Janus

Communications Controller

User Guide

Janus
Communications Controller

User Guide

Nanometrics Inc.
Kanata, Ontario
Canada

Janus Communications Controller User Guide

The information in this document has been carefully reviewed and is believed to be reliable. Nanometrics, Inc. reserves the right to make changes at any time without notice to improve the reliability and function of the product.

This product uses the Java™ 2 Runtime Environment (J2RE) Standard Edition, which includes code licensed from RSA Security, Inc. Some portions licensed from IBM are available at http://oss.software.ibm.com/icu4j/

Nanometrics, Inc.
250 Herzberg Road
Kanata, Ontario, Canada K2K 2A1
Tel (613)592-6776
Fax (613)592-5929
Email info@nanometrics.ca

Part number 14204R2
Release date 2003-07-30

Contents

Chapter 1 Getting Started

This section provides introductory information, guidelines for checking the completeness of the shipment and the condition of the shipped items prior to installation, and instructions on what to do if there are any problems with the shipment.

1.1 About the Janus Communications Controller

The Janus Communications Controller (Janus) relays timestamped, error-corrected data between the remote site devices and the acquisition centre. Janus communications with remote site devices are via either serial or NMXbus connection; data transmission to the acquisition centre can be via either IP (recommended) or serial. Transmission options include radio (fixed frequency, spread spectrum), telephone modem, fiber optic modem, and IP via 10Base-T. Multicast IP routing allows the Janus to forward continuous data to multiple acquisition systems simultaneously without requiring additional bandwidth.

For timing, Janus uses an internal TimeServer. Options for the GPS clock signal reference for the TimeServer include local timing (typically, the GPS engine is integrated in the Janus unit; there is also an option for external GPS), and central timing (the clock signal from a central site GPS is distributed to several remote Janus units).

Janus is easy to install, and includes a graphical user interface—the Nanometrics UI—for configuration and monitoring.

1.2 About this User Guide

This user guide contains basic procedural information for installing and operating the Janus Communications Controller, and general reference information. See also related documents, listed in section 1.2.1, for detailed information on changing configurations, monitoring operation, and viewing data.

- Chapter 1, “Getting Started” – an introduction to the Janus communications controller and to this manual, guidelines for unpacking the shipment, and technical support contact information.
- Chapter 2, “Technical Overview” – an overview of Janus features and hardware modules, and a general overview of installation options.
- Chapter 3, “Installation and Operation” – installation and operation instructions, and maintenance guidelines.

- Appendices:
  - Appendix A, “Connector Pinouts”
  - Appendix B, “Specifications”
  - Appendix C, “Test Cable”

1.2.1 Related documents

Related documents include configuration sheets specific to the equipment in your shipment, and general product documentation.

1.2.1.1 As-shipped configuration sheet

The as-shipped configuration sheet lists the serial numbers of the parts shipped, the hardware configuration, IP address for the unit, and any calibration parameters associated with the hardware. The configuration described on the configuration sheet determines how the Janus will operate on the initial startup.

1.2.1.2 Software reference manual pages

- Nanometrics UI – information on monitoring the operation and changing configuration parameters on an installed Janus and connected instruments.
- NaqsServer – information on configuring the data acquisition software.
- NaqsClient (NaqsView, Waveform Viewer) – information on data monitoring (state of health, and seismic data).
- Playback – description of utilities for retrieving data (time-series, SOH, and serial).

1.3 Unpacking the shipment

Note The information in this section should be used in conjunction with system warranty information.

Open the shipment and check the contents for completeness against the packing slip. There is a configuration sheet containing specific configuration information for each Janus Communications Controller included in the shipment. Visually inspect the equipment for any damage that may have occurred in transit. If there are any problems with the shipment, please contact Nanometrics Support.

1.4 Technical support

Read the appropriate sections of this manual and related documents carefully before installing or operating the Janus Communications Controller.

If you need technical support, please submit your request by email or fax. Include a full explanation of the problem, and supporting data.

email: support@nanometrics.ca
FAX: To: Support
+1 (613) 592-5929

Chapter 2 Technical Overview

This chapter provides an overview of the Janus features, internal modules, and installation options.

2.1 General features

The Janus communications controller receives data from NMXbus and serial data devices, and prepares data for transmission to the acquisition centre(s). Data transmission can be via the built-in IP option over 10Base-T, or external options including RF, fiber optic, and dedicated telephone line. Janus provides a high precision timing subsystem and rigorous error correction for the data, and supplies power to the Trident digitisers and sensors (and optionally to Telesto).

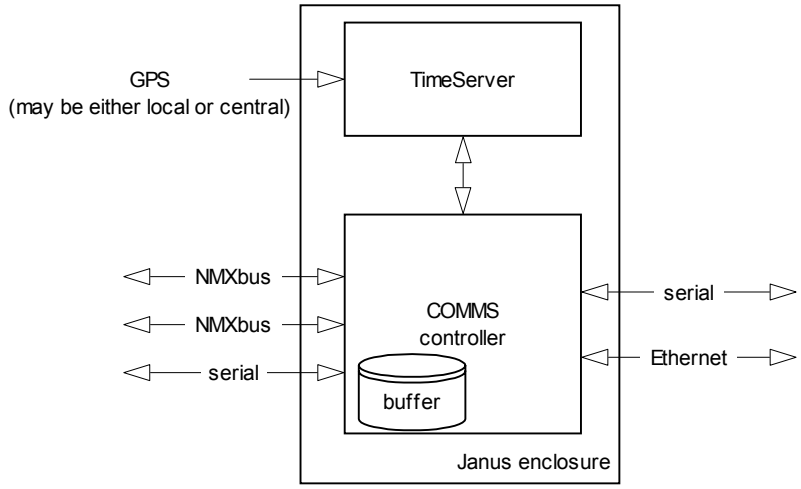
The Janus contains two main modules—the comms controller and the TimeServer. These modules communicate through the internal NMXbus. A 12MB ringbuffer is available to store packets for retransmission. The user interface provides options for operation monitoring, configuration and control, and software updates for the Janus and connected instruments (see also the Nanometrics UI User Guide).

Timing is provided by the TimeServer, which is essentially a GPS disciplined clock; the TimeServer system time is synchronized to GPS time. Options for the GPS clock signal source include local timing (at the remote site unit) and central timing (at the network central site).

Data ports include two NMXbus ports, two serial ports, an Ethernet port, and three external analog state-of-health (SOH) channels. Additional ports are available for factory configuration of the controller and the TimeServer. Figure 2-1 on page 4 is a block diagram of the Janus hardware modules and data ports.

