

<b>WinFrog Device Group:</b>	<b>GPS</b>
<b>Primary Device Name/Model:</b>	<b>NovAtel OEMV-3</b>
<b>Primary Device Manufacturer:</b>	NovAtel Inc. 1120 - 68th Avenue NE Calgary, Alberta Canada T2E 8S5 Tel: 403-295-4500 Web: www.novatel.com
<b>Supplemental Device Name/Model:</b>	<b>Microhard IP921 High Speed Ethernet/SE Radio Modems</b>
<b>Supplemental Device Manufacturer:</b>	Microhard Systems Inc. Building 17, 2135-32 Ave NE Calgary, Alberta Canada T2E 6Z3 Tel: 403-248-0028 Web: www.microhardcorp.com
<b>Device Data String(s) Output to WinFrog:</b>	Dependent upon configuration, see Configure Device
<b>WinFrog Data String(s) Output to Device:</b>	Dependent upon configuration, see Configure Device
<b>WinFrog Data Item(s) and their RAW record:</b>	POSITION            303 & 306 HEADING            408, 409 & 412 VECTOR MASTER    314 (new) VECTOR REMOTE    N/A

#### **DEVICE DESCRIPTION:**

GPS device configured via WinFrog to perform the following:

- Standard positioning
  - SPS
  - DGPS
  - WAAS
  - SBAS
  - VBS/XP/HP
- Time synchronization via a 1PPS w/ time message (RS232 serial only) or a NMEA ZDA message
- Moving Baseline providing heading calculated by the receiver
- Vector determination calculated within WinFrog using third party software (RTKNav by Waypoint Products Group, NovAtel) providing a precise vector to support positioning of the remote GPS unit.  
Note: This option requires a Waypoint security dongle in addition to the WinFrog security dongle.

**Note:** The heading data (HEADING data item) represents the heading from the Master antenna to the Remote antenna in the Moving Baseline antenna pair. Any variation of

this orientation with respect to the actual vehicle orientation must be calculated and applied as a Heading Offset in the respective HEADING data item configuration.

The interface supports RS232 serial and TCP/IP.

The device also supports the control and configuration of Microhard IP Series 900MHz radio/modems. These units are used to provide an Ethernet network between multiple vehicles and the NovAtel GPS receivers and peripheral equipment on them.

## ***DEVICE CONFIGURATION INSTRUCTIONS***

---

### **WINFROG I/O DEVICES > EDIT I/O:**

#### **GPS Receiver RS232 Serial Interface**

The receiver has three serial ports that can be used to interface with WinFrog. These are labelled on the ProPak version of the receiver as COM1, COM2 and AUX. These default to 9600 8-N-1 but can be configured. The WinFrog serial port interface option defaults to 9600 8-N-1 to match the receiver's defaults. It is recommended that the interface be configured to as a high a baud rate as possible while maintaining reliable communications.

For the purpose of standardizing the interface, the following must be considered:

- You can specify which receiver port to use to output data, with the following exceptions:
  - Binary and ASCII outputs cannot be output on the same port.
  - For the Moving Baseline application, the respective receivers must be connected using the receiver's Com1 and therefore when used in this configuration, the selection of COM1 to output data is restricted accordingly.

**Note:** The device supports communications with a single GPS receiver. If communications with multiple receivers are required, e.g. for the Vector determination, two instances of the device are required.

#### **Radio Interface**

The radio has two serial ports and an Ethernet port. For the purpose of standardizing the interface, the following interface connections are used:

- The radio's Com1 is used to interface with the GPS receiver's Com2 (this is the indirect connection with WinFrog).
- The radio's Ethernet port is connected to WinFrog, either directly or via an Ethernet switch.
- The radio's Com2 is available as an alternative to the Ethernet connection for configuring.

## GPS/Radio Communications

When the receiver is interfaced with a radio, the serial port must be configured either as a TCP Client, TCP Server or TCP Client/Server. The WinFrog device communication parameters must then be configured to match.

The screenshot shows the 'NovAtel OEMV-3 Interface' dialog box. It is divided into three main sections: 'Connect Using', 'IP Configuration', and 'Connection Options'.  
1. 'Connect Using': Three radio buttons are present: 'Serial' (unselected), 'TCP/IP' (selected), and 'UDP/IP' (unselected).  
2. 'IP Configuration': A group box containing five text input fields: 'Device Name' (OEMV-3), 'Host Address' (172.20.212.51), 'IP Address' (192.168.0.10), 'Subnet Mask' (255.255.255.0), and 'Port Number' (2201).  
3. 'Connection Options': A group box containing the text 'Select the connection type.', two radio buttons ('Listen' unselected, 'Call' selected), a 'Timeout' field (60s), and a 'Disconnect' checkbox (unchecked).  
At the bottom of the dialog are 'OK' and 'Cancel' buttons.

In addition, when configured for TCP Client, a Timeout for outgoing connections can be configured. If WinFrog detects that the connection has been idle with respect to received data for this period, it will check the connection by attempting to write to it. If this check fails, the connection will automatically disconnect and revert to attempting to connect.

## WINFROG I/O DEVICES > CONFIGURE DEVICE:

This device must be configured at the I/O Device window level. It is very important to note that the device configuration is used to configure the connected receiver to operate and output as required for all users of the receiver, i.e. if a receiver is to provide multiple output types on selected ports, it should be configured once from one PC running WinFrog for all other users that may be requiring data via a radio. The device

configuration supports configuring just itself so WinFrog knows what data to expect, without necessarily configuring the receiver.

Note: It is very strongly advised that a receiver be configured completely for its intended application from one instance of this device and then instruct the receiver to save this configuration to its non-volatile memory. Subsequent additional instances of this device connected to the respective receiver should only be configured for the specific use within WinFrog and not used to reconfigure the receiver.

In the I/O Devices window, click the device name to select it, then right-click and select Configure Device. The NovAtel OEMV-3 Configuration dialog box appears, as seen below. The configuration dialog has multiple tabs, each addressing a different component of the configuration.

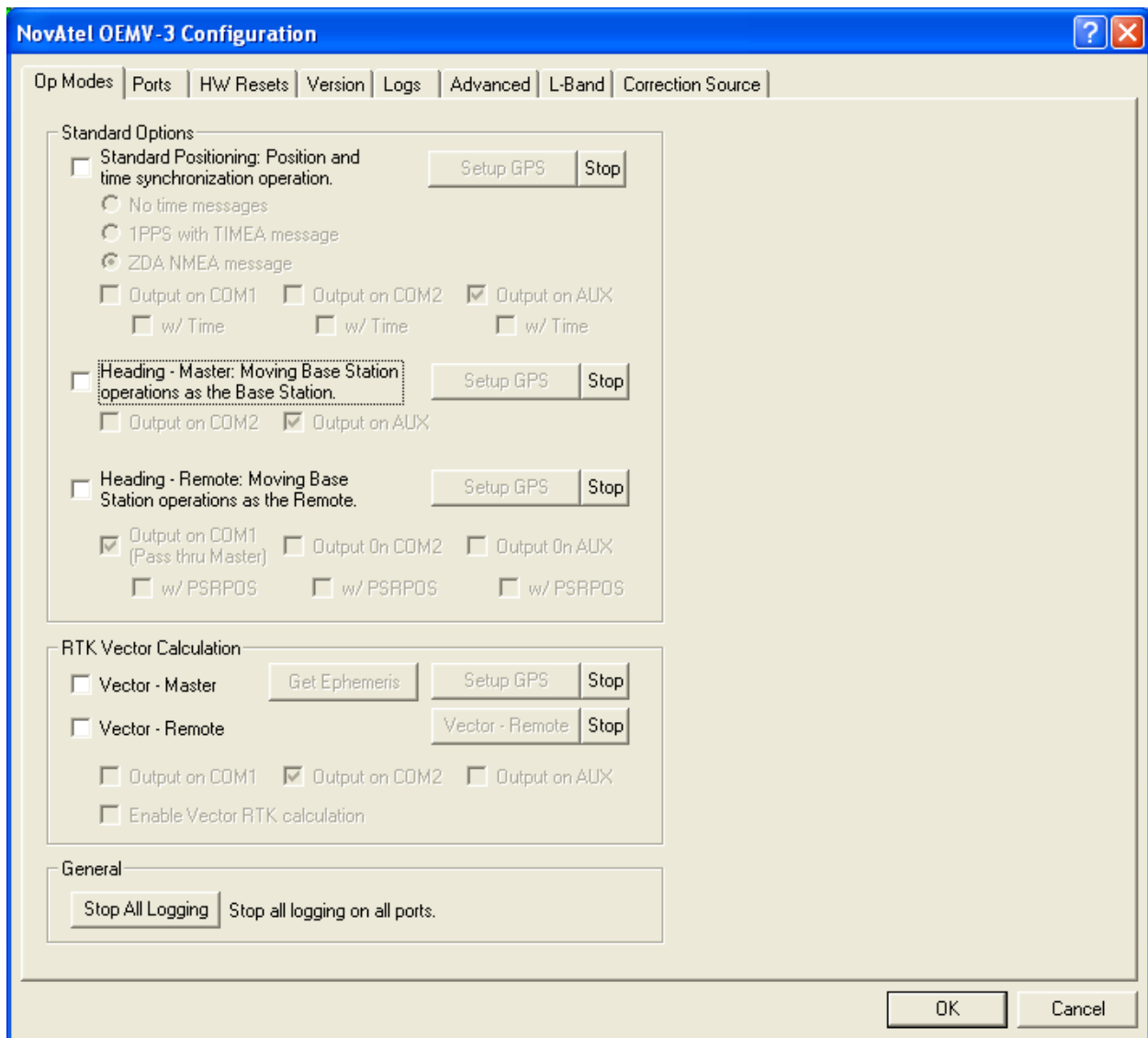
Notes:

- When the device is added or loaded, queries are sent to the receiver to establish that the receiver is there and to acquire basic configuration settings and version information. These are as follows:
  - LOG VERSIONA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG COMCONFIGA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG ECUTOFFA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG DYNAMICSA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG ASSIGNLBANDA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG LBANDINFOA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG LBANDSTATA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG PSRDIFFSOURCEA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG DGPSTIMEOUTA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG PASSTOPASSMODEA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG RTKSOURCEA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG SBASCONTROLA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>

And if the receiver is already configured as for RTK Vector Calculations as the Master

- LOG RAWEPHEMB ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
- When a command is sent, WinFrog waits for an acknowledgement or response. If only an acknowledgement is expected, WinFrog waits for 5 seconds before timing out. If a response is expected, WinFrog waits for 10 seconds before timing out.
- Commands are queued. When a command is sent, WinFrog waits for the appropriate response or times out before sending the next command.

- When the configuration dialog is open, only those commands that are initiated from within the dialog are transmitted. The automated command sequence noted above is suspended. While a response is being waited for, those dialog controls that initiate commands are de-activated. If a response is being waited for when the dialog is opened, these will be de-activated until the response is received or times out.



### Op Modes tab

This device driver may be used to configure the GPS receiver and WinFrog or just WinFrog should the connected GPS receiver already be configured. Selection of checkboxes and radio buttons instructs WinFrog what to expect from the receiver but does not initiate any commands to the receiver. If checked, the associated options are active and can be configured. Configuration commands are only sent to the GPS receiver if the respective Setup GPS button is clicked.

To configure the receiver, select all operations the receiver is to be used for, and the ports that the respective data is to be output on and click the associated **Setup GPS** button(s).

To configure WinFrog for the operation with the connected receiver, select **only** the operations the receiver is to be used for, and the ports being used to output the respective data. **Do not click the Setup GPS button.**

To stop the receiver from outputting data for a specific operation, click the associated **Stop** button. This will instruct the receiver to stop outputting only those data associated with the respective operation.

#### Notes:

- When configuring the receiver for a specific operation, the respective messages are configured to be output on the selected ports and not to be output on those ports not selected, i.e. the receiver is specifically told to stop the respective logs on non-selected ports.
- Binary data (RTK Vector –Master/Remote) cannot be output on a port configured for ASCII data output (Standard, Heading-Master/Remote), and vice versa. You are prevented from doing this through the enabling and disabling of the Output on COMn checkboxes accordingly.
- It is advised that when configuring the receiver, the Stop All Logging button is clicked before proceeding with the configuration to put the receiver output to a known state.
  
- Standard Options
  - Standard Positioning: Position and time synchronization operation
    - Provides data for POSITION data item using the BESTPOSA message with the option to output either 1PPS and the TIMEA message or the GPZDA message to support the synchronization of WinFrog to UTC.
    - Option to select the position output on COM1, COM2 or AUX, depending upon other configurations, by checking the respective box.
      - Option to include the time related output, if this output has been selected, independently for each port, by checking or un-checking the respective w/Time box. It is recommended that if it is not required, do not include it.
    - Clicking the Setup GPS button causes the necessary commands to configure the receiver to be sent as detailed below, where n refers to the port (1 for COM1, 2 for COM2 and 3 for AUX). The commands are repeated for each port.
      - If the port is selected for output:
        - Output the BESTPOSA message at 1 Hz
          - LOG COMn BESTPOSA ONTIME 1<sup>C</sup><sub>R</sub>L<sub>F</sub>
        - Then addresses the selected time synchronization options



- Sets the MOVINGBASESTATION mode
  - MOVINGBASESTATION ENABLE<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Sets the output to the Remote for the moving base station mode
  - LOG COM1 RTCAOBS ONTIME 1<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG COM1 RTCAREF ONTIME 1<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - LOG COM1 RTCA1 ONTIME 1<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Sets the port interfaced to the Remote to only send moving base station data but receive standard messages, both without any response (e.g. command prompt “[COM1]”)
  - INTERFACEMODE COM1 NOVATEL RTCA OFF<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Sets the pass through of data from the Remote to WinFrog (actual data pass through depends on Remote setup options) for the selected ports
  - LOG COMn PASSCOM1A ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
- If the port is not selected for output:
  - UNLOG COMn PASSCOM1A<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Clicking the Stop button causes the necessary commands to stop the output associated with this mode to be sent as detailed below:
  - MOVINGBASESTATION DISABLE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - UNLOG COM1 RTCAOBS<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - UNLOG COM1 RTCAREF<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - UNLOG COM1 RTCA1<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - UNLOG COMn PASSCOM1A<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - INTERFACEMODE COM1 NOVATEL NOVATEL OFF<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - COMCONTROL COM1 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Heading – Remote
  - This utilizes the Moving Baseline feature of the receiver, requiring two receivers. Com1 of both receivers must be connected and configured to the same port parameters.

