NOMAD™ Telemetry System

Service Manual

CJPS Medical Systems
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NOMAD™ Telemetry System Service Manual

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All CJPS Medical Systems monitoring devices are intended for use only by qualified medical personnel.

For the sake of brevity, the term NTS is sometimes used in this document to refer to the VitalPoint® NTS software. The former acronym MPC is also sometimes used on the software.

For the sake of brevity, the term PRO is sometimes used in this document to refer to the VitalPoint® PRO.

1. Before using the NTS be sure to read carefully and understand all sections of this User's Guide. Failure to read and understand the instructions may lead to misuse of the NTS which could result in harm to the patients.

Technical Assistance

If you have a question or need help installing or servicing any part of the NOMAD™ Telemetry System, please contact CJPS Medical Systems Technical Support:

Email: **CJPS-Info@CJPS.com**

Phone: **(480) 939-4362**

For more information, please consult our web site:

www.CJPS-MedicalSystems.Com

Advisory

CJPS Medical Systems equipment, installation, maintenance repair, and modification must be performed by CJPS Medical Systems authorized service technicians.

Table of Contents

General Information

This Service Manual provides information for service technicians and biomedical engineers who are responsible for installing and maintaining the VitalPoint® NOMAD™ Telemetry System. Components of the NOMAD™ Telemetry System include the VitalPoint® PRO, and the NTS software (Multi-patient Console).

The VitalPoint® PRO is a small, lightweight patient monitor designed to acquire physiological waveforms and parameters, and to transmit this data to a NOMAD™ central monitoring station. For the sake of brevity, the term NOMAD™ Telemetry System is sometimes referred to as the NTS in this document.

The NTS computer is the central monitoring station for the NOMAD™ Telemetry System which houses the NTS software and allows viewing and control of the Intranet-connected VitalPoint® monitors. The NTS computer connects to a network of VitalPoint® PRO bedside patient monitors, allowing you to view information from up to 64 patients at once

The NOMAD™ Direct Connect cable (VS-940), is a cabling set to connect one individual VitalPoint® **directly** to a computer, laptop, or tablet.

NOMAD™ Intranet cable, (VS-945) is a cabling set to connect each VitalPoint® PRO monitors to the Intranet, for viewing and control from the NOMAD™ computer.

The NTS Software (VS-925) provides viewing and control of the PRO monitors parameters from the NOMAD™ computer. This software comes with a laptop, unless ordered with a tablet or a PC.

Before installing or servicing any part of the NOMAD™ Telemetry System, be sure to read carefully and understand all sections of this Service Manual. Failure to read and understand the instructions may lead to misuse of the system, which could result in harm to the patients.

Typographical Conventions in this Service Manual

This manual contains warnings, cautions, and notes to help call your attention to the most important safety and operational aspects of the system. To help identify these items when they occur in the text, they are shown using the following typographical conventions:

WARNING -- Statements that call attention to the possibility of injury, death, or other serious adverse reactions associated with the use or misuse of the device.

CAUTION -- Statements that call attention to the possibility of a problem with the device associated with its use or misuse. Such problems include device malfunction, device failure, damage to the device or damage to other property.

Note -- Statements that provide supplemental information.

Software Levels Compatible With This Service Manual

This Service Manual was written to match the features in the following software versions:

NTS Software Version 2.3.2014
VitalPoint® PRO Version 2.3.16

You can tell which NTS software version you are running by selecting the "Help", "About NTS" item from the NTS main menu.

You can tell which VitalPoint® PRO software version you are running by selecting the "Setup", "Configuration" item from the VitalPoint® PRO main menu.

CAUTION -- If the software version you are running does not appear in the list above, contact CJPS Medical Systems Customer Support for a new version of this Service Manual. Applying instructions from a Service Manual that does not match the software version could lead to confusion and mistakes in caring for the patients.

1. Overview

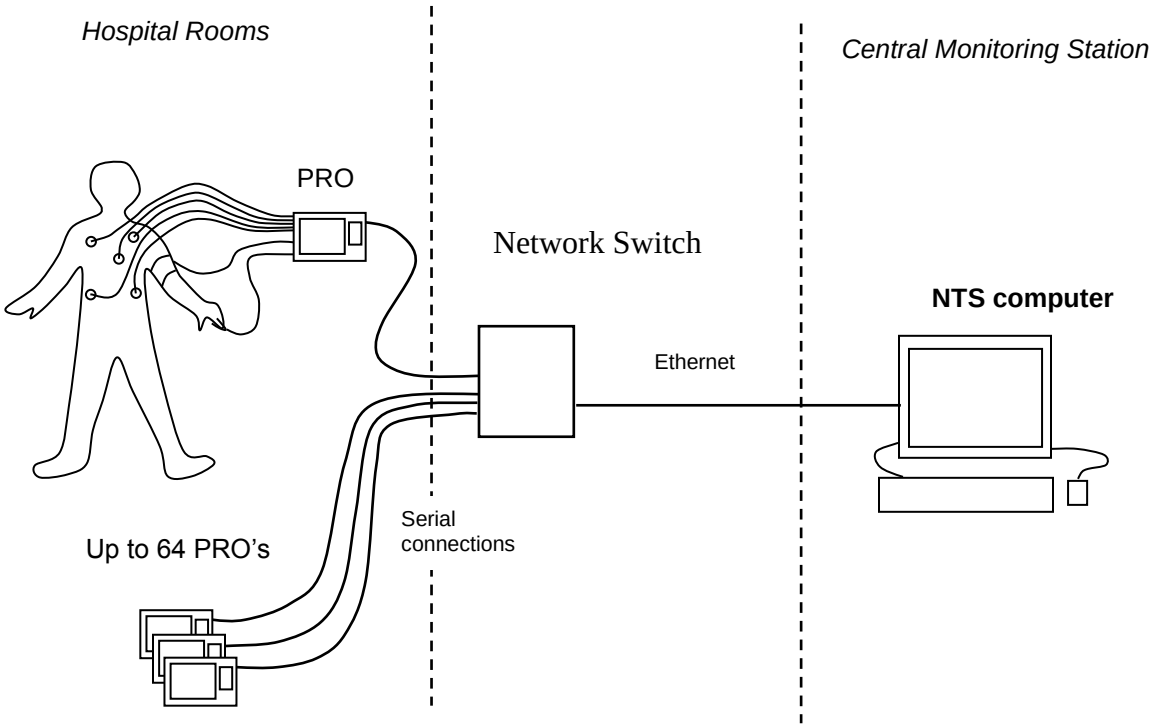
This chapter provides an overview of the NOMAD™ Telemetry System, showing how the various components of the system are related.

1.1. NTS Diagrams

The NTS hardware is composed of standard PC components. PC hardware shipped to the customer for use as an NTS station will have first been validated at the factory to ensure that it functions properly and meets all NOMAD™ Telemetry System requirements.

For this reason, a diagram showing the NTS hardware, along with specific technical data describing the hardware, is provided by the manufacturer of the PC selected for use as an NTS station. All the manufacturer's drawings and manuals are shipped to the customer along with the NTS.

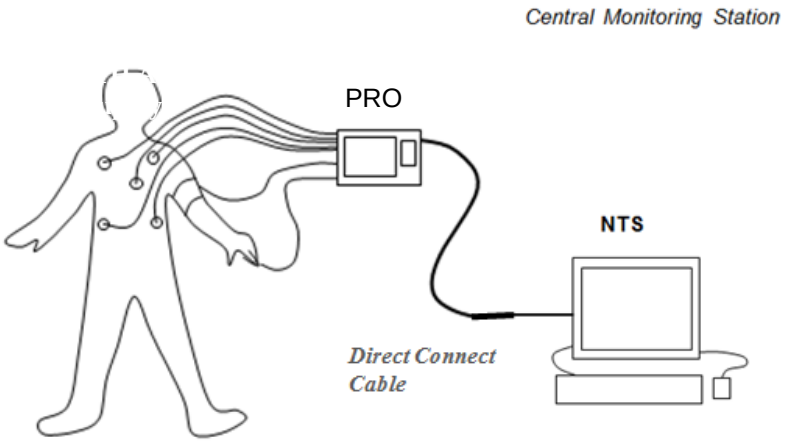
The main components of the NOMAD™ Telemetry System are shown in the following diagram:



Overview

The VitalPoint® PRO serves as the bedside patient monitor. All VitalPoint® PRO monitors are connected to the NOMAD™ Telemetry System at the central station.