The Janus communications controller is packaged in a rugged waterproof steel box. All of the connectors are on the faceplate.

Figure 2-1 Janus block diagram



2.2 Communications control

The comms controller board receives data on the NMXbus ports and the serial ports, and prepares the data for transmission over the communications link between the remote site and the acquisition centre. A 12 MB ringbuffer is available to store packets for retransmission. The comms controller also generates equipment state-of-health (SOH) messages; this SOH information can be used to simplify network maintenance.

Data received on the NMXbus and serial ports from Nanometrics digitisers (Trident and HRD) are in NMXP format. At the comms controller, the NMXP packets are either embedded into UDP packets for transmission over IP, or are sent over a serial connection. Data received from other devices are converted to NMXP format at the comms controller before being transmitted to the central site over an IP or a serial connection. (See the Nanometrics Data Formats manual for information on the NMXP data format, and transport-specific wrapping of packets.) Data sent over a serial connection are bridged to the Naqs server, typically via an RM-4.

SOH messages are formatted as NMXP packets and are sent to the Naqs server using UDP, and to the UI using TCP. (See also section 2.4 “State-of-health information” on page 5).

In addition to being transmitted to the central site, each NMXP packet is stored in the comms controller memory. The memory is a ringbuffer type in which the oldest packet is continuously overwritten by the newest one. If the data are not received at the central site by the Naqs data acquisition software, a request is generated for retransmission (the retransmission request setting is optional). On receipt of the retransmission request, the communications controller fetches the requested packet from its memory and queues it for transmission.

2.3 Timing

Janus will use bus timing derived either from local GPS data acquired at the remote site, or central timing; the option is set at the factory. In either case, timing is provided by the internal TimeServer, which is essentially a GPS disciplined clock—the TimeServer system time is synchronized to GPS time.

- With the local timing option, the TimeServer uses a built-in GPS engine. (Janus also has an option for local timing using an external GPS. See the Janus External GPS Kit supplement if applicable.)
- With the central timing option, a central GPS unit is used to acquire and distribute the GPS clock signal to several remote site Januses. Janus units equipped with the central timing option accept these clock signals through the COMMS connector. (See also the Central GPS manual.)

Time-related messages carried on the NMXbus are the time, frequency error, time error, and accuracy. Time quality information and GPS status are displayed in the Nanometrics UI, under the [Janus]  > Operation > Timing tab. TimeServer operation, configuration, and maintenance parameters are displayed in the panels under the [TimeServer]  instrument module tab. (See also the Nanometrics UI User Guide.)

2.4 State-of-health information

The Janus monitors three configurable analog SOH channels, and a number of non-configurable (fixed) instrument SOH parameters.

The three external analog SOH channels are available for user-defined applications. See section 2.5.4 on page 8.

Of the fixed SOH parameters, input supply voltage and internal temperature are derived from internal analog SOH channels. The appropriate scale and offset values for these SOH parameters are determined during the final test and are entered into the as-shipped configuration file. A hard copy of this file is shipped with the Janus. The remaining fixed SOH parameters, such as time quality and NMXbus transmission statistics, are derived from various instrument sources and managed by the comms controller.

You can manage and view SOH information using various utilities:

- Select the reporting rate for SOH data to Naqs (Report interval) and the packet size, in the Nanometrics UI under the Configuration > System > SOH Report to Naqs panel.
- Monitor SOH status in real time, in the Nanometrics UI under the Operation tab for the instrument.
- View and plot current and historical SOH information in detail, using NaqsView (a Naqs Client utility).

2.5 Ports

Janus ports include data ports—two NMXbus ports, two serial ports, an Ethernet port, and three external analog SOH channels—and factory configuration ports. The Nanometrics UI provides options to configure some of the port and channel parameters.

2.5.1 NMXbus ports

The two NMXbus ports are functionally equivalent. They provide power, time, and data communication means for Trident digitisers. The NMXbus ports do not require configuration; the ports are active when an instrument is connected, and automatically terminate the line when necessary. The NMXbus protocol provides error-correction for data from the Tridents.

Up to three Tridents can be connected to the two NMXbus ports on the Janus; multiple Tridents can be daisy-chained on one NMXbus port. Maximum cumulative data throughput using Trident digitisers is 3000 samples per second.

2.5.2 Serial ports

Janus has two serial ports. In general:

- Each of the available serial ports can be configured, via the Nanometrics UI, to operate in any of five modes.
- Typical configuration depends on availability of ports and on the data transport mode.

2.5.2.1 Serial port configuration options

Available serial ports can be configured, via the Nanometrics UI, to operate in any of five modes, or can be set as unused (Table 2-1). Basic configuration parameters for all five modes include the serial port name, baud rate, and port timeout. Baud rates include all of the standard rates from 2.4–57.6kbps. Additional parameters, such as data packet length and TDMA slot definition, depend on the mode (see also the Nanometrics UI manual).

In general, each of the two ports can be configured for either unidirectional or full duplex communication. If both ports are available, use the high-performance port 2 for high volumes of data. If port 1 is available, it can be configured for other modes; for example, for full duplex communication with a remote serial data source (Interactive mode).

Table 2-1 Serial port configuration options

Option	Description
Unused	The port is not configured for any mode. (For port 1, availability depends on the Janus timing mode. See section 2.5.2.2.)
NMXP Receive	Receives NMXP data packets, typically from a Nanometrics digitiser or possibly from another Nanometrics communications unit, and transmits command packets back to the digitiser or unit.
NMXP Transmit	Transmits data in NMXP packets, and receives command packets from NaqsServer. Only one port at a time may be configured in this mode.

Table 2-1 Serial port configuration options (Continued)

Option	Description
Serial Receive	Receives serial data in any format from a device, for transparent relay to the acquisition centre. The comms controller packetizes the data as NMXP packets, then prepares the packetized data for transmission over either a serial or a UDP/IP connection. The data are stored in a serial data ringbuffer at the acquisition centre, for extraction using Data Playback utilities.
Interactive	Allows you to communicate via a Telnet session with a device that is connected to the serial port (typically serial port 1). This would be used, for example, to manage configuration of the data source device.
Console	Allows you to monitor the comms controller operation. Connection to the Janus is via a test cable (see also section 3.3.2 on page 17). In this mode, information received on the serial port is not transmitted over the network.

