X500/X1000 Product Family
Model X501NET

Document Number X1000-3104-IOM

Manual Rev. 1.0

X501 NET
SYSTEM CONFIGURATION MANUAL

2008

RONAN ENGINEERING COMPANY
21200 Oxnard Street
Woodland Hills, CA 91367
http://www.ronan.com

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REVISION LOG

Rev #	Description	Date	By	Eng	Appr	QA
0.1	First rough draft for engineering review	1/11/2008	Tobol			
0.2	Second draft for engineering review (all sections complete)	1/15/2008	Tobol			
1.0	First release version	1/23/2008	Tobol			

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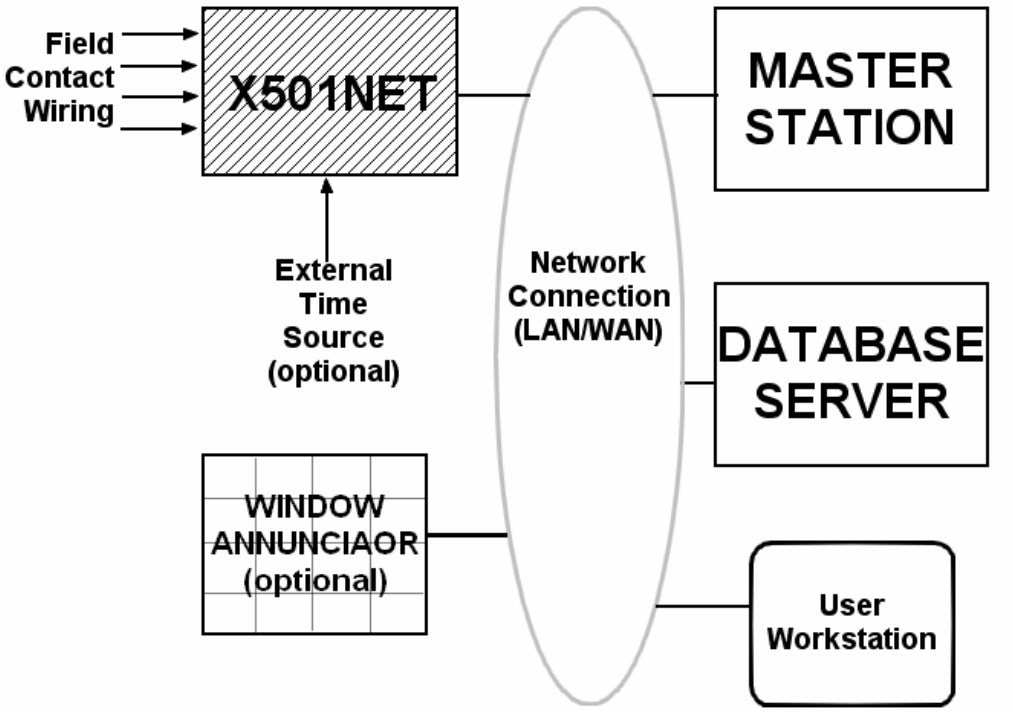
CHAPTER 1 – INTRODUCTION

The X501NET is a network device. It has no local display or keyboard. It is configured through the same local area network (LAN) connection that it uses to pass the data it collects.

The X501NET has a built-in web server and uses the HTTP protocol for configuration. No special software is required. Any computer attached to the same LAN as the X501NET can use a JavaScript enabled web browser (e.g. Internet Explorer, Mozilla, FireFox, etc) to configure the X501NET.

1.1 Overview

The X501NET is a component of Ronan's Sequence of events Recorder (SER) system. An SER is an electronic system which monitors external inputs and records the time and sequence of the changes of the inputs.



SER Functional Diagram

1.1.1 X501NET

The X501NET Multiplexers is an event acquisition device. It:

- monitors field contacts,
- detects changes in signals,
- time-stamps the signals changes as events,

- maintains a copy of the most recent 8000 events,
- sends the events to master station(s),
- optionally sends the events to window annunciator(s), and
- optionally generate IRIG-B[1]

One or more event acquisition device(s) are always part of an SER system.

1.1.2 Master Station

The master station(s):

- receives events[2] from the event acquisition devices (e.g. X501NET),
- stores the events on the database server, and
- provides a user interface to the SER system.

1.1.3 Database Server

The database server maintains the event history. It is written to by the master station(s) can be accessed by the master station(s) and user work station(s).

1.1.4 User Workstation

User workstations allow plant personnel access to the event status and history. They also provide a interface to configure the X501NET(s),

1.1.5 Window Annunciator

A window annunciator (such as the Ronan X110) is a display device that shows events and process status by lighting individual windows. A window annunciator provides plant operators with an instantly identifiable view of plant status and can save critical seconds when problems occur.

1.1.6 Network Connection (LAN/WAN)

The network connects all of the parts of the SER system. Logically, the network is always the same, it simply passed messages between the components of the SER system. In physical implementation, the network is the most variable part of the SER system. It can be as simple a single LAN or as complex as a set of LANs interconnected by the both public (e.g. world wide web) and private data networks.

1.2 Getting Started

To get started using the X501NET configuration program you need a computer with web browser[3] attached to the same LAN as the X501NET. Put the address[4] of the X501NET that you

[1] IRIG-B120.
[2] This function is called an Event Producer by IEC 60870.

wish to configure into the address bar of the browser and hit return. Then click the Login button, enter your user name and password[5] and you should be able to start using the configuration program.

1.3 X501 Hardware Description

The X501NET Multiplexers, designed for industrial application, are available for rack mount or surface mount NEMA (IP) enclosures. Each multiplexer houses single or dual power supplies for field contact and logic voltage capable of accepting single or dual power sources such as 115/235 Vac or 115 Vac/125 Vdc or 24, 48 Vdc. The single or dual multiplexer-controller provides for input card status interrogation, time tagging of events to 1 ms resolution, storing of up to 8,000 events, queuing of events, and transfer of events via several popular configurable communication protocols (IEC 60870, DNP 3.0, TCP/IP) over 10 Mbs 10baseT communication layer to the respective subscribers of events present on the network.

Four version[6] of the controller card for the X501NET are available:

- Two versions that include an GPS time receiver with simple cable/antenna interface and IRIG-B generator output input (models PL1 and PL3), and
- Two versions support IRIG-B input (models PL2 and PL4)

Additional standard features are temperature controlled precision oscillator, NTP (Network Time Protocol) for backup synchronization and complete web server for simple browser interface configuration and monitoring facilities. Up to 8,000 event local data storage, hardware/software diagnostic, field contact input test that includes the opto-isolator input circuit. The sixteen input modules, each serving eight input contacts, are microprocessor controlled for input status interrogation, status change queuing, digital filters by individual inputs for alarm, return-to-normal, debounce, and normally open/normally closed field contact logic. This multiplexer is a self-sustained event acquisition, recorder, and producer unit.

1.4 Glossary

Term	Definition
IEC	International Electrotechnical Commission – an international organization responsible for creating standards for the process control and SCADA industries.
IEC 60870-5	Provides a communication profile for sending basic telecontrol messages between two systems, which uses permanent directly connected data circuits between the systems. The IEC Technical Committee 57

[3] Almost any web browser will work providing JavaScript and cookies is enabled. Having the web browser security setting at their default settings will virtually always assure that JavaScript is enabled. To all cookies, the browser's privacy settings may need to be set to low.
[4] See section 4.1 if needed for more information about logging in.
[5] The default user name is **User1** and the default password is **pwd1**.
[6] For a complete description of the features of all versions of the X501NET controller card, see the X501NET Hardware Manual.

Term	Definition
	(Working Group 03) have developed a protocol standard for Telecontrol, Teleprotection, and associated telecommunications for electric power systems.
IEC 60870-5-104	Transmission Protocols that define network access for IEC 60870-5-101 using standard transport profiles.
JavaScript	JavaScript is an interpreted programming or script language widely used on the web.
LAN	Local Area Network - A group of computers and other devices dispersed over a relatively limited area and connected by a communications link that enables any device to interact with any other on the network.
NTP	Network Time Protocol as defined by the RFC 1305 standard.
SCADA	Supervisory Control And Data Acquisition - A process control application that collects data from sensors and machines on the shop floor or in remote locations and sends them to a central computer for management and control.
SNTP	Simple Network Time Protocol. SNTP is simplified version of NTP. SNTP can be used when the ultimate performance of the full NTP implementation is not needed or justified.
SER	Sequence of Events Recorder
TCP/IP	Transmission Control Protocol/Internet Protocol - A communications protocol developed under contract from the U.S. Department of Defense to internetwork dissimilar systems. Invented by Vinton Cerf and Bob Kahn, this de facto Unix standard is the protocol of the Internet and the global standard for communications.
Web Browser	The program that serves as your front end to the Web on the Internet.

1.5 Documentation Conventions

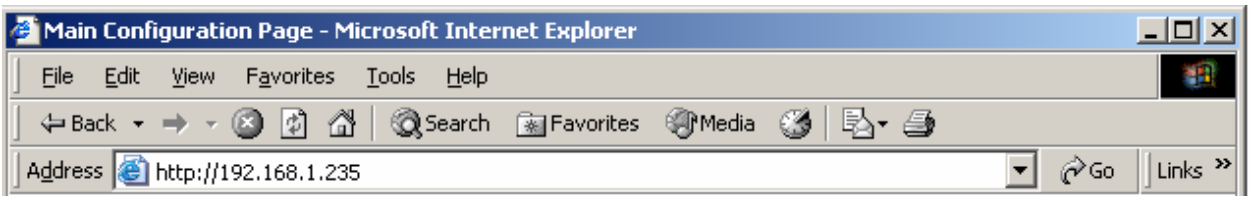
This documentation uses some typographical conventions to highlight the points of interaction between the user and the configuration system.

Item	Example	Font/Format
Button	Save	Arial Black.
Field Names	**User ID**	Arial bold.
Field Values	User1	Arial.

Item	Example	Font/Format
Links	**Points Status**	Arial bold underlined.
Page Name	**Main Menu**	Courier New bold. Spaces between words Times New Roman bold.
TCP/IP Address	**192.168.1.235**	Courier New Bold

CHAPTER 2 – INTERFACE

The X501NET configuration interface is a series of web pages that can be accessed through any web browser. Access to this interface is accomplished by putting the TCP/IP address of the device to be configured into web browser's address bar and pressing the enter key.



The above picture shows using Internet Explorer to access an X501NET at address[7] **192.168.1.235**.

2.1 Common Elements

The X501NET configuration uses common elements as much as possible to make the interface consistent and easy to use.

2.1.1 Common Buttons

Button	Action
Continue	Pressing the **Continue** button takes the user to the previous page.
Goto Bottom of page	Pressing the **Goto Bottom of page** button takes the user to the bottom of the current page.
Goto top of page	Pressing the **Goto top of page** button takes the user to the top of the current page.
Logout	Pressing the **Logout** button logs out the current user. After pressing the **Logout** button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the **Main Menu** button takes the user to the **Main Menu** page.
Restore original values	Pressing the **Restore original values** button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the **Save** button causes the changes made by the

[7] When an X501NET is manufactured it programmed with the default TCP/IP address of **192.168.1.234**. Before it is shipped to the customer it is configured to the specific TCP/IP address required for the customer installation. Typically, **MUX1** has TCP/IP address **192.168.1.234**, **MUX2** has TCP/IP address **192.168.1.235**, and so on.

