracy

The AC analog subsystem was designed for a high degree of accuracy over the operating environmental range. This accuracy was achieved through an innovative subsystem design, the utilization of tight tolerance components, and instrument grade magnetics. The overall accuracy is:

Current Channels:

±0.25% Full Scale, 0-150% nominal Full Scale input
±5.0% Full Scale, 150-2000% nominal Full Scale input
(for values reported during fault condition only)

Voltage Channels:

±0.25% Full Scale, 0-125% nominal Full Scale input

14.1.1.4 Environment

All user field connections designed to pass IEEE 472-1974, ANSI C37.90-1979 (R1982).

14.1.2 Interface Options

The ACI can be used for interfacing to conventional PTs and CTs as well as standard current/ voltage linepost sensors such as the S&C SCADAMATE, Square D LSCV Line Post™ Sensors or Lindsey CVMI™ linepost sensors. These terminations include custom instrument-grade transformers, designed for high linearity and ultra low phase shift, which provide the high impedance inputs required for the linepost sensor resistor divider voltage outputs.

14.1.3 Digital Signal Processor (DSP)

DSP	Analog Devices Series 2101, 40MHz
RAM	26 kilobytes, 35 nsec, 1 wait
ADC	80 kHz, 12 bit sampling
SAMPLING	Crystal controlled sampling clock 16 channels of solid state multiplexing

14.1.4 AC Analog Inputs

INPUT TYPES	Current/voltage linepost sensor or CT/PT (transformer isolated)
INPUT RANGES	All popular linepost sensors supported CT: 0-5, 0-2.5, 0-1 A RMS PT: 0-69, 0-120 V RMS
FREQUENCY	50/60 Hz software selectable
RESOLUTION	12 bits (11 bits + sign)

OVERALL ACCURACY	CT or current sensor: ±0.25% Full Scale, 0- 150% nominal Full Scale input ±5.0% Full Scale, 150-2000% nominal Full Scale input PT (during the fault) ±0.25% Full Scale, 0-125% nominal Full Scale input
CONVERSION RATE	Current and Voltage Inputs sampled 96 times per cycle, then filtered and down sampled to an effective sample rate of 16 times per cycle
BURDEN	CT: 0.0004 VA@5A PT: 0.012 VA@120VAC, 0.012 VA@69VAC
PT INPUT RESISTANCE	399 K ohms for 69VAC 1.2 M ohms for 120VAC
CALCULATION RATE	all calculated values updated once per cycle; fault detection performed once per cycle.
OPERATING TEMPERATURE	-40°C to +85°C

14.1.4.1 Terminations

BASEBOARD TO ACI	SFB (Special Function Bus) To J1 (34 conductor ribbon cable)
TB2	3 current input (low) and 3 voltage input (low). Source of these inputs is Telvent PTs & CTs or conditioned outputs of Telvent AITM unit.
ACI TO NEXT ACI	J2 TO J1 (34 conductor ribbon cable)
CT	Primary: unbroken wire loop through a toroidal transformer Secondary: Number 10 stud with nuts
PT	Number 10 stud with nuts

14.1.4.2 Input Power Requirement

Voltage	10-33 VDC

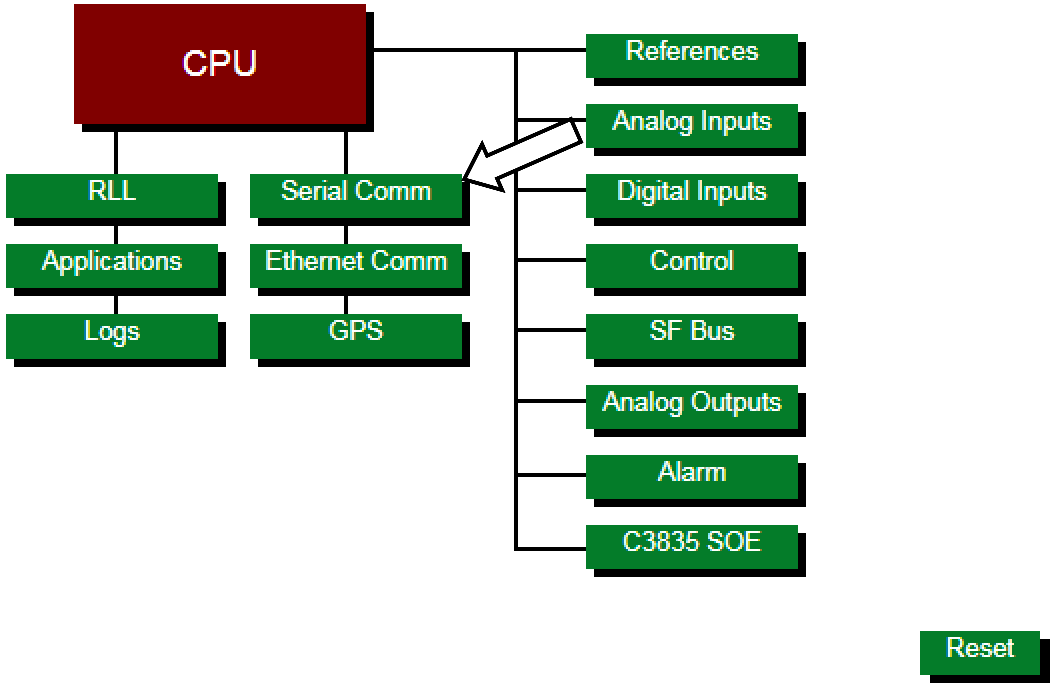
14.2 Feeder Management Application

14.2.1 Configuration

14.2.1.1 Feeder Management Configure Serial Comm

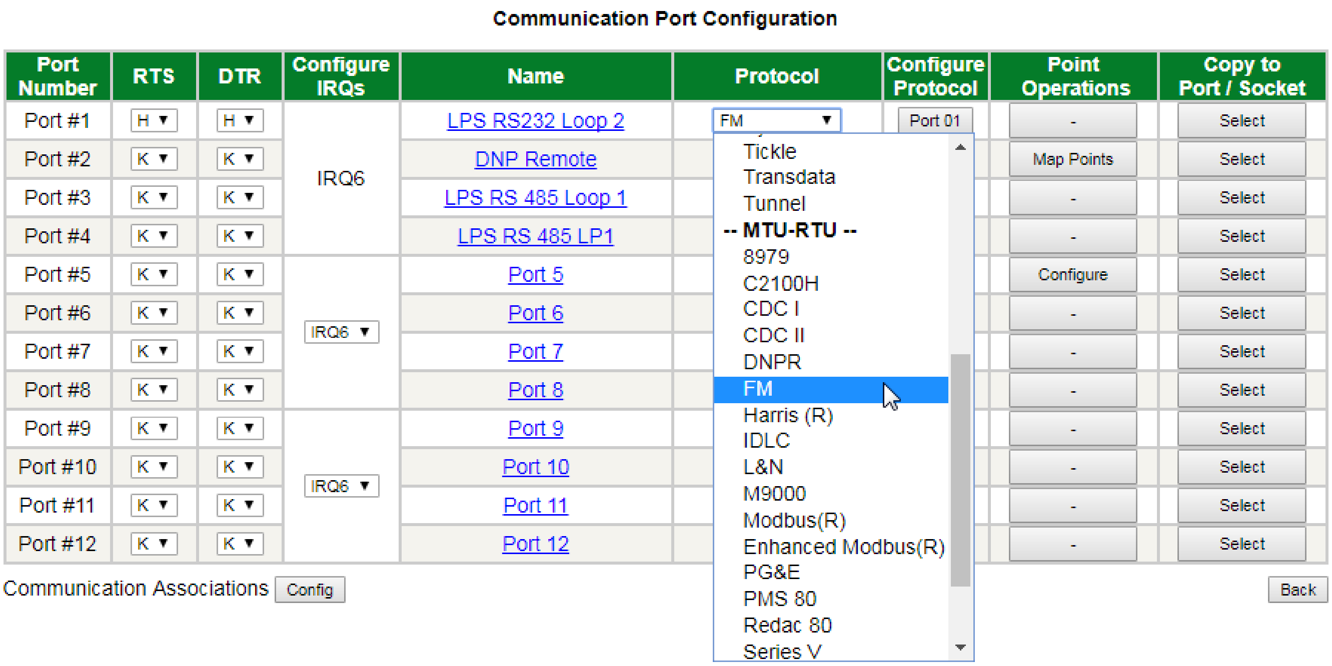
From the Configuration screen, click Serial Comm block or Ethernet Comm block as shown below.

Figure 14-2 Selecting Comm Port



From the Communication Port Configuration screen, click the Protocol drop-down menu for the port of your choice. Select FM from the drop-down list as shown below.

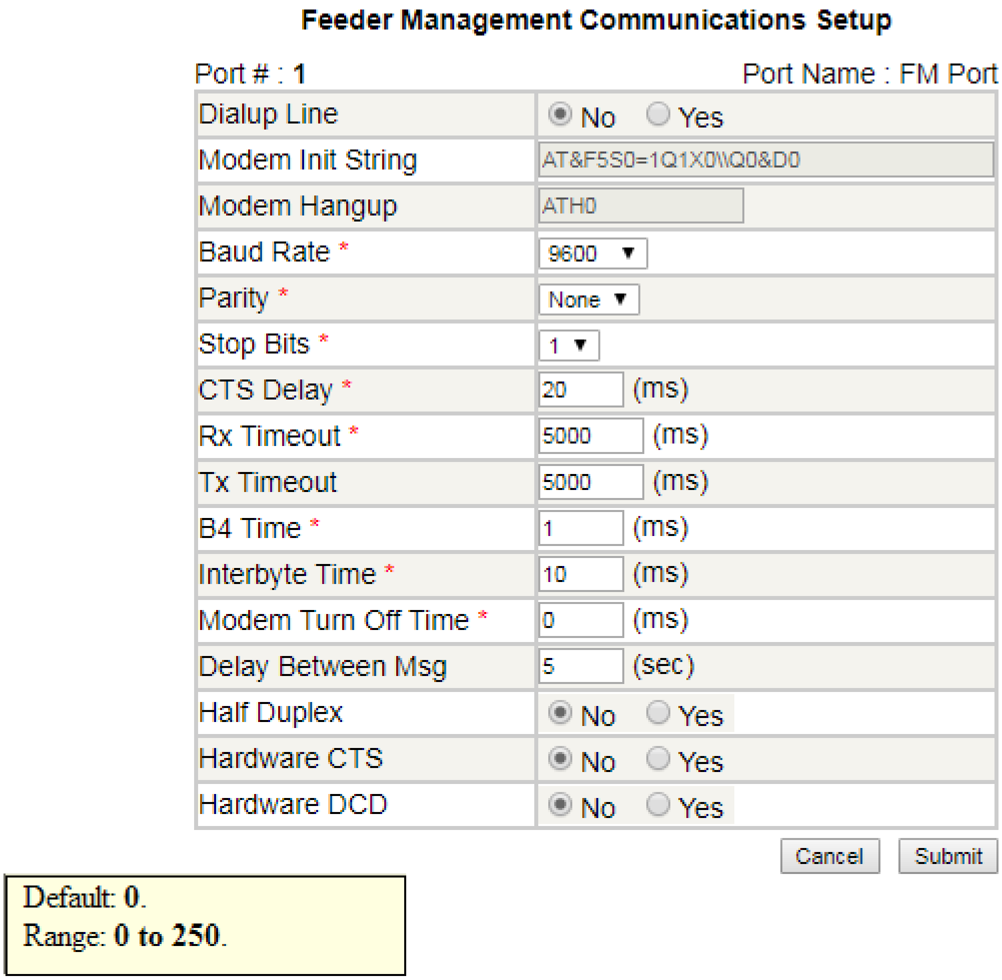
Figure 14-3 Serial Communication Port Configuration



14.2.1.2 Configure Protocol

Click the Configure Protocol box for the Feeder Management port. You will get a screen similar to Figure 14-4.

Figure 14-4 FMS Communication Channel Setup



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 the RTU.

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 Modem Turn Off Time.

Dialup Line (No, Yes)

Select whether or not the FM port is connected to a dialup line. Default is No.

Modem Init String

Enter the modem initiation string for the dialup line if Dialup Line is Yes. Default is AT&F5S0=1Q1X0\\Q0&D0.

Modem Hangup

Enter the modem hangup string for the dialup line if Dialup Line is Yes. Default is ATH0.

Baud Rate (300 – 19200)

Select the communications speed for the associated channel. Default setting is 9600.

Parity (None, Odd, Even)

From the drop-down menu, select the parity for the associated channel. The default setting is None.

Stop Bits (0,1,2)

From the drop-down menu, select the stop bits for the associated channel. The default setting is 1.

CTS Delay (0 – 1000ms)

Enter the Clear-To-Send (CTS) 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. The 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.

Delay Between Msg (0 – 250ms)

Enter the time delay between messages. The default is 5.

Half Duplex

Select either Half Duplex (Yes) or Full Duplex (No). The default 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

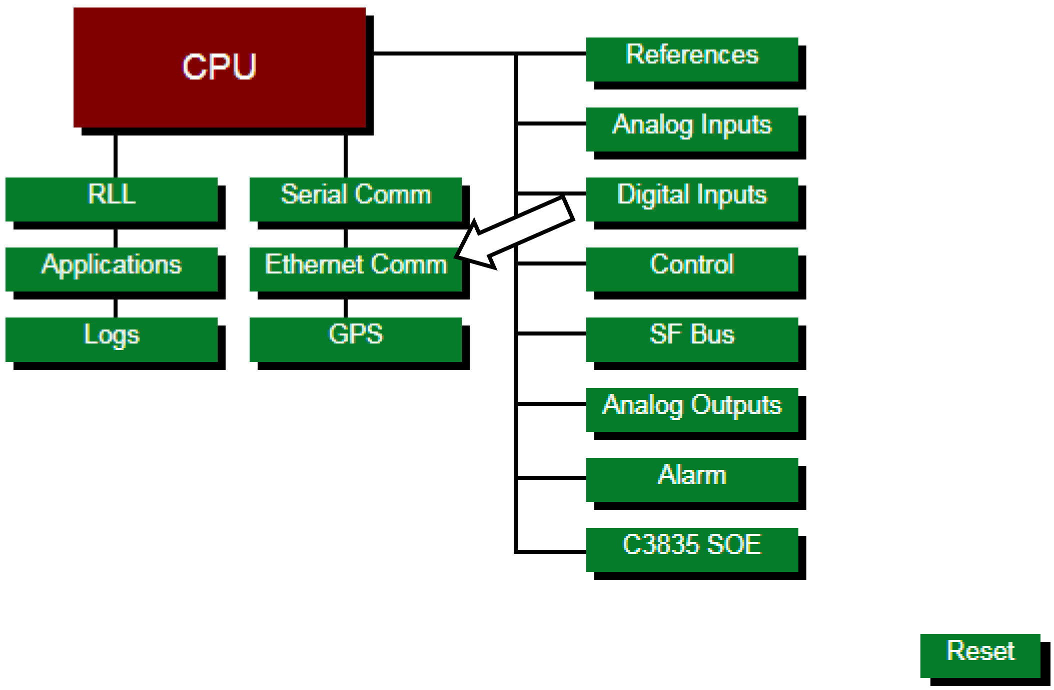
Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

14.2.1.3 Configure Ethernet Comm

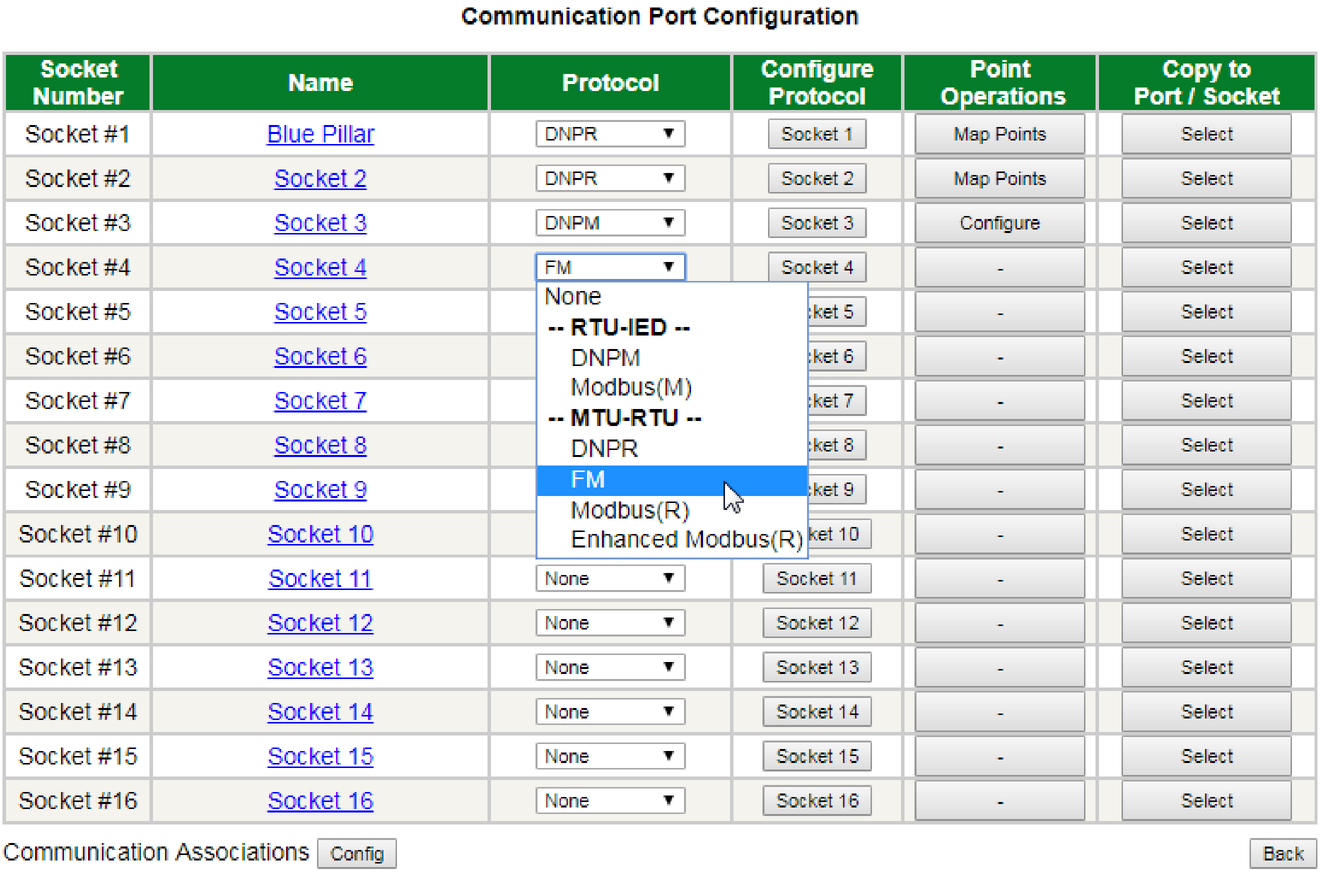
Click on Ethernet Comm as shown below.

Figure 14-5 Configuring Ethernet Comm



From the Communication Port Configuration screen, select a port and select FM from the Protocol drop-down menu as shown below.

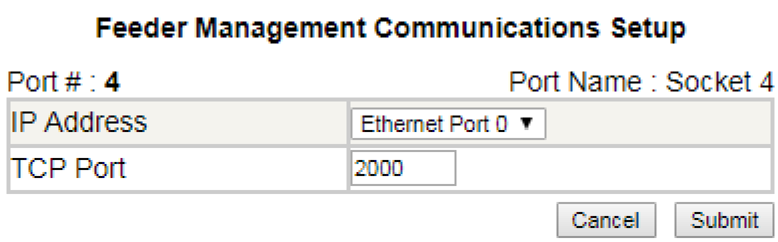
Figure 14-6 Communication Port Configuration


Communication Port Configuration

Socket Number	Name	Protocol	Configure Protocol	Point Operations	Copy to Port / Socket
Socket #1	Blue Pillar	DNPR	Socket 1	Map Points	Select
Socket #2	Socket 2	DNPR	Socket 2	Map Points	Select
Socket #3	Socket 3	DNPM	Socket 3	Configure	Select
Socket #4	Socket 4	FM	Socket 4	-	Select
Socket #5	Socket 5		ket 5	-	Select
Socket #6	Socket 6		ket 6	-	Select
Socket #7	Socket 7		ket 7	-	Select
Socket #8	Socket 8		ket 8	-	Select
Socket #9	Socket 9		ket 9	-	Select
Socket #10	Socket 10		ket 10	-	Select
Socket #11	Socket 11	None	Socket 11	-	Select
Socket #12	Socket 12	None	Socket 12	-	Select
Socket #13	Socket 13	None	Socket 13	-	Select
Socket #14	Socket 14	None	Socket 14	-	Select
Socket #15	Socket 15	None	Socket 15	-	Select
Socket #16	Socket 16	None	Socket 16	-	Select

From the above screen, click the Socket under Configure Protocol as shown in Figure 14-6, to get the screen shown in Figure 14-7.

Figure 14-7 Feeder Management Communications Setup



Use the dropdown to enter either Ethernet Port 0 or Ethernet Port 1.

Enter the appropriate TCP Port value, or accept the default.

Navigation

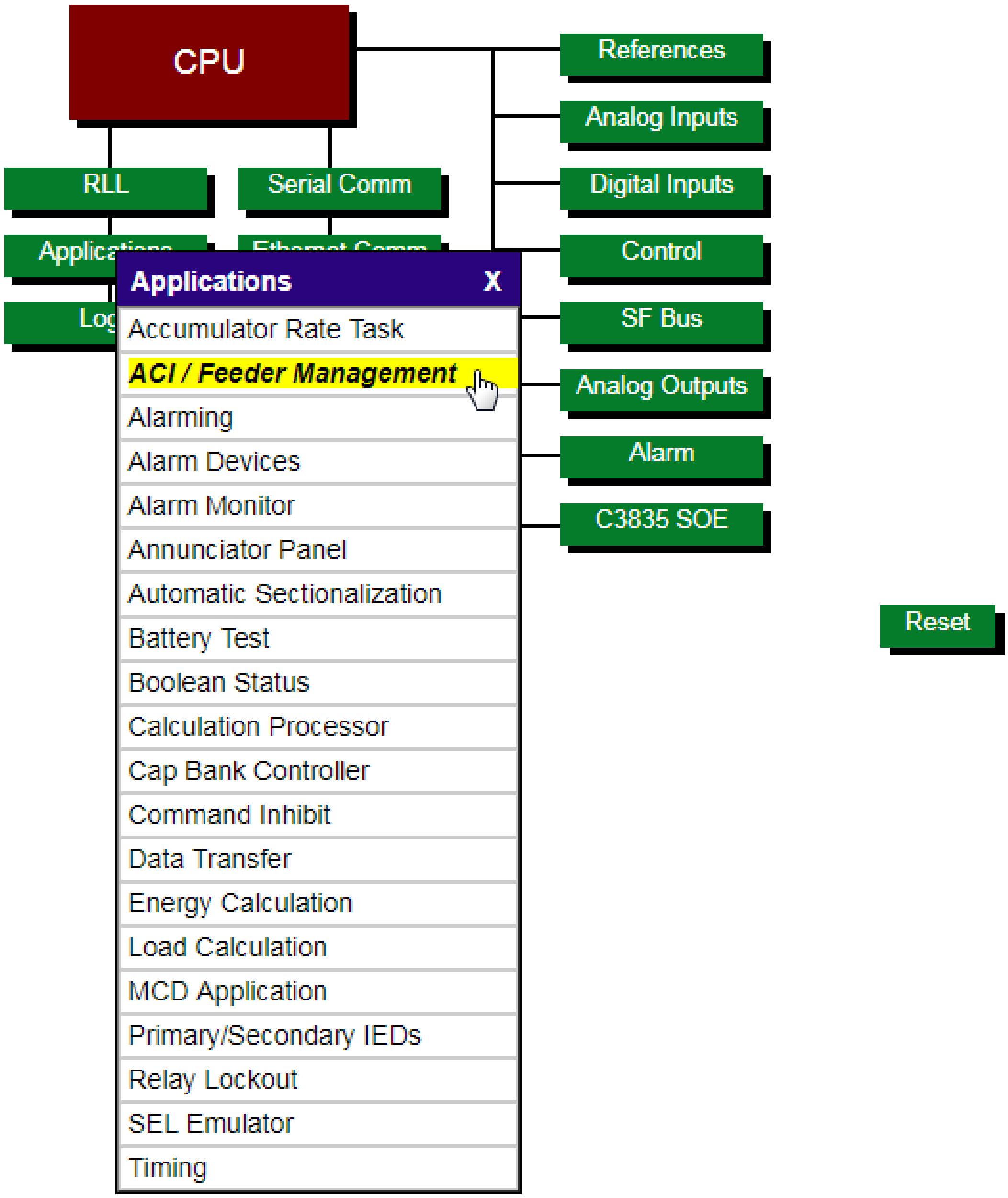
Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

14.2.1.4 Configure Application

From the Configuration screen, click Applications block, then select FMS, as shown below.

Figure 14-8 Selecting FMS Application



14.2.1.5 Records Configuration

Use the Records Configuration setup to set the basic parameters of Feeder Management.

Figure 14-9 Records Configuration

Feeder Management System

Record Type	# of Records	Size per Rec (Bytes)	Memory Usage(Bytes)
Total FMS Memory Available			512000
Maximum number of Event Records	0	* 6084 =	0
Maximum number of Periodic Data Records	0	* 50 =	0
Maximum number of Fast Survery Records	0	* 44 =	0
Maximum number of Diagnostic Data Records	0	* 28 =	0
Total Free Memory			512000

Cancel Submit

Record Type

This parameter lists the various types of Memory and Records.

of Records

Number of Records available for each type of Record.

- **Maximum Number of Event Records**

The maximum number is determined by available memory.

Set this number according to the number of events to be stored. Event records are used to store data for over/under voltage, over current, outages, or forced events. The default is 0.

- **Maximum Number of Periodic Data Records**

The maximum number is determined by available memory.

Set this number according to the number of periods to be stored before the FMS program reads the information from the RTU. A new record is stored every 15 minutes, synchronized to the top of the hour. Failure to set this value large enough will result in lost periodic data. The default is 0.

- **Maximum Number of Fast Survey Records**

The maximum number is determined by available memory.

Set this number according to the number of fast survey records to be collected. Points in this data set may be configured via the FMS master. The default is 0.

- **Maximum Number of Diagnostic Records**

The maximum number is determined by available memory.

Enter the number of diagnostic records to be collected. It is suggested that the largest possible value be used to prevent the overwriting of diagnostic records. Diagnostic records include powerups, setting the time, and resets of the ACI measurement system. The default is 0.

Size per Record (Bytes)

This is the size of the record for the particular type, in bytes.

Memory Usage (Bytes)

This is the total size in Bytes for each type of record or memory usage.

Navigation

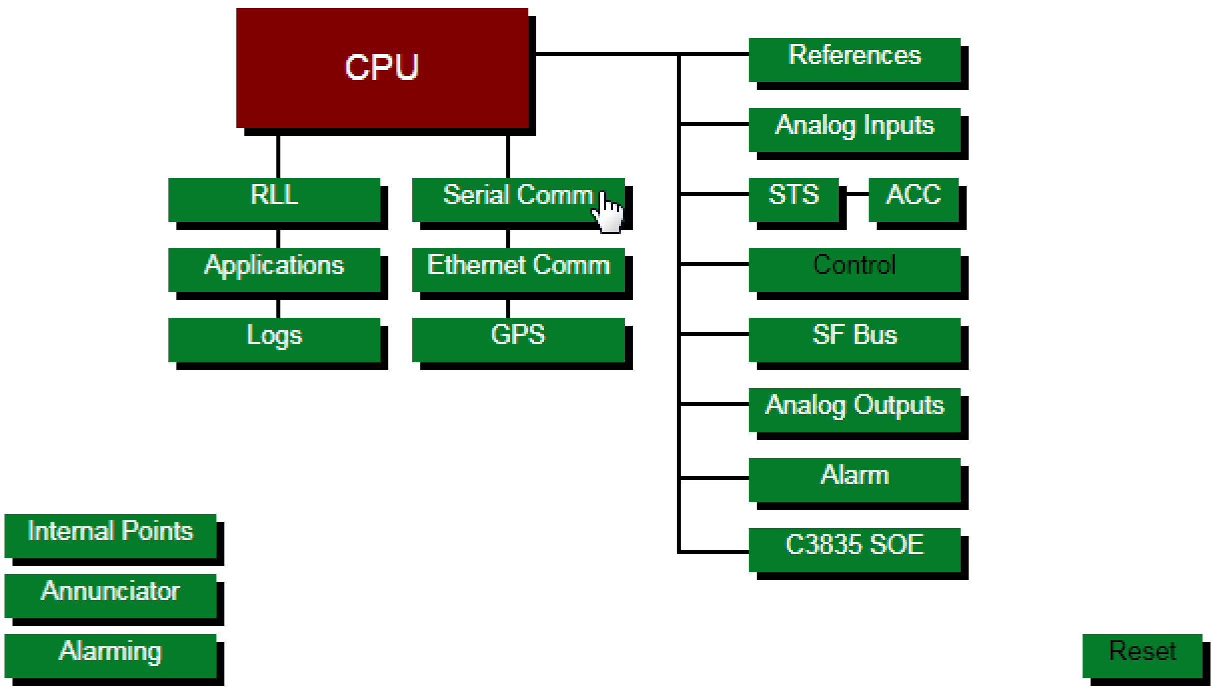
Port # : *n* tells you which port you are on. Port Name : *name* tells you the name of the port. Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

14.2.2 Feeder Management Data Display

Click the Data Display tab as shown below, then click the Serial Comm block.

Figure 14-10 Data Display Screen



14.2.2.1 Display Serial Comm

Click Serial Comm to get the screen shown in Figure 14-11.

Figure 14-11 Display Communication Port Data

Display Communication Port Data

Port Number	RTS	DTR	Name	Protocol	Comm Counters	Display Port Data
Port # 1	H	H	FM Port	FM	View	Port Data
Port # 2	K	K	DNP Remote	DNPR	View	Port Data
Port # 3	K	K	LPS RS 485 Loop 1	None	View	Port Data
Port # 4	K	K	LPS RS 485 LP1	None	View	Port Data
Port # 5	K	K	Port 5	SEL	View	Port Data
Port # 6	K	K	Port 6	None	View	Port Data
Port # 7	K	K	Port 7	None	View	Port Data
Port # 8	K	K	Port 8	None	View	Port Data
Port # 9	K	K	Port 9	None	View	Port Data
Port # 10	K	K	Port 10	None	View	Port Data
Port # 11	K	K	Port 11	None	View	Port Data
Port # 12	K	K	Port 12	None	View	Port Data

Communication Associations Display Back

Port Number
Physical Port number of the RTU.

Name
The port name given during configuration or default name accepted.

Protocol
The configured protocol for this port.

Comm Counters
Click the View button under Comm Counters to display a set of Communication Counters for this port.

Display Port Data
N/A.

Navigation

Click the Back button to return to the previous screen.

14.2.2.2 Communication Counters

Under Comm Counters, click View to get the screen shown in Figure 14-12.

Figure 14-12 Communication Counters Display

FM Communication Counters Display

Port # : 1 Port Name : FM Port

Point	Counter Name	Counts
1	Current user	0
2	Total time	0
3	Total messages	0
4	CRC errors	0
5	RX timeout errors	0
6	RX format errors	0
7	Logon failures	0

Data Trap Configure

Done

Point Number

A logical point number for reference only.