Alternately, if using the NOMAD™ Direct Connect Cable, the diagram below illustrates the main components and setup:



1.2. VitalPoint® PRO Diagrams

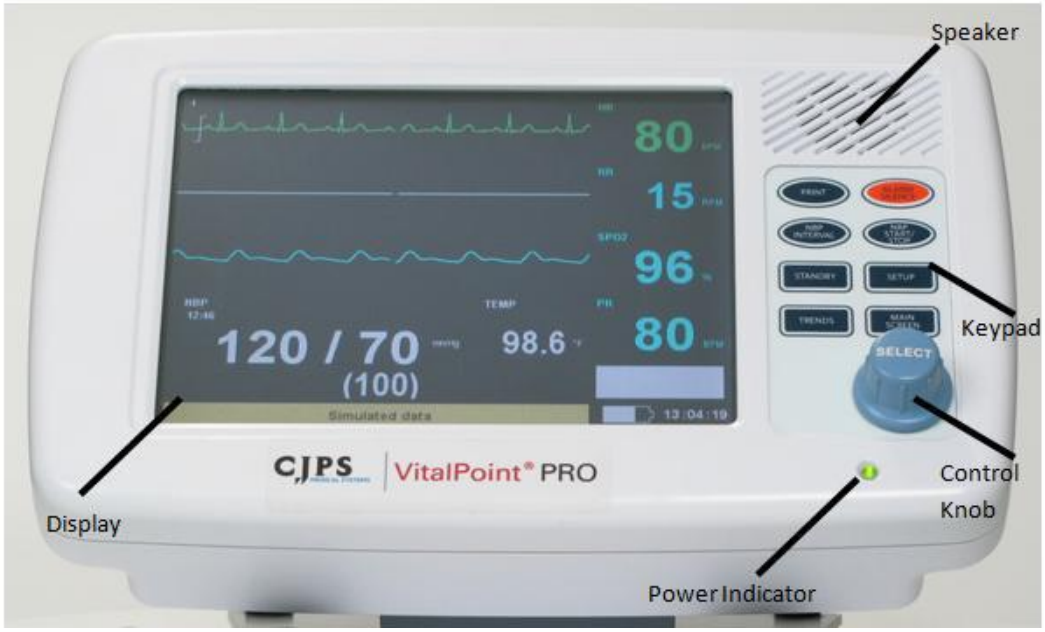


Figure 1. VitalPoint® PRO Front View

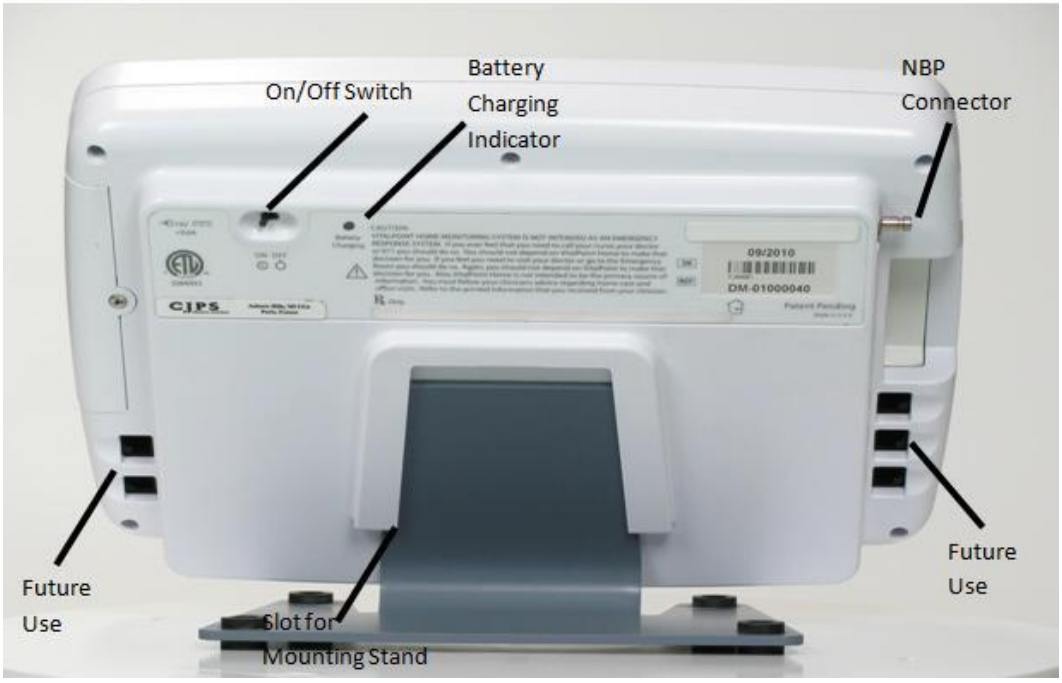


Figure 2. VitalPoint® PRO Back View

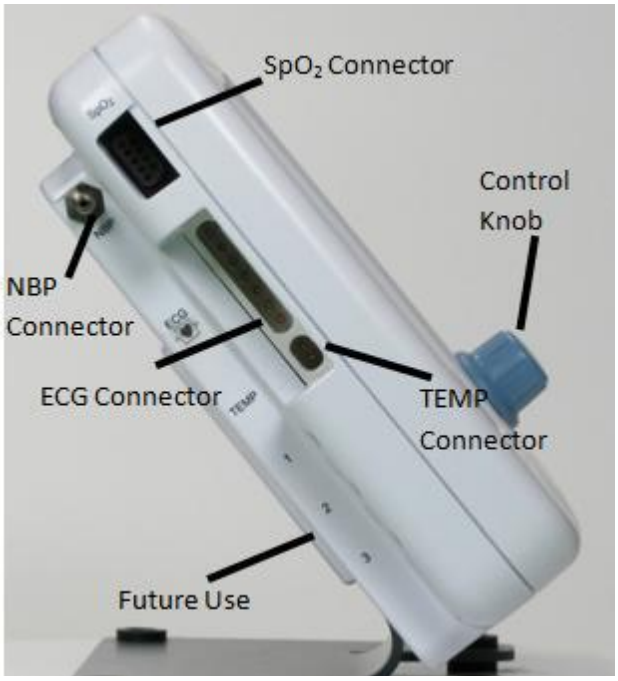


Figure 3. VitalPoint® PRO Left Side View

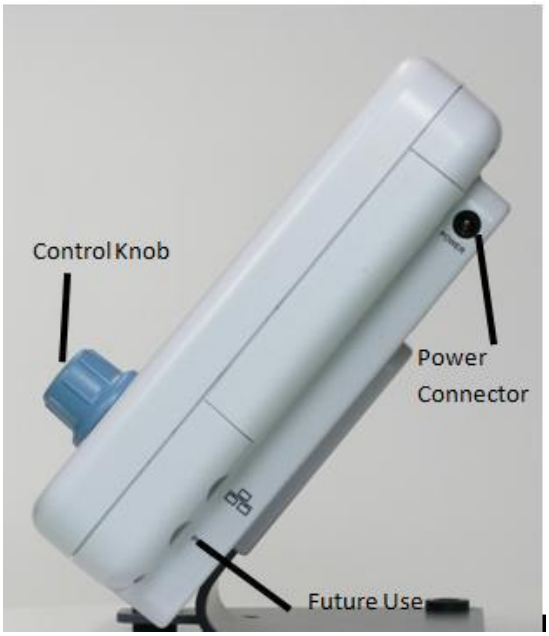


Figure 4. VitalPoint® PRO Right Side View

1.3. Scope of this Service Manual

This Service Manual provides information for service technicians and biomedical engineers who are responsible for installing and maintaining the NOMAD™ Telemetry System. This manual describes service aspects of the NOMAD™ Telemetry System, and the VitalPoint® PRO.