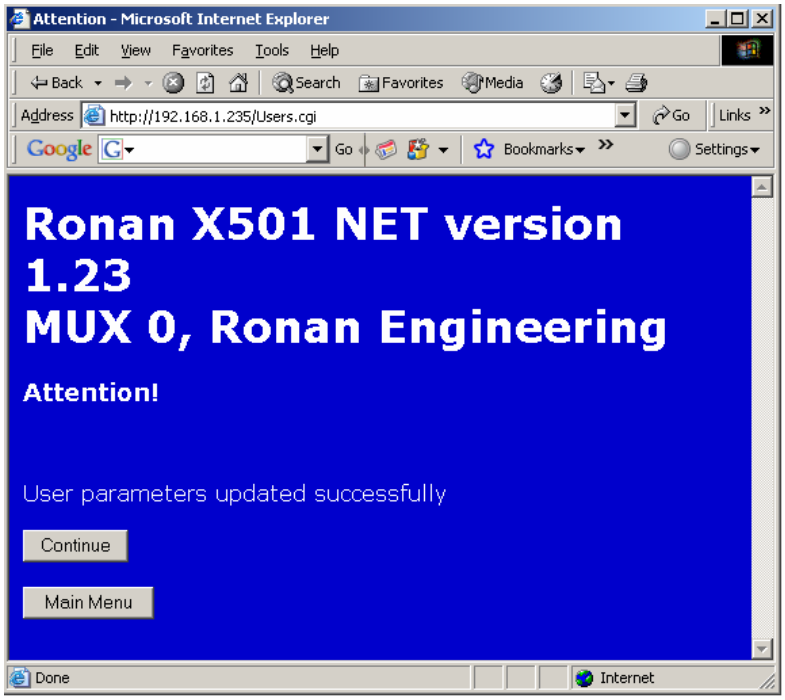
Button	Action
	user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.1.2 Results Pages

Whenever a user attempts to perform an action (e.g. **Save**), they are taken to a results page to inform the user if the action was successful or if the action failed. In addition, results pages (e.g. the **No Rights** page) is reached if a user attempts to go a page that thy are not permitted to access.

2.1.2.1 **Success** Page

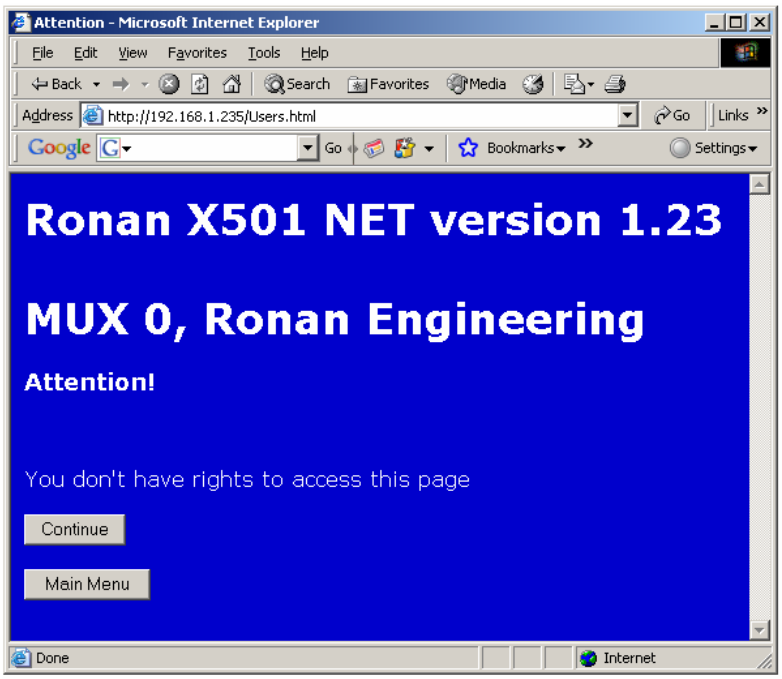
The **Success** page is reached when a user performs an action (e.g. **Save**) that is successfully completed.



Button	Action
Continue	Pressing the **Continue** button takes the user to the previous page.
Main Menu	Pressing the **Main Menu** button takes the user to the **Main Menu** page.

2.1.2.2 **No Rights** Page

The **No Rights** page is reached when a user attempts to go to a page or perform an action (e.g. Save) that is not permitted by the user's access rights (see section 2.12.3).



Button	Action
Continue	Pressing the **Continue** button takes the user to the previous page.
Main Menu	Pressing the **Main Menu** button takes the user to the **Main Menu** page.

2.2 **Main Menu** *Page*

The **Main Menu** page displays login status and the menu for accessing the status and configuration pages. In order to access any of those pages the user must login (see section 4.1). The **Login** page will be displayed automatically if the user attempts to access any page without being logged in.

`Main Menu` – Not Logged In

`Main Menu` –Logged In

2.2.1 `Main Menu` Page Buttons

Button	Action
Login	Pressing the **`Login`** button takes the user to the **`Login`** page.
Logout	Pressing the **`Logout`** button logs out the current user. After pressing the **`Logout`** button it is necessary for a user to login before any other pages can be accessed.

2.2.2 Status and Reports

The Status and Report portion of the **`Main Menu`** page contains links that are used to view operational information (current point state and history). These links can be accessed by all users (Administrators, Operators, and Guests).

2.2.2.1 **Points Status** Link

Clicking the **Point Status** link takes the user to the **`Point Status`** page (see section 2.4).

2.2.2.2 **Events History** Link

Clicking the **Event History** link takes the user to the **`Event History`** page (see section 2.5).

2.2.3 Configuration

The Configuration portion of the **Main Menu** page contains links that are used to view or change configuration information. These links can only be accessed by users that have Administrator or Operator access rights.

2.2.3.1 **General Configuration** Link

Clicking the **General Configuration** Link takes the user to the **General Configuration** page (see section 2.6). This page shows the device's physical and logical addresses, and time subsystem parameters. This page also allows these parameters to be changed if the user has Administrator access rights.

2.2.3.2 **Input Cards** Link

Clicking the **Input Cards** Link takes the user to the **Input Cards** page (see section 2.7). This page displays the status of all input cards and can be used by an Administrator to enable/disable and configure input cards.

2.2.3.3 **Points Configuration** Link

Clicking the **Points Configuration** Link takes the user to the **Points Configuration** page (see section 2.8). The **Points Configuration** page provides a means to view and/or configure the parameters of each input point of the X501NET, as well as a means to navigate through the points.

2.2.3.4 **Network** Link

Clicking the **Network** Link takes the user to the **Network** page (see section 2.9). The **Network** page provides a means to view and configure the parameters of the TCP/IP protocol used by the X501NET.

2.2.3.5 **IEC 60870-5-104** Link

Clicking the **IEC 60870-5-104** Link takes the user to the **IEC 60870-5-104** page (see section 2.10). The **IEC 60870-5-104** page allows the user to view/modify the parameters of the IEC 60870-104-5 Protocol. This Protocol is used for communication between the X501NET and IEC60870 master stations.

2.2.3.6 **X110 Connection Configuration** Link

Clicking the **X110 Connection Configuration** Link takes the user to the **X110 Connection Configuration** page (see section 2.11). The **X110 Connection Configuration** page is used to setup the Ethernet communication with up to four X110 annunciators.

2.2.3.7 **Users** Link

Clicking the **Users** link takes the user to the **Users** page (see section 2.12). The **Users** page can only be accessed by administrators. It enables administrators to permit up to 10 users to access the X501NET configuration pages and to assign to each user appropriate access rights.

2.2.3.8 **User Notes** Link

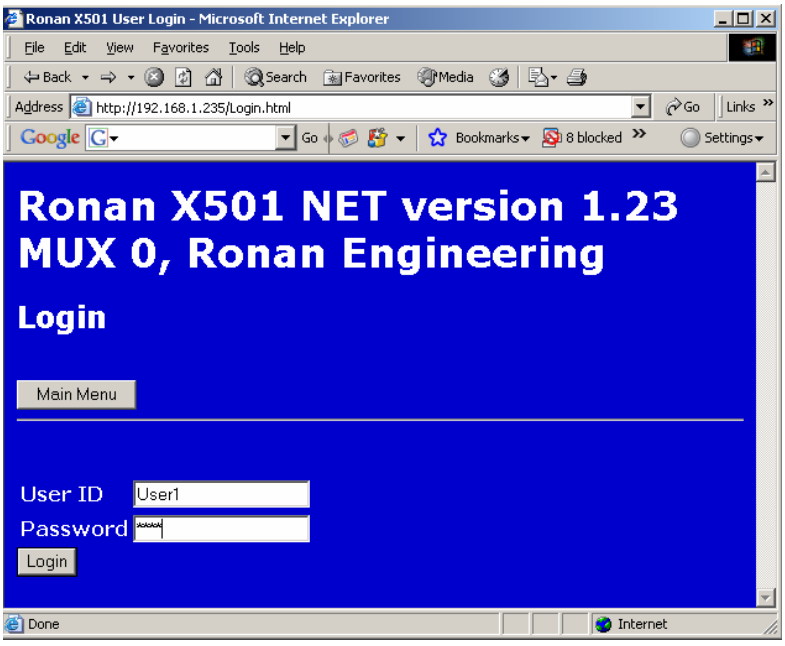
Clicking the **User Notes** link takes the user to the **User Notes** page (see section 2.13). The **User Notes** page allows the user to enter plain text notes[8] and to modify/delete the previous notes.

2.2.3.9 **Configuration File** Link

Clicking the **Configuration File** link takes the user to the **Configuration File** page (see section 2.14). The **Configuration File** page can only be accessed by administrators. It displays the entire content of the X501NET's configuration file and allows administrators to change any parameter.

2.3 **Login** *Page*

To prevent unauthorized personnel from accessing the X501NET configuration, all users must login[9] before any menu items can be selected.



[8] The X501NET can store to 999 bytes of notes.
[9] User can log out by clicking the Logout button found on almost every page. Users are also automatically logged out when they have been inactive for longer than the inactivity timer (about 20 minute if cookies are enabled, only about 1 minute if they are not).

To login in, the user is required to enter **User ID** (User1 in the example screen shown above), **Password** (asterisks automatically replaces characters typed in the password field to help maintain system security) and press the `Login` button.

2.3.1 `Login` Page Buttons

Button	Action
Login	Pressing the `Login` button causes the **User ID** and **Password** entered to be checked and, if valid, the appropriate access level is granted.
Main Menu	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.

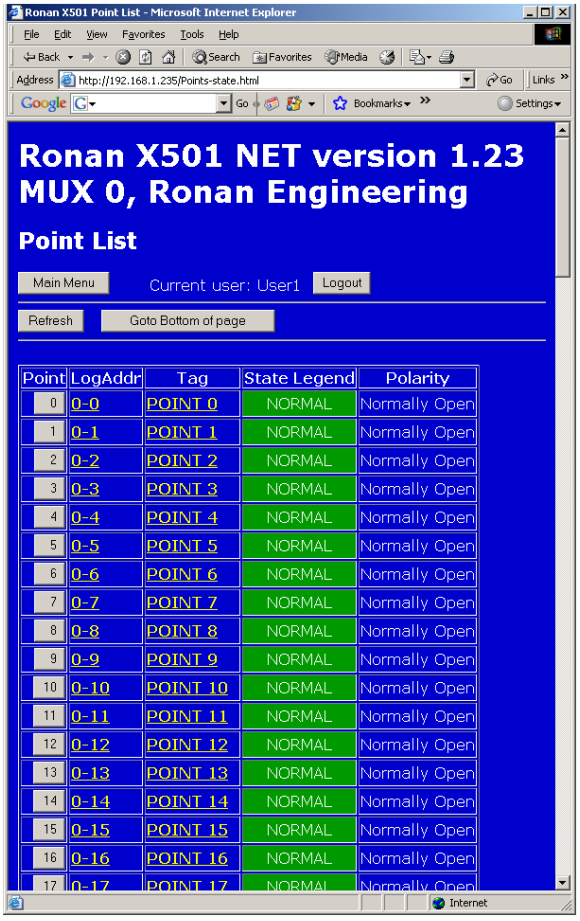
2.3.2 User ID and Password

Both **User ID**s and **Password**s are case sensitive (i.e. A is not the same as a). See Section 4.8 for information on how add users to the system.

2.4 `Point Status` *Page*

The **`Point Status`** page displays the status of every input point in the X501NET. As a result the page is **very** long. To assist in page navigation, there are buttons at the top and bottom of the page to jump from top to bottom.

This page does not allow for direct modifications of the point configuration parameters. However, each row displays a link to the corresponding **`Point Configuration`** page.



Top of `Point Status` Page

Botton of `Point Status` Page

2.4.1 `Point Status` Page Buttons

Button	Action
Goto Bottom of page	Pressing the `Goto Bottom of page` button takes the user to the bottom of the **`Point Status`** page.
Goto top of page	Pressing the `Goto top of page` button takes the user to the top of the **`Point Status`** page.
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.
Refresh	Pressing the `Refresh` button reloads the page with the current status of all points.