Counter Name

The following counters are monitored:

- **Current User**

The number ID of the current user.

- **Total Time**

Total time that the current user has been logged on.

- **Total Messages**

The number of FMS messages requested since the last reset or power-up.

- **CRC Errors**

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

- **RX Timeout Errors**

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.

- **RX Format Errors**

Indicate the total number of RX format errors since the last reset or power-up.

- **Logon Failures**

Indicates the total number of logon failures since the last reset or power-up.

Counts

The counts for each type of Counter.

Data Trap

Please see the config@WEB Secure Software Users Guide.

14.2.2.3 Display Ethernet Comm

From the Display Communication Port Data screen, click Port Data to get the screen shown in Figure 14-13.

Figure 14-13 Display Communication Port Data

Display Communication Port Data

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

Communication Associations Display Back

Socket Number
The physical number of the socket.

Name
The name of the socket as determined in Configuration.

Protocol
The protocol assigned to the socket determined in Configuration.

Comm Counters
Click the View button to see the Comm Counters.

Navigation

Click the Back button to return to the previous screen.

14.2.2.4 Comm Counters

From the Display Communication Port Data, click on View to get the screen shown below.

Figure 14-14 FM Communication Counters Display

FM Communication Counters Display

Socket # : 4 Port Name : Socket 4

Point	Counter Name	Counts
1	Current user	0
2	Total time	0
3	Total messages	0
4	CRC errors	0
5	RX timeout errors	0
6	RX format errors	0
7	Logon failures	0

Data Trap [Configure]

[Done]

Point Number

A logical point number for reference only.

Counter Name

The following counters are monitored:

- **Current User**

The number ID of the current user.

- **Total Time**

Total time that the current user has been logged on.

- **Total Messages**

The number of FMS messages requested since the last reset or power-up.

- **CRC Errors**

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

- **RX Timeout Errors**

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.

- **RX Format Errors**

Indicate the total number of RX format errors since the last reset or power-up.

- **Logon Failures**

Indicates the total number of logon failures since the last reset or power-up.

Counts

The counts for each type of Counter.

Data Trap

Please see the config@WEB Secure Software Users Guide.

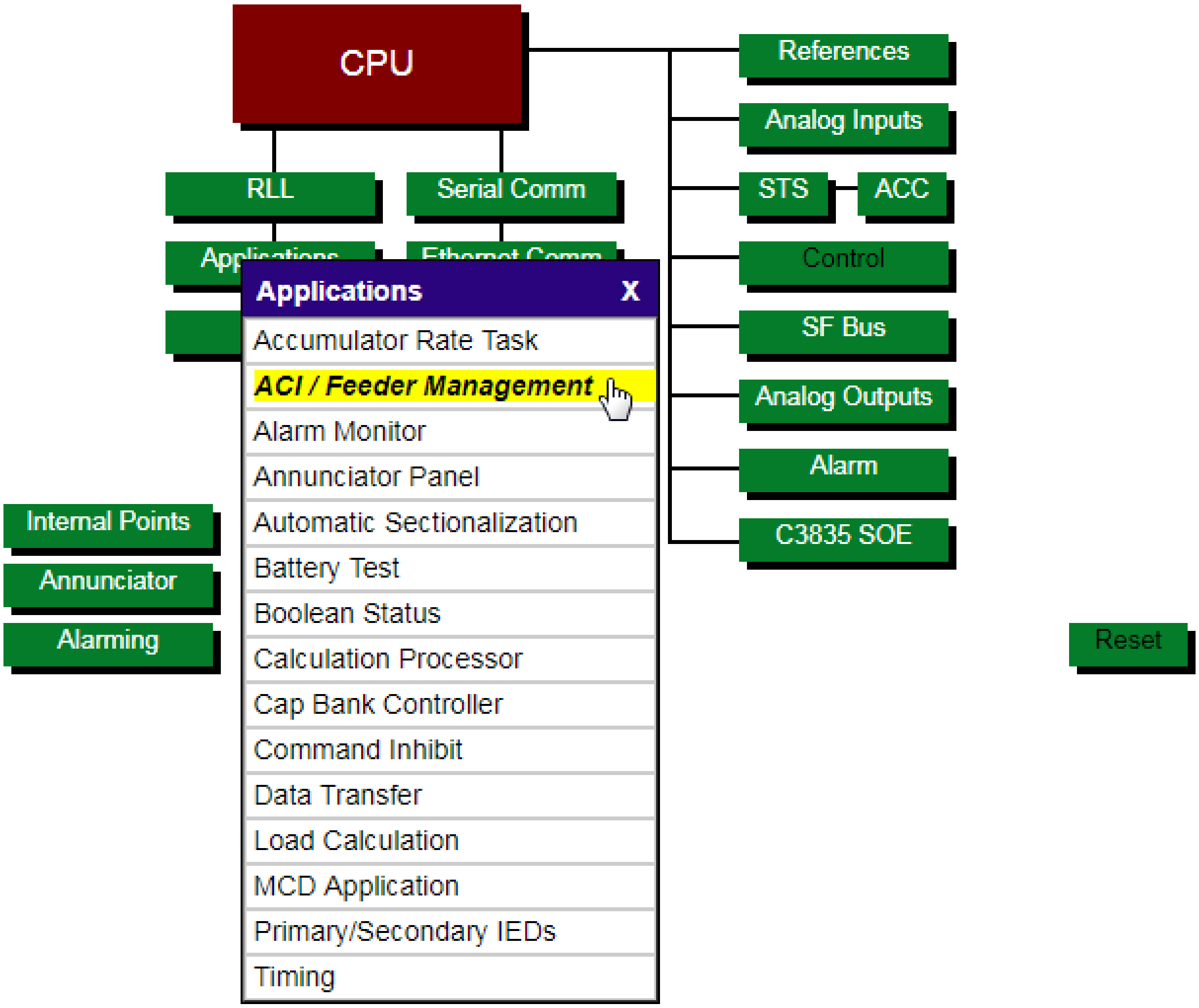
Navigation

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.

14.2.2.5 Display FMS Application

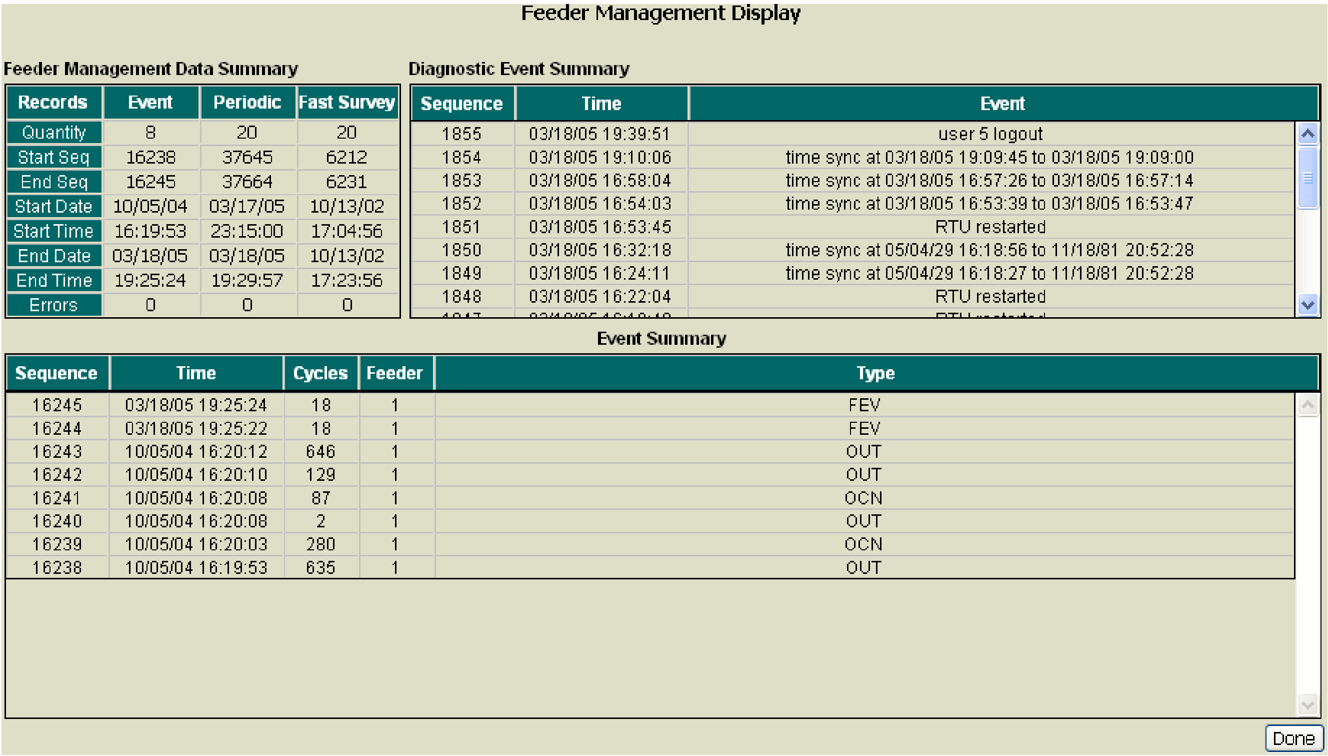
From the Data Display screen, click Applications, then click Feeder Management to get the screen shown in Figure 14-15.

Figure 14-15 Selecting Feeder Management Display



You will get the screen shown below. The extent of information displayed depends on your Configuration entries for Maximum number of Event Records, Periodic Data Records, Fast Survey Records, and Diagnostic Data Records.

Figure 14-16 Feeder Management Display



Feeder Management Display

Feeder Management Data Summary

Records	Event	Periodic	Fast Survey
Quantity	8	20	20
Start Seq	16238	37645	6212
End Seq	16245	37664	6231
Start Date	10/05/04	03/17/05	10/13/02
Start Time	16:19:53	23:15:00	17:04:56
End Date	03/18/05	03/18/05	10/13/02
End Time	19:25:24	19:29:57	17:23:56
Errors	0	0	0

Diagnostic Event Summary

Sequence	Time	Event
1855	03/18/05 19:39:51	user 5 logout
1854	03/18/05 19:10:06	time sync at 03/18/05 19:09:45 to 03/18/05 19:09:00
1853	03/18/05 16:58:04	time sync at 03/18/05 16:57:26 to 03/18/05 16:57:14
1852	03/18/05 16:54:03	time sync at 03/18/05 16:53:39 to 03/18/05 16:53:47
1851	03/18/05 16:53:45	RTU restarted
1850	03/18/05 16:32:18	time sync at 05/04/29 16:18:56 to 11/18/81 20:52:28
1849	03/18/05 16:24:11	time sync at 05/04/29 16:18:27 to 11/18/81 20:52:28
1848	03/18/05 16:22:04	RTU restarted

Event Summary

Sequence	Time	Cycles	Feeder	Type
16245	03/18/05 19:25:24	18	1	FEV
16244	03/18/05 19:25:22	18	1	FEV
16243	10/05/04 16:20:12	646	1	OUT
16242	10/05/04 16:20:10	129	1	OUT
16241	10/05/04 16:20:08	87	1	OCN
16240	10/05/04 16:20:08	2	1	OUT
16239	10/05/04 16:20:03	280	1	OCN
16238	10/05/04 16:19:53	635	1	OUT

Done

Parts of the above illustration are repeated below for clarity.

14.2.2.6 Feeder Management Data Summary

Records	Event	Periodic	Fast Survey
Quantity	6	20	20
Start Seq	16238	37634	6212
End Seq	16243	37653	6231
Start Date	10/05/04	03/17/05	10/13/02
Start Time	16:19:53	20:30:00	17:04:56
End Date	10/05/04	03/18/05	10/13/02
End Time	16:20:12	16:44:57	17:23:56
Errors	0	0	0

Records

Records are arranged by Quantity, Start Seq, End Seq, Start Date, Start Time, End Date, End Time, and Errors.

Event

Event Quantity is the number of Events to be stored. Event records are used to store data for over/under voltage, over current, outages, or forced events.

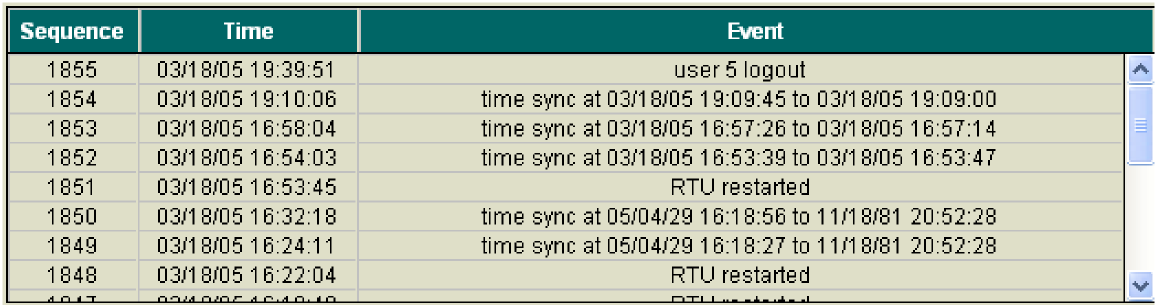
Periodic

This is the number of periods that are stored before the FMS program reads the information from the RTU. A new record is stored every 15 minutes, synchronized to the top of the hour.

Fast Survey

This is the number of fast survey records collected. Points in this data set may be configured via the FMS master.

14.2.2.7 Diagnostic Event Summary



Sequence	Time	Event
1855	03/18/05 19:39:51	user 5 logout
1854	03/18/05 19:10:06	time sync at 03/18/05 19:09:45 to 03/18/05 19:09:00
1853	03/18/05 16:58:04	time sync at 03/18/05 16:57:26 to 03/18/05 16:57:14
1852	03/18/05 16:54:03	time sync at 03/18/05 16:53:39 to 03/18/05 16:53:47
1851	03/18/05 16:53:45	RTU restarted
1850	03/18/05 16:32:18	time sync at 05/04/29 16:18:56 to 11/18/81 20:52:28
1849	03/18/05 16:24:11	time sync at 05/04/29 16:18:27 to 11/18/81 20:52:28
1848	03/18/05 16:22:04	RTU restarted

Sequence

The sequence number of the event.

Time

The starting time of the event.

Event

The nature of the event. The following list contains the possible diagnostic messages:

"RTU restarted"
"time sync at [old time] to [new time]"
"ACI evt queue overflow feeder [number]"
"RTU config downloaded"
"fast survey reconfig'd"
"passwords downloaded"
"events flushed"
"periodic data flushed"
"fast survey data flushed"
"user [name] logon"
"user [name] logout"
"session timeout"
"login failure"
"unknown event type [hex number]"

"ACI comm fail feeder [number]"
"ACI comm restored feeder [number]"
"ACI H/W failure feeder [number]"
"ACI comm error feeder [number]"
"ACI restart feeder [number]"

The brackets [] in the above diagnostic messages have the following meanings:

[number] ranges from 1 to 8
[name] is the user name
[old time] is the time previously in the RTU
[new time] is the time set into the RTU
[hex number] is a 4 digit hex number that the display system does not know how to interpret into text

14.2.2.8 Event Summary

Sequence	Time	Cycles	Feeder	Type
16238	10/05/04 16:19:53	635	1	OUT
16239	10/05/04 16:20:03	280	1	OCN
16240	10/05/04 16:20:08	2	1	OUT
16241	10/05/04 16:20:08	87	1	OCN
16242	10/05/04 16:20:10	129	1	OUT
16243	10/05/04 16:20:12	646	1	OUT

Sequence
The sequence number of the event.

Time
The starting time of the event.

Cycles
The number of AC cycles of the event.

Feeder
The feeder field indicates which ACI card is being reported, or simply, which feeder is being reported. In the case of the SAGE 1250, there is only one feeder reported. If the FM events are coming from an IED, there could be multiple feeders reporting.

Type
The following list contains the possible event record types. There may be multiple types on any one event.

"FEV" - forced event through protocol
"OUT" - Power outage
"OCN" - Neutral over current
"OCA" - Phase A over current
"OVA" - Phase A over voltage
"UVA" - Phase A under voltage
"OCB" - Phase B over current
"OVB" - Phase B over voltage
"UVB" - Phase B under voltage
"OCC" - Phase C over current
"OVC" - Phase C over voltage
"UVC" - Phase C under voltage

14.3 ACI Application

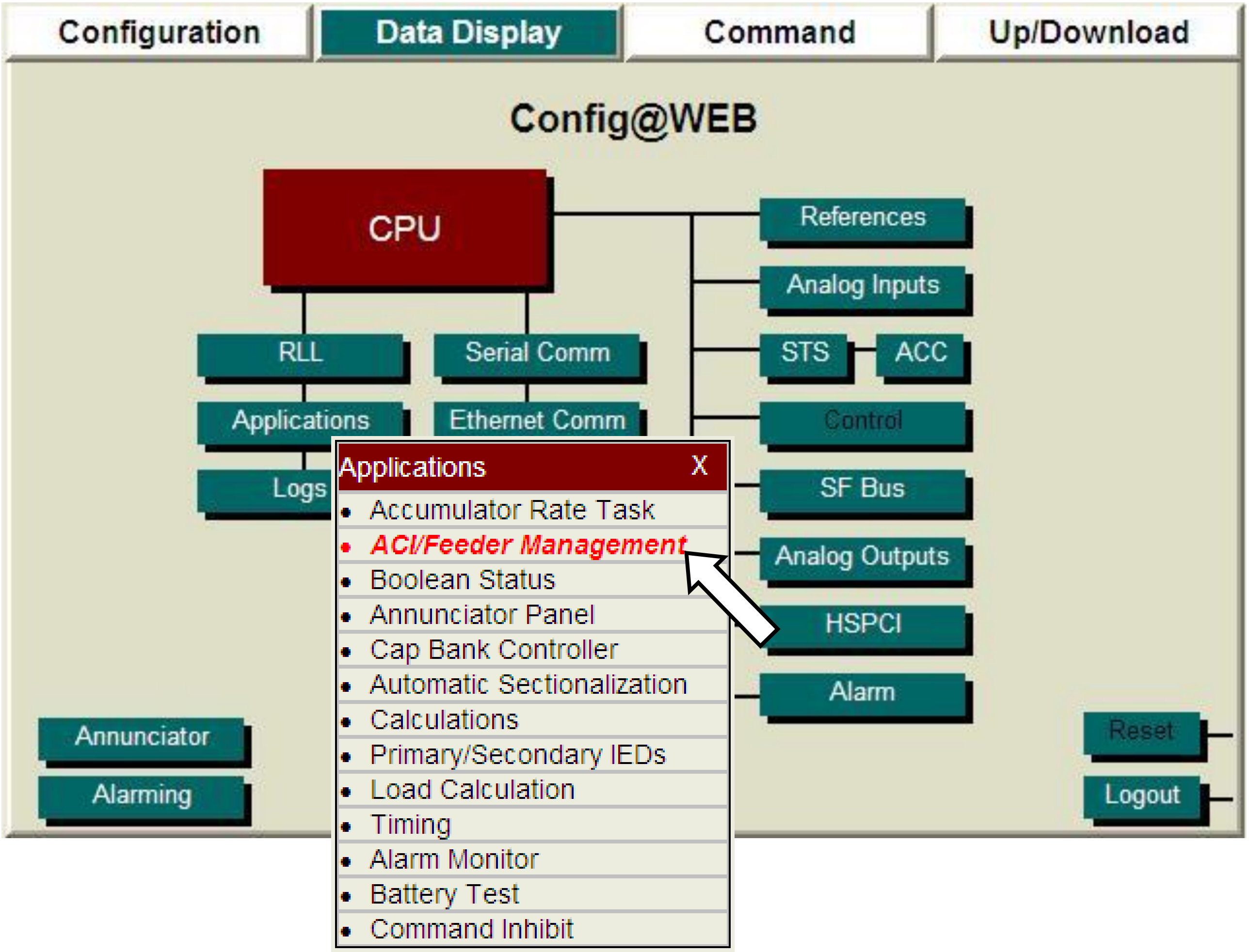
14.3.1 ACI Application Configuration

There is nothing to configure for the ACI application.

14.3.2 ACI Application Display

From the Data Display screen, click Applications, then ACI/Feeder Management as shown below.

Figure 14-17 Displaying ACI Type Data



The resulting data display will look like the figure below.

Figure 14-18 ACI Type Data Display

ACI Display

Diagnostic Event Summary

Sequence	Time	Event
7	11/29/06 11:23:15	ACI comm restored feeder 1
6	11/29/06 11:23:14	ACI comm fail feeder 1
5	11/29/06 11:23:11	ACI evt queue overflow feeder 1
4	11/29/06 11:23:11	ACI restart feeder 1
3	11/29/06 11:23:11	ACI H/W failure feeder 1
2	11/29/06 11:23:07	ACI comm restored feeder 1
1	11/29/06 11:23:00	ACI comm fail feeder 1
0	11/29/06 11:22:01	RTU restarted

Event Summary

Sequence	Time	Cycles	Feeder	Type	Ia	Ib	Ic	In	Va	Vb	Vc
4	09/08/06 13:50:53	33999	1	ABCN	5968.5	5711.7	5423.1	16970.6	13.0	12.2	11.4
3	09/08/06 13:41:29	1293	1	ABCN	16980.9	16980.9	16980.9	16970.0	4.4	0.0	172.6
2	09/06/06 21:12:27	62	1	ABCN	14588.1	14515.5	14581.6	16970.6	411.1	422.7	425.3
1	09/06/06 19:05:43	8	1	ANF	11304.6	453.3	451.9	10843.9	6659.4	7069.8	7067.2

Done

14.3.2.1 Diagnostic Event Summary

Sequence

The sequence of the event.

Time

The time of the event.

Event

The following events are reported:

"RTU restarted"
"ACI comm fail feeder [number]"
"ACI comm restored feeder [number]"
"ACI H/W failure feeder [number]"
"ACI comm error feeder [number]"
"ACI restart feeder [number]"

The brackets [] in the above diagnostic messages have the following meaning: [number] ranges from 1 to 8 ACI cards or feeders.

14.3.2.2 Event Summary

Sequence

The sequence of the event.

Time
The time of the event.

Cycles
The number of AC cycle since startup when the event happened.

Feeder
The Feeder number for the event.

Type
A code for the type of event with the meaning as follows:

A - Phase A fault
B - Phase B fault
C - Phase C fault
N - Neutral fault
F - Forward direction fault
R - Reverse direction fault

Note that there may be multiple faults types per event and that the direction may not be able to be determined on all faults.

Ia
Current in amps on Phase A during the event.

Ib
Current in amps on Phase B during the event.

Ic
Current in amps on Phase C during the event.

In
Current in amps on neutral during the event.

Va
Voltage in volts on Phase A during the event.

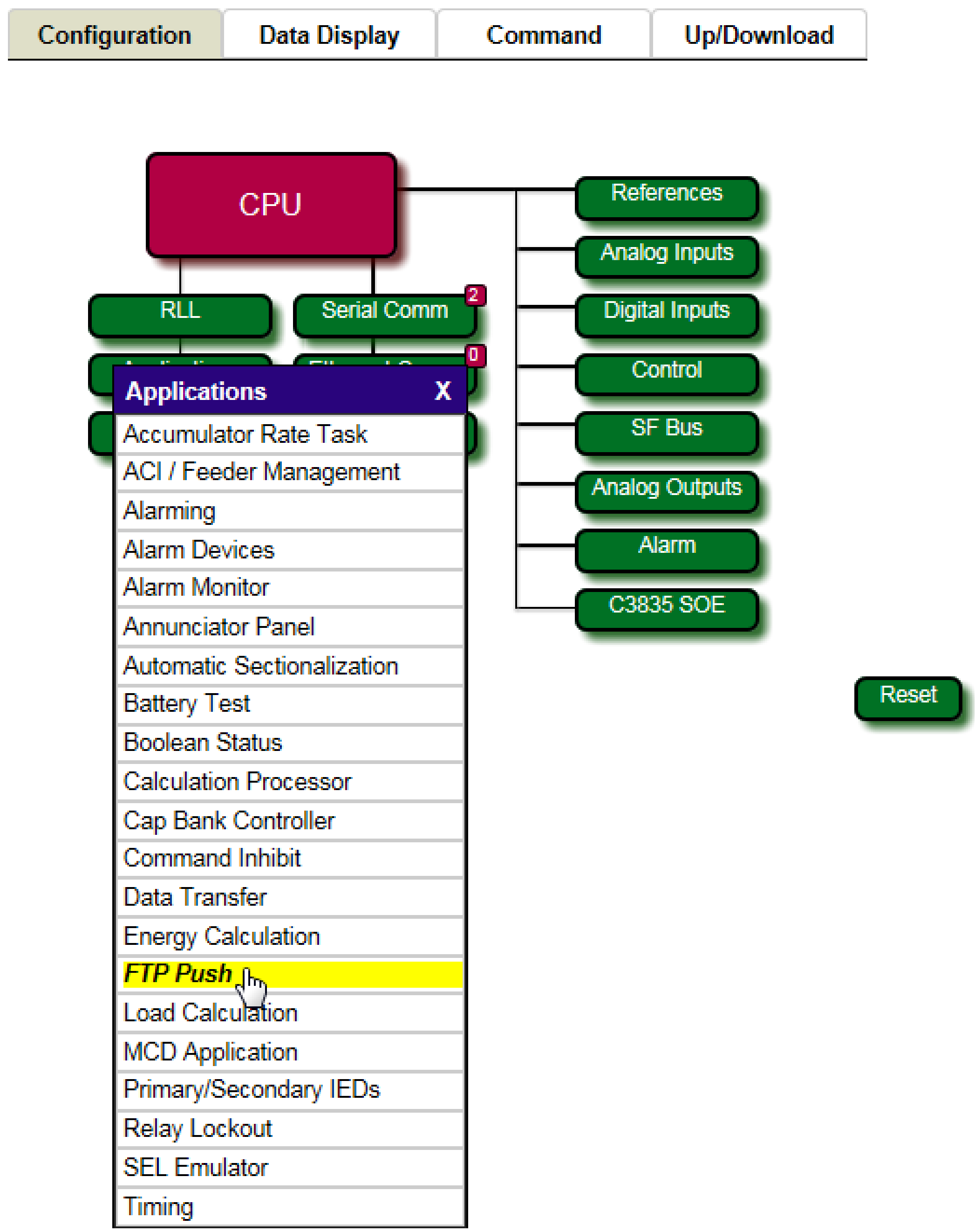
Vb
Voltage in volts on Phase B during the event.

Vc
Voltage in volts on Phase C during the event.

15 FTP Push Files

15.1 Introduction

Select the FTP Push Applications as shown below.



This application is designed to automatically push files to one or more servers to facilitate quick analysis of events generated by SEL relays connected to the RTU and from log files created by the RTU.

Non-operational data from protective relays is very useful for utilities to maintain grid health.

- Relay event records can be used to help dispatch repair crews to the exact location of the fault.

- Event records can be used to perform root cause analysis on faults to prevent future disruptions.
- Analysis of event records can highlight configuration problems in relays such as line impedance, event generation deadbands, and trip thresholds (for adjacent lines).
- Utilities may have reporting requirements for disturbances where timing is critical.
- Pushing event data to remote systems allows for better access control to the protection equipment. In many cases, the dispatchers should not have access to protective relay configurations but the event data is important for their function.

Having event records available on an enterprise system allows the utility to more efficiently perform grid repairs, root cause analysis, relay configuration analysis, facilitates reporting, improves access control, and breaker health.

Figure 15-1: Proposed Communications Topology

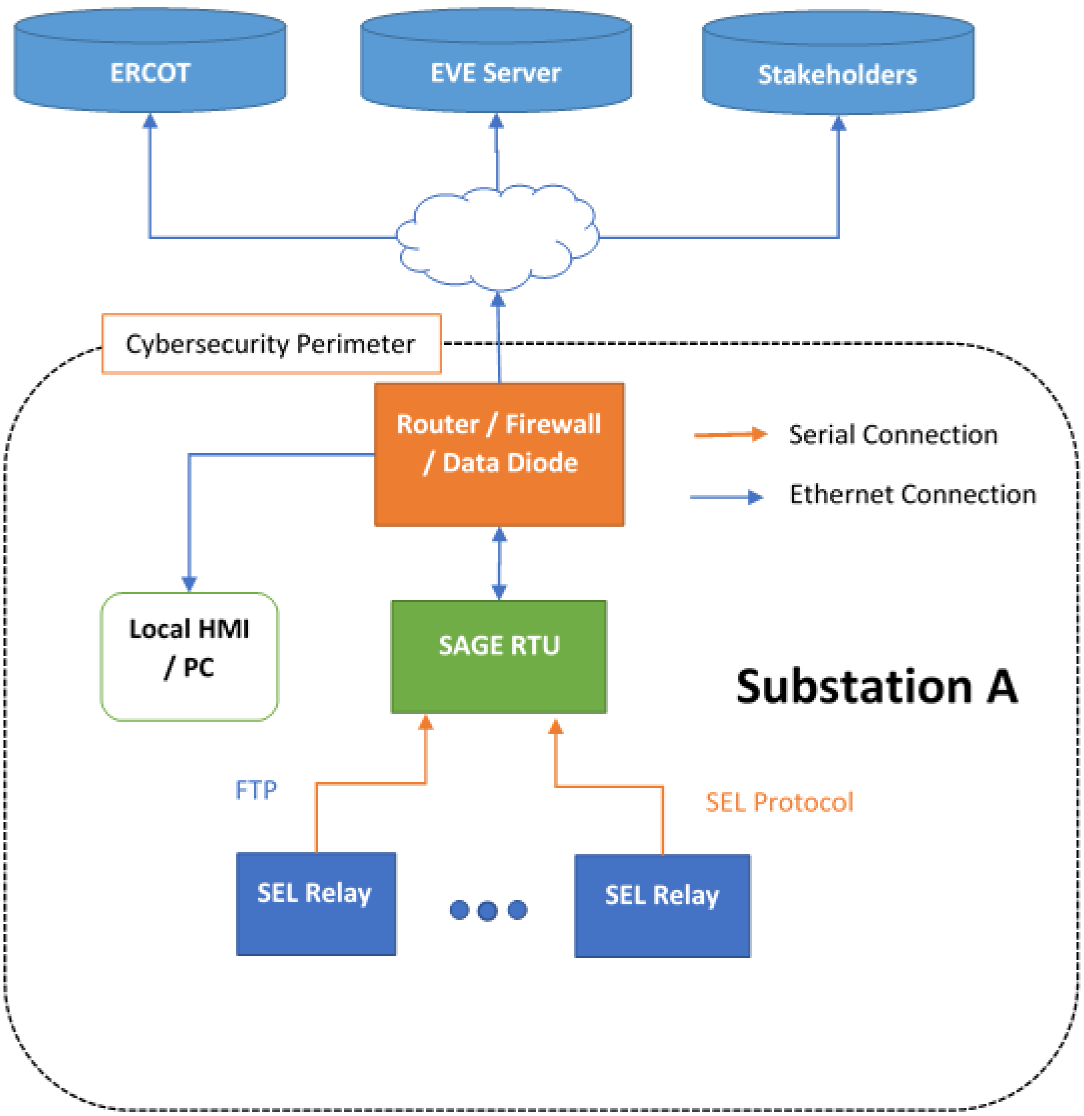
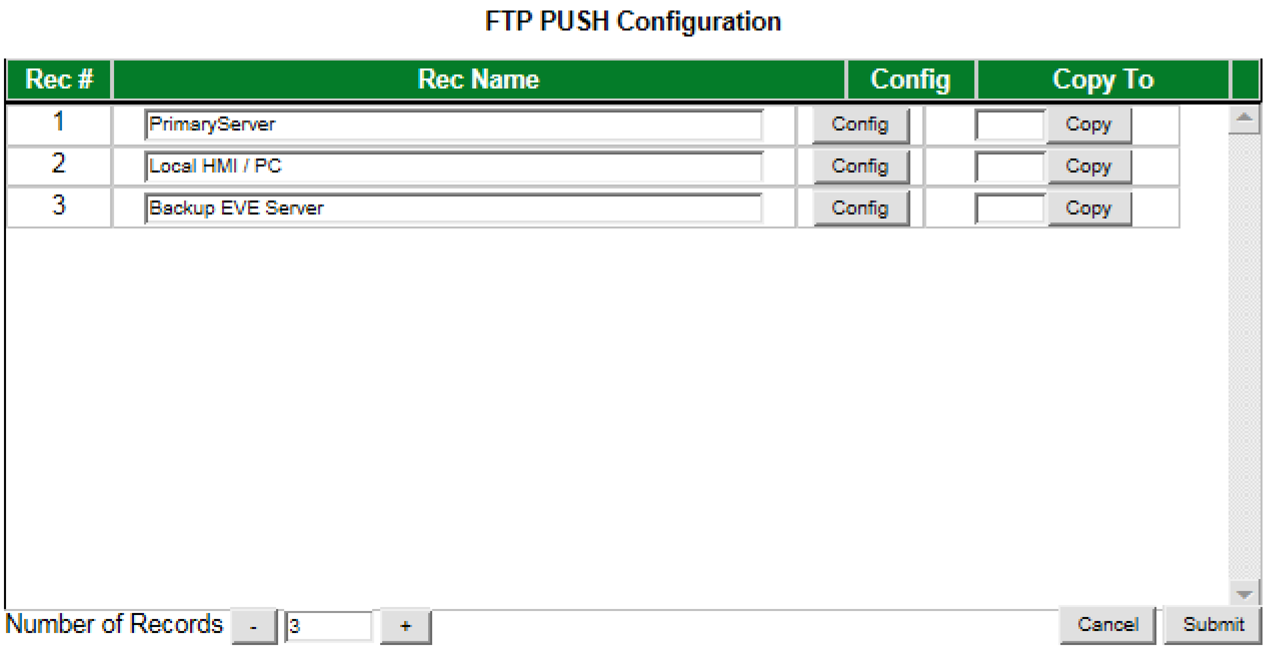


Figure 15-2 Beginning Configuration Page



Number of Records
Enter the number of servers in which you would like to send Event records and log files.