For information about how to use the NTS software, please consult the NOMAD™ Telemetry System User's Guide.

For information about how to use the VitalPoint® PRO, please consult the VitalPoint® PRO User's Guide.

2. System Installation

This chapter explains how to install the NOMAD™ Telemetry System. Certain aspects of the system installation will vary from one site to another and these need to be worked out ahead of time in consultation with the hospital's Biomedical or Information Technology departments.

The system installation process encompasses the following activities:

1. Doing a Deployment Worksheet (identifying locations for NOMAD™ PRO monitors and associated Intranet cables, and the NTS computer station)
2. Installing the NOMAD™ Intranet cables or NOMAD™ Direct Connect cable
3. Installing the NTS software (at central monitoring station or on PC used with Direct Connect cable)
4. Verifying correct system operation after installation

2.1. Deployment Worksheet

Before beginning the installation, you should work with the responsible hospital staff to do a Deployment Worksheet, in order to gather information needed to do the system installation. Record the results of this survey in the Deployment Worksheet (for a blank sample, please refer to the Forms section of this Service Manual).

Once the deployment worksheet has been completed, you should send a copy of the Deployment Worksheet to the CJPS Medical Systems Customer Service Manager, who will analyze the information and work with you to help ensure that the installation goes smoothly.

Part of the goal of the Deployment Worksheet is to identify which IP Addresses and Room Numbers will be connected to which COM ports on the NTS software. The small view areas on the NTS software display are tied to specific COM ports. The top row, left-most small view area maps to the lowest-numbered COM port, the one next to it on the top row maps to the next lowest -numbered COM port, and so on to the bottom row, right-most small view area, which maps to the highest numbered COM port.

Note: The NTS is set up at the factory with COM4 as the lowest-numbered COM port used for PRO connections and COM67 as the highest-numbered COM port used for PRO connections. Since COM1 is actually port number 0, COM4 is actually port number 3, etc.

Connecting the NTS central station to the facility's Intranet

Generally the installation will be done by a contractor approved by the hospital or Biomedical/IT department member.

CJPS Medical Systems provides the NOMAD™ Intranet Cable assembly NTS desktop, laptop or tablet PC, already loaded with the NTS software, and configured with the Deployment Worksheet information that you provided. Keyboard, mouse, and speakers, as needed. Please note that you must procure an intranet cable for each monitor, as the length of this cable will depend on each room and facility.

Network Communication Cable

For the patient room connections, the NOMAD™ system uses a multi-part cable connector (VS-945).

Install the provided NOMAD™ Intranet cable into the Network port on the lower right-hand corner of the VitalPoint® PRO monitor.

Connect the serial port (male DB9 connector) of the network cable to the serial port on the adaptor

- Plug the adapter into its power supply and plug the power supply into an outlet
- Connect one end of a standard Ethernet cable of the length of your choice into the Ethernet port on the adapter, and the other end of that cable into the Intranet wall plate.

In the case of a direct connection (without Intranet) between a PRO monitor and a computer, CJPS Medical Systems provides a 2 piece cable (VS-940) that connects the PRO monitor directly to the NTS computer.

- 1 NTS data cable
- 1 RS232 to USB converter

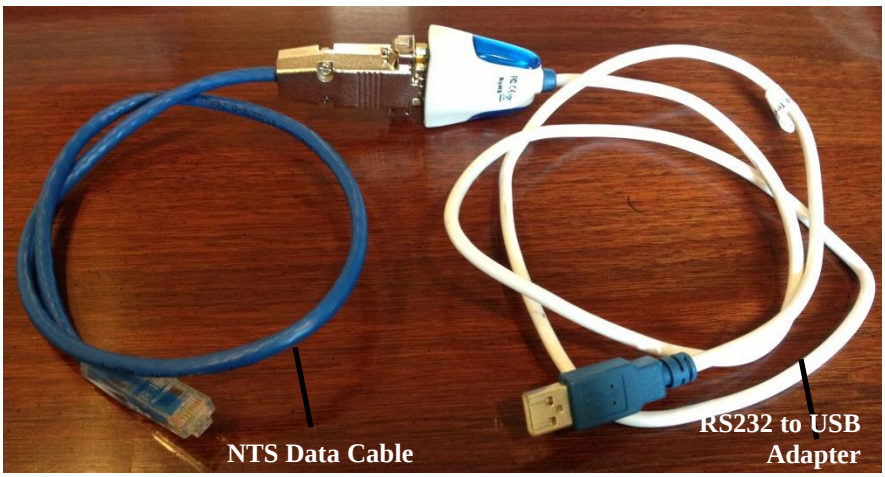


Figure 1. NOMAD™ Direct Connect (VS-940) Cable

Network Cable to NTS Station

For the connection between the VitalPoint® PRO monitors and the NTS computer, they all need to be connected to the same intranet network.

2.2. Installing the NTS Computer at the Central Nursing Station

This section does not apply to the application where each VitalPoint® PRO monitor is connected directly to a computer using the Direct Connect cable (VS-940), as no central nursing station is used in this configuration.

The NTS computer should be placed on a table or work surface at the location designated for the system's central monitoring station.

The NTS display, keyboard, and mouse should be positioned on the work surface in a way that allows an operator to use them comfortably. Pay attention to the normal ergonomic rules for PC users in setting up these components.

The speakers should be positioned such that they will not be subject to dislocation or obstruction which might interfere with the user's ability to hear them.

WARNING -- Since the alarm annunciation function of the system depends partly on audible alarm tones, it is critical that the speakers be protected from damage or obstruction.

To avoid the risk of someone attempting to turn down the volume of the speakers to the point where an alarm tone cannot be heard, we recommend positioning the speaker that has the volume control in a place where the control cannot be easily or accidentally changed.

To install the NTS computer station, use the following procedure:

1. Connect the supplied computer station to the intranet using an Ethernet cable (not supplied).
2. Connect the keyboard, mouse and speakers if required.
3. Connect the power cord, and plug the cord into a surge protector.
4. Plug the surge protector into a live AC power outlet.

CAUTION -- To avoid the risk of accidentally powering off the NTS computer station, make sure that the surge protector is securely located in a position where it cannot be accidentally kicked or stepped on.

