

PolaRx5TR

User Manual





User Manual Revision 2.7 Applicable to version 5.5.0 of the PolaRx5TR Firmware

February 09, 2024

Thank you for choosing the PolaRx5TR. This user manual provides detailed instructions on how to use PolaRx5TR and we recommend that you read it carefully before you start using the device.

Please note that this manual provides descriptions of all functions of the PolaRx5 product family. However, the particular PolaRx5TR you purchased may not support functions specific to certain variants.

While we try to keep the manual as complete and up-to-date as possible, it may be that future features, functionality or other product specifications change without prior notice or obligation. The information contained in this manual is subject to change without notice. We recommend you to look for new or updated information in our Knowledge Base at https://customersupport.septentrio.com/s/topiccatalog



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1 Introduction

1.1 User Notices

1.1.1 CE Notice

CE

PolaRx5TR receivers carry the CE mark and are as such compliant with the 2004/108/EC - EMC Directive and amendments, 2006/95/EC - Low Voltage Directive, both amended by the CE-marking directive 93/68/EC.

With regards to EMC, these devices are declared as class B, suitable for residential or business environment.

1.1.2 ROHS/WEEE Notice



PolaRx5TR receivers are compliant with the latest WEEE, RoHS and REACH directives. For more information see www.septentrio.com/en/environmental-compliance.





1.1.3 Safety information



Statement 1: The power supply provided by Septentrio (if any) should not be replaced by another. If you are using the receiver with your own power supply, it must have a double isolated construction and must match the specifications of the provided power supply.



Statement 2: Ultimate disposal of this product should be handled according to all national laws and regulations.



Statement 3: The equipment and all the accessories included with this product may only be used according to the specifications in the delivered release note, manual or other documents delivered with the receiver.



1.1.4 Support

For first-line support please contact your PolaRx5TR dealer.

Additional documentation can be found in the following manuals:

- **The PolaRx5TR Reference Guide** (contained inside the Firmware Package zip on our website) includes information on the receiver operation, the full list of receiver commands and a description of the format and contents of all SBF (Septentrio Binary Format) blocks.
- **The RxControl Manual** covers the RxTools software suite, including RxControl and RxLogger.

The Septentrio website has a dedicated Support section

(http://www.septentrio.com/support), where the User Manual, the Firmware Reference Guide and the latest officially supported Firmware version are readily available for download.

Further information can be found on our website or by contacting Septentrio's Technical Support department.

In case the PolaRx5TR does not behave as expected and you need to contact Septentrio's Technical Support department, you should attach a short SBF log file containing the support blocks and a Diagnostic Report of the receiver (see Section 6.3).



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2 PolaRx5TR overview

2.1 Hardware specifications

2.1.1 Physical and Environmental

Size: Weight:	235 x 140 x 37 mm (length includes connectors) (9.25 x 5.51 x 1.45 in) 940 g (2.07 lb)
Operating temperature: Storage temperature:	-40 to +65 °C (-40 to +149 °F) -40 to +85 °C (-40 to +185 °F)
Certification:	IP65, RohS, CE FCC Class B Part 15

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2.2 PolaRx5TR design

2.2.1 Front panel

The front-panel layout of the PolaRx5TR is shown in Figure 2-1. A description of the front-panel sockets as well as their PIN assignments can be found in Appendix A. The cables available for use with the PolaRx5TR are listed in Appendix D and the LED behavior is described in Appendix E.



Figure 2-1: PolaRx5TR front-panel layout

2.2.2 Rear panel

Figure 2-2 shows the layout of the rear-panel connectors on the PolaRx5TR. More information on these connectors can be found in Appendix B.



Figure 2-2: PolaRx5TR rear-panel layout



2.2.3 Powering the Receiver

The receiver can be powered through either:

- The PWR connector (9-30 VDC)
- The Ethernet connector (Power over Ethernet PoE, 37-57 VDC). Please note that only mode A, as specified in the 802.3af standard, is supported.

If power is provided through both the Ethernet and the PWR connectors, Ethernet power takes precedence. This allows the connection of a back-up battery to the ODU PWR connector. The battery will only be used in case of an outage of the power over Ethernet.

The current power source (PWR or Ethernet connector), and the voltage at the PWR connector are reported in the <code>PowerStatus SBF bock</code>.

2.2.4 Power Button

When power is initially applied to the PWR or Ethernet connector, or after a power outage, the receiver always starts up without the need to press the power button.

In case the receiver is only powered through PoE, pressing the power button resets the receiver. After a few seconds, the receiver will restart.

In case the receiver is powered through the PWR connector or through both PWR and PoE, pressing the power button turns the receiver off. Pressing the button again switches the receiver back on.

In all cases, the state of the power button is not retained across a power outage. If the receiver was off before the power outage, it will restart when power is restored.

2.2.5 WiFi Button

The WiFi button 奈 toggles the WiFi modem on and off.

When the receiver starts up, WiFi is enabled or disabled according to the settings of the **setWiFiMode** command stored in the boot configuration file. When the receiver is operating, pressing the WiFi button turns WiFi on and off in turn. The red WiFi LED next to the WiFi button lights when WiFi is enabled.

2.2.6 Internal memory

The PolaRx5 has a 16 GB Memory for internal data logging. Data can be logged in SBF, RINEX, BINEX, NMEA or RTCM-MSM format and may be retrieved via the âĂŸLoggingâĂŹ menu of the web interface.

2.2.7 External memory

The PolaRx5TR can log data to an external memory device.



3 Getting started with the PolaRx5TR

This section details how to power-up, connect to and communicate with the PolaRx5TR. The PolaRx5TR has an on-board web interface which you can connect to in three ways: Ethernet, USB or WiFi. The PolaRx5TR is fully configurable using the web interface. Please note that older versions of certain browsers may not properly display the web interface.

3.1 **Powering the PolaRx5TR**

You can power the PolaRx5TR by connecting the power adapter that is supplied as standard to the front-panel power socket as indicated in Figure 3-1. The receiver will start up automatically without pressing the power button.



Figure 3-1: Front-panel power socket

The PolaRx5TR can also be powered over Ethernet (PoE) as described in Section 2.2.3 or by supplying 9 to 30 V via PIN 1 of the open-ended power cable (CBLe_PWR_OE) as detailed in Appendix A.8.

3.2 Connecting an antenna

The rear panel of the PolaRx5TR has a TNC connector labeled **MAIN** to connect a GNSS antenna. Connect an antenna to the PolaRx5TR using an antenna cable as shown in Figure 3-2. The connector can provide 5V DC and up to 200 mA to power an antenna (see Appendix B.1 for more information).



Figure 3-2: Rear-panel antenna connector

Before connecting an antenna, the orange front-panel tracking LED $\frac{1}{25}$ will be blinking fast indicating that the receiver is searching for satellites. After connecting an antenna that has a clear view of the sky, the PolaRx5TR will start to track satellites and the tracking LED will



start to blink more slowly. The number of blinks between pauses indicates the number of satellites being tracked as described in Appendix E.

3.3 Connecting to the PolaRx5TR via the Web Interface

You can connect to the receiver on any device that supports a web browser using the receiver's on-board Web Interface. The connection can be made over USB, Ethernet or WiFi. The following sections describe each of the connection methods.

3.3.1 Using the USB cable

Connect the USB cable (CBLe_USB) to the socket labeled **COM3-4/USB** on the front panel of the PolaRx5TR as indicated in Figure 3-3.



Figure 3-3: Connecting to the front-panel USB socket

The first time that the USB cable is connected to your PC, you may be prompted to allow installation of drivers which can take several minutes. When the drivers have been installed, it is recommended to unplug then re-plug in the USB cable on your device to fully activate the drivers.

If the USB drivers do not install automatically, they can be installed manually by double clicking on the executable installer file found in the folder 'driver' as shown in Figure 3-4.



🚱 🗢 🎮 🕨 Computer 🕨	✓ 4 Search	Computer			
Organize 🕶 Eject Properties System	properties Uninstall or change a pro	gram » 🚛 🕶 🚺 🔞			
Music Pictures Subversion Videos Computer Network	s (1) e of 465 GB movable Storage (2) rive (D:)	Drive (E:) PolaRs5 Drivers			
CD Drive (E:) PolaRx5 Drivers Space CD Drive Space	COO V 🕌 E:\driver	- 4	Search driver		<mark>ک</mark> ۵
	Organize 👻 📷 Open	Burn		8≕ - 6	. 0
	J Music ^	Name		Date modified	Туре
	E Pictures	USB_driver_2_30_1_Ins	taller.exe	07/12/2015 19:54	Applicati
	Videos 🗉				
	P Computer DSDisk (C:)				
	🗧 CD Drive (E:) PolaRx5 🔻	٠	"		F

Figure 3-4: Manually installing the USB drivers

Again, when the drivers have been installed, it is recommended to unplug then re-plug in the USB cable on your device to fully activate the drivers.