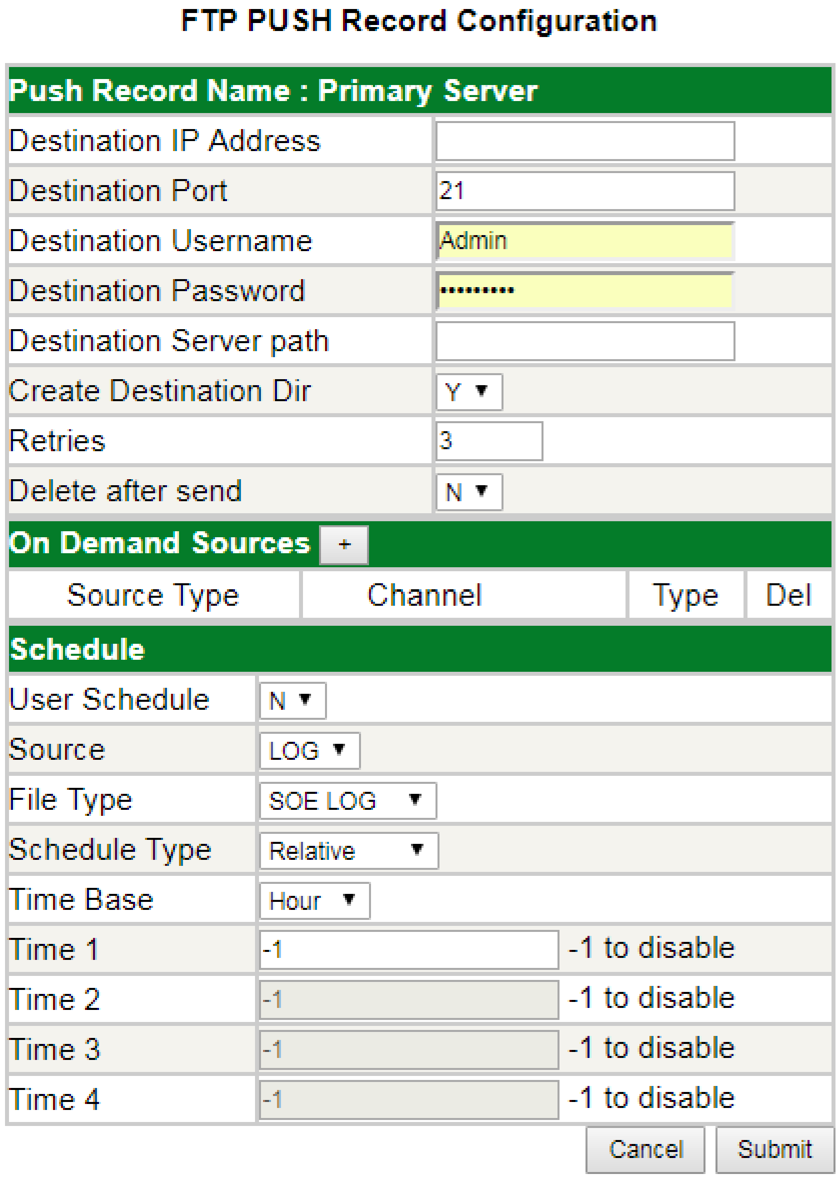
Rec
The Server Number.

Rec Name
The name (alias) of the server in which to send the configured files.

Config
Click Config to add different files to send to this server.

Copy To
Copy the configured file information to a new server. Useful for sending files to a backup server.

Figure 15-3: FTP Push Record Configuration



Each FTP Push record can be configured to send several different files from different sources including SEL EVE, HIS, and SER files. Also, you may send RTU SOE, User, and System log files on a periodic schedule.

Push Record Information

The FTP Push record corresponds to a single server in which to send files for analysis.

Destination IP Address

The IP address of the server in which to send the files configured below.

Destination Port

The TCP port number in which the server is listening. 21 is the default for FTP servers.

Destination Username

The Username used to log into the server.

Destination Password
The Password used to log into the server.

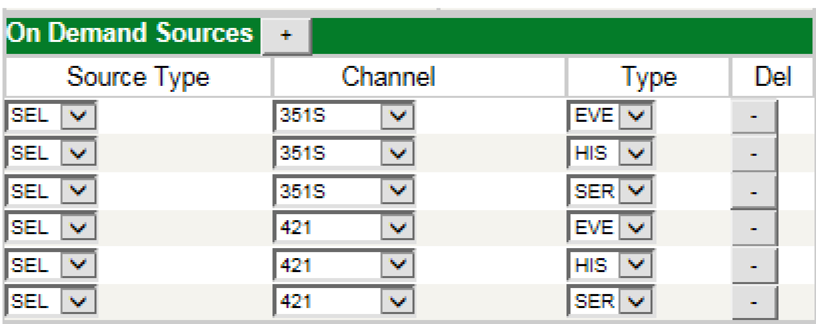
Destination Server Path
Once logged into the destination server, this is the folder in which the files will be saved to. Typically, the RTU name will be used here or IED name.

Create Destination Dir
Whether or not to create the Server Path configured above to store files into.

Retries
The number of times to attempt sending files to the server before a failure detected. On a failure, the FTPPUSH Xfer Error status point will be pulsed.

Delete After Send
Should the file be deleted from the RTU storage after a successful transfer to the server.

Figure 15-4: On Demand Sources



On Demand Sources
On demand sources are files which will be transferred as soon as they are retrieved from the IED. The RTU periodically checks SEL Relays for new EVE, HIS, and SER files and stores new files when they become available. The RTU will then send these files to each FTP Push Record server immediately.

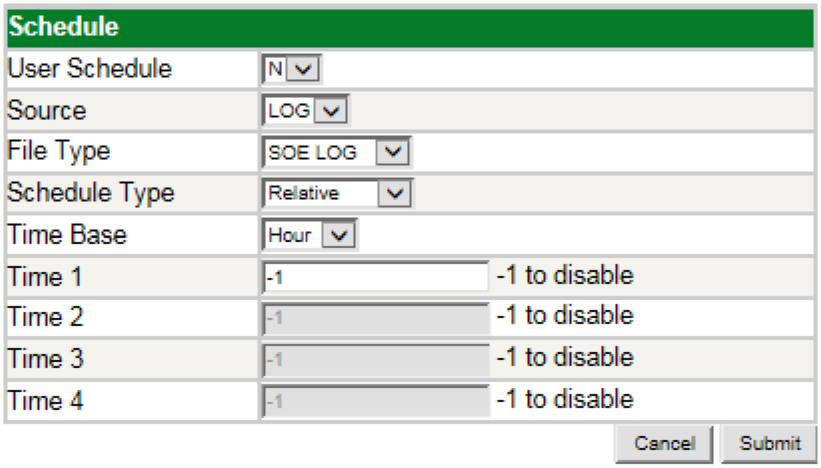
Source Type
The device from which files will be sent to the FTP Push record server.

Channel
The name of the IED from which the file is sent. For SEL protocol, this corresponds to a serial port.

Type
The file / event type to send to the FTP server. EVE files are SEL Fault Event capture files. HIS are SEL history files that contain a summary of the recent fault events seen by the relay. SER files are the status change logs generated by the relay.

Schedule
Scheduled sources are files which will be transferred periodically to the FTP server. The RTU periodically sends SOE (Sequence of Events), User (Cybersecurity), and System (Internal troubleshooting) Logs.

Figure 15-5: On Demand Sources



User Schedule

Enable or disable sending of RTU log files entirely.

Source

Logs are currently the only available source for Scheduled File Transfers.

File Type

Select the log type to send to the server. SOE Log send the most recent status change events file to the server. User Log file contains cybersecurity audit information such as successful logins, failed logins, logouts, config changes, new users files received, etc. System Log files contain internal RTU debugging information which is helpful in troubleshooting errors.

Schedule Type

Relative indicates that the application will send files periodically according to the configured Time Base and Time. For example, if the Time base is set to Hour and Time 1 is set to 3, the RTU will send the log files every 3 hours after startup.

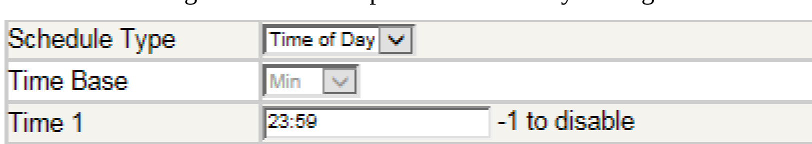
Time Base

How often the periodic file transfer occurs. Minutes, Hours, Days, and Weeks are the available choices.

Time x

If Schedule Type is Relative, this tells the RTU how often to send files after startup. If the Schedule Type is Time of Day, enter up to four times throughout the day to send the log files. Must be in the “HH:MM” 24 Hour time format.

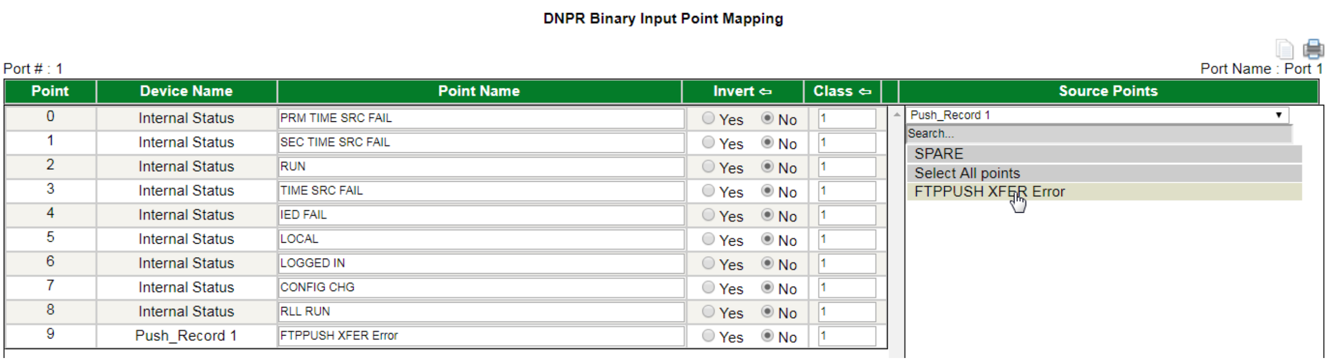
Figure 15-6: Example of Time of Day Config



Map Status Inputs

The FTP Push application creates a status point which can be mapped back to the master to indicate that a file transfer error has occurred on the FTP Push record (one per record). An example is shown below.

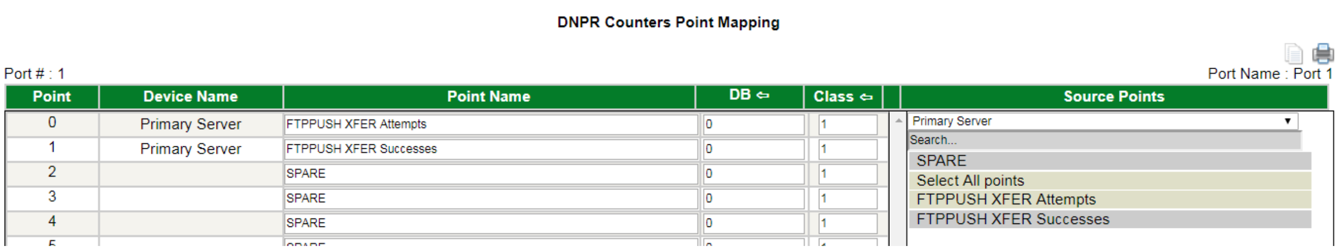
Figure 15-7 Status Mapping



Map Accumulator Inputs

The FTP Push application creates accumulator points which can be mapped back to the master to indicate that a file transfer attempt has occurred and a successful transfer has occurred on the FTP Push record (two per record). An example is shown below.

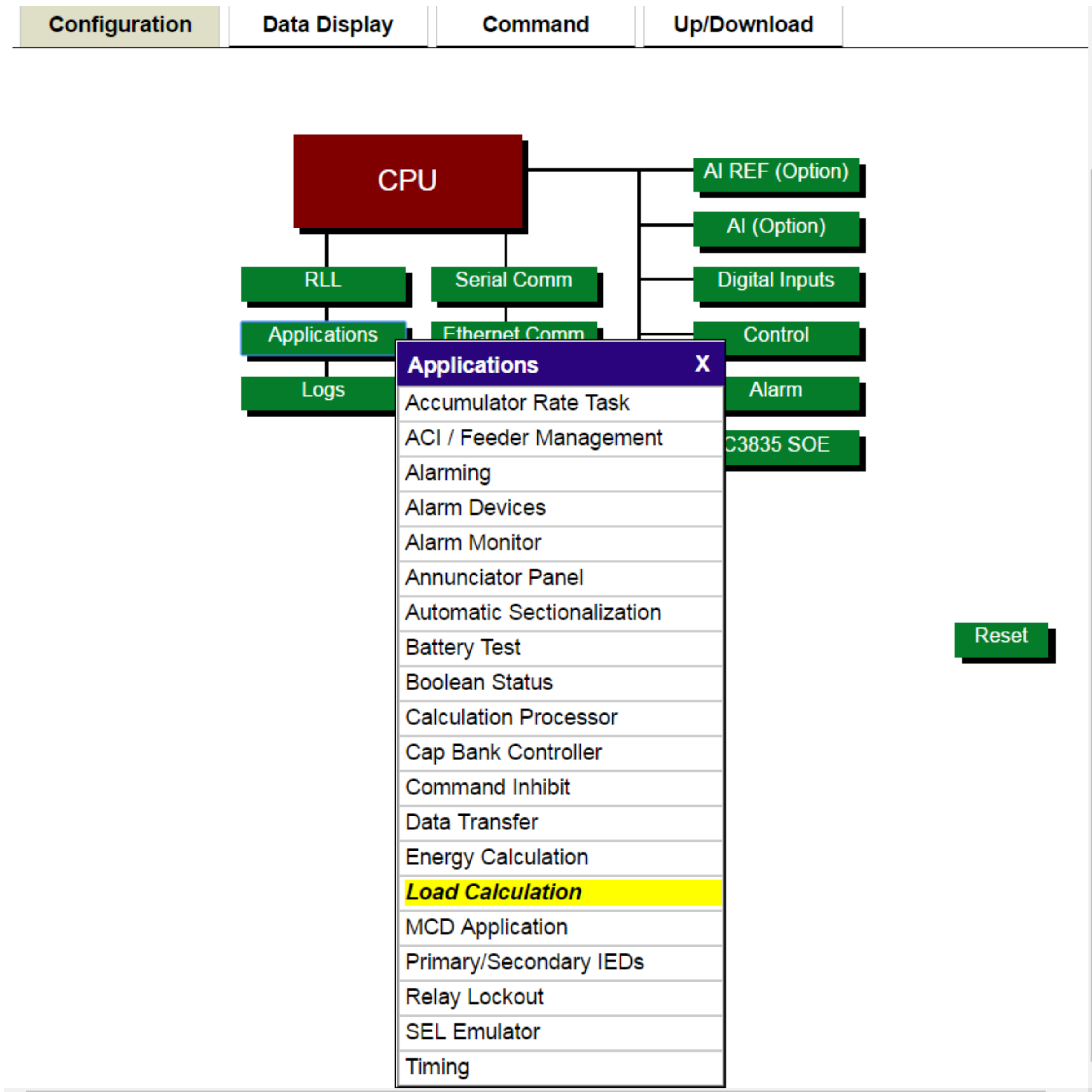
Figure 15-8 Accumulator Mapping



16 Load Calculation

16.1 Introduction

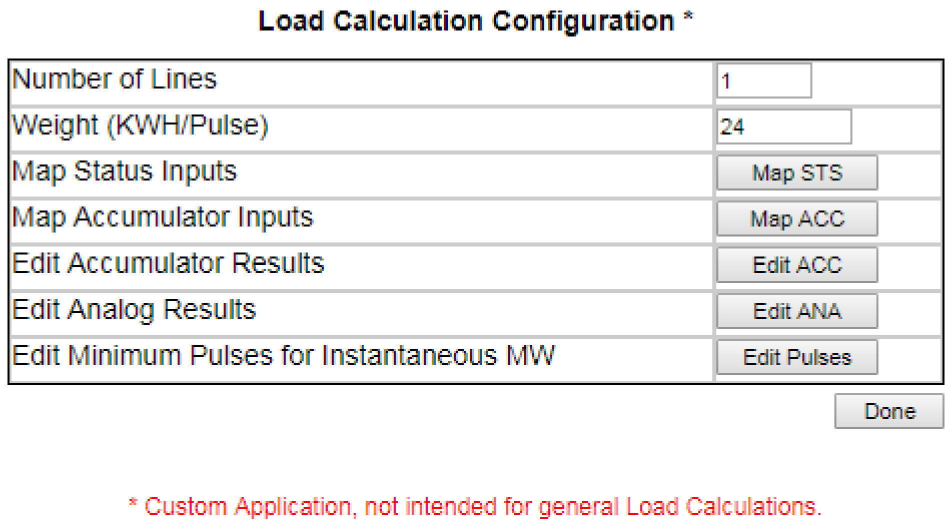
Select the Load Calculation Application as shown below.



This is a specialized Load Calculation application. Up to ten lines can be defined over which load calculations will be performed. A single digital input point is defined for a synchronization pulse to occur every fifteen minutes. At the first pulse, the application begins counting pulses from a digital input point for each line which represents a configurable number of kilowatt-hours. When a certain number of pulses have been counted, the application projects the rate of input to a one-hour basis and computes an estimated instantaneous megawatt input rate. Pulse accumulators are also monitored for kilowatt-hour output, kilovar-hours input in both a positive and negative direction and kilovar-hours output in positive and negative directions. Fifteen one-minute samples are collected and stored. When a full fifteen minutes of data have been collected, the application computes average values over the last fifteen minutes for each line. The next pulse from the synchronization input starts the calculations for the next fifteen-minute interval.

The beginning configuration page is as follows.

Figure 16-1 Beginning Configuration Page

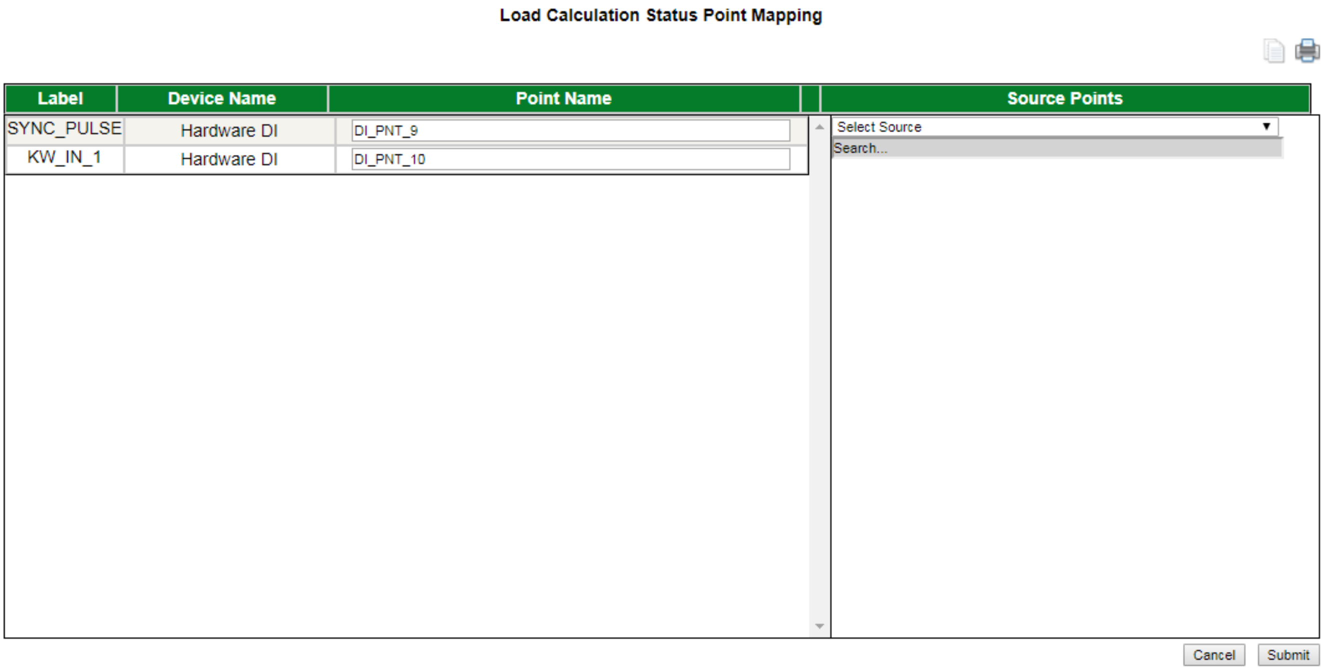


Number of Lines
Enter the number of lines to be monitored (1 to 10).

Weight (Kwh/pulse)
Enter the number of kilowatt-hours represented by each pulse of the KW-hour input points.

Map Status Inputs
Click this button to bring up a page on which to select the digital input point to be used for the synchronization pulse and for the KW-hour input for each line. An example is shown below.

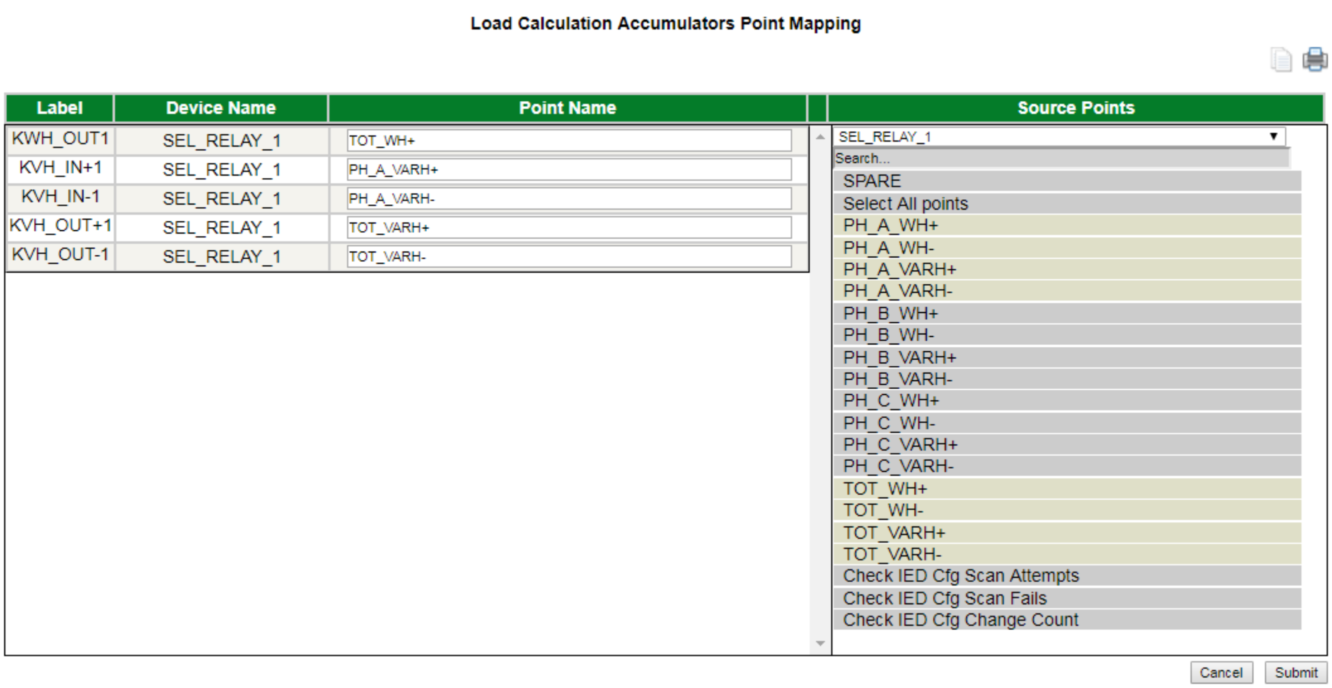
Figure 16-2 Status Mapping



Map Accumulator Inputs

Click this button to bring up a page on which to select the pulse input accumulator points to be used for the KWh out, positive KVH In, negative KVH In, positive KVH out and negative KHV out for each line. An example is shown below.

Figure 16-3 Accumulator Mapping



Edit Accumulator Results

Click this button to edit the names of the pseudo-accumulators calculated by the application: The total KWH over all lines, the number of KWH pulses for each line and the number of KWH for each line. An example is shown below.

Figure 16-4 Accumulator Name Editing

Load Calculation Accumulator Point Names

Point #	Name
1	TOTAL_KWH
2	KW_PULSES_IN_1
3	KWH_IN_1

Cancel Submit

Edit Analog Results

Click this button to edit the names and enter scaling factors for the pseudo-analogs calculated by the application: The average total MW and MVAR over all lines, the estimated instantaneous MW and the average MW, MVAR and instantaneous MW input for each line. An example is shown below.

Figure 16-5 Analog Editing

Load Calculation Analog Point Names

Point #	Name	Egu Min	Egu Max
1	AVG_MW_TOTAL	0	1000
2	AVG_MV_TOTAL	0	1000
3	INSTANT_MW	0	1000
4	AVG_MW_1	0	1000
5	AVG_MVAR_1	0	1000
6	AVG_MWI_1	0	1000

Cancel Submit

Edit Minimum Pulses for Instantaneous MW

Click this button to edit the minimum number of KWH input pulses required for extrapolation to an hour's basis for each line. An example is shown below.

Figure 16-6 Pulses Editor

Load Calculation Pulses Editor

Line #	Value
1	5

Cancel Submit

16.2 Data Display

The display for the Load Calculation application shows the number of pulses counted for each line for each of the fifteen one-minute intervals. A sliding arrow indicates which values are to be computed on the next cycle.

Below that table are shown the average and total MW and MVAR computed for each line, the estimated instantaneous MW for each line and the measured KWH input for each line. At the bottom of the display are shown the total instantaneous MW and KWH input over all lines. An example is shown below.

Figure 16-7 Data Display

Load Calculation Display

	Line 1		Line 2		Line 3		Line 4		Line 5		Line 6		Line 7		Line 8		Line 9		Line 10	
Sample	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp	#KWHp	#KVRHp
1	0	0																		
2	0	0																		
3	0	0																		
4	0	0																		
-> 5	0	0																		
6	0	0																		
7	0	0																		
8	0	0																		
9	0	0																		
10	0	0																		
11	0	0																		
12	0	0																		
13	0	0																		
14	0	0																		
15	0	0																		

Totals

Line	MW		MVAR	KWHi
	Average	Inst.	Average	
1	0.00	0.00	0.00	384
2				
3				
4				
5				
6				
7				
8				
9				
10				
Total	0.00	0.00	0.00	384

Back

17 MCD Application

17.1 Introduction

This application creates multiple changes for a status point by using the state and a three bit counter provided by points mapped from the status database. It has a single status point output, which can be named, that represents the current state of the point.

Access to this application will be by using the "Configuration/Applications/MCD Application" and "Display/Applications/MCD Application". Any number of these points may be created.

A timer is used to wait a period of time to collect state and counter bit changes before processing the data to determine the validity of the data received. Any change of the state or counter bits starts the timer and all changes are collected as one event until the timer expires, at which point the data collected is processed. Only valid states of the point state and counter values listed below will have multiple changes queued to the status system. Invalid states will queue the changed state only.

An MCD configuration contains the following:

1) Name of the MCD block status output point
2) Mapped state point from the status database
3) Mapped status point from the status database for bit 0 of the 3 bit counter
4) Mapped status point from the status database for bit 1 of the 3 bit counter
5) Mapped status point from the status database for bit 2 of the 3 bit counter
6) Timer value to wait for state/counter data bits to be reported to the application in the range of 34 to 60000 milliseconds. The minimum value of 34 will guarantee that there will always be at least 1 clock tick of delay (each tick is 16.67ms)

An MCD display shows the following:

1) The configuration data.
2) State, counter value, time, and status for (n-1)th evaluation of the data
3) State, counter value, time, and status for nth evaluation of the data

The status will be one of the following states – Configuration Error, Invalid, or Valid

Counter values in the table below

```
000 = 0
100 = 1
010 = 2
110 = 3
001 = 4
101 = 5
011 = 6
111 = 7
```

Initial state of 0, flip state bits (S column) for initial state of 1

Counter bits are 0, 1, and 2 columns

S 012	S 012	S 012	S 012	S 012	S 012	S 012	S 012	
0 000	0 100	0 010	0 110	0 001	0 101	0 011	0 111	Initial state and counter
1 000	1 100	1 010	1 110	1 001	1 101	1 011	1 111	Invalid (state only change)
1 100	1 010	1 110	1 001	1 101	1 011	1 111	1 000	Valid - 1 change
1 010	1 110	1 001	1 101	1 011	1 111	1 000	1 100	Invalid (Note 1)
1 110	1 001	1 101	1 011	1 111	1 000	1 100	1 010	Valid - 3 changes
1 001	1 101	1 011	1 111	1 000	1 100	1 010	1 110	Invalid (Note 1)
1 101	1 011	1 111	1 000	1 100	1 010	1 110	1 001	Valid - 5 changes
1 011	1 111	1 000	1 100	1 010	1 110	1 001	1 101	Invalid (Note 1)
1 111	1 000	1 100	1 010	1 110	1 001	1 101	1 011	Valid - 7 changes

(Note 1) Even number of changes to opposite state

17.1.1 Application Logic

After reset:

1) The application will waits until the signal occurs that all the point data has been acquired or that communications with the device is failed.
2) The output state will be established and queued if needed. The output state will reflect the communications state of the mapped state point.
3) The initial counter value will be established

On any change of state or counter bit associated with an MCD block:
If timer is not already running, start a timer for the MCD block containing the bit.
Accumulation of state and counter bit data begins.