2.5.2.2 Serial port availability

Serial port availability depends on the timing mode for the Janus, and typical configuration of available ports is further determined by the data transport mode (Table 2-2):

- For Janus with local timing having an internal GPS, both serial ports can be configured for either unidirectional or full duplex communication. When sending data via serial port, one of the ports must be configured as an NMXP transmit port.
- For Janus with local timing having an external GPS, serial port 1 is not available. For serial data transport, port 2 must be configured for NMXP transmit.
- For Janus with central timing, serial port 1 is not available. For serial data transport, port 2 must be configured for NMXP transmit.

Table 2-2 Serial data port options by data transport and timing mode

Data transport mode	Timing mode		
	Local timing		Central timing
	Internal GPS	External GPS	
IP	port 1 or port 2 = any	port 1 = unavailable	port 1 = unavailable
		port 2 = any	port 2 = any
Serial	port 1 or port 2 = any = NMXP transmit	port 1 = unavailable	port 1 = unavailable
		port 2 = NMXP transmit	port 2 = NMXP transmit

2.5.3 Ethernet port

The Ethernet port supports email (SMTP), FTP, and Telnet. Data transport over the link to the acquisition centre uses both UDP/IP and TCP/IP. Naqs and alert message destination IP addresses are configured in the Naqs.stn file.

Janus supports multicast of data and alert messages. Options to either unicast data to one or more data acquisition systems, or multicast data to a Naqs class address or to all multicast addresses in the network, are under the Configuration > Internet > Destination panel.

2.5.4 External SOH channels

The three external SOH channels can be used to monitor voltages from analog devices (for example, a meteorological sensor with analog output, a vault tamper switch). There are two calibration factors that need to be set for an external SOH channel. Both the calibration factor and offset parameters are set in the Nanometrics UI, in the Configuration > System > External SOH Calibration panel:

- The scale calibration factor is built from two constants. One is the sensitivity of the sensor. This might be expressed as "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. (To report the actual voltage on the connector use 0.1, 0.5, and 0.5 respectively for SOH channels 1, 2, and 3.)
- 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.

2.5.5 Configuration ports

The comms controller and TimeServer configuration ports are available for factory configuration. The comms controller configuration port can also be used for some operation monitoring; see section 3.3.2 on page 17.

2.6 General installation options

Janus supports these data and command options:

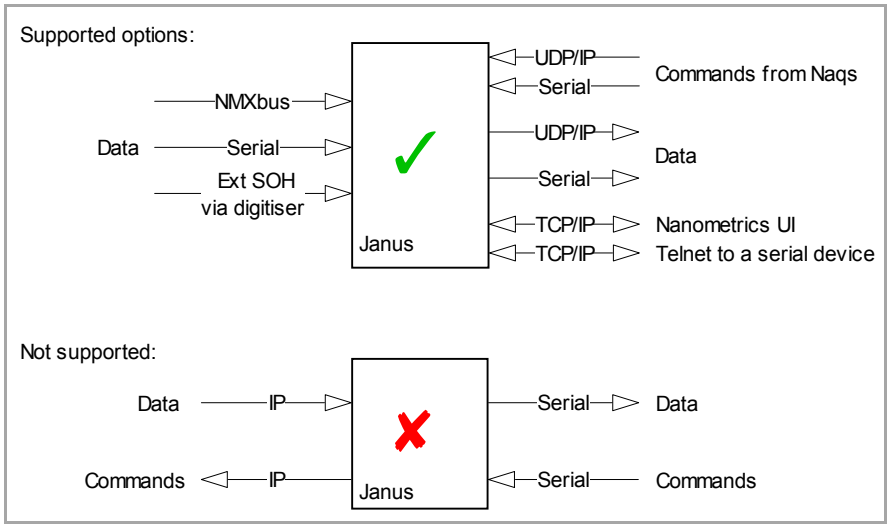
- Data input can be via NMXbus and/or serial, to data output via IP and/or serial.
- Commands from the Naqs server can be received via IP or serial.
- Communications with the Nanometrics UI, and Telnet sessions with third-party devices connected to a serial port, are via TCP/IP.

These options are not supported:

- Data as IP in and serial out.
- Commands as serial in and IP out.

Janus data and command flow options are summarised in Figure 2-2.

Figure 2-2 Data and command flow options



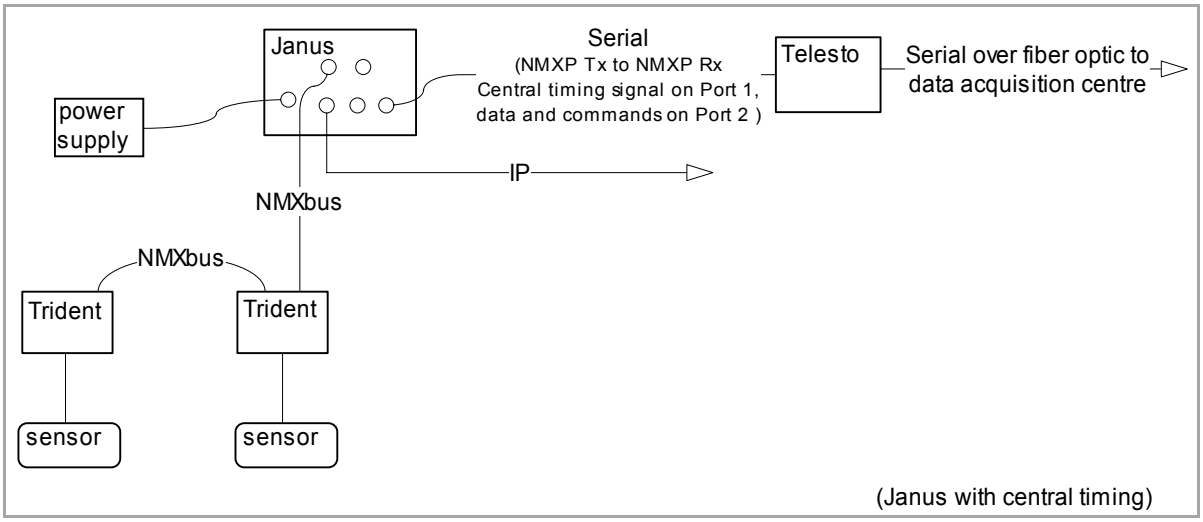
Janus can be installed as the direct interface between the data devices and the communications infrastructure, and can also be used in a repeater station for a radio network. The connection to the central site can be via private wire, fiber optic cable, RF (fixed frequency or spread spectrum), or a direct Ethernet connection. For example, some installation options are shown in Figure 2-3 on page 10.