**Note:** The Moving Baseline data is provided as delta X, delta Y and delta Z in WGS84 Cartesian coordinates. In order to derive a heading from this data, an approximate position for either the Heading-Master or Heading-Remote is required. If the system is configured to pass the data through the Heading-Master to WinFrog and the Heading-Master unit is also configured for Standard Positioning, WinFrog uses the position from the Standard Positioning output for this. If the Heading-Remote is outputting directly to WinFrog, it is necessary that a position message also be output to provide this approximate position, which in this case is a PSRPOSA message.

- Option to select to output on COM1 (pass data through to Master unit for output to WinFrog), COM2 or AUX, depending upon other configurations.



- If the Heading-Remote mode is not passing the Moving Baseline data through the Heading-Master, as noted above, check the respective w/ PSRPOS box to include the PSRPOSA message in the output on the selected port.
  - Clicking the Setup GPS button causes the necessary commands to configure the receiver to be sent as detailed below:
    - You can select to pass data to WinFrog via the Master and/or directly. One must be selected or you will be warned and forced to select before being able to continue with the setup of the Remote – Heading.
    - Ensures the RTS line use on com 1 (interface with Remote) is at default settings
      - COMCONTROL COM1 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - Sets the LBand, pseudorange corrections and SBAS off
      - ASSIGNLBAND IDLE<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - PSRDIFFSOURCE NONE<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - SBASCONTROL DISABLE<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - Sets the RTK parameters and timeout
      - RTKCOMMAND USE\_DEFAULTS<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - RTKSOURCE AUTO ANY<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - DGPSTIMEOUT 2<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - Configures the output of the selected ports
      - LOG COMn BSLNXYZA ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - If configured to include the PSRPOSA message
        - LOG COMn PSRPOSA ONTIME 1<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - else
        - UNLOG COMn PSRPOSA<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - If the port is not selected for output:
      - UNLOG COMn BSLNXYZA<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - UNLOG COMn PSRPOSA<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - Sets the port interfaced to the Master to only receive moving base station data but send standard messages, both without any response (e.g. command prompt “[COM1]”)
      - INTERFACEMODE COM1 RTCA NOVATEL OFF<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - Clicking the Stop button causes the necessary commands to stop the output associated with this mode to be sent as detailed below:
    - UNLOG COMn BSLNXYZA<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - UNLOG COMn PSRPOSA<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - INTERFACEMODE COM1 NOVATEL NOVATEL OFF<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - COMCONTROL COM1 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- RTK Vector Calculation
  - Vector – Master
    - This mode utilizes the third party Waypoint DLL software.
    - Provides the VECTOR MASTER data item association, though no actual data is passed between device and vehicle.

- Provides the POSITION data item using the BESTPOSB message (binary version of the BESTPOS message).
  - Option to select to output on COM1, COM2 or AUX, depending upon other configurations.
  - Clicking the Get Ephemeris button sends the command to initiate the output of the raw ephemeris data only on the port currently used to connect to the receiver. This enables you to force the receiver to send the ephemeris data even though it may not have changed since the last time it was output. This addresses the scenario of configuring WinFrog for operation with an already configured device without having to send the complete configuration to get the current ephemeris.
    - LOG COMn RAWEPHEMB ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - Clicking the Setup GPS button causes the necessary commands to configure the receiver to output the data required for the Waypoint RTK Engine to be sent as detailed below:
    - LOG COMn VERSIONB<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG COMn BESTPOSB ONTIME 1.000000<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG COMn RANGECMPB ONTIME 1.000000<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG COMn RAWEPHEMB ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - Clicking the Stop button causes the necessary commands to stop the output associated with this mode to be sent as detailed below:
    - UNLOG COMn PROPAGATEDCLOCKMODEL<sup>C<sub>R</sub>L<sub>F</sub></sup>  
(addresses historical output)
    - UNLOG COMn BESTPOSB<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - UNLOG COMn RANGECMPB<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - UNLOG COMn RAWEPHEMB<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Vector – Remote
- This mode utilizes the third party Waypoint DLL software.
  - Provides data for the VECTOR Remote data item.
  - Provides the POSITION data item using the BESTPOSB message (binary version of the BESTPOS message).
  - Check the Vector RTK calculation checkbox. Must be checked for Remote operation.
  - Option to select to output on COM1, COM2 or AUX, depending upon other configurations.
  - Clicking the Vector Remote button causes the necessary commands to configure the receiver to output the data required for the Waypoint RTK Engine to be sent as detailed below:
    - LOG COMn VERSIONB<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG COMn BESTPOSB ONTIME 1.000000<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG COMn RANGECMPB ONTIME 1.000000<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - Clicking the Stop button causes the necessary commands to stop the output associated with this mode to be sent as detailed below:
    - UNLOG COMn PROPAGATEDCLOCKMODEL<sup>C<sub>R</sub>L<sub>F</sub></sup> (addresses historical output)

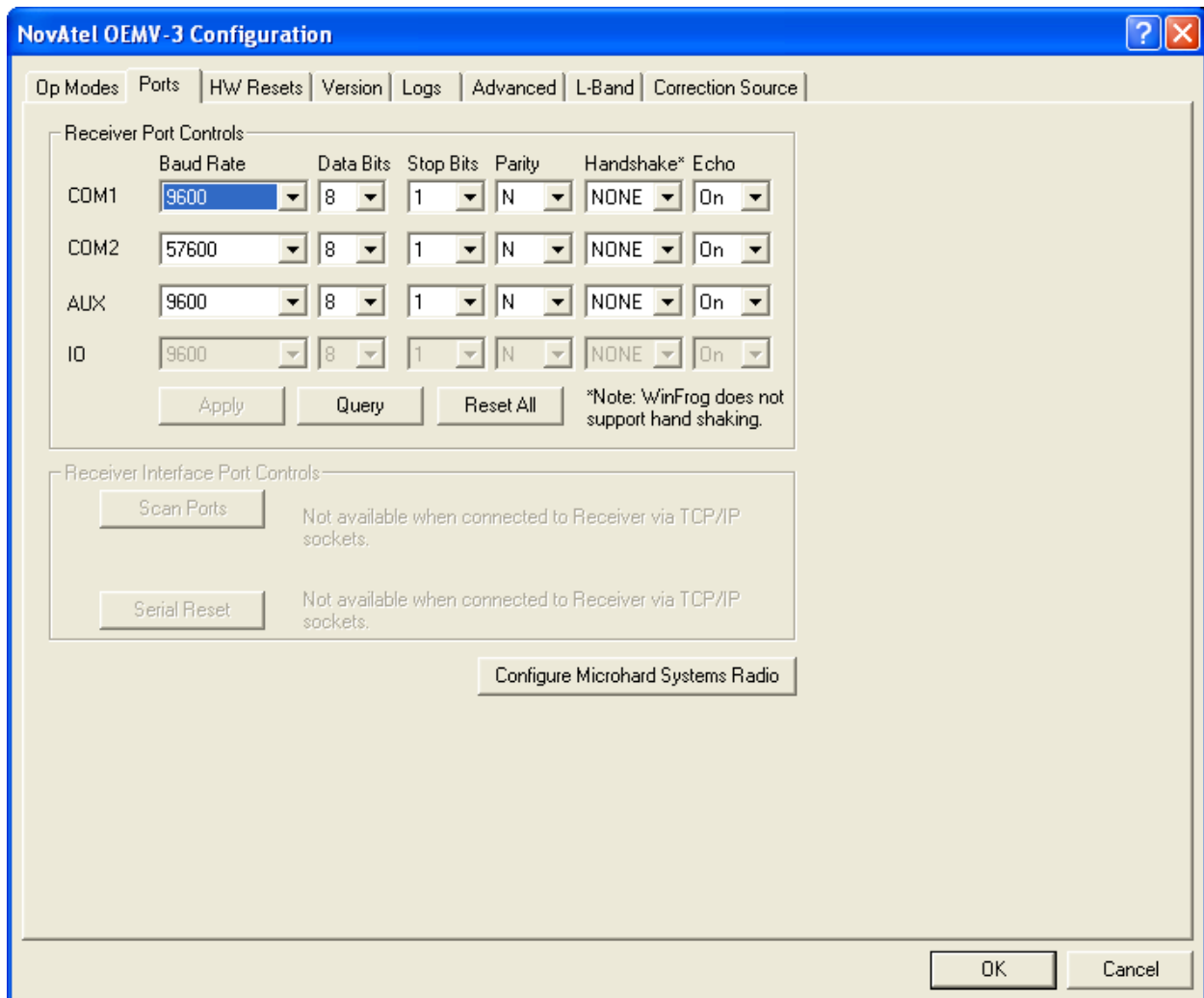
- UNLOG COMn BESTPOSB<sup>C<sub>R</sub>L<sub>F</sub></sup>
- UNLOG COMn RANGECMPB<sup>C<sub>R</sub>L<sub>F</sub></sup>
- UNLOG COMn RAWEPHEMB<sup>C<sub>R</sub>L<sub>F</sub></sup> (addresses historical output)

- General

- Clicking the Stop All Logging button results in the necessary commands to be sent to the receiver to stop all data output on all of the receiver's ports and sets the ports to their default RTS control, as detailed below:
  - UNLOGALL ALL\_PORTS TRUE<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - COMCONTROL COMn DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>

**NOTE:** Not all modes are compatible, i.e. a receiver can only be configured for certain combinations. The following combinations are not supported:

- The Heading-Remote and Heading-Master or Standard.
- Vector Master and Vector Remote



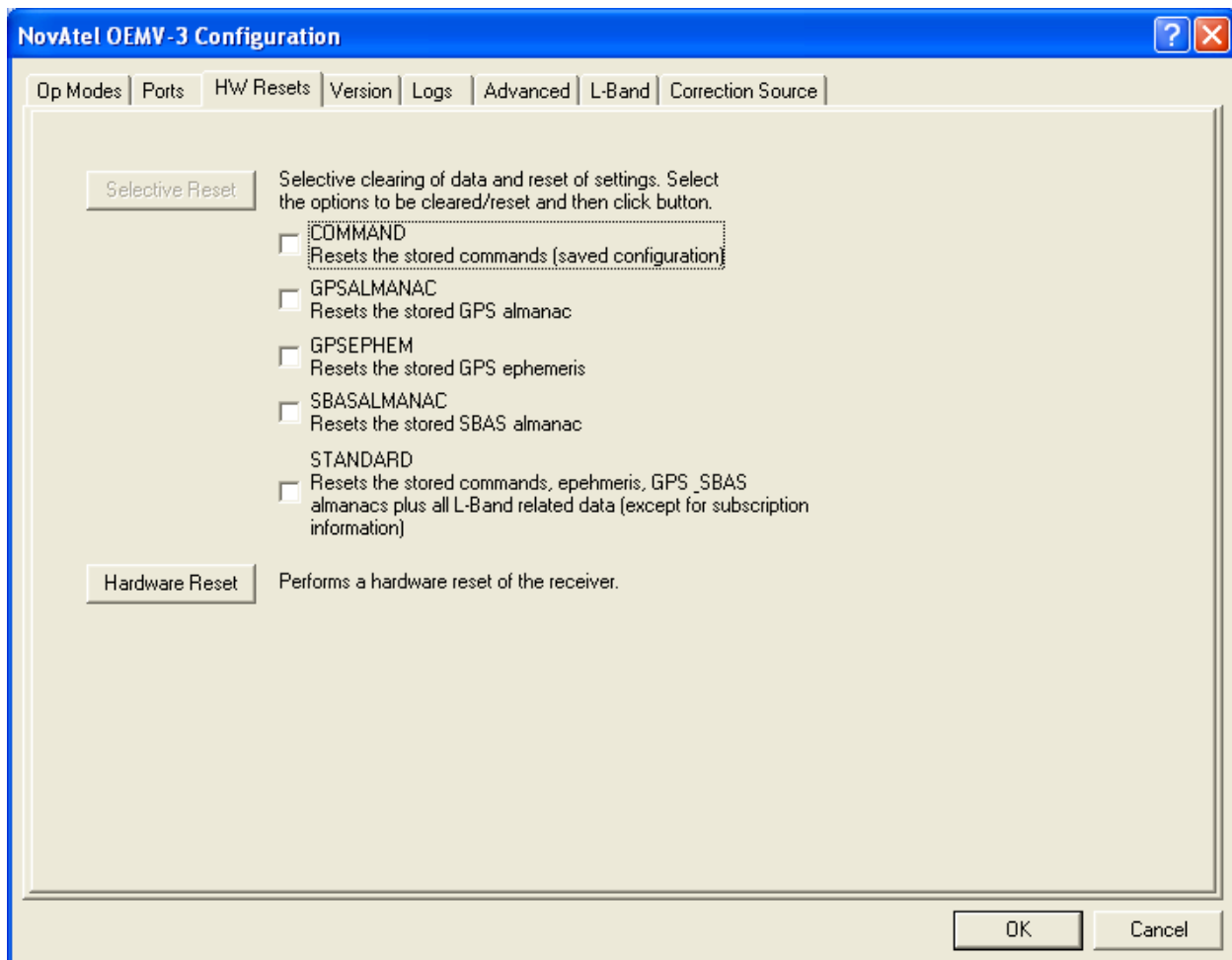
## Ports tab

You can monitor and control the GPS receiver port settings from this tab. In addition, if in place, the Microhard radio can be configured as it pertains to the application for WinFrog operations.