At the end of the time out period for the MCD block:
Evaluation of the data collected when the timer was running.

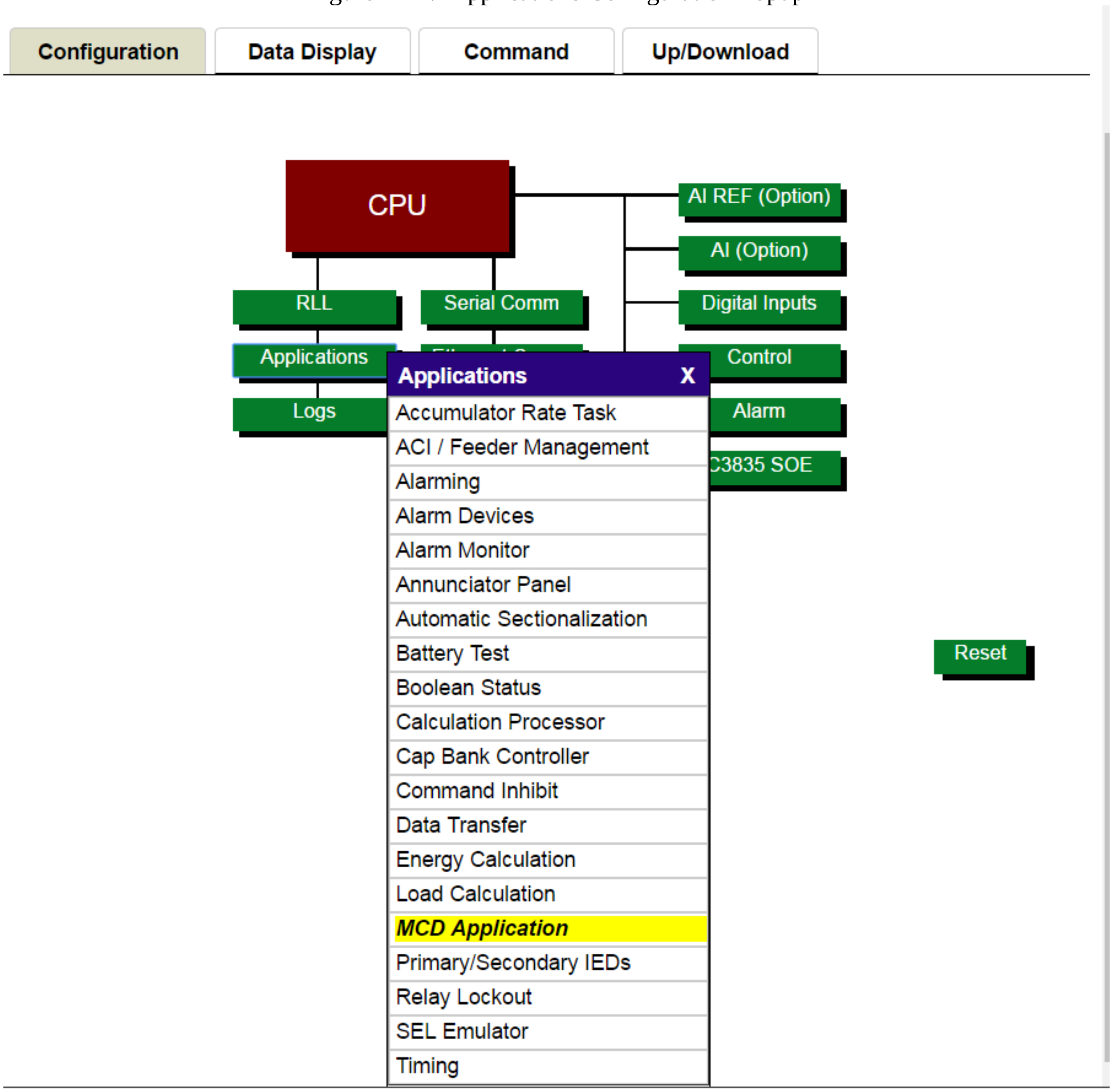
A. For valid counter values above:
1) The number of changes will be queued. The time queued for each event will be unique, 1ms apart, with the current state having the newest time.
2) A new current state and count will be established.

B. For invalid counter values above:
1) The new state will be queued.
2) A new current state and count will be established.

17.2 Configuring the MCD Application

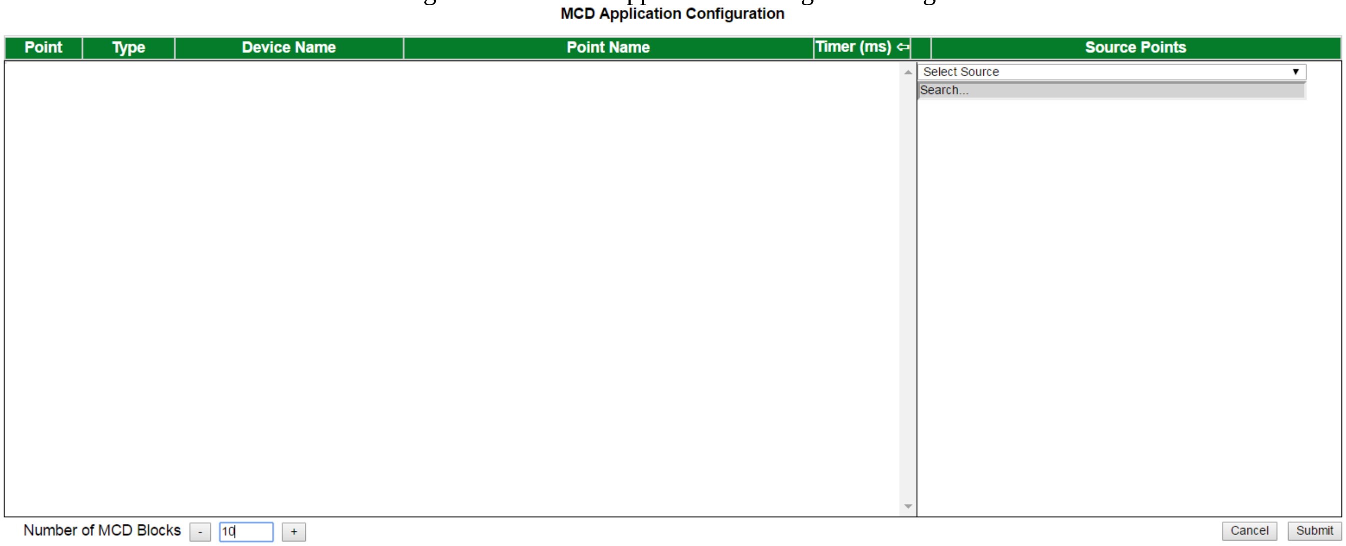
MCD Application changes require a reset for configuration changes to take effect. At the Configuration screen click the "Applications" button then select "MCD Application" from the list of applications to enter the MCD Application configuration page.

Figure 17-1: Applications Configuration Popup



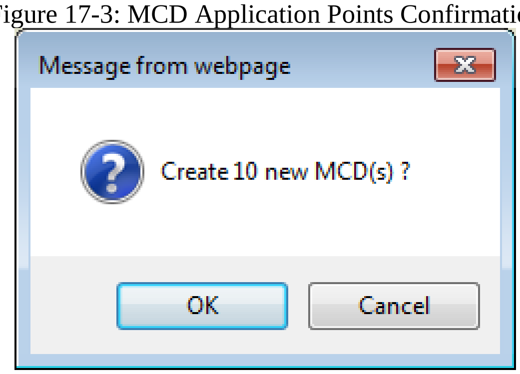
You will see the screen shown in Figure 2. Enter the number of MCD blocks that is desired in the bottom left corner. In this example the number of MCD blocks entered is 10. Press Enter on keyboard.

Figure 17-2: MCD Application Configuration Page



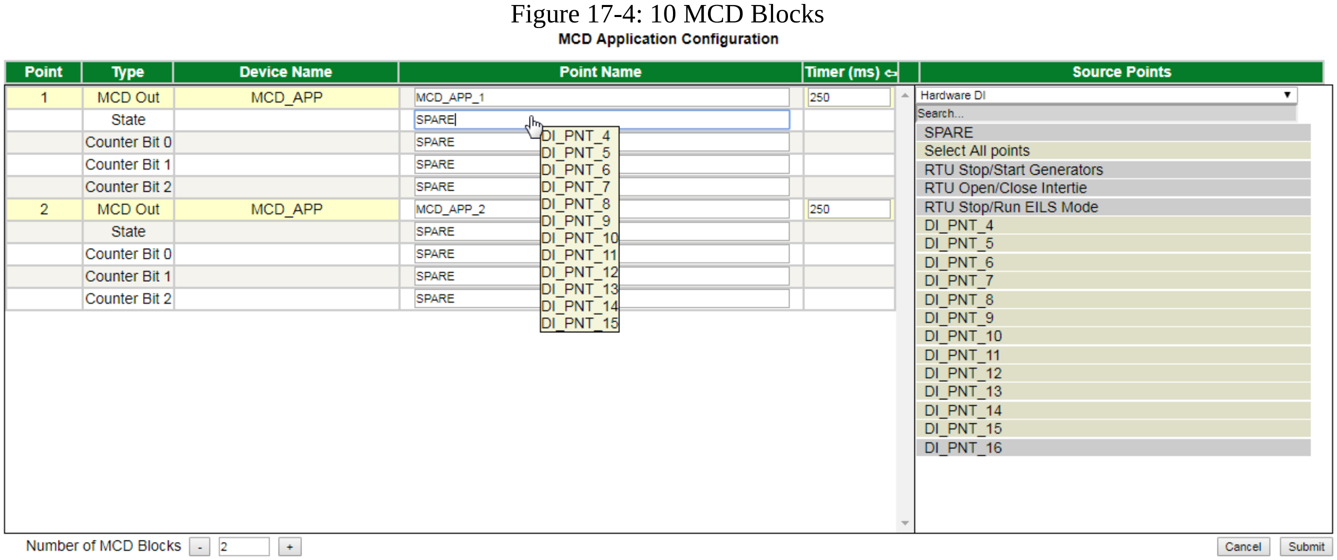
The popup below will appear after pressing enter. Click OK to confirm the number of points desired.

Figure 17-3: MCD Application Points Confirmation



After clicking OK, the screen will updated like Figure 17-4 below.

Figure 17-4: 10 MCD Blocks



Below is a description of the columns in the table:

Point
The MCD output configuration block number

Type
- **MCD Out:** Status point that is a result of the application. [Output of application]
- **State:** Current state of status point [Input to application]
- **Counter Bit 0:** Least significant bit of 3-bit counter [Input to application]
- **Counter Bit 1:** 2^{nd} least significant bit of 3-bit counter [Input to application]
- **Counter Bit 2:** Most significant bit of 3-bit counter [Input to application]

Device Name
The origin of the point.

Point Name
The name of the point assigned during configuration.

Timer
Number of milliseconds in an event. An event is triggered when either the State status input or one of the Counter status inputs change states. Default is set to 250 ms.

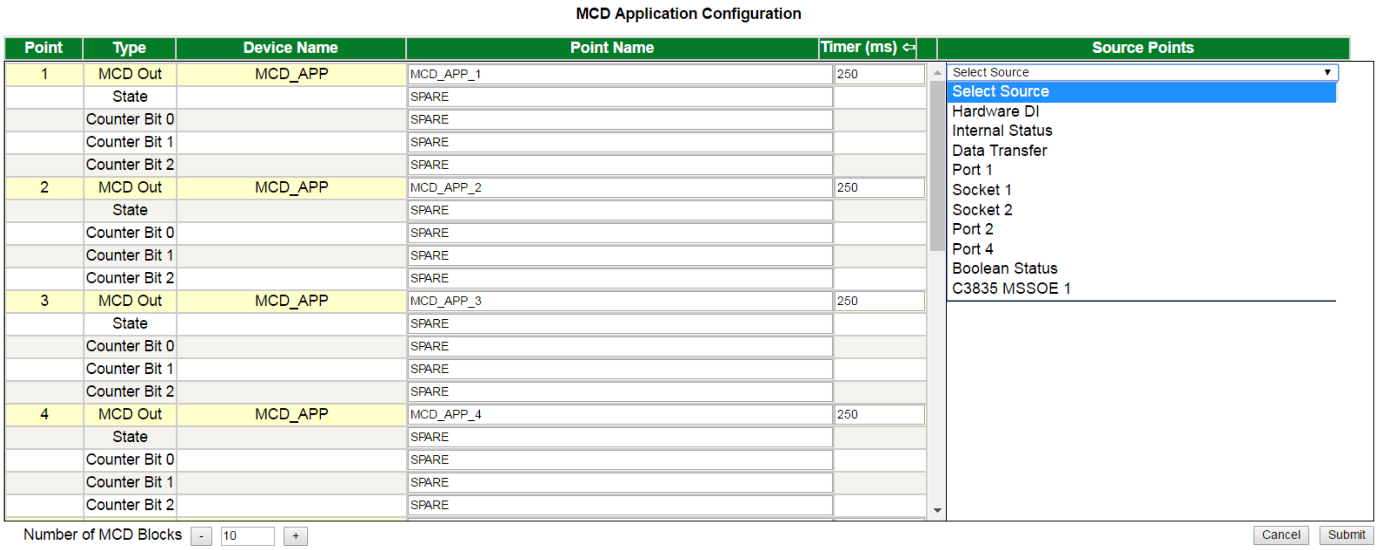
Source Points
Available status points in RTU database listed by source.

The source points table used for the MCD application functions the same as any mapping page on the Sage RTU. Source points in the source table can be selected by:

- Clicking individual points.
- Selecting multiple sequential points by selecting the first point in the series, then while holding down Shift on the keyboard select the last point in the series;
- Selecting all points from a source by clicking "Select All points"

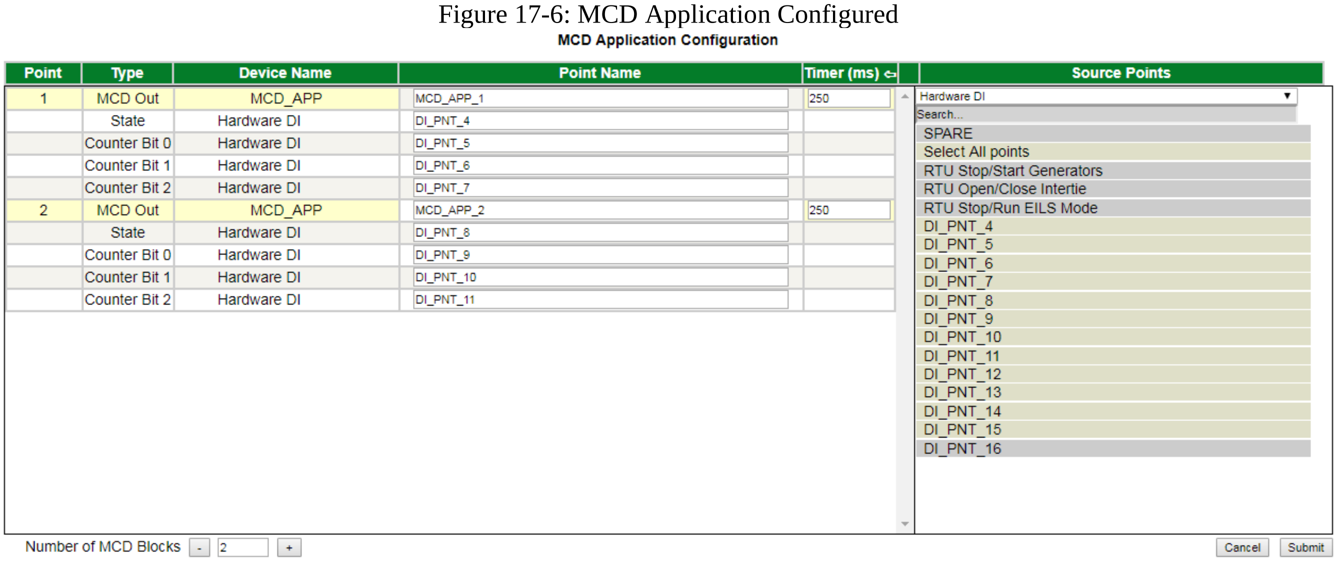
Once point(s) are selected, drag point(s) from source table to desired point in Point name column. Figure 5 shows multiple sequential points selected and then dropped into the MCD Block 1 State input.

Figure 17-5: Dragging Source Points into MCD Application



The figure below shows the completed configuration.

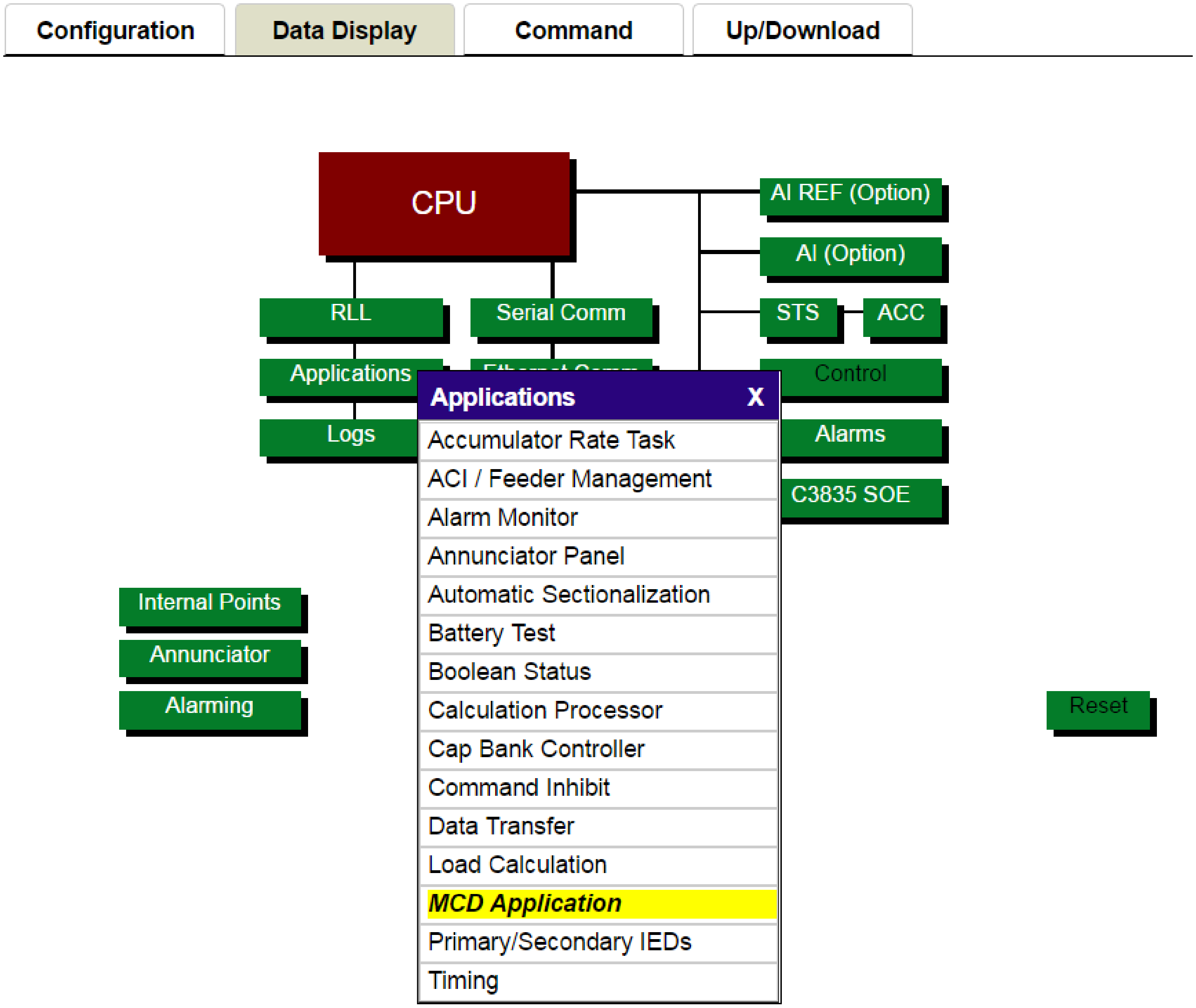
Figure 17-6: MCD Application Configured



17.3 MCD Application Display

MCD Application Display data is viewable after RTU is reset with new MCD Application configuration. View the MCD Application Display data by clicking the on the Data Display tab. Next, click on Applications to open the Applications popup menu. Click on the MCD Application in the Applications list. This is shown in Figure 7 below.

Figure 17-7: Data Display



After clicking the MCD Application option, the following screen in Figure 8 will be displayed. A description of data categories follows the figure.

Figure 17-8: MCD Application Display

MCD Application Display

Configuration: Valid
Timer Value (ms): 250

Pnt	Type	Device Name	Point Name	Status	State	·	Last Change
1	MCD Out	MCD App	MCD_APP_1		OPEN	·	07/28/2017 15:14:37.847
-	State	Hardware DI	DI_PNT_4		OPEN	·	07/28/2017 15:14:37.075
-	Counter Bit 0	Hardware DI	DI_PNT_5		OPEN	·	07/28/2017 15:14:37.785
-	Counter Bit 1	Hardware DI	DI_PNT_6		OPEN	·	--/--/-- --:--:--.---
-	Counter Bit 2	Hardware DI	DI_PNT_7		OPEN	·	--/--/-- --:--:--.---

Last 10 Events in Descending Order

Start Time	End Time	Total Time (ms)	Valid MCD	MCD Out ·	State ·	Counter
07/28/2017 14:14:37.590	07/28/2017 14:14:37.785	195	Valid	OPEN ·	OPEN ·	0
07/28/2017 14:14:36.825	07/28/2017 14:14:37.075	250	Valid	OPEN ·	OPEN ·	0
07/28/2017 14:14:16.300	07/28/2017 14:14:16.300	0	Invalid	OPEN ·	OPEN ·	0
07/28/2017 14:14:15.865	07/28/2017 14:14:15.865	0	Invalid	CLOSED ·	CLOSED ·	0
07/28/2017 14:13:06.769	07/28/2017 14:13:06.769	0	Valid	OPEN ·	OPEN ·	0
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

MCD# 1 of 2 Go To [ ] Go > Done

Configuration

Configuration is Valid if state status point and three counter status points are configured to valid status points. Otherwise configuration is Invalid.

Timer Value (ms)

Displays the timer value configured for MCD on configuration page.

The first table shows the current state of the input and output status points. Below are descriptions of the columns:

Point

Logical point number.

Device Name

The origin of the point.

Point Name

The name of the point assigned during configuration.

Point Status

- **'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.

Point State

Indicates that point is either a logical 0 (OPEN) or a logical 1 (CLOSE).

The second table shows the last 10 events that occurred for the MCD you are currently viewing. Below are descriptions of the columns:

Start Time

The time the event began.

End Time

The time the event stopped.

Total Time

The total time of the event.

Valid MCD

Valid if conditions are met for a valid event contained in the specification document. If conditions are not met the value in this column will be invalid.

MCD Out

The new state of the MCD output status as a result of this event.

State

The status of the state status after event timer has expired.

Counter

The value of the 3 counter values after event timer has expired.

17.4 Navigation

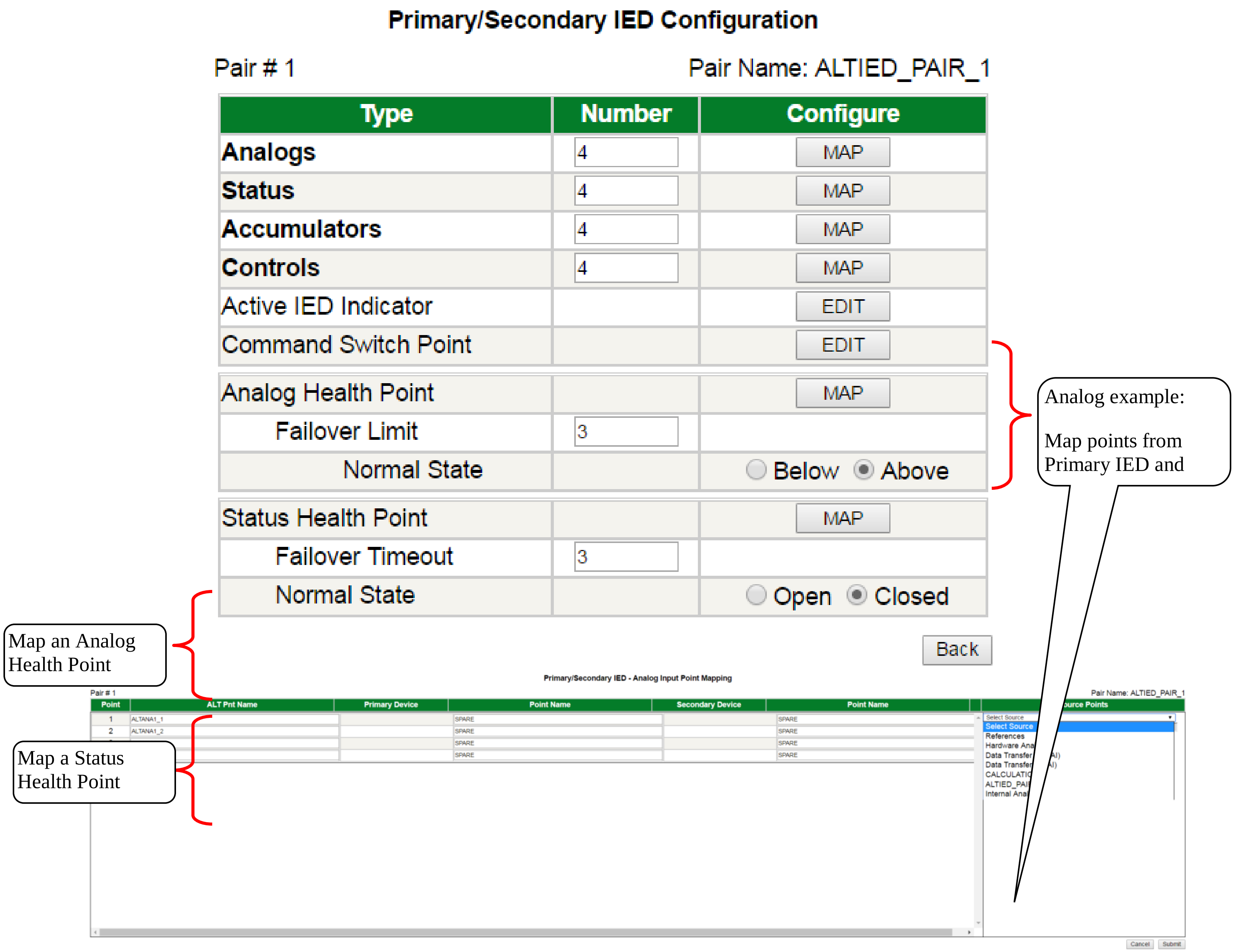
MCD# of n tells you which MCD block you are viewing. Back allows you to go to the previous MCD block. Next allows you to go to the next MCD block. Type in desired MCD # in Go To textbox to view a particular MCD.

18 Primary/Secondary IEDs

18.1 Introduction

This is an application that allows the user to configure "back up" IEDs. The inputs are not limited to IED points, and may be any data points known to the system. At the heart of the program are the following screens. Here's an overview.

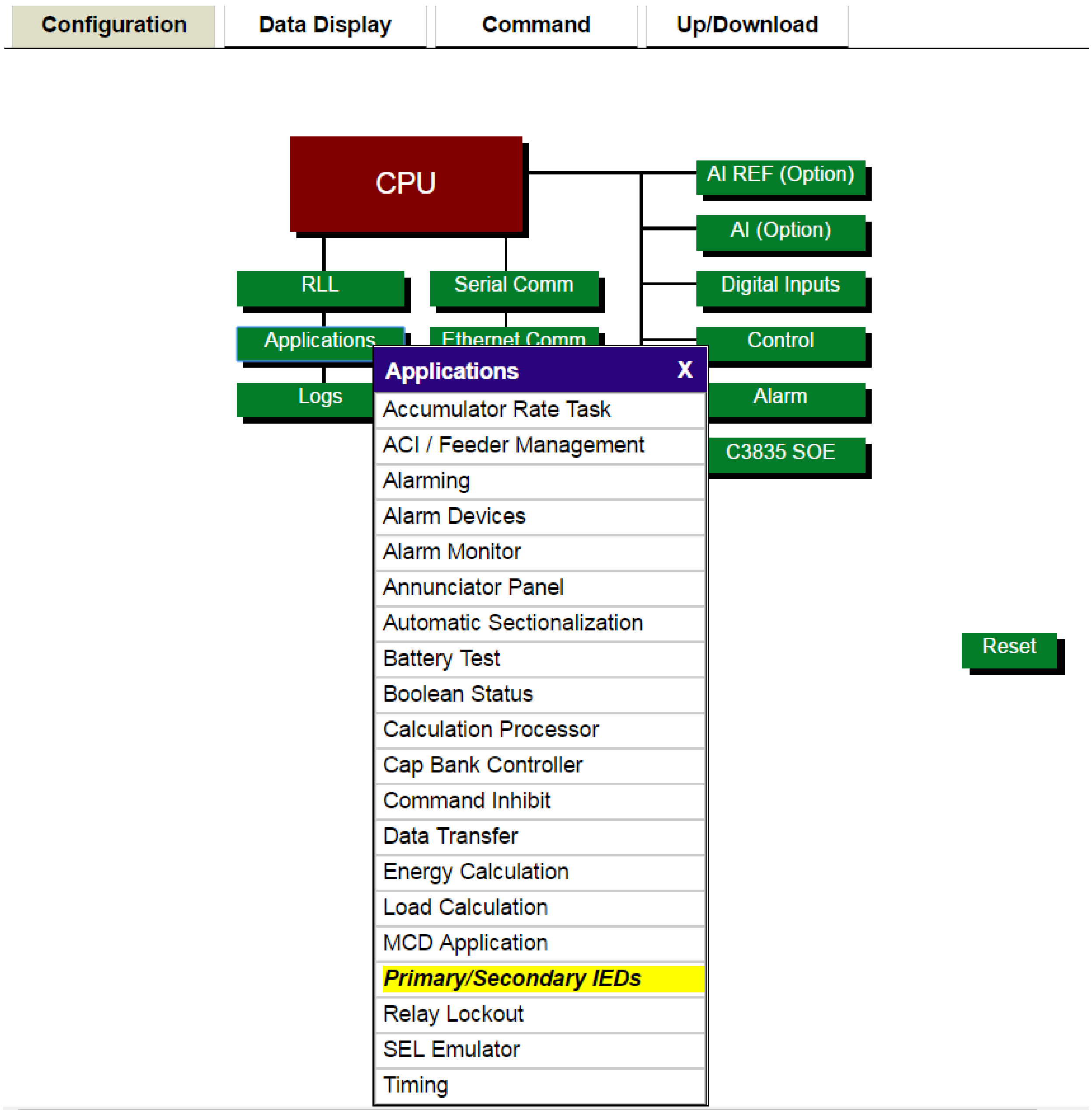
Figure 18-1 Heart of the Program



18.2 Configuration

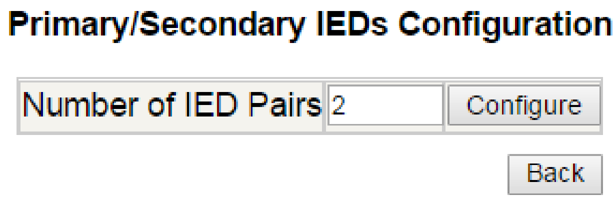
When you click on the Applications block, the screen shown in Figure 4-1 will appear.   is explained in the following sections.