The USB connection on the PolaRx5TR functions as network adapter and the DHCP server running on the receiver will always assign the PolaRx5TR the IP address 192.168.3.1.

To connect to the PolaRx5TR, you can then simply open a web browser using the IP address **192.168.3.1** as shown in Figure 3-5.

🖻 🖅 💡 PolaRx5-3012432 (SEPT	× + ~		let Habber			- 🗆	×
\leftarrow \rightarrow \circlearrowright \bigtriangleup 19	92.168.3.1/			🛄 🕁 岸	≡ <i>l</i> ~	8 🖸]
	Receiver	Position	Status			<mark>&</mark> L	.og in 🔷
4	PolaRx5-3012432 (SEPT)	Lat: N50°50'55.1095" 0.398m	Tracked Sats: 46	G SBAS Status			
	IP Address (Eth): 192.168.110.98	Lon: E4°43'55.6768" 0.354m	Time: 2019-06-18 12:08:40	Corrections Ext. Logging			
septentrio	Uptime: 0d 00:15:15	Hgt: 129.351m 0.623m	Temp: 51.00 °C — V: 12.10 volts	🛠 Wifi 🔿 Internal 🎉 SECORX 🍿 Spectrum clea	an		

Figure 3-5: Connect to the Web Interface of the PolaRx5TR over USB using the IP address 192.168.3.1 on any web browser



3.3.2 Over WiFi

The Web Interface can also be accessed over a WiFi connection. You can turn on the WiFi modem of the PolaRx5TR by pressing firmly on the WiFi button as shown in Figure 3-6.



Figure 3-6: Press firmly on the front-panel WiFi button to turn on the WiFi modem. When active, the red WiFi led will be lit.

On your PC or tablet, search for visible WiFi signals: the PolaRx5TR identifies itself as a wireless access point named 'PolaRx5TR-*serial number*'. The serial number of the PolaRx5TR can be found on an identification sticker on the receiver housing. Select and connect to the PolaRx5TR as shown in Figure 3-7.



Figure 3-7: Select the PolaRx5TR from the list of detected wireless signals and connect





When your PC has connected to the PolaRx5TR WiFi signal, you can open a web browser using the IP address **192.168.20.1** as shown in Figure 3-8.

🖻 🖅 👎 PolaRx5-3012432 (SEPT	× + ~				-		×
\leftarrow \rightarrow \circlearrowright \bigtriangleup \bigstar 1	92.168.20.1/			□ ☆ ≦	L B		
	Receiver	Position	Status			2 Log	in ^
A	PolaRx5-3012432 (SEPT)	Lat: N50°50'55.1098" 0.414m	Tracked Sats: 46	SBAS Status			- 1
1	IP Address (Eth): 192.168.110.98	Lon: E4°43'55.6770" 0.374m	Time: 2019-06-18 12:09:51	Corrections Ext. Logging Ext. Logging			
septentrio	Uptime: 0d 00:16:26	Hgt: 129.343m 0.642m	Temp: 51.00 °C - V: 12.10 volts	Wifi 🕐 Internal K SECORX 🍿 Spectrum clean			

Figure 3-8: Connect to the Web Interface of the PolaRx5TR over WiFi using the IP address 192.168.20.1 on any web browser



3.3.3 Using the Ethernet cable

Connect the Ethernet cable (CBLe_ETH_MS) to the socket labeled **ETH** on the front panel of the PolaRx5TR as shown in Figure 3-9.



Figure 3-9: Connecting to the front-panel Ethernet socket

For the most straightforward setup, the RJ45 socket of the Ethernet cable should be connected to a network running a DHCP server. The IP address assigned to the receiver will be associated with the hostname 'PolaRx5TR-*xxxxxx*', where *xxxxxxx* are the 7 digits of the serial number of the GNSS Receiver Board (GRB) inside the PolaRx5TR. This number can also be found on an identification sticker on the receiver housing. You can then make a connection to the receiver using the web address **http://PolaRx5TR-xxxxxxx**.

Figure 3-10 shows a screenshot of an Ethernet connection to a PolaRx5 receiver with serial number 3013369 using 'http://polarx5-3013369/'.

🖻 🖅 🗧 PolaRx5-3012432 (SE	ept. × + ×				-	- 0	×
\leftarrow \rightarrow \circlearrowright \textcircled{a}	http://PolaRx5-3012432/			□ ☆ 5=	l~	ê 🗵	
	Receiver	Position	Status			<mark>&</mark> L	og in 🗠
4	PolaRx5-3012432 (SEPT)	Lat: N50°50'55.1079" 0.395m	Tracked Sats: 46	General Carling Contraction			
N 10 1	IP Address (Eth): 192.168.110.98	Lon: E4°43'55.6759" 0.340m	Time: 2019-06-18 12:07:25	Corrections 💮 Ext. Logging			
septentrio	Uptime: 0d 00:14:00	Hgt: 129.377m 0.600m	Temp: 51.00 °C - V: 12.10 volts	♥ Wifi ♥ Internal ✗ SECORX ∭ Spectrum clean			

Figure 3-10: Connecting to the Web Interface over Ethernet



4 The PolaRx5TR for time and frequency transfer

This chapter details the configuration of the PolaRx5TR receiver and the RxControl tool for timing applications and CGGTTS generation.

4.1 Setup for timing applications

In time and frequency transfer applications, the receiver is fed with a 10 MHz reference and a PPS signal originating from an external clock. The 10 MHz reference signal is connected to the REF IN connector, and the PPS signal is connected to the PPS IN connector of the PolaRx5TR. This has the effect of aligning the receiver time with the time of the external clock, bypassing the receiver's internal clock.

It is important that the PPS input signal and the 10 MHz REF IN reference are generated from the same external clock and that the PPS input signal be roughly synchronized to UTC (offset with UTC should be smaller than 0.5 milliseconds). It is also necessary that the REF IN and PPS IN signals are present from the start-up of the receiver. Plugging in a PPS input signal when the receiver is already operating will lead to erroneous measurements.

A typical setup is shown in Figure 4-1. The various delays involved in time-transfer applications are also indicated in the figure.



 $X_{s,i}$: delay in antenna for signal i $X_{R,i}$: delay in RF section of receiver for signal i X_c : delay in RF cable (including amplifier and splitter) X_P : delay in PPS cable X_0 : delay between PPS IN connector and internal receiver time reference ($X_0 = 0$ on PolaRx5TR when autocalibration is enabled)

Figure 4-1: Typical setup for time-transfer applications showing relevant delays



4.2 Calibration of the delay from PPS IN to the internal time reference

The receiver synchronizes its own internal time reference (i.e. its measurement latching) with the low-to-high transitions of the reference time signal at the PPS IN connector. This synchronization occurs with some small delay, often referred to as ' X_0 ' in the literature (see Figure 4-1). In the PolaRx5TR, X_0 can take any value from 24ns to 59ns depending on the phase relationship between the 10 MHz frequency reference and the PPS input signal at the REF IN and PPS IN connectors respectively. X_0 remains constant when the receiver is reset or power-cycled, but changes when the cables feeding the REF IN and/or the PPS IN connectors are changed.

 X_O can either be left uncompensated, or can be measured and compensated for by the receiver itself. For legacy reasons, the compensation is disabled by default. In new installations that have not been calibrated yet, it is easier to enable X_O compensation. Both options are described below.

4.2.1 X_o uncompensated

This is the default behavior. To verify that the X_O compensation is disabled, check that 'off' has been selected in the 'PPS In Parameters' field on the Timing>PPS window of the Web Interface as shown in Figure 4-2.

Timing > PPS PPS OUT Parameters Interval 1 sec Time scale RxClock	
PPS OUT Parameters Interval 1 sec V Time scale RxClock V	
Interval 1 sec T Time scale RxClock T	
Time scale RxClock •	
PPS IN Parameters	
PPS IN Monitor	
Reset and resync when PPS IN phase changes ● off ○ on	
Default Ok	

Figure 4-2: Configuration to disable automatic PPS IN internal delay compensation (PPS IN Parameters) and to bring the measurement latching strobe to the PPS OUT connector (PPS OUT Parameters)

The X_O delay is the delay from the PPS IN connector to the actual measurement latching (see Figure 4-1). The measurement latching is an internal signal, but it can be brought to the PPS OUT connector so that it can be monitored externally. This is done by selecting 'RxClock' in the 'PPS OUT Parameters' field as shown in Figure 4-2. In this configuration, the PPS OUT materializes the internal receiver time reference.

An example of a setup which can be used to manually determine the delay between the PPS IN and the internal time reference (X_0) is shown in Figure 4-3. For this calibration, it is not necessary to connect an antenna to the receiver. For the most straightforward interpretation of the results, cables C1 and C2 should have the same length.





Figure 4-3: Manual calibration of the PPS IN to internal reference delay

 X_0 is the time difference between the leading edges of the pulses on the Input 1 and Input 2 ports of the oscilloscope. The oscilloscope trigger level should be set to 1V.

