Nanometrics UI
Version 5.13

User Guide

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Chapter 1 Getting Started

The Nanometrics User Interface (Nanometrics UI) provides utilities for you to configure and monitor the operation of hub and remote stations in Nanometrics Libra satellite and Callisto terrestrial systems. A technician can update the system software, modify the system configuration, and monitor the system operation (for example, after hardware replacements or software updates). A general user can view real-time state-of-health information for the system. The UI communicates with network instruments via TCP connections.

This manual contains an overview of Nanometrics UI functions, installation, and start-up, and procedures for monitoring and configuring Nanometrics network instrument operation. See also the Release notes for any additional information about the current version of the instrument software and the UI, and the hardware manuals for the instruments in your system.

1.1 Overview of the Nanometrics UI

The Nanometrics UI is used with several types of network instruments. It provides options to monitor operation, change configuration settings, and upload new software.

1.1.1 Network instruments

The Nanometrics UI is used with these comms devices, and associated instruments (integrated TimeServer, Trident 24-bit digitiser with NMXbus):

- Carina (satellite hub transceiver).
- Cygnus (satellite remote transceiver with two external serial ports and NMXbus).
- Lynx/Lynx-Plus (satellite remote transceiver with integrated HRD digitiser, option for one external serial port).
- Europa with IP option (integrated HRD digitiser, Ethernet port, one external serial port).
- Europa with authentication (integrated HRD digitiser, Ethernet port, one external serial port, and PCMCIA authentication card reader with card).
- Europa T (Europa with integrated Trident instead of HRD, Ethernet port, one or two external serial ports, authentication option, central timing option).
- Janus (Ethernet port, one or two external serial ports, NMXbus, central timing option, external GPS option).

The UI communicates with one comms device at a time (for example, Libra system Cygnus remote, Libra Carina hub, Callisto system Janus communications controller.) The integrated TimeServer and any Trident digitisers associated with a comms device will also have Nanometrics UI options under their own instruments tabs in the UI. Table 1-1 on page 3 shows a list of the instrument tab icons.

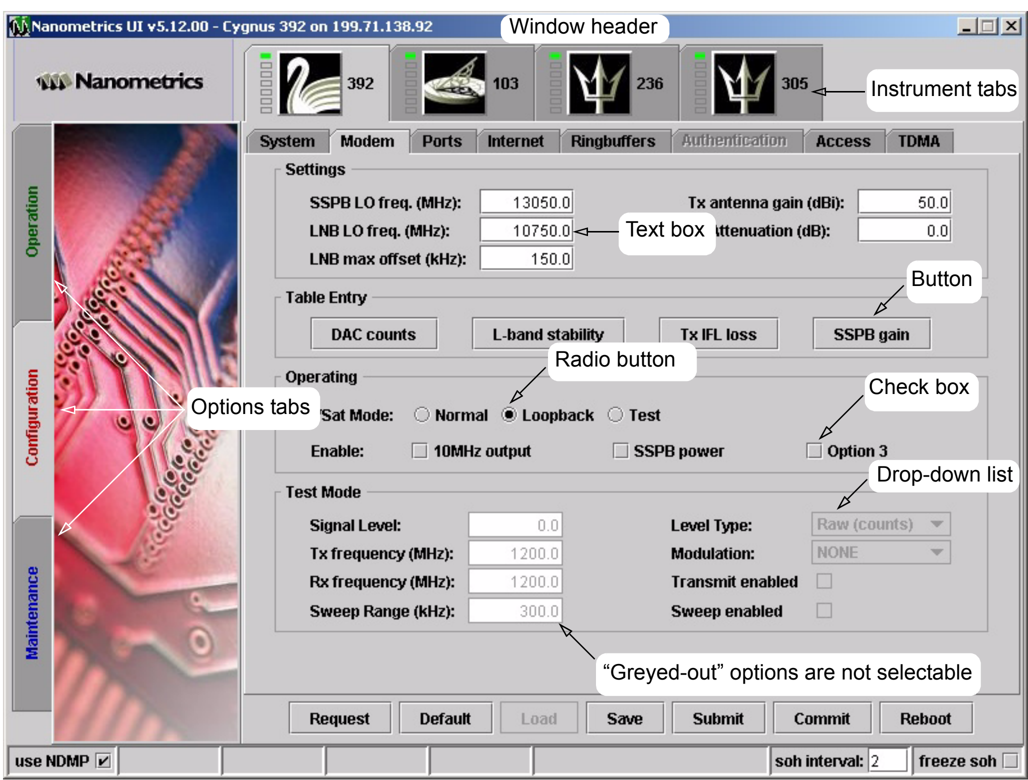
1.1.2 User interface elements

The instrument type, serial number, and IP address of the comms device is displayed in the window header (Figure 1-1). User interface elements, including command widgets such as buttons and checkboxes, and tabs containing groups of options, have typical graphical UI application functions (Section 1.1.2.1).

Sets of functions and individual options that are not applicable to a particular instrument or that are not permitted for the current level of user access are not selectable. This is indicated by the option being “greyed-out”. (For example, in Figure 1-1, the Test Mode options are not currently valid as the instrument is in Normal mode, and Authentication is a set of options that is not available for the Cygnus.) A user interface element will not be selectable if any of these conditions is true:

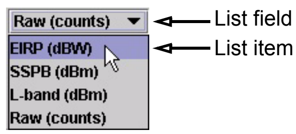
- The level of user access does not allow the option to be selected or edited.
- The element is read-only at any level of user access.
- The option is not a supported feature on this particular instrument or in the current instrument mode.

Figure 1-1 Examples of user interface elements



1.1.2.1 Command widgets

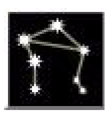
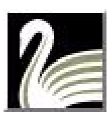
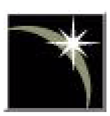
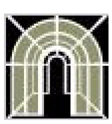
- Text boxes – If the text box is not read-only, click in the text box, and type in or edit the text.
- Buttons – Click the button to launch the associated function.
- Radio buttons – Click the radio button to choose the one option to be selected, changing the remaining options to be deselected.
- Check boxes – Click the check box to toggle the option to be selected or deselected.
- Drop-down lists – Click in the list field to open the list, and then click a list item to select the item:



1.1.2.2 Instrument tabs and options tabs

The network instrument tab displays an icon representing the selected instrument, and the instrument serial number. Table 1-1 lists the instrument icons.

Table 1-1 Network instrument icons

Icon	Network instrument
	Libra network comms devices: • Carina hub transceiver • Lynx digitiser
	• Cygnus remote transceiver
	Callisto network comms devices: • Europa or Europa T digitiser
	• Janus communications controller
	TimeServer • Integrated in Cygnus, Janus, and Europa T
	Trident digitiser • External instrument (it is integrated in the Europa T)

Options to view and configure network instrument settings and to upload new software are grouped under three main options panels:

- Operation
- Configuration

- Maintenance
- Click on the appropriate options tab (Operation, Configuration, or Maintenance) to view and edit instrument information. The settings accessible through these tabbed panels are for the instrument selected with the instrument tab.

Note Options that are not supported by the firmware will not appear in the UI.

1.1.2.2.1 Operation tab

A user with any level of access can view current status information for an instrument using options in the tabbed panels within the Operation tab (for example, view instrument state-of-health data, time quality, and the instrument log). The instrument status information is updated automatically. The type of information available depends on the instrument. See also Chapter 2, “Instrument Operation Monitoring”.

If the instrument is a Libra system Carina hub, there is a Shutdown Tx option to stop transmission of the network over the satellite link. (See Section 2.3 on page 22.)

1.1.2.2.2 Configuration tab

A user with tech access can view and change instrument configuration information using options in the tabbed panels within the Configuration tab. A user with user access can view the configuration settings. The settings that can be changed depend on the instrument. See also Chapter 3, “Instrument Configuration”.

1.1.2.2.3 Maintenance tab

Instrument software file and partition information is accessible under the Maintenance tab. A user with tech access can update instrument files. A user with user access can view the file and partition information. See also Chapter 4, “Maintenance”.

1.2 Installing the Nanometrics UI

The Nanometrics UI is contained in a Java archive (`.jar`) file, and it requires the Java 2 Run-time Environment (J2RE) version 1.4.2_0*x* or later. The Nanometrics UI is included on the Nanometrics software installation CD.

1.2.1 Install the Nanometrics UI

On Windows:

1. If the directory `c:\nmx\bin` does not already exist on the computer, create it.
2. From either a command prompt or Windows Explorer, open the installation CD directory `Win32\GUI\`*version number*
3. Copy all files from the `bin` directory into the `c:\nmx\bin` directory.
4. Check the system path, and add the directory `c:\nmx\bin` if it is not already included.
5. Create a shortcut to the file `LibraGUI.bat`. Optionally, edit the shortcut to use a specific instrument IP address (Section 1.2.2).

On Solaris:

1. If the directory `/nmx/bin` does not already exist on the computer, create it.
2. From either a terminal window or the File Manager, open the installation CD directory `Solaris/GUI/`*version number*
3. Copy all files from the `bin` directory into the `/nmx/bin` directory.
4. Create a shortcut to the executable file `ConfigUI`. Optionally, edit the shortcut to use a specific instrument IP address (Section 1.2.2).

1.2.2 Create and edit a shortcut

If users frequently log on to the same Nanometrics instrument with a known IP address or name, it can be passed as an argument to the ConfigUI.jar file. The optional parameter *instrumentIP* specifies an instrument on startup.

On Windows:

1. Right-click on `c:\nmx\bin\ConfigUI.bat` and select Edit.
2. Verify that the startup parameters are set to accept a variable instrument IP address or name (edit if necessary). For example:
   `javaw -jar c:\nmx\bin\ConfigUI.jar %1`
3. Save and close the file.
4. Right-click on `c:\nmx\bin\LibraGUI.bat` and select Create Shortcut. Click and drag the shortcut to the desktop.
5. Right click on the shortcut icon and select Properties.
6. Edit the Shortcut > Target to use the specific instrument IP address or name:
   `C:\nmx\Bin\ConfigUI.bat` *instrumentIP*
7. Edit the shortcut name as appropriate, under the General tab. Click Apply and then click Close.
8. You may make copies of this shortcut and edit the properties as appropriate for additional instruments.

On Solaris:

1. Add an icon to the Front Panel (the task bar along the bottom of the desktop): Right click on the Front Panel and select Add Icon.
2. Right click on the new icon space and select Install Icon.
3. Open the File Manager and drag the ConfigUI to the new icon space.

   Optionally, you can rename the icon, add a subpanel to store additional icons, and use Run With Options to run with arguments (see also the Solaris Help).

1.3 Starting the Nanometrics UI

You can run separate instances of the Nanometrics UI simultaneously for various comms devices in your network—such as Libra system Cygnus and Carina—and you can log on to a different comms device from a currently running instance of the UI.

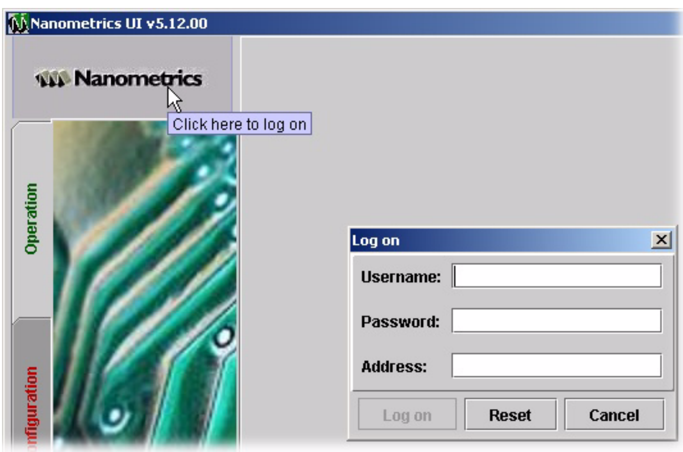
If the Nanometrics UI has been installed according to the installation instructions (Section 1.2), the program icon for the UI should be on the desktop of the computer.

1. Start the user interface:
   - Double click the desktop icon for the UI.
   - If you have not defined a shortcut, you can start the Nanometrics UI from the command line, using the syntax `libragui.bat` *instrumentIP*, where *instrumentIP* is an optional parameter specifying an instrument IP address or name.

   When the UI has loaded, the main window shows the blank main panel.
2. Log on to a comms device:

   a) Click on the Nanometrics logo to open the Log on dialog box (Figure 1-2).

Figure 1-2 Log on to a comms device



   b) In the Log on dialog box, type the appropriate values into the three fields:
   - Username – the name identifying the level of access, either user or tech (see Section 1.4.1 on page 7). The default name for the user level of access is `user` and for the tech level of access is `tech`.

     If the access information is changed, make sure that the change is recorded and that potential users of the instrument are informed.
   - Password – the password for either user or tech access level.
   - Address – the IP address of the comms device on the system LAN subnet.

   - To clear both the Username and Password fields (for example, to enter a correction), click Reset.

   c) Click Log on to send the request to log on to the comms device. (To exit without logging on, click Cancel.)

With a successful log-on request, the Nanometrics UI connects to the comms device at the specified IP address, and to any Tridents connected to the comms device. The UI begins receiving continual real-time updates of the system state-of-health, and is ready to pass requests to the connected instruments (for example, configuration updates and log requests).

1.4 Using the Nanometrics UI

Depending on your level of user access, you can edit some parameter values and perform some maintenance functions. See also Section 1.1.2, “User interface elements,” on page 2.

Caution For Comms Controller firmware versions 5.80 and higher, Nanometrics UI interaction with an instrument is supported only via NDMP. Upgrade any Tridents in the system that still have non-NDMP NMXbus subsystems to a Trident firmware version that supports NDMP.

1.4.1 Set levels of access to instrument and network configuration

Caution Commands available to operators of Libra satellite networks can disrupt data collection or violate terms of the satellite lease contract. Tech access for Libra systems should only be used by operators having a thorough understanding of Libra systems and satellite link design.

- Use options under the Configuration > Access panel to change user name and password for the various levels of access.

There are two general levels of access to instruments:
- user – allows a user to view system operation and configuration settings.
- tech – allows a user to change network instrument settings and upload new software. Tech level access should be restricted to those who are responsible for installing, configuring, and maintaining the network, and who have a detailed understanding of network requirements (for example, satellite lease restrictions for Libra networks).

For Libra networks, there is an additional level of access:
- TX control – allows the satellite provider to enable or disable the network transmission over the satellite link.

1.4.2 Interpret parameter text colours

For any configurable parameter:
- Black text indicates the current value.
- Blue text indicates an edited valid value, prior to clicking Submit.
- Red text indicates an out-of-range value.

1.4.3 Revert to the original value of an edited parameter

Before you click Submit, you can restore the original value of an edited parameter:

- To revert from an edited value to the original value in a text box, press Escape (Esc).
- To find the original value in a drop-down list, use the cursor arrow keys to scroll up or down through the list. The original value will show as black text when it is selected in the list.

Valid edited values will change to the new current value (black text) after you click the Submit button.

1.4.4 Cancel a request

The Nanometrics UI communicates with comms devices through TCP connections. Every time a request is sent to the comms device, the UI will open a dialog box providing the option to cancel the request (for example, Figure 1-3). The dialog box is displayed for the period of time required to send the request (this may be for only a few seconds, depending on the request and the communications link). The time required to cancel varies depending on what stage the request is at (for example, searching the host, writing to the socket, or reading from the socket). A pop-up message box is displayed when the request has been cancelled.

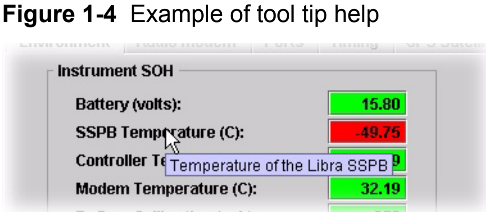
Figure 1-3 Cancel a connection request

1.4.5 View help about a parameter

The Nanometrics UI includes embedded help for most of the UI elements. These help windows provide a brief description of the selected parameter.

- To view tool tip help about a parameter, hold the mouse pointer over the field or the description (for example, Figure 1-4).

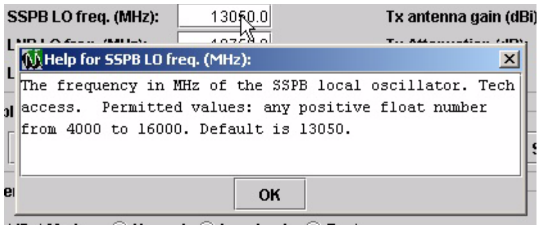
Figure 1-4 Example of tool tip help



✧ Hold the mouse pointer over an interface element to view the tool tip

- To open a help window that provides a description of the parameter, right click on the field or the description (for example, Figure 1-5).

Figure 1-5 Example of embedded help



✧ Right click on an interface element to open a help window

Chapter 2 Instrument Operation Monitoring

The operation status, or state-of-health (SOH), of network instruments is reported in the panels under the Operation tab. This information can be viewed by a user with any level of access.

The information displayed depends on the network instrument type. Network instrument types include:

- Libra satellite system comms devices – Cygnus remote transceiver, Carina hub transceiver, Lynx digitiser
- Callisto terrestrial system comms devices – Janus communications controller, Europa/EuropaT digitiser
- Instruments associated with Callisto and Libra comms devices – TimeServer (for comms devices that control Trident digitisers), and Trident digitisers

2.1 SOH updates for all network instruments

Instrument state-of-health (SOH) information is updated automatically to the UI, at a user-selectable interval.

2.1.1 Select the SOH update interval

The SOH update interval is selectable at any level of user access. The soh interval and freeze soh options are always visible at the bottom of the Nanometrics UI window (Figure 2-1).

- In the soh interval field, type in an update interval, in seconds—valid range is 2 to 60—and press Enter to accept the interval.
- To toggle automatic updates on ☐ (updates are not frozen) or off ☑ (updates are frozen), click the freeze soh checkbox.

Figure 2-1 Select the SOH update interval

2.1.2 View the time of the most recent SOH update

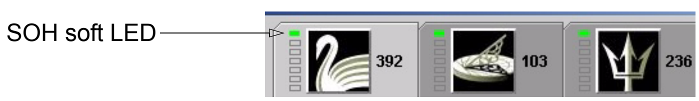
The Last update time field is visible on all Operation panels for all instruments (for example, Figure 2-3 on page 13). It displays the time stamp of the most recent SOH data received from the instrument. It is updated automatically on each SOH update.

2.1.3 View the SOH transmission status LED icons

LED icons on each instrument tab provide a quick, colour-coded indicator of the SOH of the instrument (Figure 2-2). The LED icon at the top is operational in this version of the UI. It indicates whether SOH data are being received from the instrument:

- Green indicates normal data transfer.
- Both yellow and red indicate no data transfer, for a period defined as some multiple of the soh interval.

Figure 2-2 SOH LEDs



2.2 Monitoring comms device operation

The SOH of a comms device, for both Libra and Callisto systems, is reported in the tabbed panels under the Operation tab (for example, the Operation > Environment panel in Figure 2-3). Most of the SOH reporting is the same for both Callisto and Libra comms devices; some SOH reporting is specific to either Callisto or Libra comms devices.

See Table 2-1 for a summary of the comms device Operation panels. The specified sections provide details on the SOH parameters for each panel. For information on SOH parameters of associated instruments, see Section 2.4, “Monitoring TimeServer operation,” on page 23 and Section 2.5, “Monitoring Trident digitiser operation,” on page 28.

Table 2-1 Comms device Operation panels

Panel	SOH reported	See this section for parameter descriptions
Environment	• Power supply voltage • Temperatures • Environmental variables measured by the instruments on the analog external SOH channels (if applicable) • Authentication system information (if applicable)	Section 2.2.1, “Environment,” on page 13

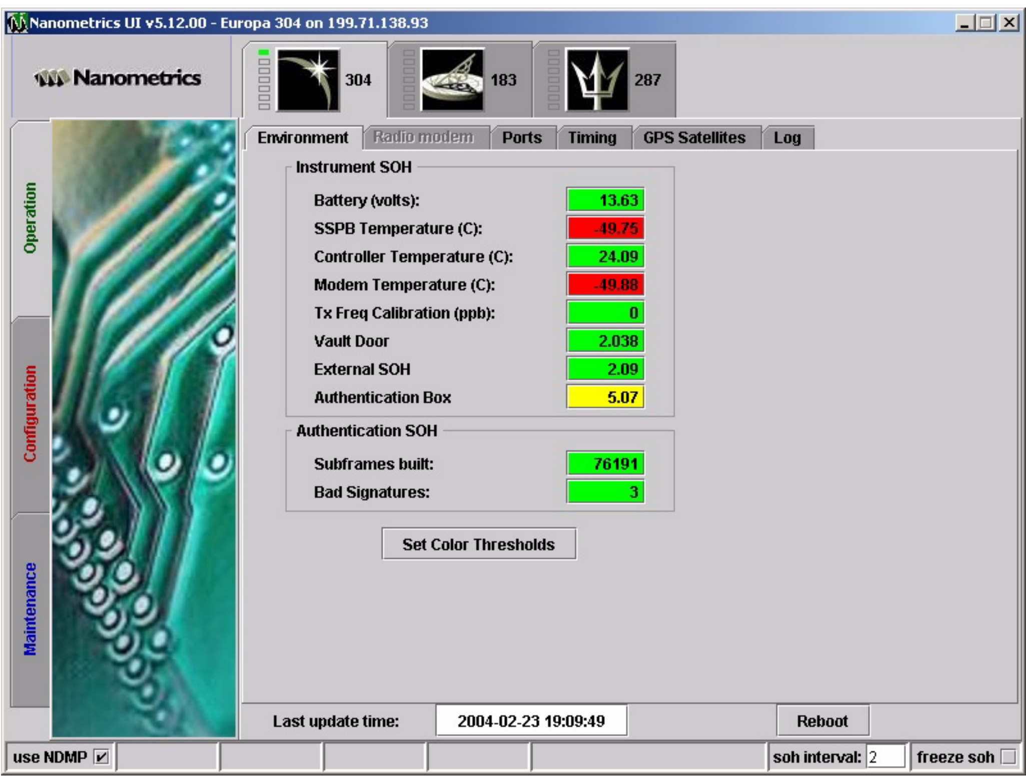
Table 2-1 Comms device Operation panels (Continued)

Panel	SOH reported	See this section for parameter descriptions
Radio modem	Applicable to Libra comms devices only. • Statistics for data transmission through the Libra modem system, reported for each enabled TDMA time slot • The start time of the next TDMA configuration	Section 2.2.2, “Radio modem,” on page 16
Ports	Statistics for the serial data ports	Section 2.2.3, “Ports,” on page 18
Timing	Status of the system timing and GPS engine	Section 2.2.4, “Timing,” on page 19
GPS Satellites	Status of satellite tracking by the GPS engine	Section 2.2.5, “GPS Satellites,” on page 20
Log	Recent log messages for the instruments	Section 2.2.6, “Log,” on page 21

2.2.1 Environment

The Environment panel (Figure 2-3) displays internal and external SOH information for the comms device. Parameters are describes in Table 2-2 and Table 2-3.

Figure 2-3 Operation > Environment panel



Each parameter is displayed with its measured value, and a background colour code for the current status of the parameter value: Green indicates a normal state, yellow a warning state, and red an error state. You can edit the thresholds for colour-coding of the current status (see Section 2.2.1.1 on page 15).

Table 2-2 Instrument SOH parameters

SOH Parameter	Description
Battery (volts)	Voltage measurement of the DC power input for the comms device.
SSPB Temperature (C)	Applicable to Libra comms devices only. Temperature measurement of the SSPB.
Controller Temperature (C)	Temperature measurement of the Comms Controller board within the comms device.
Modem Temperature (C)	Applicable to Libra comms devices only. Temperature measurement of the L-band modulator board within the Libra transceiver.