If using the NOMAD™ Direct Connect Cable:

1. With a laptop that already has the NTS software installed, connect the USB connector of the USB to DB9 serial cable to a USB port on the computer
2. Connect the RS232 serial connector on the USB cable to the RS232 serial connector on the data cable
3. Connect the data cable to the Network port on the VitalPoint® PRO monitor
4. In the NTS software select ‘Configuration’ then ‘Setup’
5. In the Setup window, set the number of COM ports to 1 and ‘First COM Port’ to the COM port assigned to the USB port on the computer
   This can be found in the Device Manager application on the computer

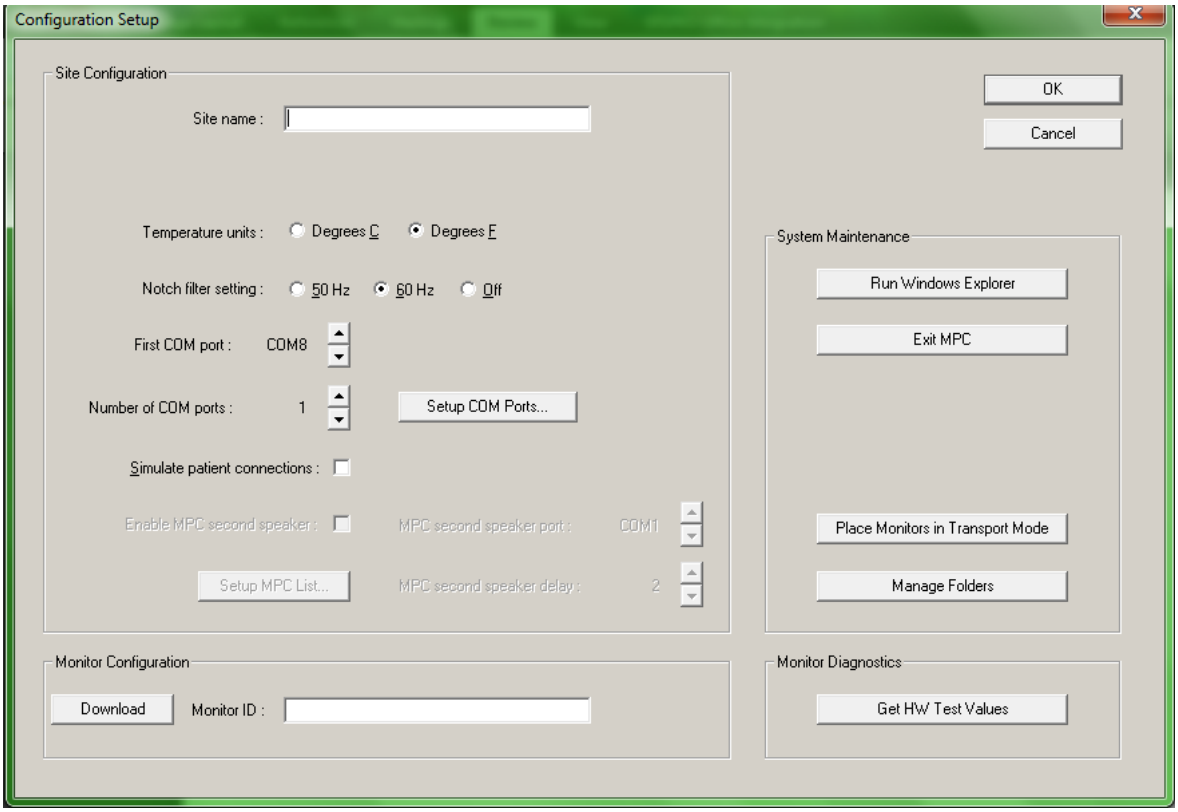
6. Restart the NTS software, with the VitalPoint® PRO monitor on and collecting data, the data will be transmitted to the software

If using the NOMAD™ Intranet Cable

1. Connect the Intranet cables to the assigned room per the Deployment Worksheet
    i. Ethernet cable required (not provided)
    ii. Connect the Ethernet cable to the adapter and to the Network wall plate
2. Connect the NTS CAT 5 cable to the VitalPoint® PRO Network port
3. Setup the computer running the NTS software and connect the computer to the Intranet
4. Turn on the computer, and ensure COM port configuration software is running
5. Power on the VitalPoint® PRO monitors
6. Start the NTS software, with the VitalPoint® PRO monitor on and collecting data, the data will be transmitted to the software

Configuring the NTS Software

After installing the NTS computer, there are a number of system configuration settings that need to be initialized. The data for initializing these settings is derived from the System Configuration. To initialize the settings, select the "Configuration", "Service" menu item on the NTS' menu. This brings up the following dialog box:



This dialog box allows you to change the following values, which may differ from one site to another:

- The site name (e.g., the hospital name)
- Preferences that may differ from one location to another, such, the notch filter setting (which depends on the local AC line frequency), and the units of measure for temperature
- The number of VitalPoint® PRO monitors in the system
- The COM port numbers mapped to the serial line connections coming from the Network Connection
- If additional VitalPoint® PRO monitors are added later, the "Setup COM Ports" button leads to another dialog box that allows you to define Location Name (in case you want them to be location-oriented, such as "Room 302" instead of their default values, which are simply "Monitor 01" etc.)
- The screen layout controls allow you to maximize the screen area used for the small views in case the system contains fewer than 64 PRO's

3. Functional Verification

This chapter describes the procedure to use to verify that the NOMAD™ Telemetry System is functioning correctly. You should run through this procedure when the system is first installed. You should also run through this procedure whenever the NTS software is upgraded, and whenever the PRO software is upgraded or placed back into service.

To do the functional verification, use the following procedure:

1. Verify that the NTS computer is powered up and displaying the NTS main screen.
2. Select an intranet wall plate to use for the functional verification. Verify that a VitalPoint® PRO is powered on and properly connected to a power outlet and an Intranet outlet, using the NOMAD™ Intranet cable (VS-945) provided by CJPS.
    - If using the Direct Connect cable (VS-940) – Verify that a VitalPoint® PRO is powered on and properly connected to a power outlet and connected to the laptop running the NTS software via the NOMAD™ Direct Connect cable.
3. In the NTS software, verify that the small view area that corresponds to the VitalPoint® PRO you are using has the correct Monitor ID displayed in the name area.
4. In the NTS software, left-click on the small view area that corresponds to the VitalPoint® PRO you are using. This causes the NTS software to display data from the VitalPoint® PRO in the NTS' primary large viewing area.
5. If no patient had been admitted to the VitalPoint® PRO, use a made-up patient name to admit a patient to the VitalPoint® PRO. In either case, verify that the correct patient name appears in the name area of the primary large viewing area and also in the small view name area for the VitalPoint® PRO.
6. Go to the VitalPoint® PRO you are using and verify that the patient name appears in the name area of the VitalPoint® PRO.

7. In the NTS software turn alarms on for the temperature parameter. Verify that the message "Temperature Unplugged" appears in the message area on the NTS software.
8. Verify that the NTS computer is sounding an alarm tone. Press the Acknowledge button to silence the tone.
9. Unplug the PRO from the NOMAD™ Intranet Cable, and verify that the message "Monitor connection lost" appears in the message area on the NTS software display.
10. Verify that the NTS computer is sounding an alarm tone. Press the Acknowledge button to silence the tone.
11. Verify that the message "MPC connection lost" appears in the message area of the PRO.
12. Verify that the PRO is sounding an alarm tone. Press the Acknowledge key on the PRO keypad to silence the tone.
13. Reconnect the PRO to the NOMAD™ Intranet Cable. Verify that the message "Monitor connection lost" no longer appears in the message area on the NTS computer display
14. Verify that the message "MPC connection lost" no longer appears in the message area of the PRO.
15. Go to the NTS software. Turn alarm off for temperature parameter. If no patient had been admitted to the PRO, discharge the made-up patient name from the PRO.

When doing this functional verification in order to verify a system installation, repeat the procedure for each PRO.

See the Maintenance section of this manual for information regarding a periodic check of the VitalPoint® PRO itself.

NOTE – For initial system setup and subsequent software upgrades, complete the Functional Verification form and send it to the CJPS Medical Systems Customer Service Manager. This information is required in order to comply with FDA regulations (for a blank sample of this form, please refer to the Forms section of this Service Manual).

4. Screen Messages

This section describes the messages that may appear on the NTS computer screen, together with explanations of what the messages mean and what action may be required when you see the message.