Figure 18-2 Applications



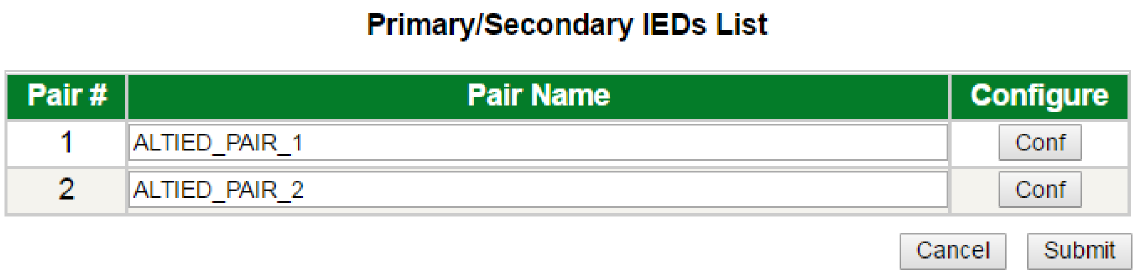
When you click on above, you get the Configuration screen shown below.

Figure 18-3 Configuration



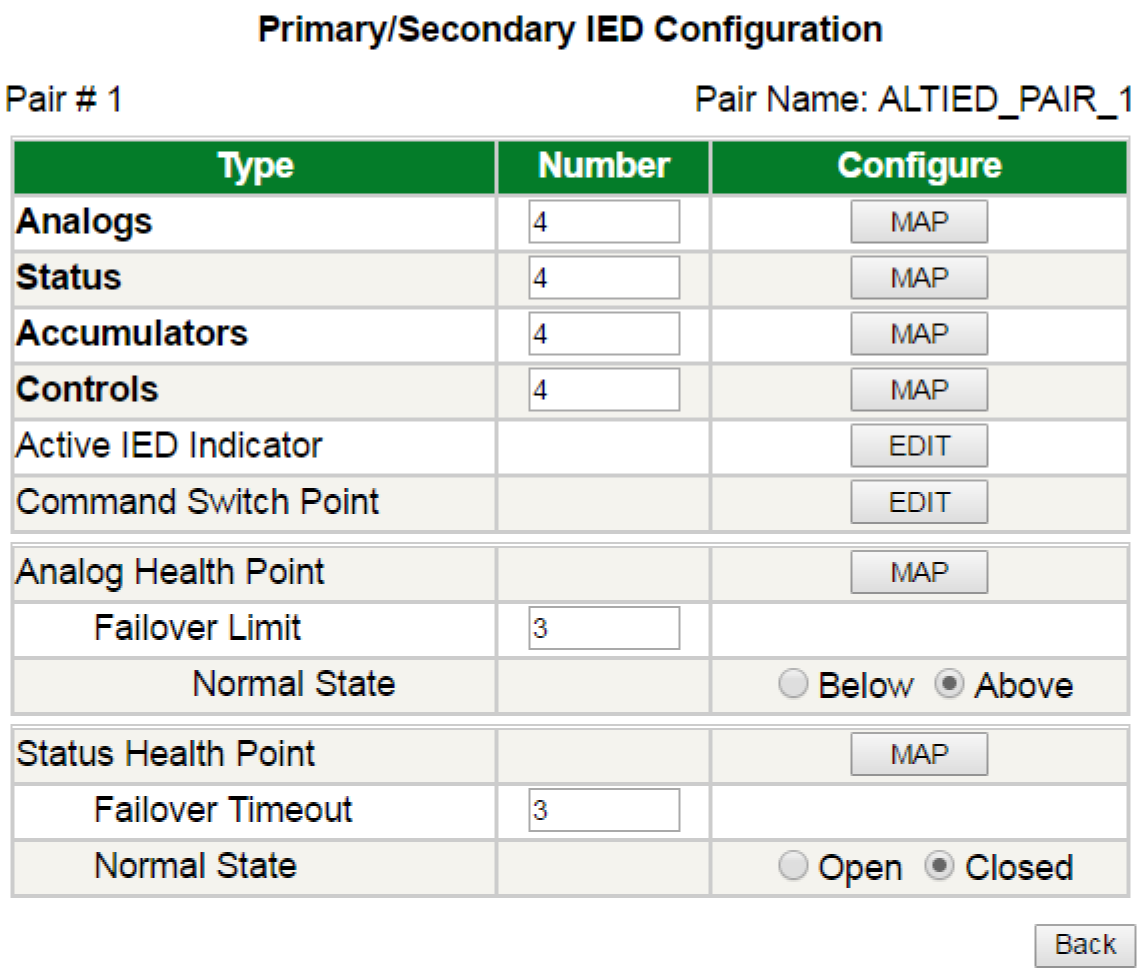
The above screen allows the user to input the number of IED pairs. When you click Configure, the following screen appears.

Figure 18-4 Primary/Secondary IED List



You may type a name for each pair, or accept the default name. When you click the Configure button for one of the pairs, you will get a screen similar to the one below.

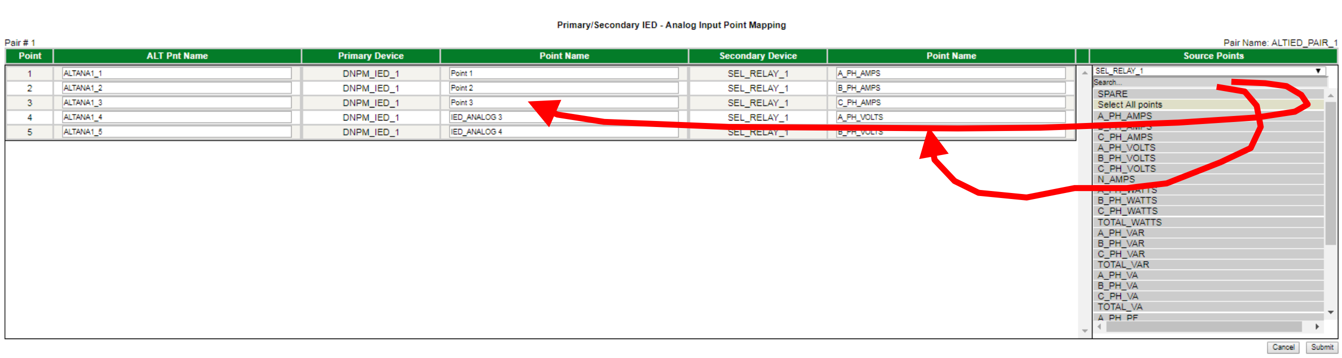
Figure 18-5 Primary/Secondary IED Configuration



18.2.1 Analog Mapping

When you click on Map Analogs (above), you will get a screen similar to below. The example is mapped from an IED pair.

Figure 18-6 Analog Input Point Mapping



Point

This is the physical pair number.

ALT Pnt Name
Type a name for the ALT (alternative) point, or accept the default.

Primary Device
The name of the primary device

Point Name
The point name as mapped from Source points.

Secondary Device
The name of the secondary device

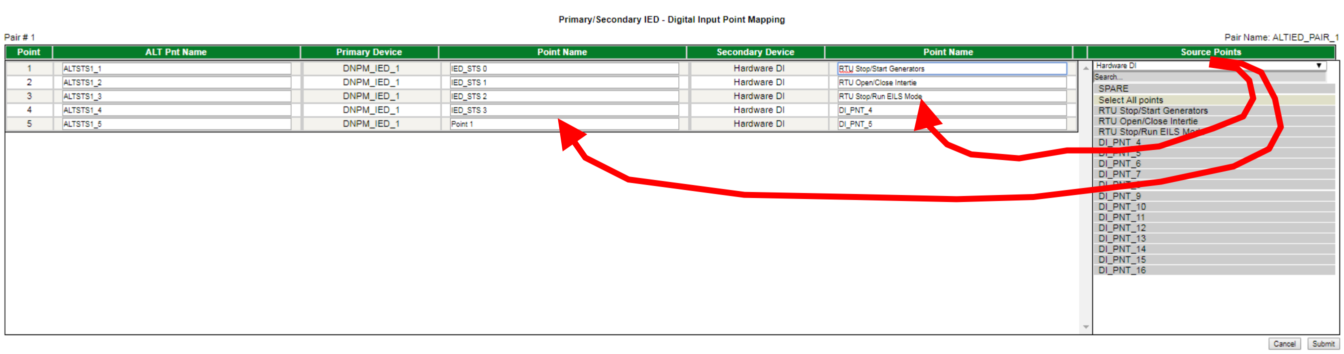
Point Name
The point name as mapped from Source points.

Source Points
Drop-down list of available points.

18.2.2 Status Mapping

When you click on Map Status, you will get a screen similar to below. The example is mapped from an IED pair.

Figure 18-7 Status Input Point Mapping



Point
This is the physical pair number.

ALT Pnt Name
Type a name for the ALT (alternative) point, or accept the default.

Primary Device
The name of the primary device

Point Name
The point name as mapped from Source points.

Secondary Device
The name of the secondary device

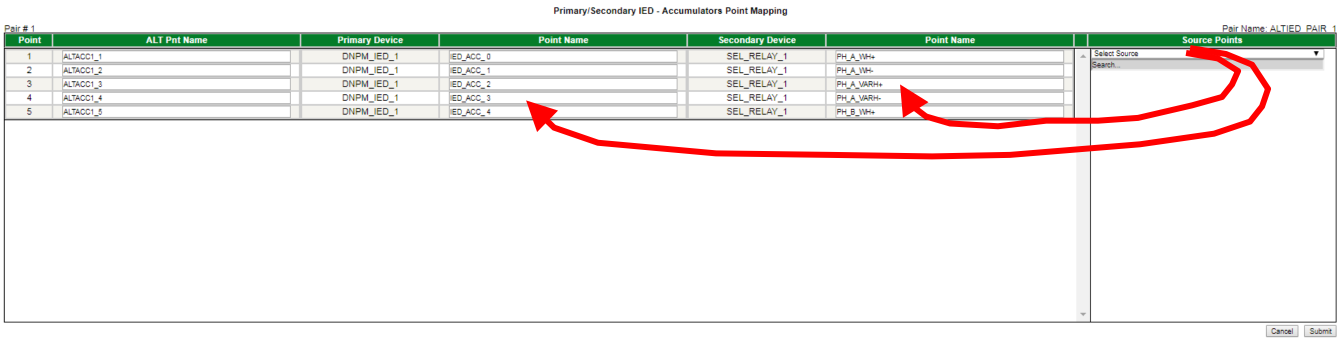
Point Name
The point name as mapped from Source points.

Source Points
Drop-down list of available points.

18.2.3 Accumulators Mapping

When you click on Map Accumulators, you will get a screen similar to below. The example is mapped from an IED pair.

Figure 18-8 Accumulators Input Point Mapping



Point
This is the physical pair number.

ALT Pnt Name
Type a name for the ALT (alternative) point, or accept the default.

Primary Device
The name of the primary device

Point Name
The point name as mapped from Source points.

Secondary Device
The name of the secondary device

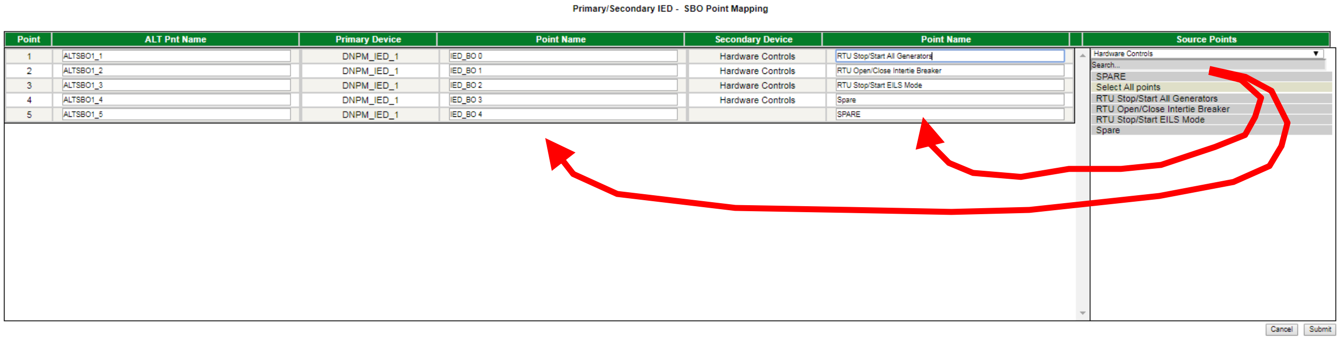
Point Name
The point name as mapped from Source points.

Source Points
Drop-down list of available points.

18.2.4 Controls Mapping

When you click on Map Controls, you will get a screen similar to below. The example is mapped from an IED pair.

Figure 18-9 Controls Point Mapping



Point
This is the physical pair number.

ALT Pnt Name
Type a name for the ALT (alternative) point, or accept the default.

Primary Device
The name of the primary device

Point Name
The point name as mapped from Source points.

Secondary Device
The name of the secondary device

Point Name
The point name as mapped from Source points.

Source Points
Drop-down list of available points.

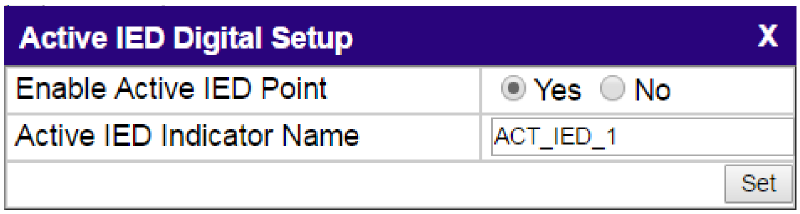
18.2.5 Active IED Indicator

When you click Edit for the Active IED Indicator, you will get a popup similar to below. If enabled,the Active IED Digital Setup creates a status point whose value is:

1 (closed) if the Primary IED is in use

0 (open) if the Secondary IED is in use

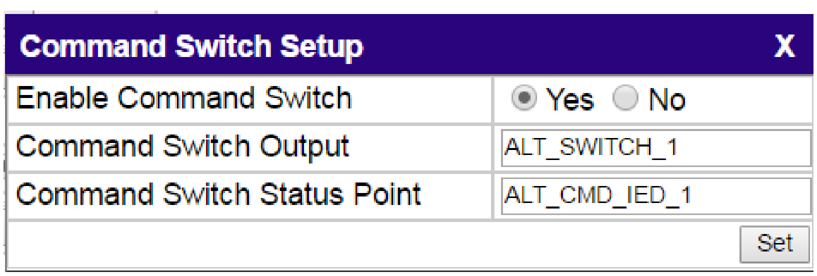
Figure 18-10 Active IED Setup



18.2.6 Command Switch Setup

If enabled, the Command Switch Point is a digital output point created by the application which can be mapped to a Master protocol and used to command the system to switch sources. If commanded to state 1 (closed), the system will use the primary inputs, unless the health point indicates they are failed. (This is the normal operating mode.) If commanded to state 0 (open), the system will use the secondary inputs regardless of the health point state.

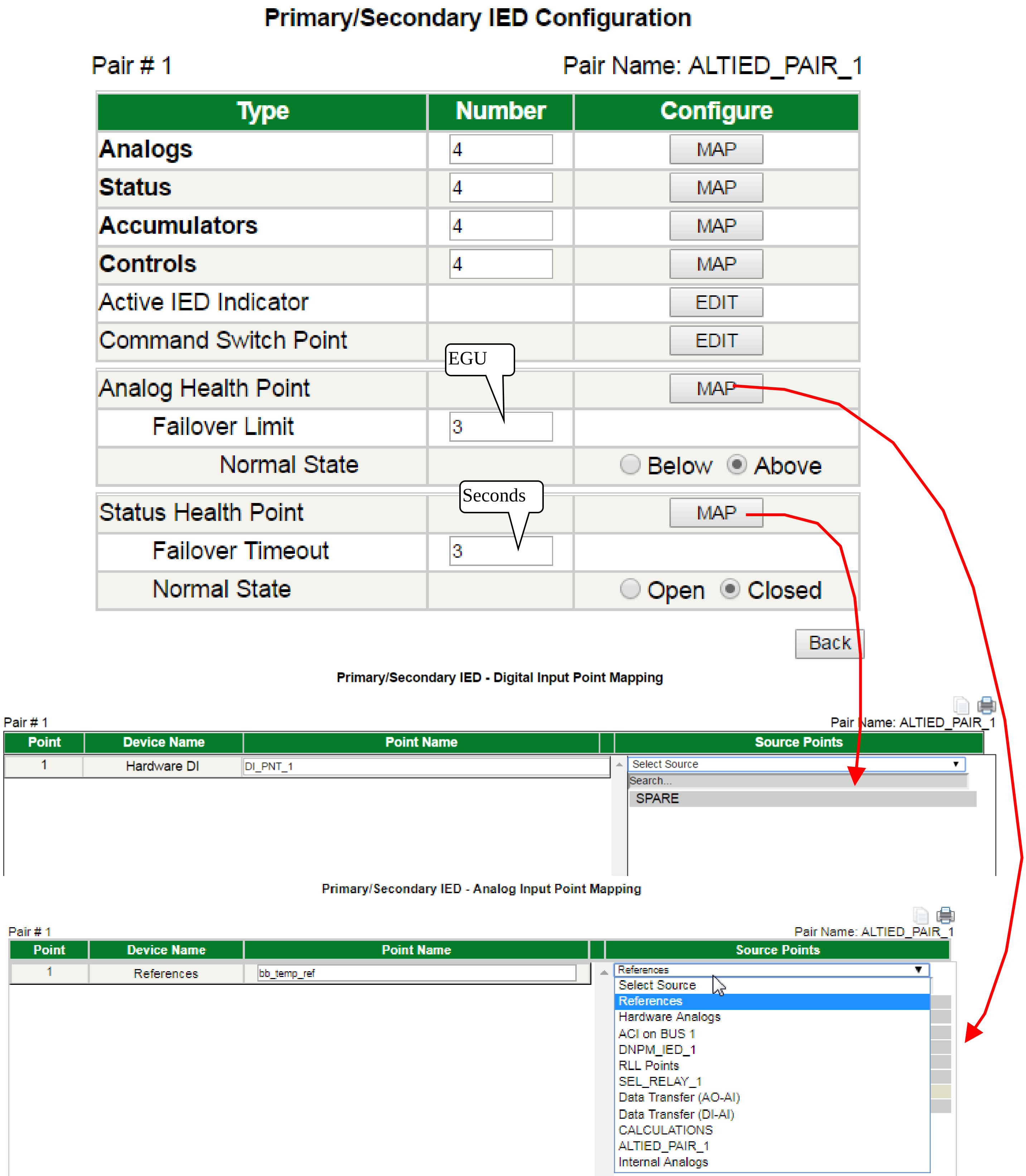
Figure 18-11 Command Switch Setup



18.2.7 Analog & Digital Health Points

The Analog and Digital Health Points allows the application to determine failover from Primary IED to Secondary IED and back again, as explained below.

Figure 18-12 Health Points


Primary/Secondary IED Configuration
Pair # 1
Pair Name: ALTIED_PAIR_1
Type
Number
Configure
Analogs
4
MAP
Status
4
MAP
Accumulators
4
MAP
Controls
4
MAP
Active IED Indicator
EDIT
Command Switch Point
EDIT
EGU
Analog Health Point
MAP
Failover Limit
3
Normal State
Below
Above
Seconds
Status Health Point
MAP
Failover Timeout
3
Normal State
Open
Closed
Back
Primary/Secondary IED - Digital Input Point Mapping
Pair # 1
Pair Name: ALTIED_PAIR_1
Point
Device Name
Point Name
Source Points
1
Hardware DI
DI_PNT_1
Select Source
Search...
SPARE
Primary/Secondary IED - Analog Input Point Mapping
Pair # 1
Pair Name: ALTIED_PAIR_1
Point
Device Name
Point Name
Source Points
1
References
bb_temp_ref
References
Select Source
References
Hardware Analogs
ACI on BUS 1
DNPM_IED_1
RLL Points
SEL_RELAY_1
Data Transfer (AO-AI)
Data Transfer (DI-AI)
CALCULATIONS
ALTIED_PAIR_1
Internal Analogs

18.3 Display Pages

18.3.1 Analog Display Pages

Below shows the Analog Input Display Page which shows the value of the source (Primary or Secondary) values for the Pseudo IED created by this application.

Figure 18-13: Analog Input Display Page

Primary/Secondary IEDs Analog Inputs (AI) Display

Point	Point Name	Source	Device Name	Point Name	Status	Value
0	ALTANA1_1	S	SEL Dev Port 5	A_PH_AMPS		-100.000
1	ALTANA1_2	S	SEL Dev Port 5	B_PH_AMPS		-100.000
2	ALTANA1_3	S	SEL Dev Port 5	C_PH_AMPS		-100.000
3	ALTANA1_4	S	SEL Dev Port 5	A_PH_VOLTS		-100.000
4	ALTANA1_5	S	SEL Dev Port 5	B_PH_VOLTS		-100.000

Page 1of 1 Go To Go Done

Legend

Point
This is the physical pair number.

Point Name
The ALT (alternative) point name.

Source
The source of the points. P for Primary device. S for Secondary device.

Device Name
The Active Device's Source Device Name.

Point Name
The point name as mapped from Source Device points.

Status
Point flags. See the Legend button for the available flags for each point type.

Value
The Engineering Units of the Point Value..

18.3.2 Digital Input Display Pages

Below shows the Digital Input Display Page which shows the value of the source (Primary or Secondary) values for the Pseudo IED created by this application.

Figure 18-14: Digital Input Display Page

Primary/Secondary IEDs Digital Input (DI) Display

Point	Point Name	Source	Device Name	Point Name	Status	Value
0	ALTSTS1_1	S	Hardware DI	RTU Stop/Start Generators		OPEN
1	ALTSTS1_2	S	Hardware DI	RTU Open/Close Intertie		OPEN
2	ALTSTS1_3	S	Hardware DI	RTU Stop/Run EILS Mode		OPEN
3	ALTSTS1_4	S	Hardware DI	DI_PNT_4		OPEN
4	ALTSTS1_5	S	Hardware DI	DI_PNT_5		OPEN

Page 1of 1 Go To Go Done

Legend

Point
This is the physical pair number.

Point Name
The name for the ALT (alternative) point

Source
The source of the points. P for Primary device. S for Secondary device.

Device Name
The Active Device's Source Device Name.

Point Name
The point name as mapped from Source Device points.

Status
Point flags. See the Legend button for the available flags for each point type.

Value
The Point Value. Open or Close..

18.3.3 Accumulator Display Pages

Below shows the Accumulator Display Page which shows the value of the source (Primary or Secondary) values for the Pseudo IED created by this application.

Figure 18-15: Accumulator Display Page

Primary/Secondary IEDs Accumulator (ACC) Display

Point	Point Name	Source	Device Name	Point Name	Status	Value
0	ALTACC1_1	S	SEL Dev Port 5	PH_A_WH+		0
1	ALTACC1_2	S	SEL Dev Port 5	PH_A_WH-		0
2	ALTACC1_3	S	SEL Dev Port 5	PH_A_VARH+		0
3	ALTACC1_4	S	SEL Dev Port 5	PH_A_VARH-		0
4	ALTACC1_5	S	SEL Dev Port 5	PH_B_WH+		0

Page 1of 1 Go To Go Done

Legend

Point
This is the physical pair number.

Point Name
The name for the ALT (alternative) point

Source

The source of the points. P for Primary device. S for Secondary device.

Device Name

The Active Device’s Source Device Name.

Point Name

The point name as mapped from Source Device points.

Status

Point flags. See the Legend button for the available flags for each point type.

Value

The counts of the Accumulator Point.

18.3.4 Controls Display Page

Below shows the Accumulator Display Page which shows the value of the source (Primary or Secondary) values for the Pseudo IED created by this application.

Figure 18-16: Controls Display Page

Primary/Secondary IEDs SBO Display

Port Name :

Point	Point Name	Source	Device Name	Point Name	Status	Value
0	ALTSBO1_1	S	Hardware Controls	RTU Stop/Start All Generators		OPEN
1	ALTSBO1_2	S	Hardware Controls	RTU Open/Close Intertie Breaker		OPEN
2	ALTSBO1_3	S	Hardware Controls	RTU Stop/Start EILS Mode		OPEN
3	ALTSBO1_4	S	Hardware Controls	Spare		OPEN
4	ALTSBO1_5	S	No Device	Spare		OPEN

Page 1of 1 Go To Go Done

Legend

Point

This is the physical pair number.

Point Name

The name for the ALT (alternative) point

Source

The source of the points. P for Primary device. S for Secondary device.

Device Name

The Active Device’s Source Device Name.

Point Name

The point name as mapped from Source Device points.

Status

Point flags. See the Legend button for the available flags for each point type.

Value

The State of the Controls Point. Open or Closed

18.3.5 Health Status Display

As shown below, if both Health Points are within the chosen parameters, the Display will indicate "Healthy" and the Primary IED will be used. If either Health Point is outside the chosen parameters, the Health Point in question will indicate "Not Healthy" and the Secondary IED will be used.

Primary/Secondary IEDs Health Display

Pair # : 1 Pair Name: ALTIED_PAIR_1

Point	Point Name	Source	Source Device	Source Point	Quality	Value	Fail Value	Norm State	Healthy
1	RTU Stop/Start Generators	STS	Hardware DI	RTU Stop/Start Generators		Open	3	Open	HEALTHY
-	-	-	-	-	-	-	-	-	-

Primary IED In Use.

Done

Primary/Secondary IEDs Health Display

Pair # : 1 Pair Name: ALTIED_PAIR_1

Point	Point Name	Source	Source Device	Source Point	Quality	Value	Fail Value	Norm State	Healthy
1	RTU Stop/Start Generators	STS	Hardware DI	RTU Stop/Start Generators		Closed	3	Open	NOT HEALTHY
-	-	-	-	-	-	-	-	-	-

Secondary IED In Use.

Done

Primary/Secondary IEDs Health Display

Pair # : 1 Pair Name: ALTIED_PAIR_1

Point	Point Name	Source	Source Device	Source Point	Quality	Value	Fail Value	Norm State	Healthy
1	ANALOG 1	ANA	Hardware Analogs	ANALOG 1		0.001	3	Above	NOT HEALTHY
2	RTU Stop/Start Generators	STS	Hardware DI	RTU Stop/Start Generators		Open	3	Open	HEALTHY

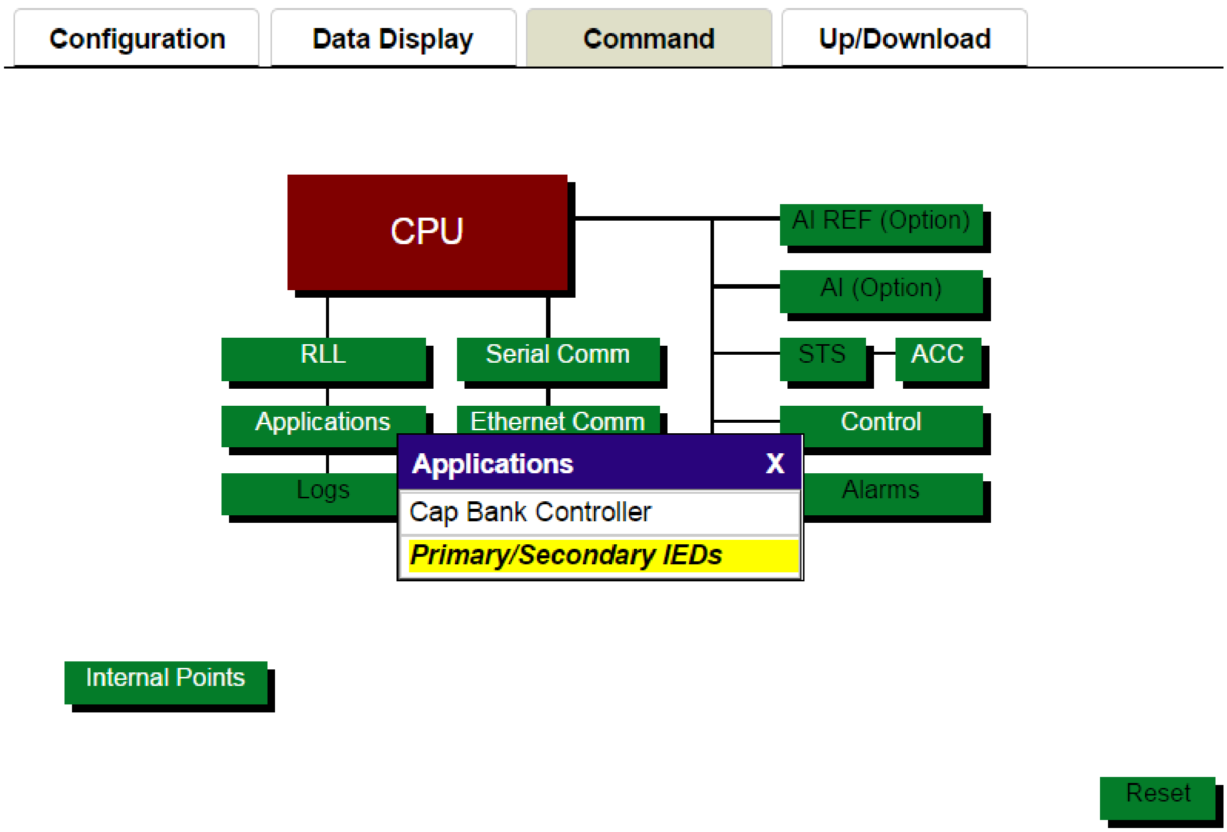
Secondary IED In Use.

Done

18.4 Command

Click the Command tab, then under Applications, click the Primary/Secondary IEDs application as shown below.

Figure 18-17 Command Primary/Secondary IEDs



The Command button on the screen below takes you to the next figure, Primary/Secondary IED Switch Command.

Figure 18-18 Primary/Secondary IEDs List

Primary/Secondary IEDs List

Pair #	Pair Name	Force Prim / Sec	SBO Trip / Close
1	ALTIED_PAIR_1	Command	Exec
2	ALTIED_PAIR_2	Command	Exec

Done

The screen below allows you to choose which particular point operations you want to command. In this example, we are commanding the Primary.

Figure 18-19 Primary/Secondary IED Switch Command

Primary/Secondary IED Switch Command

Pair	Name	Defined	Point Operations
1	ALT_SWITCH_1	No	○ Primary ○ Secondary ○ Normal [Execute]
2	ALT_SWITCH_2	No	○ Primary ○ Secondary ○ Normal [Execute]

[Back]

By clicking the Exec button under SBO Trip / Close (Figure 18-18), we can directly control one of the SBOs associated with the pair, as shown below.