Button	Action
0 thru 127	Pressing a button with a number in it takes the user to the **Point Configuration** page (see section 2.7.2) for that number point (if the user has sufficient access rights – see section 2.12.3).

2.4.2 Point List

The point list is a table where each line contains information about a point. The information in the table is current when the page is generated but it is **NOT** automatically updated while the page is viewed. Pressing the Refresh button will cause the page to be regenerated to provide a new snapshot of point status.

2.4.2.1 **Point**

The **Point** column of the point list contains a button with the number of the point (0 to 127). Pressing this button takes the user to the Point Configuration page (see section 2.7.2) for that number point (if the user has sufficient access rights – see section 2.12.3).

2.4.2.2 **LogAddr**

The **LogAddr** column of the point list contains the Logical Address of the point as defined in the **Point Configuration** page for that point.

2.4.2.3 **Tag**

The **Tag** column of the point list contains the Tag of the point as defined in the **Point Configuration** page for that point.

2.4.2.4 **State Legend**

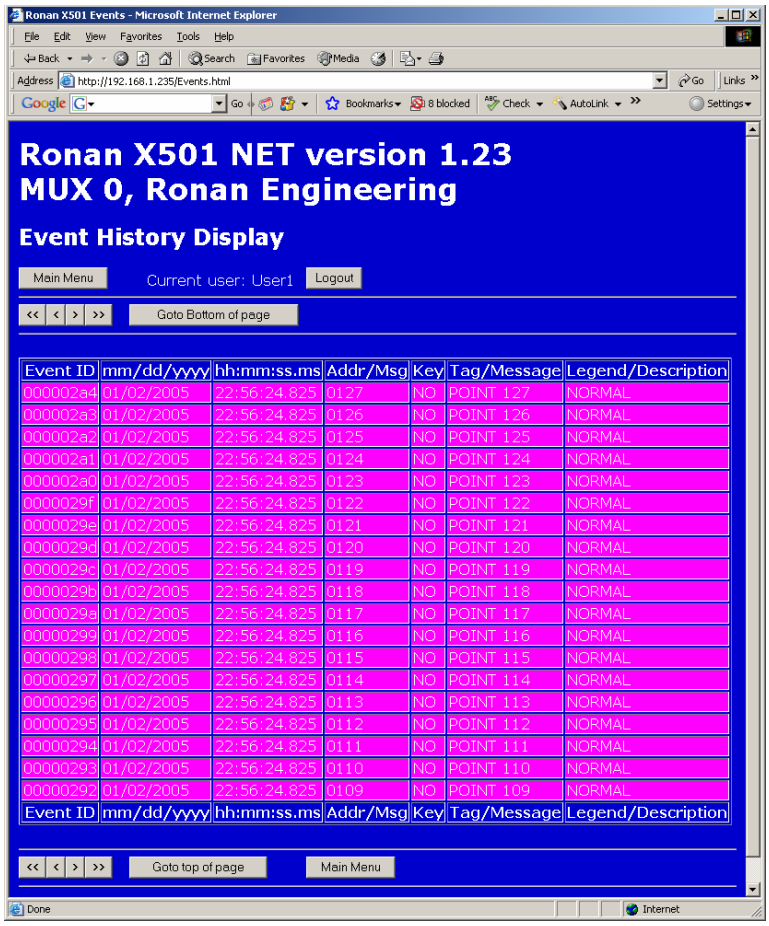
The **State Legend** column of the point list contains the legend (defined in the **Point Configuration** page for that point) that corresponds to the current state of the point.

2.4.2.5 **Polarity**

The **Polarity** column of the point list contains the Polarity of the point as defined in the **Point Configuration** page for that point.

2.5 **Event History** *Page*

The **Event History** page displays a window into the most recent events (up to 8000) that are present in the X501NET's event buffer.



Event ID	mm/dd/yyyy	hh:mm:ss.ms	Addr/Msg	Key	Tag/Message	Legend/Description
000002a4	01/02/2005	22:56:24.825	0127	NO	POINT 127	NORMAL
000002a3	01/02/2005	22:56:24.825	0126	NO	POINT 126	NORMAL
000002a2	01/02/2005	22:56:24.825	0125	NO	POINT 125	NORMAL
000002a1	01/02/2005	22:56:24.825	0124	NO	POINT 124	NORMAL
000002a0	01/02/2005	22:56:24.825	0123	NO	POINT 123	NORMAL
0000029f	01/02/2005	22:56:24.825	0122	NO	POINT 122	NORMAL
0000029e	01/02/2005	22:56:24.825	0121	NO	POINT 121	NORMAL
0000029d	01/02/2005	22:56:24.825	0120	NO	POINT 120	NORMAL
0000029c	01/02/2005	22:56:24.825	0119	NO	POINT 119	NORMAL
0000029b	01/02/2005	22:56:24.825	0118	NO	POINT 118	NORMAL
0000029a	01/02/2005	22:56:24.825	0117	NO	POINT 117	NORMAL
00000299	01/02/2005	22:56:24.825	0116	NO	POINT 116	NORMAL
00000298	01/02/2005	22:56:24.825	0115	NO	POINT 115	NORMAL
00000297	01/02/2005	22:56:24.825	0114	NO	POINT 114	NORMAL
00000296	01/02/2005	22:56:24.825	0113	NO	POINT 113	NORMAL
00000295	01/02/2005	22:56:24.825	0112	NO	POINT 112	NORMAL
00000294	01/02/2005	22:56:24.825	0111	NO	POINT 111	NORMAL
00000293	01/02/2005	22:56:24.825	0110	NO	POINT 110	NORMAL
00000292	01/02/2005	22:56:24.825	0109	NO	POINT 109	NORMAL
Event ID	mm/dd/yyyy	hh:mm:ss.ms	Addr/Msg	Key	Tag/Message	Legend/Description

2.5.1 Event History Page Buttons

Button	Action
Goto Bottom of page	Pressing the Goto Bottom of page button takes the user to the bottom of the current page.
Goto top of page	Pressing the Goto top of page button takes the user to the top of the current page.
Logout	Pressing the Logout button logs out the current user. After pressing the Logout button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the Main Menu button takes the user to the **Main Menu** page.
<<	Pressing the << button cause the page to display events starting with the earliest events in the event buffer.
<	Pressing the < button cause the page to display the previous page of events in the event buffer.

Button	Action
>	Pressing the > button cause the page to display the next page of events in the event buffer.
>>	Pressing the >> button cause the page to display events starting with the most recent events in the event buffer.

2.5.2 History

Each event history line contains the information captured by the multiplexer about a single event.

2.5.2.1 **Event ID**

The **Event ID** field is a sequential hexadecimal number assigned to the specific event.

2.5.2.2 **mm/dd/yyyy**

The **mm/dd/yyyy** field is the date of the event represented as a two digit day, a slash, a two digit month, a slash, and a four digit year.

2.5.2.3 **hh:mm:ss.ms**

The **hh:mm:ss.ms** field is the time of the event represented as a two digit hour[10], a colon, a two digit minute, a colon a 2 digit second, a period and a 3 digit millisecond.

2.5.2.4 **Addr/Msg**

The **Addr/Msg** field contains either a point number or a message identifier.

Message identifiers can be distinguished from point numbers by the prefix **M** that precedes the message number (e.g. M274 is the message identifier for Network Line ok). All messages include a plain text description in **Tag/Message** field of the condition that caused to message to be generated.

2.5.2.5 **Key**

The **Key** field contains:

Key	Meaning
AC	Point is configured as normally open and it is in alarm.
AO	Point is configured as normally closed and it is in alarm.
MUX	Event is generated by the X501NET, not by a point.
NC	Point is configured as normally closed and it is not in alarm.
NO	Point is configured as normally open and it is not in alarm.
TO	Point is toggling (an alarm condition) and has entered limit mode.

[10] Hours are in 24 hour form. 0 is 12 midnight, 12 is 12 noon, 23 is 11 PM.

2.5.2.6 **Tag/Message**

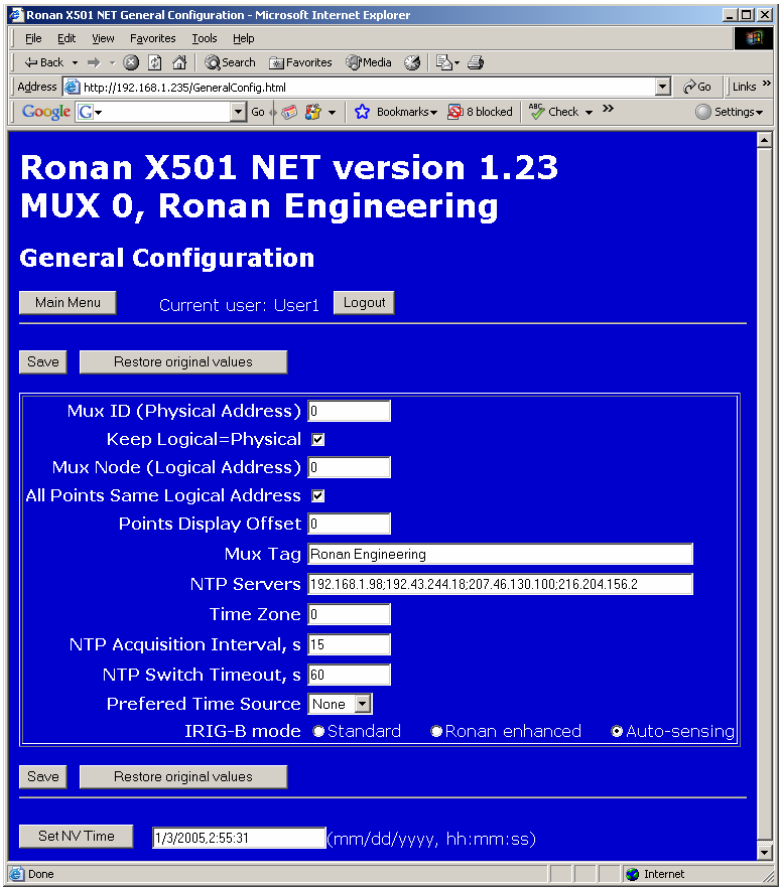
The **Tag/Message** field contains either a tag name assigned to the point or the `Message` if the event is generated by the X501NET (see section 2.5.2.4).

2.5.2.7 **Legend/Description**

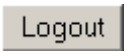
The **Legend/Description** field contains either a legend associated with the current point state or the description associated with the event generated by the X501NET (see section 2.5.2.4).

2.6 `General Configuration` *Page*

The **`General Configuration`** page shows the device's physical and logical addresses, and time subsystem parameters. This page also allows these parameters to be changed if the user has Administrator access rights.



2.6.1 `General Configuration` page Buttons

Button	Action
	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.
	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.
	Pressing the `Restore original values` button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
	Pressing the `Save` button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).
	Pressing the `SetNV Time` button sets the time of the built-in real-time clock[11] (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2). Note: this feature is only for systems that do not have SNTP, IRIG or GPS time sources available.

2.6.2 Basic Multiplexer Configuration

These fields set the basic multiplexer configuration. They deal with addressing and identification of the X501NET and the events generated by the X501NET. The configuration of these fields is dependent on the type of configuration (non-redundant vs. redundant) and the desired mapping of logical to physical addresses.

2.6.2.1 **Mux ID (Physical Address)** Field

Each X501NET must be assigned a unique physical address (typically in the range of 1 through 50).

2.6.2.2 **Keep Logical=Physical** Check Box

Check the **Keep Logical=Physical** box if the X501NET is being used in a non-redundant configuration[12].

[11] The built-in real-time contains a battery backup that allows it to maintain time accurate within ?? ms even if the X501NET is not connected to power for ?? days.

[12] The X501NET can be use in both non-redundant and redundant configurations. When the X501NET is in a non-redundant configuration, it typically uses the same logical address as the physical address.

2.6.2.3 **Mux Node Logical Address** Field

The **Mux Node Logical Address** field is used to assign the same logical to both of the devices that make up the redundant pair.

2.6.2.4 **All Points Same Logical Address** Check Box

For cases where the X501NET Multiplexer is redundant, **and** the logical address is the same for all points, but different than the physical, change the X501NET Multiplexer Node parameter and check the box **All Points Same Logical Address**.

For redundant configurations where each point could have any logical addressm the **All Points Same Logical Address** must be left unchecked and each of the points must be assigned to the appropriate logical address using the point configuration screen.