4.1. Non-physiological Messages

Message	Possible Cause	Suggested Action
Monitor connection lost	The communication link to the VitalPoint PRO has been interrupted	Check to make sure that the Power and Communications cable is still securely connected to the VitalPoint® PRO. " Ensure that the NTS is still operating normally. If none of these steps is successful, contact CJPS Medical Technical Support
Vital Point PRO overheating!	Internal temperature of the PRO is too high	Check to see if the PRO has fallen on its side or is covered by a pillow, blanket, or anything else which could be keeping air from circulating freely around the monitor. If this message continues even though the monitor is not being covered up, contact CJPS Medical Systems Technical Support.
Waveforms stopped	The waveform area was stopped temporarily	Left-click on the waveform area again to re-start the waveform drawing

4.2. ECG and Heart Rate Messages

Message	Value	Possible Cause	Suggested Action
HR asystole	ASY	No QRS detected for last 4 seconds	Check the patient and provide any necessary clinical care. Check the ECG lead being used to calculate the heart rate (the top displayed lead) -- make sure that the QRS amplitude on this lead is at least .5 mV. Change to another ECG lead to get adequate QRS amplitude. Reposition or change electrodes if no lead gives adequate QRS amplitudes. Remember the importance of good skin preparation techniques.
HR ventricular fibrillation	VF	No organized ventricular rhythm detected	Check the patient and provide any necessary clinical care. Check the ECG lead being used to calculate the heart rate (the top displayed lead) -- make sure that the QRS amplitude on this lead is at least .5 mV. Change to another ECG lead to get adequate QRS amplitude. Reposition or change electrodes if no lead gives adequate QRS amplitudes. Remember the importance of good skin preparation techniques.
HR lead off	[blank]	Unplugged cable Broken cable Loose lead wire Faulty lead wire Dried out electrode Inoperable ECG circuit	Check to make sure electrodes are still securely attached to the patient, and reattach if necessary. Remember the importance of good skin preparation techniques. Check to make sure all the lead wires are still connected to the electrodes. Check to make sure the lead wires are securely connected to the Vital Point ® PRO. Check to make sure there are no broken lead wires. Turn monitor off, then back on If message persists, contact CJPS technical support.

Message	Value	Possible Cause	Suggested Action
HR artifact	---	Patient movement Electrical noise from auxiliary equipment Bad electrode contact	Calm the patient. Isolate the patient from auxiliary equipment, if possible. Check to make sure electrodes are still securely attached to the patient, and reattach if necessary. Remember the importance of good skin preparation techniques.
HR < [lower limit]	[number]	The patient's heart rate has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.
HR > [upper limit]	[number]	The patient's heart rate has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.

4.3. Respiration Messages

Message	Value	Possible Cause	Suggested Action
RR out of range	---	The patient's respiration rate has risen above the maximum value the monitor can accurately detect. Electrical noise from auxiliary equipment Monitor confused by signal artifact	Check the patient and provide any necessary clinical care Isolate the patient from auxiliary equipment, if possible Check to make sure electrodes are still securely attached to the patient, and reattach if necessary. Remember the importance of good skin preparation techniques.
RR lead off	[blank]	Unplugged cable Broken cable Loose lead wire Faulty lead wire Dried out electrode Inoperable respiration detection circuit	Check to make sure electrodes are still securely attached to the patient, and reattach if necessary. Remember the importance of good skin preparation techniques. Check to make sure all the lead wires are still connected to the electrodes Check to make sure the lead wires are securely connected to the monitor. Check to make sure there are no broken lead wires Turn monitor off, then back on If message persists, contact CJPS technical support.
RR artifact	---	Patient movement Electrical noise from auxiliary equipment Bad electrode contact	Calm the patient. Isolate the patient from auxiliary equipment, if possible Check to make sure electrodes are still securely attached to the patient, and reattach if necessary. Remember the importance of good skin preparation techniques.
RR < [lower limit]	[number]	The patient's respiration rate has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate
RR > [upper limit]	[number]	The patient's respiration rate has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate

4.4. Pulse Oxymetry Messages

Message	Value	Possible Cause	Suggested Action
SpO_2 replace sensor	---	Bad SpO_2 sensor Incorrect set-up within the PRO.	Replace the SpO_2 sensor Contact CJPS technical support
SpO_2 check sensor placement	---	Sensor has become detached from patient Sensor not fully inserted on patient's finger Excessive ambient light Bad sensor (no red light coming from sensor)	Check to make sure the sensor is attached fully and securely to the patient Cover the sensor with opaque material, such as a towel, to reduce ambient light Reattach the sensor, possibly on a smaller or larger finger Replace sensor if there is no red light coming from it
SpO_2 weak signal	---	Poor perfusion Large tissue mass Nail polish Bad SpO_2 sensor	Check the patient and provide any necessary clinical care Warm the patient's extremities if needed Reattach the sensor on a smaller finger Remove any nail polish that may be interfering with the red light Replace the SpO_2 sensor
SpO_2 unplugged	[blank]	SpO_2 sensor not connected to SpO_2 cable	Check to make sure the SpO_2 sensor is securely connected to the SpO_2 cable on the monitor
SpO_2 artifact	---	Patient movement or coughing Hemodynamic interference Small tissue mass	Calm the patient Reattach the sensor on another finger with less movement Reattach the sensor on a larger finger
SpO_2 < [lower limit]	[number]	The patient's oxygen saturation has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate
SpO_2 > [upper limit]	[number]	The patient's oxygen saturation has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate

Message	Value	Possible Cause	Suggested Action
PR < [lower limit]	[number]	The patient's pulse rate has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate
PR > [upper limit]	[number]	The patient's pulse rate has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care Change the alarm limit if it is no longer clinically appropriate

4.5. Noninvasive Blood Pressure Messages

Message	Value	Possible Cause	Suggested Action
NBP weak signal	---	Poor limb perfusion Improper cuff placement Cuff size too large for the patient	Check the patient and provide any necessary clinical care Check to make sure the cuff is wrapped properly, with the “artery” mark lined up over the brachial artery Check the limb circumference against the recommended range as printed on the cuff, to insure the cuff is not too big
NBP artifact	---	Persistent patient movement or coughing Hemodynamic interference (varying pulse amplitudes due to breathing or valve problem) Hose is clogged or leaking	Check the patient and provide any necessary clinical care Calm the patient Move the cuff to another limb with less movement If no obvious patient motion, switching to the other limb may still help in the case of hemodynamic interference Check the cuff and hose for signs of damage
NBP cuff leak	---	Leaky cuff or hose	Check for leaks in the cuff or hose and replace if necessary
NBP blocked hose -- check patient	---	Pinched Hose	Check the patient and insure that the cuff is deflated Check for kinks or obstructions in the hose Replace hose if necessary
NBP measurement time exceeded	---	The measurement time limit (2¼ minutes) was exceeded, usually due to motion artifact	See suggestions for “NBP artifact” Repeat the measurement
NBP needs service	---	Monitor has detected a hardware problem	Check the patient and insure that the cuff is deflated Turn the monitor off, then on. If message persists, contact C JPS technical support.
NBP cannot measure	---	Initial inflation pressure may not have been high enough (if patient’s systolic pressure is above 200 mmHg) Patient movement	Repeat the measurement (monitor will automatically adjust to using a higher initial inflation pressure if needed)
NBPs < [lower limit]	[number]	The patient's systolic pressure has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.

Message	Value	Possible Cause	Suggested Action
NBPs > [upper limit]	[number]	The patient's systolic pressure has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.
NBPd < [lower limit]	[number]	The patient's diastolic pressure has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.
NBPd > [upper limit]	[number]	The patient's diastolic pressure has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.

4.6. Temperature Messages

Message	Value	Possible Cause	Suggested Action
TEMP unplugged	[blank]	Temperature probe disconnected	Check to make sure the temperature probe is connected to the temperature cable. Check to make sure the temperature cable is connected to the PRO.
TEMP out of range	---	The patient's temperature has risen above the maximum value the monitor can accurately detect. There is a problem with the connections or with the hardware.	Check the patient and provide any necessary clinical care. Check the temperature cable connections. Turn the monitor off, then on. If message persists, contact CJPS technical support.
TEMP needs service	---	Monitor has detected a hardware problem.	Turn the monitor off, then on. If message persists, contact CJPS technical support.
TEMP < [lower limit]	[number]	The patient's temperature has fallen below the current lower alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.
TEMP > [upper limit]	[number]	The patient's temperature has risen above the current upper alarm limit.	Check the patient and provide any necessary clinical care. Change the alarm limit if it is no longer clinically appropriate.