The measured X_0 should be a value between 24ns and 59ns. The value depends on the relative length of the REF IN and PPS IN cables, as shown in Figure 4-4.



Figure 4-4: Variation of X_O as a function of the relative cable length

It is recommended to avoid operating the receiver in the gray zones of Figure 4-4. Therefore, if X_O is found to be lower than 26ns or larger than 57ns, it is recommended to change the length of the REF IN or of the PPS IN cable. A change of 1 meter in the cable length corresponds to a change of X_O by about 5ns. Adding length to the REF IN cable increases the X_O value. Adding length to the PPS IN cable decreases the X_O value.

4.2.2 Auto-Calibration and compensation of X_o

The PolaRx5TR incorporates a circuit to calibrate the PPS IN internal delay and to compensate for it. Enabling X_O compensation can be done on the Timing>PPS window of the Web Interface, as shown in Figure 4-5.

20



Overview	GNSS	Timing	Station	Communication	Corrections	Data Output	Logging	Admin
Timing > PPS								
CPI	PS OUT Paramet	ers						
I	nterval 1 sec	*						
Т	ime scale Times	Sys ▼						
CPI	PS IN Parameter	5						
E	nable compensa	tion of PPSIN int	ernal delay:	off auto				
			,					
CPI	PS IN Monitor	21						
R	eset and resync	when PPS IN ph	ase changes	●off ◎on				
	dvanced Setting							
	avanced Setting	95						
De	fault Ok							
De	OK							

Figure 4-5: Select 'auto' in the PPS IN Parameters field to enable automatic PPS IN internal delay compensation

To ensure that the receiver continues to compensate for the X_0 delay following a reboot or reset, click 'Save' on the pop-up that appears on the web page, as shown in Figure 4-6.



Figure 4-6: Click 'Save' on the pop-up to save the new settings to the boot configuration

From now on, if a PPS signal is fed into the PPS IN connector, the PolaRx5TR calibrates the X_0 delay and adjusts its measurements accordingly. This calibration is repeated again after each reboot or reset. The result of this process is that X_0 can be considered zero in time transfer applications, for example when generating a CGGTTS file.

The calibration takes up to 20 minutes (this time being required to ensure that most of the temperature transients have vanished) during which time the X_0 estimation gradually improves to reach a final accuracy of 100 ps. During calibration, the xPPS output signal is unavailable, but all other receiver functions work normally. The PPS_IN_CAL bit of the RxState field of the ReceiverStatus SBF block is set to indicate that calibration is ongoing. When calibration is complete, the receiver outputs a message with the result of the calibration. It can be viewed in the 'Receiver Messages' window such as is shown in Figure 4-8.







4.3 **PPS IN monitoring**

By default, the receiver uses the PPS IN signal only at startup for initial synchronization and delay calibration. During operation, PPS IN is ignored and the receiver time is kept in sync by counting the cycles of the 10 MHz REF IN reference. It is assumed that the phase of PPS IN remains constant with respect to the 10 MHz reference, or in other words, that there are exactly 10 millions of cycles of the 10 MHz reference between each PPS IN pulse.

In some cases, this assumption is not valid, for example when the PPS IN phase can jump independently of the 10 MHz reference. The receiver can detect such PPS IN phase changes and reset and resynchronize when they occur. If auto-calibration of the X_0 delay is enabled (see section 4.2.2), the new delay is measured.

To enable PPS IN monitoring, open the Timing>PPS page of the Web Interface and select 'on' in the PPS IN Monitor section, as shown below.

Overview	GNSS	Timing	Station	Communication	Corrections	Data Output	Logging	Admin
Timing > PPS								
6	PPS OUT Par	ameters						
	Interval	1 sec 🔻						
	Time scale	TimeSys 🔻						
	DDC IN Dava							
ſ	Enable com	neters	ntornal dolayu	off @ auto				
L		Defisation of PPSINT		on auto				
C	PPS IN Moni	tor						
	Reset and re	esync when PPS IN p	ohase changes 🧉	off 🖲 on				
		ettinge-						
		ettings						
	Default							
	Delaun							

Figure 4-8: Enabling PPS IN monitoring and reset in case of a PPS IN phase change

Note that the PPS IN jump detection threshold is set to about one nanosecond.



Timing

4.4 How to log CGGTTS files

CGGTTS is a data format for accurate transfer of time and frequency using GNSS receivers. The PolaRx5TR supports CGGTTS version V2E. As of firmware version 5.3, the PolaRx5TR receiver can autonomously log CGGTTS files on its internal disk and FTP them to a remote server at the end of each day. The different constellations (GPS, GLONASS, Galileo and BeiDou) are logged in separate CGGTTS files.

This section explains how to configure CGGTTS logging using the receiver's Web Interface. Before starting, make sure that the PolaRx5TR is synchronized to your external clock. The set-up is described in Section 4.1. If the REF IN and the PPS IN signals are properly connected and recognized by the receiver, the Web Interface will report the "ExtFreq+ExtTime" status next to the clock icon, confirming that the receiver is now using the external frequency and time sources.



Figure 4-9: The "ExtFreq+ExtTime" status

4.4.1 Configuring the CGGTTS parameters

Go to the Timing>CGGTTS page of the Web Interface to enter all the parameters that the receiver will need to generate CGGTTS files. The page is split in three tabs.

Under the "Antenna Phase Center Coordinates" tab, enter the X, Y, Z coordinates of the antenna phase center. These are the coordinates that will appear in the header of the CGGTTS files, and that the receiver will use for its CGGTTS computations. By default, the same coordinates are used for all constellations, but it is also possible to enter a different set of coordinates for GPS, GLONASS, Galileo and BeiDou, in case the phase centers would significantly differ between them.

Antenna Phas	e Center Coord	inates	Parameters	Del
Mode	manual	•		
Phase Center X	4021429.050	Dm		
Phase Center Y	332877.422	Dm		
Phase Center Z	4923031.475	Dm		

Figure 4-10: Coordinates of the antenna phase center

Under the "Parameters" tab, enter all the information that will be put in the CGGTTS header or be used to generate the CGGTTS file name. The elevation mask used for the CGGTTS generation can also be set.



Timing > CGGTTS

Laboratory name	SEP
Calibration ID (CAL ID field of the CGGTTS header)	9999-2019
Calibration revision date (REV DATE field of the CGGTTS header)	2019-01-01
Time reference (REF field of the CGGTTS header)	UTC(SEP)
Comment (COMMENTS field of the CGGTTS header)	Fictitious data
Laboratory ID (used in CGGTTS file name)	SL
Receiver ID (used in CGGTTS file name)	SR
Elevation mask	10 deg

Figure 4-11: Laboratory and time calibration information

Finally, under the "Delays" tab, enter all the delays applicable to time transfer:



Press "OK" to apply the changes.

Figure 4-12: Time transfer delays

INTDLY = X_S + X_R is the combined antenna and receiver RF delays. They are usually determined by comparison with a calibrated reference receiver from BIPM. For



timing labs contributing to TAI, BIPM have a set of traveling reference receivers for this purpose (http://www.bipm.org/jsp/en/TimeCalibrations.jsp). A second, absolute method for determining these delays involves the use of a calibrated GPS simulator.

- **CABDLY = X_c** is the delay in the antenna cable, which must be measured using appropriate equipment.
- **REFDLY = X_P + X_O** is the delay between the external reference (the PPS from the external clock) and the receiver internal time reference. Referring to Figure 4-13, this is the delay between A and B if X_O compensation is disabled and the PPS OUT is configured in 'RxClock' mode (see section 4.2.1), or the delay between A and C if X_O compensation is enabled (i.e. it is only the PPS cable delay X_P in that case, X_O being zero as explained in section 4.2.2).



Figure 4-13: The reference delay (X_P+X_O) corresponds to the A-B delay if X_O compensation is disabled, and to the A-C delay if it is enabled

In the example illustrated in Figure 4-12, the compensation of PPS IN delay is enabled (see "auto" in the PPS IN Parameters tab). This means that the REFDLY only contains the delay in the cable from the clock to the PPS IN connector, as X_0 is zero.

After entering all information under the three tabs, click the orange 'Ok' button at the bottom of the page. To ensure that all CGGTTS parameters are kept after a power cycle, click 'Save' on the pop-up that appears in the bottom right corner (see Figure 4-6).

4.4.2 Configuring the CGGTTS logging and FTP push

After having configured the CGGTTS parameters as explained in section 4.4.1, it is time to define where to log the CGGTTS files and where to FTP push them at the end of each UTC day.