Tx Freq Calibration (ppb)	Applicable to Libra comms devices only.
	The remaining uncorrected frequency offset, in ppb, of the 10 MHz reference oscillator on the L-Band Modem board. (The Libra comms device compares the very accurate reference frequency of the GPS receiver to the frequency of the 10 MHz reference oscillator on the L-Band Modem board. Frequency offset is then corrected digitally to ensure accurate transmission frequency.)
	• Range:
	  • Between –2000 and +2000 in normal operation.
	  • In hub installations where many Carinas share a single SSPB, the Tx Freq Calibration values of all Carinas should fall within 500 ppb: The difference between the highest and lowest values should be less than 500 ppb.

External SOH 1	Channel 1 of the comms device analog external state-of-health (see also Section 3.2.1.3, “External SOH calibration,” on page 37).
External SOH 2	Channel 2 of the comms device analog external state-of-health (see also Section 3.2.1.3, “External SOH calibration,” on page 37).
External SOH 3	Channel 3 of the comms device analog external state-of-health (see also Section 3.2.1.3, “External SOH calibration,” on page 37).

Note Authentication SOH is applicable only to comms devices equipped with the authentication option.

Table 2-3 Authentication SOH parameters

SOH Parameter	Description
Subframes built	Total number of CD1 subframes built, modulo 1 billion, since the comms device was last rebooted.
Bad Signatures	Total number of CD1 subframes with bad signature, modulo 10 thousand, since the comms device was last rebooted. There may be a few bad signatures at start-up. ▸ If the number of bad signatures increases, check the token hardware or the Authentication configuration.

2.2.1.1 Edit SOH thresholds for colour-coded parameters

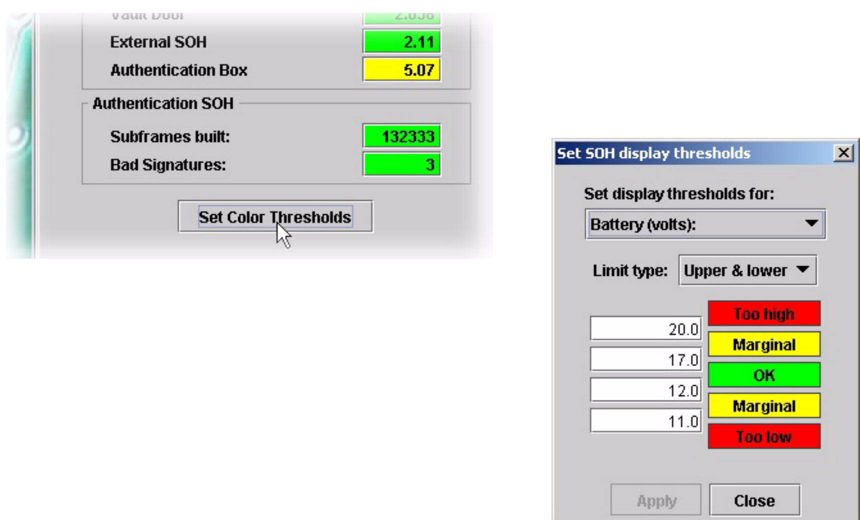
SOH parameter fields use colour codes to provide a qualitative grading of the present value of the parameter, using this convention:

- Green – The value is within the acceptable range.
- Yellow – The value is marginal and should be monitored closely.
- Red – The value is out of range, indicating a possible problem.

You can edit the thresholds for these parameters:

1. On the Operation > Environment panel, click Set Color Thresholds. This will open the Set SOH display thresholds dialog box (Figure 2-4):
   a) From the Set display thresholds drop down list, select the parameter (for example, Battery).
   b) From the Limit types drop down list, select the thresholds to edit (for example, Upper thresholds only).
2. Edit the threshold display settings as desired, then click Apply. (To exit from the dialog box without making any changes, click Close.)
3. Click Close.
4. Save the settings to the configuration:
   a) Click the Configuration tab.
   b) In any Configuration panel, click Submit.

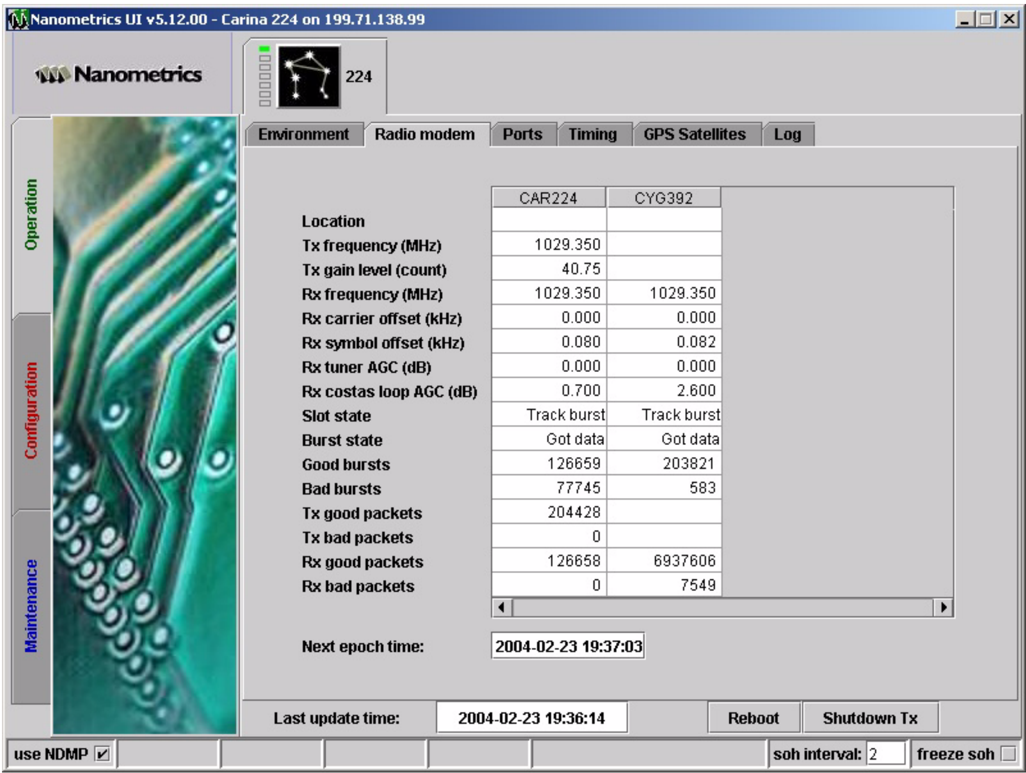
Figure 2-4 Set SOH display thresholds dialog box



2.2.2 Radio modem

The Radio modem panel (Figure 2-5), for monitoring data transmission over the satellite modems, is available only for Libra comms devices.

Figure 2-5 Operation > Radio modem panel



The Radio modem panel displays statistics for Libra network data transmission over the satellite link. State-of-health information is reported for each enabled TDMA time slot (Table 2-4).

Table 2-4 Radio modem SOH parameters (Libra comms devices)

SOH Parameter	Description
Location	The name of the station for which the SOH information is displayed. (See also Table 3-31, “TDMA slot configuration parameters,” on page 64.) ▸ To refresh the Location field for a new session of the UI, open the Configuration > TDMA panel, then reopen the Operation > Radio Modem panel.
Tx frequency (MHz)	The centre L-band frequency in megahertz of the RF carrier at which this station is transmitting to the SSPB. (See also Table 3-5, “Modem Settings configuration parameters,” on page 38 and Table 3-28, “Authorized transmission configuration parameters,” on page 61.)

Table 2-4 Radio modem SOH parameters (Libra comms devices) (Continued)

SOH Parameter	Description
Tx gain level (count)	The power level in DAC counts of the RF carrier at which this station is transmitting to the satellite. (See also Section 3.2.2.2, “Power calibration and gain and loss variations with temperature,” on page 39.)
Rx frequency (MHz)	The nominal L-band frequency in megahertz of the RF carrier at which this station is receiving from the LNB. (See also Table 3-5, “Modem Settings configuration parameters,” on page 38.)
Rx carrier offset (kHz)	The frequency difference between the expected centre frequency of the received RF carrier and the actual frequency measured by the demodulator. This frequency difference is typically caused by LNB local oscillator (LO) drift and satellite LO drift. (See also Table 3-5, “Modem Settings configuration parameters,” on page 38.)
Rx symbol offset (kHz)	Difference in kilohertz between the receive symbol rates and the demodulator reference symbol rate.
Rx tuner AGC (dB)	The value of the automatic gain control being used by the HSP50110 tuner to regulate its output baseband signal level.
Rx costas loop AGC (dB)	The value of the automatic gain control being used by the HSP50210 digital costas loop to regulate its output baseband signal level.
Slot state	State of the receiving slot. • Possible states for Normal mode: Find burst, Verify burst, Track burst. • Possible states for Test mode: unlocked, locked.
Burst state	Status of the process of locking on and recovering data. It is only used in Normal and Loopback operation modes. • Possible states: Not found (includes locking to a carrier, synchronizing clock signals), Found UW (recovered unique word identifying the burst), Got data (recovering the data).
Good bursts	Number of bursts for which the unique word was recovered since the start of the current TDMA configuration.
Bad bursts	Number of bursts for which the unique word was not recovered since the start of the current TDMA configuration.
Tx good packets	Number of packets successfully transmitted since the start of the current TDMA configuration.
Tx bad packets	Number of packets transmitted unsuccessfully since the start of the current TDMA configuration.
Rx good packets	Number of packets received without errors since the start of the current TDMA configuration.
Rx bad packets	Number of packets received with errors since the start of the current TDMA configuration.
Next epoch time	The time at which the Libra comms device switches from the TDMA configuration in the current epoch to that in the next epoch. (See also Table 3-29, “TDMA configuration parameters,” on page 62.)

2.2.3 Ports

The Ports panel (Figure 2-6) displays the statistics of the data transmission through the serial ports of the comms device. SOH information is reported for each enabled port (Table 2-5).

Figure 2-6 Operation > Ports panel

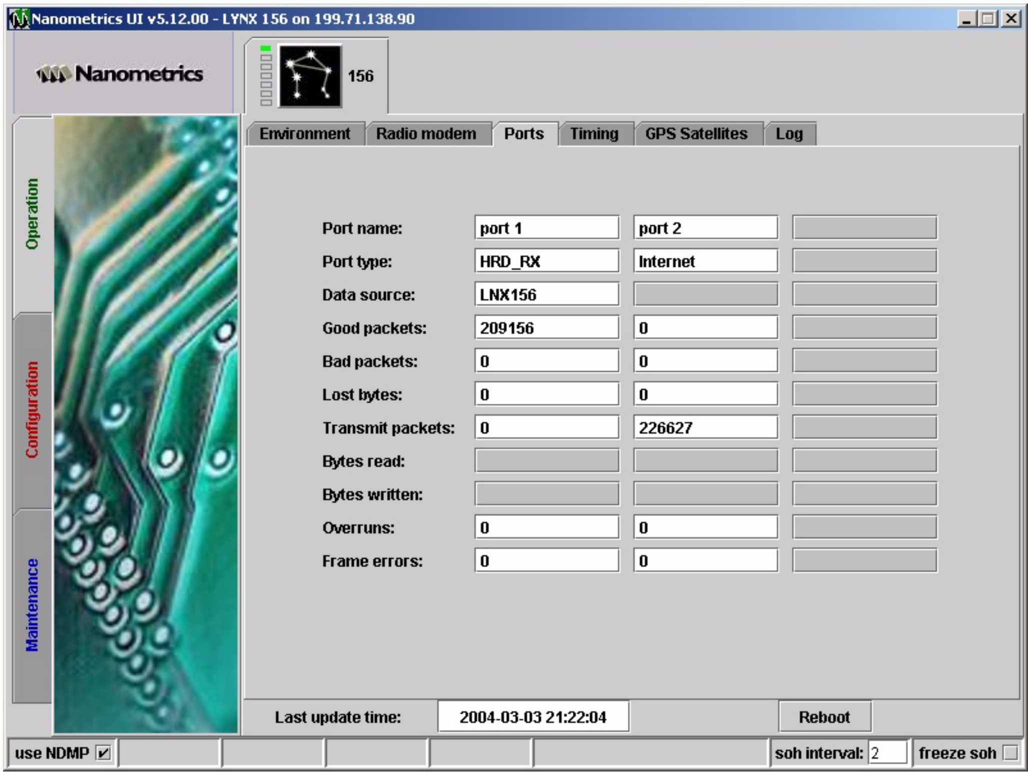


Table 2-5 Serial ports SOH parameters

SOH Parameter	Description
Port name	The name of the port as defined in the Ports panel under the Configuration tab. (See also Section 3.2.3, “Ports,” on page 43.)
Port type	The type of data received/transmitted at this port as defined in the Ports panel under the Configuration tab. (See also Section 3.2.3, “Ports,” on page 43.)
Data source	Source of the data received at this port, typically the ID of the instrument sending the data.
Good packets	The number of data packets received at this port, modulo 10 million, since starting or rebooting the comms device.
Bad packets	The number of data packets received with an error at this port, modulo 10 million, since starting or rebooting the comms device.
Lost packets	The number of lost data packets, modulo 10 million, since starting or rebooting the comms device.

Table 2-5 Serial ports SOH parameters (Continued)

SOH Parameter	Description
Transmit packets	The number of packets transmitted at this port, modulo 10 thousand, since starting or rebooting the comms device.
Bytes read	The number of bytes read from this port, modulo 1 billion, since starting or rebooting the comms device.
Bytes written	The number of bytes written to this port, modulo 1 billion, since starting or rebooting the comms device.
Overruns	The number of overrun errors at the port since starting or rebooting the comms device.
Frame errors	The number of frame errors at the port since starting or rebooting the comms device.

2.2.4 Timing

The Timing panel (Figure 2-7) displays the operation status and timing statistics of the time controller and GPS receiver during the most recent GPS cycle. The information displayed is divided into the sections System Internal Clock (Table 2-6), GPS Engine (Table 2-7), and Location (Table 2-8).

Figure 2-7 Operation > Timing panel

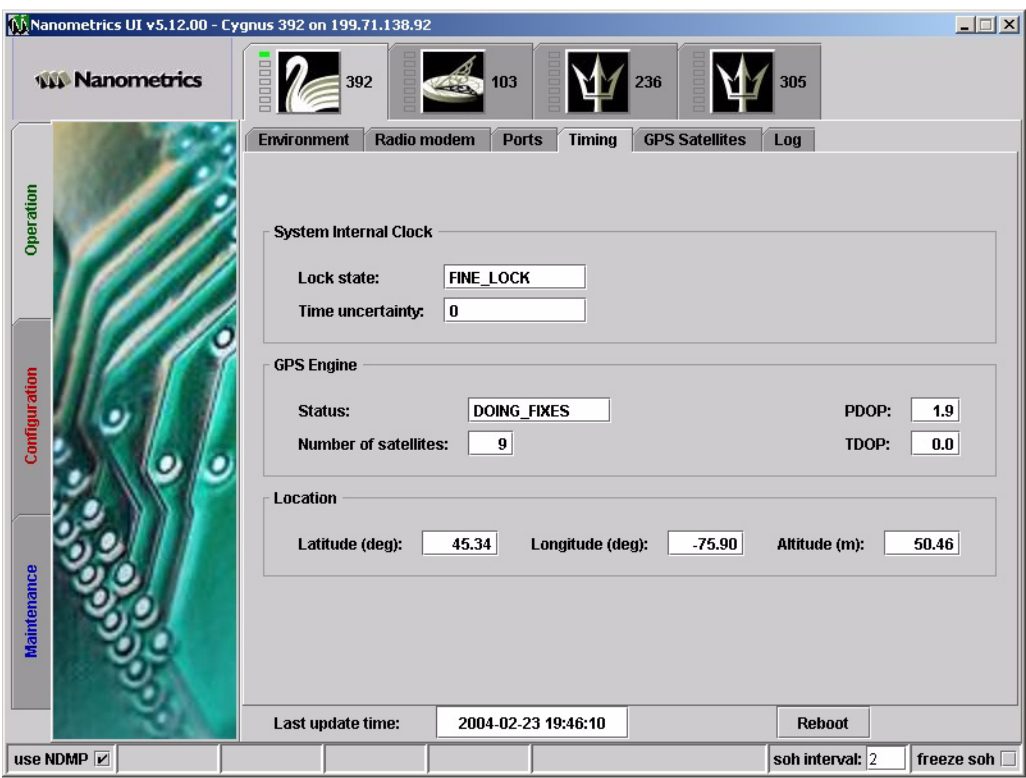


Table 2-6 System internal clock SOH parameters

SOH Parameter	Description
Lock state	The operating mode of the PLL in phase locking. • Possible values: FINE_LOCK, COARSE_LOCK, NO_LOCK.
Time uncertainty	The time quality of the GPS. • Possible values: TIME_UNKNOWN, TIME_NOT_GOOD, an integer indicating the predicted error (in nanoseconds) in the next second.

Table 2-7 GPS engine SOH parameters

SOH Parameter	Description
Status	The status of the GPS engine. • Possible values: DOING_FIXES, NO_TIME, NEED_INIT, PDOP_TOO_HIGH, and ACQUIRE_SATS
Number of satellites	The number of usable satellites currently being tracked.
PDOP	Position dilution of precision. An estimate of the GPS position precision, based on the geometry of the visible satellites. Lower value means more precise.
TDOP	Time dilution of precision. An estimate of the GPS time precision, based on the geometry of the visible satellites. Lower value means more precise.

Table 2-8 GPS location SOH parameters

SOH Parameter	Description
Latitude (deg)	The current latitude of the GPS engine, obtained from the last GPS query. The value is in degrees with north positive. For comms devices with local timing, this corresponds to the latitude of the comms device.
Longitude (deg)	The current longitude of the GPS engine, obtained from the last GPS query. The value is in degrees with east positive. For comms devices with local timing, this corresponds to the longitude of the comms device.
Altitude (m)	Altitude in meters of the GPS engine above the current datum defined by the Earth model (ellipsoid) obtained from the last GPS query. For comms devices with local timing, this corresponds to the altitude of the comms device.

2.2.5 GPS Satellites

The GPS Satellites panel (Figure 2-8) displays the satellite tracking information for each channel of the GPS engine (Table 2-9).

- To open a Help window describing the parameters, click the button About this table.

Figure 2-8 Operation > GPS Satellites panel

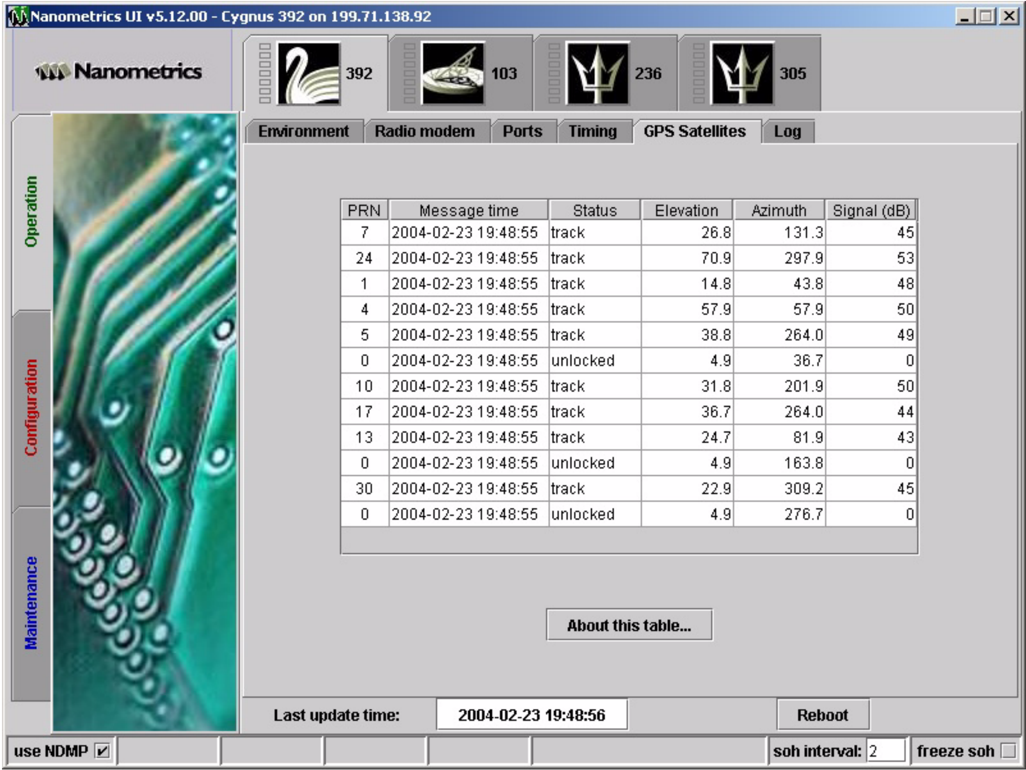


Table 2-9 GPS satellites SOH parameters

SOH Parameter	Description
PRN	The PRN (Pseudo-random noise) code used to specify each satellite.
Message time	The time at which the update message was generated.
Status	The channel activity. • Possible values: unlocked, search, track.
Elevation	The elevation angle of the satellite in degrees. It ranges from 0° to 90° (0° is parallel to the surface).
Azimuth	The azimuth of the satellite in degrees, measured clockwise from true north.
Signal (dB)	The strength of the signal in decibels.

2.2.6 Log

The Log panel (Figure 2-9) displays information on the most recent activity of the system (the 100 most recent log messages), including for each network activity:

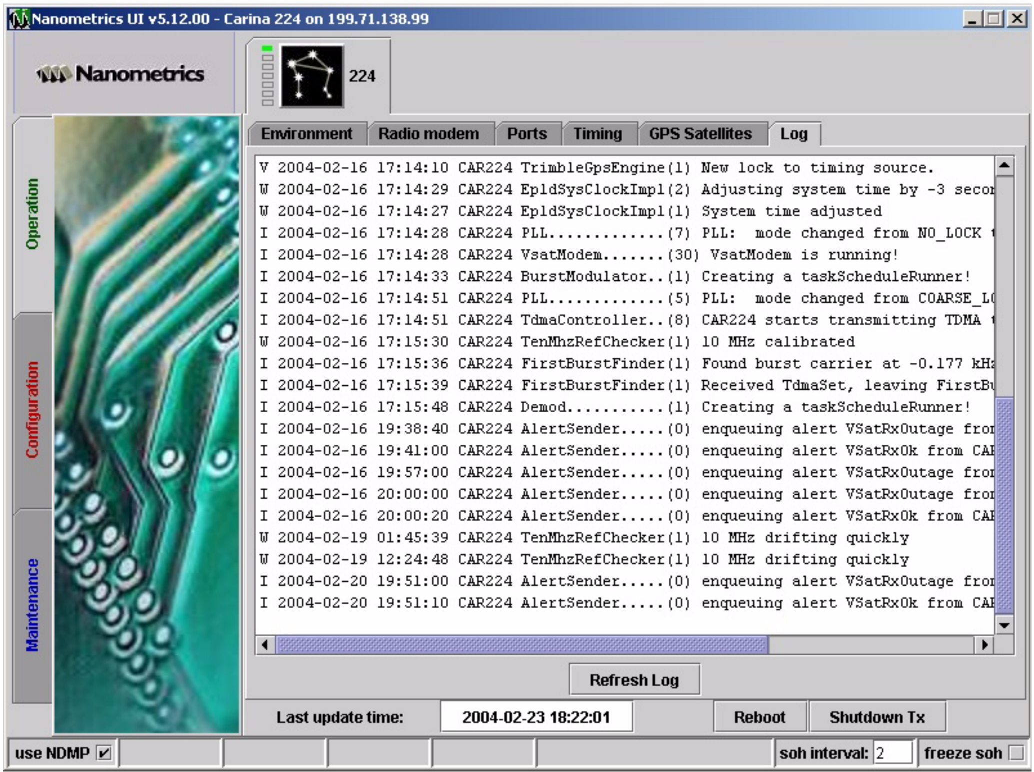
- message level – (V)erbose, (I)nformation, (W)arning, or (E)rror
- date and time stamp
- instrument ID
- activity type

- description

- To request the most recent log messages, click Refresh Log.

Older log messages are stored in the Naqs log files. A new `naqs_`*yyyymmdd*`.log` file is created each day, in the location defined in the `Naqs.ini` file [NaqsLog] section. See also the NaqsServer manual.