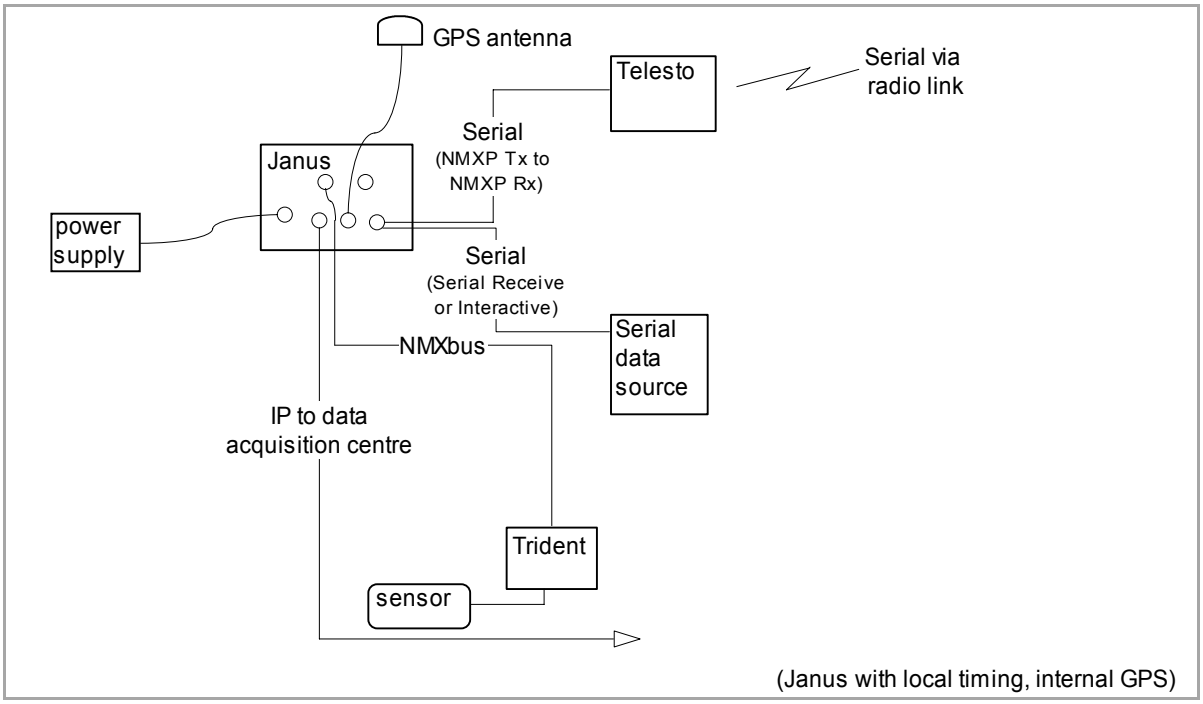
For radio networks, you can configure the Janus to use a Time Domain Multiple Access (TDMA) scheme to synchronise the transmission of serial data and commands. TDMA time slots are referenced to the GPS timing system and are independent of the data packet structure or flow.

You can set the packet length to tailor it to the quality of the radio link. (Packet length must be the same within a network branch; that is, the network segment connected to a given RM-4.):

- Use a shorter packet length on noisy or error-prone links. This reduces the likelihood of dropping, and requiring retransmission of, large segments of data.
- Use a longer packet length on higher quality links. This reduces unnecessary packet overhead, allowing more efficient use of the available bandwidth.

Figure 2-3 Examples of installation options





Chapter 3 Installation and Operation

This chapter describes how to install and operate the Janus Communications Controller. For additional information on monitoring operation and changing the configuration, see the related documents listed in section 1.2.1 on page 2.

Note Make a backup copy of the CD that is shipped with the system, and keep a record of any changes made to the hardware and firmware.

3.1 Installing Janus

Installing the Janus typically requires adding the Janus and Tridents to the system configuration, setting some parameters for the Janus, and installing the hardware. This section gives an overview of the basic installation tasks.

- If Janus has been preconfigured for your system as part of the contract, the as-shipped configuration sheet will list the configured parameter values for the unit. Installing the Janus typically will require these tasks:
  - Add the Janus (and associated Tridents) to the Naqs station file.
  - Create data ringbuffers.
  - Install the hardware at the remote site.
- If the Janus has not been preconfigured specifically for your system, the as-shipped configuration sheet will list the default parameter values for the unit. Installing the Janus typically will require these tasks:
  - Add the Janus (and associated Tridents) to the Naqs station file.
  - Set instrument parameters for the Janus (and associated Tridents) as required.
  - Create data ringbuffers.
  - Install the hardware at the remote site.

    For a typical installation the Janus units are configured at the central site and are then installed in the field, although the installation tasks do not have to be performed in this sequence.

3.1.1 Configure Naqs

For data to be received by a Naqs server, the Janus and associated Trident digitisers must be included in the Naqs station file (naqs.stn). Table 3-1 provides an overview of the basic configuration tasks. See the NaqsServer manual for more detailed information, such as descriptions of parameters in the naqs.stn file sections.

Table 3-1 Overview of basic Naqs configuration tasks

Task	Description	Section type in the naqs.stn file
▸ Add the instruments to the **naqs.stn** file	▸ Define “Janus” as an instrument prototype for the network, if it is not already defined. ▸ Define “Trident” as an instrument prototype for the network, if it is not already defined.	[InstrumentPrototype]
	▸ Add this Janus to Naqs. ▸ Add the Trident(s) associated with this Janus to Naqs.	[Instrument]
▸ Add the data channels to the **naqs.stn** file	▸ Define seismic channel(s) of the type that will be processed by the digitiser, if applicable and if these channel types are not already defined.	[ChannelPrototype]
	▸ Define seismic channel(s) from the digitiser associated with this Janus.	[Channel]
	▸ Define serial channel(s) from data sources associated with this Janus, if applicable and if these channel types are not already defined.	[SerialChannelPrototype]
	▸ Define serial channel(s) from data sources associated with this Janus.	[SerialChannel]
▸ Apply the changes to the **Naqs Server**	▸ Restart NaqsServer to start using the changes in the configuration.	

3.1.2 Configure the Janus

Note Parameter values are listed on the Janus configuration as-shipped sheet. Units will have been preconfigured for the network if this was included in the contract, otherwise the values are defaults that will need to be redefined.

Configure the Janus via the Nanometrics UI over a TCP/IP connection.

1. Connect a computer that has the Nanometrics UI installed, to the Janus Ethernet port. (For example, use cable 12186 (RJ-45 to 4-pin circular) via a hub to the Janus, or connect directly using a crossover cable).
2. Start the Nanometrics UI and log in to the Janus. (See also the Nanometrics UI manual.)