Note: To match the labelling of the NovAtel OEMV-3 ProPak enclosure, the ports are referred to as COM1, COM2, AUX and IO. However, when sending commands, the ports are referenced as COM1, COM2 and COM3 for COM1, COM2 and AUX respectively. The I/O port is not controlled by WinFrog and is shown here for display purposes only.

- Receiver Port Controls
  - Drop down lists for port parameter options
    - The drop down lists display the current receiver port settings as known by WinFrog. Note that though WinFrog automatically queries the receiver for these parameters, they may not be correct when the dialog is first opened.
    - Select the desired setting from the respective lists.
  - Apply Button
    - When a drop down list is accessed, the Apply button becomes active. Clicking the Apply button queues the commands required for setting all of the receiver's ports. The following is an example of setting all ports to 9600 8-N-1 with handshaking off and echo on.
      - INTERFACEMODE COM2 NOVATEL NOVATEL ON<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
      - COM COM1 9600 N 8 1 N OFF ON<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
      - COM COM2 9600 N 8 1 N OFF ON<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
      - COM COM1 9600 N 8 1 N OFF ON<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
    - If the port settings for the receiver port that WinFrog is interfaced to change, WinFrog automatically adjusts its port settings to match.
    - The configuration command for the receiver port that WinFrog is interfaced with is sent last since if it is sent first, WinFrog may not adjust its port settings in time to continue the command sequence appropriately.
  - Query Button
    - Clicking the Query button queues the request to log the receiver ports' serial settings once.
      - LOG COMCONFIGA ONCE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
    - When the message containing the receiver ports' settings is received and decoded, the drop down lists are updated to display the current settings.
  - Reset All Button
    - Clicking the Reset All button resets all the receiver's ports to default state. Note that this is accomplished by sending the respective commands, sending the command for COM2 last.
      - UNLOGALL ALL\_PORTS TRUE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
      - INTERFACEMODE COM1 NOVATEL NOVATEL ON<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>

- COMCONTROL COM1 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COM COM1 9600 N 8 1 N OFF ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- INTERFACEMODE COM3 NOVATEL NOVATEL ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COMCONTROL COM3 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COM COM3 9600 N 8 1 N OFF ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- INTERFACEMODE AUX NOVATEL NOVATEL ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COMCONTROL AUX TX DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COM AUX 9600 N 8 1 N OFF ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- INTERFACEMODE COM2 NOVATEL NOVATEL ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COMCONTROL COM2 DEFAULT<sup>C<sub>R</sub>L<sub>F</sub></sup>
- COM COM2 9600 N 8 1 N OFF ON<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Receiver Interface Port Controls
  - Scan Ports
    - Initiates the sequence to try all possible serial port settings (baud, data bits, stop bits and parity) supported by the WinFrog (PC) serial port and the receiver's ports.
    - When a setting is tried and communications are successful, the scan is stopped and these settings are used.
    - When the scan is started, the button displays Stop Scan. Clicking this stops the scan.
    - Note: This feature is only available if the connection with the receiver is a direct serial interface.
  - Serial Reset
    - Initiates the break command sequence required to reset the receiver port that WinFrog is connected to, to the default serial parameters regardless of whether the WinFrog port and the receiver port parameters match or not.
    - Note: This feature is only available if the connection with the receiver is a direct serial interface.
- Configure Microhard Systems Radio
  - This accesses the configuration dialog for the Microhard IP921 radio (see the Configure Microhard Systems Radio section later in this document).
  - Note: This feature is only available if the connection with the *GPS receiver* is a TCP/IP socket interface, i.e. a radio is known to be the link with the receiver.

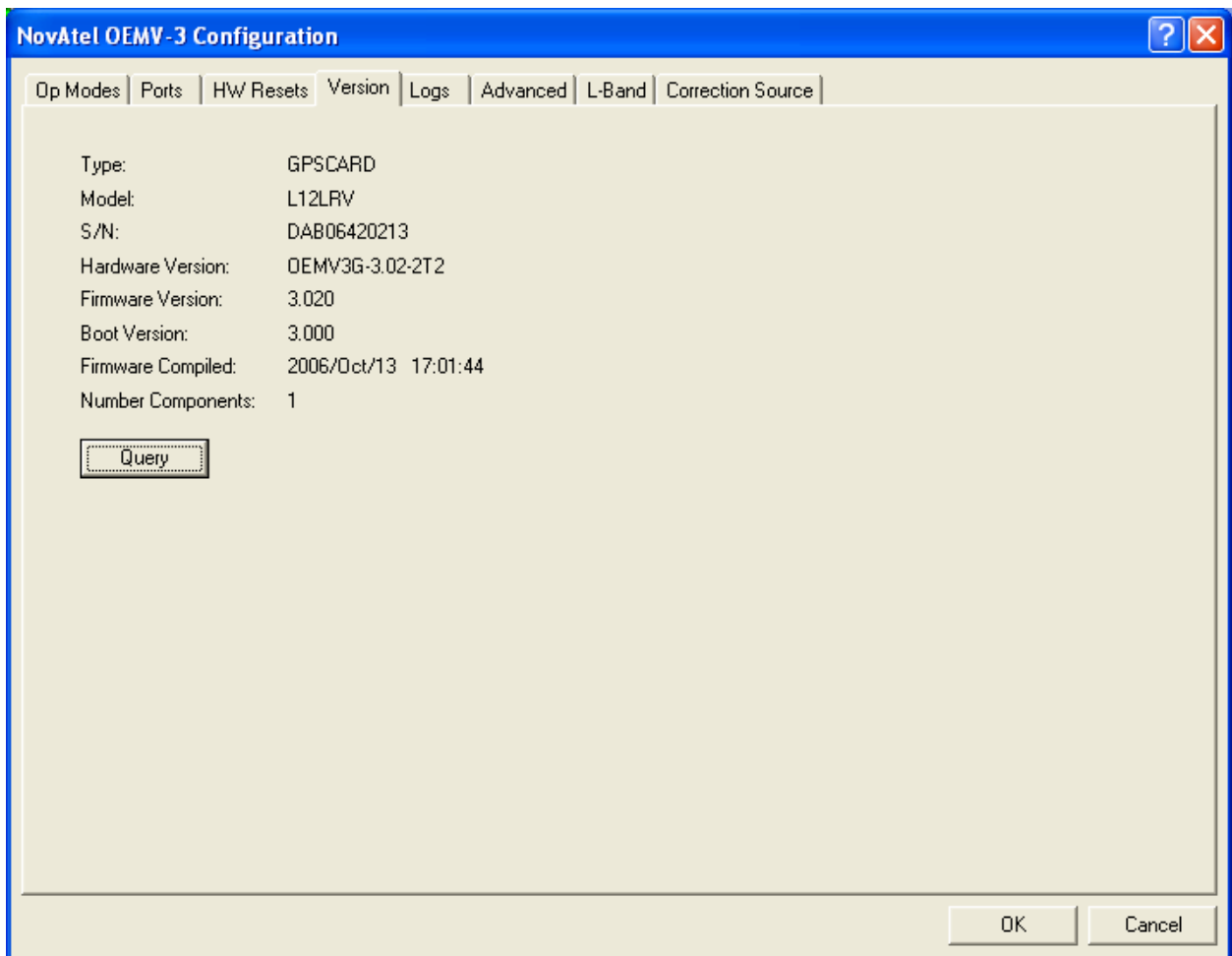


## HW Resets tab

You can control the resetting of the GPS receiver from this tab. This may be required in a case where the receiver is to be set to a known state.

- Selective Reset
  - 5 reset options associated with this feature are available for selection.
  - Selection of 1 or more of these options enables the Selective Reset button.
  - Clicking the Selective Reset button then queues the commands required for the selected resets, as follows:
    - COMMAND
      - FRESET COMMAND<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - GPSALMANAC
      - FRESET GPSALMANAC<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - GPSEPHM
      - FRESET GPSEPHM<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - SBASALMANAC
      - FRESET SBASALMANAC<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - STANDARD
      - FRESET STANDARD<sup>C<sub>R</sub>L<sub>F</sub></sup>

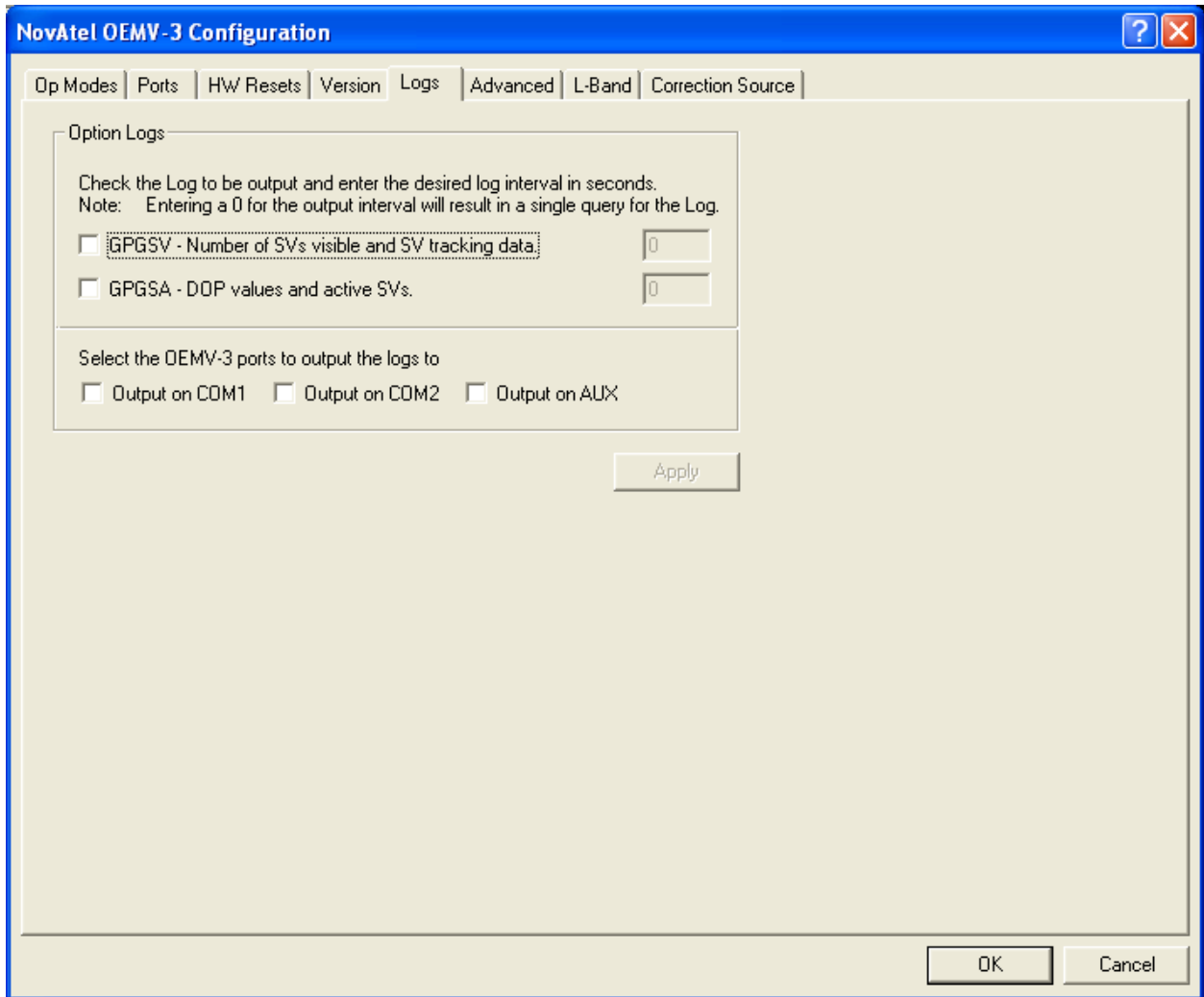
- Hardware Reset
  - Clicking this button queues the command to perform a receiver hardware reset.
    - $\text{RESET}_{R F}^{C L}$
  - The receiver initiates a cold start boot up, reverting to the factory defaults or if previously saved, the configuration saved to the non-volatile memory.



### Version tab

The information for the GPS receiver is displayed. This information is queried for when the device is added or loaded. If necessary, it can be queried for directly by clicking the Query button. This will result in the following command been sent:

- $\text{LOG VERSIONA ONCE}_{R F}^{C L}$



### Logs tab

The GPS receiver can be configured to output messages that help evaluate the satellite tracking, specifically the NMEA GPGSV and GPGSA messages. However, if transmission bandwidth is an issue, it is recommended that the output of these messages be limited to only what is required to trouble shoot the operation of a receiver.