Figure 2-9 Operation > Log panel



2.3 Shutting down Libra network transmission

The Libra system Carina hub provides the Shutdown Tx option, to stop data transmission for the network over the satellite link. The Shutdown Tx option is visible on every panel under the Carina Operation tab (for example, Figure 2-10). It is available at all levels of user access, but requires a user name and password to complete the shutdown.

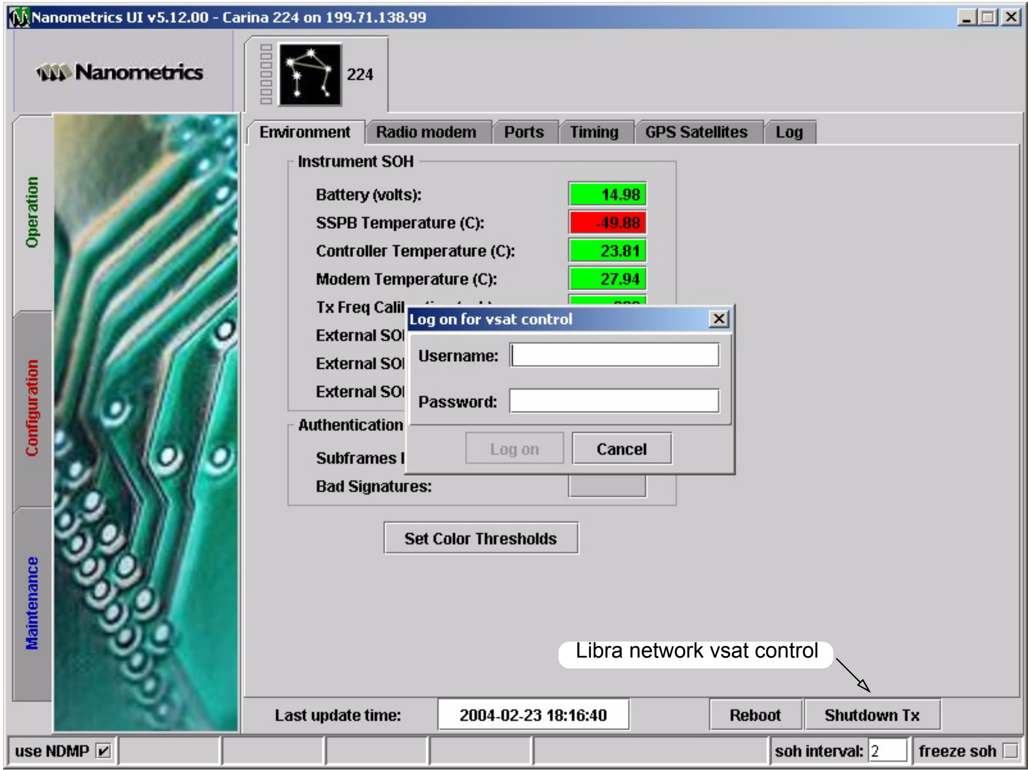
Conditions under which a Libra network will need to be shut down and restarted include, in particular, the acceptance test required by the satellite service provider. See also the Libra Satellite Network Reference Guide.

2.3.1 Shut down Libra network transmission

- To shut down the network, click Shutdown Tx, and then log on with the correct user name and password in the Log on for vsat control dialog box.

  After a successful shutdown, the UI displays a message indicating that data transmission is shut down. The Shutdown Tx button becomes the Resume Tx button.

Figure 2-10 Libra network shutdown option on Carina

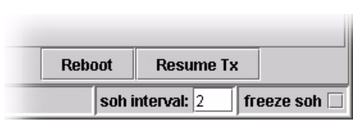


2.3.2 Resume Libra network transmission

- To restart data transmission after shutting down the Libra network, click Resume Tx, and then log on with the correct user name and password in the Log on for vsat control dialog box.

  After a successful restart, a message displays indicating that data transmission has resumed. The Shutdown Tx button becomes the Resume Tx button (Figure 2-11).

Figure 2-11 Libra network resume transmission option on Carina



2.4 Monitoring TimeServer operation

For comms devices that control Trident digitisers, the SOH of the TimeServer is reported in the three tabbed panels under the [TimeServer] > Operation tab (for example, the Instrument tab in Figure 2-12). See Table 2-10 for an overview of the TimeServer Operation panels.

Timing for a comms device and associated Tridents is provided by the TimeServer, which is essentially a GPS disciplined clock—the TimeServer system time is synchronized to GPS time. The TimeServer module has an internal direct connection to the Comms Controller module in the comms device, and communicates over the NMXbus.

The TimeServer continues to provide time with its internal clock even when GPS signal reception is temporarily interrupted. You have the option to accept data acquired during gaps in GPS signal reception, and can use time quality information generated by the TimeServer to assist with this decision. (Timing for Janus and Europa–T with central timing use this same principle.)

Table 2-10 TimeServer Operation panels

Panel	SOH reported	See this section...
Instrument	Instrument voltages, temperature, NMXbus termination, time since start-up, and NMXbus statistics.	Section 2.4.1, "TimeServer Instrument operation"
Timing	Status of the system timing and the GPS receiver.	Section 2.4.2, "TimeServer time and GPS engine status," on page 25
GPS Satellites	Status of satellites tracked by the GPS device.	Section 2.4.3, "TimeServer GPS satellites status," on page 27

2.4.1 TimeServer Instrument operation

The TimeServer Instrument panel (Figure 2-12) displays internal and external state-of-health information for the instrument. The information displayed is divided into the sections Instrument (Table 2-11) and NMXbus statistics (Table 2-12).

Figure 2-12 TimeServer Operation > Instrument panel

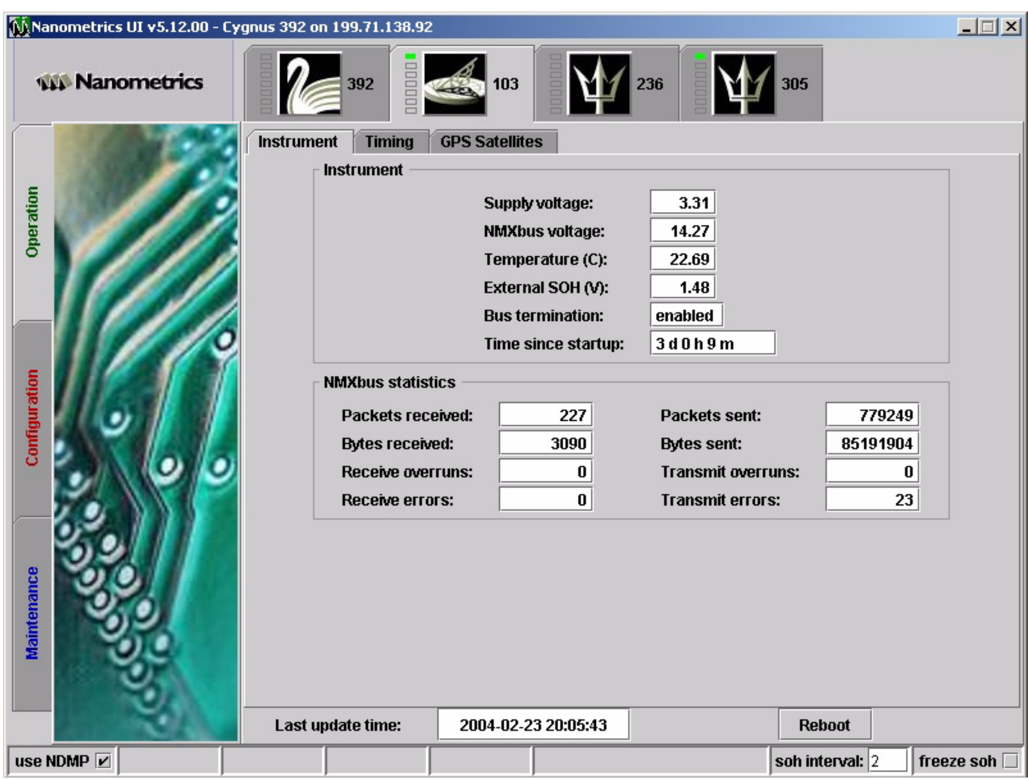


Table 2-11 TimeServer Instrument SOH parameters

SOH Parameter	Description
Supply voltage	The voltage measurement of the DC power input for the TimeServer.
NMXbus voltage	The DC voltage supplied via the NMXbus to peripheral devices.
Temperature (C)	The temperature measurement of the TimeServer board within the host instrument.
External SOH (V)	An External SOH measurement (this option is currently not used).
Bus termination	Indicates whether NMXbus internal termination is enabled or not enabled.
Time since startup	The amount of time the TimeServer has been running since start-up.

Table 2-12 NMXbus Statistics SOH parameters

SOH Parameter	Description
Packets received	The total number of packets received, modulo 1 billion, since starting or rebooting the device.
Packets sent	The total number of packets sent, modulo 1 billion, since starting or rebooting the device.
Bytes received	The total number of bytes received, modulo 1 billion, since starting or rebooting the device.
Bytes sent	The total number of bytes sent, modulo 1 billion, since starting or rebooting the device.
Receive overruns	The number of receive overrun errors on the bus, modulo 10000, since starting or rebooting the device.
Transmit overruns	The number of transmit overrun errors on the bus, modulo 10000, since starting or rebooting the device.
Receive errors	The number of receive errors on the bus, modulo 10000, since starting or rebooting the device.
Transmit errors	The total number of transmit errors, modulo 10000, since starting or rebooting the device.

2.4.2 TimeServer time and GPS engine status

The TimeServer Timing panel (Figure 2-13) displays the operation status and timing statistics of the time controller and GPS receiver during the most recent GPS cycle. The information displayed is divided into the sections System Internal Clock (Table 2-13), GPS Engine (Table 2-14), and Location (Table 2-15).

Figure 2-13 TimeServer Operation > Timing panel

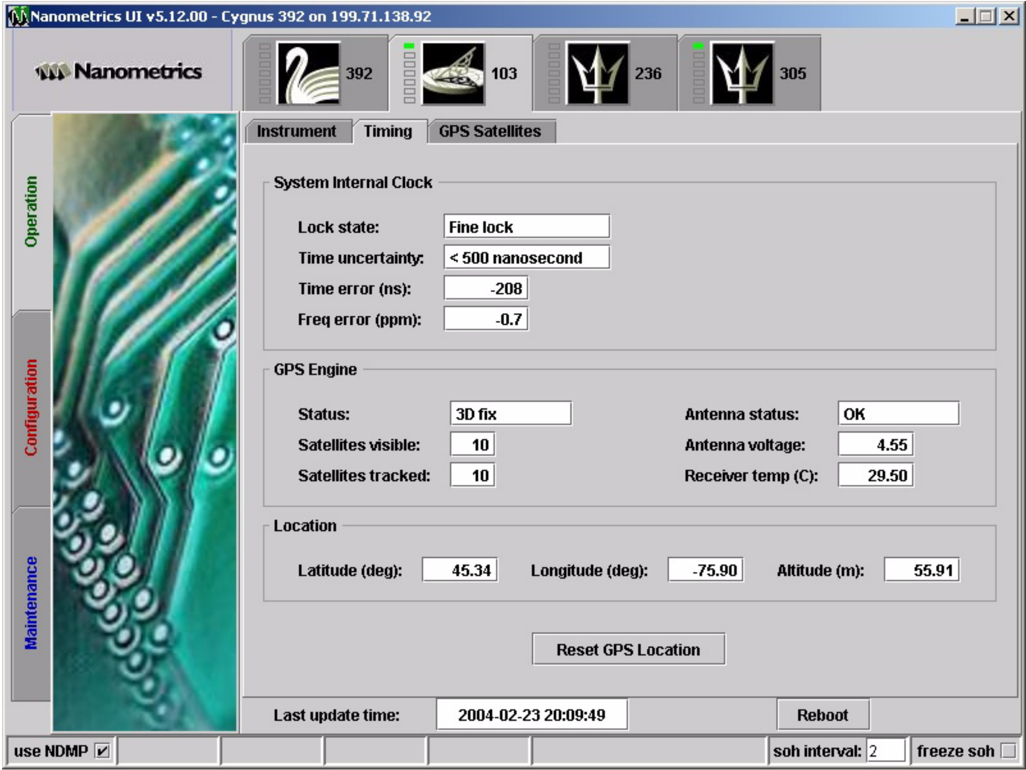


Table 2-13 TimeServer system internal clock SOH parameters

SOH Parameter	Description
Lock state	The operating mode of the time PLL. • Possible states: Initialization, No time, Raw time, Approximate time, Measuring frequency, No lock, Coarse lock, Fine lock, Superfine lock.
Time uncertainty	The time quality provided by the time PLL. Values indicate how well the time error is known.
Time error (ns)	Signed value; the error of the internal clock as measured by GPS.
Freq error (ppm)	Signed value; the error of the internal clock frequency as measured by GPS.

Table 2-14 TimeServer GPS engine SOH parameters

SOH Parameter	Description
Status	The status of the GPS engine. • Possible values: 3D Fix, 2D Fix, Propagate mode, Position Hold, Acquiring Satellites, Bad Geometry.
Satellites visible	The number of satellites currently visible as predicted by the Satellite Almanac.
Satellites tracked	The number of satellites currently being tracked.

Table 2-14 TimeServer GPS engine SOH parameters (Continued)

SOH Parameter	Description
Antenna status	Connection status of the GPS antenna. • Possible values: OK, not connected, overcurrent.
Antenna voltage	The voltage on the antenna connector of the GPS receiver.
Receiver temp (C)	The internal temperature of the GPS receiver.

Table 2-15 TimeServer GPS location SOH parameters

SOH Parameter	Description
Latitude (deg)	The latitude of the GPS engine, obtained from the last GPS query. The value is in degrees with north positive. For comms devices with local timing, this corresponds to the latitude of the comms device.
Longitude (deg)	The longitude of the GPS engine, obtained from the last GPS query. The value is in degrees with east positive. For comms devices with local timing, this corresponds to the longitude of the comms device.
Altitude (m)	The altitude in meters of the GPS engine above the current datum defined by the Earth model (ellipsoid) obtained from the last GPS query. For comms devices with local timing, this corresponds to the altitude of the comms device.

2.4.2.1 Reset GPS for a new location

The GPS may take a long time to find satellites and lock if the comms device has been moved to a location with very different settings.

- To speed up GPS locking on initial startup in a new location, click Reset GPS Location (Figure 2-13 on page 26) and use the Reset GPS options to set approximate location and time information for the new location (Figure 2-14).

Figure 2-14 Reset GPS dialog box

2.4.3 TimeServer GPS satellites status

The TimeServer GPS Satellites panel displays the operation status and the timing statistics of the integrated GPS receiver during the most recent GPS cycle. For a description of these GPS satellite parameters, see Section 2.2.5, “GPS Satellites,” on page 20.

2.5 Monitoring Trident digitiser operation

The SOH of a Trident digitiser is reported under the [Trident] > Operation tab (Figure 2-15). The information displayed is divided into Timing, NMXbus statistics, and Mass Position sections.

The Trident digitiser is a peripheral instrument to all comms devices except the EuropaT, which has an internal Trident. In either case, each Trident associated with a comms device has its own instrument tab in the Nanometrics UI.

Figure 2-15 Trident Operation > Instrument panel

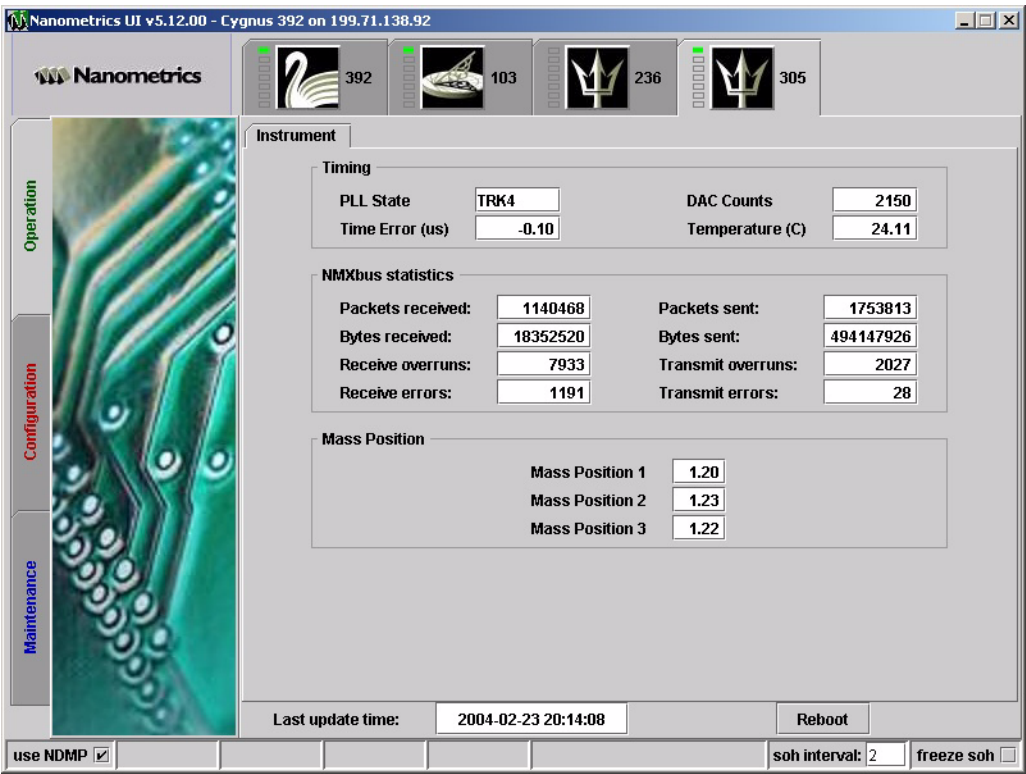


Table 2-16 Trident timing section parameters

SOH Parameter	Description
PLL state	The operating mode of the time PLL. • Possible states: INIT (not digitizing), TIME (correcting time error), ACQ0, TRK1, TRK2, TRK3, TRK4
Time error (us)	Signed value; the time error in microseconds relative to the TimeServer. A positive value indicates that the Trident is ahead of the TimeServer.
DAC Counts	The value used by the DAC to control the VCXO. • Possible values: range from 0 to 4096.
Temperature (C)	The internal temperature of the Trident.

Table 2-17 Trident NMXbus statistics section parameters

SOH Parameter	Description
Packets received	Total number of packets received, modulo 1 billion, since starting or rebooting the device.
Packets sent	Total number of packets sent, modulo 1 billion, since starting or rebooting the device.
Bytes received	Total number of bytes received, modulo 1 billion, since starting or rebooting the device.
Bytes sent	Total number of bytes sent, modulo 1 billion, since starting or rebooting the device.
Receive overruns	Number of receive overrun errors on the bus, modulo 10,000, since starting or rebooting the device.
Transmit overruns	Number of transmit overrun errors on the bus, modulo 10,000, since starting or rebooting the device.
Receive errors	Number of receive errors on the bus, modulo 10,000, since starting or rebooting the device.
Transmit errors	Total number of transmit errors, modulo 10,000, since starting or rebooting the device.

The Trident digitiser optionally can monitor and control active sensors such as the Trillium broadband seismometer. The mass position indicators from the seismometer are connected to three SOH analog inputs in the Trident, and their status is displayed in the corresponding Mass Position fields in the Nanometrics UI. These SOH channels are sampled at the same rate that is selected for all SOH updates. The channels have an input range of ±10 V, and a sensitivity of 4.88 mV/count. An open input will appear as a 1.1 V input.

Chapter 3

Instrument Configuration

Users with tech access can change instrument and network settings using options under the Configuration tab. Most of the configuration settings can be viewed by a user with any level of access. The configuration options depend on the instrument type. Network instrument types include:

- Libra satellite comms devices – Carina hub transceiver, Cygnus remote transceiver, and Lynx digitiser
- Callisto terrestrial comms devices – Janus communications controller, and Europa/EuropaT digitiser
- Instruments associated with network comms devices – TimeServer, and Trident digitiser

3.1 Configuration functions

The Nanometrics UI provides general configuration functions (these can be used on all instrument types), and configuration functions that are specific to an instrument type.

3.1.1 General configuration functions

There are six configuration functions that apply to all network instruments.

Caution For Comms Controller firmware versions 5.80 and higher, Nanometrics UI interaction with an instrument is supported only via NDMP. Upgrade any Tridents in the system that still have non-NDMP NMXbus subsystems to a Trident firmware version that supports NDMP.

3.1.1.1 Request: Request current configuration information

- Click Request to update the UI with the current configuration information from the instrument.

3.1.1.2 Default: Request the default configuration

- Click Default to request the default configuration values from the instrument. Default configuration values are noted on the as-shipped configuration sheet for the instrument, and in the parameter descriptions in this chapter.

3.1.1.3 Submit: Submit an updated configuration

Caution If you do not Commit changes within the configured timeout after Submit, the instrument will reboot automatically. The changes that have only been submitted, not committed, will be discarded.

- Click Submit to send a new configuration to the instrument. Tech access only.

  If the configuration is valid, the instrument sends starts to use the new configuration. The new configuration is stored in the system volatile memory and will not be permanent until the configuration is committed to flash.

  - Use Reboot to restore the previous configuration if the newly submitted configuration is incorrect.

  If you entered the wrong IP address and clicked Submit, the instrument will be unreachable via IP until it reboots.

  - To recover from submitting the wrong IP address, reboot the instrument to revert to the previous configuration, with the original IP address. If it is at a remote location, wait for the amount of time defined in Config Timeout for the instrument to reboot automatically (Section 3.1.2.1).

3.1.1.4 Commit: Commit an updated configuration to flash

- Click Commit to write the current operating configuration permanently to the system flash memory. Tech access only.

3.1.1.5 Reboot: Reboot the instrument

- Click Reboot to reboot the instrument. It will discard the current configuration if it is only in the system volatile memory (not yet written into the system flash). Tech access only.

  On rebooting, the instrument uses the configuration stored in the flash memory. If it cannot read this configuration (for example, if it is an older version of firmware trying to read a new configuration) it will try to read the backup configuration. See also Chapter 4, “Maintenance”.

3.1.1.6 Save: Save the current instrument configuration to a settings file

Note Comms device `.cfg` files are text files which can be read or printed from a text editor. Trident and TimeServer `.cfg` files are binary files which you must save as text to view or print (see Section 4.3 on page 77).

- Click Save to save the current instrument configuration to a `*.cfg` file on your computer file system. You can use a saved settings file as a record of the instrument configuration.
  - For comms devices, note that there is also a Backup Config function, which stores the configuration backup on the instrument (Section 3.1.2.2).
  - For Trident and TimeServer, you can load a saved configuration to any Trident or TimeServer (Section 3.1.3.1).

3.1.2 Comms device configuration functions

In addition to the general configuration functions listed in Section 3.1.1, comms devices have three additional configuration functions: to set a timeout before the instrument reboots after a new configuration has been submitted, to allow you to make a backup of the current configuration, and to restore the configuration. These functions are available on the Configuration > System panel, and are tech access only.

3.1.2.1 Config Timeout: Set the timeout to reboot to the previous configuration

The Config Timeout feature allows automatic reboot of an instrument if you submit the wrong IP address. The instrument will be unreachable via IP until it reboots automatically to the previous configuration.

- In the Configuration > System panel, enter a convenient Config Timeout value, in the format *DDD:hh:mm:ss*. For example, set a relatively long timeout if you are configuring a large number of instruments locally, and a relatively short timeout if you are configuring a remote instrument.

3.1.2.2 Backup Config: Make a backup copy of the configuration settings

If you are upgrading the comms device firmware, do not back up the new comms device configuration until you have tested the upgrade and you are sure you do not want to revert to the earlier version of the firmware. See also Section 4.4, “Upgrading instrument files,” on page 78.

- In the Configuration > System panel, click Backup Config to make a backup copy of the configuration settings to the instrument flash.

3.1.2.3 Restore Config: Retrieve settings from the backup configuration file

- In the Configuration > System panel, click Restore Config to retrieve the configuration settings from the backup configuration file.