CGGTTS logging configuration is done in the Logging>Log Sessions page of the Web Interface:



	GNS	is Ti	ming	Station	Communication	Corrections	Data Output	Logging	Admin
gging > Log S	essions								
CD	Disk Usage	9							
		Inte	rnal Disk (1	5.1 GB)	Ext	ernal Disk			
	6		sed (71%, 10).8 GB)					
		n fi	ee (29%, 4.3	(GB)		Disk not present			
		Long	ing RINEX						
	Homount	50 M	B/day [uncon	nnressed]					
	Onthount	- ronnar 50 m	blog fancou	ipicosco]					
_									
	.og Sessio	ns							
ſĽ	.og Sessio ID	ns Name	Data	Auto-Delete	Disk FTP				
	og Sessio	Name RinexLogs	Data	Auto-Delete After 180 days	Disk FTP Internal 🔮 📔	×			
	og Sessio ID LOG1 LOG2	Name RinexLogs Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📔	× @			
	LOG1 LOG2 LOG3	Name RinexLogs Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📔				
	LOG1 LOG2 LOG3 LOG4	Name RinexLogs Unused Creat Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📝				
	LOG1 LOG2 LOG3 LOG4 LOG5	Name RinexLogs Unused Creat Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📔	XON			
	LOG1 LOG2 LOG3 LOG4 LOG5 LOG6	Name RinexLogs Unused Creat Unused Creat Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📝				
e	LOG1 LOG1 LOG2 LOG3 LOG4 LOG5 LOG6 LOG7	Name RinexLogs Unused Creat Unused Creat Unused Creat Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📝	× @			
	LOG1 LOG1 LOG2 LOG3 LOG4 LOG5 LOG6 LOG7	Name RinexLogs Unused Creat Unused Creat Unused Creat Unused Creat Unused Creat	Data RINEX	Auto-Delete After 180 days	Disk FTP Internal 🔮 📝				

Figure 4-14: Overview of the log sessions

The receiver supports eight different log sessions (LOG1 to LOG8). In the example above, LOG1 is already configured, but the other sessions are still unused. CGGTTS files can be logged in any log session, including those that are already logging other formats (such as RINEX). Here, we will for example decide to log CGGTTS files in the second log session (LOG2). Clicking the "create" button for LOG2 brings you to the "Edit Session" page:

Session nar	ne				
Disk		Internal		¥	
Auto-delete		After 180	days	¥	

Figure 4-15: Configuration of a log session

It is possible to give a name to the log session or to leave the name empty (as shown above). It is also possible to tell the receiver to delete files after a prescribed duration. In the example shown above, the LOG2 session is configured to keep files for 180 days.

Log sessions can log many different file formats, each of them being configured in their respective tab. Click the "CGGTTS" tab to open the CGGTTS logging tab, and then click "Configure CGGTTS logging":



Edit Session	LOG2	2						٦			
Session	SBF	NMEA	RINEX	BINEX	RTCM-MSM	C	GGTTS				
Stream	Stream										
CGGTTS logging is currently not configured for this session.											
Conf	Configure CGGTTS logging Clark CGGTTS Logging										
							GPS	•			
			OK	Con	an CCCTTC		GLONASS				
			UK I	Can		Or	GALILEO	•			
							BEIDOU				
					Ok	С	ancel				

Figure 4-16: Configuration of the CGGTTS logging

In the "Edit CGGTTS Logging" page, you can specify which CGGTTS file types (GPS, GLONASS, Galileo and BeiDou) need to be logged in this log session. In the example shown, the four CGGTTS types are enabled. Each constellation is logged in a different file, as per CGGTTS V2E convention. Clicking 'Ok' brings you back to the session overview page, where it is now possible to configure the FTP server to which the CGGTTS files need to be FTP-pushed (if applicable).

Change Ch			
Stream			
CGGTTS GPS+GLONASS+GALILEO+B	EIDOU 📔 🗙		
Go to the <u>Timing/CGGTTS page</u> to	configure parameters.		
─ ECGGTTS FTP Push Settings -			
	- CGGTTS FTP Push Set	tings	
	Enable	on	
Ok Car	Enable Server	on tai.bipm.org	2
OkCar	Enable Server Remote directory	on tai.bipm.org /data/UTC/xxxx	/links/cggt
Ok Car	Enable Server Remote directory Login name	on tai.bipm.org /data/UTC/xxxx MyName	/links/cggt
OkCar	Enable Server Remote directory Login name Password	on tai.bipm.org /data/UTC/xxxx MyName	/links/cggt
OkCar	Enable Server Remote directory Login name Password Server FTP control port	on tai.bipm.org /data/UTC/xxxx MyName •••••	/links/cggt

Figure 4-17: Configuration of the CGGTTS FTP push

The "Test" button allows to test that the specified folder of the FTP server can be written to.

Click 'Ok' when ready, and then 'Save' on the pop-up that appears on the web page.

4.4.3 Downloading the CGGTTS files

The CGGTTS files are logged in daily folders in the log session(s) configured in section 4.4.2. The daily folders are of the form yyddd with dd the 2-digit year, and ddd the day of year.



Note that it can take up to 30 minutes between enabling CGGTTS logging and actually seeing the CGGTTS file on the disk. This is because CGGTTS data are generated at a very low rate (typically every 16 minutes).

At any time, it is possible to download the current CGGTTS files (the ones from the current day), or the previous files. There are many ways to do this, as explained in the "Download Log Files from the Receiver" section of the Reference Guide. For example, this can be done through the Logging>Disk Contents menu of the Web Interface:

Overview	GNSS	Timing	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Disk	Contents							
	Dick Liengo							
ſ	Disk Usage]		
		Internal Disk (1	.5.1 GB)		External Disk			
		used (72%, 1)	0.8 GB)		Disk not present	:		
		Locaina RINEX	5 (65)					
	Unmount Formal	40 MB/day [uncor	mpressed]					
C								
-	Internal Dick	Extornal Disk						
	Name	Size	.]					
	Internal Disk (1)	15.1 GB) 10.8 GB						
	E LOG1 Rinex	Logs	×					
	LOG2_		×					
			×					
1	😟 🌗 19056		×					
	I9057 🔒 🕖		×					
	🗷 🌛 19058		×					
	··· 19059		×					
			<u>č</u>					
	19061		- Č					
	19062		-0					
	19063		•					
	19065		- Ç					
1	₽ 19065		× I					
			×					
	19068		×					
	🗷 🌛 19069		×					
	🖻 🍌 19070		×					
	CZSLSR	58.553.A 27.4 KB	0 X					
	EZSLSR	58.553.A 40.1 KB	0 X					
2	GZSLSR	58.553.A 57.1 KB	O X					
	RZSLSR	58.553.A 43.7 KB	O X					
	* JELOG3_hatan	ака	× -					
	Refresh							
Ľ								

Figure 4-18: Disk Contents

The CZ, EZ, GZ and RZ files correspond to the BeiDou, Galileo, GPS and GLONASS constellations respectively. The ".A" suffix at the end of a file name indicates that this file is currently being written to. This suffix is removed when the file is complete. Click on the download icon () next to a file to download it.

The "Disk Usage" panel at the top of the page indicates which data format has been logged in the last second. In the above example, "Logging RINEX" means that RINEX data has been logged in the last second. As data are added to the CGGTTS file only every 16 minutes, it is normal not to see "Logging CGGTTS" in the "Disk Usage" panel.



4.5 Generating CGGTTS files using RxControl

For completeness, this section shortly explains how to generate CGGTTS files using the RxControl program. This procedure is primarily relevant to PolaRx5TR receivers running firmware version 5.2 or earlier. As of version 5.3, the PolaRx5TR supports internal CGGTTS logging and it is recommended (and easier) to configure CGGTTS logging through the Web Interface as explained in section 4.4.

CGGTTS generation with RxControl involves logging SBF files on the RxControl computer and then converting them to CGGTTS. To start, select **Logging** then **RxControl Logging...** in the main window of RxControl, as shown in Figure 4-19. This will open up RxControl Logger where all the necessary settings can be made.