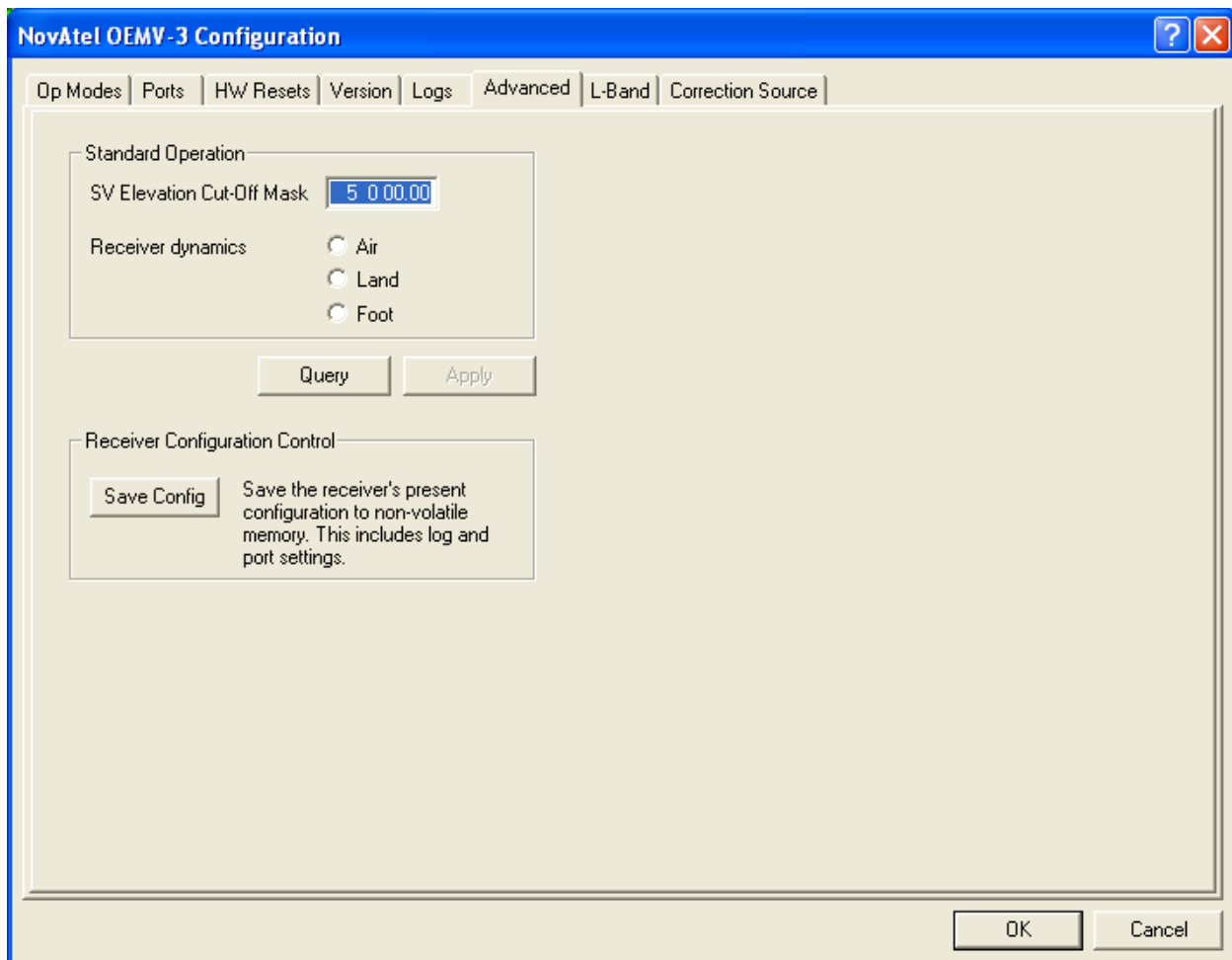
#### Notes:

- When configuring the receiver for a specific operation, the respective messages are configured to be output on the selected ports and not to be output on those ports not selected, i.e. the receiver is specifically told to stop the respective logs on non-selected ports.
- These logs cannot be output on ports that have been configured for binary (Vector Master/Remote) data output.

When a change is made to any of the settings, the Apply button will become active. When clicked, it will send the appropriate commands for both options.



- Select to output on COM1, COM2 or AUX, depending upon other configurations.
- GPGSV/GPGSA
  - Check the box if the message output is desired
  - Enter a message output interval in seconds, the options are
    - -1 will configure the message to be output on change, the command sent is:
      - LOG COMn GPGSV ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - LOG COMn GPGSA ONCHANGED<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - 0 will configure the message to be output once, the command sent is:
      - LOG COMn GPGSV ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - LOG COMn GPGSA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - 1 – 600 will configure the message to be output at the entered interval, e.g. for an entry of 5, the command sent is:
      - LOG COMn GPGSV ONTIME 5<sup>C<sub>R</sub>L<sub>F</sub></sup>
      - LOG COMn GPGSA ONTIME 5<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - If a box is already checked and is unchecked, the commands sent are
    - UNLOG COMn GPGSV<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - or
    - UNLOG COMn GPGSA<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - The Apply button will become active.
  - Click the Apply button to cause WinFrog to send the necessary commands for both options.

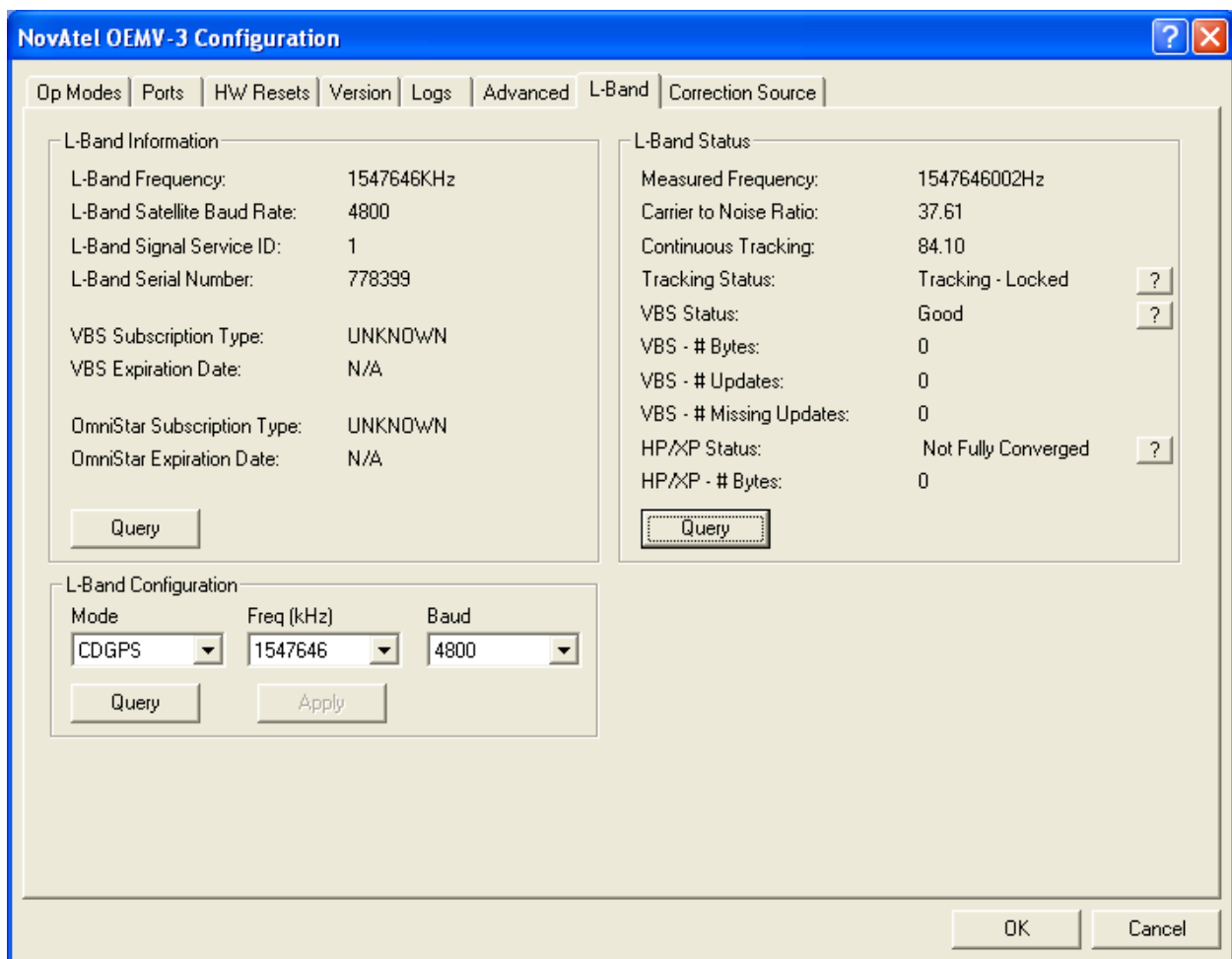


### Advanced tab

The options on this tab support configuration of the satellite tracking and standard positioning dynamics plus the option to instruct the receiver to save its current configuration to its non-volatile memory.

- Standard Operation
  - SV Elevation Cut-off Mask
    - Enter the elevation cut-off angle (d.dd, or dd mm.mm or dd mm ss.ss) for satellite tracking. Searches for a satellite will not start until the satellite rises above this angle. Conversely, tracking of a satellite will stop when it drops below this angle.
  - Receiver dynamics
    - Select the appropriate dynamic that represents the environment the GPS receiver is operating in. The default is Air; this must be used for marine applications.
  - When a change is made to one of the above, the Apply button will become active; clicking it causes the commands to be sent for both controls, e.g. the following are sent for the default settings:
    - ECUTOFF 5.0<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>

- DYNAMICS AIR<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - The receiver is queried for these settings as part of the initial device launch sequence. The current settings can also be requested by clicking the Query button, in which case the following commands are sent:
    - LOG ECUTOFFA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG DYNAMICSA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
- Receiver Configuration Control
  - Clicking the Save Config button will result in the following command to be sent, instructing the receiver to save its current configuration, including port parameters and output logs, to its non-volatile memory. This configuration is reverted to on power up and on a hardware reset.
    - SAVECONFIG<sup>C<sub>R</sub>L<sub>F</sub></sup>



### L-Band tab


The NovAtel OEMV-3 GPS receivers support L-Band corrections services, including:

- CDGPS
- OMNISTAR VBS, HP & XP

The configuration and monitoring of this feature is done from this tab. The above figure shows the configuration for CDGP service using the East spot-beam.

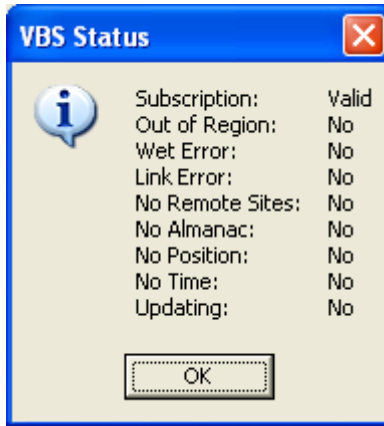
- L-Band Information
  - This panel lists the L-Band configuration for the receiver. Refer to the NovAtel documentation for further details.
  - L-Band Frequency: Selected frequency (KHz) for L-Band service.
  - L-Band Satellite Baud Rate: Baud rate for download of data from the satellite.
  - L-Band Signal Service ID
  - L-Band Serial Number: This is required when subscribing to VBS, HP or XP subscription services.
  - VBS Subscription Type:
    - EXPIRED: The subscription has expired or does not exist.
    - FIXEDTIME: The subscription expires at a fixed date and time.
    - COUNTDOWN: The subscription expires after a specified amount of running time.
    - COUNTDOWNOVERRUN: The countdown subscription has expired, but a brief grace period is in effect.
    - UNKNOWN: Subscription type is unknown.
  - VBS Expiration Date: Gives the subscription expiration information as follows:
    - FIXEDTIME: The date and time the subscription expires.
    - COUNTDOWN: The amount of running time remaining in the subscription.
    - COUNTDOWNOVERRUN: The amount of overrun time.
  - Omnistar Subscription Type: See VBS Subscription Type.
  - Omnistar Expiration Date: See VBS Expiration Date.
  - The information displayed in this panel is requested as part of the command sequence initiated at device launch. It can also be requested at anytime by clicking the Query button. This will cause the following command to be sent:
    - LOG LBANDINFOA ONCE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
- L-Band Configuration
  - The selection of the L-Band service to use is configured from here.
    - Mode: Select the L-Band service to use
      - OMNISTAR (requires a subscription)
      - CDGPS (free)
      - IDLE
    - Freq (KHz)
      - Based on the service selected, the available frequencies are displayed in this drop down list. Select the frequency for the service/satellite to be used.
    - Baud
      - The download rate for the service type and satellite/frequencies selected.
  - Note: Note that for OMNISTAR, the same frequency is used for different satellites. Check to ensure the correct frequency and baud rate are selected for the required satellite.