3.1.3 TimeServer and Trident digitiser configuration functions

In addition to the general configuration functions listed in Section 3.1.1, TimeServers and Trident digitisers have an option to load a saved configuration from the computer file system (see also Section 3.1.1.6).

3.1.3.1 Load: Load a configuration settings file

Use Load to load a configuration that has been saved from another instrument to the file system. Tech access only.

1. Click Load to browse for a configuration file that has been saved to the file system.
2. Select the file, and then click Open to load the new configuration to the UI.
3. To apply the new configuration permanently to the instrument, click Submit.

3.2 Configuring comms device and network parameters

Comms device and network configuration parameters are grouped into eight tabbed options panels under the Configuration tab (for example, the System panel in Figure 3-1). See Table 3-1 for an overview of the configuration panels, and the subsections for a description of the configuration options. For information on configuring other instruments, see Section 3.3, "Configuring the TimeServer," on page 66 and Section 3.4, "Configuring Trident digitisers," on page 69.

Most of the configuration options, and ranges for the options, are the same for both Callisto and Libra comms devices. If there is a difference between the range indicated in this manual and that defined in the as-shipped configuration sheets provided with your system, use the range defined in the as-shipped configuration sheets since these are specific to your system.

Table 3-1 Comms device Configuration panels

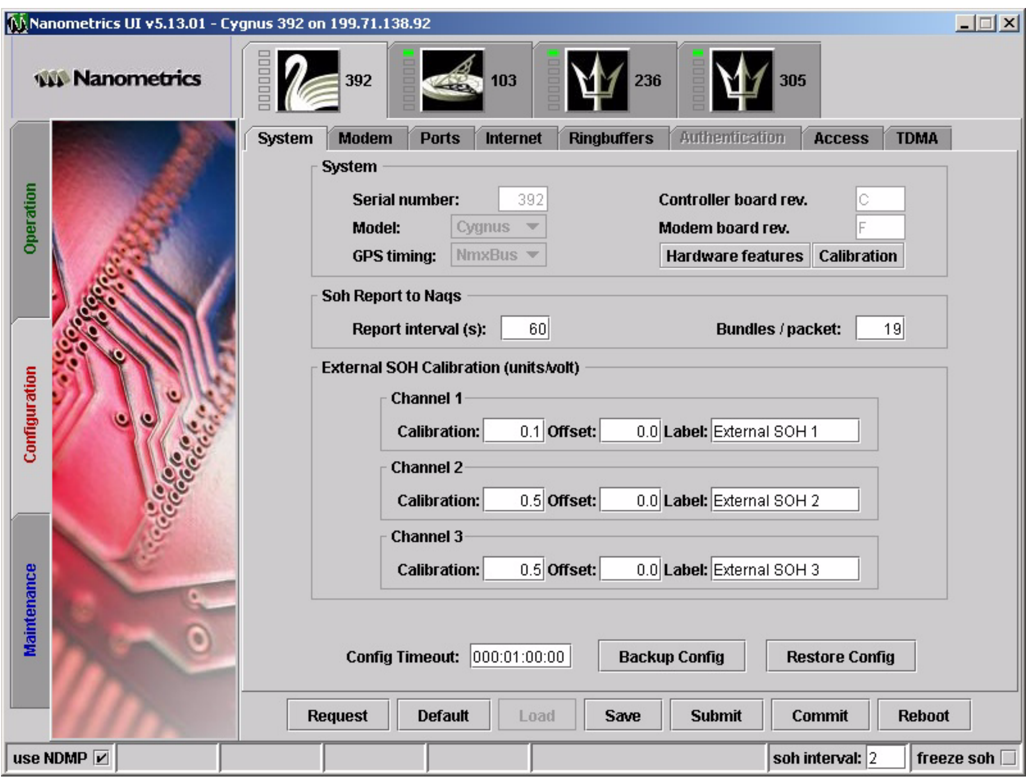
Panel	Overview	See this section for parameter descriptions
System	• Read-only information about the hardware configuration. • Settings for acquiring system state-of-health information. • Environmental variables measured via the analog external SOH channels.	Section 3.2.1, "System," on page 35
Modem	Applicable to Libra comms devices only. • Settings and the expected performance of the radio system for Libra networks. • Operating mode for the Libra comms device (normal, test, or loopback).	Section 3.2.2, "Modem," on page 38
Ports	Serial port settings for digital data input and output (including the integrated HRD for Europa, Lynx).	Section 3.2.3, "Ports," on page 43

Table 3-1 Comms device Configuration panels (Continued)

Panel	Overview	See this section for parameter descriptions
Internet	IP configuration for: • The comms device in its LAN and in the network. • Data and alert message destinations. • Calibration command source, either a specific address or a subnet.	Section 3.2.4, “Internet,” on page 49
Ringbuffers	Configuration of data ringbuffers for the comms device and the associated Tridents.	Section 3.2.5, “Ringbuffers,” on page 53
Authentication	Applicable only to comms devices with an authentication system installed. • Configuration and status-monitoring variables for the authentication system.	Section 3.2.6, “Authentication,” on page 56
Access	Name and password for levels of user access to the comms device, associated Tridents, and network.	Section 3.2.7, “Access,” on page 59
TDMA	Applicable to Libra comms devices only. • Information about the satellite used by the Libra network. • Authorized transmission settings for the station. • Time division multiple access (TDMA) configuration of the satellite carrier, configured at the Carina hub.	Section 3.2.8, “TDMA,” on page 60

3.2.1 System

Figure 3-1 Configuration > System panel



The System panel (Figure 3-1) provides options to view and configure internal and external state-of-health settings for comms devices. Parameters such as hardware information are also noted on the as-shipped configuration sheet for the instrument. The configuration parameters are grouped into three main sections: System, Soh Report to Naqs, and External SOH Calibration. (See Section 3.1.2, “Comms device configuration functions,” on page 33 for information on the Config functions.)

3.2.1.1 System hardware identification

The system subsection parameter values are set at the factory.

Table 3-2 System configuration parameters

Parameter	Description
Serial number	Read only. The serial number of the comms device that is connected to this session of the UI.
Model	Read only. The model of the comms device. • Options are: Lynx, Cygnus, Carina, Europa, and Janus.
GPS timing	Read only. The configuration of the GPS timing device for this comms device: • None – This unit does not use GPS time. Typically used only for testing. • Local – This comms device receives timing information from its own onboard GPS engine. • Central – This comms device receives timing information via serial port from a central GPS time server. • Server – This comms device receives timing information from its own onboard GPS engine, and broadcasts that information via serial port for use by other network instruments. • NMXbus – This comms device receives timing information through the NMXbus from a TimeServer.
Controller board rev.	Read only. The hardware revision letter of the controller board.
Modem board rev.	Applicable to Libra comms devices only. • Read only. The hardware revision letter of the satellite L-band modem board.
Hardware features	Read only. A list showing currently supported hardware features for the comms device. • Options are: Satellite RF, Authentication
Calibration	Read only. Battery calibration settings, for sensitivity and offset.

3.2.1.2 SOH reports to Naqs

Table 3-3 SOH Report configuration parameters

Parameter	Description
Report interval (s)	The time interval in seconds at which the comms device reports its SOH status to Naqs. Tech access. • Possible values: any positive integer. Default is 60.
Bundles/packet	Number of bundles per SOH packet. Tech access. • Possible values: any integer from 1 to 28. Default is 19.

3.2.1.3 External SOH calibration

The External SOH calibration panel contains configuration options for the three external state-of-health channels. These SOH channels can be used to monitor voltages from analog devices (for example, a meteorological sensor with analog output, a vault tamper switch). Each channel has three parameters—calibration in units per volt, offset for the calibration, and a channel output label.

There are two parameters, scale calibration and offset, that need to be set to calibrate an external SOH channel:

- The scale calibration factor is built from two constants:
  - One constant is the sensitivity of the sensor, expressed as the appropriate units per volt. For example, with a temperature sensor, this might be set to 44 degrees Celsius per volt.
  - The other constant is the actual sensitivity of the ADC, which is a factory setting.
- The offset is used to allow for the sensor not producing zero output volts when registering zero sensor measurement units. The offset is expressed in units appropriate to the sensor. For example, for a temperature sensor, the offset is expressed in degrees Celsius.

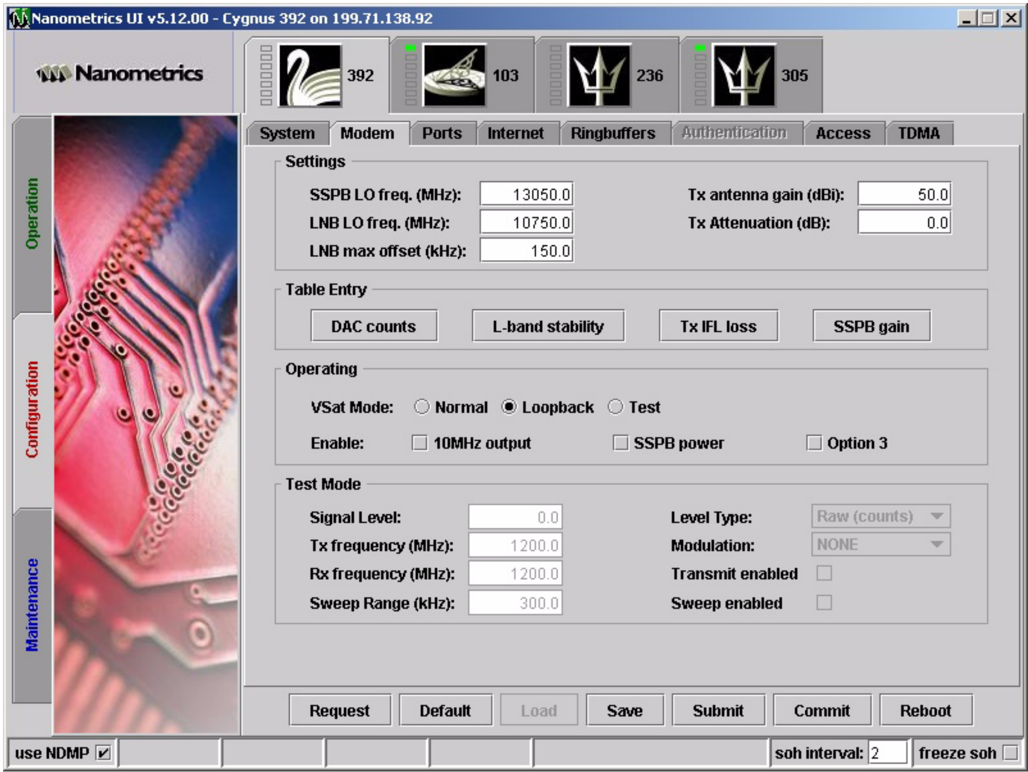
Table 3-4 External SOH calibration parameters

Parameter	Description
Calibration	The scale value to convert the voltage readings to the values of the observed item. This is K * device sensitivity in units per volt, where K = 0.1 for channel 1, and K = 0.5 for channels 2 and 3. Tech access. • Possible values: any non-zero float number. ▸ To report the actual voltage on the connector use 0.1, 0.5, and 0.5 respectively for SOH channels 1, 2, and 3; channel 1 has higher gain than channels 2 and 3.
Offset	The value that is added to the calibrated output reading. Tech access. • Possible values: any float number. Default is 0.
Label	The name of the channel output. Tech access. The label defined here is displayed in the Operation > Environment > Instrument SOH panel. • Possible values: any string of 1 to 25 characters.

3.2.2 Modem

The Modem panel is available only for Libra system comms devices.

Figure 3-2 Configuration > Modem panel



The Modem panel (Figure 3-2) provides options to view and configure settings for the Libra network radio system. The configuration parameters are grouped into four main sections: Settings, Table Entry (to calibrate modem power, and variations in gain and loss with temperature), Operating, and Test Mode.

3.2.2.1 Settings

Changing these settings requires tech access.

Table 3-5 Modem Settings configuration parameters

Parameter	Description
SSPB LO freq. (MHz)	The frequency in megahertz of the SSPB local oscillator. • Possible values: any float number from 4000 to 16000. Default is 13050. The value is in MHz x 10000 when reported in an error message.
LNB LO freq. (MHz)	The centre frequency in megahertz of the LNB local oscillator. • Possible values: any float number from 2500 to 12000. Default is 10750.0. The value is in MHz x 10000 when reported in an error message.

Table 3-5 Modem Settings configuration parameters (Continued)

Parameter	Description
LNB max offset (kHz)	The maximum drift offset in kilohertz of the LNB local oscillator. This is used to determine the frequency range over which the receiver searches for the carrier. The value is in kHz x 10 when reported in an error message. • Possible values: any float number from 0 to 1000. Default is 150 kHz.
Tx antenna gain (dBi)	The transmit gain in decibels relative to isotropic of the satellite antenna. • Possible values: any float number from 30.0 to 60.0. Default is 46.5.
Tx Attenuation (dB)	The attenuation in decibels applied to a transmitter. It is a factory modification for use with sensitive satellites. The value is in dB x 10 when reported in an error message. • Possible values: any possible float number from 0 to 20. Default is 3.5

3.2.2.2 Power calibration and gain and loss variations with temperature

The options in the Table Entry section allow a user with tech access to calibrate modem power and variations in gain and loss with temperature. They include the options listed in Table 3-6.

Caution The values in these four configuration tables vary with transmit frequency. If the transmit frequency is changed, the values in these tables must be reconfigured. Failure to keep the values in these tables in agreement with the transmit RF frequency may violate terms of the satellite lease contract.

Table 3-6 Power calibration and gain and loss variations with temperature

Use panel...	to configure...
DAC counts	L-band Tx (DAC counts) vs. exciter power (dBm). For configuring L-band transmit power calibration. Values are measured at the factory and noted on the as-shipped configuration sheet. • Power: any float number from –35.0 to +5.0. • Calibration: any float number from 0.0 to 1024.0.
L-band stability	L-band Tx relative gain (dB) vs. temperature (deg. C). For configuring L-band transmit gain variation with temperature. Values are measured at the factory and noted on the as-shipped configuration sheet. • Temperature: any float number from –40.0 to 60.0. • Gain: any float number from –1.0 to 1.0.
Tx IFL loss	Tx IFL loss (dB) vs. temperature (deg. C). For configuring Tx IFL loss variation with temperature. IFL—or InterFacility Link—refers to the cables between the SSPB and the Libra comms device. Values are measured at the factory and noted on the as-shipped configuration sheet. • Temperature: any float number from –40.0 to 60.0. • Loss: any float number from 0.0 to 20.0.

Table 3-6 Power calibration and gain and loss variations with temperature (Continued)

Use panel...	to configure...
SSPB gain	SSPB gain (dB) vs. temperature (deg. C). For configuring SSPB gain variation with temperature. A calibration sheet is provided by the SSPB manufacturer and is shipped with the SSPB. • Temperature: any float number from –40.0 to 60.0. • Gain: any float number from 35.0 to 60.0.

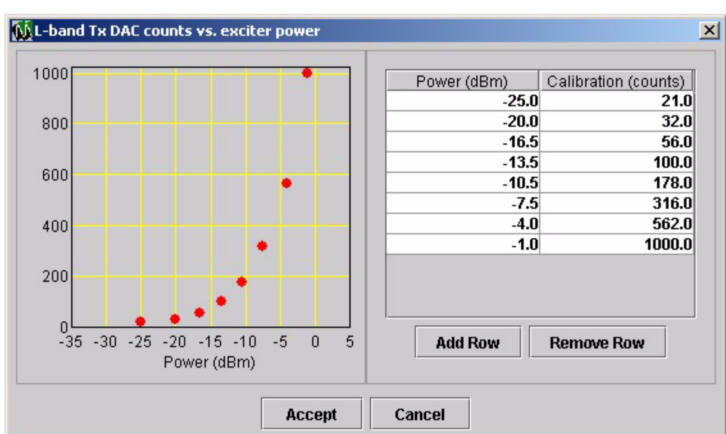
3.2.2.2.1 Change a modem configuration (Table Entry pop-up panels)

A Table Entry configuration pop-up panel contains an editable table of the current configuration values, and a graphic plot of the values listed in the table. The table uses the variable name as the column label. The graph is an X-Y plot, with the values in the first column of the table as the X values. It is automatically updated every time a pair of values is removed from the table.

1. Click the Table Entry button to launch the associated pop-up panel and enter the changes in the configuration table (for example, Figure 3-3 on page 40):
   - To add a new pair of values to the configuration, click Add Row. This creates a new row under the currently selected row. Edit the default values in the new row.
   - To remove a pair of data in the configuration, click Remove Row. This removes the selected row from the table.
2. Click in any other table cell to set the value that was edited last. The graph is updated automatically.
3. Click Accept to accept the current configuration and quit the pop-up window. This will save the values in the table as the new configuration and store it until the entire Libra configuration is submitted to the comms device. (To quit the pop-up panel without saving any changes in the configuration, click Cancel.)

   The new values are not used by the Libra comms device until you Submit and Commit the configuration (Section 3.1.1 on page 31).

Figure 3-3 Gain table general format



3.2.2.3 Libra network operation modes

A Libra comms device can operate in normal, loopback, or test mode (Table 3-7). These options are contained in the Operating section, and are selectable with tech access.

The system typically would be operating in Normal mode, for data transmission via the satellite link. Loopback mode is used to assure normal operation of a Libra comms device before an operator sets the system to Normal mode. Use Test mode to test a system; for example, during system upgrades.

Table 3-7 Libra system operating modes

Operating mode	Description
Normal	Use this mode for collecting data and transmitting it to the central site via the satellite link. The Libra transmits the data in burst mode.
Loopback	Use this mode to confirm normal operation of a Libra comms device before setting the system to Normal mode. The Libra transmits in burst mode via a local test loop (for example, a cable-attenuator-cable connection between RF IN and RF OUT). The modulator compensates for there being no satellite transmission delay. ▸ Use the appropriate Operating settings for the loopback test setup. For example, for a cable-attenuator-cable connection between RF IN and RF OUT, disable SSPB power and 10MHz output: 
Test	Use this mode only for system commissioning and troubleshooting tests; for example, for system upgrade or hardware replacement. The Libra transmits in continuous mode and the receiver searches for a carrier until it locks. See also Section 3.2.2.3.2, “Libra network test mode,” on page 42.

3.2.2.3.1 Operation options

Table 3-8 Libra operation options

Operation option	Description
10MHz output	Select this option to turn on the 10MHz reference output from the L-band transceiver to the SSPB. Deselect this option to turn off the 10MHz output. The 10MHz output is applied automatically when in Normal mode regardless of this setting.
SSPB power	Select this option to turn on the DC power supply to the SSPB. Deselect this option to turn off the DC power supply to the SSPB. DC power is applied automatically when in Normal mode regardless of this setting.

Warning Power may be applied momentarily on startup. Do not rely on deselecting this option to protect sensitive RF equipment.

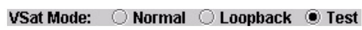
Table 3-8 Libra operation options (Continued)

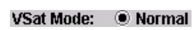
Operation option	Description
Option 3	To be implemented. An option for state-of-health update.

3.2.2.3.2 Libra network test mode

Caution The transmit frequency is not continuously corrected in Test mode. Transmitting to the satellite (10 MHz output and SSPB power enabled) in Test mode for a long duration may violate satellite lease constraints.

Use Test mode for checking operation of a system; for example, during system commissioning or upgrades. Changes to Test Mode options (Table 3-9) require tech access. To test a new configuration:

1. Click to select Test mode 

, configure the new settings, and then click Submit to send the test configuration to the Libra comms device.
2. Once the test result is satisfactory, switch to Normal mode:
   a) Switch the system operation mode from Test to Normal 

.
   b) Click Submit to send the configuration to the Libra comms device. To store the configuration in the instrument flash, click Commit (Section 3.1.1 on page 31).

Table 3-9 Libra test mode options

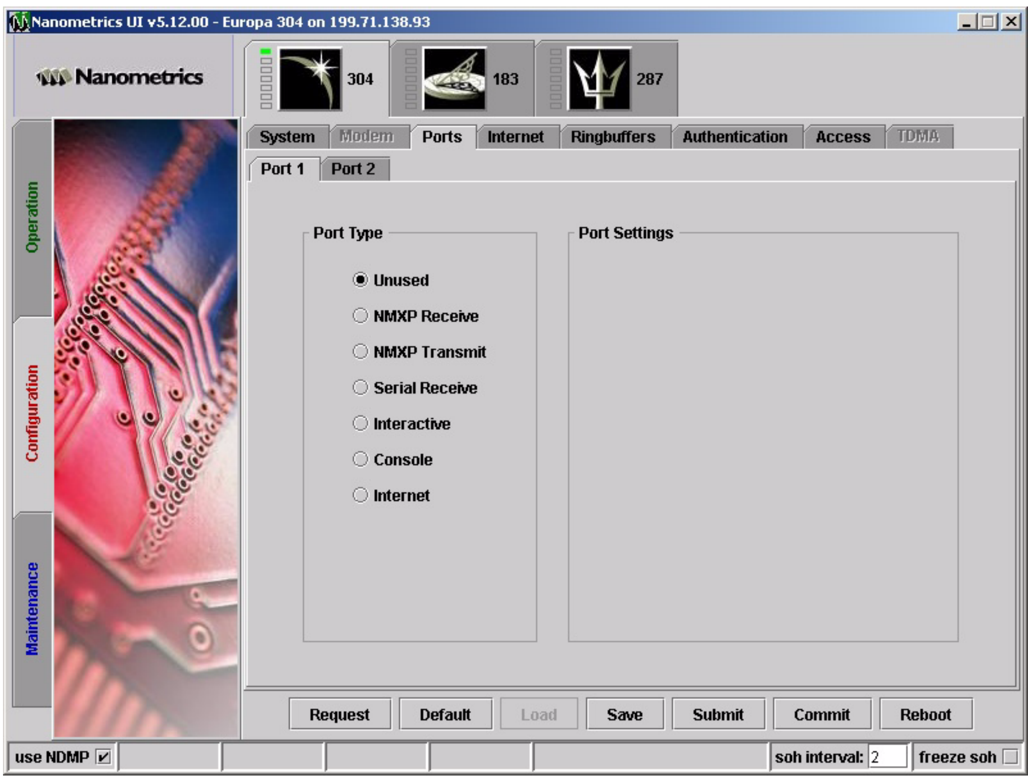
Test mode option	Description
Signal Level	The signal level used for the test. The units are dependent on the Level Type setting. • Possible values: any float number. Default is 0.0.
Level Type	The signal level type to be used for the test. This controls the unit in the Signal Level setting, and the range for valid Tx frequency and Rx frequency. • Options: EIRP (dBW), SSPB (dBm), L-band (dBm), and Raw (counts). The default is Raw (counts).
Tx frequency (MHz)	Test transmission frequency in megahertz. • Possible values: any positive float number. Default is 1200.0. • If Level Type is L-band or Raw, the frequency must be a valid L-band frequency in the range 950–1450 MHz. • If Level Type is EIRP or SSPB, the frequency must result in a valid L-band frequency in the range 950–1450 MHz after up-conversion by the SSPB LO frequency.
Rx frequency (MHz)	Test receiving frequency in megahertz. • Possible values: any positive float number. Default is 1200.0. • If Level Type is L-band or Raw, the frequency must be a valid L-band frequency in the range 950–1450 MHz. • If Level Type is EIRP or SSPB, the frequency must result in a valid L-band frequency in the range 950–1450 MHz after down-conversion by the LNB LO frequency.
Transmit Enabled	Select whether transmission should be on during the test. ▸ To set transmission on during the test, select this option ☑. ▸ To set transmission off during the test, deselect this option ☐.

Table 3-9 Libra test mode options (Continued)

Test mode option	Description
Modulation	Set the type of modulation used in transmission. • Options: None; BPSK, 32KB, 1/2FEC; QPSK, 64KB, 1/2FEC; QPSK, 96KB, 3/4FEC; QPSK, 112KB, 7/8FEC
Sweep enabled	Select whether the receiver should keep the sweeper enabled after it has locked or timed out.
Sweep Range (kHz)	The range in kilohertz to search for the received carrier centre frequency. • Possible values: any positive float number. Default is 300.0.