2.6.2.5 **Points Display Offset** Field

By default all points in the X501 are zero based, i.e. the first point is number 0. There are applications where the customer may want to see them starting from 1, or even another number[13]. The **Point Display Offset** is used for this purpose. It is important to note that setting this field to a value different than zero will **not** affect the communication with other devices (except the X110[14]) and is used **only** to offset the display of the point on the X501NET Multiplexer local pages (e.g. the **`Points Status`** and **`Point Configuration`** pages).

2.6.2.6 **Mux Tag** Field

The X501NET **Mux Tag** parameter is displayed on each page by this configuration interface.

2.6.3 Time Configuration

Time stamping events with the accurate time of occurrence is one of the main tasks of the X501NET. Since this is such an important function, the X501NET supports many options to assure that it can have as accurate a time stamp as possible[15].

2.6.3.1 **NTP Servers** Field

The X501NET is able to receive the time using SNTP protocol. The time received from the NTP servers can be:

- the primary time source for the X501NET, or
- a fall-back time source that is used in case any better quality[16] time source is not available.

[13] Valid values for this field are 0 through 65525.
[14] This parameter is also used to offset the points for X110 communication.
[15] Within the limits of the time sources provided.
[16] The NTP precision is about ±10 ms in most of the local networks.

If the SNTP protocol is to be used to obtain time, the **NTP Servers** field must contain a list of the TCP/IP addresses NTP servers. Up to four TCP/IP server addresses can be listed, separated by semicolons.

2.6.3.2 **Time Zone** Field

The **Time Zone** field is used to add a signed offset to the time obtained through GPS or SNTP. In the case of using IRIG-B for synchronization, the time is directly set without taking into account the time zone.

2.6.3.3 **NTP Acquisition Interval** Fields

This field, **NTP Acquisition Interval**, and the following field, **NTP Switch Timeout**, are used to control the frequency of polling the time server and the timeout after which to switch to NTP in the case of the loss of a better quality time[17] source[18] (i.e. GPS or IRIG-B).

The **NTP Acquisition Interval** field is used to control how often (in seconds) an NTP server is polled when that server is being used as the time source.

2.6.3.4 **NTP Switch Timeout** Field

The **NTP Switch Timeout** field is used to determine how long (in seconds) the X501NET will wait after losing a higher quality time server before it starts to get time form an NTP server (also see section 2.6.3.3).

2.6.3.5 **Preferred Time Source** Field

The **Preferred Time Source** field displays, and allows an Administer to change, the primary time source to be used by the X501NET.

Preferred Time Source	**Description**
None	No external time source is available, see the description of the SetNV Time button in section 2.6.1 for information on setting the internal real-time clock.
GPS	Use an external GPS receiver as the primary time source.
IRIG-B	Use an external IRIG-B time code generator as the primary time source.
SNTP	Use a network time server as the primary time source.

[17] Higher accuracy or more reliable.

[18] In many cases the X501NET MULTIPLEXER could temporarily lose the satellite connection (GPS) or the IRIG-B synchronization and since the timing subsystem will continue to run on the last known good settings it is undesirable to switch immediately to NTP. The default value is 60 seconds, but values up to one hour (3600 s) could be acceptable.

Note, if an IRIG-B is connected as a time source, do **not** select None. This can cause the year to be unreliable.

2.6.3.6 **IRIG-B mode** Field

If an IRIG-B time code generator is connected to the X501NET, this field must be set to select to mode[19] of operation of the IRIG-B[20] interface.

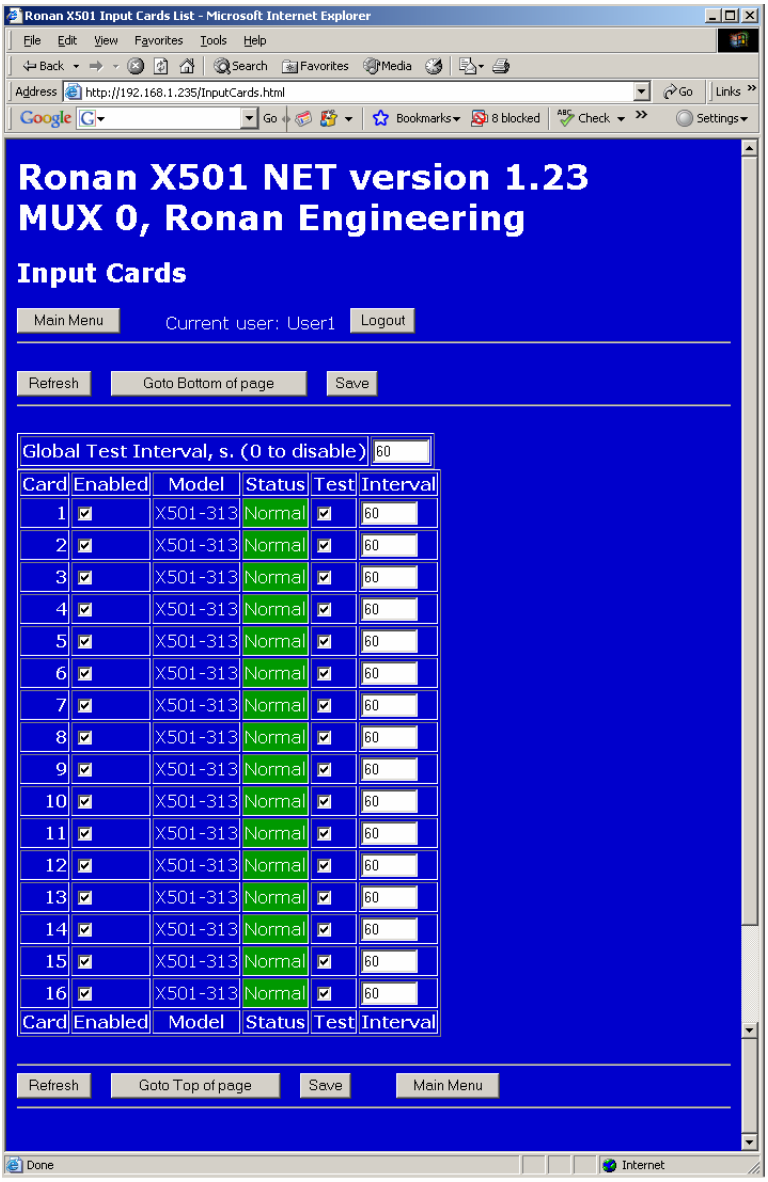
IRIG-B mode	Description
Standard	Use with standard (non-Ronan) IRIG-B time generators
Ronan enhanced	Use Ronan enhanced time code generators that provide year in addition the standard IRIG-B information.
Auto-sensing	Automatically[21] select the correct IRIG-B mode.

Setting this field is **very** important. If a Ronan enhanced IRIG-B is not attached (either a standard IRIG-B or **no** IRIG-B) the field **must** be set to Standard to avoid a risk of having the year change due to noise on the IRIG-B port.

2.7 `Input Cards` *Page*

The **`Input Cards`** page displays the status of all input cards, and can be used by an Administrator to enable/disable and configure input cards.

[19] Since the standard IRIG-B frame doesn't carry information about the year, Ronan Engineering has developed a proprietary extension of the IRIG-B protocol that passed the year as additional frame validation information.
[20] Specifically IRIG-B120.
[21] Since the automatic selection of IRIG-B mode can not be guaranteed compatible with all non-Ronan time code generators, this mode should not be used unless it is not possible to determine what type of IRIG-B generator is connected to the X501NET.



2.7.1 `Input Cards` Page Buttons

Button	Action
Goto Bottom of page	Pressing the `Goto Bottom of page` button takes the user to the bottom of the current page.
Goto top of page	Pressing the `Goto top of page` button takes the user to the top of the current page.
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.

Button	Action
	Pressing the Main Menu button takes the user to the **Main Menu** page.
	Pressing the Refresh button reloads the page with the current status of all cards.
	Pressing the Save button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.7.2 Card Configuration

The X501NET configuration displays input card type and status and input cards operation to be controlled.

2.7.2.1 **Global Test Interval** Field

In most cases it is preferred to use the same test interval for all cards. If the **Global Test Interval** to a number different than 0 all input cards (capable of running an input test) are tested at that interval[22].

2.7.2.2 **Card** Field

The **Card** field is read-only. It identifies the card slot (1 through 16) associated with the row of fields.

2.7.2.3 **Enabled** Field

If the card is present but not required to report data, it can be disabled by clearing the check in the **Enabled** column.

2.7.2.4 **Model** Field

The **Model** field is read-only. It contains the model name (e.g. X501-312) of the card in the slot (1 through 16) associated with the row.

2.7.2.5 **Status** Field

The **Status** field is read-only. It contains the status of the card in the slot (1 through 16) associated with the row:

Status	Enabled	Card in Slot
Normal	checked	yes
Not Configured and Present	not checked	yes

[22] Individual **Interval** settings are ignored.

Status	Enabled	Card in Slot
Configured and missing	checked	no
Not Available	not checked	no

2.7.2.6 **Test** Field

The **Test** field allows input card test to be enabled[23] (field checked) or disabled (field not checked) on an individual card basis.

2.7.2.7 **Interval** Field

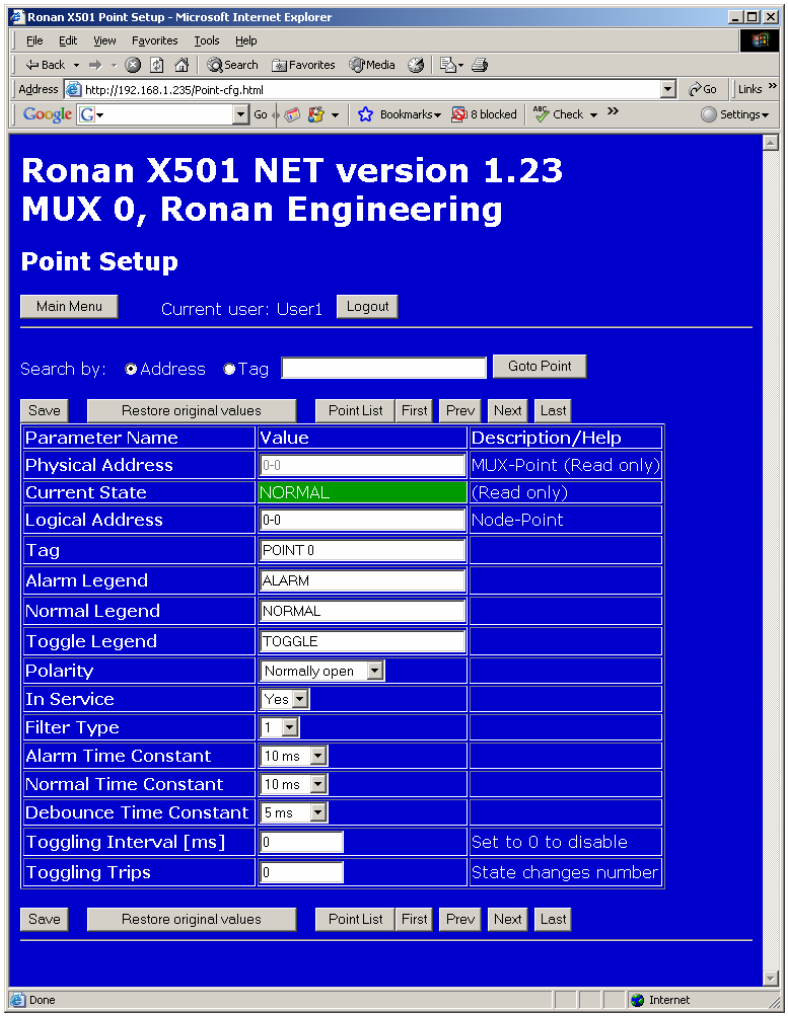
The **Interval** field allows interval between tests card test to be assigned[24] on an individual card basis.

Regardless that it is possible to assign an individual loop test interval for each card, in most cases it is preferred to use single and same for all cards intervals. By setting Global Loop Test interval to a number different than 0 the individual intervals are disregarded

2.8 **Points Configuration** *Page*

The **Points Configuration** page provides a means to view and/or configure the parameters of each input point of the X501NET, as well as a means to navigate through the points.