5. Troubleshooting

The following table is meant to help you solve problems that you may encounter while installing or servicing the NOMAD™ Telemetry System. If you are still experiencing a problem and none of these steps seem to help, please contact CJPS Technical Support:

Email: **CJPS-Info@CJPS.com**

Phone: **(480) 939-4362**

For more information, please consult our web site:

www.CJPS-MedicalSystems.com

Trouble Symptom	Possible Causes	Things to Try
The Vital Point® PRO is plugged in but it does not start up	No power to outlet	Verify that the power outlet is working. Verify that the green LED on the VitalPoint® PRO front panel is illuminated.
	The Vital Point® PRO Power Supply is not working	Verify that the green LED on the power supply is illuminated. If possible, try using a different VitalPoint® PRO Power Supply to see if that is the problem.
	Internal system error	Power cycle the VitalPoint® PRO – if condition persists, stop using the monitor, contact CJPS Medical Technical Support to request a repair or replacement
The VitalPoint® PRO won't run on battery power.	Battery needs recharging.	Connect the VitalPoint® PRO to wall power. Verify that the green (charging) LED on the battery pack is illuminated.
The Monitor ID in the NTS small view is not right.	The Monitor ID was not entered right at installation time.	Follow the instructions in this manual for setting up the Monitor ID's

	The CJPS communication cable location has been changed	Contact CJPS Technical Support to verify the correct communication cable is in the correct location.
No patient name appears on the VitalPoint® PRO	No connection to NTS	Verify that the VitalPoint PRO is powered on, that the Power and Communications Cable is securely connected to the monitor, and that the Communications Plug is securely connected to the Ethernet wall plate
	Patient has not been admitted at the NTS	Verify that the patient is admitted at the NTS
The patient name on the VitalPoint® PRO does not match the name on the NTS	The patient was admitted to the wrong small view area on the NTS	Verify that the patient is admitted into the correct small view area for the monitor.
	The location of the connection cabling to the VitalPoint® PRO has been changed	Stop using the VitalPoint® PRO, contact CJPS Medical Systems Technical Support to re-check the system installation
The VitalPoint® PRO keypad is not working right	Keypad failure	Stop using the VitalPoint® PRO, contact CJPS Medical Systems Technical Support to request a repair or replacement
The VitalPoint® PRO display is not working right	Display failure	Stop using the VitalPoint® PRO, contact CJPS Medical Systems Technical Support to request a repair or replacement
The VitalPoint® PRO is not working right and displays an error message	Operating system failure	Power cycle the VitalPoint® PRO – if condition persists, stop using the monitor, contact CJPS Medical Systems Technical Support to request a repair or replacement
The VitalPoint® t PRO displays a message stating that the disk is too full.	The PRO's disk is too full and needs to be cleaned up.	Stop using the PRO, contact CJPS Medical Systems Technical Support to request a repair or replacement
The PRO displays a message stating that the CPU is too busy.	Internal system failure	Stop using the PRO, contact CJPS Medical Systems Technical Support to request a repair or replacement
The NTS display is flashing but there is no sound	The NTS speaker volume has been turned down	Verify that the NTS speaker volume is not turned down
	The NTS speakers have been disconnected	Verify that the speakers are connected to the NTS
The NTS computer is displaying	There was an internal Windows	Power cycle the NTS and be sure

an error message or has reset and is displaying a blue screen	operating system error	not to interrupt the start-up sequence when it is coming back on. If the NTS does not start working normally after this, contact CJPS Medical Systems Technical Support
The NTS computer display is not working right	Display failure	Contact CJPS Medical Systems Technical Support for a replacement

5.1. Reducing EMI

All NOMAD™ Telemetry System components comply with current regulatory standards regarding electromagnetic compatibility. The following is a list of actions that should be taken to reduce problems that are caused by electromagnetic interference (EMI):

1. Only use accessories that are listed in the Parts and Accessories section of the manual.
2. Ensure that other products in the area comply to accepted emissions standards (EN 55011).
3. Maximize the distance between electromedical devices.
4. Strictly limit the use of portable radio-frequency sources (e.g., cellular phones and radio transmitters).
5. Maintain good cable management. Try not to route cables over electrical equipment.

6. Repair

None of the components of the NOMAD™ Telemetry System are designed to be repaired in the field. If any of the components are not working correctly, return them to CJPS Medical Systems and we will provide a replacement component. Depending on the warranty status of the system, this replacement may involve full or partial payment (or no payment) by the customer for the replacement component.

Components in the following list are covered by this repair policy:

- VitalPoint PRO
- PRO Power Supply
- ECG Cable
- Temperature Cable
- NBP Hose
- NTS computer
- NTS Cables

Before returning any component to CJPS Medical Systems, please contact CJPS Medical Systems Customer Service to get a return authorization number.

Email: **CJPS-Info@CJPS.com**

Phone: **(480) 939-4362**

For the latest information, please consult our web site:

www.CJPS-MedicalSystems.com

7. Parts and Accessories

This section lists the part numbers of the components and accessories that make up the NOMAD™ Telemetry System.

WARNING -- Use only approved accessories with the PRO. Using non-approved accessories may result in damage to the monitoring equipment or in harm to the patient, and may void warranty coverage.

Part Number	Description
VS-101	VitalPoint® PRO Monitor (includes 1 blood pressure cuff)
VS-925	NOMAD™ Software with computer. This software connects multiple VitalPoint® PRO monitors to a Windows® based computer. Compatible only with VitalPoint® PRO.
VS-600	ECG Cable, 5-Lead,
VS-500	Temperature Probe, Reusable
VS-201	NBP Cuff, Adult Medium, Self-Applying (52x14.5cm)
VS-202	NBP Cuff, Adult Large, Self-Applying (64.5x17.5cm)
VS-203	NBP Cuff, Adult Extra Large, Self-Applying (42x55cm)
VS-204	NBP Cuff, Pediatric, Self-Applying (19x26cm)
VS-300	Pulse & Oxygen Saturation Nellcor Type Sensor, Adult & Pediatric, Wired
VS-301	SpO2 Extender Cable
VS-940	NOMAD™ Direct Connect Cable
VS-945	NOMAD™ Intranet Cable

8. Cleaning

The following table provides instructions about how to clean the various components of the NOMAD™ Telemetry System and its accessories. Before cleaning, please refer to the cautions listed below the table.

Part	Recommended cleaning method
VitalPoint PRO ECG Cables TEMP Cable SpO2 Cable NBP Cuff NBP Hose PRO Power Supply NOMAD Station (display, case, keyboard, mouse, and speakers) NTS Communication Cables	Materials • Enzymatic detergent such as ENZOL (US) or CIDEZYME (outside the US) • Distilled water • Disinfectant solution (such as CIDEX OPA, or a 10% solution of household bleach (5.25% sodium hypochlorite) in distilled water) • Soft cloths and/or soft-bristled brushes • Protective gloves and eyewear Procedure 1. Disconnect the unit from the wall outlet. 2. Put on gloves and protective eyewear. 3. Prepare the enzymatic detergent according to the manufacturer's instructions, and also the disinfectant solution, in separate containers. 4. Apply detergent to product using a soft cloth. If material is dried on, allow to sit for 1 minute. 5. Wipe smooth surfaces with the cloth. 6. Use a soft-bristle brush on visibly soiled areas and irregular surfaces. 7. Remove detergent from product using cloth dampened in distilled water. 8. Repeat as necessary. 9. Apply disinfectant solution on affected area using a soft cloth. Allow product to sit for 5 minutes. 10. Wipe away excess solution and clean product again with cloth dampened in distilled water. 11. Allow 2 hours for drying.