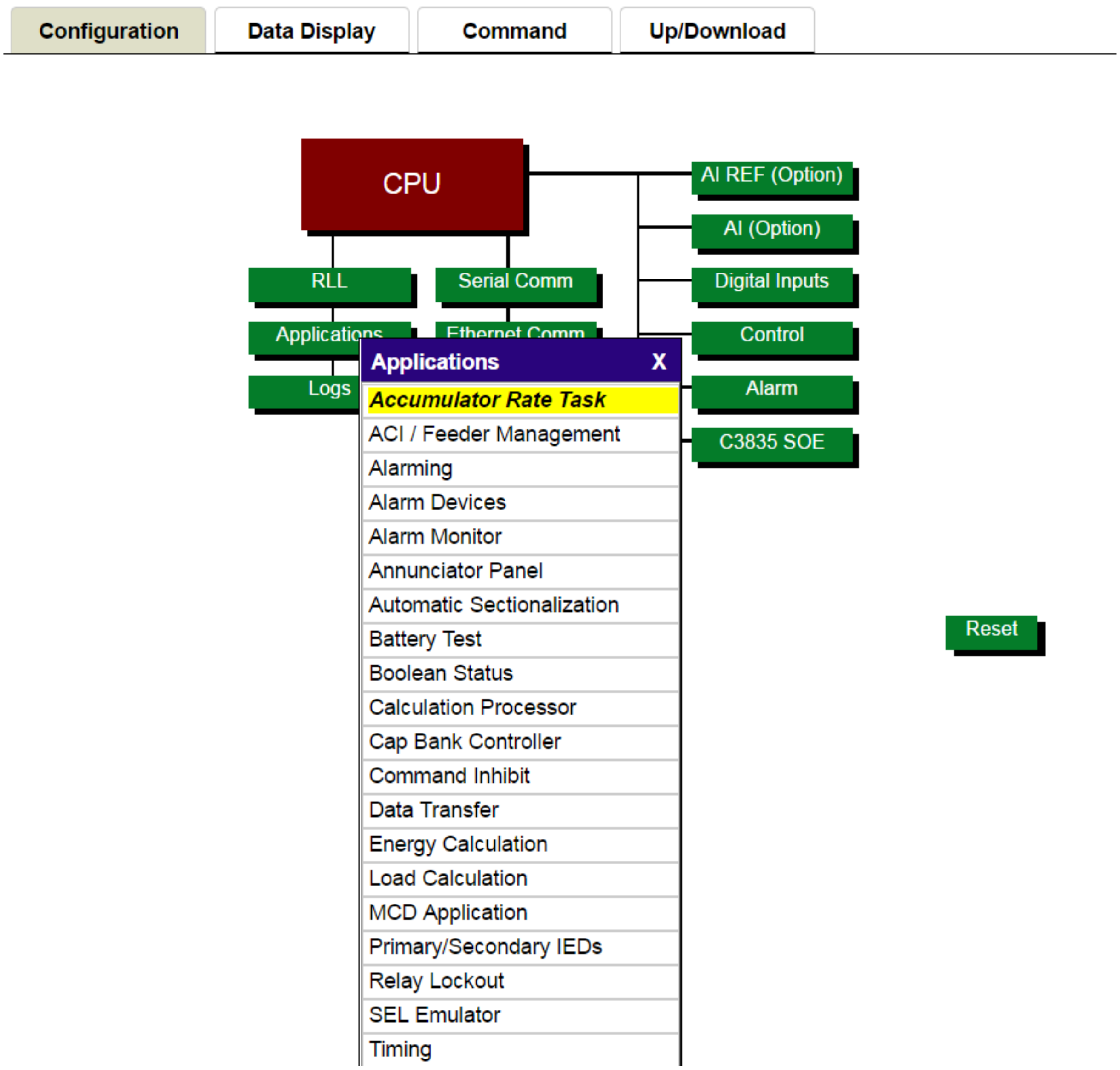
Figure 18-20 Command ALTIED_PAIR_1 SBO's

19 Rate Task

19.1 Introduction

When you click on the Applications block, the screen shown in Figure 4-1 will appear.   is explained in the following sections.

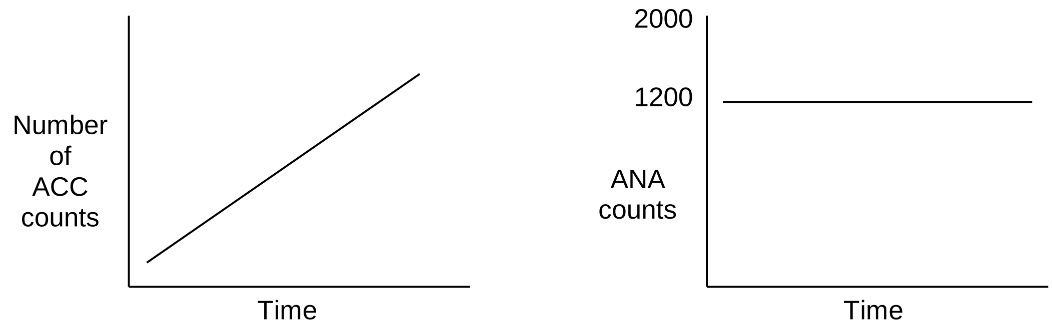
Figure 19-1 Applications



19.2 Theory

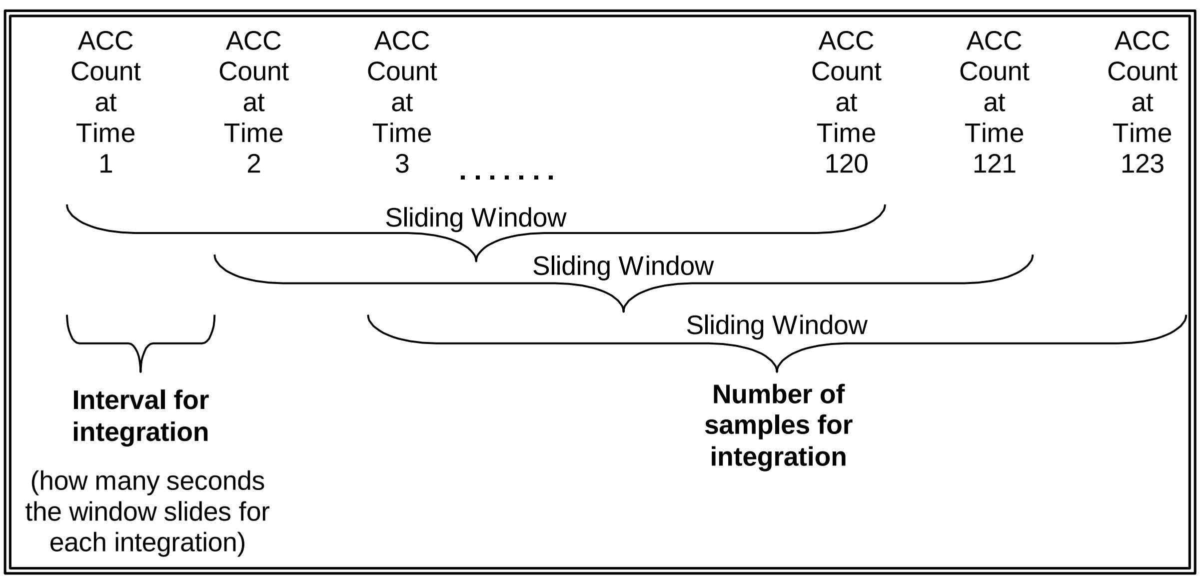
is an application that monitors accumulator points and converts the rate of change accumulator counts into analogs. If the rate of change of the accumulator is constant, for instance, the analog value will be some fixed number (1200 is based on an increase of 10 counts per second x 120 samples), as shown in Figure 19-2.

Figure 19-2 Rate of Change



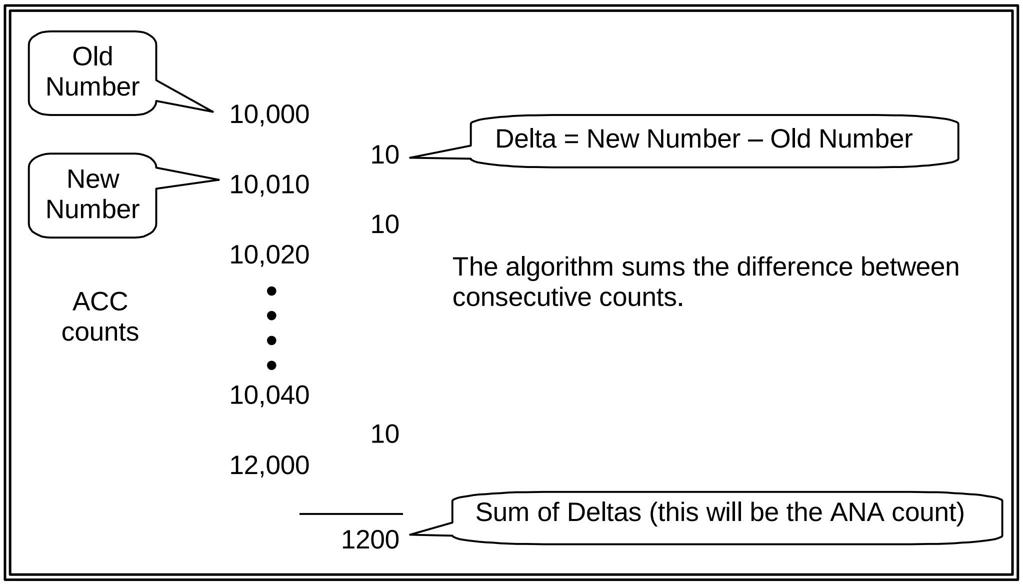
The calculation is performed with a "sliding window". An example accumulator calculation is shown in Figure 19-3. The captions in bold correspond to the captions in the Rate Task Configuration dialog box.

Figure 19-3 Example Rate Task Calculation



The algorithm sums the difference between consecutive counts. See the example shown in Figure 19-4.

Figure 19-4 Summing the Deltas

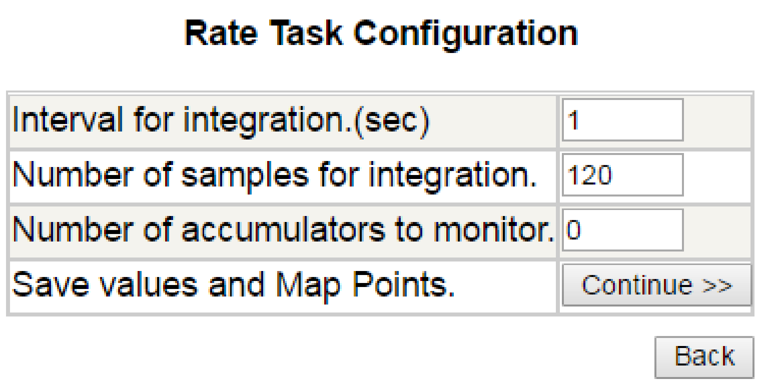


Upon power up, the analog values will remain zero until at least the "Number of samples for integration" deltas have been collected.

19.3 Configuration

From the Configuration screen, click on Applications, then click on Rate Task. A screen similar to Figure 19-5 will appear.

Figure 19-5 Rate Task Configuration



Interval for integration (sec)

Enter the integration number in seconds. This is the number of seconds the "sliding window" will move for each sample. See Figure 19-3 and Figure 19-4. Default setting is 1.

Number of samples for integration

Enter the number of samples for integration. The number of samples will be the width of the "sliding window". See Figure 19-3 and Figure 19-4. Default setting is 120.

Number of accumulators to monitor

Enter the number of accumulators to monitor. This is the number of accumulators whose rate-of-change values will be translated into an equivalent analog value.

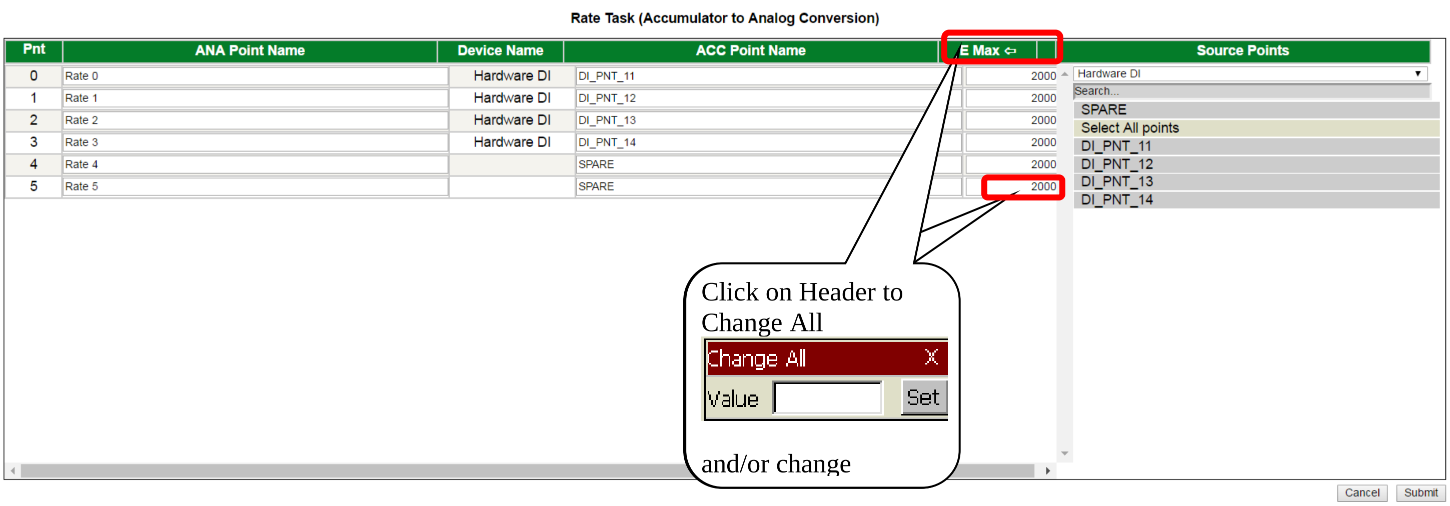
Navigation

Click Continue to accept the changes and go to the next screen. Click Back to back out of the function without saving.

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

Click Continue from the Rate Task Configuration screen. You will get a screen similar to Figure 19-6. Select source points from the drop-down list for the ACC Point Names. These point names will be mapped to the ANA Point Names on the left.

Figure 19-6 Rate Task (Accumulator to Analog Conversion)



Pnt

The logical point number.

ANA Point Name

The name of the point after conversion to analog.

Device Name

The name of the source device for the accumulator point.

ACC Point Name

The name of the ACC point.

E Max

Enter the maximum number of counts for the point. 2000 is the default.

Source Points

Select the source points to place under ACC Point Name from the drop-down list. Single points, or all points, or spare, may be selected.

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.

19.4 Display

From the Display screen, click on Applications, then click on Accumulator Rate Task. A screen similar to Figure 1-7 will appear.

Figure 19-7: Rate Task Display Page

Accumulator Rate Task Display

Point	Source Device	Source Acc	Counter Value	Analog Name	Status	Rate Value
1	RTU Internal Accumulator	UPTIME	1314	Rate 0		120
2	RTU Internal Accumulator	SUCCESSFUL LOGINS	14	Rate 1		1
3	RTU Internal Accumulator	FAILED LOGINS	4	Rate 2		0
4	RTU Internal Accumulator	USER ACCOUNT VERSION	2	Rate 3		0
5	RTU Internal Accumulator	RTU POINTS FORCED	0	Rate 4		0
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

Page 1of 1 Go To [ ] Go Done

Counter Value

The current value of the accumulator.

Rate Value

The current rate of change or how fast the accumulator is counting. The Rate Value moves towards zero if the accumulator stops counting.

20 Relay Lockout

20.1 Introduction

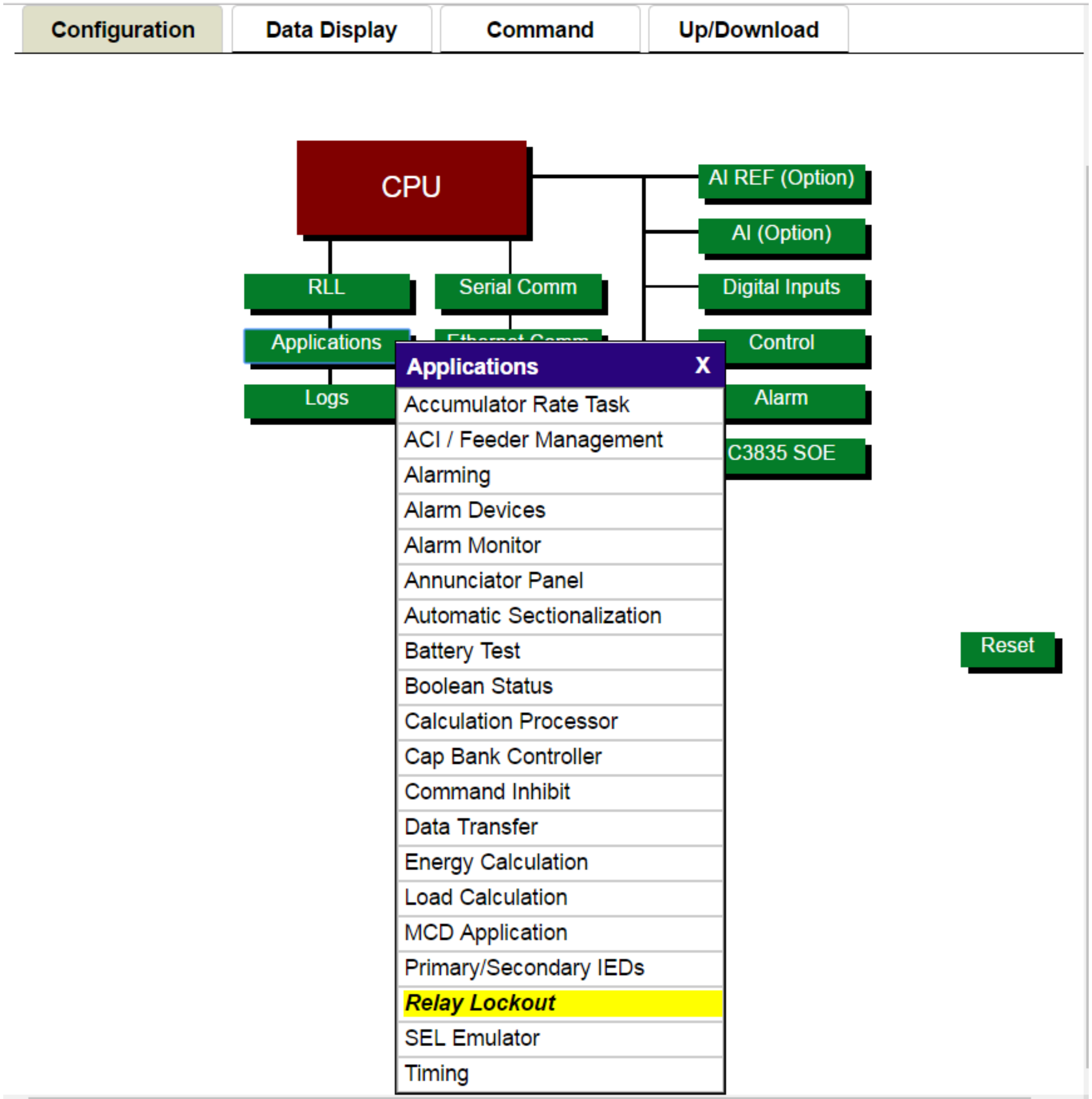
The function of the relay lockout task is to monitor the operation of a status point in a given period of time. An SBO control is operated if the status point exceeds the allowable operations. Up to six (6) status points can be monitored for a number of maximum operations during a given time allowance.

If the number of SBO operations has been exceeded then an alarm, if selected, will be set to indicate a SBO failure and keep the SBO point from operating until the alarm is cleared. The lock out or the alarm can be cleared if the valid reset time has expired or a twenty-four hour period has elapsed.

Once the status point is locked out and the status point is closed, a valid reset timer will begin to count down. If during the count down the status point toggles to the open state the reset timer is suspended and awaits a close to re-initialize the valid reset timer. If the reset timer expires and there was no change in the state of the status point then the status point is set back to normal operation and the failure alarm is cleared.

When you click on the Applications block, the screen shown in Figure 4-1 will appear. Click on Relay Lockout.

Figure 20-1 Applications

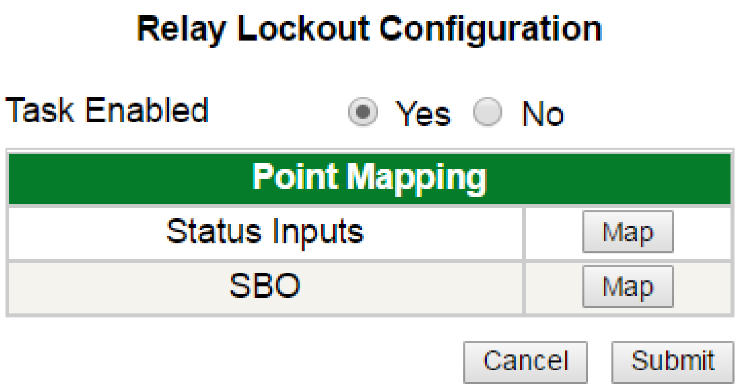


20.2 Configuration

20.2.1 Status Inputs

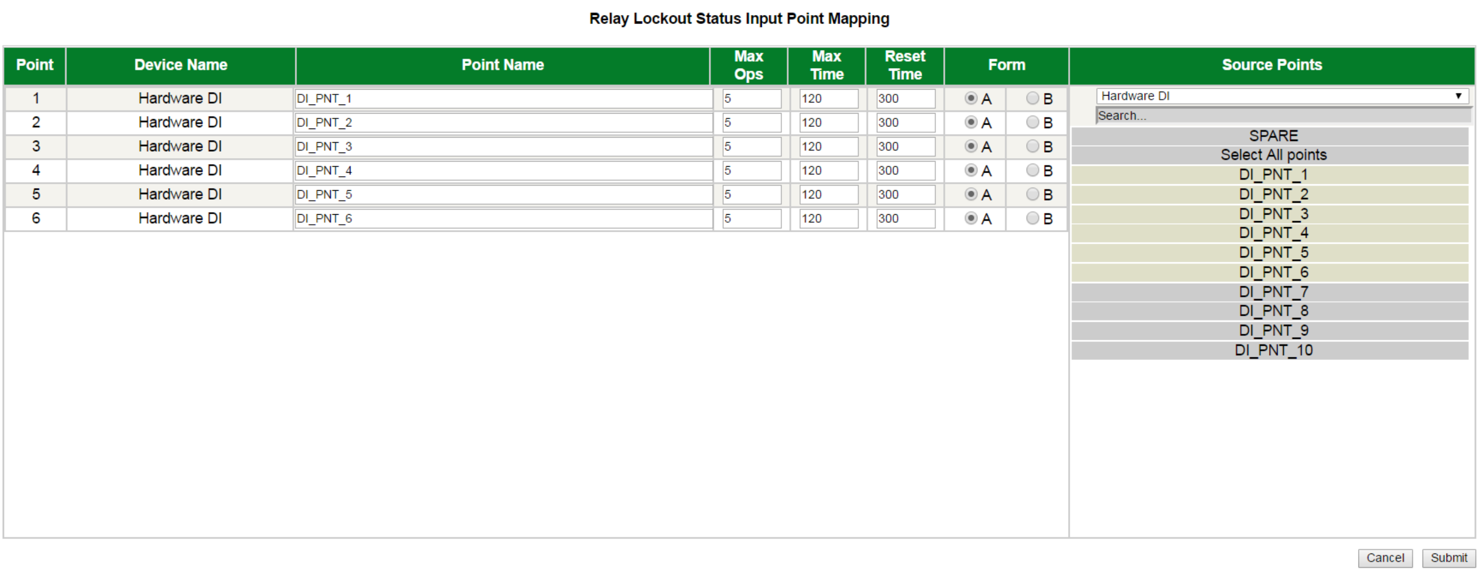
From the Relay Lockout Configuration screen, click on Yes to enable the Relay Lockout task. Click on Map for Status Inputs.

Figure 20-2 Configuration



Six status points are automatically allowed. Map the appropriate Source Points into the Point Name field.

Figure 20-3 Status Input Point Mapping



Relay Lockout Status Input Point Mapping

Point	Device Name	Point Name	Max Ops	Max Time	Reset Time	Form
1	Hardware DI	DI_PNT_1	5	120	300	A B
2	Hardware DI	DI_PNT_2	5	120	300	A B
3	Hardware DI	DI_PNT_3	5	120	300	A B
4	Hardware DI	DI_PNT_4	5	120	300	A B
5	Hardware DI	DI_PNT_5	5	120	300	A B
6	Hardware DI	DI_PNT_6	5	120	300	A B

Point
The physical point number.

Device Name
The name of the source device for the mapped point.

Point Name
The name of the mapped point.

Max Ops
Enter the maximum number of allowable operations before lockout.

Max Time
Enter the maximum time in seconds for the operations before lockout.

Reset Time
Enter the time in seconds after lockout before the point will reset.

Form

Select either Form A (SPST-NO) or Form B (SPST-NC) type of status point.

Source Points

Select the source points to place under Point Name from the drop-down list. Single points, or all points, or spare, may be selected.

Navigation

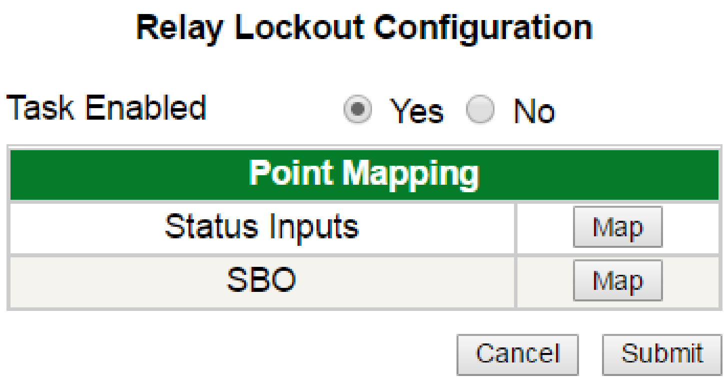
Click the Cancel button to discard changes. Click the Submit button to accept the changes.

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

20.2.2 SBO Point Mapping

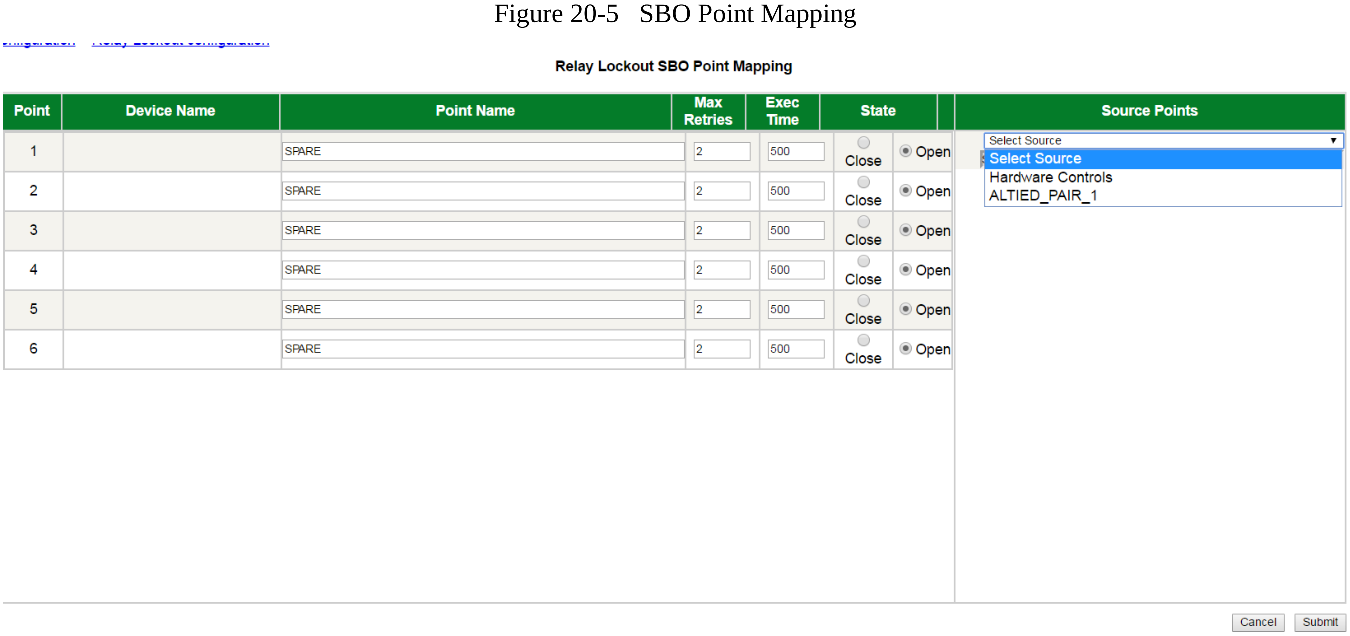
From the Relay Lockout Configuration screen, click on Map for SBO.

Figure 20-4 Configuration



Six SBO points are automatically allowed. Map the appropriate Source Points into the Point Name field. These six SBO points are directly connected to the six status points. That is, status point 1 connects to SBO1, etc.

Figure 20-5 SBO Point Mapping



Point
The physical point number.

Device Name
The name of the source device for the mapped point.

Point Name
The name of the mapped point.

Max Retries
The maximum allowable SBO operations before considering the operation a fail.

Exec Time
The pull-in time of the momentary SBO relay.

State
Select the state of the SBO for lockout.

Source Points
Select the source points to place under Point Name from the drop-down list. Single points, or all points, or spare, may be selected.

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.

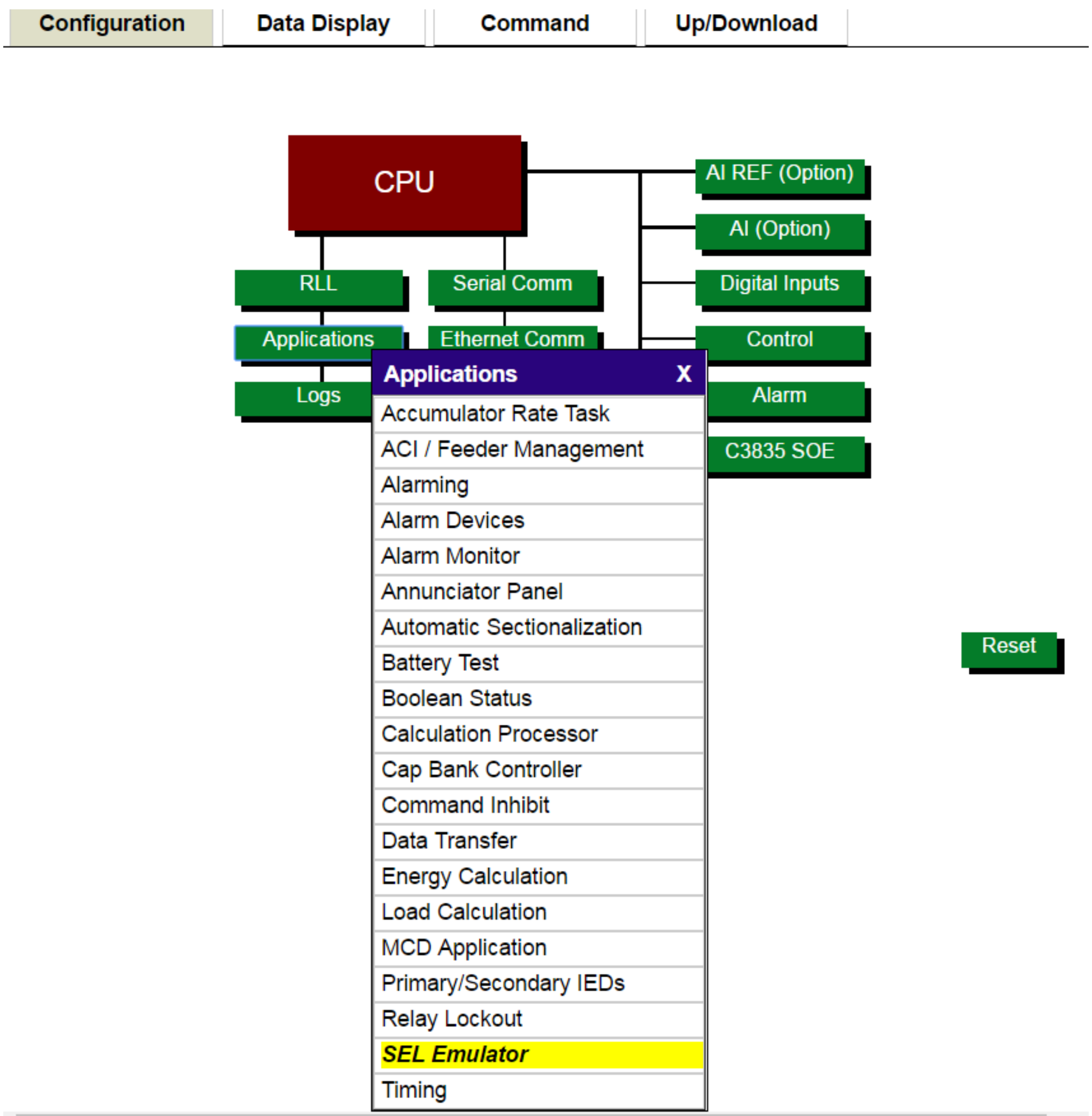
21 SEL Emulator (Tunnel)

21.1 Introduction

Note: You must have a SEL port configured for the SEL Emulator to work.