- L-Band Status

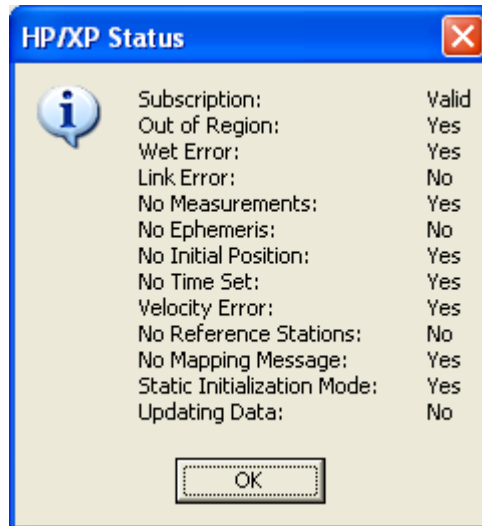
- The L-Band tracking and use information is displayed here. Refer to the NovAtel documentation for further details.
- Clicking the  button across from an item will pop-up a box with expanded status details for the respective item.
  - Measured Frequency: The actual frequency tracked (Hz), may be different than frequency selected.
  - Carrier to Noise Ratio: Carrier to noise density ratio (dB-Hz).
  - Continuous Tracking: Number of seconds of continuous (no cycle slips) tracking.
  - Tracking Status:
    - Searching: Searching for satellite/frequency.
    - Pull-in: Satellite/frequency found, downloading information.
    - Tracking-Locked: Satellite/frequency found, tracking and using.
    - Tracking-Not Locked/Error: Satellite/frequency found, tracking but errors associated with bit timing, phase lock, DC offset and AGC lock encountered.
    - Expanded status display is as follows:



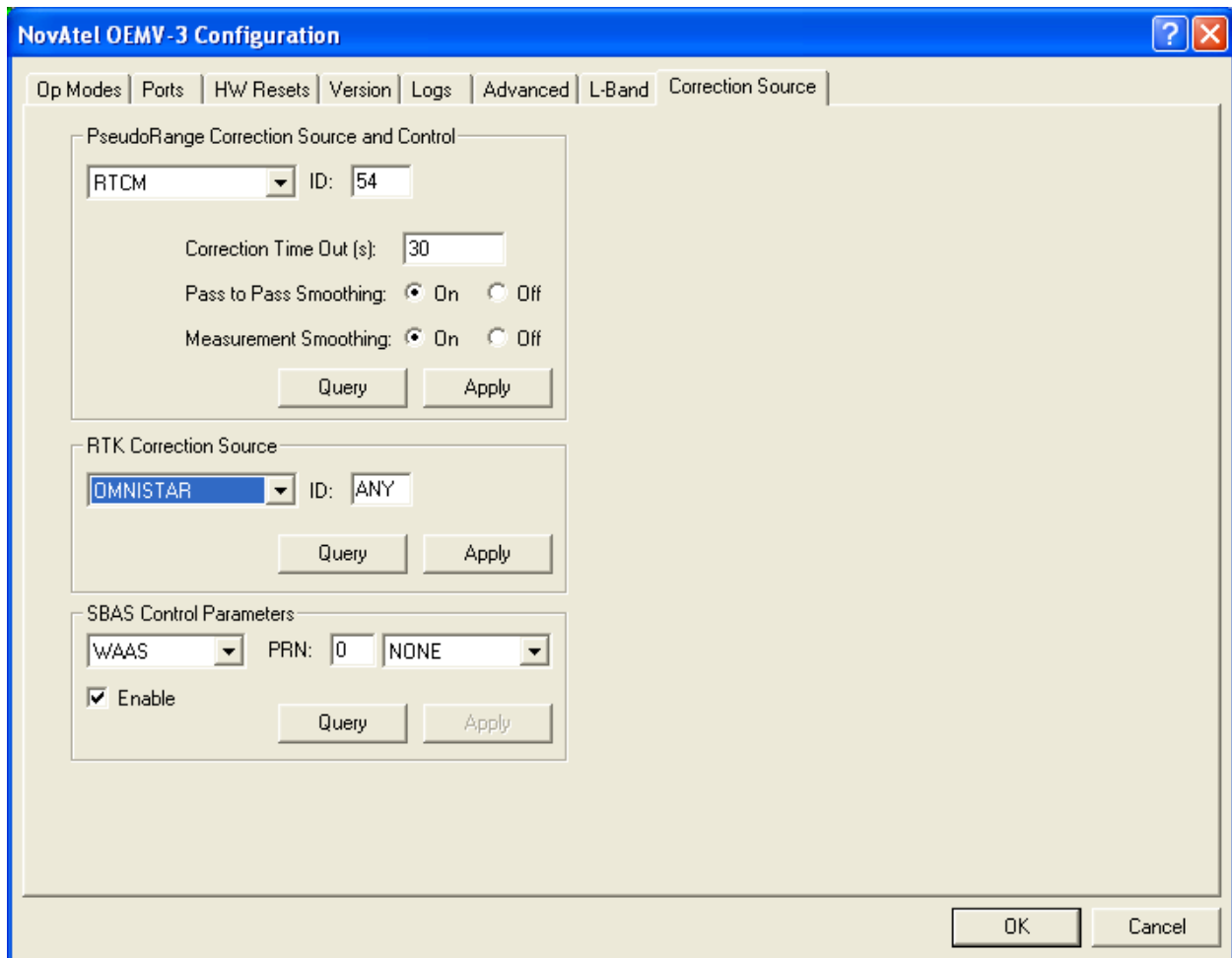
- VBS Status: Displays the VBS status, possible states are as follows:
  - Good
  - Updating
  - Expired
  - Errors
  - Expanded status is as follows:



- VBS - # Bytes: The number of bytes passed to the standard process (receiver).
- VBS - # Updates: The number of standard updates received.
- VBS - # Missing Updates: The number of standard updates missed.
- HP/XP Status: Displays the XP/HP status, possible states are as follows:
  - Converged
  - Not Fully Converged
  - Updating
  - Expired
  - Expanded status is as follows:



- HP/XP - # Bytes: Number of bytes passed to the HP/XP process (receiver).
- The information displayed in this panel is requested as part of the command sequence initiated at device launch. It can be updated at anytime by clicking the Query button. This will cause the following command to be sent:
  - LOG LBANDSTATAONCE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>



### Correction Source tab

The OEMV-3 receiver supports application of a variety of correction types. The configuration of this feature is done from this tab. The configuration of the correction source can support the selection of a pseudorange correction, an RTK correction and SBAS. The BESTPOS message, which is used for outputting the position from the receiver to WinFrog, outputs the best position of those available, based either on statistics or the availability of the respective sources. The figure above illustrates this:

- OMNISTAR XP or HP is enabled and used if available, but if it fails
- RTCM w/ reference station 54 is enabled and used if available, but if it fails
- WAAS is enabled and used if available

#### Notes:

- If the receiver is configured for MOVING BASELINE operations as the Heading-Remote, the application of correction source by the receiver is configured accordingly. Changes made from this tab can negatively affect this operation to the extent of stopping it, therefore all controls are disabled if the respective receiver is configured as a Heading-Remote.

- Pseudorange Correction Source and Control
  - Select the source/type of the differential corrections from the drop down list (note that OMNISTAR refers to VBS subscription).
  - ID: This identifies the specific station whose corrections are to be used. This is dependent upon the correction type selected:
    - RTCM: Reference station ID, 0 - 1023 or ANY
    - RTCA: 4 character alpha-numeric string or ANY
    - OMNISTAR: N/A
    - CDGPS: N/A
    - SBAS: N/A
    - AUTO: Any of the above
  - The following controls are applicable to RTCM, RTCA, OMNISTAR and the AUTO source/type and will activate when any of these are selected:
    - Correction Time Out (s): Enter the maximum age of corrections before the corrections will be ignored.
    - Pass to Pass Smoothing: Controls pass to pass smoothing.
    - Measurement Smoothing: Controls measurement smoothing.
  - The Apply button will become active whenever a change is made in the associated options. Clicking it will cause the commands for all settings to be sent; the following is an example for RTCM, with reference station ID 54, a timeout of 30 seconds and both pass to pass and measurement smoothing enabled:
    - PSRDIFFSOURCE RTCM 54<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - DGPSTIMEOUT 30<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - PASSTOPASSMODE ENABLE ON OFF DEFAULT 1.0<sup>C<sub>R</sub>L<sub>F</sub></sup>
  - These settings are queried as part of the device launch command sequence. They can be queried and updated any time by clicking the Query button. This will cause the following commands to be sent:
    - LOG PSRDIFFSOURCEA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG DGPSTIMEOUTA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
    - LOG PASSTOPASSMODEA ONCE<sup>C<sub>R</sub>L<sub>F</sub></sup>
- RTK Correction Source
  - Select the correction source/type of corrections to use from the drop down list (note that OMNISTAR refers to HP or XP, depending upon the subscription in place).
  - ID: This identifies the specific station whose corrections are to be used. This is dependent upon the correction type selected:
    - RTCM: Reference station ID, 0 - 1023 or ANY
    - RTCA: 4 character alpha-numeric string or ANY
    - CMR: 0 – 31 or ANY
    - OMNISTAR: N/A
    - RTCMV3: Reference station ID, 0 – 4095 or ANY
    - AUTO: Any of the above



- The Apply button will become active whenever a change is made in the associated options. Clicking it will cause the command to be sent; the following is an example for RTCM, with reference station ID 54:
  - RTKSOURCE RTCM 54<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
- These settings are queried as part of the device launch command sequence. They can be queried and updated any time by clicking the Query button. This will cause the following commands to be sent:
  - LOG RTKSOURCEA ONCE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
- SBAS Control Parameters
  - Select the system to use from the drop down list.
  - PRN: Enter the PRN to be used
    - 0: Receiver uses any PRN
    - 120 - 138
  - Select the Test Mode from the drop down list. This instructs the receiver how to handle the test modes for the respective systems. At the time of the implementation of this device, the option to use for all systems is ZEROTOTWO.
  - Enable: Check to enable SBAS use.
  - The Apply button will become active whenever a change is made in the associated options. Clicking it will cause the command to be sent; the following is an example for SBAS enabled for WAAS, any PRN and no test mode setting:
    - SBASCONTROL ENABLE WAAS 0 NONE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>
  - These settings are queried as part of the device launch command sequence. They can be queried and updated any time by clicking the Query button. This will cause the following commands to be sent:
    - LOG SBASCONTROLA ONCE<sup>C</sup><sub>R</sub><sup>L</sup><sub>F</sub>

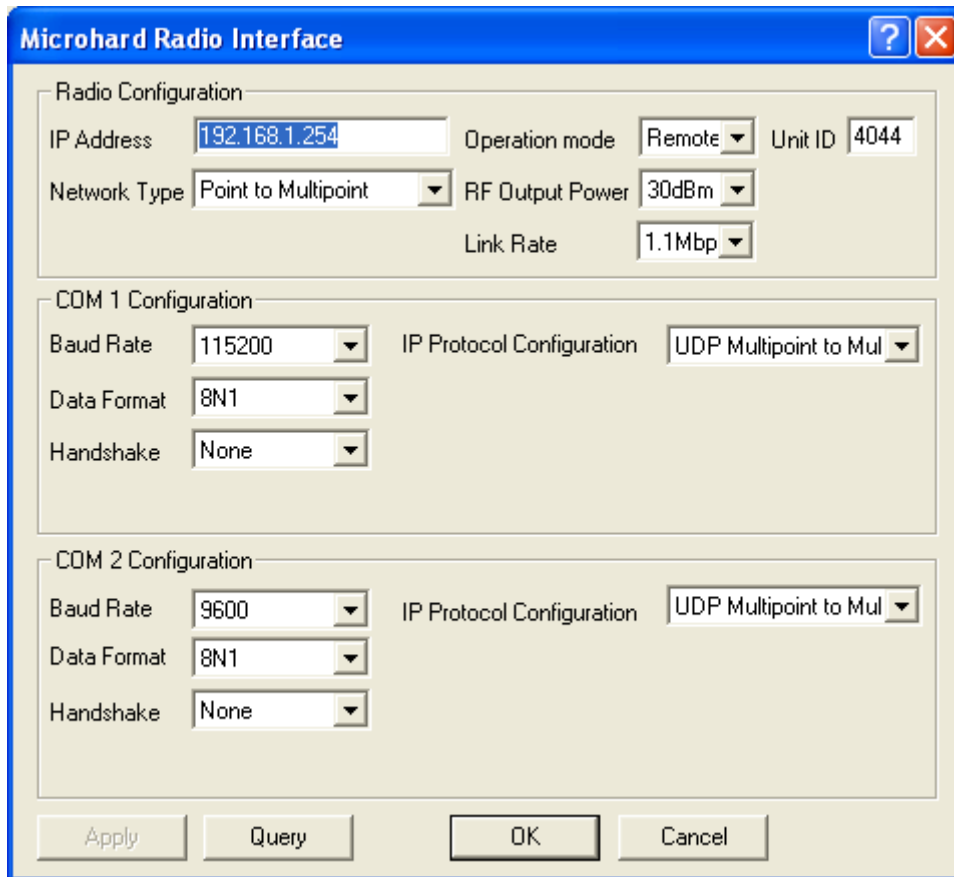
## ***CONFIGURE MICROHARD SYSTEMS RADIO***

---

If the connection for the NovAtel device is set to TCP/IP, the configuration of the Microhard radios is supported via the Ports tab.

Clicking the  button from the Ports tab will bring up the Microhard Radio Interface dialog box.

Note: The Microhard radio can support protocols and baud rates that are not supported by the NovAtel receiver or the WinFrog software. The display and option to select these is supported in this configuration in order to be able to present the actual current configuration of a radio. However, WinFrog will not let these settings be uploaded to the radio. Messages informing you accordingly are presented as required.



The image shows the 'Microhard Radio Interface' dialog box. It is divided into three main sections: 'Radio Configuration', 'COM 1 Configuration', and 'COM 2 Configuration'. At the bottom, there are four buttons: 'Apply', 'Query', 'OK', and 'Cancel'.

Section	Parameter	Value
Radio Configuration	IP Address	192.168.1.254
	Operation mode	Remote
	Unit ID	4044
	Network Type	Point to Multipoint
Radio Configuration	RF Output Power	30dBm
	Link Rate	1.1Mbps
	COM 1 Configuration	
Baud Rate	115200	
Data Format	8N1	
Handshake	None	
IP Protocol Configuration	UDP Multipoint to Mul	
COM 2 Configuration		
Baud Rate	9600	
Data Format	8N1	
Handshake	None	
IP Protocol Configuration	UDP Multipoint to Mul	

### Notes:

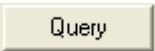
- This dialog can be used to query and configure any Microhard radio currently visible on the respective network. Therefore, care must be exercised to ensure that the correct radio is being communicated with.
- The radio IP address should be known prior to entering this dialog because it was either set to some known value or can be safely assumed to be at its

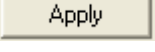
factory default value. The IP address entered for this NovAtel device cannot be safely assumed to be the radio IP address until or unless it has been “Applied” to the radio either via this dialog or via another means such as the WebGUI or serial link (see Microhard radio technical manual).

### Microhard Radio Interface

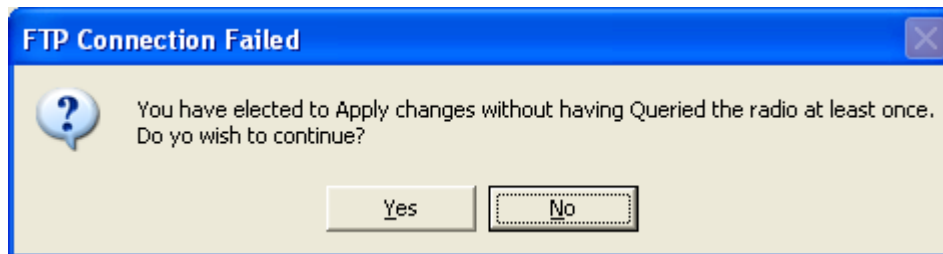
The page is initialized with the last known radio setup. If this is the first time that the device has been added then the software assumes that the radio is in its factory default condition (as shown above).