3.2.3 Ports

Figure 3-4 Configuration > Ports panel



The Ports panel (Figure 3-4) provides options to view and configure settings for the comms device serial data ports.

3.2.3.1 Configure a serial data port

There are seven configuration options for each of the serial data ports, including an option to leave the port unused (Table 3-10).

Note A Time Division Multiple Access (TDMA) scheme is provided with firmware versions 5.32 and higher, to allow deployment of Nanometrics instruments multiplexed in a radio network. The radio modems connect to the Nanometrics instruments through RS-232 serial links. The TDMA scheme is configured locally on each instrument. The relevant serial port types—NMXP Transmit, NMXP Receive, and Internet—have TDMA configuration parameters in the UI. These include frame length, slot duration, and slot start, and also broadcast for NMXP Receive. For an example radio network TDMA configuration, see Appendix B.

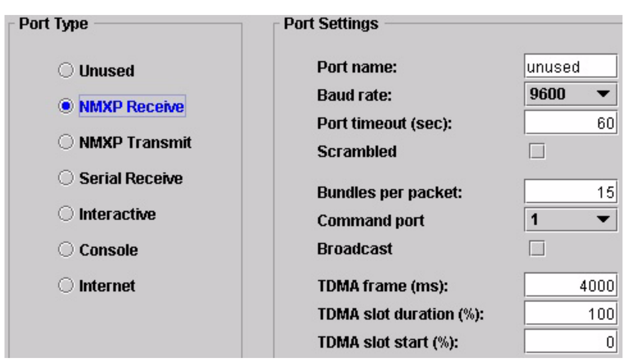
Table 3-10 Data port types

Data port type	Description
Unused	The port is not in use although it is available. • Port 1 is not available for Europa T and Janus with central timing, and Janus with external GPS.
NMXP Receive	The port receives data packets generated by a Nanometrics HRD-type digitiser and transmits command packets to the HRD. • On a Lynx or Europa digitiser with an integrated HRD, port 1 should be configured for NMXP Receive. • In some network configurations, the port may receive data from another Nanometrics comms device rather than a digitiser.
NMXP Transmit	The port transmits packets in Nanometrics format to NaqsServer, and receives command packets from NaqsServer. This port type supports RTS/CTS flow control on Port 2.*
Serial Receive	The port receives serial data in any format and forwards the data to NaqsServer as Nanometrics format packets.
Interactive	The port supports an interactive connection via Telnet.
Console	The port is used as a console for debugging or monitoring.
Internet	For firmware v5.80 and higher, and UI v5.13 and higher: The port is configured to carry data and commands via Serial Link Internet protocol (SLIP). You must also configure the IP address of the port (see Section 3.2.4, “Internet,” on page 49). This port type supports RTS/CTS flow control on Port 2*.

* This requires a cable to route the RTS/CTS signals to Port 2. Port 1 will not be available in this mode.

3.2.3.1.1 NMXP Receive

Figure 3-5 NMXP Receive data port options



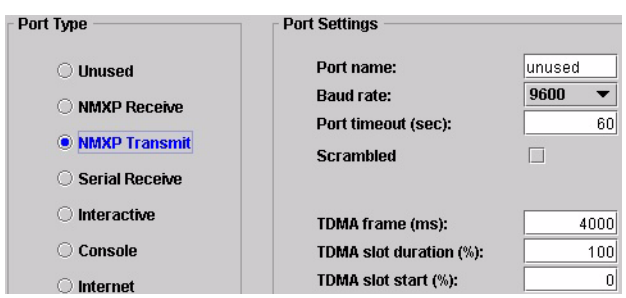
Note On a Lynx or Europa digitiser with an integrated HRD, port 1 should be configured for NMXP Receive.

Table 3-11 NMXP Receive configuration parameters

Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.
Scrambled	Defines whether the data are scrambled during transmission. This implementation of scrambling is used only for an older-generation radio. • Checked box indicates scrambled. Default is not scrambled.
Bundles/packet	The maximum number of data bundles per data packet. • Possible values: any integer from 1 to 28. Default is 15.
Command port	The port on which to forward commands to instruments that are sending data to this port. Typically, this is set to the same port number as the port that is being configured.
Broadcast	Defines whether this port is used to transmit retransmission requests from the central site to all remotes. • Select ☑ to set the port to broadcast retransmission requests. Default is to not broadcast ☐.
TDMA frame (ms)	The TDMA frame length in milliseconds. • Possible values: any integer from 1000 to 10000. Default is 4000.
TDMA slot duration (%)	The TDMA slot duration as percent of frame length. • Possible values: any integer from 0 to 100. Default is 100.
TDMA slot start (%)	The TDMA slot start as percent mark within frame length. • Possible values: any integer from 0 to 100. Default is 0.

3.2.3.1.2 NMXP Transmit

Figure 3-6 NMXP Transmit data port options



Notes:

1) Only one port can be selected as an NMXP Transmit port in a system.

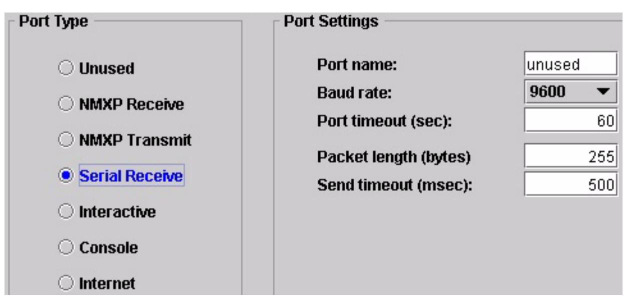
2) This port type supports RTS/CTS flow control on Port 2. This requires a cable to route the RTS/CTS signals to Port 2. Port 1 will not be available in this mode.

Table 3-12 NMXP Transmit data port configuration parameters

Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.
Scrambled	Defines whether the data are scrambled during transmission. This implementation of scrambling is used only for an older-generation radio. • Checked box indicates scrambled. Default is not scrambled.
TDMA frame (ms)	The TDMA frame length in milliseconds. • Possible values: any integer from 1000 to 10000. Default is 4000.
TDMA slot duration (%)	The TDMA slot duration as percent of frame length. • Possible values: any integer from 0 to 100. Default is 100.
TDMA slot start (%)	The TDMA slot start as percent mark within frame length. • Possible values: any integer from 0 to 100. Default is 0.

3.2.3.1.3 Serial Receive

Figure 3-7 Serial Receive data port options



- When you configure a Serial Receive port, also configure the retransmission buffer to store the recent serial data packets. (See Section 3.2.5, "Ringbuffers," on page 53)

Table 3-13 Serial Receive data port configuration parameters

Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.
Packet length (bytes)	The number of data bytes in each packet. The comms device sends the data to Naqs when it has received enough data to fill a defined packet. • Possible values: any integer from 100 to 476.
Send timeout (msec)	The maximum idle time to wait in milliseconds before forwarding a partially filled packet to Naqs. • Possible values: any integer from 100 to 10000.

3.2.3.1.4 Interactive (Telnet)

Figure 3-8 Interactive data port options

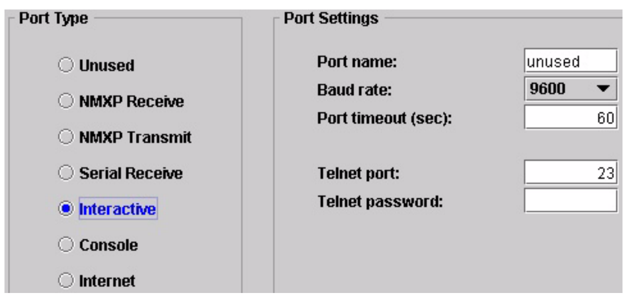


Table 3-14 Interactive connection data port options

Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.
Telnet port	The TCP port used for establishing a TCP connection. • Possible values: any integer from 0 to 99999. Default is 23 (standard Telnet port).
Telnet password	The password used for remote TCP connection. • Possible values: any string of 1 to 25 characters.

3.2.3.1.5 Console (configuration)

Figure 3-9 Console data port options

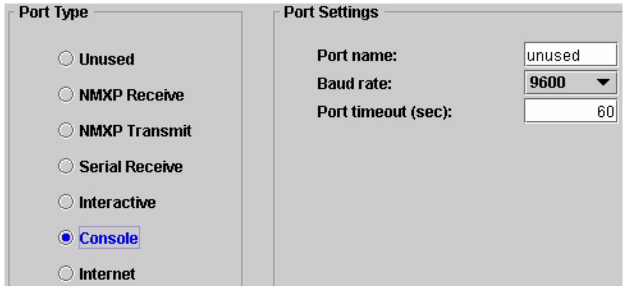
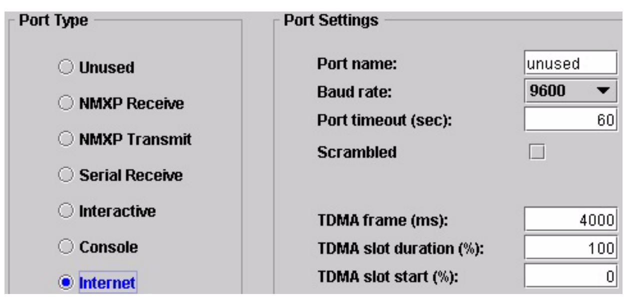


Table 3-15 Console data port configuration parameters

Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.

3.2.3.1.6 Internet

Figure 3-10 Internet data port options



Note This port type supports RTS/CTS flow control on Port 2. This requires a cable to route the RTS/CTS signals to Port 2. Port 1 will not be available in this mode.

Table 3-16 Internet data port configuration parameters

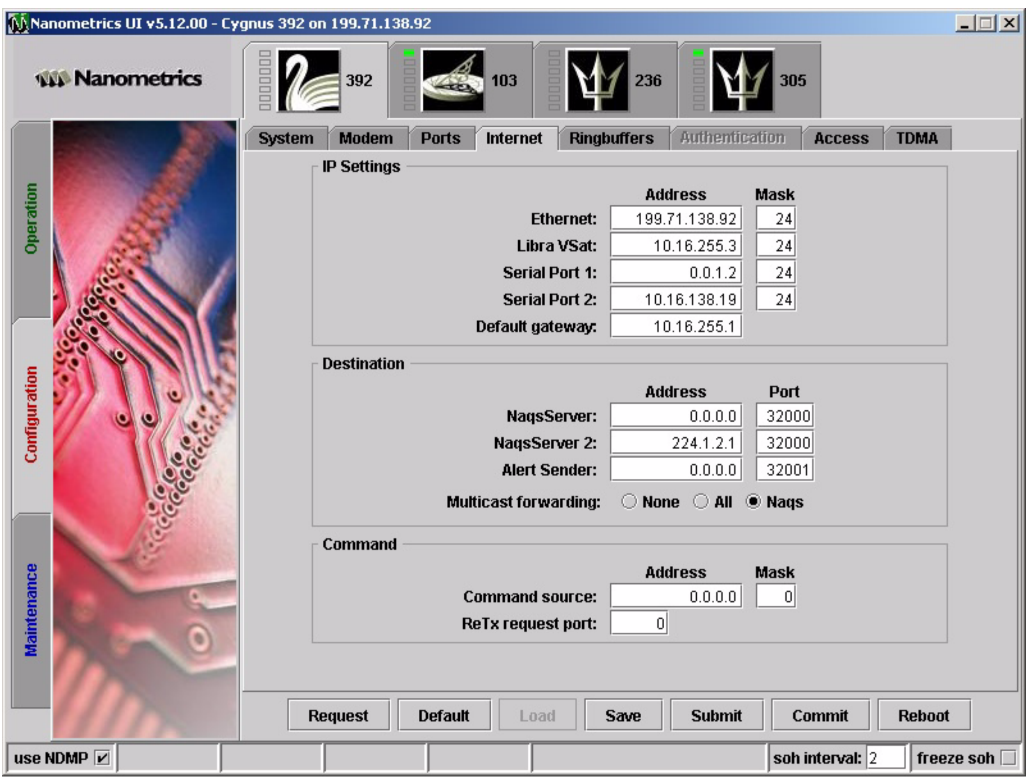
Parameter	Description
Port name	The name of the port. • Possible values: any string of 1 to 25 characters.
Baud rate	The baud rate of the port. • Options: standard rates from 1200 to 57600. Default is 9600.

Table 3-16 Internet data port configuration parameters (Continued)

Parameter	Description
Port timeout (sec)	The receive timeout in seconds. If no data are received on the port for this period of time, the port will be rebooted. • Possible values: any integer from 1 to 999. Default is 60.
Scrambled	Defines whether the data are scrambled during transmission. This implementation of scrambling is used only for an older-generation radio. • Checked box indicates scrambled. Default is not scrambled.
TDMA frame (ms)	The TDMA frame length in milliseconds. • Possible values: any integer from 1000 to 10000. Default is 4000.
TDMA slot duration (%)	The TDMA slot duration as percent of frame length. • Possible values: any integer from 0 to 100. Default is 100.
TDMA slot start (%)	The TDMA slot start as percent mark within frame length. • Possible values: any integer from 0 to 100. Default is 0.

3.2.4 Internet

Figure 3-11 Configuration > Internet panel



The Internet panel (Figure 3-11) provides options to view and modify the IP network configuration of the comms device. Settings are editable by a user with tech access, and can be viewed by any user. Options are grouped into three sections: IP Settings, Destination, and Command.

Address conventions:

- IP addresses are in dotted decimal format (four octets separated by periods). For example, 129.3.14.3. Valid addresses depend on whether you select unicast or multicast:
  - unicast – The first octet can be any positive integer from 1 to 223; each of the last three octets can be any positive integer from 0 to 255.
  - multicast – The first octet must be between 224 and 240, inclusive; each of the last three octets can be any positive integer from 0 to 255.
- Network masks are expressed as mask widths. The mask width indicates the number of bits, starting at the left of the 32-bit IP address and working right, that are the defining bits for the mask. The remaining bits are not constrained. For example:

  16 = 255.255.0.0

  24 = 255.255.255.0

  28 = 255.255.255.240

3.2.4.1 IP Settings

Note To change the IP address of a comms device, both the device and the computer running the UI must be on the same IP subnet. If you Submit a new IP address that is on a different subnet, the comms device will no longer be accessible by the computer that is running the UI. In this case, change the computer IP address and log on again to the comms device.

Table 3-17 LAN subnet configuration parameters

Parameter	Description
Ethernet Address	The IP address for the LAN interface of the comms device. • Possible values: any valid unicast IP address. • For a Libra comms device, the Ethernet IP address and the Libra VSAT IP address cannot belong to the same network defined by the network masks.
Libra VSAT Address	The IP address for the VSAT interface of the Libra comms device* (not used for Callisto networks). • Possible values: any valid unicast IP address. • The Libra VSAT IP address and the Ethernet IP address cannot belong to the same network defined by the network masks.
Serial Port 1 Address	The IP address of serial port 1. Only valid if the port is configured as an IP interface (see Section 3.2.3.1.6, “Internet,” on page 48). • Possible values: any valid unicast IP address. • On Cygnus instruments the third octet of the IP address must be the same as that of the LAN port, for proper HDLC address filtering.
Serial Port 2 Address	The IP address of serial port 2. Only valid if the port is configured as an IP interface (see Section 3.2.3.1.6, “Internet,” on page 48). • Possible values: any valid unicast IP address. • On Cygnus instruments the third octet of the IP address must be the same as that of the LAN port, for proper HDLC address filtering.
Mask	Network mask used for the relevant IP interface of the comms device. • Possible values: any integer from 0 to 32.

Table 3-17 LAN subnet configuration parameters (Continued)

Parameter	Description
Default gateway	The address to which all IP packets are sent if they cannot be routed locally. • Possible values: any valid unicast IP address on the Ethernet, Libra, or serial port subnets. • For Libra network Cygnus and Lynx, this typically will be the Libra IP address of the Carina hub. For Carina it typically will be the address of a router which connects the Carina LAN to an external network or the Internet.

* Recommended IP configuration for VSAT networks is provided in Appendix A.

3.2.4.2 Destination

A Naqs station is a central or remote data acquisition computer, and is the destination to which the comms device sends time series and state-of-health data via an Internet connection. The comms device listens for requests for data retransmission; the Naqs station sends a retransmission request if it detects that data are missing.

Libra remote comms devices support unicast and multicast of data and alert messages. Other comms devices support unicast only. NaqsServer destination routes:

- If the NaqsServer is a unicast address on the LAN subnet, packets to Naqs will be sent via LAN.
- If the NaqsServer is a unicast address on the Libra subnet, packets to Naqs will be sent via VSAT.
- If the NaqsServer is a unicast address which is not on either the LAN or the Libra subnet, or if the Naqs IP is a multicast address, then Naqs data will be sent via the default gateway (which may be on either the LAN or the Libra subnet).

Caution Configuring a Cygnus to send to two different Naqs addresses over the VSAT network will require double the bandwidth. When possible, it is better to use multicast if you wish to receive data at multiple destinations.

Table 3-18 Destination configuration parameters

Parameter	Description
NaqsServer Address	The IP address of the Naqs acquisition computer. • Possible values: any valid unicast or multicast IP address. Use 0.0.0.0 to indicate not in use.
NaqsServer 2 Address	The IP address of a second Naqs acquisition computer.* • Possible values: any valid unicast or multicast IP address. Use 0.0.0.0 to indicate not in use.
NaqsServer Port	The port number on which the Naqs server listens for data (must agree with the `Naqs.ini` [NetworkInterface] configuration). • Possible values: any integer from 0 to 65535. Default is 32000.
NaqsServer 2 Port	The port number on which a second Naqs server listens for data (must agree with the `Naqs.ini` [NetworkInterface] configuration). • Possible values: any integer from 0 to 65535. Default is 32000.

Table 3-18 Destination configuration parameters (Continued)

Parameter	Description
Alert Sender Address	The IP address of the destination that receives the alert messages. The destination could be a message handler or forwarder such as one computer running AlertMailer. • Possible values: any valid unicast or multicast IP address. Use 0.0.0.0 to indicate not in use.
Alert Sender Port	The port to which the comms device sends alert messages. • Possible values: any integer from 0 to 65535. Default is 31000.
Multicast forwarding	Libra comms devices only. Select which multicast packets received on the remote LAN interface are to be forwarded via the satellite link: Either unicast data to one or more acquisition systems, or multicast data to a Naqs class address or to all multicast addresses in the network. • Options: • None – No multicast forwarding. • All – Forward all multicast packets received on the remote LAN to the central Carina. Ensure that the remote LAN does not contain unexpected multicast packets. • Naqs – Forward only multicast packets which are addressed to the Naqs multicast address. The NaqsServer address must be a multicast IP address to enable this option.

* NaqsServer 2 is an option for a second Naqs server destination, supported in these versions and higher: firmware version 5.70, UI version 5.10.

3.2.4.3 Command

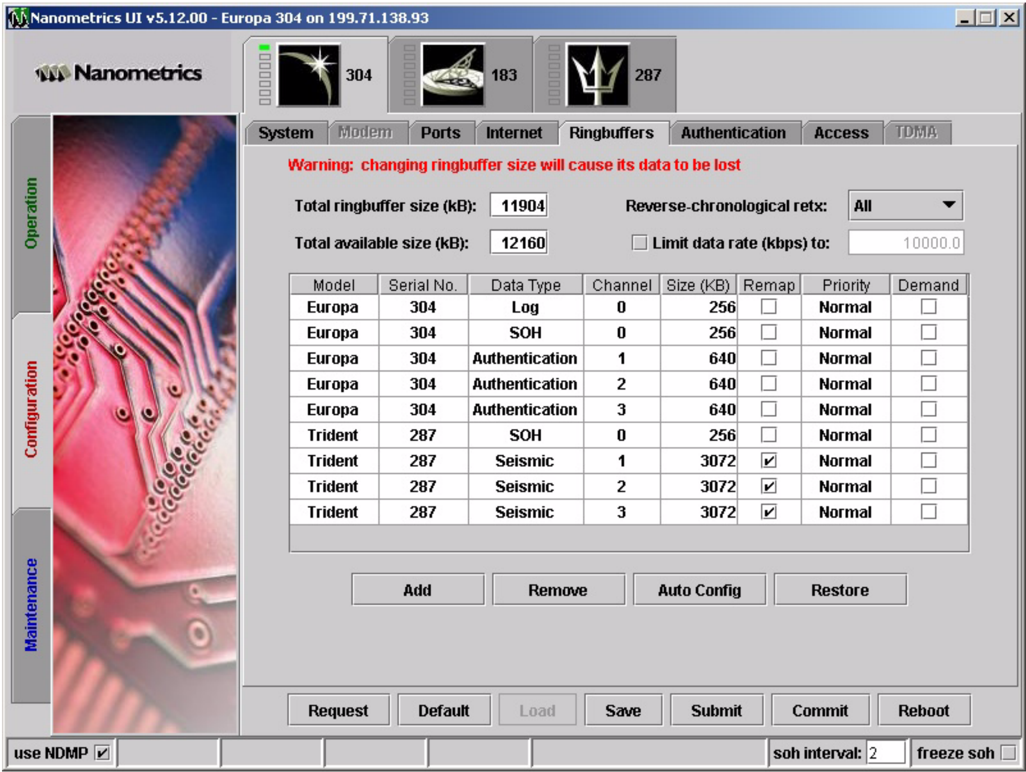
The comms device listens for calibration commands from a designated Naqs server, or from computers on a designated subnetwork.

Table 3-19 Command configuration parameters

Parameter	Description
Command source Address	The IP address from which calibration and key management commands are accepted. Together with the command source Mask, it points to the IP address of either a specific NaqsServer or a network subnet.
ReTx request port	The port number for the outbound data link, used by the system to listen for retransmit requests sent by Naqs. • Possible values: any integer from 0 to 65535. Default is 0 which requires Naqs to determine dynamically the address and port from which the comms device is sending. • To access a Europa from the KMConsole, this parameter must be set to a non-zero value, typically 32000. ▸ When using ReTx request port = 0, in the `Naqs.stn` file set the [ChannelPrototype] *InetHostName* = Dynamic for this instrument.
Mask	Network mask for the command source. • Possible values: any integer from 0 to 32. ▸ To set the comms device to accept commands only from the single IP address specified in command address, set Mask = 32. ▸ To set the comms device to accept commands from any machine on the subnet containing the command address, set Mask = 24. ▸ To set the comms device to accept commands from any IP address, set Mask = 0.

3.2.5 Ringbuffers

Figure 3-12 Configuration > Ringbuffers panel



The Ringbuffers panel (Figure 3-12) provides options to view and configure settings for ringbuffers required by the system. These include ringbuffers for time-series data, instrument log messages, SOH information, buffered serial port data, and authentication data. A user with tech access can add, remove, automatically configure, and restore ringbuffers. Any user can view the current ringbuffer settings.

The Ringbuffer panel shows general parameters at the top, and a table to configure individual ringbuffers.

Note The ringbuffer table will always contain the Log and the SOH ringbuffers as the first two ringbuffers for the system.

3.2.5.1 General ringbuffer parameters

The general parameters apply to each of the individual ringbuffers (Section 3.2.5.2).

Table 3-20 General ringbuffer parameters

Parameter	Description
Total ringbuffer size (kB)	Read only. The total size of all individual ringbuffers that are listed in the table. ▸ Red text indicates that the total size of all ringbuffers exceeds the available hardware buffer size. Reduce the size of individual ringbuffers as necessary.

Table 3-20 General ringbuffer parameters (Continued)

Parameter	Description

Total available size (kB)	Read only. The maximum available hardware buffer size in kilobytes.
	• Note the location of the available memory varies:
	  • If this value is 2048 or less the ringbuffers are maintained in SRAM and will not be recovered following a reboot.
	  • If this value is greater than 2048, the ringbuffer is in flash and the contents can be recovered following a reboot.
	• “Total available size” does not include the ringbuffer contained in an internal HRD for Lynx or Europa.