Cleaning

Part	Recommended cleaning method
SpO2 Sensor	Materials • 70% isopropyl alcohol pad Procedure 1. Remove sensor from patient and disconnect from sensor cable. Wipe off with alcohol pad. Allow sensor to dry before placing it on a patient.

CAUTION -- Do not use harsh chemicals for cleaning – in particular, do not use disinfectants that contain phenol as they can spot plastics. Do not steam autoclave, gas sterilize, irradiate, subject to intense vacuum, or immerse in water or cleaning solution. Be careful to avoid getting cleaning liquids into connectors or the unit. If this occurs, allow the unit to dry in warm air for 2 hours, then check to make sure all monitoring functions are still working properly.

CAUTION -- Take particular care when cleaning the NBP cuff, NBP hose, and NBP connector on the PRO to prevent fluid from entering the connectors. Fluid in the NBP airway may affect blood pressure determination accuracy and damage the monitor.

CAUTION – Accessories that fall on the floor should be inspected for contamination and proper functionality. If contamination is observed, then this cleaning procedure should be followed.

CAUTION -- The user has the responsibility to validate any deviations from the recommended method of cleaning and disinfection.

9. Maintenance and Storage

The following table shows the recommended maintenance procedure for the VitalPoint® PRO monitor and its accessories. These procedures should be carried out every 12 months and can be performed by the biomedical staff.

Alternatively, the unit may be returned to the factory. Before returning a PRO unit for maintenance checks, please contact CJPS Medical Systems Customer Service to get a return authorization number.

Email: **CJPS-Info@CJPS.com**

Phone: **(480) 939-4362**

If there is a failure in one of the checks, the unit must be returned to the factory for service, according to the instructions in the Repair section of this manual.

PRO Function	Procedure
Mechanical Integrity	Check for cracks, abrasive edges and other signs of damage.
Front panel keys	Verify the keys on the front panel perform their designated function correctly by selecting each button.
Power LED	Verify that the green power LED is illuminated on both the PRO and PRO power supply.
Battery Charging LED	Verify that the green charging LED is illuminated on the back of the PRO
Speaker	Power-cycle the PRO and verify that the power-up speaker test tone is generated.
ECG / Respiration	Connect ECG leads to Patient Simulator. Verify proper heart rate at 30 and 300 bpm (+/- 2 bpm or +/- 1%). Verify 1 mV test pulse (Lead II). Verify proper respiration rate at 15 and 120 bpm (+/- 3 bpm).
SpO_2	Connect to Patient Simulator (select appropriate sensor type). Verify proper SpO_2 value at 84% and 96% (+/- 2 0_2%). Verify proper PR value at 30 and 240 bpm (+/- 5%).
NBP	Connect to Patient Simulator and take a NBP measurement. Verify proper NBP value at 120/80 (+/- 5 bpm). Enter NBP Calibration Mode: (Service>Password>NBPCalibration>On>OK>Close). Set the Patient Simulator to read as a pressure gauge. Inflate the cuff to 250 +/- 5 mmHg.

PRO Function	Procedure
	Verify that the NBP parameter value is within +/- 2 mmHg of the simulator. Release pressure. Inflate cuff to 300 mmHg. Verify that the pressure is automatically dumped at 300 +/- 30 mmHg. Inflate the cuff to 200 mmHg. Allow cuff pressure to settle (thermal effect). Verify that the pressure drops less than 5 mmHg in 1 minute. Release pressure. Inflate cuff to 50 mmHg. Verify that the pressure is automatically dumped after 180 seconds. Power cycle the monitor.
Temperature	None (self-checking).
Leakage Current	Connect to Safety Analyzer. WARNING – FOLLOW SAFETY INSTRUCTIONS AS INDICATED IN THE MANUAL FOR THE ANALYZER. Verify Patient Lead Leakage (to ground): < 10 uA. Verify Patient Lead Leakage (inter-lead): < 10 uA. Verify Patient Lead Leakage (mains applied to leads): < 50 uA. Verify Leakage to ground (normal): < 500 uA. Verify Leakage to ground (reversed polarity): < 1000 uA. Verify Leakage to ground (neutral opened): < 1000 uA.

In order to prevent the VitalPoint® PRO's risk current from increasing beyond safe limits, the ECG cable should be cleaned according to the instruction in the Cleaning section of this manual.

To place the PRO back in service after maintenance has been performed, follow in the instructions in the Functional Verification section in this manual.

The NTS computer and Cables require no special maintenance beyond periodic cleaning every 6 months according to Cleaning section in this manual.

9.1. Storage

The recommended storage environment for components in the NOMAD™ Telemetry System is as follows:

Storage Temperature	-20° C to 50° C
Storage Humidity	>20% to <80% non-condensing
Storage Altitude	0 to +3,000m

10. Disposal

The disposal of accessories such as electrodes, blood pressure cuffs, temperature probes, and SpO_2 sensors should be carried out according to the manufacturer's recommendations.

At the end of their useful lives, NOMAD™ Telemetry System equipment should be properly disposed of as well. The PRO supports lithium-ion battery and lithium coin battery. The PRO, NTS station and the Communication Cables all contain electronic circuit boards. These components should not be incinerated or exposed to extreme heat.

Also, ask CJPS Medical Systems (CJPS-Info@CJPS.com) for potential trade-in / upgrade possibilities.

Contact your local waste disposal agency for guidance on the proper recycling or disposal of these components.

11. Technical Data

PRO Technical Data

General	
Dimensions	11.3in x 7.2in x 2.4in (288mm x 182mm x 60mm)
Weight	4.5lb (2kg)
Finish	ABS
Power Requirements	100 – 240 VAC 0.7 A max
Mains Frequency Range	50 – 60 Hz
Power Consumption	12W Nomial; 25W (when charging battery)
Standards Conformance	, CSA C22.2 No. 601.1-M90 EN 60601-1, EN 60601-1-1, EN 60601-1-2, EN 60601-1-4, EN 60601-2-27, EN 60601-2-30, EN 865
Patient Risk Current (AAMI ES1-1993)	Electromedical Apparatus with Isolated Patient Connection. Meets the following limits: Enclosure Risk Current < 100 µA Patient-applied Risk Current < 10 µA Patient Isolation Risk Current < 50 µA Earth Risk Current < 500 µA
FCC Part 68 Certification	
Type of Protection (Electrical)	Class I
Degree of Protection (Electrical)	Type CF, Defibrillation-proof
Degree of Protection (Water)	Drip-proof (IPX1)
Disinfecting Method	Per the instructions in the Cleaning section
Degree of Safety (Flammable Anesthetic Mixture)	Not suitable for use in the presence of a Flammable Anesthetic Mixture
Mode of Operation	Continuous
PRO Device Markings	
CE 0123	European CE Mark according to Council Directive 93/42/EEC

Technical Data

	For indoor-use only
	Attention! Consult accompanying documents before using this device.
 05/2001	Manufacture date (month/year)
	Type CF Equipment (Defibrillation-proof)
15V ⎓ < .6A	Input power rating (15 Volts dc, less than .6 ampere)
PRO Power Supply Device Markings	
	European CE Mark according to Council Directive 93/42/EEC
	UL Recognized Component
	TÜV Licensed Test Mark
100-240 V~ 0.8A Max	Input power rating (100-240 Volts ac, 0.8 amperes max)
Battery	
Type	Lithium-Ion Rechargeable
Discharging Time	5 hours
Charging Time	5 hours
Charging Method	Battery is charged while PRO is connected to the mains supply
Environmental	
Cooling	Convection (no fan)
Operating Temperature	59 to 95 °F (15 to 35 °C)
Storage Temperature	-4 to 122 °F (-20 to 50 °C)
Operating Humidity	>30% to <90% non-condensing
Storage Humidity	>10% to <95% non-condensing
Operating Altitude	0 to 9842’ (0 to 3000 m)