You must first verify that the radio IP address is correct and then should use the “Query” button to interrogate the radio to see what its actual configuration is.

The  button is used to establish a network connection with the radio and interrogate it for its current configuration parameters.

The  button is used to re-configure the radio with configuration parameters currently displayed on the page. This button is normally grayed until a configuration parameter has been changed and no longer has focus (i.e. when you change the Unit ID the “Apply” button will not enable until you have clicked on a different parameter).

The user may “Apply” configuration parameter changes without first performing a “Query” for the current configuration parameters but this is **NOT** recommended. If the user does attempt to “Apply” configuration parameter changes then the following warning dialog will appear.

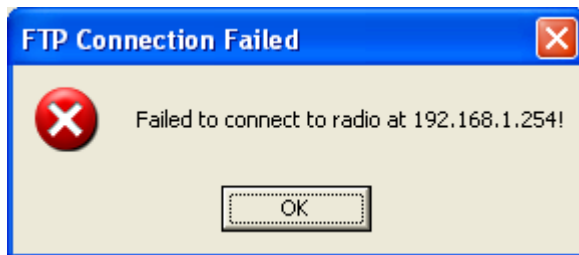


Selecting “Yes” will continue with the re-configuration while selecting “No” will abort the re-configuration and allow the user to perform a “Query”.

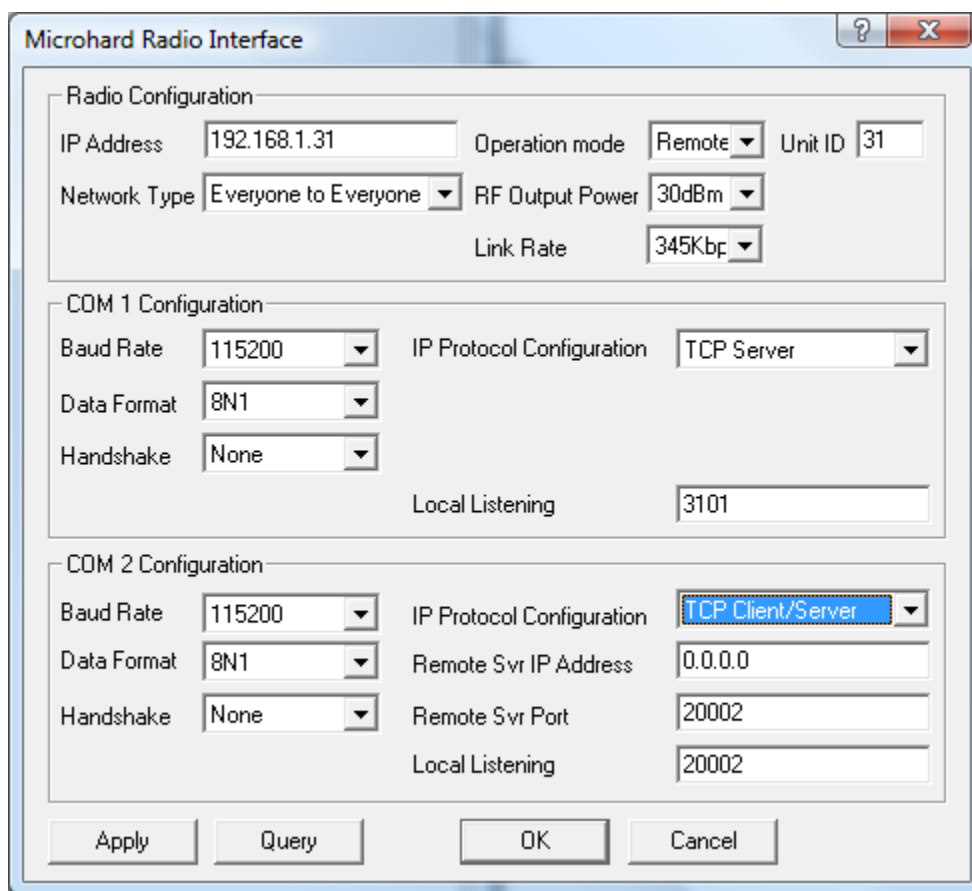
**WARNING:** When the user initiates an “Apply” the radio will go offline for 2-3 minutes while it reconfigures and re-initializes itself. The user should be patient before trying to use the radio for data transmission or to “Query” the radio and allow it to complete its re-initialization. If the user intends on changing more than one radio parameter then the user is strongly encouraged to make all required changes before selecting the “Apply” button.

If during a “Query” or an “Apply” operation the following dialog appears, it means that WinFrog could not establish an Ethernet connection with the radio. The user should verify that the IP address entered is correct and that there is network connectivity with

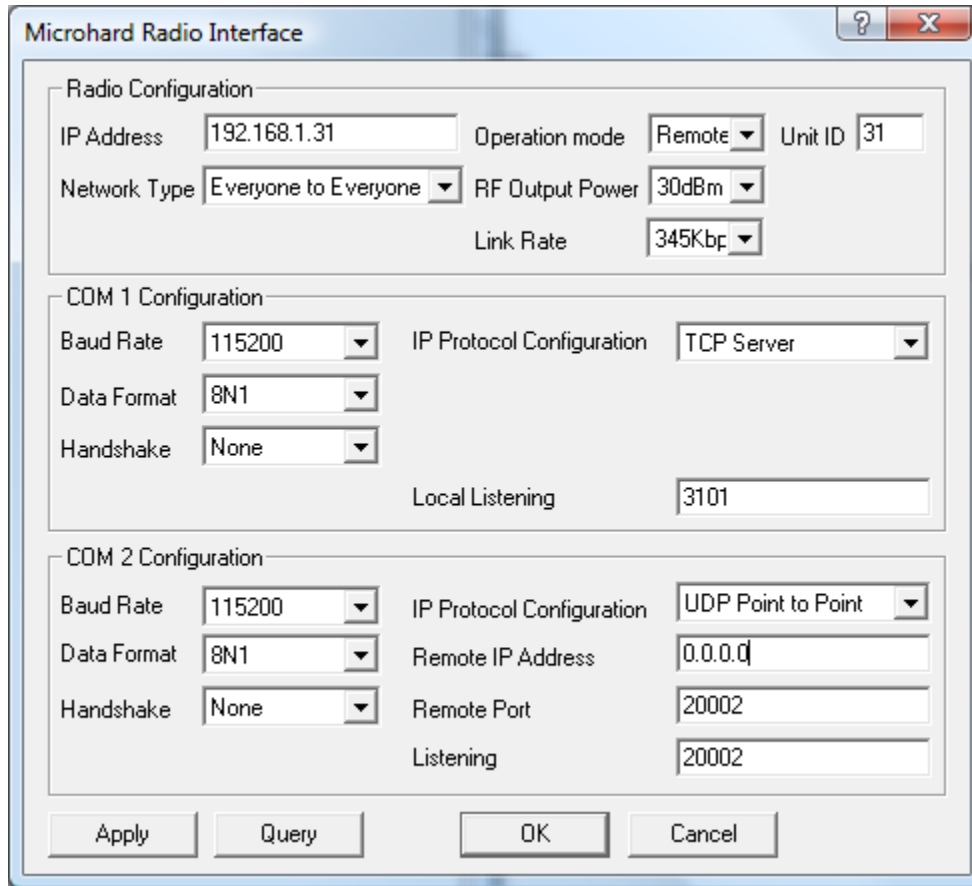
the address. This can best be done by “pinging” the IP address from a command prompt using the “ping.exe” application.



Depending on the radio’s actual configuration, the page may change based on the IP Protocol Configuration because different parameters are applicable and available for editing for different protocol selections. The different selections are the same for both COM 1 and COM 2.



This is an example of the dialog when TCP Server and TCP Client/Server are selected.



This is an example of the dialog when TCP Client and UDP Point to Point are selected.

- Radio Configuration
  - Enter the static IP address of the radio. This must be the current IP address of the radio. If you intend to change the IP address then you **must** first enter the current IP address then select “Query” to establish connection with the radio using its current IP address. Once connection with the radio has been established using the current IP address the user can enter a new IP address and select “Apply” to reconfigure the radio with the new IP address.
  - Select the Network Type from the drop down list. The Network Type should be changed to “Everyone to Everyone” and should not be changed without prior consultation with FPI.
  - Select the Operation Mode from the drop down list. Only 1 radio can be selected as “Master” and all others should be selected to “Remote”.
  - Enter Unit ID of the radio. The unit ID is, and must be, a unique identifier of each modem in a network. The Master has by default, and must retain, a unit ID of 1.
  - Select the RF Output Power from the drop down list. This setting establishes the transmit power level which will be presented to the antenna connector at the rear of the IP Series. Unless required, the RF Output Power should be set

not for maximum, but rather for the minimum value required to maintain an adequate system fade margin.

- Select the Link Rate from the drop down list. This is the RF communications Link Rate. A lower link rate offers better receive sensitivity performance; a higher link rate, better throughput. All IP Series in a network must use the same Link Rate.

- Com 1 and Com 2 Configuration

The sections “COM1 Configuration” and “COM2 Configuration” are used to configure the serial device server for the serial communications ports:

- COM1, the rear DE9 connector on the IP Series, and
- COM2, the front RJ45 connector, respectively.

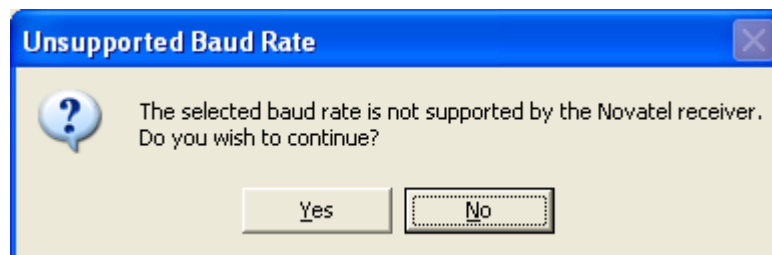
COM1 is a full-featured RS232 interface dedicated to serial data traffic. By default, this port is enabled.

COM2 is, by default, disabled. In this state, it may be used as the console port for the text user interface. Enabled, it becomes another serial port for data traffic.

Although COM2 can be configured from this dialog, it can only be enabled/disabled via the WebGUI or serial text interface.

For brevity, only COM1 is fully detailed in this section.

- Select the Baud Rate from the drop down list. The serial baud rate is the rate at which the modem is to communicate with the attached local asynchronous device. The drop down list lists all baud rates that are available for the radio but some of these baud rates are not compatible with a NovAtel receiver. If the user selects an incompatible baud then the following warning message will appear.



Selecting “No” will return the selection to the previous value while selecting “Yes” will continue with the incompatible baud rate. Continuing with an incompatible baud rate is **NOT** recommended except for very special circumstances and only after consultation with FPI.

- Select the Data Format from the drop down list. This setting determines the format of the data on the serial port. The default is 8 data bits, No parity, and 1 Stop bit.
- Select the Data Format from the drop down list. Select “None” unless prior approval of a different selection has been obtained from FPI.

- Select the IP Protocol Configuration from the drop down list. This setting determines which protocol the serial server will use to transmit serial port data over the IP Series network.

Only the “TCP Client”, “TCP Server” and “TCP/Client Server” selections are supported in the WinFrog software. An unsupported selection will result in a message alerting you that the protocol is not supported and will not be uploaded to the radio.



The “TCP Client”, “TCP Server” and “TCP/Client Server” selections have different configurable parameters and are detailed below.

- TCP Client:  
When TCP Client is selected and data is received on its serial port, the IP Series takes the initiative to find and connect to a remote TCP server. The TCP session is terminated by this same unit when the data exchange session is completed and the connection timeout has expired. If a TCP connection cannot be established, the serial port data is discarded. This selection is only valid if WinFrog has been configured for a TCP “Listen” type connection.
  - Remote Server Address  
IP address WinFrog has been configured to “Listen” to and which is ready to accept serial port data through a TCP connection.
  - Remote Server Port  
The port which WinFrog has been configured to listen to and is awaiting a session connection request from the TCP Client. Once the session is established, the serial port data is communicated from the Client to WinFrog.
- TCP Server:  
In this mode, the IP Series will not INITIATE a session, rather, it will wait for a Client to request a session of it (it’s being the Server—it ‘serves’ a Client). The unit will ‘listen’ on a specific TCP port. If a session is established, data will flow from the Client to the Server, and, if present, from the Server to the Client. If a session is not established, both Client-side serial data, and Server-side serial data, if present, will

be discarded. This selection is only valid if WinFrog has been configured for a TCP “Call” type connection.

➤ Local Listening Port

The TCP port which the Server listens to. This must be the same port that WinFrog has been configured to “Call”. It allows a TCP connection to be created by a TCP Client to carry serial port data.

▪ TCP Client/Server:

In this mode, the IP Series will be a combined TCP Client and Server, meaning that it can both initiate and serve TCP connection (session) requests. Refer to the TCP Client and TCP Server descriptions and settings described previously as all information, combined, is applicable to this mode. This selection is valid if WinFrog has been configured for either a TCP “Call” or TCP “Listen” type connection.