Reverse-chronological retx	The packet age threshold for retransmission of recent versus old data packets: Packets more recent than this threshold have higher priority than packets older than this threshold. This applies when there are many data gaps; for example, after a large event.
	If the system is intended to build a complete data set in Naqs, configure it to fill the oldest gaps first, before older packets are overwritten in the remote buffer (for example, select None). If it is intended for use of near-real-time data, configure it to fill recent gaps first (for example, select 5 minutes).
	The data are retransmitted on receipt of the Retx request from Naqs.
	• Options:
	  • None – All requested packets are retransmitted in chronological order.
	  • 5 minutes – The requested packets for the previous 5 minutes are retransmitted in reverse-chronological order. Other requested packets are retransmitted in chronological order.
	  • 20 minutes – The requested packets for the previous 20 minutes are retransmitted in reverse-chronological order. Other requested packets are retransmitted in chronological order.
	  • 60 minutes – The requested packets for the previous 60 minutes are retransmitted in reverse-chronological order. Other requested packets are retransmitted in chronological order.
	  • All – All requested packets are retransmitted in reverse-chronological order.

Limit data rate (kbps) to	The maximum data rate for the inbound link (remote site to Naqs) in kilobits per second. This is required only if some part of the inbound link has a lower bandwidth than that supported by the instrument output port (for example, if the Ethernet output is routed over a serial line). • Possible values: any float number between 1.2 and 10000.0.

Caution Do not use this option for Libra networks; Libra automatically limits the data throughput to match the assigned TDMA throughput.

3.2.5.2 Individual ringbuffer parameters

Warning Changing the ringbuffer size will cause the data currently stored in the ringbuffer to be lost.

Table 3-21 Individual ringbuffer parameters

Parameter	Description
Model	The instrument model (for example, Cygnus, Trident).
Serial No.	The serial number of the instrument.
Data Type	The data type to be stored in the ringbuffer. • Supported data types: Seismic, SOH, Log, Serial, Authentication. (Use Seismic for any type of time-series data, for example wind speed, and define the channels as appropriate in the `Naqs.stn` file.)
Channel	The channel number of the data to be stored in the ringbuffer. • For Log and SOH ringbuffers, the channel number is not applicable. • For buffered serial ports, set Channel = the serial port number (see also Section 3.2.3.1.3, “Serial Receive,” on page 46).
Size (KB)	The allocated size for this ringbuffer in kilobytes.
Remap	Select this option to relabel data packets from this channel with the instrument ID of the host comms device. With Remap enabled, the Trident serial number is irrelevant to Naqs; this allows you to connect a different Trident without having to edit the Naqs.stn file. • This works with 1 Trident per comms device. ▸ If Trident seismic data is remapped, also remap its SOH information to enable sensor calibration.

Priority	The transmission priority of the packets in this ringbuffer.
	• Options: High, Normal, Low.
	  • High priority data will be transmitted when the link capacity is available.
	  • Normal priority data will be transmitted when the link is not completely filled with High priority traffic.
	  • Low priority data will be transmitted when the link is not completely filled with High or Normal priority traffic.
	This ranking is within the overall priority hierarchy by data type, where all real-time packets rank higher than any retransmission packets, and recent retransmission packets rank higher than any old retransmission packets. Packet types without ringbuffers—for example, key management responses (highest priority) and HRD seismic data—are included in the overall priority hierarchy but their ranking is not configurable.

Demand	Send data on demand only. For example, use this option if you want to collect both broadband and accelerometer data, with broadband sent continuously and accelerometer data sent only on demand. ▸ To save data on the remote system only, select this option ☑. ▸ To save data on the remote system and send it to the central acquisition system, deselect this option ☐.

3.2.5.3 Add or remove a ringbuffer

With tech access, you can add and configure a new ringbuffer, remove existing ringbuffers, automatically configure the ringbuffer table, and restore the information in the ringbuffer table, using the function buttons at the bottom of the panel.

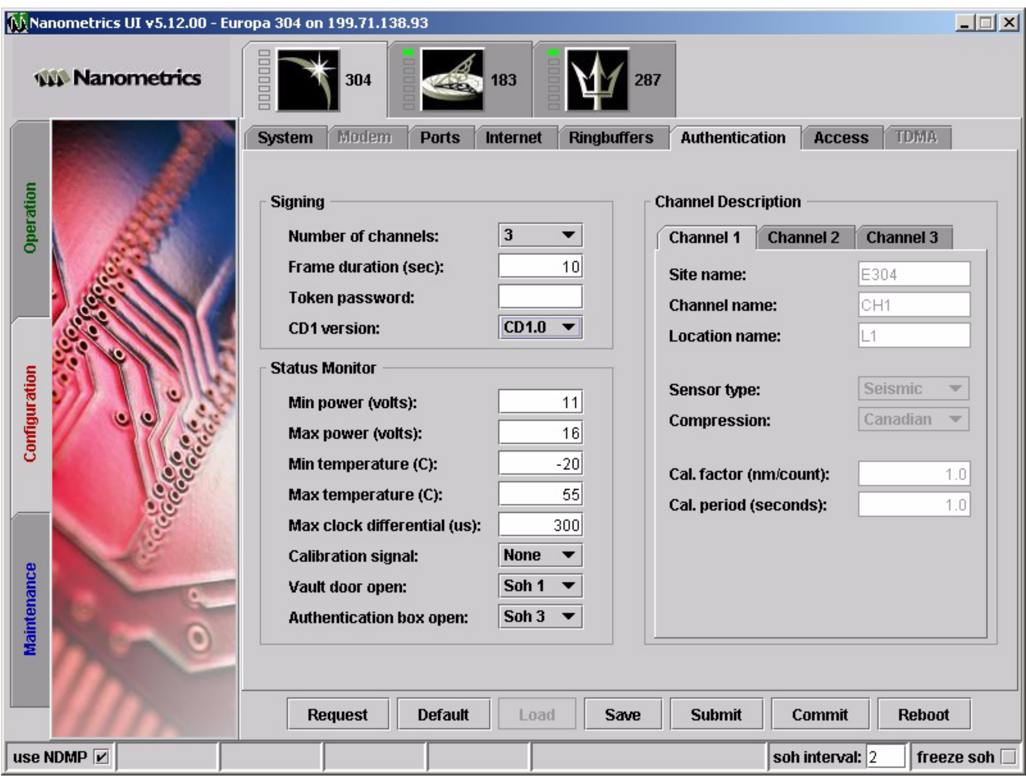
Table 3-22 Ringbuffer options

Option	Description
Add	Create a new ringbuffer. ‣ Click Add to create a new ringbuffer entry at the end of the table. Initial default values are a copy of the previous ringbuffer in the table. Edit the ringbuffer description using the options listed in Table 3-21.
Remove	Delete the selected ringbuffer. (The comms device Log and SOH ringbuffers are not removable.) ‣ Click in the table row to select the ringbuffer to be removed, and then click Remove.
Auto Config	Automatically configure all ringbuffers for the system. Auto Config reallocates the available space to ringbuffers as required—for example, for connected Tridents and defined authentication channels. ‣ Click Auto Config to automatically configure all possible ringbuffers for the system.
Restore	Apply the back-up configuration from the instrument flash. ‣ Click Restore to apply the backed-up configuration of the ringbuffers.

3.2.6 Authentication

The Authentication panel is available only for comms devices equipped with the authentication option.

Figure 3-13 Configuration > Authentication panel



Some units (Europa/EuropaT) can provide authenticated (signed) data in formats compatible with the CD1.*x* continuous data formats. (These include the formats for CD1 as defined in IDC document 3.4.2 (May 1998), and CD1.1 as defined in IDC document 3.4.3 Rev 0.2 (December 2001).) Each CD1 subframe contains a fixed duration of seismic data for a single channel, plus a header containing the time-stamp, status information, and a digital signature. Data are signed using an onboard security token. The subframe headers are sent to Naqs as generic serial data packets.

If the authentication option is installed, Authentication panel options (Figure 3-13) are editable by a user with tech access (see also the NmxToCD1 and NmxToCD11 user guides). Settings can be viewed by any user. Options are grouped into three sections: Signing, Status Monitor, and Channel Description. One or more channels must be selected to allow editing of options.

- To turn off the authentication system, set Number of channels = 0.

3.2.6.1 Signing

- When you add one or more signed channels, also configure the retransmission buffers to store the recent authentication packets. (See Section 3.2.5, “Ringbuffers,” on page 53)

Table 3-23 Data signing configuration parameters

Parameter	Description
Number of channels	The number of data channels to sign. The authentication system is activated if one or more channels is selected for signing, and deactivated if 0 channels is selected. • Options: 0, 1, 2, 3.
Frame duration (sec)	The CD1 frame duration in seconds. • Possible values: any integer from 1 to 100. Default is 10.
Token password	The password to log in to the security token as a user. • Possible values: any text string of 4 to 25 characters. ▸ When changing the token password, Commit immediately after Submit to ensure that the correct key pair is generated after reboot.
CD1 version	Supported versions of CD1. • Options: CD1 (per IDC document 3.4.2 (May 1998)), CD1.1 (per IDC document 3.4.3 Rev 0.2 (December 2001))

3.2.6.2 Status Monitor

Table 3-24 Status Monitor parameters*

Parameter	Description
Min power (volts)	The minimum power supply voltage for the normal operation range. The status bit will be set for frames during which the voltage is outside the normal range.
Max power (volts)	The maximum power supply voltage for the normal operation range. The status bit will be set for frames during which the voltage is outside the normal range.

Table 3-24 Status Monitor parameters* (Continued)

Parameter	Description
Min temperature (C)	The minimum temperature in degrees Celsius for the normal operation range. The status bit will be set for frames during which the temperature is outside the normal range.
Max temperature (C)	The minimum temperature in degrees Celsius for the normal operation range. The status bit will be set for frames during which the temperature is outside the normal range.
Max clock differential (us)	The allowed maximum clock differential in microseconds. The status bit will be set if the estimated clock differential exceeds this value.
Calibration signal	Select the external SOH channel to be used for monitoring the calibration signal†. Select None to disable monitoring of calibration.
Vault door open	Select the external SOH channel to be used for monitoring whether the vault door is opened†. Select None to disable vault door monitoring.
Authentication box open	Select the external SOH channel to be used for monitoring whether the authentication box is opened†. Select None to disable monitoring of authentication door.

* The CD-1 formats provide a field within each channel subframe to define the channel status for the current frame. Each Status Monitor parameter defines the value that will set the appropriate status bit when that value or range is exceeded.

† Ensure that the SOH calibration and offset are scaled appropriately for the SOH channel. (See also Section 3.2.1.3, “External SOH calibration,” on page 37.)

3.2.6.3 Channel Description

For authentication using CD-1.1, there is a Channel Description panel for each configured authentication channel.

Table 3-25 Status Monitor parameters

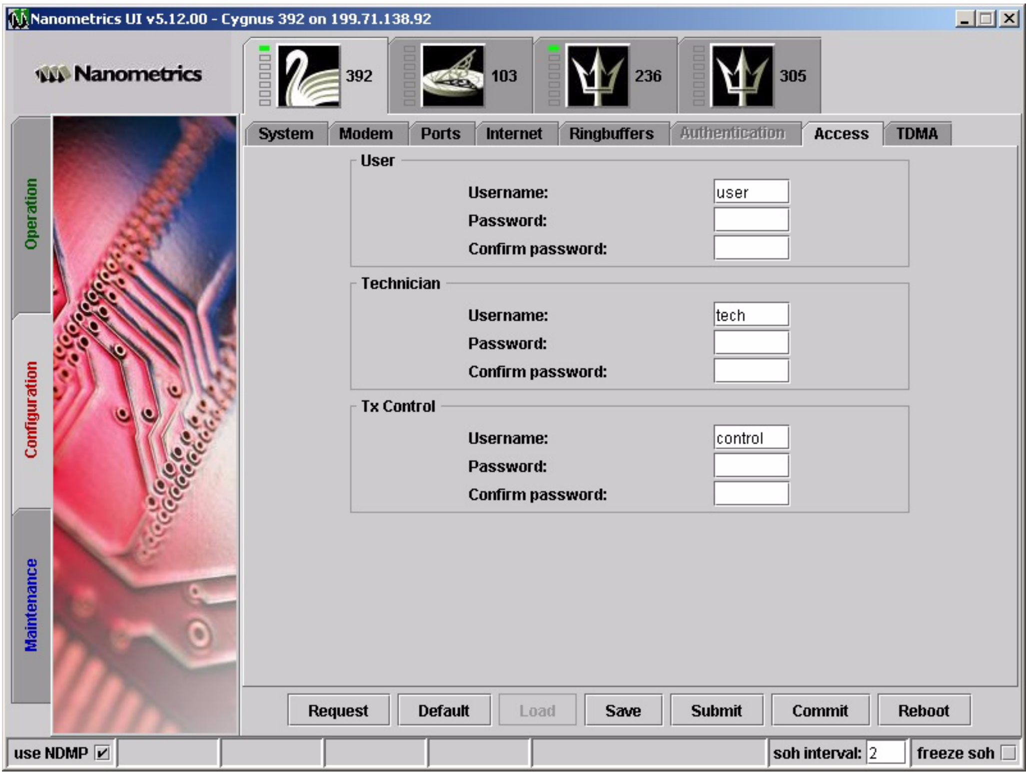
Parameter	Description
Site name	The location of the specific sensor. • Possible values: any string of 1 to 5 characters.
Channel name	The FDSN channel name. • Possible values: any string of 1 to 3 characters.
Location name	The FDSN location name. • Possible values: any string of 0 to 2 characters.
Sensor type	• Options: Seismic, Hydroacoustic, Infrasonic, Weather, Other.
Compression	• Options: None (4-byte IEEE integers), Canadian (a second-difference compression format).
Cal. factor (nm/count)	The ground motion in nanometres per digital count at the defined calibration period. • Possible values: any float number.

Table 3-25 Status Monitor parameters (Continued)

Parameter	Description
Cal. period (seconds)	The period in seconds at which the calibration factor is valid. • Possible values: any float number.

3.2.7 Access

Figure 3-14 Configuration > Access panel



The Access panel (Figure 3-14) provides options to view and modify settings that allow a user to log in to a comms device via the Nanometrics UI, and the level of access granted to view or configure other settings for the comms device once logged in.

The configuration panels have the same parameters (Table 3-26) for each levels of user access:

- User – user access; can view system operation and configuration settings, and change User access settings.
- Technician – tech access; can change network instrument settings and upload new software, and modify User, Technician, and Tx Control access settings.
- Tx Control – For Libra networks only; allows the satellite provider to enable or disable the network transmission over the satellite link.

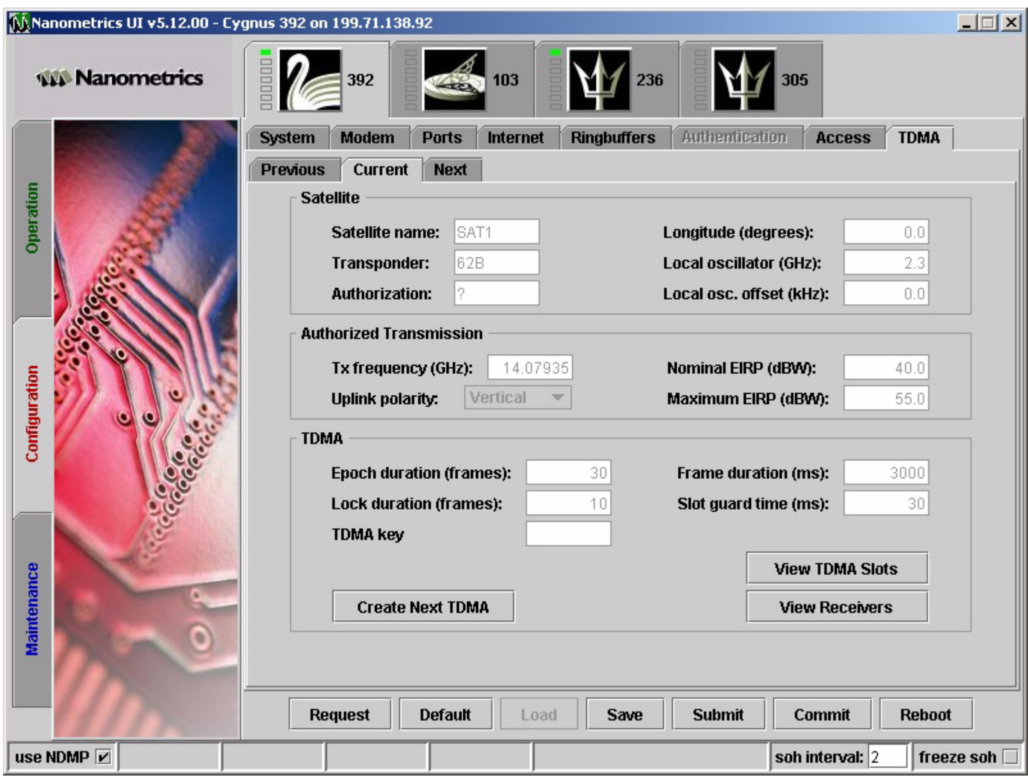
Table 3-26 Access configuration parameters

Parameter	Description
Username	▸ Type in the user name to log on to the instrument at this access level. • Possible values: any text string of 1 to 25 characters.
Password	▸ Type in the password to log on to the instrument at this access level. • Possible values: any text string of 1 to 25 characters.
Confirm password	▸ Type in the password to confirm after changing the password.

3.2.8 TDMA

The TDMA panel is available only for Libra comms devices.

Figure 3-15 Configuration > TDMA panel



The TDMA panel (Figure 3-15) provides options to view and modify settings for the time division multiple access (TDMA) configuration of the satellite carrier for the Libra network hub. With user access, you can review the settings for the previous and current TDMA configurations. With tech access, you can view settings, restore a default configuration, and submit a new TDMA configuration. The configuration parameters are grouped into three main sections: Satellite, Authorized Transmission, and TDMA.

For a typical Libra network, the Carina Hub sets the TDMA configuration for the entire network: Once communication between the hub and the remote is established, the basic TDMA configuration for the remote is replaced by the configuration sent by the hub. The remote is not allowed to update the TDMA configuration as long as it receives the TDMA configuration from the hub. Once the network is running, you can add or remove remotes from the TDMA configuration, or reassign bandwidth within the existing configuration as needed. (See also the Libra Satellite Network Reference Guide.)

3.2.8.1 TDMA parameters

There are three TDMA panels: Previous, Current, and Next. Previous and Current are read-only. You can refresh the information before creating the next TDMA:

- Under the Configuration > TDMA > Current tab, click Request to update the TDMA information in the UI.

3.2.8.1.1 Satellite

Table 3-27 TDMA satellite configuration parameters*

Parameter	Description
Satellite name	The name of the satellite. • Possible values: any string of 1 to 20 characters.
Authorization	The authorization number assigned to the satellite transmission. • Possible values: any string.
Transponder	The number of the satellite transponder. • Possible values: any string of 1 to 3 characters.
Longitude (degrees)	The longitude of the satellite. • Possible values: any float number from –180.0 to 180.0. East is positive.
Local oscillator (GHz)	The centre frequency of the satellite local oscillator in gigahertz. • Possible values: any float number from 1.0 to 4.0.
Local osc. offset (kHz)	The satellite local oscillator offset in kilohertz. • Possible values: any float number from –20000.0 to 20000.0.

* Obtain the correct values for these parameters from your satellite lease.

3.2.8.1.2 Authorized Transmission

Table 3-28 Authorized transmission configuration parameters*

Parameter	Description
Tx frequency (GHz)	The authorized transmission frequency in gigahertz from the antenna to the satellite. • Possible values: any float number from 4.5 to 14.5.
Uplink polarity	The uplink polarization of the satellite. • Possible values: Vertical, Horizontal.
Nominal EIRP (dBW)	The nominal uplink EIRP operating level in dBW. • Possible values: any float number from 30.0 to 60.0.

Table 3-28 Authorized transmission configuration parameters* (Continued)

Parameter	Description
Maximum EIRP (dBW)	Maximum EIRP level in dBW allowed by the satellite operator. • Possible values: any float number from 30.0 to 60.0.

* Obtain the correct values for these parameters from your satellite lease.

3.2.8.1.3 TDMA settings

Table 3-29 TDMA configuration parameters

Parameter	Description

TDMA key	The TDMA key identifies the TDMA table in a password-like fashion. It is used by the secondary hubs and the remotes to verify a TDMA table received from an instrument other than an eligible hub.
	• Possible values: any string.
	  • When submitting the TDMA table to the master hub, this field can be left empty, in which case the previous key is used. If a key is specified, it overwrites the previous key. The new key will be distributed to the secondary hubs and the remotes.
	  • When submitting the TDMA table to the secondary hubs or remotes, the key submitted must match the key last received from the master hub.

Frame duration (msec)	The duration of a frame in milliseconds. During this interval, the hub(s) and the remote stations each get a turn to transmit one burst. This value is the limit for the total time used by all transmitting slots: Any change in this field will result in the recalculation of the slot length times in the TDMA table. It is configured at a hub. • Possible values: any integer from 1000 to 10000.
Epoch duration (frames)	The number of frames in one epoch. The product of this value and the frame duration defines the time duration of the epoch. It is configured at a hub. • Possible values: any integer from 20 to 400.
Slot guard time	The guard time in milliseconds between adjacent slots, to eliminate overlap in data transmission. • Possible values: any integer from 30 to 500.
Lock duration (frames)	The number of frames at the end of the epoch during which the hub starts using the last submitted Next TDMA configuration. The lock duration is the product of the frame duration and the value here. In this time interval, the hub does not accept any updates in the TDMA configuration submitted by any client. This allows each remote station to receive exactly the same TDMA configuration the hub is going to switch to. It is configured at a hub. • Possible values: any integer from 10 to 200.

3.2.8.2 Set TDMA slots and receivers for a new TDMA configuration

Note If there is a difference between the parameter value range given here and that defined in the as-shipped configuration sheets, use the range defined in the as-shipped sheets as these reflect the requirement of the specific network.

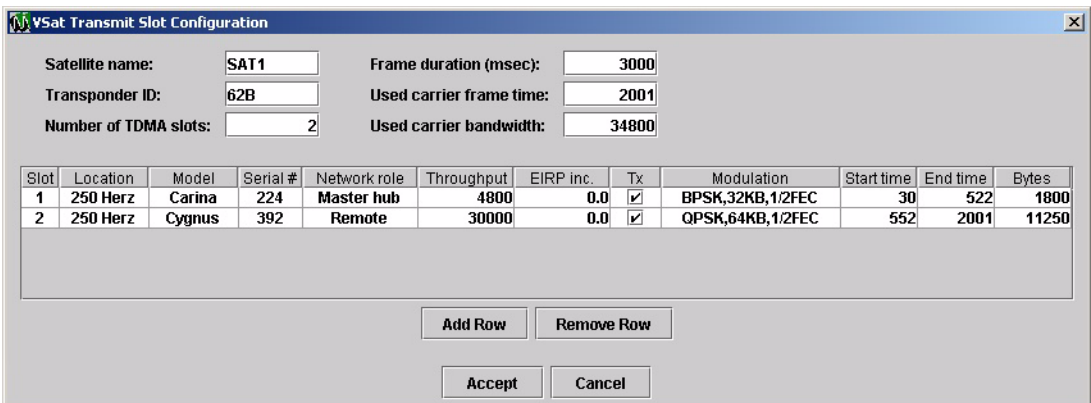
To create a new TDMA configuration:

- Click Create Next TDMA in either the Previous or the Current panel, and edit the settings as needed. (The default new values are a copy of the settings from the Previous/Current panel).

As in the case of a remote, a Libra hub stops accepting any configuration edits once it has a valid TDMA table. It resumes accepting TDMA configuration changes from the user after the TDMA table has expired, if a new table has not arrived.

3.2.8.2.1 TDMA Slots

Figure 3-16 TDMA slot configuration dialog box



The time duration (end time – start time) of a slot is derived from the data throughput and modulation of the slot and the duration of a frame. The end time of a slot and the start time of the subsequent slot is separated by the slot guard time (see Table 3-29).

- Click Create Next TDMA in either the Previous or the Current TDMA panel, then click Configure TDMA Slots to open the VSAT Transmit Slot Configuration dialog box (Figure 3-16). The six fields at the top of the panel contain read-only TDMA summary information (Table 3-30).