[23] Not all input cards (e.g. X501-307N) have hardware capabilities for performing this test. If a is enabled and the card can not perform the test, the test will not be run on the card.
[24] Although that it is possible to assign an individual loop test interval for each card, in most cases it is preferred to use single and same for all cards intervals. If the **Global Test Interval** to a value different than 0 the individual **Intervals** are disregarded.



2.8.1 `Points Configuration` Page Buttons

Button	Action
First	Pressing the `First` button cause the page to display the first point.
Last	Pressing the `Last` button cause the page to display the last point.
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.
Next	Pressing the `Next` button cause the page to display the first point.

Button	Action
	Pressing the `Point List` button takes the user to the **`Point Status`** page.
	Pressing the `Prev` button cause the page to display the previous point.
	Pressing the `Refresh` button reloads the page with the current status of all cards.
	Pressing the `Restore original values` button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
	Pressing the `Save` button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.8.2 Point Parameters

All point parameters are displayed on this page.

2.8.2.1 **Physical Address** Field

The **Physical Address** field is read-only on this page. This parameter can be changed on the **`General Configuration`** page or by modifying the configuration file.

2.8.2.2 **Current State** Field

The **Current State** field is read-only and represents the point's status at the time the Point Points Configuration page was displayed[25].

2.8.2.3 **Logical Address** Field

The **Logical Address** field contains the logical address for the point (see sections 2.6.2.3, 2.6.2.4 and 2.6.2.5 for information on how the logical address is composed).

2.8.2.4 **Tag** Field

The **Tag** field contains the name[26] of the point.

[25] Note that the state does **not** stay current and the `Refresh` button needs to be pressed to re-display the page to see what, if any, change has occurred to point status.
[26] User defined name of point.

2.8.2.5 **Alarm Legend** Field

The **Alarm Legend** Field contains the text to be displayed when the point is in the alarm state. This legend is displayed as the **State Legend** on the **Points Status** page and **Current State** on the **Point Setup** page when the point is in the alarm state.

2.8.2.6 **Normal Legend** Field

The **Normal Legend** Field contains the text to be displayed when the point is in the normal state. This legend is displayed as the **State Legend** on the **Points Status** page and **Current State** on the **Point Setup** page when the point is in the normal state.

2.8.2.7 **Toggle Legend** Field

The **Toggle Legend** Field contains the text to be displayed when the point is toggling (see section 2.8.2.14 for a explanation of the criteria for a point to toggling). This legend is displayed as the **State Legend** on the **Points Status** page and **Current State** on the **Point Setup** page when the point is toggling.

2.8.2.8 **Polarity** Field

The **Polarity** field is a pull-down menu. The choices in the menu for this field are Normally open or Normally closed. The value selected represents the state the point is normal[27].

2.8.2.9 **In Service** Field

The **In Service** field is a pull-down menu. The choices in the menu for this field are Yes or No. Yes enables the point, No disables the point.

2.8.2.10 **Filter Type** Field

The **Filter Type** field is a pull-down menu. The choices in the menu for this field are 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10. Each number represents a type of filter. The filter types 1 through 5 are **consecutive** filters. The filter types 6 through 10 are **integrating** filters.

2.8.2.10.1 **Consecutive Filter**

The consecutive type filter employs a counter for the input, which is activated when the monitoring system samples the point contact. The contact is scanned every millisecond (1/1000 of a second). The counter begins to tally when a change in the point contact is first detected. If the specified number of consecutive scans reflect this change, an event is recorded. Should the point sample return to the original state before the specified number of consecutive scans elapses, the count returns to zero. The **Alarm Time Constant** (see section 2.8.2.11) specifies the count required to enter the alarm condition and the **Normal Time Constant** (see section 2.8.2.12) specifies the count required to return to normal.

[27] When the point is in the opposite state it is in alarm.

2.8.2.10.2 **Integrating Filter**

The integrating type filter method is similar to the consecutive filtering approach, except an up/down counter is used to track the status of the point contact. The process begins in the same manner as the consecutive filter. The counter begins to tally when a change in the point's input contact is first detected. During each scan in which the new contact status is maintained, the count is incremented by one. The event is recorded when the specified count is reached. (Each count equals one millisecond.) The difference is that an input sample that shows a return to the original state merely causes one to be subtracted from the count, rather than resetting the counter to zero. If the next scan reflects a change, the counter is again increased. Should the count be reduced to zero after the initial state has been maintained for a specified number of counts, the counter will remain at zero until a new change has been detected. The **Alarm Time Constant** (see section 2.8.2.11) specifies the count required to enter the alarm condition and the **Normal Time Constant** (see section 2.8.2.12) specifies the count required to return to normal.

2.8.2.10.3 **Filter Time Constants**

In addition to determining the type of filter (integrating or consecutive), the selected filter type also determines the group of constants available for:

- alarm time,
- return to normal, and
- de-bounce time.

The following table shows which group of time constants is associated with each filter type for each of the three time parameters of the filter.

Filter Type Selected	Type of Filter	Alarm Time Constant Group	Return to Normal Constant Group	De-Bounce[28] Time Constant Group
1	Integrating	Low	Low	0 or Low
2	Integrating	Low	Medium	0
3	Integrating	Medium	Medium	Low
4	Integrating	Medium	Equal to Alarm	0
5	Integrating	High	Equal to Alarm	0
6	Consecutive	Low	Low	0 or Low
7	Consecutive	Low	Medium	0
8	Consecutive	Medium	Medium	Low
9	Consecutive	Medium	Equal to Alarm	0
10	Consecutive	High	Equal to Alarm	0

[28] For both the integrating or consecutive type of filter, the debounce time allows the user to specify a time period which must elapse before either the consecutive state or integrating filter methods are activated.

If an entry in the table specifies “0” or “Equal to Alarm”, then there is no choice of this filter parameter. The parameter is automatically set to 0 or the same value as selected for the alarm time constant, respectively.

2.8.2.10.3.1 Low Time Constants Group

The low time constant group allows a choice of times between 1 ms and 255 ms in 1 ms steps.

When a time constant is specified in the table above as “0 or Low”, the range of choices allowed is **0** ms to 255 ms in 1 ms steps.

2.8.2.10.3.2 Medium Time Constants Group

The medium time group allows the following choices:

Selected Value	Time in Milliseconds	Approx. Time in Seconds
256 ms	256	256
512 ms	512	512
1K ms	1024	1.024
2K ms	2048	2.048
4K ms	4096	4.096
8K ms	8192	8.192
16K ms	16384	16.384
32K ms	32768	32.768

2.8.2.10.3.3 High Time Constants Group

The high time group allows the following choices:

Selected Value	Time in Milliseconds	Approx. Time in Minutes
64K ms (1.09 min)	65,536	1.09
128K ms (2.18 min)	131,072	2.18
256K ms (4.37 min)	262,144	4.37
512K ms (8.74 min)	524,288	8.74
1M ms (17.48 min)	1,048,576	17.48
2M ms (34.95 min)	2,097,152	34.95
4M ms (69.90 min)	4,194,304	69.90
8M ms (139.81 min)	8,388,608	139.81

2.8.2.11 **Alarm Time Constant** Field

The **Alarm Time Constant** Field is a pull down menu. The possible values of this parameter change depending on the on the filter type selected (see 2.8.2.10).

2.8.2.12 **Normal Time Constant** Field

The **Normal Time Constant** Field is a pull down menu. The possible values of this parameter change depending on the on the filter type selected (see 2.8.2.10).

2.8.2.13 **Debounce Time Constant** Field

The **Debounce Time Constant** Field is a pull down menu. The possible values of this parameter change depending on the on the filter type selected (see 2.8.2.10). The time constant set by this field is used to filter noise and is applied to the data before the data is filtered.

2.8.2.14 **Toggling Interval [ms]** Field

The toggling (also called limit) mode is a mode that introduces another state for a point – toggling. For points that change their state (alarm or normal) too often, either because of sensor malfunction or the nature of the signal itself, like level switches in a tank with waves, it is sometimes preferred to report this state only once instead of overfilling the events history with multiple transitions.

The parameter that controls the toggling mode is the interval during which a number of state transitions have occurred. The interval is entered in milliseconds and could be up 65536 milliseconds (65 seconds). The number of state changes (trips) is limited to 16.

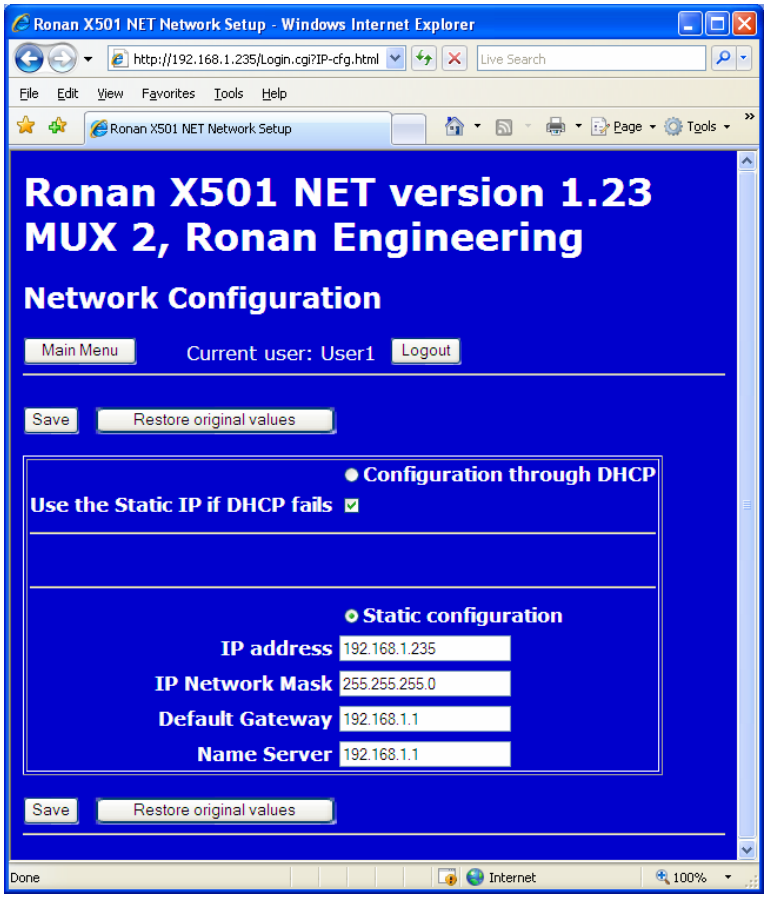
Once the point enters a toggling mode it will be reported only once and the point will stay in this state as long as the condition exists, i.e. the number of state trips for the last *Toggling Interval* milliseconds is equal or greater than the programmed value. If the condition disappears the point will be reported to its real state. Of course, if the point still changes state but with lower frequency all changes will be reported.

2.8.2.15 **Toggling Trips** Field

See section 2.8.2.14.

2.9 `Network` *Page*

The **`Network`** page provides a means to view and configure the parameters of the TCP/IP protocol used by the X501NET.



By default the factory[29] settings are:

- **Static configuration**
- **IP address**: **`192.168.1.234`**
- **IP Network Mask:** **`255.255.255.0`**
- **Default gateway:** **`192.168.1.1`**
- **Name Server**: **`192.168.1.1`**

Note: changes to the IP configuration do **not** take effect until the X501NET is rebooted.

2.9.1 `Network` page Buttons

Button	Action
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.

[29] Before January 14, 2008, the factory settings were DHCP and on fail to use the static address. The X501NETs with these setting are at risk of losing communication with the Ronan Master Station (e.g. AlarmX) if:

- that setting is not changed,
- a DHCP server is added to the local area network with the X501NET, and
- the X501NET is restarted (e.g. power fail).

Button	Action
Main Menu	Pressing the Main Menu button takes the user to the **Main Menu** page.
Restore original values	Pressing the Restore original values button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the Save button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2). However, changes made do **not** take effect until the X501NET is rebooted.

2.9.2 DHCP

Although the X501NET supports the use of a DHCP server[30], all of the current Ronan SERs expect to find the X501NET via a static IP address. **Never check the box Configure through DHCP** unless you are **sure** that all portions of the SER system that must communicate with the X501NET are compatible with this feature.