   The IP address of the Janus is listed on the as-shipped configuration sheet. This may be a default value if the unit was not preconfigured.
3. Configure the Janus. Table 3-1 provides an overview of the basic instrument configuration tasks. See the Nanometrics UI and NaqsServer manuals for more detailed configuration information.

Table 3-2 Overview of basic Janus configuration tasks

Task	Description	Parameter(s)
▸ Define IP connection information, if applicable. Use the options under the **Configuration > Internet** tab.	▸ Enter the network IP address of this Janus.	IP Address
	▸ Enter the IP address for the Naqs computer, and a second Naqs computer if applicable.	• Naqs IP • Naqs 2 IP
	▸ Enter the port number on which the Naqs computer(s) communicates with instruments. • This port number is defined in the naqs.ini file [NetworkInterface] section.	• Naqs port • Naqs 2 port
	▸ Enter the IP address for the computer receiving alert messages from Naqs. (For example, a computer running AlertMailer.)	Alert IP
	▸ Enter the port number on which the alert message destination computer listens for alert messages. • This port number is defined in the naqs.ini file [AlertSender] section. • See also the AlertMailer manual for information on setting alertmailer.ini parameters.	Alert port
	▸ Enter the IP address and subnet mask for the computer from which Janus will accept commands (for example, calibration commands). • Defaults are 0.0.0.0 (determined dynamically). Subnet mask of 255.255.255.255 allows only the specific IP address, 255.255.255.0 allows any on the subnet.	• Command source IP • Command source submask
	▸ Enter the port number on which the Janus listens for retransmission requests and commands. • Default is 0 (determined dynamically).	ReTx request port
▸ Define serial data ports, if applicable. Use the options under the **Configuration > Ports** tab.	▸ See section 2.5.2 “Serial ports” on page 6. for an overview of the options.	Port Type options and associated parameters
▸ Define ringbuffers for the data that will be collected via this Janus. Use options under the **Configuration > Ringbuffers** tab.	▸ Add ringbuffers as required for time-series and serial data channels (for example, time-series data for each channel from Trident, data from a serial source, Trident SOH). The Janus SOH and Log ringbuffers exist by default. If you use the Auto Config function, to allow assignment of channels: ▸ For IP, connect the Trident to the Janus for this task. ▸ For serial, define the ports first.	Ringbuffer panel parameters
▸ Set the packet length for SOH report to Naqs. Use the option under the **Configuration > System** tab.	▸ Set the packet length, in bundles per packet, for SOH report to Naqs. The length must be the same for all instruments on the subnet. • Default is 15.	Bundles / packet

3.1.3 Install the hardware

The Janus typically is installed in the remote site equipment vault or hut, on the equipment mounting plate (see section 3.1.3.1) or on shelving. The weather-sealed enclosure allows the Janus to be installed outdoors if required by the site design.

Hardware installation consists of mounting the Janus on support hardware, and then connecting the antenna, power, and data cables to the unit. GPS antenna and power cables, and NMXbus cable and connector kits, are included with the Janus.

3.1.3.1 Install the equipment mounting plate

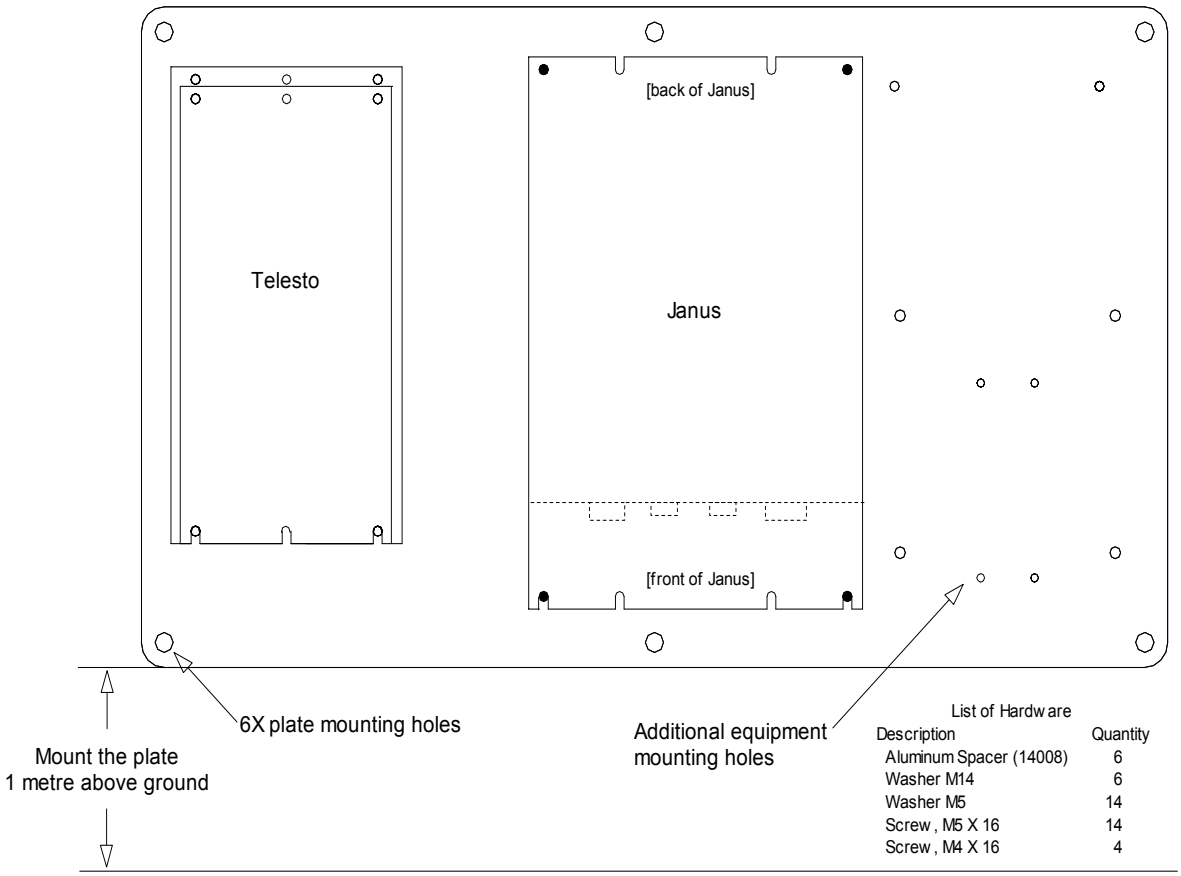
The optional equipment mounting plate kit (13828) contains the plate (13007), and hardware to mount Nanometrics units to the plate. It does not include hardware to mount the plate to the wall of the equipment vault or hut.