Position Information Position Information Position Velocity Geodetic	40893° σ _N : 133475° σ _E : 8,758m σ _U :	+0,44 +0,36 +1,14	Co Do Rer Dis Inte Tes	wnload Intern move Internal k(s) ernal Logging it FTP Push to ernal RINEX Lo	ng nal Files File Settings. Server ogging					
Satellite Status GPS GLONASS Galileo Bei	Dou SBAS	OZSS	Int Clo IRNSS	ernal CGGTTS oudit L-Band	Logging	•				
E01 E02 E03 E04 E05	E06 E0	y px5 tr fv	v - RxCont	rol Logger - S	5/N 30124	32		- 0	×	
E13 E14 E15 E16 E17	E18 E1	Status	Global	File Naming	SBF	NMEA	Post Processing			
E25 E26 E27 E28 E29	E30 E3	Off		Stream	hΑ				^	
Search: 5 0G 0R 0E 0C 1S 0J Sync: 0 0G 0R 0E 0C 0S 0J	4I 0I	PostPro Rinex	cess				px5 tr fw - RxContr	rol Logger - S/N	3012432	- 0
Receiver Status Time RxClock DOP F	PL RAIM	RinexMe Support ⊞ Meas	eas3 t surements			F	Status Global File Naming Conventio IGS Options	File Naming	SBF NMEA Post Pr	ocessing
GNSS time frame PDOP: ma 8-jul-2019 TDOP: 09:57:25,000 HDOP: +18s offset to UTC VDOP:	0,90 0,47 0,50 0,74	 	s3 NavBits				Log messages w Limit the Marker	IGS 1 hour IGS 6 hours IGS 24 hours Nam Manual	tamp to "00000\ <m< td=""><td>arkerName>0000.00"</td></m<>	arkerName>0000.00"
015 (B. D. L.) (B. D. W		🕀 GLO					O Force the Marke	rName to: SEP	т]
pen the RxControl Logger	Exevent	GAL					Manual File Name Op	otions		
		⊞ BDS					File Name:	loggg		
		⊡ QZS					SBF File Extension:	sbf		
		■ PVTC	art				NMEA File Extension	: nmea		
		⊞ PVTG	ieod			-	Split Files After:	 Size Limiter Time Limiter 	d: 100,000 MB ‡	
						_	Station Settings			
	L					_	Set Station Settings	5		

Figure 4-19: Using RxControl to log the SBF data needed for CGGTTS file generation

In the **SBF** tab, check the **Rinex** box as shown. This will automatically select all the SBF blocks needed for CGGTTS generation.



In the **File Naming** tab, you can select the size and naming convention for SBF files. The selected value of 'IGS 24 hours' means that 24 hr SBF files will be logged and named according to IGS naming convention. This is the recommended settings to generate daily CGGTTS files.

In the **Post Processing** tab you can define what you want to happen to the SBF file as Figure 4-20 shows. Click on **Add** to define a new conversion and then select **CGGTTS Conversion** from the drop-down list as shown.

					2
Enable Input Post Process Action Name		🕝 및 Create a new Pi	ost Process Action		
Add	Correction Inp Select the input and which action t SF NMEA No Conversion NMEA Rine Conversion Coorrection SF Analyzer ISMR Conversion	CGGTTS Parame Global Laboratory: Laboratory ID: Receiver ID: Calibration ID: Revision Date: Time Reference: Comment: GPS Leap Seconds: Elevation Mask: Use contiguous Specify ARP poi Project: SERI Marker: TEMI	SSN	Delays GPS L1 (X ₄ + X ₂) 0.00ns © GPS L2 (X ₄ + X ₂) 0.00ns © GL0 L1 (X ₄ + X ₂) 0.00ns © GL 2 (X ₄ + X ₂) 0.00ns © GL 2 (X ₄ + X ₂) 0.00ns © GL 4 E1 (X ₄ + X ₂) 0.00ns © BDS 12 (X ₄ + X ₂) 0.00ns © BDS 12 (X ₄ + X ₂) 0.00ns © Cable (X ₂) 0.00ns © Figure Figure Figure	Phase Center Offset GPSL1/GALE1 0.000m G GC0L1 0.000m G GL0L2 0.000m G GALE50 0.000m G BDSB1 0.000m G BDSB2 0.000m G Note: Postive when phase center is above Antenna Reference Point (ARP).

Figure 4-20: Entering the CGGTTS file parameters

The **CGGTTS Parameters** window contains all the parameters needed to generate the CGGTTS files. Most parameters are identical to those defined in section 4.4.1. A noteworthy difference between the CGGTTS configuration through the Web Interface and through RxControl is the handling of the antenna coordinates. In the Web Interface (see Figure 4-10), you must provide the phase center coordinates directly. With RxControl, you must specify the antenna reference point (ARP) or just use the ARP position from the SBF file, and also provide the phase center offsets for the different frequency bands. RxControl will then compute the corresponding phase center coordinates to put in the CGGTTS file header.

5 Reference station operation

5.1 How to configure the PolaRx5TR as an RTK base station

The PolaRx5TR can be configured to work as a base station and provide differential correction data to one or more rover receivers. The steps below describe how to configure the position of the reference station and output differential corrections over an Ethernet connection. Connecting to the PolaRx5TR over Ethernet is described in Section 3.3.3.

Step 1: Configuring the PolaRx5TR base station position

Set the position as static

To work as a base station, the position of the PolaRx5TR should be set to static. If not, the PolaRx5TR will still work as a base station however the position of the rover may show more variation. The 'Static' position mode can be selected in the 'Position' window of the 'Station' menu as shown in Figure 5-1.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Station > Positi	on						
-	Status Settings	8		_			
	Position Mode						
	Mode	🖲 Static 🔍 Ro	over				
	⊞ RTK	2					
	StandAlone	×.					
	SBAS	V					
	DGPS	1					
	PPP	A					
	Reference position	on 🖲 auto 🔍 Geo	odetic1 OCartesian1				

Figure 5-1: Setting the PolaRx5TR base station position to static

Set the correct position

An accurate position of the antenna that is connected to the PolaRx5TR should also be set. The default setting of 'auto' can be used for demonstrations however, for most other purposes, a properly surveyed position is advisable. In the example shown in Figure 5-2, the position stored under 'Geodetic1' is used. The antenna position can be entered in either Geodetic or Cartesian coordinates.

Select the Datum of the antenna position

In the **Datum** field, you can select the datum to which the antenna coordinates refer. The selected value is stored in the Datum field of position-related SBF blocks (e.g. PVTCartesian) and also in any output differential corrections. Please note that the **Datum** setting does not apply any datum transformation to the antenna position coordinates.



Status Sett	ings
Position Mo	de
Mode	Static OROVER
⊞ RTK	
StandAlone	
SBAS	
DGPS	v
PPP	
Static posit	ion 🔵 auto 💿 Geodetic1 🖸 Cartesian1
Static Positi	on Geodetic
Static Positi	on Geodetic
Static Positi	on Geodetic Geodetic1 50.848639400deg
Static Positi Latitude Longitude	on Geodetic Geodetic1 50.848639400deg 4.732134300deg
Static Positi Latitude Longitude Altitude	on Geodetic Geodetic1 50.848639400 deg 4.732134300 deg 128.9420 m

Figure 5-2: Setting the static position of the reference station antenna

Click on '**Ok**' to apply the new settings

i

Step 2: Configure output of correction data over Ethernet

Output of differential corrections can be configured in the **Corrections Output** window as Figure 5-3 shows. Click on **New RTCM3 output** to start the sequence of configuration steps.

RTCMv3 is the most compact and robust differential correction format and it is recommended to use this format where possible.

Select the Ethernet port you wish to use avoiding the commands port (28784), the webserver port (80), the FTP port (21) as well as the default NTRIP port (2101) and the NTP port (123). The example shown in Figure 5-3 uses port 28785.

The messages necessary for RTK and DGNSS are selected by default. A summary of other RTK messages can be found in the 'PolaRx5TR Reference Guide'.



Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Corrections > Cor	rrections Output			Corrections Input			
				Corrections Output			
Da	ta Streams			SECORX			
CD	ifferential Correc	tions Output					
Т	nere is currently i	no corrections ou	tput defined.				
	New PTCM2 out			CMP2			
ou	utput		ins output				
<u> </u>			New RTCMv3 Output	÷			
		5	elect connection typ	e:			
			Serial nort				
			USB port				
			NTRIP server				
			IP server				
			Post Next	Canaal		New R	TCMv3 Output
				Cancer]	Select	messages to outp
			New RTC	Mv3 Output			SM1
			Select co	praction/part:			SM2
			Select co				SM3
			• New I	P server connection	on III		SM4
			Back	Next Finish	Cancel		SM5
							SM6
				New RTCM	v3 Output	—— <u>■ M</u>	SM7
				Configure n	ew IP server conn	ection:	11001
				Dort	29795	RIC	11002
				Mode	20/03		11003
				LIDDAddree	255 255 255 255	PTC	11004
				ODPAddres	200.200.200.200	RTC	41006
				Back	Next Finish	Cancel RTCN	11007
						RTCM	11008
						Back	Next Finis
						Pres	s "OK" to apply t

Figure 5-3: Click New RTCM3 output to start the configuration steps to output differential corrections over Ethernet

Step 3: Verifying the configuration

Having configured the settings and clicked 'Ok' to apply them, you can now connect to the configured Ethernet port of the PolaRx5TR using a terminal emulator tool such as Data Link*. The Ethernet IP address you need can be found in the information bar at the top of the web interface. In the example shown in Figure 5-4, the IP address is: 192.168.105.246.

Receiver	Position	Status
PolaRx5-3013369 (SEPT)	Lat: N50°50'55.1018" N/A	Tracked Sats: 43
IP Address (Eth): 192.168.105.246	Lon: E4°43'55.6835" N/A	Time: 2016-11-03 13:35:02
Uptime: 0d 00:01:40	Hgt: 128.942m N/A	Temp: 46 °C — V: 12.40 volts

Figure 5-4: The IP address of the PolaRx5TR can be found on the information bar

Data Link is part of Septentrio's RxTools suite of GUI Tools supplied with the PolaRx5TR



This IP address and the port number 28785 can then be used to configure a Data Link connection as shown in Figure 5-5.