2.9.3 Static Address

The X501NET is typically connected to a network that only has devices associated with the SER system. In this case a DHCP server is typically not present on the network. It the X501NET is attached to a network that had non-Ronan devices attached, you **MUST** coordinate with the network administrator to assure that the static addresses assigned to the X501NET are also controlled by the network's DHCP server.

2.9.3.1 **IP Address** Field

When an X501NET is manufactured it is programmed with the default TCP/IP address of **192.168.1.234**. Before it is shipped to the customer it is configured to the specific TCP/IP address required for the customer installation. Typically, **MUX1** has TCP/IP address **192.168.1.234**, **MUX2** has TCP/IP address **192.168.1.235**, and so on.

2.9.3.2 **IP Network Mask** Field

If the X501NET is connected to a network that only has devices associated with the SER system, the **IP Network Mask** is typically **255.255.255.0**. If the X501NET is attached to a

[30] The X501NET can be configured to obtain its IP address and the other TCP/IP parameters dynamically through the DHCP protocol or to use static values. Since revision 1.8 it is possible to select DHCP configuration and, if the DHCP fails or times out, to set X501NET to the static settings. This is very convenient when configuring the device at the office where DHCP is normally present and without reconfiguring it back to be used later at an installation where fixed IP addresses are used.

network that has non-Ronan devices attached, the **IP Network Mask** must be the same as the mask used on the other network devices.

2.9.3.3 **Default Gateway** Field

If the X501NET is connected to a network that only has devices associated with the SER system, the **Default Gateway** is typically **192.168.1.1**. It the X501NET is attached to a network that has non-Ronan devices attached, the **Default Gateway** should be the same as the network gateway used by the other network devices.

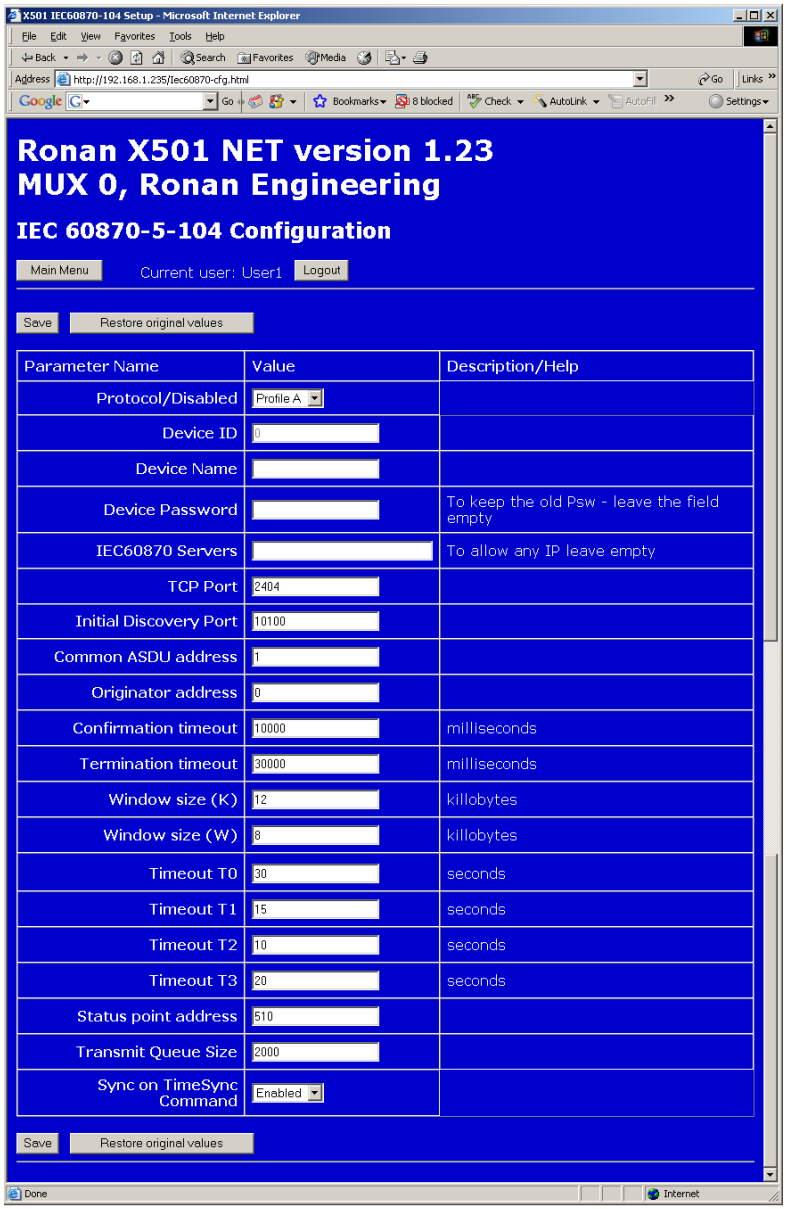
2.9.3.4 **Name Server** Field

If the X501NET is connected to a network that only has devices associated with the SER system, the **Name Server** is typically **192.168.1.1**. It the X501NET is attached to a network that has non-Ronan devices attached, the **Name Server** should be the same as the name server used by the other network devices.

2.10 **IEC 60870-5-104** *Page*

The **IEC 60870-5-104** page allows the user to view and modify the parameters of the IEC 60870-104-5 Protocol[31].

[31] This Protocol is used for communication between the X501NET and master stations such as the IEC60870 Producer that is part of the AlarmX software product.



Note: changes to the IEC60870 configuration do **not** take effect until the X501NET is rebooted.

2.10.1 IEC 60870-5-104 page Buttons

Button	Action
Logout	Pressing the Logout button logs out the current user. After pressing the Logout button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the Main Menu button takes the user to the **Main Menu** page.
Restore original values	Pressing the Restore original values button restores

Button	Action
	the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the Save button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2). However, changes made do **not** take effect until the X501NET is rebooted.

2.10.2 Parameters

These parameters are typically set by Ronan. **DO NOT CHANGE ANY OF THESE PARAMETERS UNLESS YOU COMPLETELY UNDERSTAND IEC 60870 AND HOW CHANGES CAN AFFECT THE ENTIRE SER SYSTEM.**

Changes to these parameters do not take effect until the X501NET is rebooted.

The configuration parameters are:

2.10.2.1 **Protocol/Disabled** Field

The **Protocol/Disabled** field is a pull-down menu. It should not be changed from its default value of Profile A.

2.10.2.2 **Device ID** Field

The **Device ID** field is a read-only field on this page[32]. This is an integer number by which the X501NET MULTIPLEXER is identified within the system.

2.10.2.3 **Device Name** Field

The **Device Name** field contains the name of the X501NET that is used for display purposes.

2.10.2.4 **Device Password** Field

The **Device Password** field contains the password used by the X501NET to login to the IEC60870 master station[33].

2.10.2.5 **IEC60870 Servers** Field

The **IEC60870 Servers** field can be used to limit the IEC60870 communications between the X501NET and IEC60870 master station to an IEC60870 master station fixed IP address (or set of IEC60870 master stations at fixed IP addresses).

[32] This field can be changed on the **General Configuration** page.
[33] Also known as the IEC 60870 Producer.

2.10.2.6 **TCP Port** Field

The **TCP Port** field contains the TCP port number used by the X501NET to listen for incoming connections from the IEC60870 master station.

2.10.2.7 **Initial Discovery Port** Field

The **Initial Discovery Port** field contains the UDP port number on which the X501NET broadcasts the Initial Discovery Datagram[34] when no connection exists between it and an IEC60870 master station. This datagram is broadcast repeatedly until a connection is established. The datagram contains enough information for an eventual IEC60870 master station to connect to the X501NET via the IEC60870 protocol.

2.10.2.8 **Common ASDU Address** Field

The value of this parameter is used for the ASDU Address field of the IEC 60870-5-104 protocol frames sent from the X501NET to the IEC60870 master station.

2.10.2.9 **Originator Address** Field

The value of this parameter is used for the Originator Address field of the IEC 60870-5-104 protocol frames sent from the X501NET to the IEC60870 master station.

2.10.2.10 **Confirmation Timeout** Field

This parameter is the maximum delay in milliseconds for the X501NET to send an activation confirmation (ACTCON) following an activation request (ACT).

2.10.2.11 **Termination Timeout** Field

This parameter is the maximum delay in milliseconds for the X501NET to send an activation termination (ACTTERM) following an activation request (ACT).

2.10.2.12 **Window Size (K)** Field

Size in KB of the TCP transmit window.

2.10.2.13 **Window Size (W)** Field

Max number of TCP frames which can be received without the transmission of an ACK frame.

[34] This datagram has to be broadcasted because the X501NET doesn't know in advance the IP address of its IEC60870 master station.

2.10.2.14 **Timeout T0** Field

The **Timeout T0** field is the controls the T0 delay as defined in the IEC 60870-5-104 standard. The T0 delay is the timeout interval in seconds for connection establishment.

2.10.2.15 **Timeout T1** Field

The **Timeout T1** field is the controls the T1 delay as defined in the IEC 60870-5-104 standard. The T1 delay is the timeout interval in seconds for function confirmations.

2.10.2.16 **Timeout T2** Field

The **Timeout T2** field is the controls the T2 delay as defined in the IEC 60870-5-104 standard. The T2 delay is the timeout interval in seconds for ACK receptions.

2.10.2.17 **Timeout T3** Field

The **Timeout T3** field is the controls the T3 delay as defined in the IEC 60870-5-104 standard. The T3 delay is the maximum inactivity timeout interval in seconds.

2.10.2.18 **Status Point Address** Field

The **Status Point Address** field displays the virtual point address of the X501NET's status word and allows this point address to be changed by administrators.

2.10.2.19 **Transmit Queue Size** Field

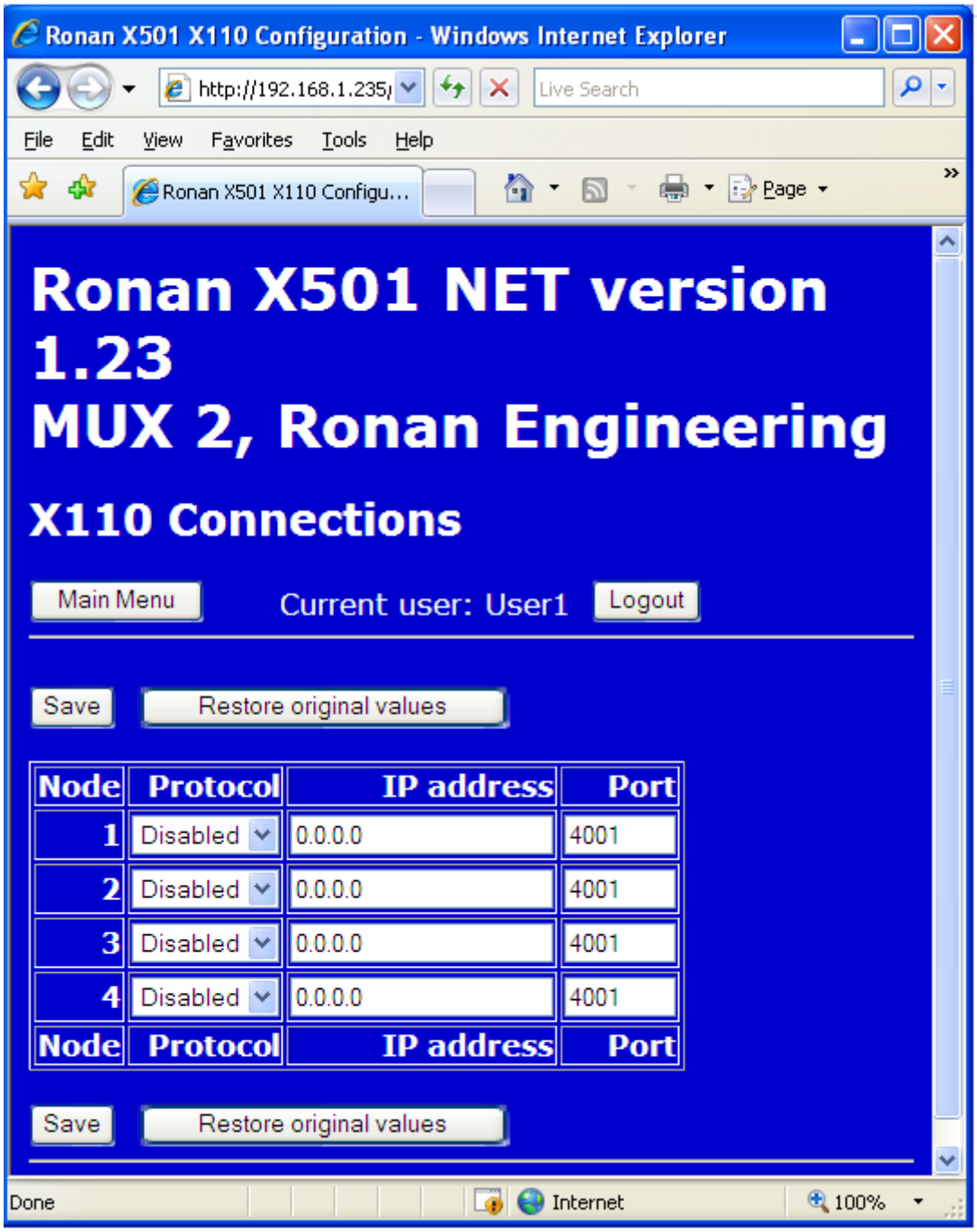
This parameter specifies the size of the event buffer.