1. Select a means of attaching the mounting plate firmly to the wall of the vault or hut (for example, directly with self-tapping concrete screws, or to a plywood sheet that is bolted to the wall). This support structure and hardware must be able to bear a load of 28–32 kg.

Note The inner diameter of the spacers (14008) and M14 washers that will need to fit over the plate mounting screws or bolts is 15.2 mm.

2. Firmly attach the mounting plate not less than 1 metre above the floor of the vault or hut (Figure 3-1):
   - Use the aluminum spacers 14008 between the back of the mounting plate and the structure surface.
   - Use the M14 washers between the head of the mounting screw or bolt and the top of the mounting plate.
3. Attach the Janus to the mounting plate using the M5 screws and washers included in the kit:
   a) Into 2 equipment mounting holes at the bottom of the plate, thread the screws and washers, and tighten the screws 2 or 3 turns.
   b) Place the Janus slotted mounting holes (at the front of the Janus) over the 2 screws.
   c) Thread screws and washers into the 2 corner holes at the back of the Janus.
   d) Tighten all screws to firmly secure the Janus to the mounting plate.
4. Ensure that the mounting plate is firmly attached to the structure, and that all the hardware holding instruments to the plate is tightened.

Figure 3-1 Example of equipment mounting plate



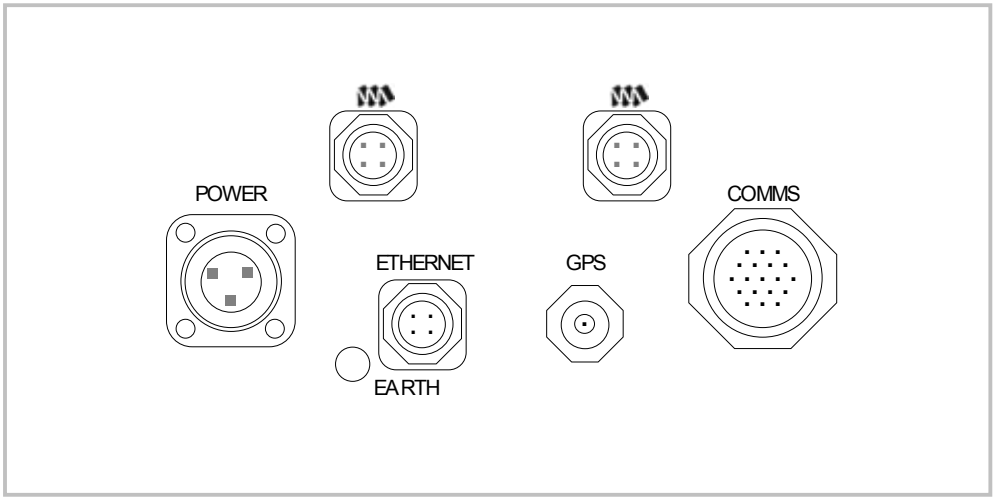
3.1.3.2 Interconnect the Janus and other instruments

Caution Forcing the wrong cable onto the NMXbus connector may damage the unit and connectors. Both the NMXbus and Ethernet connectors are 4-pin circular bayonet type, but are opposite genders. Check the cable type and the gender of the connectors before connecting the cable to the unit.

All of the connectors are on the front plate of the Janus (Figure 3-2).

- Connect the Janus to the other instruments as required by your system design. (See section 2.6 on page 8 for a general overview of installation options.)
  - To connect Janus to another Nanometrics instrument (such as a Cygnus) directly via Ethernet, use null modem cable 14469 (4-pin circular to 4-pin circular).

Figure 3-2 Janus connectors



3.2 Testing the installation

1. Ensure that the Janus gains a GPS lock on startup, for proper time-stamping of the data.
   - The GPS lock state is shown in the [Janus] > Operation > Timing panel.
   - The option [Trident] > Configuation > Timing > Require GPS Lock to start, is by default set to not enabled.

   If the Janus does not gain GPS lock within 15 minutes:

   - If the initial GPS location is in a different hemisphere from the actual location of the Janus (initial location is shown in [TimeServer] > Operation > Timing > Location panel), try putting in an approximate location and then use the Reset GPS Location button to set the closer initial location.
   - Check the placement of the GPS antenna and the antenna cable connections.
     - Reposition the antenna to a location with better visibility of the sky.
     - Ensure that the antenna cable is not hanging from the antenna, but is secured with the U-bracket or a few tie wraps near the antenna to carry the weight of the cable.
   - Check whether another GPS will lock to satellites. If this GPS receiver also does not gain lock it may mean that there is not enough GPS satellite coverage over the area at the time the test is being performed.
2. Check the Naqs server console to confirm that data are being received and no error messages are reported.

   For an IP connection, if data are not being received:

   - Ping the LAN IP address of the Janus. If the ping is not successful, then check:
     - That you are pinging the correct IP address (the IP address of the LAN interface of the Janus, listed on the configuration sheet).

- That the IP address of the computer is in the same subnet as the IP address of the Janus LAN interface.
- The connections between the Janus and the computer.

▸ Check whether the option [Trident] > Configuation > Timing > Require GPS Lock to start is enabled and the Janus initial GPS lock state is No Lock. If so, no data will be sent (see above).

▸ Check to see whether data packets are being received by Janus from the data source—for example, whether the number of received good packets is continuously increasing and the number of bad packets is stable.

- For the Trident, NMXbus transmission status parameters are shown in the [Trident] > Operation > Instrument panel.
- For a serial input device, transmission status parameters are shown in the [Janus] > Operation > Ports panel.

▸ If the number of framing errors is continuously increasing check if the serial port is configured for the baud rate at which the data source outputs data.

▸ If data are not being received at all, then check:

- Whether the data source outputs data.
- The connections between the data source and the Janus.

For a serial connection, if data are not being received:

▸ Confirm via the RM-4 user interface that data are being received by the RM-4. If not, confirm that the RM-4 serial port settings (such as packet length) correspond to settings for the Janus port.

3. If no retransmission requests are being sent, check whether the Janus has been configured with ringbuffers for the appropriate Trident.

If you have any questions, contact Nanometrics support.

3.3 Monitoring operation

Operation of the Janus can be monitored through the Nanometrics UI or via the comms controller configuration port.

3.3.1 Monitor operation via the Nanometrics UI

Options under the Operation tab display information on the instrument state of health, serial port data traffic, GPS satellite information, and instrument log messages. See the Nanometrics UI User Guide for more information.