🧬 Data Link		
<u>File Tools H</u> elp		
Connection 1		
Connect	Serial COM15-115200-8-None-1-Off	
Show Data		
Link $\rightarrow \square 1$	Select the connection	
$GGA \rightarrow \square 1$		
Send every 10'th received	Serial TCP/IP UDP N	TRIP
Connect Script:	Connection Modes	
Send every 1.00 s.	TCPIP Client TCPIP Ho	🔗 Data Link
Close Script:	Host Name or IP-Address	File Tools Help
🕅 Log File:	192.168.105.246	Connection 1
	Port Number	Disconnect TCP/IP Client
Press Connect	28785 🜩	192, 168, 105, 246; 28785
		Link → 1
		$GGA \rightarrow \square 1$
		Send every 10'th received GGA
		Connect Script:
		Send every 1.00 s.
		Close Script:
	ОК	Log File:
		Connected to 192. 168, 105.246 I/O 0.5/0.0 kBps

Figure 5-5: Configure the Data Link terminal emulator tool to connect to the PolaRx5TR Ethernet port over which differential corrections have been configured

When connected to the output correction stream, click on the 'Show Data' button on Data Link and you should see output similar to that shown in Figure 5-6.

Pata Link: Connection 1	
ÓÔ>À9ÑáBÐ4Qª┬≡ŪÐó&ÙÁÖÃý¢M~L/ÿ¦þ;FþÍü ŗï─ó!″∄ œl6ê]1@3íkÁ-ÒF°;;újðvàuÌÿFXáë∄ÀY¥þf >Dض ‰¢°~;¤µú	ß×¢%:FrDôm¦÷=Yÿh9ÿ‡c ▲ (└(
ç¯ò`¶^I ₁ Oèt6B¬GýÀèL±@Çú⊷ G `Iÿ, ¿KOOB@•Unknown 1ÿ*E?Â, [⊥] 'òµH1èàrÍýV¬ýß÷8¿sΰ∔ã©/ê¶\$æ_çfý]@!* }r× ~=@\ysÉ-ÒoYOújðơOwnÿFXáì®ÀY‰pf(ηÈ 7♡x" <u0∽:ÿ¤ur<sup>L</u0∽:ÿ¤ur<sup>	nSEPT POLARX5⊽5.0.0-tst: ∵→.ÿHÄO}└≫▼óNæ6ÁΩſú>{úè†
Ó¶ò`¶> _F ÷Oèt@6B″Óý Aè6ÒŒĭú∽ U I∖ÿ, !u≢ÓB@•Unknow	nSEPT POLARX5 [♥] 5.0.0-tst ▼
Show All data Auto completion for None Clear Freeze 	Close

Figure 5-6: The RTCMv3 differential correction stream output from the IPS1 Ethernet connection of the PolaRx5TR



When a connection to the configured Ethernet port has been established, in this example using Data Link, the 'Data Streams' field on the Corrections Output window should now show the active blue connection shown in Figure 5-7 and the corrections output icon in the information panel should appear active.



Figure 5-7: Web Interface showing differential corrections output over an Ethernet connection



5.2 Configuring the PolaRx5TR NTRIP Caster

The PolaRx5TR includes a built-in NTRIP Caster that makes correction data from the PolaRx5TR available to up to 10 NTRIP clients (or rovers) over the internet. The caster supports up to three mount points and can also broadcast correction data from a remote NTRIP server.

All settings relating to the PolaRx5TR NTRIP Caster can be configured on the NTRIP Caster window of the Web Interface shown in Figure 5-8.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Communication > NTRIP Caster							
General Settings							
	Enable NTRIP caster off on ID Port 2101						
	Caster identifier defaul	default					
	L						
	Mount Points There are currently no mount points		NTRIP Caster				
22			Serial Port				
C New mount point		Point-to-Point Protocol					
Client Users There are currently no users defined. New user							



Step 1: Define a new mount point

In the NTRIP Caster window, click on 'Settings'.

In the General Settings field, enable the NTRIP Caster and select the IP port over which you wish to send correction data: the default port is 2101.

Click on " New mount point' as indicated in Figure 5-9. Select 'Yes' to enable the mount point and give it a name. This is the name that will appear in the caster source table. Up to 3 mount points can be defined each with a different name. You can also select the type of **Client authentication** for the mount point: **none** - any client can connect without logging in or, **basic** - clients have to login with a username and password.

To select a correction stream from the NTRIP server of the PolaRx5TR, select '**No**' in the 'Allow external server' field*.

Click on the '**Local Server** ...' button to enable the local NTRIP server of the PolaRx5TR and to select the individual messages you want to broadcast. By default, correction messages necessary for RTK are pre-selected. Click 'Ok' to apply the settings.

By setting 'Allow external server' to 'Yes' the mount point can receive a stream from a remote NTRIP server


Status Settings General Settings Enable NTRIP caster off IP Port 2 Caster identifier default Mount Points There are currently no moun	• on 101			Configure NTRIP Output Enable Local Server Enable Local Server on Output Type The internal caster mount point is configured to distribute RTCMv3 Currently, no RTCMv3 output is conf	igured.	
	Edit Mount Point	Vee	- 1	Which RTCMv3 messages do you wa	nt to	
Client Users	Mount point name	Leuven	•	B MSM1		
There are currently no user	Allow external server	No	•	B MSM2		
C New user	Server user name			MSM3		
	Server password		0	MSM5		
Ok	Client authentication	basic	٣	MSM6 ■	-Edit Mount Point	
	Data format	RTCMv3]	B- MSM7	Enabled	Yes
	Manual format string			RTCM1001	Mount point name	Leuven
	Format details	rtcmv3		RTCM1002	Allow external server	No
				RTCM1004	Server user name	
	Ok Ci	ancel Local S	Server	RTCM1005	Server ascrward	
<u> </u>				RTCM1006	Client authentication	hasia
				This selection will be applied for al	Data format	Dasic V
				ouput	Manual format string	RTCIVIV3
				Ok Cancel		
			5		Format details	rtcmv3
					Ok Car	Local Server

Figure 5-9: The configuration sequence for defining a new mount point

Step 2: Define a new user

If you selected '**basic**' client authentication when configuring the mount point in the previous step, you will need to define at least one user. The user name and password are the credentials needed for the NTRIP client (rover) to access the correction stream.

In the 'Client Users' section, click on ' **New User**' as shown in Figure 5-10. Enter a User Name and Password for the user and select the mount points that they will have access to. Up to 10 NTRIP clients can log in as a particular user. Click 'Ok' to apply the settings.

Status Settings General Settings Enable NTRIP caster off IP Port 2101 Caster identifier Mount Points Name Format Enabled Authentication • Leuven RTCMv3 • New mount point Client Users There are currently no users c • New user • New user	Status Settings General Settings Enable NTRIP caster IP Port 2101 Caster identifier Mount Points Name Format Enabled Authentication Leuven RTCMv3 Yes basic
Ok Leuve Allowed Mount Points Unuse Max number of clients 10 Ok C	ed/MP2 ed/MP3 Client Users User Name Allowed Max. Nr. Mount Points of Clients Mildred All 10 X New user
	Press "OK" to apply the changes.

Figure 5-10: Configuring the login credentials for a user



Step 3: Is the NTRIP Caster working?

In the '**Status**' tab of the NTRIP Caster window, you can see a summary of the NTRIP Caster to make sure that it has been properly configured. In the example shown in Figure 5-11, two rover clients are connected to the mount point named 'Leuven' as user 'Mildred'.

If the client rover receivers are configured to send a GGA message to the caster (as was the case in Figure 5-12), then their position will also be visible.

mountpoints					
Mountpoint	Serve Connect	er Con ted Ti	nect me	Rate	Clients
Leuven	Yes	39n	n31s	480 Bp	s 2
Connected Clie	ents				
Connected Clie	ents User	Connect	Lati	tude	Longitude
Connected Clie Mountpoint	ents User	Connect Time	Lati	tude	
Connected Clie Mountpoint Leuven	ents User Mildred	Connect Time 2m22s	Lati 50°50	tude '45.4"	Longitude 4°43'42.8"

Figure 5-11: Connecting as a client to the PolaRx5TR NTRIP Caster

On the NTRIP Client side

Rover receivers can connect to the NTRIP Caster by entering its IP address and Port as shown in Figure 5-12. After clicking 'Ok', the mount point source table will be filled and a mount point can be selected. The user name and password can then be entered and within a few seconds, the rover receiver should report an RTK fixed position.