When you click on the Applications block, the screen shown in Figure 4-1 will appear. is explained in the following sections.

Figure 21-1 Applications

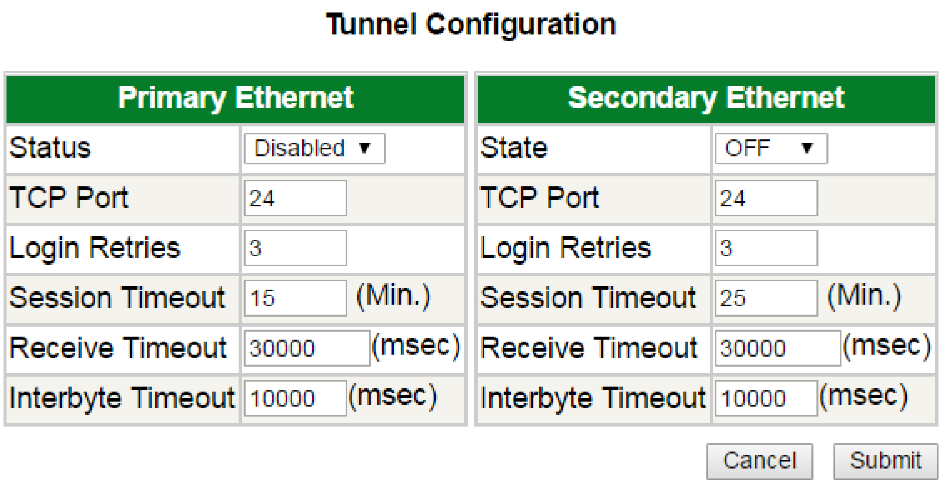


The purpose of the application is to be able to set up communications using Telnet on Ethernet to talk directly to the SEL device.

21.2 SAGE Configuration

When you click on SEL Emulator, the following screen will appear.

Figure 21-2 SEL Tunnel Configuration



Ethernet Interface
Each Ethernet Interface can be configured to use the Tunnel Protocol independently.

Status
Each Ethernet Interface can configured to be Disabled, use SSH, or use Telnet independently.

TCP Port
This is the network port assignment. Accept the default or type in a new number. The default is 24.

Note: For each Telnet session, the TCP port number in the SEL Tunnel Configuration and the Telnet session must match.

Login Retries
This is the number of logins that the network attempts before failure. Accept the default or type in a new number. The default is 3

Session Timeout

This is the length of time Accept the default or type in a new number. The default is 15 seconds.

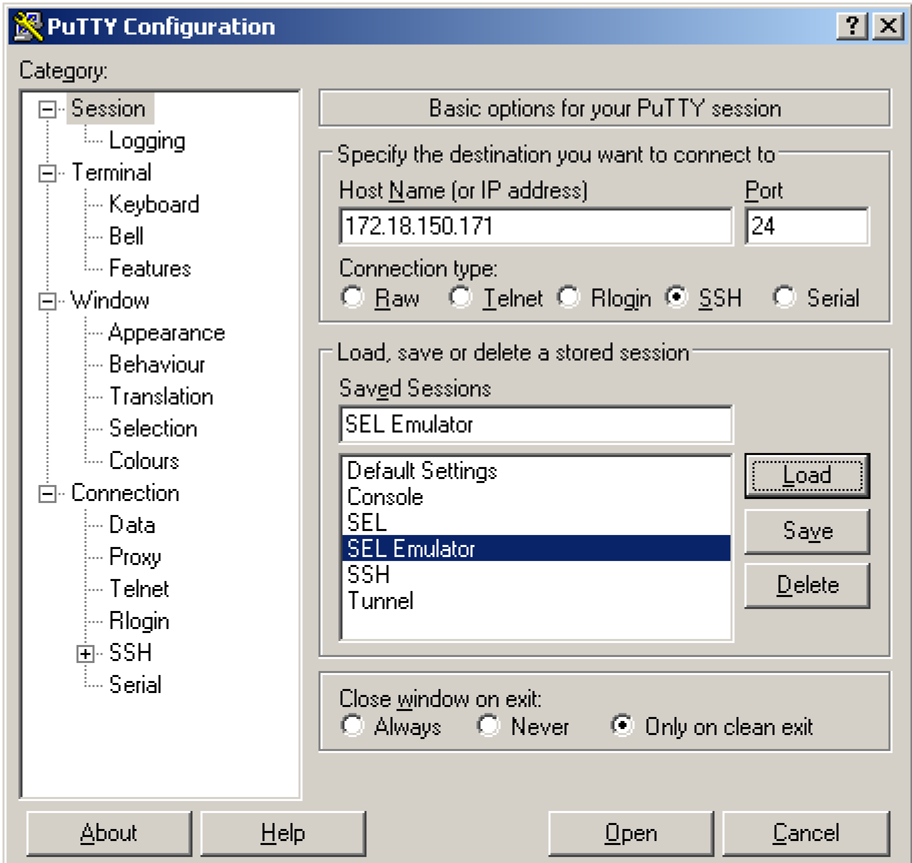
Receive Timeout
The receive timeout is the length of time the channel will wait for valid communications prior to declaring the channel in communications error and resetting the channel. Accept the default or type in a new number. The default is 30 seconds.

Interbyte Time
The Interbyte time is the maximum time allowed between consecutive bytes of a message. This timer is started at the receipt of each byte. The entire message will be discarded if the timer expires between two bytes of a message. The default is 10 seconds.

21.3 PuTTY Configuration

Start a new PuTTY session. Give the new connection a name as shown below.

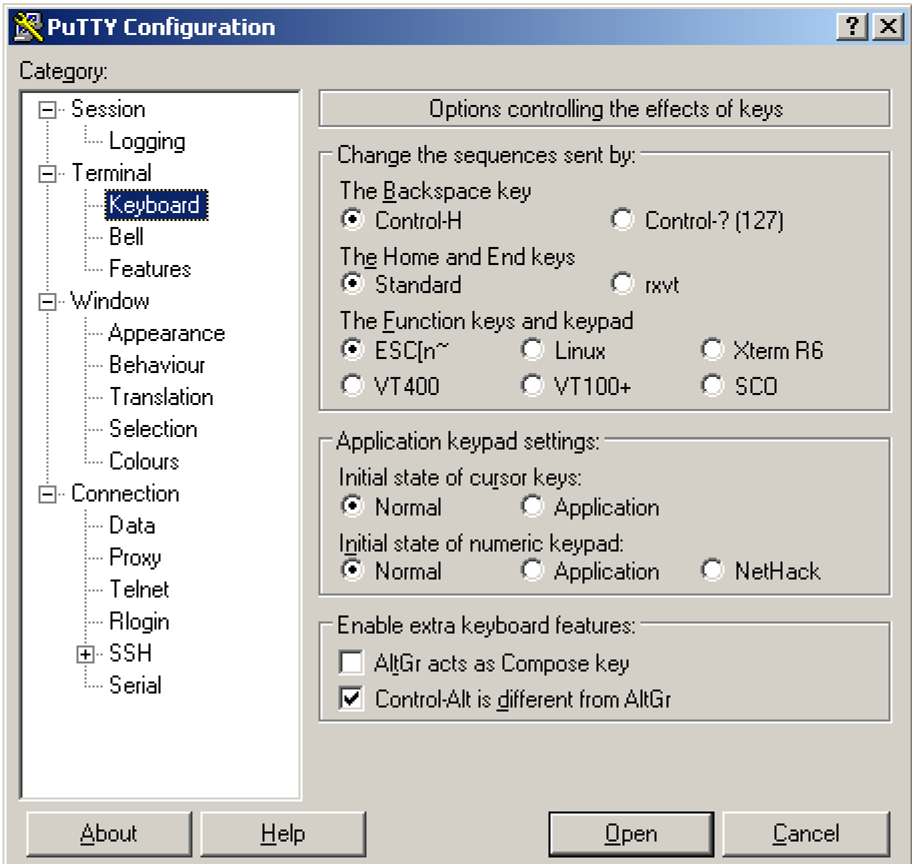
Figure 21-3 Naming the PuTTY Connection



Note: For each PuTTY session, the TCP port number in the SEL Tunnel Configuration and the PuTTY session must match.

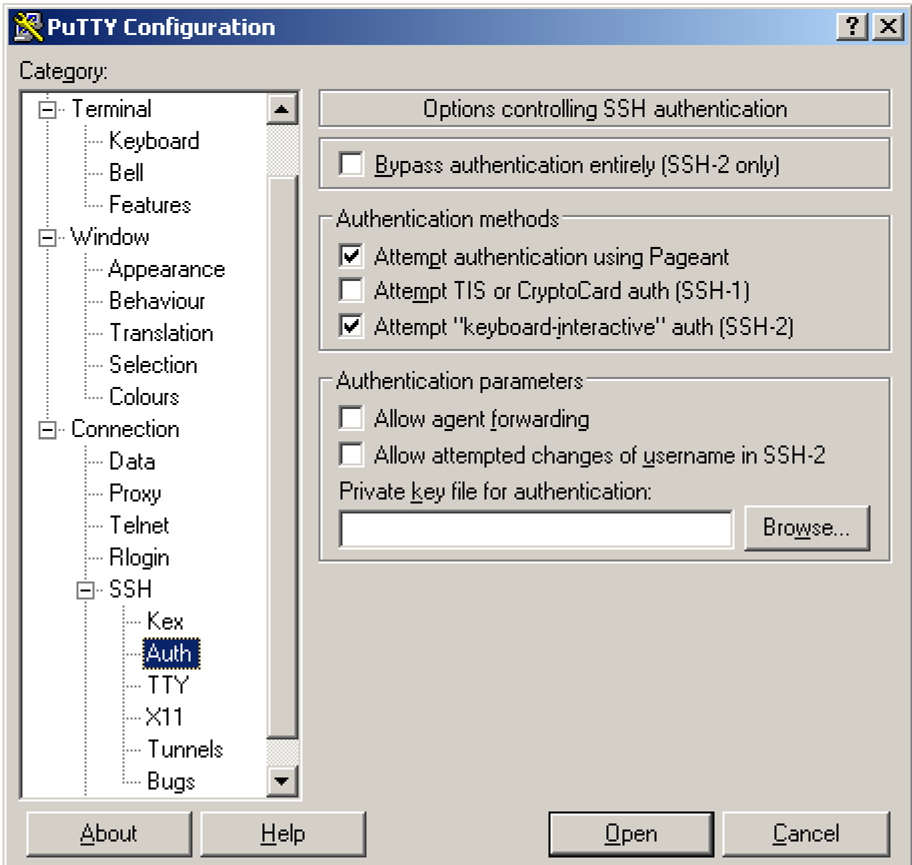
Make sure the PuTTY Keyboard settings are as shown below.

Figure 21-4 PuTTY Keyboard Settings



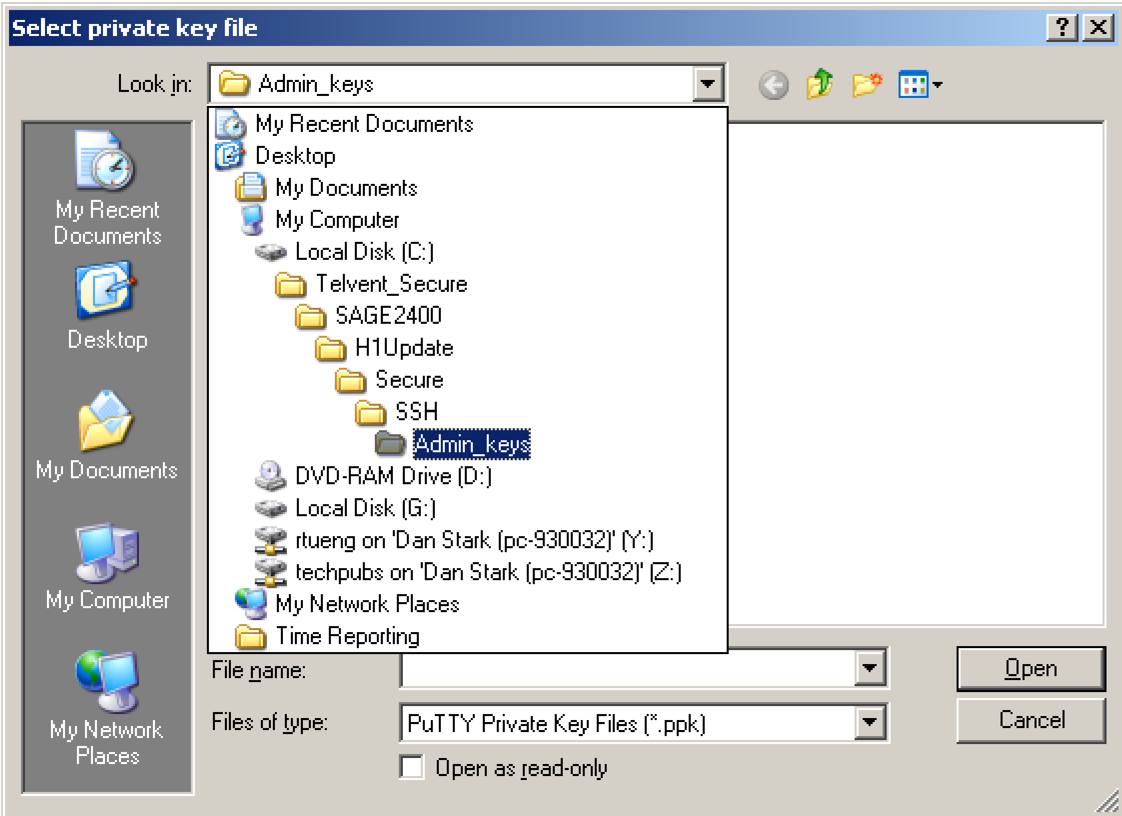
Expand the SSH header as shown, then select Auth (Authentication), as shown.

Figure 21-5 Authentication File Loading



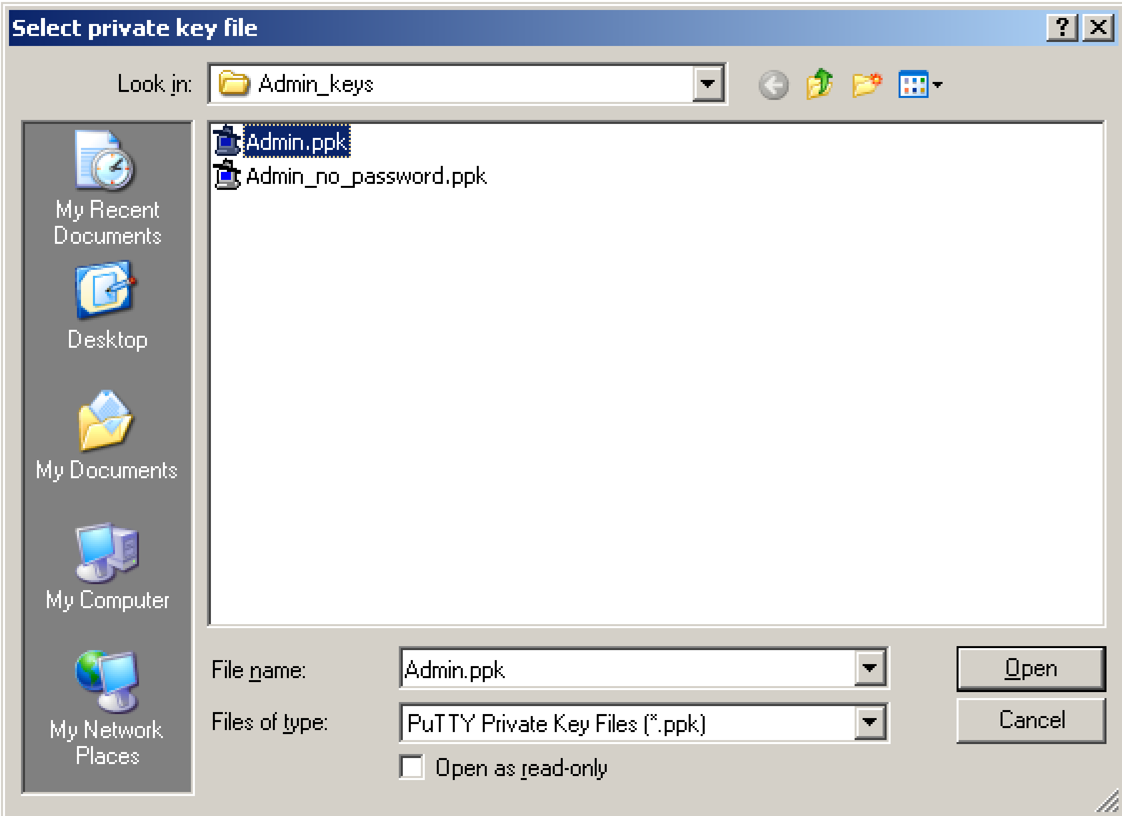
Click The Browse button. Select the folder Admin_keys.

Figure 21-6 Selecting the Admin_keys Directory



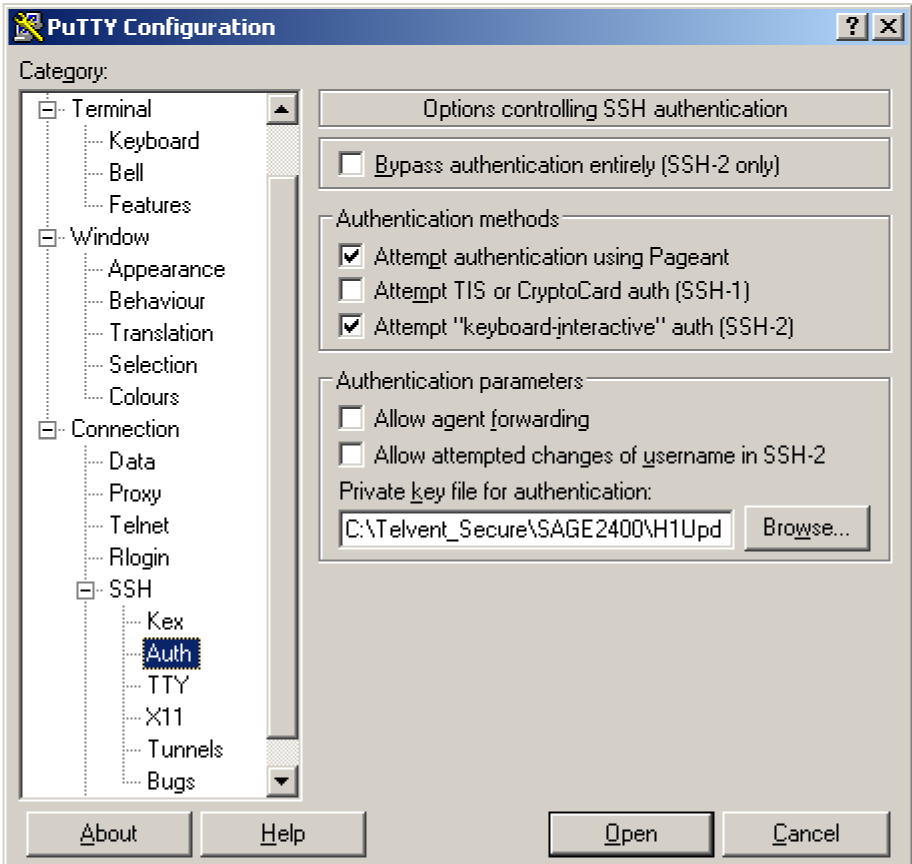
Select the file Admin.ppk.

Figure 21-7 Select the Admin.ppk File



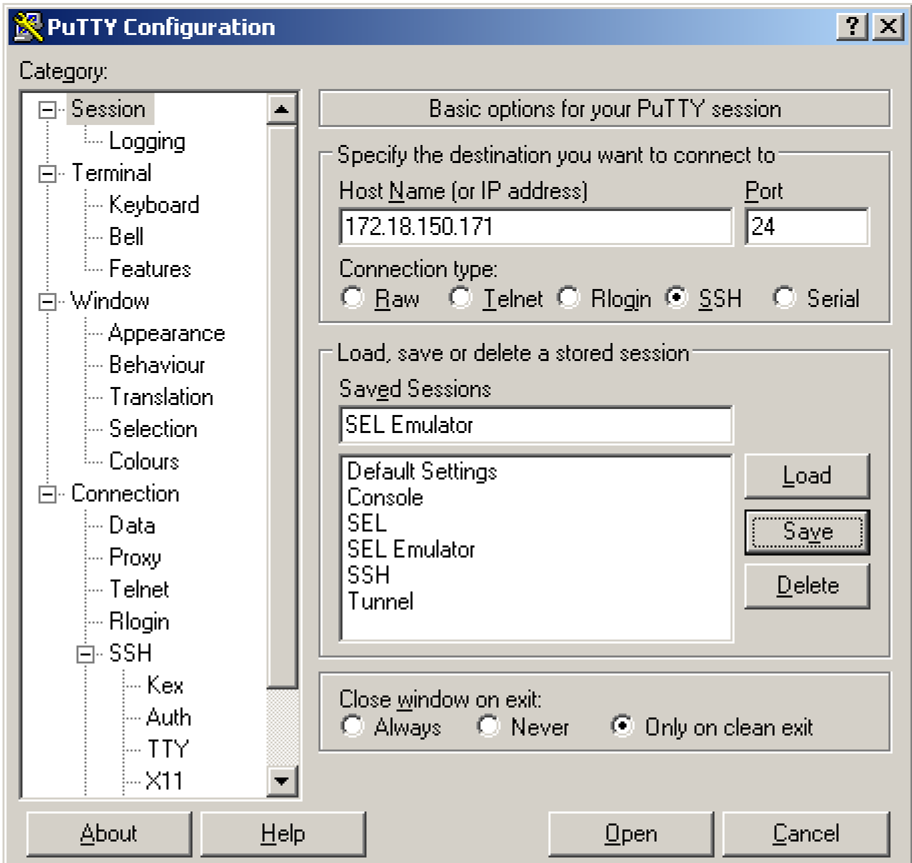
The path will be shown in the "Private key file for authentication" field.

Figure 21-8 The Proper Authentication Path



Go back to the Session header and save your settings.

Figure 21-9 Saving Your Settings

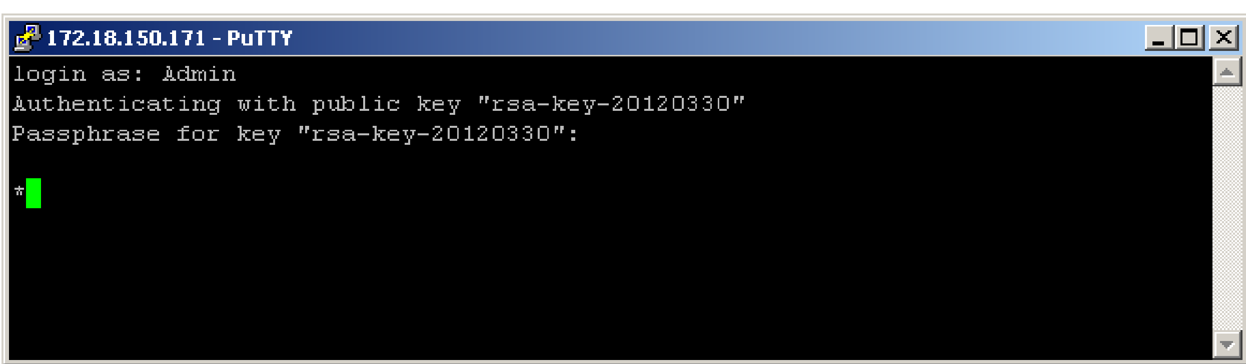


Click Open to start a window.

21.3.1 Logging In

After clicking Open, wait a few seconds until the session initializes. You must Login with User Name and Password. After entering User Name, hit a Return (not a Tab key), then enter the Password and hit Return (not a Tab key).

Figure 21-10 Logging In



21.3.2 Valid Commands

Type in a question mark to get a list of valid commands, as shown below.

Figure 21-11 Valid Commands

```
172.18.150.171 - PuTTY
login as: Admin
Authenticating with public key "rsa-key-20120330"
Passphrase for key "rsa-key-20120330":

*?
Valid commands are

   who     List port assignments
   port n  Establish transparent communications to port n
   quit    Release access to serial ports
   id      Show firmware and device IDs
   ctl-d   Terminate connection or exit

*
*Invalid command. Enter '?' for a list of valid commands

*
```

21.3.3 ID Command

The ID command returns information about the SEL relay configured on Port 3.

Figure 21-12 ID Command

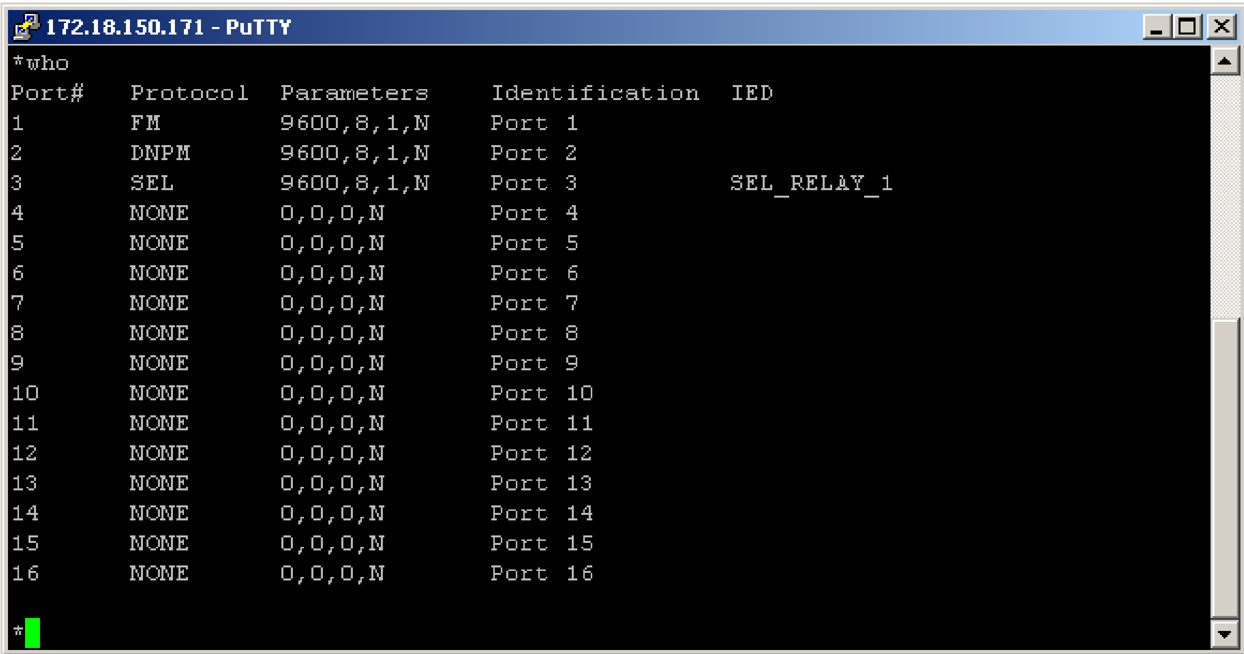
```
172.18.150.171 - PuTTY

*?
Valid commands are

   who     List port assignments
   port n  Establish transparent communications to port n
   quit    Release access to serial ports
   id      Show firmware and device IDs
   ctl-d   Terminate connection or exit

*
*Invalid command. Enter '?' for a list of valid commands

*id
"FID=SEL-2020-EMULATOR","05eb"
"DEVID=Telvent Tunneling Terminal Emulator","0f94"

*
```

We know it's on Port 3 because of the Who command, shown next.

21.3.4 Who Command

The Who command lists what devices are on which port, as shown below.

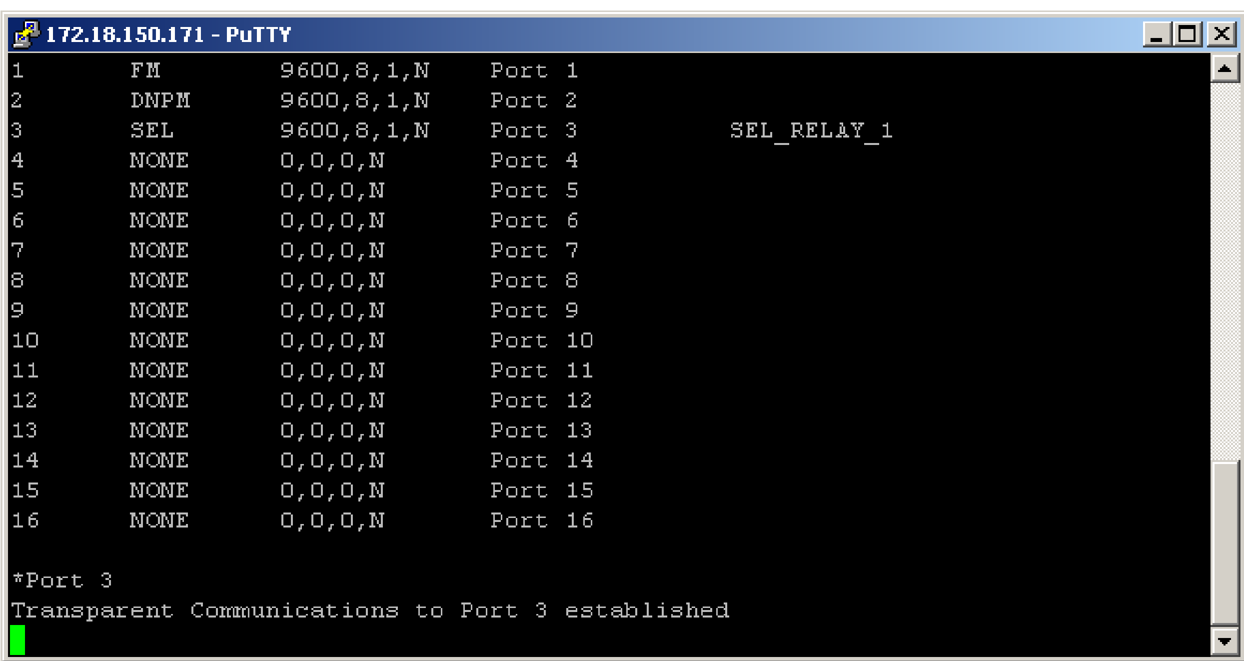
Figure 21-13 Who Command



21.3.5 Port n Command

Typing Port 3, as shown below, establishes transparent communications with the SEL relay.