3.3.2 Monitor operation via the comms controller monitoring port

The comms controller monitoring port is an RS-232 port that can be used for monitoring the basic operation of the Janus, via a terminal emulator reading the COM port of

the computer to which the Janus test cable is connected. (See Appendix C for information on building a test cable). It is a three-pin port on the COMMS connector:

- TX: pin L
- GND: pin U
- RX: pin V

Although the Janus configuration cannot be changed from its monitoring port, accessing the unit via this port is a means of finding out the IP addresses configured in Janus, and for monitoring basic unit operation. The IP address of the Janus is displayed as the unit boots up.

Configure the terminal emulator for 38400 Baud, 8 bits, no parity, and 1 stop bit (8N1), and no hardware or software handshaking.

- To access the port, connect the test cable to the COMMS connector of the Janus, and the Controller Config connector to the serial port of a computer.

3.3.3 Viewing the instrument log data

The last 100 log messages for the Janus and its associated instruments are displayed in the Nanometrics UI, in the [Janus]  > Operation > Log panel.

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 Naqs Server manual.

3.4 Changing the configuration

There are a number of configurable parameters for controlling the operation of the Janus and connected instruments. The values for these parameters are accessible through the Nanometrics UI (user access allows the values to be viewed, and technician access allows the values to be modified). See the Nanometrics UI User Guide for detailed information on these parameters. See also the Naqs Server manual for detailed information on defining instruments included in the data acquisition network.

3.5 Maintenance

The Janus hardware does not require scheduled maintenance. New firmware uploads may periodically be available; these can be uploaded with the Nanometrics UI via an IP connection. See the Nanometrics UI User Guide for more information.

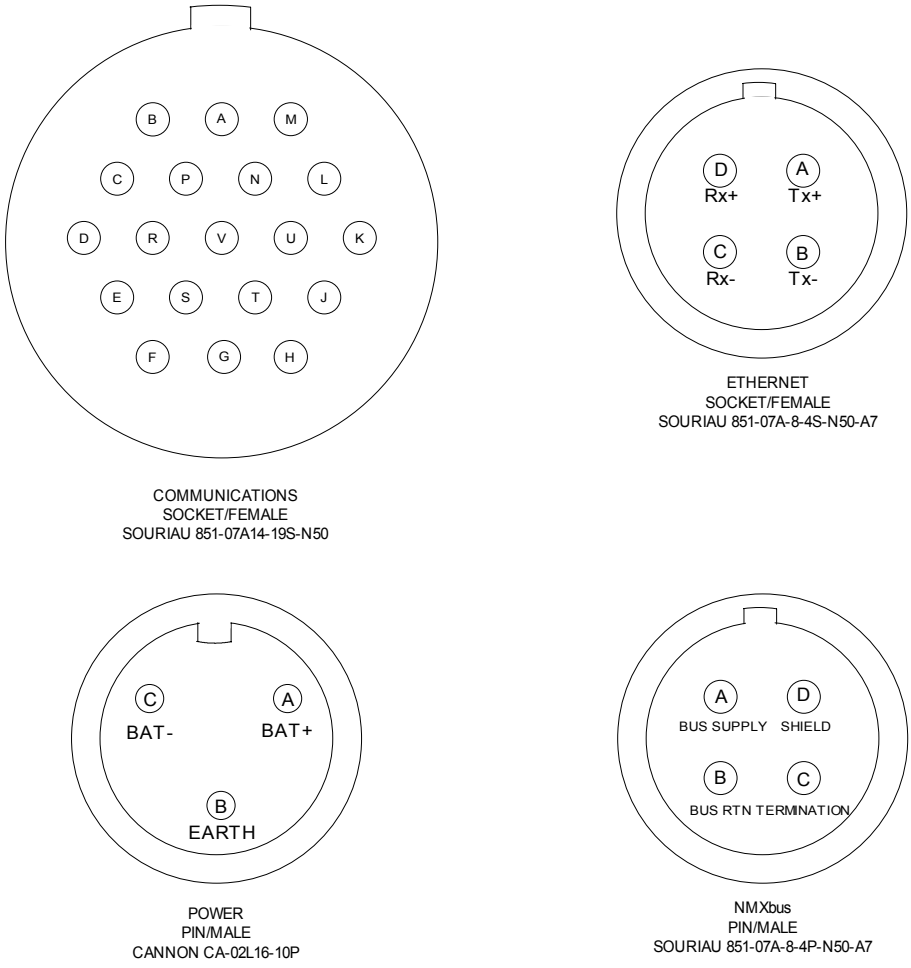
3.5.1 Repair

If after troubleshooting (see section 3.2 “Testing the installation” on page 16) it is determined that the Janus requires repair, send the unit back to Nanometrics. If you have any questions, contact Nanometrics support.

Appendix A Connector Pinouts

A.1 Connector diagrams

Figure A-1 Janus connectors, front face view



A.2 Pinouts

Table A-1 Ethernet connector pinout

Pin	Function
A	Tx+
B	Tx–
C	Rx–

Table A-2 Power connector pinout

Pin	Function
A	BAT+
B	EARTH
C	BAT–

Table A-3 NMXbus connector pinout

Pin	Function
A	Bus voltage (positive, IN or OUT) and bus signals
B	Bus ground
C	Connection sense, for line termination
D	Bus cable shield
shell	Janus chassis ground

Table A-4 COMMS connector pinout

Pin	Function		
	Local timing (internal GPS)	**Central timing**	**Local timing (external GPS)**
A	Digital ground*		
B	Analog ground†		
C	External state-of-health channel 3		
D	External state-of-health channel 1		
E	External temperature sensor		
F	+5 V, fused, for external temperature sensor		
G	TimeServer configuration port receive		GPS 1 Hz pulse in
H	TimeServer configuration port transmit		GPS power supply switch out
J	User serial port 2 receive		
K	User serial port 2 transmit		
L	Comms controller configuration port transmit		
M	User serial port 1 transmit	GPS 1 Hz pulse in	GPS port transmit
N	User serial port 1 receive	GPS messages in	GPS port receive
P	Internal +3 V, not separately fused. Use only to check internal voltage.		
R	External state-of-health channel 2		
S	Analog ground; common to pin B		
T	Digital ground		
U	Digital ground		
V	Comms controller configuration port receive		

* All four serial ports are referenced to digital ground (DGND)

† External temperature sensor and SOH are referenced to analog ground (AGND)

Appendix B Specifications

B.1 Environment/Operational

Table B-1 Environment/operational specifications

Parameter	Specification
Supply input voltage	12 to 24V DC nominal (9 to 36V DC)
Power consumption	3.3 W typical (at 24V), maximum 4.5W across input voltage range
Operating temperature	–20 to +55°C
Humidity	0 to 100%
Packaging	Weather-sealed enclosure