Ntr	ip							
	N -			- (h	RTCMv3		
							192.168.107.123	: Leuven
Ed	it NTRIP Connection	on ———						
M	ode	Client			V			
Ca	ister	192.168.107.	123					
Po	ort	2101						
Us	er name	Mildred						
Pa	ssword	••••		0				
M	ount point	Leuven			¥			
		Details						
Se	end GGA to caster	1 sec			•			
		OkCance						

Figure 5-12: Connecting as a client to the PolaRx5TR NTRIP Caster



5.3 How to output a PPS (Pulse-per-Second) signal

The PolaRx5TR can output a PPS (Pulse-per-Second) signal that can be used for example, to synchronize a secondary device to UTC time.

Step 1: Connect a cable with a BNC connector

Connect a cable with a BNC connector to the rear-panel connector labeled 'PPS OUT' and indicated in Figure 5-13.



PPS OUT

Figure 5-13: PPS connector on the rear panel of the PolaRx5TR

Step 2: Configure the PPS settings

You can configure the PPS settings on the 'Timing' window of the 'GNSS' menu as shown in Figure 5-14.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
GNSS > PPS/Tim	Satellites and Signals						
	Tracking						
	Spectrum						
	Atmospheric Models	-DDS OUT Dars	meters				
	PPS/Timing	Interval	1 sec	•			
		Polarity	Low2High	High2Low			
		Delay	0.00	Ins			
		Time scale	TimeSys	Ŧ			
		Max sync age	e 60 s				
		Timing System	n				
		System G	ST 💿 GPS 🔍 Bei	Dou			

Figure 5-14: PPS configuration field in the web interface

The **Interval** is the time interval between successive timing pulses and is selectable between 10 ms and 10 s. The default **Polarity** of the PPS signal is a low-to-high transition which can be alternatively configured as high-to-low.

The **Delay** argument can be used to compensate for signal delays in the system (including antenna, antenna cable and PPS cable). For example, if the antenna cable is replaced by a



longer one, the overall signal delay would be increased by say, 20 ns. If the Delay value is left unchanged, the PPS pulse will arrive 20 ns too late. To re-synchronize the PPS pulse, the Delay should be increased by 20 ns. The delay can be configured with values between -1 ms and +1 ms.

By default, PPS pulses are aligned with the satellite time system (TimeSys) as shown in the **Time Scale** field. PPS signals can alternatively be aligned with UTC, local receiver time (RxClock) or GLONASS time.

When Time Scale is set to anything other than RxClock, the accuracy of the time of the PPS pulse depends on the age of the last PVT computation. During PVT outages, the PPS generation time, which is extrapolated from the last available PVT information, may start to drift. To avoid large biases, the receiver stops outputting the PPS pulse when the last available PVT is older than the specified **MaxSyncAge**. The MaxSyncAge is ignored when TimeScale is set to RxClock.

Step 3: Click on 'Ok' to apply settings

The new configuration can also be saved as the boot configuration by clicking 'Save' in the pop-up.

5.4 How to enable the NTP server

NTP (Network Time Protocol) is an Internet protocol for clock synchronization between computer systems over data networks. It is intended for synchronizing participating computers to within a few milliseconds of UTC. The NTP server functionality on the PolaRx5TR can be configured as shown in Figure 5-15. When enabled, the NTP server accepts UDP time-stamp requests on port number 123.



Figure 5-15: Enabling the NTP server

40



5.5 How to log data

The PolaRx5TR has a 16 GB memory for internal data logging. Data can also be logged to an external USB memory disk.

5.5.1 Internal logging

Step 1: Defining the Disk Full action

When setting up a logging session for the first time, it is a good idea to define what you would like to happen when the internal memory is full. This can be configured on the 'Disk Full Management' page of the 'Logging' menu as shown in Figure 5-16. There are two options, either the receiver stops logging when the memory is full or it continues logging by making space for new files by deleting the oldest. The default setting is 'Delete oldest'.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Global	Log Settings					Log Sessions	
-1	nternal Disk Ex	ternal Disk				Disk Contents	
	Disk Full Action-	Conton Dibix]		Global Log Settings	
	When disk is full:						
	 Stop logging in Delete oldest fil 	all sessions les by session pri	ority				
	Session Priority— No log sessions de	fined for internal	disk.				
G	obal File Naming C	ptions					
A	dd .A suffix to curr	ent file names	◎ off ● on				
Pi	refix all file names	with log session .	ID ● off ● on				
Det	fault Ok						

Figure 5-16: Selecting what you wish to happen when the internal 16 GB memory is full

Step 2: Configuring a logging session

On the 'Log Sessions' window of the 'Logging' menu you can check which logging sessions have already been defined and define new ones. Up to 8 simultaneous logging sessions can be defined independently: logging Septentrio Binary Format (SBF), RINEX, BINEX, NMEA and RTCM (MSM).

To define a new logging session, click on a **Create** button as shown in Figure 5-17.



Overview	GNS	is 🛛	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Ses	sions						Log Sessions	
- Die	k Usago -						Disk Contents	
C DIS	K Usage						Global Log Settings	
		Inter	nal Disk (15.	1 GB)	External D	isk		
	- 16	us us	ed (U%, 88.0	KB)) 🔲 Disk not	present		
			se (100%, 15.					
		ormat			23555			
)		
CLO9	j Sessions		Dete		CTD			
· · · · · ·		lame	Data	Auto-Delete Disk	FIP			
	1062 1	Inused Create						
	1063 1		5					
	LOG4 U	nused Create	.					
	LOG5 U	nused Create	5					
	LOG6 U	nused Create						
	LOG7 U	nused Create						
	LOG8 U	nused Create						
	and a second second second		0.254					

Figure 5-17: Click on a 'Create' button to start defining a new logging session

You can then follow the sequence of steps shown in Figure 5-18 selecting the various configuration settings for the logging session. In this example, the default settings of 'Internal' Disk and 'Never' for Auto-Delete* have been selected. In the 'Edit SBF Stream' window, the messages required for RINEX generation have been selected as well as those useful for the Support department for diagnosing problems. SBF messages can also be selected individually.

Edit Session LOG1	RTCM-MSM		
Disk Internal V			
Auto-delete Never 🔻			
OK Cancel	Session LOG1 ession SBF NMEA RINEX BINEX RTCM Streams There are currently no SBF streams defined. New SBF stream Ok Cancel	Edit SBF Stream Interval 1 sec PostProcess Rinex (meas3) Support Histocidatiod selection Meas1 RawNavBits GRS GLO GAL GEO BDS QZS DUTCat OK Cance	n LOG1 SBF NMEA RINEX BINEX RTCM-MSM rs ages Interval ages Interval ages Value (SST Stream) rs prepared, press "OK" to apply the changes. Logging Parameters rg type IGS15M ression off • • TP Push Settings- OK Cancel

Figure 5-18: Follow the sequence of windows to fully configure the logging session

Please note that, this setting is overruled by the 'Disk Full Action' setting defined in the **Global Log Settings** window.



Step 3: Verifying the configuration

When you have finished configuring the logging session, the 'Log Sessions' window will show a summary of the defined logging sessions as in Figure 5-19. An estimate of the daily size of data generated with the current logging configuration is also given.

	mount	Internal Disk (used (0%, 8 free (100%, Logging RINEX+ Format	(15.1 GB) .3 MB) 15.1 GB) -SBF compressed]		Exter	rnal Di	i sk prese	ent	
	ID	Name	Data	Auto-Delete	Disk	FTP			
•	ID LOG1	Name my_logging_session	Data RINEX, SBF	Auto-Delete	Disk Internal	FTP		×	ON
0	ID LOG1 LOG2	Name my_logging_session another_logging_session	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		××	
•	ID LOG1 LOG2 LOG3	Name my_logging_session another_logging_session Unused <u>Create</u>	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		××	ON ON
•	ID LOG1 LOG2 LOG3 LOG4	Name my_logging_session another_logging_session Unused Create Unused Create	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		×	
•	ID LOG1 LOG2 LOG3 LOG4 LOG5	Name my_logging_session another_logging_session Unused Create Unused Create Unused Create	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		××	ON ON
•	ID LOG1 LOG2 LOG3 LOG4 LOG5 LOG6	Name my_logging_session another_logging_session Unused Create Unused Create Unused Create	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		×	
•	ID LOG1 LOG2 LOG3 LOG4 LOG5 LOG6	Name my_logging_session another_logging_session Unused <u>Create</u> Unused <u>Create</u> Unused <u>Create</u> Unused <u>Create</u>	Data RINEX, SBF SBF	Auto-Delete Never Never	Disk Internal Internal	FTP ®		×	





5.5.2 Logging to an external USB memory device

The PolaRx5TR can also log data to an external memory device. To connect the device, you will need a USB Host cable* (CBLe_USB_HOST) to connect to the front-panel socket indicated by the USB icon + as shown in Figure 5-20.

0

A high-quality memory device is recommended for external logging as multiple logging sessions can result in a large throughput of data. The 4K random write speed should be greater than 0.1 MBps, and the 4K random read speed should be at least 2 MBps[†].