## ***DEVICE CONFIGURATION INSTRUCTIONS (CONT.)***

---

### **WINFROG I/O DEVICES > DEVICE MONITORING:**

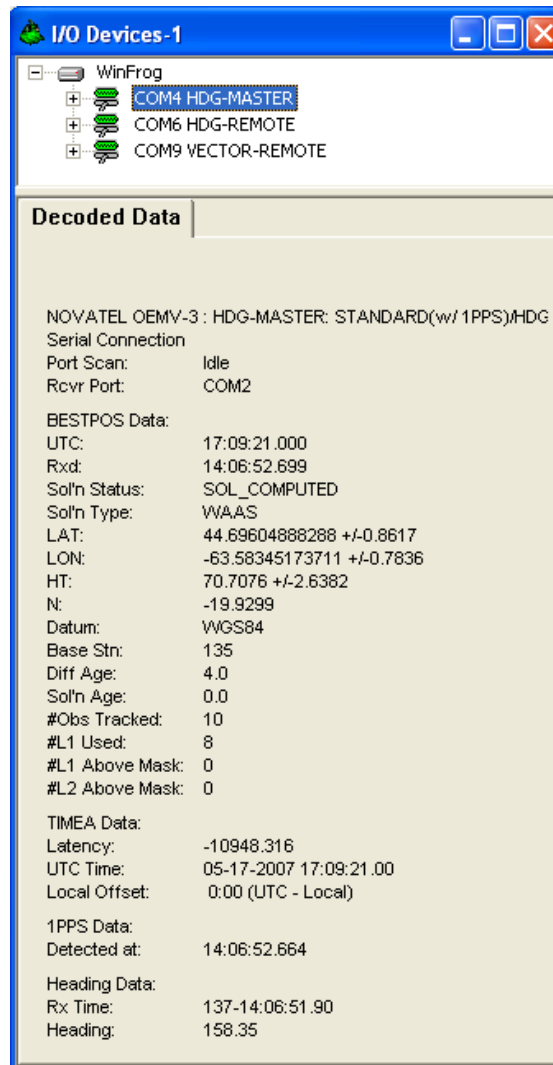
This device is monitored utilizing different page displays in the I/O Devices window. The respective pages display all the respective data and statuses. The common element is the device type and name, operation mode setting and communication type, and if applicable, status. If data is not available for the selected page, N/A is displayed for selected items to indicate this.

The following are the available page types, what is displayed on each, and an example:



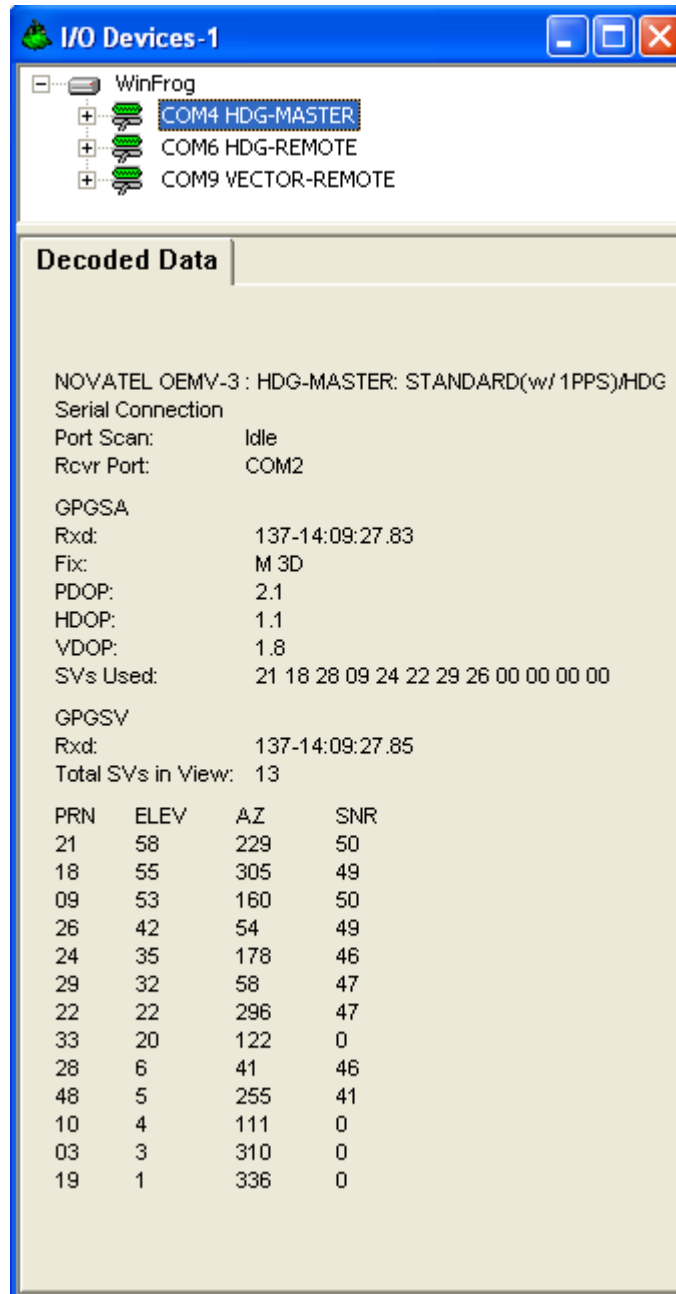
## Position/Time/Hdg

- Position data
  - If source is the binary BESTPOSB, a 'B' in brackets appears in the line indicating the data source BESTPOS or PSRPOS
- Position solution status (e.g. SOL\_COMPUTED) and type (e.g. WAAS).
- Time Data, if so configured
- Heading data (e.g. pass through from a Heading – Remote)



## SV Info

- GPGSV and/or GPGSA messages, if received



The screenshot shows the 'I/O Devices-1' window in WinFrog. The device list includes 'COM4 HDG-MASTER', 'COM6 HDG-REMOTE', and 'COM9 VECTOR-REMOTE'. The 'Decoded Data' section displays the following information:

NOVATEL OEMV-3 : HDG-MASTER: STANDARD(w/ 1PPS)/HDG  
Serial Connection  
Port Scan: Idle  
Rcvr Port: COM2

GPGSA  
Rxd: 137-14:09:27.83  
Fix: M 3D  
PDOP: 2.1  
HDOP: 1.1  
VDOP: 1.8  
SVs Used: 21 18 28 09 24 22 29 26 00 00 00 00

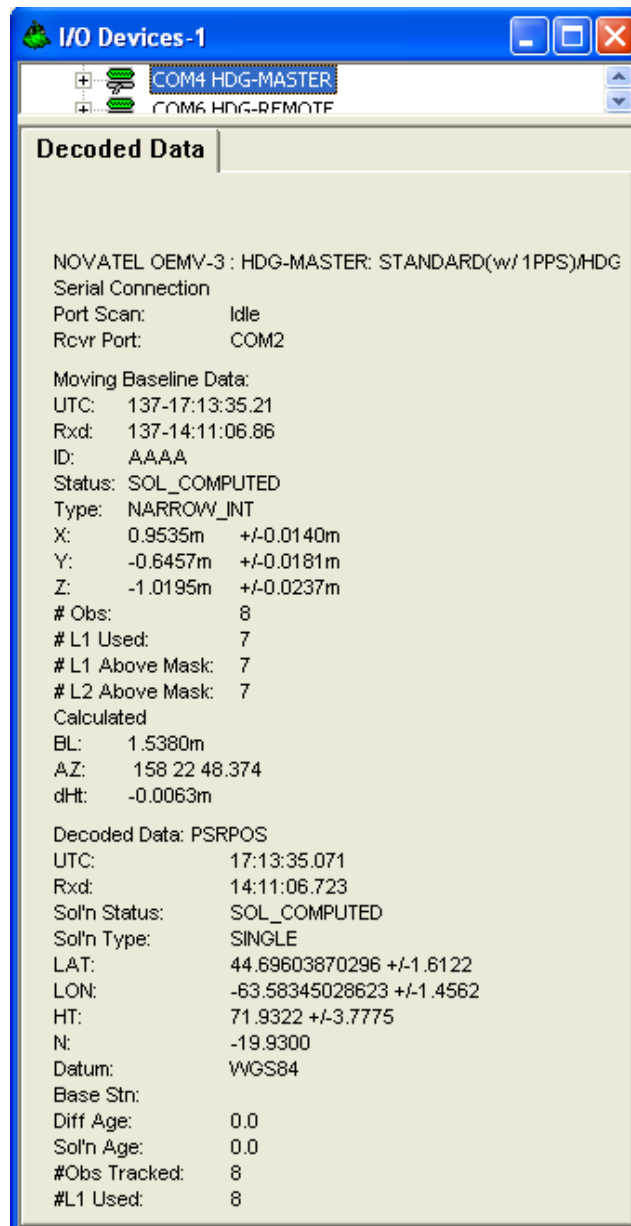
GPGSV  
Rxd: 137-14:09:27.85  
Total SVs in View: 13

PRN	ELEV	AZ	SNR
21	58	229	50
18	55	305	49
09	53	160	50
26	42	54	49
24	35	178	46
29	32	58	47
22	22	296	47
33	20	122	0
28	6	41	46
48	5	255	41
10	4	111	0
03	3	310	0
19	1	336	0

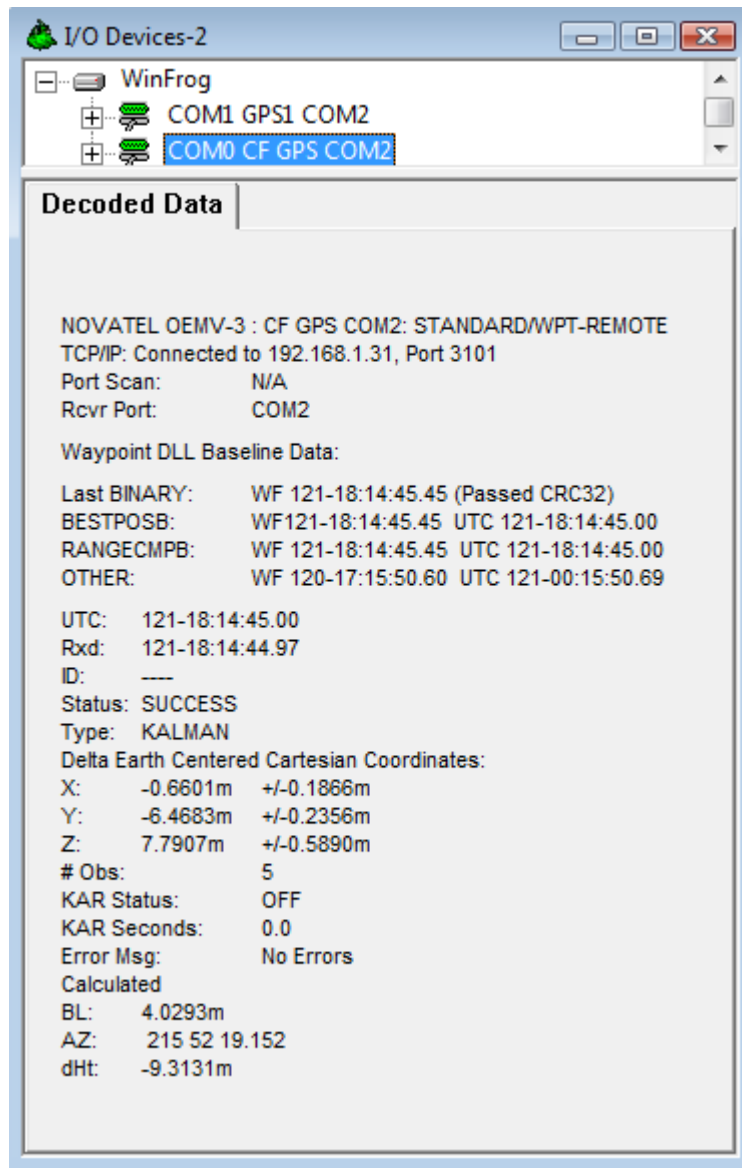
## Vector

- Baseline data for a Moving Baseline or Waypoint Vector calculation
- If a Vector calculation, display of the status of the last binary received (time received and pass/fail checksum) and the received time and decoded UTC time of those messages required for the Vector calculations.
- Solution status (e.g. for Vector SUCCESS) and type (e.g. for Vector KALMAN).
- If for a Moving Baseline, the associated position data, type and status

### *Moving baseline page*



## Waypoint Vector Calculation page



The screenshot shows a window titled "I/O Devices-2" with a tree view containing "WinFrog" and two sub-items: "COM1 GPS1 COM2" and "COM0 CF GPS COM2". The "COM0 CF GPS COM2" item is selected and highlighted in blue. Below the tree view is a "Decoded Data" section containing the following text:

```
NOVATEL OEMV-3 : CF GPS COM2: STANDARD/WPT-REMOTE
TCP/IP: Connected to 192.168.1.31, Port 3101
Port Scan:      N/A
Rcvr Port:     COM2

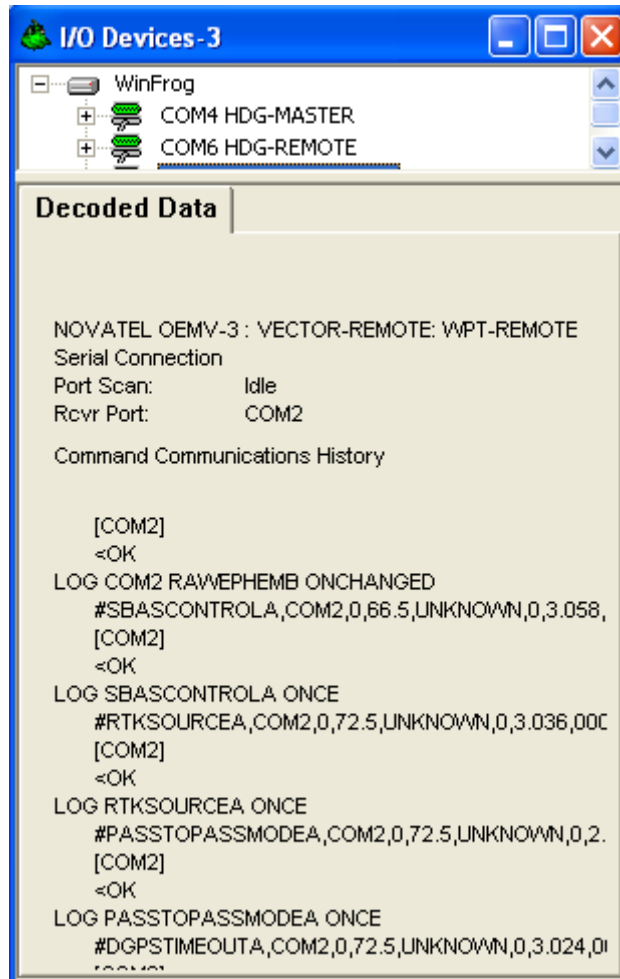
Waypoint DLL Baseline Data:

Last BINARY:    WF 121-18:14:45.45 (Passed CRC32)
BESTPOSB:      WF121-18:14:45.45 UTC 121-18:14:45.00
RANGECMPB:     WF 121-18:14:45.45 UTC 121-18:14:45.00
OTHER:         WF 120-17:15:50.60 UTC 121-00:15:50.69

UTC:   121-18:14:45.00
Rxd:   121-18:14:44.97
ID:    ---
Status: SUCCESS
Type:  KALMAN
Delta Earth Centered Cartesian Coordinates:
X:     -0.6601m +/-0.1866m
Y:     -6.4683m +/-0.2356m
Z:      7.7907m +/-0.5890m
# Obs: 5
KAR Status: OFF
KAR Seconds: 0.0
Error Msg:  No Errors
Calculated
BL:     4.0293m
AZ:    215 52 19.152
dHt:   -9.3131m
```

## COMMS

- Displays the commands sent by WinFrog and the associated responses.
- Newest is at the top



**WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:**

When you first add the NOVATEL OEMV-3 device no data items are created. The data items are created as you configure the device. Up to four data items may be created: POSITION, HEADING, VECTOR MASTER and VECTOR REMOTE. Once the data items have been added to the correct vehicle, they must be edited to suit the application.