Storage Altitude	0 to 39370’ (0 to 12000 m)
Display	
Type	Digital
Area	3.375” x 4.5” (5.6” diagonal)
Matrix	240 x 320
Pixel Dimension	0.36mm
Number of Channels	3
Sweep Speed	6.25, 12.5, 25 mm/s
Display Mode	Eraser Bar
ECG	
Accessories	5-lead cable
Input Connector	7-pin connector
Displayable Leads	5-lead cable: I, II, III, V
HR Resolution	1 bpm (beats per minute)
Measurement Range	15 to 300 bpm
Measurement Accuracy	±2 bpm or ±1%, whichever is greater
Response Time	Step change from 80 to 120 bpm: < 7 seconds Step change from 80 to 40 bpm: < 11 seconds Per AAMI EC13-1992 3.1.2.1(f), response time is measured from the onset of the first QRS at the new rate to the time the measurement reads a value that is the original rate plus 63% of the change
Report Interval	1 second
HR Averaging Scheme	Average of the 10 most recent, valid R-R intervals, discarding the shortest and longest interval
Time To Alarm - Tachycadia	< 10 seconds (5 seconds typical) for 150 bpm ventricular tachycardia or 3.5 Hz sinusoidal ventricular fibrillation
Notch Filter Frequency	50Hz, 60Hz, Off
Monitor Bandwidth	0.4Hz to 50Hz (-3dB)
Dynamic Range AC	±20 mV
Dynamic Range DC	±300 mV
Electrode Impedance	>2.5 Mohm at 10 Hz

Defibrillation Protection	Complies with AAMI EC13-1992 3.2.2.2 Complies with IEC 60601-2-27
Pacer Pulse Detection	Lead II
Pacer Pulse Rejection	Rejects all pulses of amplitude ±2mV to ±700mV and duration 0.1 to 2 ms with no tail, as per AAMI EC13-1992 3.1.4.1 Rejects all pulses of amplitude ±2mv to ±700mV and duration 0.1 to 2 ms with 10 ms time constant tail of < 2mV, per AAMI EC13-1992 3.1.4.2
Tall T-Wave Rejection	Rejects all T-Waves less than or equal to 120% of a 1mV QRS and a Q-T interval of 350 ms, per AAMI EC13-1992 3.1.2.1(c)
HR Response to Irregular Rhythm	HR is 82 bpm for a bigeminy rhythm consisting of 0.51 and 0.96 second R-R intervals. HR is 76 to 82 for a trigeminy rhythm consisting of 0.51, 0.81 and 0.96 second R-R intervals. HR is 76 to 80 for a frequent multifocal rhythm consisting of 0.63, 0.65, 0.75, 0.95 and 1.03 second R-R intervals.
Active Noise Suppression	RL drive (< 500 nA)
Pulse Tone	Yes

Respiration

Method	Impedance Pneumography
Input Connector	Same as ECG
Sensing Lead	II
RR Resolution	1 bpm (breaths per minute)
Measurement Range	2 to 120 bpm
Measurement Accuracy	±3 bpm
Report Interval	1 second
Bandwidth	0.17 to 3.3 Hz (-3dB)
Impedance Measuring Current	< 10 µA @ 44 kHz square wave across Lead II

Pulse Oxymetry

Method	Absorption – Spectrophotometric (dual wavelength) (Functional oxygen saturation of arterial hemoglobin)
Input Connector	9-pin connector
SpO_2 / PR Resolution	SpO_2: 1 O_2% PR: 1 bpm (beat per minute)
Measurement Range	SpO_2: 20 to 100% PR: 30 to 240 bpm
Measurement Accuracy	SpO_2: from 80 to 100%: ±2% (O_2%), < 80%: unspecified PR: ±5%
Measurement Test Method	Fluke Spot Light SpO_2 Simulator
Report Interval	1 second. Numeric values are held for less than 30 seconds, per EN 865
Pulse Tone	Yes (pulse tone pitch tied to SpO_2 parameter value)
Temperature	
Compatibility	YSI 400-series probes
Input Connector	2-pin connector
Display Units	°F and °C (user-selectable)
Measurement Resolution	0.1 °F (0.1 °C)
Measurement Range	32.0 to 122.0 °F (0.0 to 50.0 °C)
Measurement Accuracy	±0.1 °F (±0.1 °C) plus probe tolerance
Non Invasive Blood Pressure	
Method	Oscillometric
Input Connector	Single Lumen Hose (Rectus fitting)
Cuff	Adult Small, Medium, Large Adult, Extra Large, and Pediatric
Derived Parameters	Systolic, Mean, Diastolic
Resolution	1 mmHg
Measurement Range	Systolic: 30 to 250 mmHg Mean: 20 to 230 mmHg Diastolic: 10 to 210 mmHg
Measurement Accuracy	Sys: ±5mmHg (*s* < 8mmHg) Mean: ±5mmHg (*s* < 8mmHg) Dia: ±5mmHg (*s* < 8mmHg)
Pulse Rate Range	30 to 240 bpm

Update Interval	Upon measurement completion
Measurement Time	30 seconds (typical) < 135 seconds (maximum)
Initial Cuff Pressure	160 mmHg (user-selectable)
Repeated Cuff Pressure	Previous systolic + 40 mmHg
Static Cuff Pressure Accuracy	±3 mmHg
Overpressure Cutoff	290 ± 3 mmHg (normal means), 300 ± 30 mmHg (back-up)
Measurement Modes	Single Measurement or Auto (Interval) Measurement
Auto Measurement Settings	3, 5, 10, 15, 30, 60, 120 minutes

12. Forms

This section contains blank copies of forms required by the installation and servicing procedures. You should make copies of these forms and complete them as described in the relevant procedure.

Deployment Worksheet

	Name	*Email*	*Phone*
Customer Information (Contact)			

Facility Address/Building (Distinguish if multiple locations)	
Qty of NTS PC Stations being deployed	
Worksheet Date:	
PC Station #	

Filled out by Customer		*Filled out By CJPS*
Static IP Address	**Location Name**	**VCOMM Port**
Example 192.168.0.30	Example Rm 300	COM 4

Deployment Worksheet

1. Care Unit Name _____

Fill out separately per unit (per NTS station)

2. Installation

Order Type ☐ New System ☐ Add-on to Existing NOMAD™ Telemetry System

For existing installations, indicate current software versions:

NTS _____

VitalPoint® PRO _____

PRO Mounting: ☐ Rolling Stand ☐ Wall ☐ Other (specify) _____

Functional Verification Record

Customer: _____

Address: _____

City, State, Zip: _____

	Part Number	Serial Number	Verification Pass/Fail
NTS Software			
VitalPoint® PRO			

☐ NTS site configuration done

(Please refer to attached pages for PRO and Network Verification)

Verification done by:

Name _____ Date _____

Signature _____

Functional Verification Record

VitalPoint® PRO Verification (cross out unused cells)

Count	Part Number	Serial Number	Verification Pass/Fail
1			
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32			

Count	Part Number	Serial Number	Verification Pass/Fail
33			
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Functional Verification Record

Network Verification (cross out unused cells)

Display Position	Room Number	Verification Pass/Fail
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Display Position	Room Number	Verification Pass/Fail
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Service Report

Customer: _____

Address: _____

City, State, Zip: _____

Device serviced: _____

Part number: _____

Serial number: _____

Service date: _____

Service location: _____

Description of service:

Test and inspection data (attach Functional Verification Record if applicable):

Service done by:

Name _____ Date _____

Signature _____

Transferred to database: Date _____ Name _____