B.2 Connectors

Table B-2 Connector specifications

Connector	Specification
Power	3-pin MS connector
Ethernet	4-pin MIL bayonet connector, female
GPS antenna	• TNC • Supports a 5V active antenna
COMMS	• 19-pin MIL bayonet connector, female • Connector for the two serial ports, the two configuration ports, and the external state-of-health channels
NMXBus 1 and 2	• 4-pin MIL bayonet connectors, male • The two connectors are functionally equivalent

B.3 Ports

Table B-3 Port specifications

Port	Specification
NMXbus ports 1 and 2	• For data, timing, and power distribution to NMXbus devices • Duplex communications, managed by a request/grant protocol • Do not require configuration • Bus voltage: 12 to 24 V DC nominal (9 to 36 V DC) • Maximum current provided: 1 A • Maximum number of Tridents supported per Janus: 3 • Trident connection method: direct or daisy-chained • Maximum cumulative data throughput using Trident digitisers: 3000 samples per second • Maximum bus cable length: up to 150 m, for Trillium and passive sensor (see also the Trident User Guide) • NMXbus time: provided by the TimeServer
User serial port 1	• 1 external RS232 data port • Available Baud rates: up to 57600 • Can be configured for either transparent full duplex serial or unidirectional; typically would be configured for full duplex. • Not available for Janus with central timing or Janus with external GPS kit
User serial port 2	• 1 external RS232 data port • Available Baud rates: up to 57600 • Can be configured for either transparent full duplex serial or unidirectional; typically would be configured for unidirectional if local data buffering is required

External state-of-health	• Number of channels: 3 (user-defined)
	• Data rate: 1 sample per minute
	• Sensitivities:
	  • Ch 1: ±2 V DC
	  • Ch 2: ±10 V DC
	  • Ch 3: ±10 V DC

Ethernet	10Base-T port for on-site configuration and IP packet forwarding
Configuration	• 1 external RS232 data port, used for factory configuration • Available Baud rates: up to 57600
TimeServer configuration	• 1 external RS232 data port, used for factory configuration of the TimeServer • Available Baud rates: up to 57600

B.4 Timing subsystem

Table B-4 Timing subsystem specifications

Parameter	Specification
Type	UTC timed with digitally controlled VCXO clock disciplined by GPS receiver
Time accuracy	±20 µs, relative to UTC

Table B-4 Timing subsystem specifications (Continued)

Parameter	Specification
Frequency offset without GPS lock	±4 ppm maximum
GPS receiver	12-channel
GPS antenna	External, active, 26 dB gain minimum
GPS antenna cable	15 m (standard)

B.5 NMXbus

Table B-5 NMXbus specifications

Parameter	Specification
Number of bus connectors	Two (to permit daisy-chaining)
Multiple seismic channels	• Multiple Trident digitisers can share the same NMXbus • Maximum cumulative data throughput using Trident digitisers: 3000 samples per second
Bus cable specification	Shielded twisted-pair
Termination	Automatic
Bus length	Maximum 150 m (subject to sensor power requirements and source voltage; see also the Trident User Guide)

B.6 Janus commands

Table B-6 Commands supported

Command	Description
Configuration	Get / change / save the current configuration
Software upload	Upload new firmware
Test code	Test new code before setting as default
Reboot	Reboot the Janus

Appendix C Test Cable

This section contains information for building the optional test and configuration cable (14217).

Figure C-1 Test and configuration cable

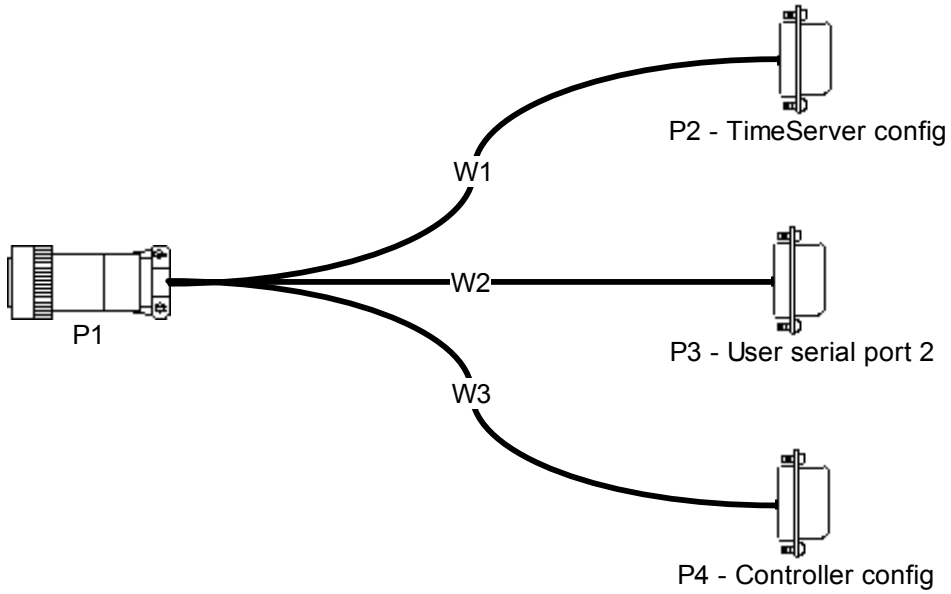


Table C-1 Test and configuration cable parts

Nanometrics part number	Manufacturer part number	Quantity	Description
WIR0058	BELDEN, 8443-500	3 x 1.5m	22 AWG, 3 conductor, unshielded
CON0907	SOURIAU, 851-06JC14-19P-N50	1	Plug, straight plug, shell 14, 19P
CON0011	ESONIC, AMP DE09-S	3	Dsub 9-pin female

Table C-2 Test and configuration cable connector pin wiring

From			To			Wire	Run
Conn	Pin	Description	Conn	Pin	Name	Colour	
P1	H	TimeServer Config Tx	P2	2	Rx	green	1
P1	G	TimeServer Config Rx	P2	3	Tx	red	1
P1	T	DGND	P2	5	Gnd	black	1
P1	K	User serial port 2 Tx	P3	2	Rx	green	2
P1	J	User serial port 2 Rx	P3	3	Tx	red	2
P1	A	DGND	P3	5	Gnd	black	2
P1	L	Controller config Tx	P4	2	Rx	green	3
P1	V	Controller config Rx	P4	3	Tx	red	3
P1	U	DGND	P4	5	Gnd	black	3