  You can add, edit, or remove a slot configuration for an individual time slot in the TDMA table:

  - Add a slot: Click Add Row to create a new slot at the end of the table. Initial settings are a copy of the configuration of the previous slot. See Table 3-31 for a description of the parameters.

  - Remove a slot: Click in the row you wish to remove, then click Remove Row to delete the slot from the table.

  An error message displays if the sum of time or bandwidth has exceeded the frame length and bandwidth defined in the configuration.

Table 3-30 TDMA summary information

Field	Description
Satellite name	Read only. The name of the satellite, as defined in the Satellite name field in the Configuration > TDMA > Satellite section (Table 3-27).
Transponder ID	Read only. The number of the transponder, as defined in the Transponder field in the Configuration > TDMA > Satellite section. (Table 3-27).
Number of TDMA slots	Read only. The total number of slots, automatically updated when a slot is added or removed.
Frame duration (msec)	Read only. The frame length in milliseconds, defined in the Frame duration field in the Configuration > TDMA > TDMA section (Table 3-29).
Used carrier frame time	Read only. The used carrier frame time in milliseconds. The time is recalculated if the values in the table are changed. The field is automatically updated and the value shown here currently includes all the configured slots (Tx enabled and Tx disabled).
Used carrier bandwidth	Read only. The used carrier bandwidth in hertz. The value is updated automatically when the values in the table are changed. This value includes all configured slots (enabled and disabled).

Table 3-31 TDMA slot configuration parameters

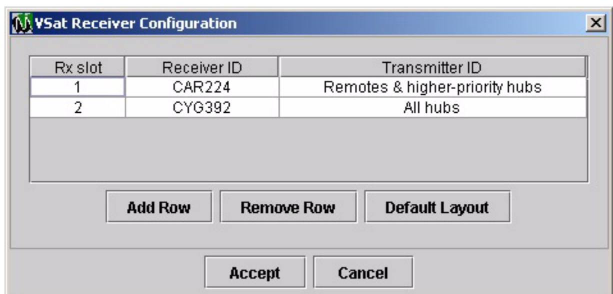
Parameter	Description
Slot	Read only. The slot number is assigned by the UI.
Location	The name of the geographical location of the Libra unit. It is displayed as the site name in the Radio modem state-of-health panel (Table 2-4 on page 16). • Possible values: any text string.
Model	The model name of the Libra comms device assigned to this time slot. • Options: Carina, Cygnus, Lynx.
Serial #	The serial number of the Libra comms device in this time slot. • Possible values: any positive integer up to 4 digits long.
Network role	The functional role of the Libra comms device in this slot. • Options: Master hub, Backup hub 1, Backup hub 2, Slave hub, Remote.
Throughput	The data throughput in bits per second. This should correspond to the rate of all data ports combined that receive data continuously from all data sources. • Possible values: any positive integer.
EIRP inc.	The correction of EIRP in decibels, applied to this slot. The value is added to the nominal EIRP that is set in the network satellite configuration. • Possible values: any float number from –10.0 to 10.0. Default is 0.0.
Tx	Enable or disable the slot. • Options: set the slot to transmit ☑ or to not transmit ☐.
Modulation	The type of modulation used in transmission. • Options: None; BPSK 32KB 1/2FEC; QPSK 64KB 1/2FEC; QPSK 100KB 3/4FEC; QPSK 112KB 7/8FEC. ▸ Do not use QPSK 100KB 3/4FEC

Table 3-31 TDMA slot configuration parameters (Continued)

Parameter	Description
Start time	Read only. The time in milliseconds at which the slot starts data transmission. The value is relative to the 0 start time of a frame.
End time	Read only. The time in milliseconds at which the slot stops data transmission. The value is relative to the 0 start time of a frame.
Bytes	Read only. The number of bytes transmitted in this slot during a frame.

3.2.8.2.2 Receiver permissions

Figure 3-17 Receivers configuration dialog box



- Click Create Next TDMA in either the Previous or the Current TDMA panel, then click Configure Receivers to open the Vsat Receiver Configuration dialog box (Figure 3-17). The dialog box displays current permissions, defining which units are allowed to receive from which other units.

  You can add, edit, or remove a receiver configuration, or select the default configuration:

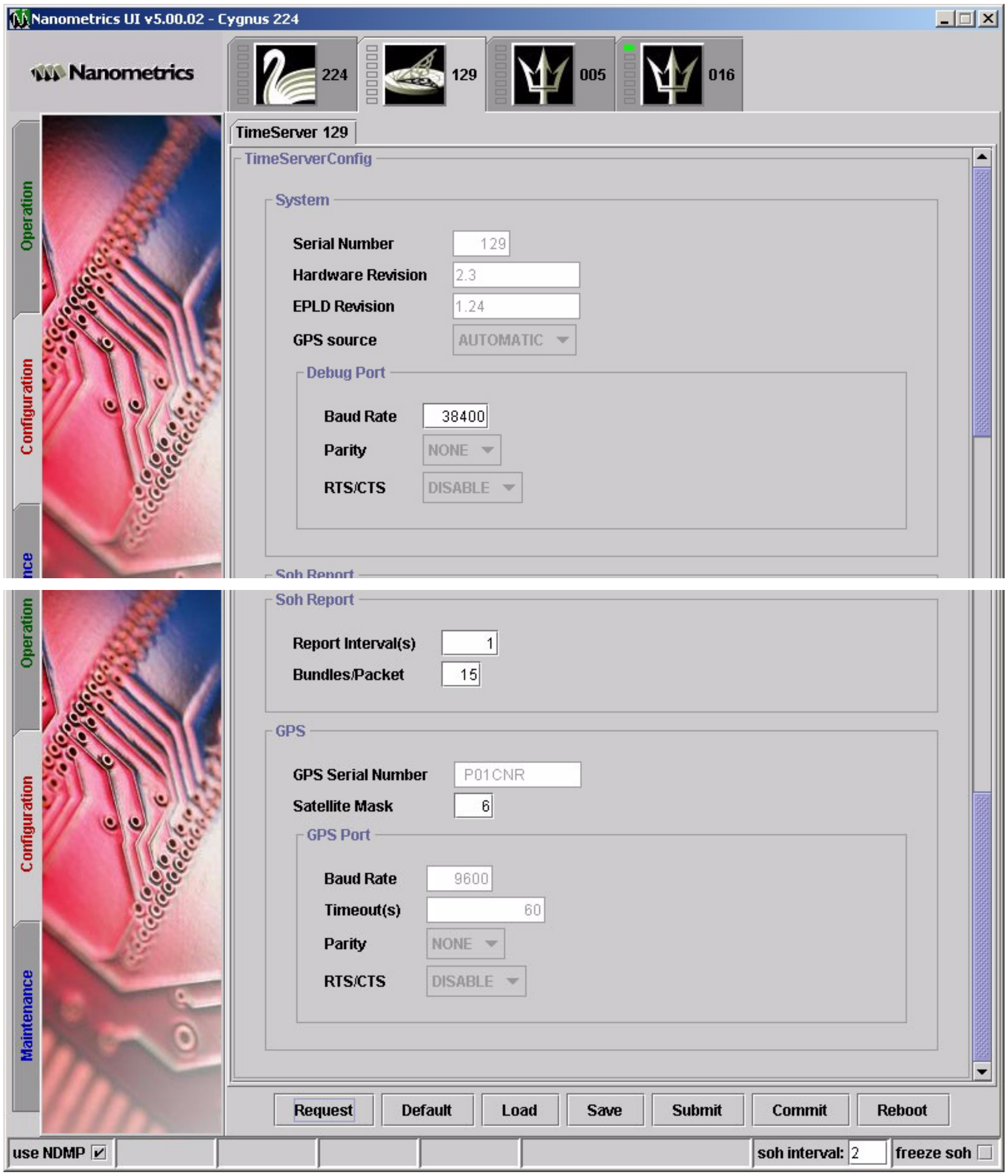
  - Add a set of receiver permissions: Click Add Row to define a new set of permissions. Initial settings are a copy of the configuration of the previous row. See Table 3-32 for a description of the parameters.
  - Remove a set of receiver permissions: Click in the row you wish to remove, then click Remove Row.
  - Use the default layout: Click Default Layout to use a layout in which all hubs listen to higher priority hubs as well as all remotes, and all remotes listen to all eligible hubs. It is based on the units listed in the slot configuration window (Figure 3-16 on page 63).

Table 3-32 Receiver configuration parameters

Parameter	Description
Rx slot	Read only. The receive slot number is assigned by the UI.
Receiver ID	Default labels for the units that are listed in the slot configuration window. • Options: see specific options in the drop-down list.
Transmitter ID	Default labels for units that are allowed to transmit and that are listed in the • Options: see specific options in the drop-down list.

3.3 Configuring the TimeServer

Figure 3-18 TimeServer configuration panel



The TimeServer configuration options are grouped on one scrolling Configuration panel (Figure 3-18). (The UI takes the configuration from the TimeServer, so the options that are visible may vary from the example shown.) This panel provides options to view current settings and edit some parameter values for the TimeServer used by the comms device. A user with tech access can view current settings, restore a default configuration, save the current configuration to a file, load a configuration from a saved file, and submit a new configuration to test before committing it to the instrument flash. The configuration parameters are grouped into four main sections: System, Soh Report, GPS, and Oscillator.

3.3.1 System

The System section provides options to view and configure internal and external state-of-health settings. The configuration parameters are grouped as hardware identification and debug port settings.

Table 3-33 TimeServer system parameters

Parameter	Description
Serial Number	Read only. The serial number of the TimeServer that is connected to the UI.
Hardware Revision	Read only. The hardware revision number of the TimeServer PCB.
EPLD Revision	Read only. The revision number of the EPLD code.
(Debug Port) Baud Rate	Editable with tech access. Options are standard baud rates, up to 38400.
(Debug Port) Parity	Read only. Standard parity values.
(Debug Port) RTS/CTS	Read only. Indicates whether RTS/CTS is enabled. Default is RTS/CTS not enabled.

3.3.2 Soh Report

The Soh Report section provides options to configure TimeServer SOH reporting to the comms device.

Table 3-34 TimeServer SOH parameters

Parameter	Description
Report Interval (s)	The SOH report interval in seconds for the TimeServer. • Possible values: any integer from 1 to 3600.
Bundles/Packet	The number of bundles per packet for transmission from the instrument. • Possible values: any integer from 1 to 22. Default is 15.

3.3.3 GPS

The GPS section provides options to view GPS information for the instrument, and to specify the satellite mask. The parameters are grouped as GPS and GPS Port.

Table 3-35 TimeServer GPS parameters

Parameter	Description
GPS Serial Number	Read only. The serial number of the GPS receiver used by the TimeServer.
Satellite Mask	The satellite elevation lower cutoff angle in degrees. • Possible values: any integer from 0 to 89.
GPS source	Read only. Indicates the type and location (local or central) of the GPS engine used by the TimeServer.

Table 3-35 TimeServer GPS parameters (Continued)

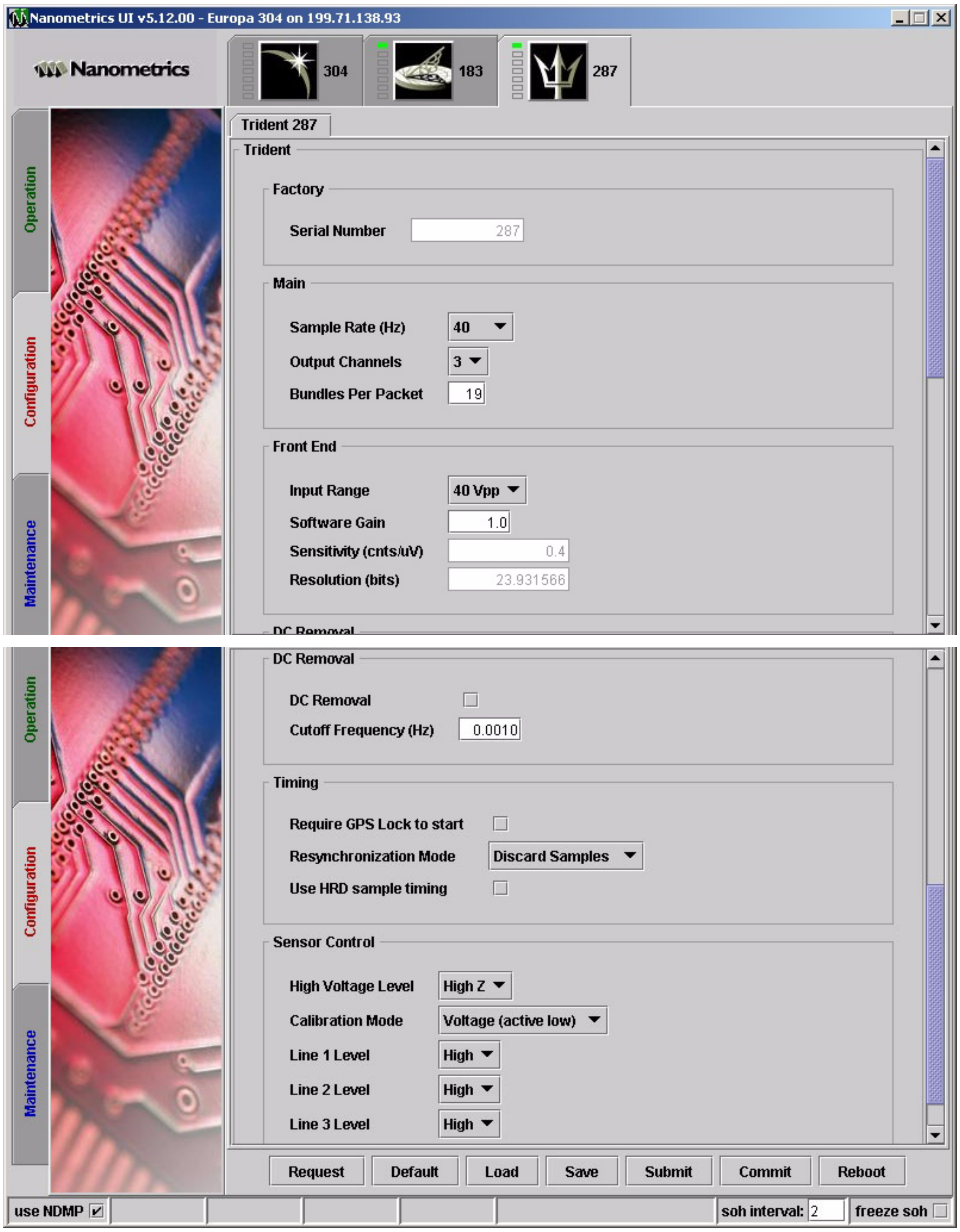
Parameter	Description
1 PPS Selection	Read only. Indicates the source of the 1 hertz signal (either TimeServer or GPS) synchronized to the start of the second.
(GPS Port) Baud Rate	Read only. Specifies the baud rate between the GPS engine and the TimeServer.
(GPS Port) Timeout (s)	Read only.
(GPS Port) Parity	Read only. Standard parity values.
(GPS Port) RTS/CTS	Read only. Indicates whether RTS/CTS is enabled. Default setting is not enabled.

3.3.4 Oscillator

The Oscillator section shows VCO calibration in PPM (read only).

3.4 Configuring Trident digitisers

Figure 3-19 Trident configuration panel



The Trident digitiser configuration options are grouped on one scrolling Configuration panel (Figure 3-19). (The UI obtains the configuration from the Trident, so the options that are visible may vary from the example shown.) This panel provides options to view current settings and edit some parameter values for Tridents connected to the comms device. A user with tech access can view current settings, restore a default configuration, save the current configuration to a file, load a configuration from a saved file, and submit a new configuration to test before committing it to the instrument flash. The configuration parameters are grouped into six main sections: Factory, Main, Front End, DC Removal, Timing, and Sensor Control.

Caution For Comms Controller firmware versions 5.80 and higher, Nanometrics UI interaction with an instrument is supported only via NDMP. Upgrade any Tridents in the system that still have non-NDMP NMXbus subsystems to a Trident firmware version that supports NDMP.

3.4.1 Factory

The parameter in this section is Serial Number for this Trident (read only).

3.4.2 Main

Table 3-36 Trident Main configuration parameters

Parameter	Description
Sample Rate (Hz)	The sampling rate on the sensor signal in hertz. • Options: 10, 20, 40, 50, 80, 100, 120, 200, 250, 500, 1000. Default is 100.
Output Channels	The number of channels to output over the bus to the comms device. • Options: 0, 1, 2, 3. Default is 3.
Bundles Per Packet	The number of bundles per packet for transmission of time-series data from the instrument. • Possible values: any integer from 7 to 28. Default is 15. • SOH bundles are always sent with 15 bundles per packet.

3.4.3 Front End

Table 3-37 Trident Front End configuration parameters

Parameter	Description
Input Range	The voltage range for the sensor input in volts peak-to-peak. The input voltage ranges represent the differential between the positive and negative signal inputs. For example, for the $40V_{pp}$ input range, the maximum input is +20V differential, with +10V on the positive signal input and –10 V on the negative signal input. Similarly, the minimum input is –20V differential, with –10V on the positive signal input and +10V on the negative signal input. • Options: 2, 4, 8, 16, 40. Default is 40.
Software Gain	Use this parameter to set the ADC front end gain, to attenuate or amplify the sensor input signal to a level that will optimise use of the digitiser dynamic range. • Possible values: any float number from 0.001 to 100. Default is 1.0.

Table 3-37 Trident Front End configuration parameters (Continued)

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Sensitivity (cnts/µV)</td><td>Read only. Displays digitiser sensitivity in counts per microvolt, determined by the input voltage range and gain settings.
<table>
<tr><th>Input Range (V_{pp})</th><th>Recommended Sensitivity (counts/µV)</th></tr>
<tr><td>40</td><td>0.4</td></tr>
<tr><td>16</td><td>1</td></tr>
<tr><td>8</td><td>2</td></tr>
<tr><td>4</td><td>4</td></tr>
<tr><td>2</td><td>8</td></tr>
</table>
▸ To obtain an updated value for the digitiser sensitivity, ensure that the option use NDMP is enabled, and then click Request.</td></tr>
<tr><td>Resolution (bits)</td><td>Read only. Displays the number of bits of resolution for the output.
▸ To obtain an updated value for the resolution, ensure that the option use NDMP is enabled, and then click Request.</td></tr>
</table>

3.4.4 DC Removal

Table 3-38 Trident DC Removal configuration parameters

Parameter	Description
DC Removal	This parameter defines whether the DC removal filter is used on data output over the bus into memory. • Options: DC Removal ☑, DC Removal not enabled ☐. Default is not enabled.
Cutoff Frequency (Hz)	The cutoff frequency for the DC removal filter in hertz. • Possible values: any float number from 0.001 to 1.0.

3.4.5 Timing

Table 3-39 Trident Timing configuration parameters

Parameter	Description
GPS Lock required on start-up	Defines whether GPS lock is required before the Trident starts digitising on startup. • Options: GPS lock required on start-up ☑, GPS lock not required on start-up ☐. Default is not required.
Resynchronization Mode	Defines how the Trident makes a time correction in its sample timing. Options are described in Section 3.4.5.1, “Selecting a Resynchronization Mode”. • Options: Discard Samples, Slow Coarse Lock, No UTC Alignment

3.4.5.1 Selecting a Resynchronization Mode

Time errors are typically introduced because the TimeServer had to perform a time correction when its GPS relocked after a prolonged interval of free-running. The magnitude of the TimeServer time correction is dependent on the length of time the GPS was unlocked and the stability of the ambient temperature of the Timeserver.

Three resynchronization mode options are selectable from a drop-down list to configure how the Trident will behave when making a correction in its sample timing (Table 3-40). For all three modes, time errors between 1.25 µs and the time correction threshold are corrected by using the TIME (coarse lock) mode. The TIME mode will run the clock slightly off-frequency until the time error is eliminated. The TIME mode is also used to correct the remaining time error after any time correction. The actual time error of the Trident from the Timeserver is always reported in the Trident PLL Status bundle.

Table 3-40 Resynchronization Mode options

Option	Description
Discard Samples	Discard Samples is the default resynchronization mode. A time correction is performed in a multiple of 100 µs when the time error between the Trident and Timeserver exceeds 66.7 µs. To preserve data quality, the FIR filters buffers are flushed of their samples and the FIR filtering is disabled for a few hardware samples, so that the first output sample occurs on a UTC aligned multiple of the output sample period. Advantages: • All output samples are UTC aligned. • Very low maximum time error (66.7 µs) between the Trident and Timeserver. • Very little time is spent in the TIME (coarse lock) mode, so that time error between the Trident and Timeserver is brought under 1.25 µs very quickly. Disadvantages: • Hardware samples are discarded during a time correction so the last sample before the time correction is not one sample period before the first sample afterwards. • A gap in data slightly larger than the FIR filter period is introduced. For example, when sampling at 100 Hz, the FIR filter period is 36254 hardware samples or 1.2084667 seconds; results in gaps of 1.21 seconds.

Table 3-40 Resynchronization Mode options (Continued)

Option	Description
Slow Coarse Lock	A time correction is performed in a multiple of the output sample period when the time error between the Trident and Timeserver is greater than 2/3 the output sample period. For example, for 100 samples per second, the time correction is performed in multiples of 10 ms when the time error exceeds 6.67 ms. Before digitizing has started, the time corrections are performed in multiples of 100 µs to minimize the time error. Advantages: • All output samples are UTC aligned. • Fewer time corrections are performed in this mode than any other because the threshold is much higher. • No hardware samples are discarded during a time correction, so that the last sample before the time correction is still exactly one sample period before the first sample afterwards. Disadvantages: • May require several hours in TIME (coarse lock) mode to slowly correct some time errors, especially when using low sample rates. • Time errors of up to 6.66 ms between the Trident and Timeserver may occur when sampling at 100 Hz. • May not be suitable on an NMXBus with multiple Tridents where simultaneous sampling of all channels is required at all times.
No UTC Alignment	A time correction is performed in a multiple of 100 µs when the time error between the Trident and Timeserver exceeds 66.7 µs. When first starting to digitize, after power-on or after a reboot, the output samples are UTC aligned. The Trident can be rebooting via the user interface to restore the output samples to UTC alignment. Advantages: • Very low maximum time error (66.7 µs) between the Trident and Timeserver. • Very little time is spent in the TIME (coarse lock) mode, so that time error between the Trident and Timeserver is brought under 1.25 µs very quickly. • No hardware samples are discarded during a time correction, so that the last sample before the time correction is still exactly one sample period before the first sample afterwards. Disadvantages: • UTC alignment is not preserved after a time correction, therefore the actual phase of the output samples in the output sample interval is not always the same. For example, when sampling at 100 Hz after performing a time correction of –1.1 ms, the first sample output in each second will be time stamped as *xx*.0089 rather than *xx*.0000. • Is not suitable for networks where simultaneous sampling is required.

3.4.6 Sensor Control

Table 3-41 Trident Sensor Control configuration parameters

Parameter	Description
High Voltage Level	The high voltage level for sensor control signals output. • Options: High Z (open drain), +5 V, +12 V. Default is High Z.

Table 3-41 Trident Sensor Control configuration parameters (Continued)

Parameter	Description
Calibration Mode	The sine calibration mode. The active high level is defined by control High Voltage Level (cannot be set to Voltage (active high) if control High Voltage Level is set to High Z). When calibrating a channel, the corresponding enable/return is set to this level. When not calibrating a channel, signal and enable/return are open. • Options: Voltage (active low), Voltage (active high), or Current. Default is Voltage (active low).
Line 1 Level	The control line level for line 1, independent of the other two control lines. Low outputs 0 V, high outputs the voltage that is set with the High Voltage Level parameter. • Options: Low, High. Default is High.
Line 2 Level	The control line level for line 2, independent of the other two control lines. Low outputs 0 V, high outputs the voltage that is set with the High Voltage Level parameter. • Options: Low, High. Default is High.
Line 3 Level	The control line level for line 3, independent of the other two control lines. Low outputs 0 V, high outputs the voltage that is set with the High Voltage Level parameter. • Options: Low, High. Default is High.