2.10.2.20 **Sync on TimeSync Command** Field

This parameter specifies whether to accept the time sync command from and IEC60870 server, since this synchronization is not precise.

2.11 `X110` `Connection` `Configuration` *Page*

The **`X110` `Connection` `Configuration`** page is used to setup the Ethernet communication with up to four X110 Annunciators via TCP or an unlimited number of X110 Annunciators attached to the same LAN of a UDP broadcast connection.



2.11.1 `X110` `Connection` `Configuration` Page Buttons

Button	Action
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.

Button	Action
Main Menu	Pressing the Main Menu button takes the user to the **Main Menu** page.
Restore original values	Pressing the Restore original values button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the Save button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.11.2 Connections

Up to 4 nodes can be configured.

2.11.2.1 **Node** Field

The **Node** field is read-only. It identifies the the row of fields.

2.11.2.2 **Protocol** Field

Select the **Protocol** to use for a node:

- Select Disabled if this node is not in use.
- Select TCP to be able to communicate over both LANs and WANs.
- Select UDP if the communication is only over the same LAN as the X501NET and if broadcast communication if desired (a broadcast address to be used that to communicate with an unlimited number of X110s attached to the same LAN).

2.11.2.3 **IP Address** Field

The **IP Address** field is to the:

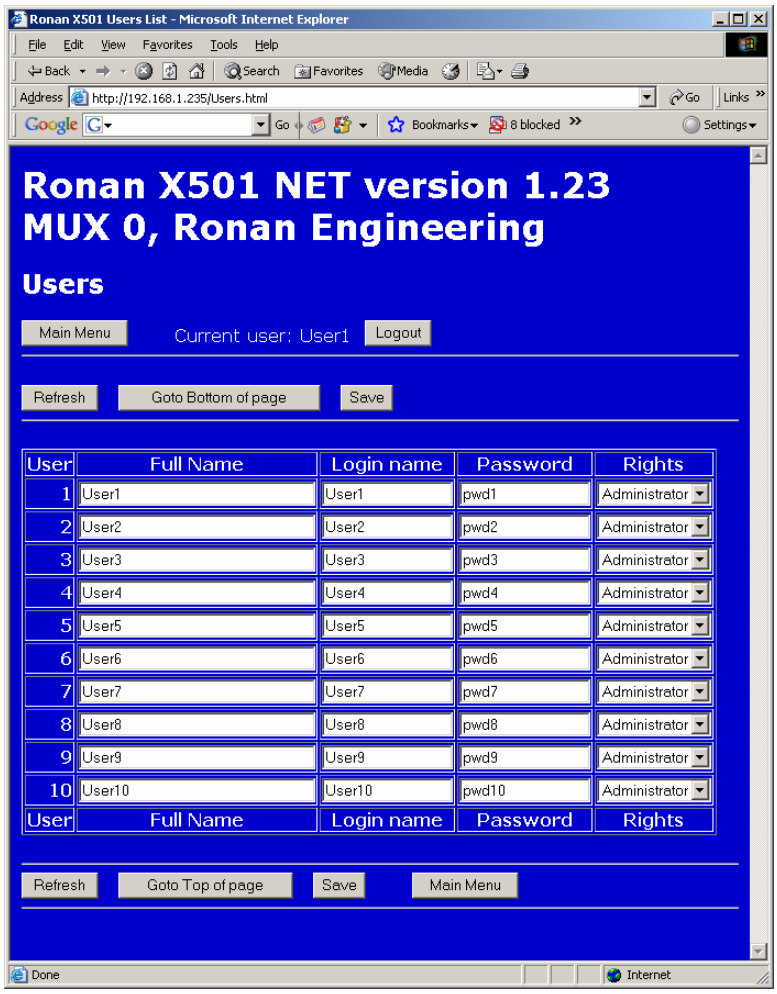
- IP Address of the X110 when TCP is selected as the **Protocol**
- The broadcast address **255.255.255.255** when UDP is selected.

2.11.2.4 **Port** Field

The default value for the **Port** field is 4001. **Do not change this value**.

2.12* Users *Page

The **Users** page allows administrators to allow up to 10 users to access the X501NET configuration pages and to assign appropriate access rights to each user.



2.12.1 `Users` Page Buttons

Button	Action
Goto Bottom of page	Pressing the `Goto Bottom of page` button takes the user to the bottom of the current page.
Goto top of page	Pressing the `Goto top of page` button takes the user to the top of the current page.
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.
Refresh	Pressing the `Refresh` button reloads the page with the current status of all users.

Button	Action
Restore original values	Pressing the `Restore original values` button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the `Save` button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.12.2 User Names and Passwords

For each user a **Full Name** must be entered, as well a **Login name** and **Password**.

Warning: If a **Full name** is not entered the account is automatically disabled.

2.12.3 User Rights

There are currently defined 3 groups: Administrator, Operator and Guest.

2.12.3.1 Administrator

A user that has Administrator rights has full access to all menus and the ability to change all parameters. Administrators can also see and modify the other users' settings. It is recommended to keep the number of users with administrator rights as low as possible, preferably one.

2.12.3.2 Operator

A user that has Operator access rights has permission to:

- view all menu pages except the **`User`** and the **`Configuration File`** pages and
- make changes to the **`User Notes`** page.

A user that has Operator access rights can not make any changes to parameters.

2.12.3.3 Guest

A user that has Guest access rights only has permission to:

- view the **`Point Status`** page and
- view the **`Event History`** page.

A user that has Guest access rights can not modify any settings in the X501NET multiplexer.

2.13 `User Notes` *Page*

The **`User Notes`** page allows a user to enter plain text notes (up to a limit of 999 characters) and to modify or delete the previous notes. The notes are kept in the X501NET non-volatile memory.

2.13.1 `User Notes` Page Buttons

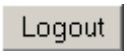
Button	Action
Logout	Pressing the `Logout` button logs out the current user. After pressing the `Logout` button it is necessary for a user to login before any other menu pages can be accessed.
Main Menu	Pressing the `Main Menu` button takes the user to the **`Main Menu`** page.
Restore original values	Pressing the `Restore original values` button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
Save	Pressing the `Save` button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.14 `Configuration File` *Page*

The **`Configuration File`** page can only be accessed by administrators. It displays the entire content of the X501NET's configuration file[35] and allows an administrator to change any parameter.

[35] The Configuration Agent in the master station (typically AlarmX or some other version of X1000 software) usually loads this file into the X501NET through a subset of FTP. However, this page provides an alternative way to view/modify the entire file. Please note that if the file is modified using this page, the file in the master station and the file in the X501NET may be different.

2.14.1 `Configuration File` Page Buttons

Button	Action
	Pressing the Logout button logs out the current user. After pressing the Logout button it is necessary for a user to login before any other menu pages can be accessed.
	Pressing the Main Menu button takes the user to the **`Main Menu`** page.
	Pressing the Reset Device button cause the X501NET to do a hardware reset (if the user has sufficient access rights – see section 2.12.3) or takes the user to the appropriate results page (see section 2.1.2) if the user does not have sufficient access rights.
	Pressing the Restore original values button restores the last saved values for all parameters on the page. Note: it does **NOT** restore the values to original factory settings.
	Pressing the Save button causes the changes made by the user on the page to be saved (if the user has sufficient access rights – see section 2.12.3) and then takes the user to the appropriate results page (see section 2.1.2).

2.14.2 Configuration File Content

Anytime the X501NET configuration file (see appendix A for and example) is be modified through the web interface, the X501NET will update its configuration parameters accordingly and will generate appropriate events. These events will then be sent to the Event Server. Depending on the parameter type, the new values may take effect immediately or may require the X501NET to be rebooted before they take effect.

CHAPTER 3 – INITIAL CONFIGURATION

3.1 First Login

When an X501NET is manufactured, it is programmed with the default TCP/IP address of **192.168.1.234**[36]. Before it is shipped to the customer it is configured to the specific TCP/IP address required for the customer installation. Typically, **MUX1** has TCP/IP address **192.168.1.234**, **MUX2** has TCP/IP address **192.168.1.235**, and so on.

Put the address[37] of the X501NET that you wish to configure into the address bar of the browser and press the **Enter** key. Next, click the Login button on the X501NET **Main Menu** page. This will take you to the **Login** page. Enter your user name and password[38] on the **Login** page and click the Login button on this page. If the user name and password are correct, you will be taken back to the **Main Menu** page and be logged in.

3.2 Network Configuration

Setting the network address should be the first step in configuring an X501NET. Click on the **Network** link on the **Main Menu** page to get to the network configuration menu. Check the box marked **Static Configuration**[39]. Fill in the desired network address information (**IP address**, etc.) and click SAVE.

Restart the X501NET[40]. Put the address that you just configured into the address bar of the browser and press the **Enter** key. You should see the X501NET **Main Menu** page again and be able to login.

3.3 User Configuration

The next step is to configure the users of the X501NET. This is very important for security if the network where the X501NET is not physically secure or where the SER used any public network as part of its network connection.

Most users do not require Administrator access rights. You should give these rights to as few people as possible. Keep a copy of a user name/password combination in a safe location. **If the administrator**

[36] This is the same address that is usually used for **MUX1**. To add a new X501NET to an existing SER, it is necessary to configure the TCP/IP address **before** attaching the X501NET to the LAN that is part of the SER. This can be accomplish by having a user workstation or laptop computer attached to a hub that is not part of the SER LAN and connection the X501NET to this mini-LAN for configuration before attaching it to the LAN that is part of the SER.

[37] See section 4.1 if needed for more information about logging in.
[38] The default user name is **User1** and the default password is **pwd1**.
[39] Do not select **Configure through DHCP** and **Use the Static IP if the DHCP fails** even it there is no DHCP server on the LAN with the X501NET. Configuring an X501NET in this way can cause the SER to **fail** if a DHCP server is ever added to the LAN.
[40] The change to the TCP/IP address does not take effect until the X501NET is restarted.

password(s) is lost, the X501NET controller boards must be returned to Ronan to be re-programmed to factory defaults.

3.4 General Configuration

The data on the **General Configuration** page is totally system dependent. Refer to your system documentation to configure to values on this page.

3.5 Card and Point Configuration

The card and point configuration is typically downloaded to the X501NET by the master station.

3.6 IEC 60870 Configuration

Most systems do not require and IEC 60870 configuration. The only exceptions are systems that use a public network as part of their network configuration. These systems should configure the **IEC 60870 Servers** field on the **IEC 60870-5-104 Configuration** page to **only** accept connection from the master stations that are part of your SER.

3.7 X110 Configuration

If the SER system includes X110 Window Annunciators, please refer the SER system documentation for the specific configuration information.

CHAPTER 4 – PROCEDURES

Since X501NET configuration is not an everyday procedure, the following descriptions are included as a quick reference for some of the more common tasks that may be required.

4.1 Logging In

To login to the X501NET configuration program you need a computer with web browser[41] attached to the same LAN as the X501NET. Put the address[42] of the X501NET that you wish to configure into the address bar of the browser and hit the **Enter** key.