Note: The application of VECTOR data involves a MASTER and a REMOTE data item. The MASTER is associated with the sensor for which a position can be determined, or the *known* end of the vector. The Remote is associated with the sensor that is being positioned with the vector data, or the *unknown* end of the vector.

**Data item: GPS, NOVATEL OEMV-3, POSITION**

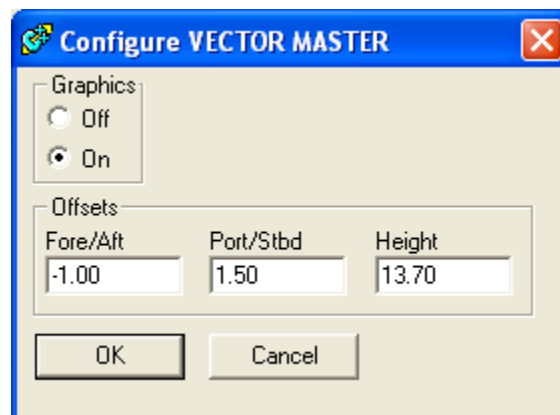
*Standard application of POSITION data item*

**Data item: GPS, NOVATEL OEMV-3, HEADING**

*Standard application of HEADING data item*

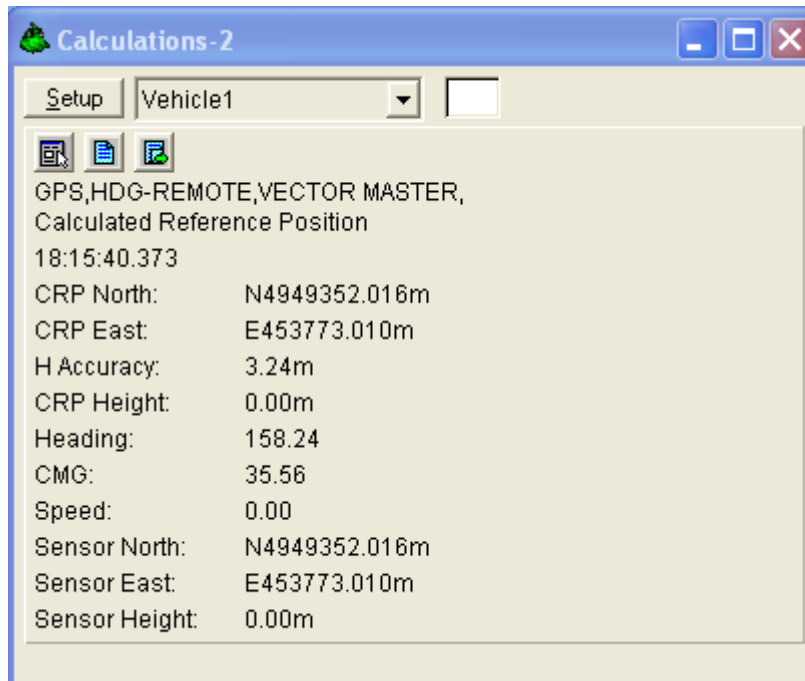
**Data item: GPS, NOVATEL OEMV-3, VECTOR MASTER**

The VECTOR MASTER data item is associated with the vehicle on which the master sensor associated with the vector is located. No data is actually passed from the device to the vehicle via this data item; rather it maintains a time series for the associated vehicle's CRP Easting, CRP Northing, CRP Height, position accuracy, vehicle advance (CMG) and speed. These are then available for retrieval by the VECTOR REMOTE data item.



The configuration involves the entering of the offsets of the master sensor from the vehicle's CRP. In addition, the Graphics Off/On setting controls the display of the master sensor location derived from the vehicle's position and the offsets.

The Calculation window displays latest data for the associated vehicle and the derived sensor position.



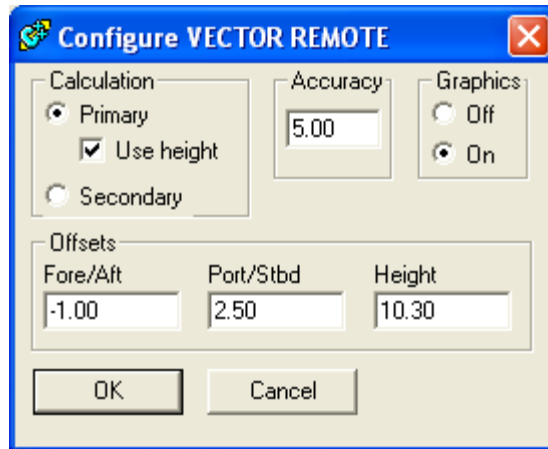
**Data item: GPS, NOVATEL OEMV-3, VECTOR REMOTE**

The VECTOR REMOTE data item is associated with the vehicle on which the remote sensor associated with the vector is located. The vector (baseline) data is retrieved from the device and applied.

The application involves the following steps:

- Search for the vehicle that the associated VECTOR MASTER is assigned to
- Retrieval from the VECTOR MASTER of:
  - the position data from the time series for the vector data epoch
  - the sensor offsets
- Determination of the master sensor position and height
- Application of the vector data to the master sensor position to derive the remote sensor position and height
- Application of the remote sensor offsets to derive a CRP position and height for the associated vehicle
- Propagation of the respective standard deviations (master vehicle position accuracy and the vector component standard deviations) to derive an estimate of the remote vehicle position accuracy at the 95% confidence level

The configuration of the VECTOR REMOTE data item involves the following:

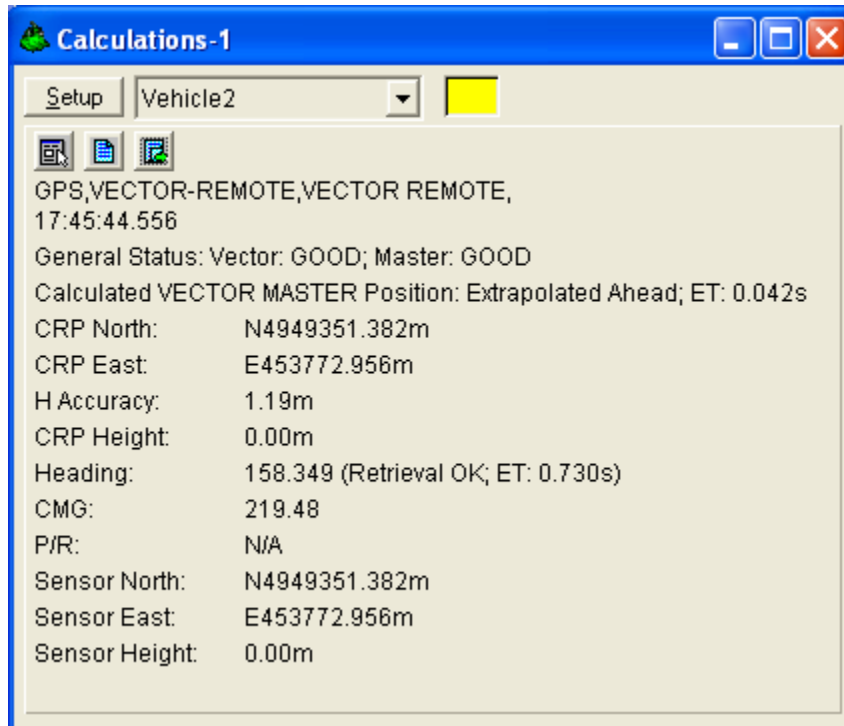


- Calculation
  - Primary: select if the calculated position is to be used to position the associated vehicle.
    - Use Height: check if the calculated height is to be used to provide the height of the associated vehicle
  - Secondary: select if the calculated position is not to be used to position the associated vehicle
- Accuracy
  - Enter the standard deviation to be applied with the position in the Kalman Filter (if enabled for the associated vehicle)
    - Note: This value is not used in the propagation of the standard deviations, only for the Kalman Filter
- Graphics
  - Off: select if the raw sensor position is not to be displayed in the Graphics window.
  - On: select if the raw sensor position is to be displayed in the Graphics window.
- Offsets
  - Enter the offsets of the remote sensor from the associated vehicle's CRP.

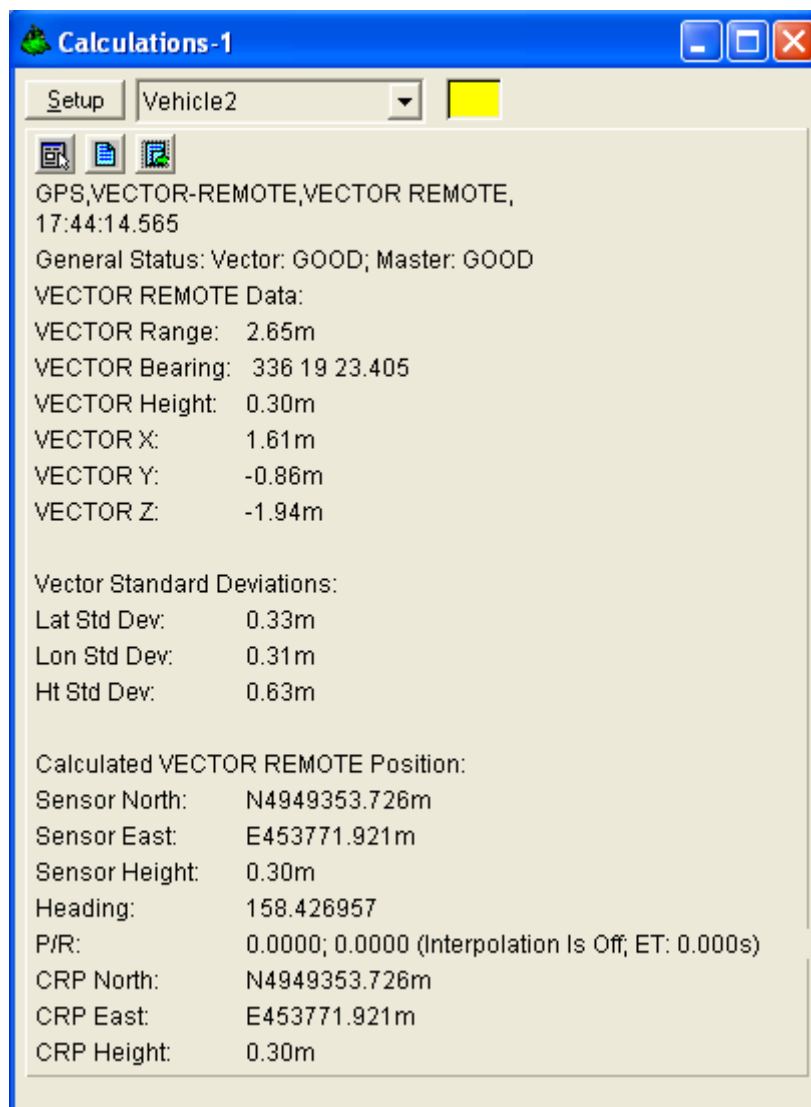
The operation of the VECTOR REMOTE data item can be monitored in the Calculation Window. There are two pages associated with this data item. One displays the retrieved VECTOR MASTER data and its status.

**Note:** ET in these displays refers to the time that the interpolation/extrapolation used to retrieve the data to match the vector data epoch was performed over.





The second displays VECTOR REMOTE data and calculated positions and heights.



**Note:** If a VECTOR MASTER vehicle cannot be found, the VECTOR REMOTE cannot determine a position for the remote sensor. If this situation is detected, the appropriate status is displayed in the Calculation window.

**Note:** If the retrieval of the position data from the VECTOR MASTER fails due to the extrapolation period exceeding twice the respective position update, the VECTOR REMOTE cannot determine a position for the remote sensor. If this situation is detected, the appropriate status is displayed in the Calculation window.

**Note:** There are operator alerts associated with this data item. In each case, a message box alerting you pops up, telling them to check the I/O Device window for details. If the problem is uncorrected after 30 seconds, the message pops up again.

- 5 sequential updates with a bad data status
- 10 sequential updates with a data warning status
- 10 sequential updates with a combination of bad data status and data warning status

**TELGRAM SPECIFICATION:**

The telegram specification has been addressed in the Configure Device section.