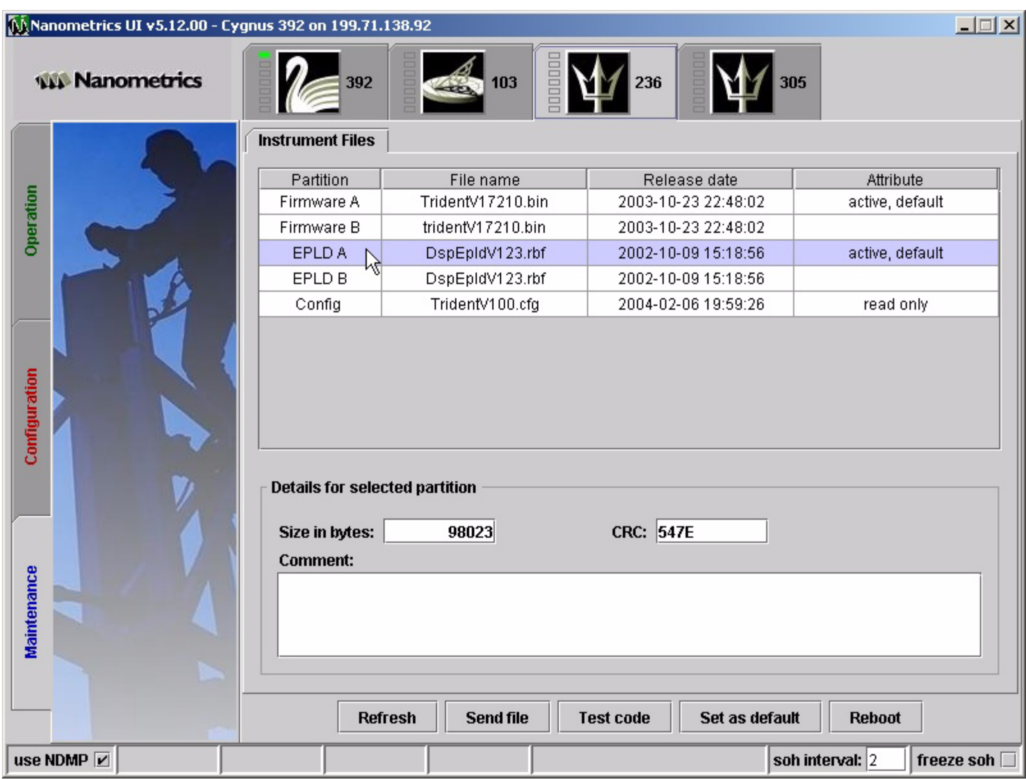
Chapter 4 Maintenance

Nanometrics UI maintenance options allow all users to view current instrument file information (for example, names and versions of comms device configuration files, firmware, and EPLD code), and users with tech access to upgrade network instrument files. This chapter provides instructions for viewing file information, upgrading instrument files, and recovering a misconfigured instrument.

4.1 Instrument files

The Instrument Files panel (for example, Figure 4-1) displays instrument file information, and provides options to upgrade instrument files. All fields on this panel are read only.

Figure 4-1 Maintenance > Instrument Files panel



4.1.1 Types of instrument files

The types of files stored in the flash memory of an instrument depends on the type of instrument (Table 4-1).

Table 4-1 Instrument file types

Instrument type	File type	Description
Libra comms devices	Config	Configuration settings for the comms device. Example: `Libra.cfg`
	Program	The executable program code used by the Libra hardware. Two executable programs can be stored. Example: `LibraV57005A.bin`
	TDMA	The satellite TDMA configurations of the Libra comms device. Example: `Epochs.cfg`
Callisto comms devices	Config	Configuration settings for the comms device. Example: `Libra.cfg`
	Program	The executable program code used by the Callisto hardware. Two executable programs can be stored. Example: `LibraV57005A.bin`
TimeServer	Config	Configuration settings for the TimeServer. Example: `TsConfig.bin`
	Firmware	The executable code used by the TimeServer. Two executable programs can be stored. Example: `TsrV20000A.bin`
	EPLD code	Program code for the TimeServer EPLD. Two instances of EPLD code can be stored. • Used only for some TimeServers Example: `PLD13513V2_00.rbf`
Trident	Config	Configuration settings for the Trident. Example: `TridentV100.cfg`
	Firmware	The executable code used by the Trident. Two instances of firmware can be stored. Example: `TridentV17200.bin`
	EPLD code	Program code for the Trident EPLD. Two instances of EPLD code can be stored. Example: `DspEpldV123.rbf`

4.2 Viewing file and partition information

Any user can view and update (refresh) information about the instrument files and partitions. The selected instrument tab indicates the instrument currently connected to the Nanometrics UI, with the instrument icon and serial number (for example, Trident 236 shown in Figure 4-1).

Caution For Comms Controller firmware versions 5.80 and higher, Nanometrics UI interaction with an instrument is supported only via NDMP. Upgrade any Tridents in the system that still have non-NDMP NMXbus subsystems to a Trident firmware version that supports NDMP.

4.2.1 View partition information

- View the Maintenance > Instrument Files table to see lists of file and partition information:
  - Partition – The type of the file on this partition.
  - File name – The name of the file (if there is a file loaded to this partition).
  - Release date – The date when the file was released or generated.
  - Attribute – The attributes of the partition, which include:
    - Active – The program is running and cannot be overwritten.
    - Default – The program is set to be the default program that is run on reboot and cannot be overwritten.
    - Read only – The configuration is read only (use options under the Configuration tab to modify the configuration; see Chapter 3).
    - Not valid, or invalid – Either this file type is not supported by this instrument, or it is supported but this partition does not currently have a file loaded.

4.2.2 View details for a selected file

- To display details for the file loaded to the partition, click to select the file in the Instrument Files table. (For example, in Figure 4-1, partition EPLD A is selected.) File details include:
  - Size (Bytes) – The size of the file at the selected partition.
  - CRC – 16 bit CRC computed for the file. This value is recomputed and checked following file upload to verify the integrity of the file.
  - Comment – Descriptive comment, if one was entered by the technician when the file was uploaded to the instrument. This is not available for Trident.

4.2.3 Refresh the partition and file information

To obtain the current file information from the instrument and to update the information displayed in the Instrument Files partition table and Selected file details section:

- Click Refresh.

4.3 Viewing configuration files

Comms device `.cfg` files are text files which can be read or printed from a text editor. Trident and TimeServer `.cfg` files are binary files which you must save as text to view or print.

- To view a TimeServer or Trident configuration file, save it as a text file:
  - i. Open a command prompt and go to the directory where the configuration file is stored.

ii. Use the `viewcfg` command to save the binary `.cfg` file as a text file. For example, enter the command `viewcfg TS456.cfg > TS456.txt`

4.4 Upgrading instrument files

The buttons at the bottom of the Maintenance panel (Figure 4-1) provide options for managing network instrument files. The Refresh option is available at all levels of user access (Section 4.2.3). The remaining options are used during the process of upgrading the instrument software, and are tech access only:

- Send file – Upload a file from the computer hard drive to the instrument volatile memory.
- Test code – Test-run the instrument using code in the non-default partition.
- Set as default – Set the currently running program code as the default. Once set as the default, the file is used by the instrument on startup.
- Reboot – Reboot the comms device to the configuration stored in flash.

Caution Rebooting may cause the loss of the current comms device or TDMA configuration if the configuration is only submitted to the system memory but not yet written into the flash.

4.4.1 Upgrade the instrument files

This procedure generally applies to all comms device, Trident, and TimeServer software upgrades. (Assume the instrument is running old firmware in partition A for the purpose of this procedure.)

1. Observe these upgrade recommendations:
   - To upgrade from Trident firmware V1.08 and earlier, contact Nanometrics support.
   - If you are upgrading software for several network components, do the upgrades as applicable in this order:
     i. Nanometrics UI
     ii. Comms devices (for example, Janus, Cygnus)
     iii. TimeServer
     iv. Trident
     v. NaqsServer
   - Test the upgrade on one unit and allow it to run for 24 hours before upgrading other units. This will provide time to ensure that all aspects of the system, from the remote site to the NAQS server, are configured correctly. If upgrades are to be performed in the field, practice upgrading units at the central site first.
   - After running the unit, review the system log files to identify any areas that may need to be reconfigured. In most cases there will be configuration changes to make after running the firmware.
   - Run the new software for as long as possible—preferably several hours or days—before committing the new configuration. This is particularly important when upgrading the first unit in a network.

TimeServer and Trident configurations are forward- and backward-compatible, so you can normally revert to an earlier firmware version without problems. However, older versions of comms device firmware typically cannot read newer configurations. Comms devices running firmware version 5.62 or higher will automatically back up the older configuration when a new version of firmware is loaded:

- Do not back up the new comms device configuration until you are sure you do not want to revert to the earlier version of the firmware. Backing up the new configuration will overwrite the original backup.
- Always set the new firmware as default *before* committing the configuration with that version. That way, if the instrument is rebooted, it will come up running the new firmware, which can read both the new and the old configuration.

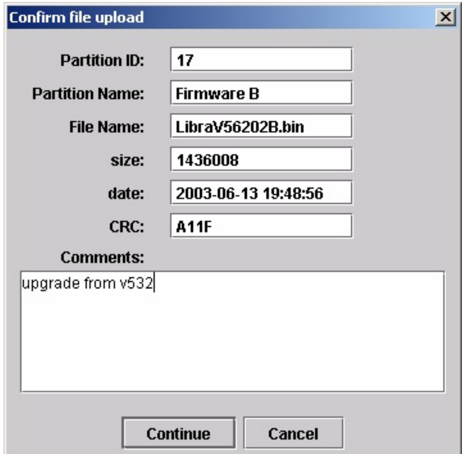
For Trident firmware and EPLD upgrades, the first few steps (up to but not including “Test new code”) may be performed before upgrading the Comms Controller or Timeserver to minimize data disruption. The Nanometrics UI should be upgraded before any other changes.

Upgrading from Trident firmware V1.50 or later:

i. Ensure the use NDMP box is checked on Nanometrics UI.
ii. Upload the new version into the inactive and non-default firmware partition.
iii. If applicable, also upload the new DSP EPLD into the unused and inactive EPLD partition.
iv. Do not proceed until the Comms Controller, Timeserver, and Nanometrics UI have been upgraded.
v. Test new code.
vi. Verify that the configuration is still correct (especially the serial number). If the configuration is incorrect, contact the factory.
vii. Set new code as default.

2. In the [instrument] > Maintenance > Instrument Files table, click to select partition B.
3. Click the Send file button at the bottom of the main window to upload the new software to partition B.
4. In the Open dialog box, select the file to upload. Double click the file name or click Open to load the file.
5. The Confirm file upload dialog box (Figure 4-2) shows the file information. Optionally, type a description in the Comments field.
6. Click Continue to upload the file. (To exit without uploading the file, click Cancel.)

Figure 4-2 Confirm file upload dialog box



7. Optionally, repeat steps 2 to 6 if both firmware and EPLD code is to be uploaded to the same partition.
8. After the software has uploaded successfully, click Test code to try the new software.
    - If this error is displayed

      `Error: Command failed while connection to` *device_inet_address* `java.net.connectException:connection refused`

      it may indicate that the connection attempt timed out because the ARP table has not been flushed (UI version 5.13 and CC 5.80.72). Use the `arp -d` command to clear the entry from the ARP table, then choose Test Code again. On Windows:

      i. Open a command window and enter `arp -a`. Check to see if the internet address of the instrument is in the table.

      ii. Delete the address from the table: Enter `arp -d` *device_inet_address*.

      iii. Test the new firmware: click Test code.
9. Allow the instrument to run for a period of time to ensure that it is running stably with the new software:
    - For the first instrument to be upgraded for the network, allow the instrument to run for at least several hours.
    - For each subsequent instrument, allow the instrument to run for at least a few minutes.
10. Click Set as default to set the new software to be run whenever the instrument is rebooted.
11. Change configuration parameters as required by the new firmware.
12. Submit the changes. Do *not* commit the changes yet.
13. Allow the firmware to run with the new configuration until you are satisfied that it is running correctly.

14. Commit the changes.

4.5 Recovering a misconfigured instrument

Reverting to the old firmware after a new configuration has been committed and backed up can result in a misconfigured instrument. If the instrument cannot read the primary or backup configuration from flash, it will boot up running a default configuration, with:

Serial Number = 0

LAN IP address = 199.71.138.59

The instrument may appear “dead”, since it is no longer communicating on the correct IP address. To recover the instrument, use the procedures described below. Always try the procedure described in Section 4.5.1 first.

4.5.1 Case 1: New firmware is set as default

If the new firmware is set as default, then power-cycling the instrument will cause it to run the new firmware on restart. The new firmware will be able to read the configuration correctly.

1. Power-cycle the instrument.
2. Log on to the instrument and verify that it is running properly.

4.5.2 Case 2: Old firmware is set as default

If the old firmware is set as default, power-cycling will not help, since the instrument will always boot up running the old firmware. In this case, connect to the instrument on the default IP address, then boot up the new firmware:

1. Connect a laptop to the LAN port of the instrument.
2. Configure the IP address of the laptop to be on the same subnet as the instrument (that is, 199.71.138.*x*).
3. Log on to the instrument at 199.71.138.59, as tech, using password `nmx`. *Do not change the configuration.*
4. From the Maintenance page, click Test code to run the new firmware. It will boot up and read its correct configuration.
5. Change the laptop IP address back to the original address.
6. Log on to the instrument and verify that it is running OK.
7. Set the active partition to be the default partition.

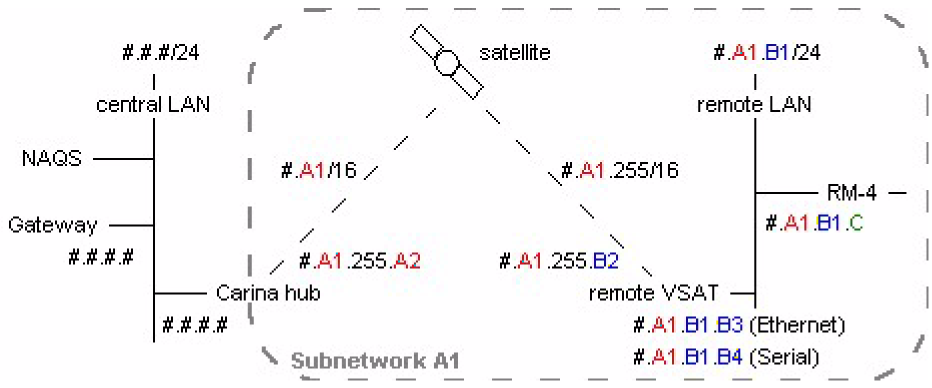
Appendix A Configuring IP Addresses on Libra VSAT Networks

This section describes how to configure the network in order to communicate from the LAN at the HUB with the LAN at the VSAT. It provides an overview of guidelines to assign distinct addresses as required, and an example.

Where:

- **An** number that distinguishes the Carina hub from other Carina hubs in the network:
  - **A1** satellite network identifier for this subnet (valid values for A1 are 0 to 254)
  - **A2** host identifier for the Carina hub on subnet A1
- **Bn** number that distinguishes the VSAT unit from other VSATs in the A1 subnet:
  - **B1** identifies this remote LAN
  - **B2** host identifier for this VSAT unit on the satellite subnet A1
  - **B3** host identifier for this VSAT unit on the remote LAN (for example, the unit serial number)
  - **B4** host identifier for this VSAT unit for IPoS (for example, the serial port number)
- **C** number that distinguishes the RM4 from others in LAN B1 on subnet A1:
  - **C** host identifier for the RM4 on remote LAN B2 (for example, the unit serial number)

Figure A-1 Overview of general settings



- Every VSAT host identifier on A1 must be unique (that is, all remote B2 and the hub A2).
- Every unit host identifier on the B1 remote LAN must be unique (B2, B3, and C).
- On Cygnus, the third octet of the IP address for the serial port must be the same as that of the LAN port (B1), for proper HDLC address filtering.

For example:

	actual values	sample values
Carina Default Gateway	see network administrator	199.71.138.2
Carina LAN IP address		199.71.138.99
Carina LAN subnet mask		255.255.255.0 (24)
Carina SAT IP address	10.A1.255.A2	10.1.255.100*
Carina SAT subnet mask	255.255.0.0 (16)	255.255.0.0 (16)†
Cygnus/Lynx Default Gateway	10.A1.255.A2	10.1.255.100
Cygnus/Lynx SAT IP address	10.A1.255.B2	10.1.255.1
Cygnus/Lynx SAT subnet mask	255.255.255.0 (24)	255.255.255.0 (24)
Cygnus/Lynx LAN IP address	10.A1.B1.B3	10.1.1.100
Cygnus/Lynx LAN subnet mask	255.255.255.0 (24)	255.255.255.0 (24)
Cygnus/Lynx serial port IP address	10.A1.B1.B4	10.1.1.1
Cygnus/Lynx serial port subnet mask	255.255.255.0 (24)	255.255.255.0 (24)
RM4 Default Gateway	10.A1.B1.B3	10.1.1.100
RM4 LAN IP address	10.A1.B1.C	10.1.1.200
RM4 LAN subnet mask	255.255.255.0 (24)	255.255.255.0 (24)
Additional routes on NAQS PC:	10.A1.0.0	10.1.0.0
Subnet mask	255.255.0.0 (16)†	255.255.0.0 (16)
Carina LAN IP address		199.71.138.99

* The 255 in the SAT IP addresses is so that the TDMA broadcast from the hub with the subnet mask above will be accepted by the remotes.
† The 255 in the HUB SAT subnet mask and in the NAQS route is so that no additional routing is required in the hub for packets to reach the remote LAN at the VSAT.

Figure A-2 Example settings (one subnet with one remote)

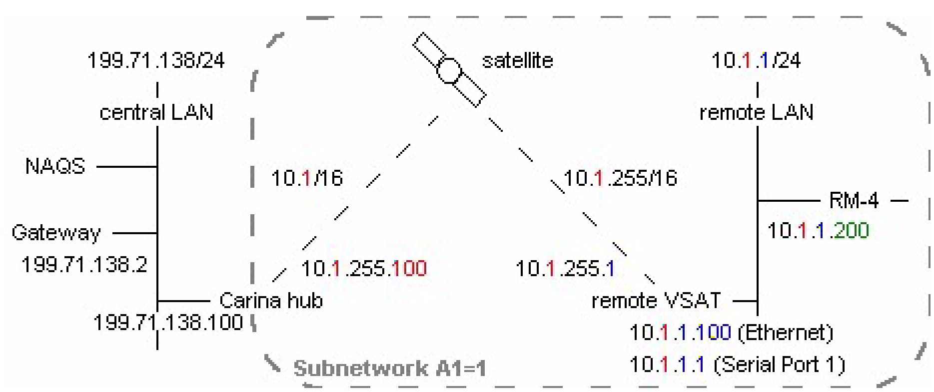
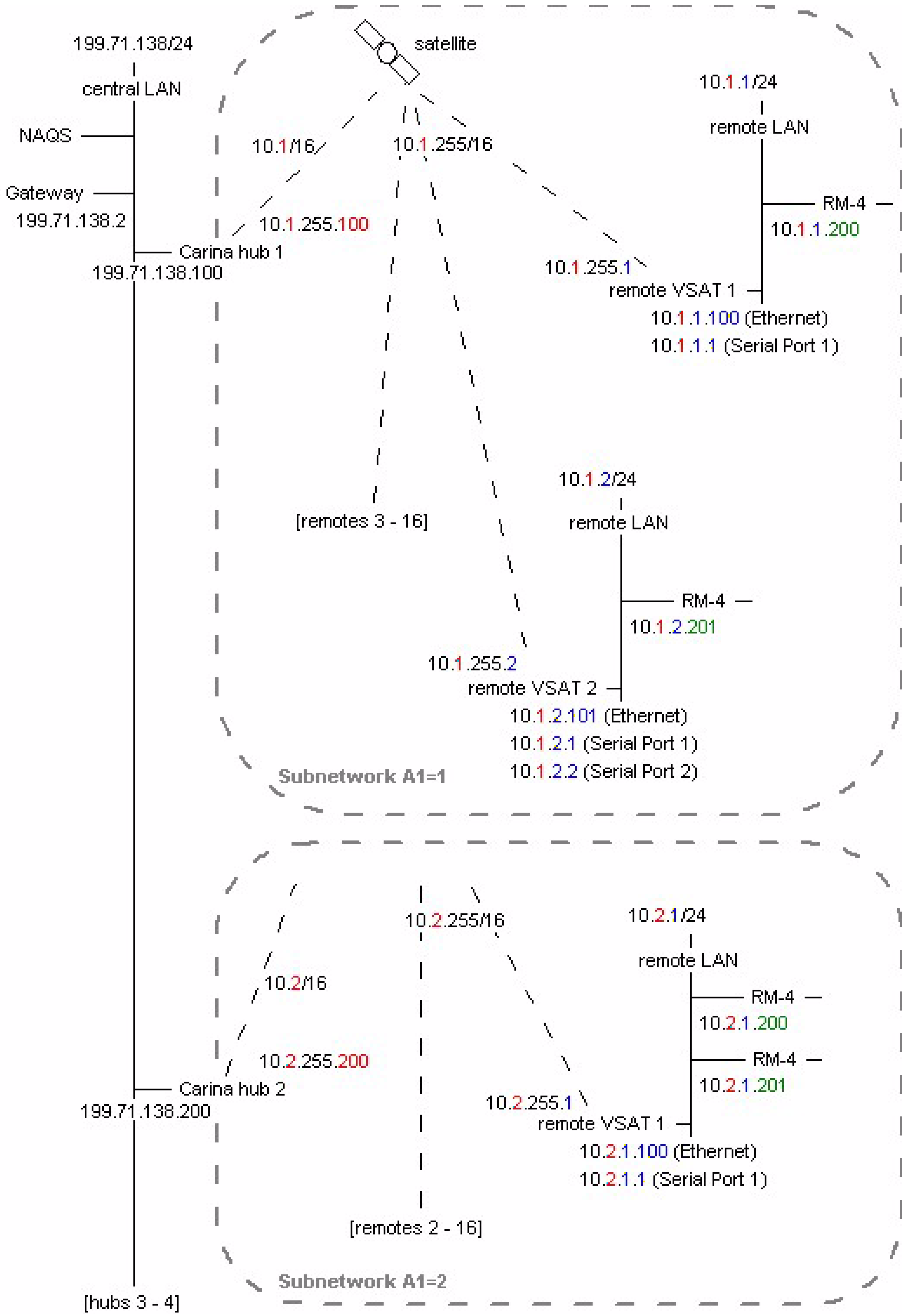


Figure A-3 Example settings (multiple subnets with multiple remotes)



Appendix B TDMA Configuration for Radio Networks

For an example radio network of 10 remote EuropaTs, with 1 RM4, 1 Janus, and 1 re-transmission control processor (RCP) at the central site (see also Figure B-1):

- The RM4 receives data packets from 7 EuropaTs
- The Janus receives data packets from 2 EuropaTs
- The RCP receives data packets from 1 EuropaT, and also broadcasts re-transmission command packets from the central site to all the remote EuropaTs.
- NAQS server receives data packets from the RM4, Janus, and RCP. The NAQS server sends command packets to the RCP for broadcast to the remotes.

The TDMA scheme is configured locally on each instrument of the network (set these values in the Configuration > Ports panel; see also Section 3.2.3, “Ports,” on page 43). Typical port settings for this type of network are:

- EuropaT:
  - port1 = unused
  - port2 = NMXP transmit, with:
    - TDMA frame duration = 4000
    - TDMA slot duration = 80
    - TDMA slot start = 0
- Janus:
  - both port1 and port2 = NMXP receive, with the default TDMA settings:
    - Broadcast disabled
    - TDMA frame duration = 4000
    - TDMA slot duration = 100
    - TDMA slot start = 0
- RCP:
  - port1 = NMXP receive, as for the Janus
  - port2 = NMXP receive, with:
    - Broadcast enabled
    - TDMA frame duration = 4000
    - TDMA slot duration = 20
    - TDMA slot start = 80

Figure B-1 Example radio network data flow