Next, click the `Login` button on the X501NET **`Main Menu`** page. This will take you the **`Login`** page. Enter your user name and password[43] on the **`Login`** page and click the `Login` button on this page. If the user name and password are correct, you will be taken back to the **`Main Menu`** page and be logged in and able to access all menu functions permitted by your user rights.

4.2 Viewing Point State

Login (see section 4.1). Click on **Points Status** link on the **`Main Menu`** page.

4.3 Viewing Event History

Login (see section 4.1). Click on **Event History** link on the **`Main Menu`** page.

4.4 Disabling/Enabling a Point

Login (see section 4.1) as an administrator. Click on **Points Status** link on the **`Main Menu`** page. Use the scroll buttons on the **`Points Status`** page to navigate to the desired point. Click the button with the number of the point to be enabled/disabled. This will take you to the **`Point Setup`** page for this point. Change the **In Service** field to enabled or disabled the point. `Yes` enables the point, `No` disables the point.

4.5 Adjusting Point Parameters

Login (see section 4.1) as an administrator. Click on **Points Status** link on the **`Main Menu`** page. Use the scroll buttons on the **`Points Status`** page to navigate to the desired point. Click the button with the number of the point to be enabled/disabled. This will take you to the **`Point Setup`** page for this point. Change the parameters as required.

[41] Almost any web browser will work providing JavaScript and cookies is enabled. Having the web browser security setting at their default settings will virtually always assure that JavaScript is enabled. To all cookies, the browser's privacy settings may need to be set to low.
[42] See section 4.1 if needed for more information about logging in.
[43] The default user name is **User1** and the default password is **pwd1**.

4.6 Adding/Removing Multiplexer Cards

Login (see section 4.1) as an administrator. Click on **Input Cards** link on the **Main Menu** page. This takes you to the **Input Cards** page. Click the check box on the line for the correct input card in the **Enabled** column to toggle between enabling and disabling the card.

4.7 Adding/Removing Users

Login (see section 4.1) as an administrator. Click on **Users** link on the **Main Menu** page. This takes you to the **Users** page. Make any changes required and click the Save button.

Note that it is essential that there always be at least one user that has administrator rights on the list of users. If you remove the all administrators or lose the user name/password combination for the administrator(s) you will not be able to correct the problem and the X501NET controller boards will need be returned to Ronan to be re-programmed to factory defaults.

CHAPTER 5 – TROUBLESHOOTING CONFIGURATION PROBLEMS

The X501NET is a simple device to configure. Most configuration problems are caused by errors in network configuration.

5.1 Conflicts With DHCP Server

If there is a DHCP server attached to the same LAN as X501NETs, it is necessary to configure the DHCP server to exclude the TCP/IP addressed used by the X501NETs for the addresses that it managed. **FAILURE TO DO THIS CAN RESULT IN DUPLICATE ADDRESS ASSIGNMENT AND CAUSE THE SER TO STOP WORKING CORRECTLY!**

5.2 Network Address Conflicts

The X501NET is comes factory configured with address **`192.168.1.234`**. This is the same address that is usually used for **MUX1**. To add a new X501NET to an existing SER, it is necessary to configure the TCP/IP address **before** attaching the X501NET to the LAN that is part of the SER. This can be accomplish by having a user workstation or laptop computer attached to a hub that is not part of the SER LAN and connect the X501NET to this mini-LAN for configuration before attaching it to the LAN that is part of the SER.

5.3 Network Traffic Issues

Normally the X501NETs are on a LAN dedicated to the SER. Network traffic is virtually never an issue in this case. Sometimes it is necessary to share this LAN with other network devices. If there is a great deal of traffic from these devices (video, large file transfers, etc.) it can impact the performance of the SER system. If this is the case, the LAN should be split into multiple LANs with filtering bridges or routers between the LANs and the devices that are the source and destination of high traffic transfers put onto a different LAN.

5.4 Lost Password

DO NOT LOSE THE ADMINISTRATOR PASSWORD! If the administrator password(s) is lost, the X501NET controller boards must be returned to Ronan to be re-programmed to factory defaults.

APPENDIX A – SAMPLE CONFIGURATION FILE

```
[DEVICE]
Version 1
MuxTag Ronan Engineering
MuxNumber 2
MuxNode 2
SamePhysLogAddr 1
AllPointsSameLogAddr 1
PointDisplayOffset 0
IpAddress 192.168.1.235
IpNetMask 255.255.255.0
DefaultGateway 192.168.1.1
NameServer 192.168.1.1
UseStaticIpFallback 1
HttpPort 80
FtpPort 21
NtpPort 123
IrigInput 1
IrigType 0
PreferedTimeSource 0
CardTestInterval 60
Timezone 0
NtpServer 192.168.1.98;192.43.244.18;207.46.130.100;216.204.156.2
NtpInterval 15
NtpSwitchTimeout 60
RtuBroadcastPort 8738
[X110]
1 0,0.0.0.0,4001
2 0,0.0.0.0,4001
3 0,0.0.0.0,4001
4 0,0.0.0.0,4001
[IEC_60870]
Protocol 1
DeviceId 0
IecServers
TcpPort 2404
BroadcastPort 10100
CommonAsduAddress 1
OriginatorAddress 0
ConfTimeout 10000
TermTimeout 30000
WindowsSizeK 12
WindowsSizeW 8
Timeout0 30
```

```
Timeout1 15
Timeout2 10
Timeout3 20
StatusWordAddr 510
ConfigCrcAddress 1001
ObjQueueSize 2000
AllowSync 1
[USERS]
User1,pwd1,User1,0
User2,pwd2,User2,1
User3,pwd3,User3,2
User4,pwd4,User4,0
User5,pwd5,User5,0
User6,pwd6,User6,0
User7,pwd7,User7,0
User8,pwd8,User8,0
User9,pwd9,User9,0
User10,pwd10,User10,0
[CARDS]
1 1,1,60
2 1,1,60
3 1,1,60
4 1,1,60
5 1,1,60
6 1,1,60
7 1,1,60
8 1,1,60
9 1,1,60
10 1,1,60
11 1,1,60
12 1,1,60
13 1,1,60
14 1,1,60
15 1,1,60
16 1,1,60
[POINTS]
0 2,0,0,0,10,10,5,1,POINT 0,ALARM,NORMAL,TOGGLE,0,0
1 2,1,0,0,10,10,5,1,POINT 1,ALARM,NORMAL,TOGGLE,0,0
2 2,2,0,0,10,10,5,1,POINT 2,ALARM,NORMAL,TOGGLE,0,0
3 2,3,0,0,10,10,5,1,POINT 3,ALARM,NORMAL,TOGGLE,0,0
4 2,4,0,0,10,10,5,1,POINT 4,ALARM,NORMAL,TOGGLE,0,0
5 2,5,0,0,10,10,5,1,POINT 5,ALARM,NORMAL,TOGGLE,0,0
6 2,6,0,0,10,10,5,1,POINT 6,ALARM,NORMAL,TOGGLE,0,0
7 2,7,0,0,10,10,5,1,POINT 7,ALARM,NORMAL,TOGGLE,0,0
8 2,8,0,0,10,10,5,1,POINT 8,ALARM,NORMAL,TOGGLE,0,0
9 2,9,0,0,10,10,5,1,POINT 9,ALARM,NORMAL,TOGGLE,0,0
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10 2,10,0,0,10,10,5,1,POINT 10,ALARM,NORMAL,TOGGLE,0,0
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12 2,12,0,0,10,10,5,1,POINT 12,ALARM,NORMAL,TOGGLE,0,0
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15 2,15,0,0,10,10,5,1,POINT 15,ALARM,NORMAL,TOGGLE,0,0
16 2,16,0,0,10,10,5,1,POINT 16,ALARM,NORMAL,TOGGLE,0,0
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18 2,18,0,0,10,10,5,1,POINT 18,ALARM,NORMAL,TOGGLE,0,0
19 2,19,0,0,10,10,5,1,POINT 19,ALARM,NORMAL,TOGGLE,0,0
20 2,20,0,0,10,10,5,1,POINT 20,ALARM,NORMAL,TOGGLE,0,0
21 2,21,0,0,10,10,5,1,POINT 21,ALARM,NORMAL,TOGGLE,0,0
22 2,22,0,0,10,10,5,1,POINT 22,ALARM,NORMAL,TOGGLE,0,0
23 2,23,0,0,10,10,5,1,POINT 23,ALARM,NORMAL,TOGGLE,0,0
24 2,24,0,0,10,10,5,1,POINT 24,ALARM,NORMAL,TOGGLE,0,0
25 2,25,0,0,10,10,5,1,POINT 25,ALARM,NORMAL,TOGGLE,0,0
26 2,26,0,0,10,10,5,1,POINT 26,ALARM,NORMAL,TOGGLE,0,0
27 2,27,0,0,10,10,5,1,POINT 27,ALARM,NORMAL,TOGGLE,0,0
28 2,28,0,0,10,10,5,1,POINT 28,ALARM,NORMAL,TOGGLE,0,0
29 2,29,0,0,10,10,5,1,POINT 29,ALARM,NORMAL,TOGGLE,0,0
30 2,30,0,0,10,10,5,1,POINT 30,ALARM,NORMAL,TOGGLE,0,0
31 2,31,0,0,10,10,5,1,POINT 31,ALARM,NORMAL,TOGGLE,0,0
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34 2,34,0,0,10,10,5,1,POINT 34,ALARM,NORMAL,TOGGLE,0,0
35 2,35,0,0,10,10,5,1,POINT 35,ALARM,NORMAL,TOGGLE,0,0
36 2,36,0,0,10,10,5,1,POINT 36,ALARM,NORMAL,TOGGLE,0,0
37 2,37,0,0,10,10,5,1,POINT 37,ALARM,NORMAL,TOGGLE,0,0
38 2,38,0,0,10,10,5,1,POINT 38,ALARM,NORMAL,TOGGLE,0,0
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75 2,75,0,0,10,10,5,1,POINT 75,ALARM,NORMAL,TOGGLE,0,0
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83 2,83,0,0,10,10,5,1,POINT 83,ALARM,NORMAL,TOGGLE,0,0
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86 2,86,0,0,10,10,5,1,POINT 86,ALARM,NORMAL,TOGGLE,0,0
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90 2,90,0,0,10,10,5,1,POINT 90,ALARM,NORMAL,TOGGLE,0,0
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92 2,92,0,0,10,10,5,1,POINT 92,ALARM,NORMAL,TOGGLE,0,0
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94 2,94,0,0,10,10,5,1,POINT 94,ALARM,NORMAL,TOGGLE,0,0
95 2,95,0,0,10,10,5,1,POINT 95,ALARM,NORMAL,TOGGLE,0,0
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97 2,97,0,0,10,10,5,1,POINT 97,ALARM,NORMAL,TOGGLE,0,0
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100 2,100,0,0,10,10,5,1,POINT 100,ALARM,NORMAL,TOGGLE,0,0
101 2,101,0,0,10,10,5,1,POINT 101,ALARM,NORMAL,TOGGLE,0,0
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103 2,103,0,0,10,10,5,1,POINT 103,ALARM,NORMAL,TOGGLE,0,0
104 2,104,0,0,10,10,5,1,POINT 104,ALARM,NORMAL,TOGGLE,0,0
105 2,105,0,0,10,10,5,1,POINT 105,ALARM,NORMAL,TOGGLE,0,0
106 2,106,0,0,10,10,5,1,POINT 106,ALARM,NORMAL,TOGGLE,0,0
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108 2,108,0,0,10,10,5,1,POINT 108,ALARM,NORMAL,TOGGLE,0,0
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110 2,110,0,0,10,10,5,1,POINT 110,ALARM,NORMAL,TOGGLE,0,0
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114 2,114,0,0,10,10,5,1,POINT 114,ALARM,NORMAL,TOGGLE,0,0
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122 2,122,0,0,10,10,5,1,POINT 122,ALARM,NORMAL,TOGGLE,0,0
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124 2,124,0,0,10,10,5,1,POINT 124,ALARM,NORMAL,TOGGLE,0,0
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126 2,126,0,0,10,10,5,1,POINT 126,ALARM,NORMAL,TOGGLE,0,0
127 2,127,0,0,10,10,5,1,POINT 127,ALARM,NORMAL,TOGGLE,0,0