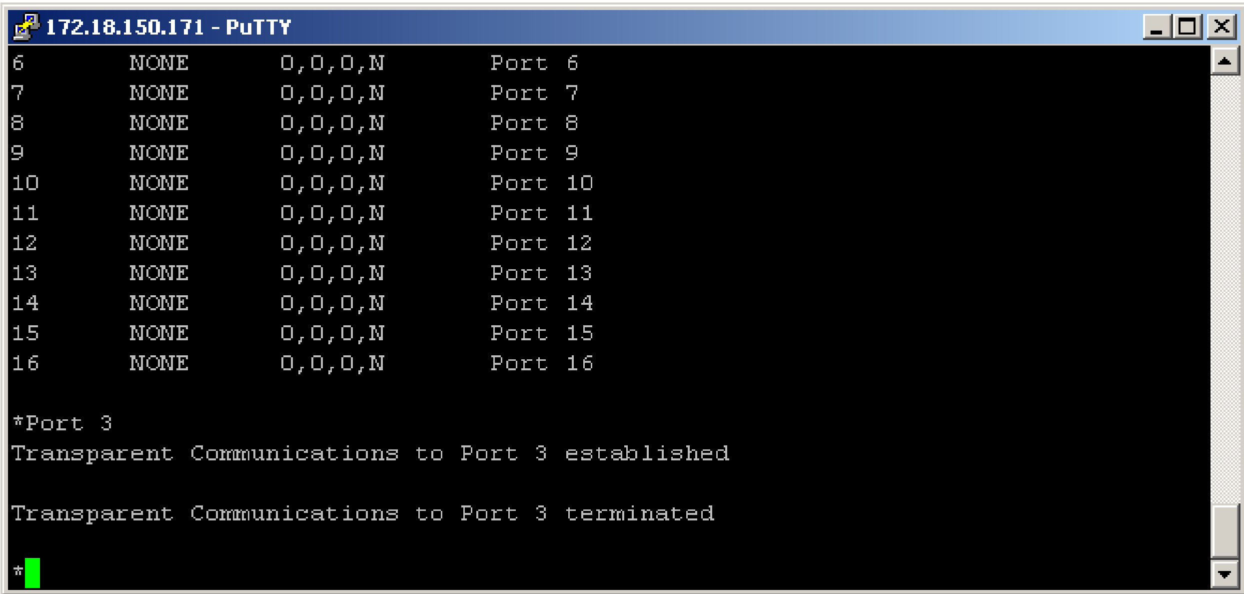
Figure 21-14 Port n Command



21.3.6 Ctl-D Command

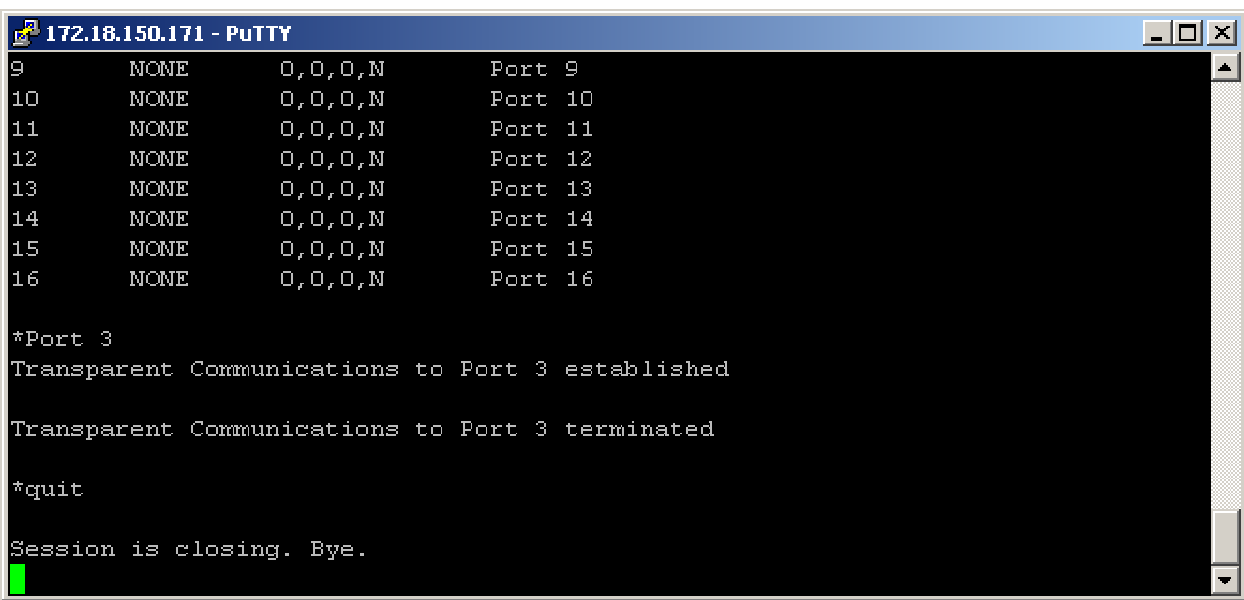
Ctrl-D ends communication with the SEL relay.

Figure 21-15 Ctrl-D Command



21.3.7 Quit Command

The Quit command ends your tunneling session. You may close the window by clicking the X at the top right.



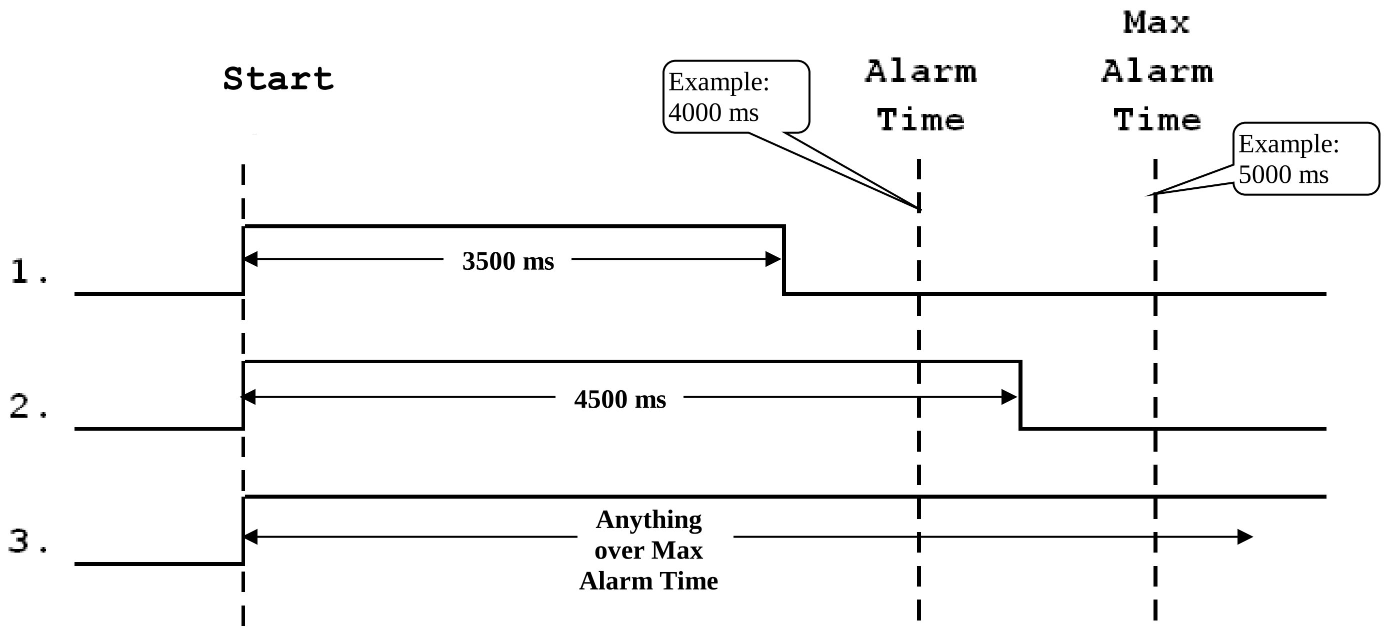
22 Switch Operation Timing

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.

22.1 Operation

The sense of the application is summarized in the diagram and explanation below. The numbered examples show a Open to Close to Open (referred to below as Start/Stop time). For the example, the Alarm Time is 4000ms and the Max Alarm time is 5000ms and the analog input points are mapped to two DNPR analog input points with CMIN of 0 and a CMAX of 5000.

Figure 22-1 Timing Diagram



Example 1: Start/Stop time is less than the Alarm Time setting – the analog point (NEWEST_ALM_TIME_1) and analog average time point (AVG_ALM_TIME_1) is calculated from the Start/Stop time. The NEWEST_ALM_TIME_1 analog value in the DNPR protocol would be 3500 and the AVG_ALM_TIME_1 analog value would be 3500 (assumes that this is the first measured event). The status point TIMER_ALM_STS_1 is not generated.

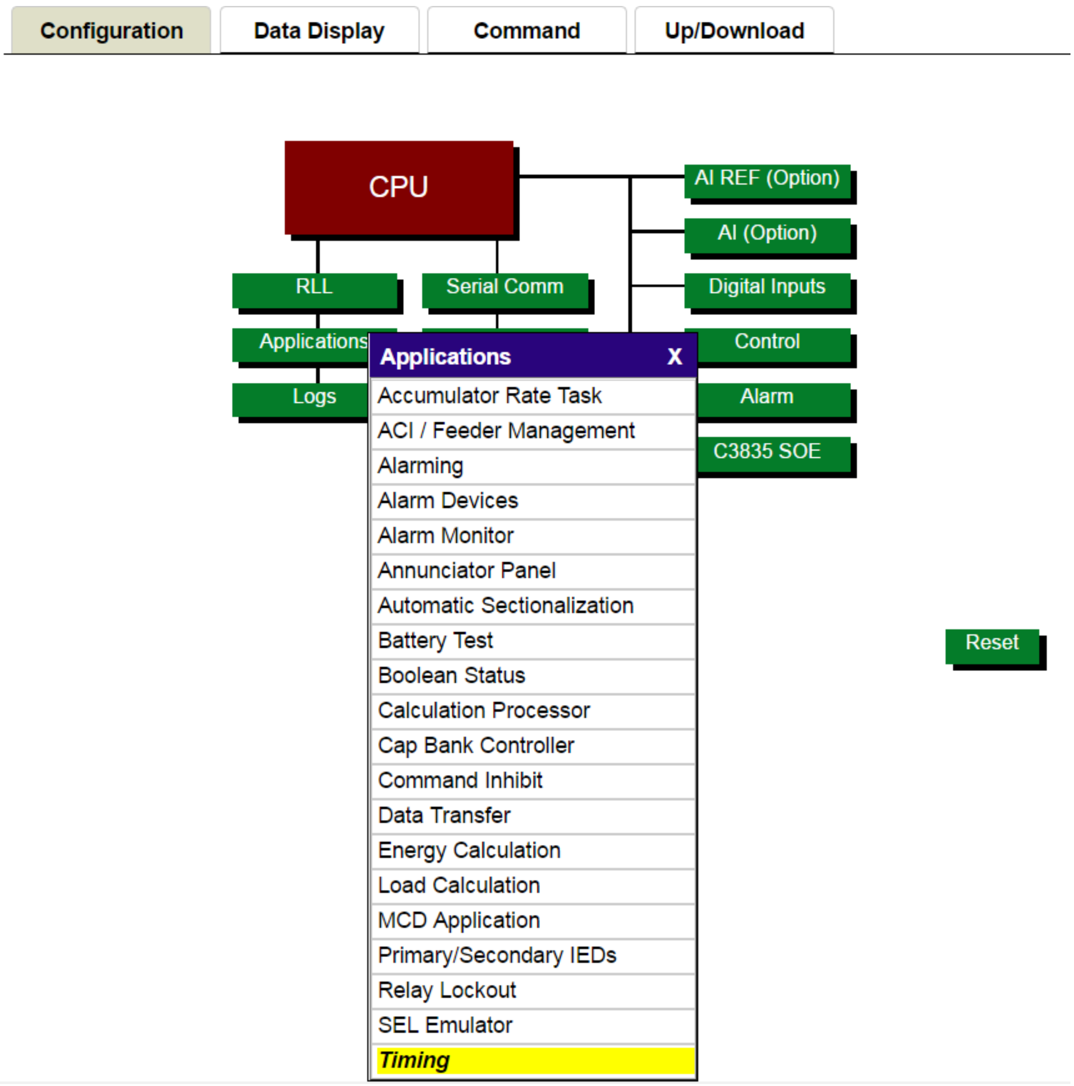
Example 2: Start/Stop fall between the Alarm Time and the Max Alarm Time – the analog points NEWEST_ALM_TIME_1 analog value in the DNPR protocol would be changed to 4500 and the AVG_ALM_TIME_1 analog value would be changed to ((3500+4500)/2)= 4000 (assumes that this is the second measured event). The TIMER_ALM_STS_1 status point is pulsed (normally open/change to closed/change to open).

Example 3: Stop goes beyond the Max Alarm Time – the application no longer attempts to measure Start/Stop, so the analog NEWEST_ALM_TIME_1 reports Max Alarm Time. The NEWEST_ALM_TIME_1 analog value in the DNPR protocol would be 5000 and the AVG_ALM_TIME_1 analog value would be ((3500+4500+5000)/3)=4333 (assumes that this is the third measured event). The status point TIMER_ALM_STS_1 is pulsed (normally open/change to closed/change to open).

22.2 Introduction and Configuration

Select the application as shown below.

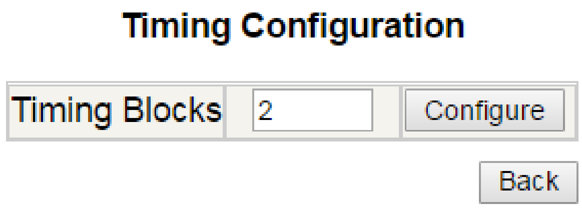
Figure 22-2 Application



The application allows the user to configure up to 64 pairs of any status points for the purpose of measuring the time between defined state changes of the pairs with millisecond resolution. If desired, the time of a single status point from open to close or close to open may be measured with the same precision. The application generates one status point and two analog points per pair that may be mapped to the Master Station as an alarm and actual time measurement with a running average.

The beginning configuration page is as follows. Enter the number of status point pairs to be measured, then click Configure.

Figure 22-3 Timing Configuration



The above action creates a source of points (Block) with a default name. You may accept the default name or type in another name (click Submit to save any names changed). Click Conf to configure the Block.

Figure 22-4 Timing Blocks List

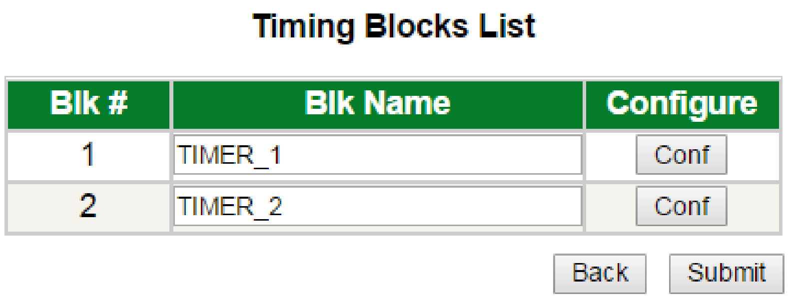
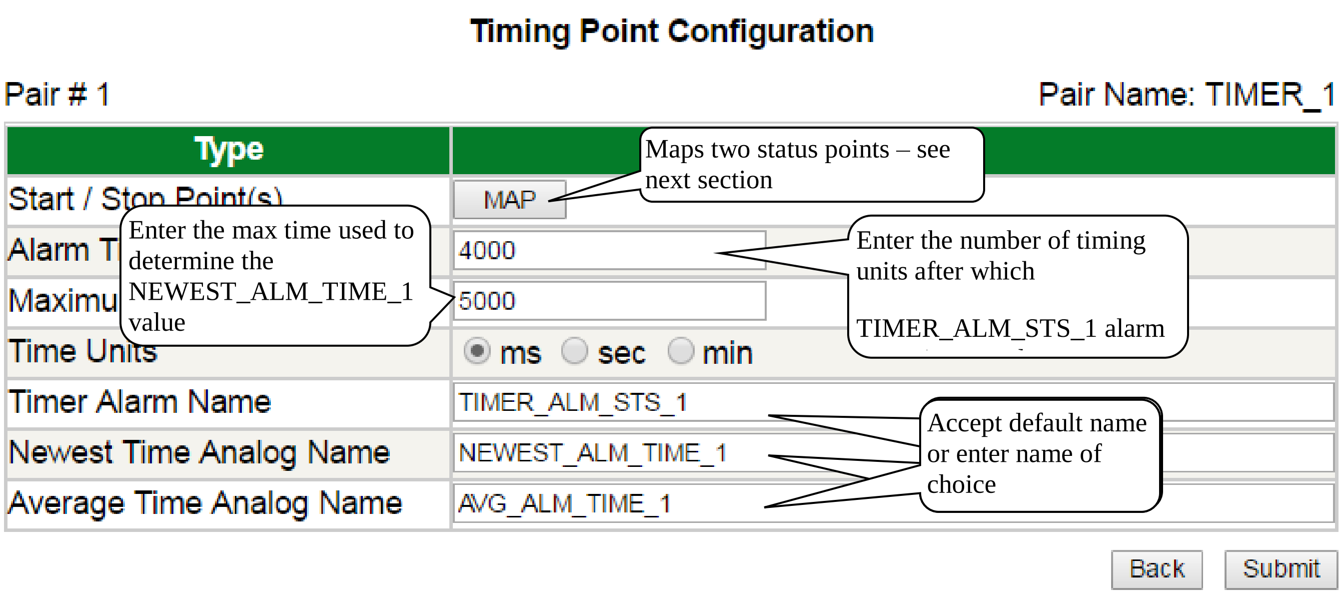


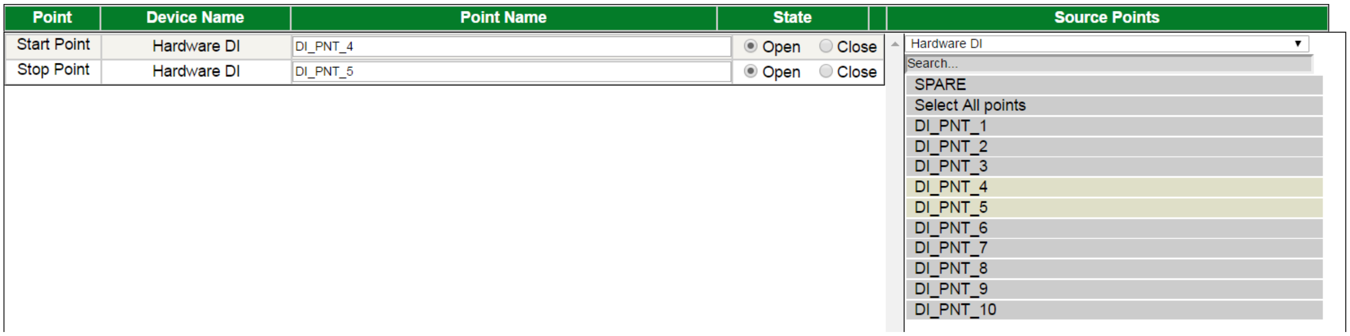
Figure 22-5 Timing Point Configuration



22.2.1 Start/Stop Points Map

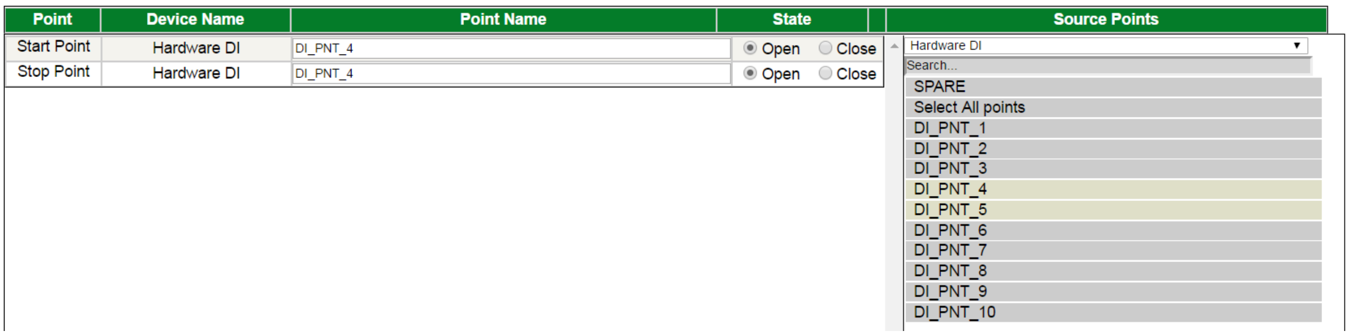
The Start/Stop status points may be taken from any source, such as Hardware points (as below), or IEDs. Both the Start and the Stop can be selected from either Open or Close States.

Figure 22-6 Mapping Start/Stop Points



The flexibility of this arrangement allows the user to map the same status point to both Start/Stop as shown below in order to measure the time of one status point.

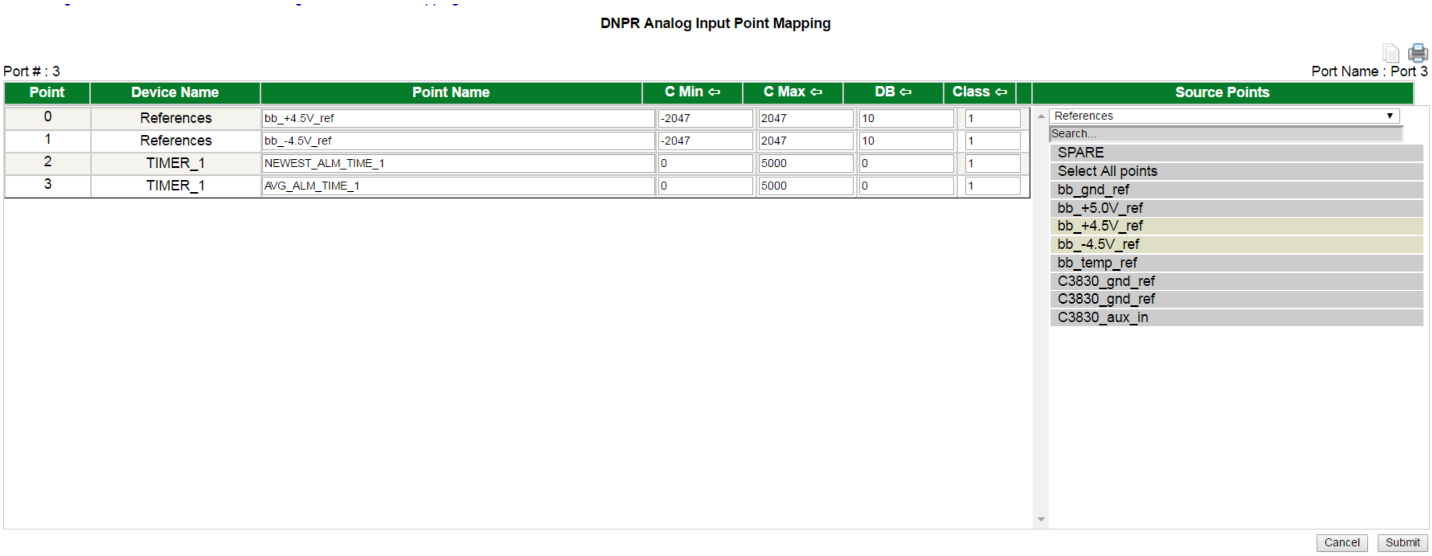
Figure 22-7 Mapping Start/Stop Points from a Single Status Point



22.2.2 Configuring Analog Points to the Master

To make the principle clear, when we map the timer analog values to the Master, we have selected a C Min of 0 and a C Max of 5000 with the deadbands effectively disabled. This count range duplicates the number of milliseconds we have configured for maximum time duration. We will get one count for every millisecond of duration. If you need to choose another C Min and C Max, then the duration will have to be interpreted at the Master.

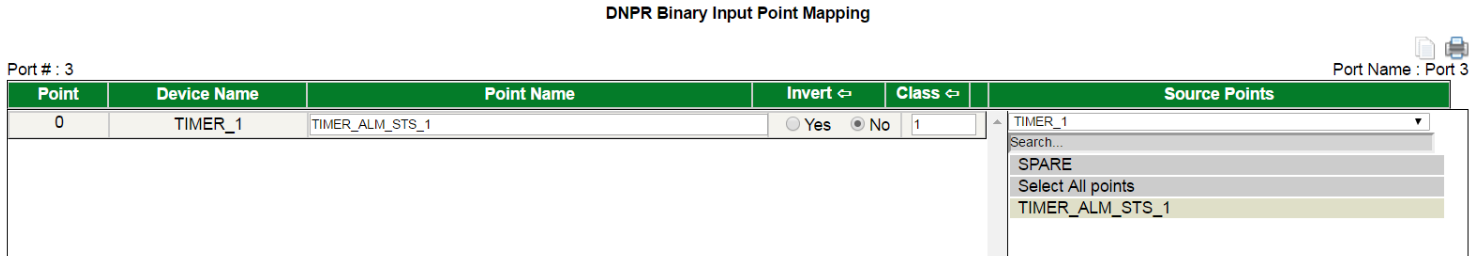
Figure 22-8 Mapping Points to the Master



22.2.3 Configuring TIMER_ALM_STS to Master

If you wish the Master to see alarms from the Timing application, you must map TIMER_ALM_STS to the Master. See the example below.

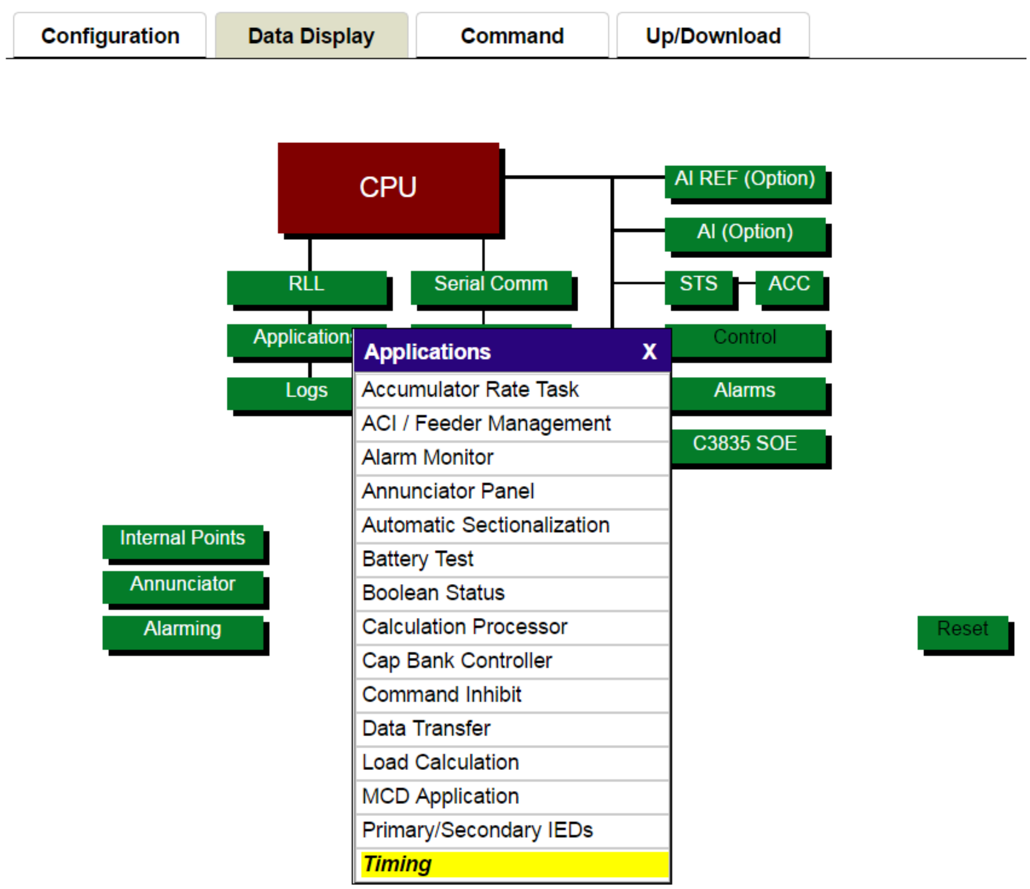
Figure 22-9 Mapping TIMER_ALM_STS to the Master



22.3 Data Display

Select Data Display, Applications and Timing as shown below.

Figure 22-10 Data Display for Timing



22.3.1 Historical Data

According to the examples under Configuration, we have configured two Timers. The display of the timers is shown below.

Figure 22-11 Timer 1 Display

TIMER_1 Historical Data Display

Total Timers: 1 [Clear]

Blk	Date/Time ▼		Duration	Tolerance
1	2017/07/28	18:19:45.070	3.000 sec	🔴
2	2017/07/28	18:19:38.055	2.140 sec	🔴
3	2017/07/28	18:19:32.025	1.095 sec	🟢
4	2017/07/28	18:19:27.030	1.655 sec	🟢
5	2017/07/28	18:19:21.165	2.645 sec	🔴
6	2017/07/28	18:19:14.120	1.235 sec	🟢

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Since we have set the Maximum Alarm Time to 5000 ms, no duration will show more than 5000 ms. Any duration which exceeds our configured Alarm Time of 4000 ms, will display a red dot under Tolerance. Notice that the Date/Time may be set for ascending or descending order.

Note: The Clear button will clear all events displayed for any timer

Note: The total number of events in the Historical Data is the 10 most recent events.

22.3.2 Analog Display

Compare the Point Value and Point Counts we send to the Master with duration values shown under Historical Data shown above. The values sent to the Master have no historical record; they simply reflect the last value obtained and the running average of the last ten values.

Figure 22-12 Analog Values Sent to the Master

DNP (R) Analog Inputs (AI) Display

Socket # : 2 Port Name : Socket 2

Point	Device Name	Point Name	Assigned Class	Status	Value	Counts
0	Event Timer	NEWEST_ALM_TIME_1	1		1815.000	6881
1	Event Timer	AVG_ALM_TIME_1	1		1340.000	-3495
2	No Device	Spare	1		NaN	-2147483648
3	No Device	Spare	1		NaN	-2147483648

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[Legend]

22.3.3 Status Display

The TIMER_ALM_STS point will always display as open in the RTU because the point is a transitory pulse that the Master can read, but is not designed for the RTU Display to see.

Figure 22-13: Digital Input Display Page

DNP (R) Digital Input (DI) Display

Socket # : 2

Point	Device Name	Point Name	Assigned Class	Status	Value
0	Event Timer	TIMER_ALM_STS_1	1		OPEN
1	No Device	Spare	0	F	OPEN
2	No Device	Spare	0	F	OPEN
3	No Device	Spare	1	F	OPEN
4	No Device	Spare	1	F	OPEN

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Legend