Figure 5-20: Connecting an external USB memory device to the PolaRx5TR

With an external memory device connected, the new device should be visible in the 'Log Sessions' window as shown in Figure 5-21. If the device is not formatted or the formatting is not compatible with the receiver file system, you will be prompted to format the device. This can be done by clicking on the 'Format' button.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Ses	sions					Log Sessions	
Disk L	Jsage					Disk Contents	
		ternal Disk (15.1 G used (26%, 4.0 GB) free (74%, 11.1 GB		External D used (10 free (99)	i sk (1.8 GB) %, 26.1 MB) %, 1.8 GB)	Global Log Settings	
Unm	ount Format		Unmount F	ormat			

Figure 5-21: With a 2 GB external USB memory device connected to the PolaRx5TR

New logging sessions can then be defined in a similar way as in Section 5.5.1 making sure to select 'External' from the drop-down list in the 'Disk' field as shown in Figure 5-22.

^{*} The CBLe_USB_HOST is an optional item. It is not part of the standard PolaRx5TR delivery

The 4K random read/write speed is a standard specification for memory devices. More information and a list of benchmarked devices can be found on: http://usb.userbenchmark.com



Session na	me			
Disk		Internal	T	
Auto-delete	е	Never	T	

Figure 5-22: Select 'External' from the drop-down list to log data to an external memory device

5.5.3 How to FTP push logged data to a remote location

SBF, RINEX and BINEX files can also be automatically sent to a remote FTP server (FTP push). A different FTP server can be configured for each logging session and, SBF and RINEX files logged in the same session can be sent to different servers.

The FTP server settings can be entered in the 'Edit Session' window, after configuring SBF or RINEX logging, as shown in Figure 5-23. FTP push will create the folder 'data' on the remote server if it does not yet exist. If file transfer fails, the receiver will retry after the 'Retry Interval' which has been selected as 15 minutes in this example.

- Stream		-		
Type Signals RINEX v2x GPS L1CA,L1P' Glonass L1CA, Galileo L1CA,E SBAS L1,L5 BeiDou L1,E5b QZSS L1CA,L2c IRN L5	Y,L2PY,L2C,L5 L2CA,L3 6BC,E5a,E5b,E5 ,B3 C,L5	Interv 1 sec	al Duration 1 hour	≧ X
RINEX FTP Push Settir	ngs			
Enable	on		•	
Server	pc60devlin200			
Remote directory	data			
Login name	sarah			
Password	•••••		0	
Server FTP control port	21	_		
Retry interval	15 min		•	
Test				

Figure 5-23: Configure pushing of RINEX files to an external FTP server

You can check that the FTP server credentials are correct by clicking on the 'Test' button. This will push a small test file to the remote folder and then delete it. The receiver reports whether or not the file was successfully sent and deleted as shown in Figure 5-24. If the



server is configured such that files cannot be deleted then the receiver will also report this and the test file will remain in the remote folder.

FTP Push Test		
FTP Push Test ongoing O This may take a minute		
Abandon Test	FTP Push Tes	t successful
	FTP Push Tes	t has been successfully completed.

Figure 5-24: Testing the remote FTP server credential are correct

5.6 How to access logged data

5.6.1 Downloading data using the web interface

Data files logged by the PolaRx5TR, both on its internal memory and to an external USB device, can be downloaded using the web interface on the 'Disk Contents' window of the 'Logging' menu. Each logging session is logged to a separate folder. Individual files can be downloaded by clicking on the green download arrow () next to the file name as shown in Figure 5-25.

If you need to download multiple files from the receiver, it may be more convenient to use the FTP server of the PolaRx5TR as described in Section 5.6.2.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Ses	sions					Log Sessions	
~ Dis	k Usage					Disk Contents	
	it obuge	Internal Dick (1E 1	(P)	S External D	iak	Global Log Settings	
		used (0%, 88.0 K	B)	External D	ISK		
		free (100%, 15.1	GB)	Disk not	present		
				/			
	Unmount Format				J		
In	ternal Disk 🔁	ternal Disk					
Na	me		Size 🔺				
9 I	nternal Disk (15.	.1 GB)	2.2 GB				
	LOG1_my_logo	jing_session	×				
	LOG2 another	logging session	×				
G	16314		X				
	SEPT3140	.16 5	2.9 MBOX -				
Re	efresh		0				





5.6.2 Downloading data using the on-board FTP server

FTP, SFTP or rsync can be used to download data files logged on the PolaRx5TR. The example below details how the on-board FTP server can be used to download data files logged both internally or to an external device. Using an FTP client application such as FileZilla, multiple files can queued for download. The Host name is simply the address in the URL bar of the web interface. Figure 5-26 shows how to connect using FTP with FileZilla over both the USB connection (**192.168.3.1**) and over Ethernet (**PolaRx5TR-3010305***).

The **DSK1** folder contains data files logged on the internal memory while **DSK2** contains files logged to an external device.

192.168.3.1	- FileZilla							
File Edit V	iew Transfer Server	Bookmarks Help						
	eq 🐰 😫 🧲 🕒 🗉	💺 🛷 🔳 🗐 🔗 🖉	8					
Host: 192.168	.3.1 Username:	anonymous Pa	ssword:	Port:	Quic	kconnect		
Status: Status:	🔁 polarx5-3010305 - Fil	 zIlla						3
Status:	File Edit View Tra	nsfer Server Bookmark	s Help					
Status:	1 1 1 1 1 1 1 1	* 🛃 🕷 🖗 👘	🔳 🕵 😤 👧					
Status:	Host: polarx5-3010305	Username: anonym	ous Pass <u>w</u> o	rd:	<u>P</u> ort:	2	uickconnect	F
Local site: \	Status: Resolvi	ng address of polarx5-3010	0305					*
Filename	Status: Conne	ting to 192.168.105.246:21	 or welcome messag					
C:	Status: Insecu	e server, it does not suppo	ort FTP over TLS.					
E. (CON TN	Status: Conne	ted						
* E: (35IV_IIV	Status: Directo	ry listing of "/" successful						-
8 directories	Local site: \		÷	Remote site:	/			-
	Filename	Filesize Filetype	Last moc 🔦	Filename	Filesize	Filetype	Last modified	d
	€ C:	Local Disk		.				
	4 D:	CD Drive		J DSK1		File folder	17/11/2015 14	4:
	🗧 E: (SSN_INSTALL)	CD Drive	-	📕 DSK2		File folder	17/11/2015 14	4:
	•	m	•	4				*
	8 directories			2 directories				
					A BEE Qu	eue: empty		

Figure 5-26: Downloading logged data files using the PolaRx5TR FTP server with a FileZilla client (**DSK1**: files logged on the internal memory, **DSK2**: files logged on an external USB device)

You can also connect over FTP using a file manager such as Windows File Explorer. When connected to the PolaRx5TR over USB for example, just enter **ftp://192.168.3.1** in the address bar as shown in Figure 5-27.

The 7-digit number is the serial number of the receiver.





Figure 5-27: Downloading logged data files using the FTP server with Windows File Explorer. (**DSK1**: files logged on the internal memory, **DSK2**: files logged on an external USB device)



5.7 **Point-to-Point Protocol (P2PP)**

The PolaRx5TR features a Point-to-Point Protocol (P2PP*) server, which emulates an IP link over a serial port.

5.7.1 How to configure P2P Protocol

To start configuring the Point-to-Point Protocol, go to the Point-to-Point window as shown in Figure 5-28

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Communicati	on > Point-to-Point Pro	itocol	Ethernet				
	Point-to-Point Prot	ocol Settings	WiFi	:-to-Point Protoc	ol Status		
	Mode	Off	Dynamic DNS	N/A			
	Port	COM1	IP Ports	is N/A			
	Client IP	192.168.50.2	Firewall	N/A			
	Server IP	192.168.50.1	Web Server				
	Authentication	None	NTDID				
	Password	0					
	Connect Timeout	60 s	NTRIP Caster				
	Activity Timeout	600 s	Serial Port				
l			Point-to-Point Protoco	I Contraction of the second			
	Default Ok			-			
	Password Connect Timeout Activity Timeout Default Ok	60 s 600 s	NTRIP NTRIP Caster Serial Port Point-to-Point Protoco	1			

Figure 5-28: The Point-to-Point window

In the current version, the receiver implements a single P2PP server, and the first argument (ServerID) can only take the value P2PP1 .

To enable the P2PP server, change the Mode setting to 'Server'. Note that it is disabled by default. Once the server is enabled, all the other P2PP settings can be configured as shown in Figure 5-29. The Port option allows to select the COM port to be used for the point-to-point communication. Next the client and server IP's will need to be set. The ClientIP sets the IP address that will be given to the client (remote from the receiver's perspective) when a connection is established while the ServerIP refers to the IP address that will be given to the server (local from the receiver's perspective) when a connection is established.

Though sometimes abbreviated as PPP, this feature is referred to as P2PP in Septentrio receivers as to avoid confusion with Precise Point Positioning.



Mode	Server
Port	Off
Client IP	Server
Server IP	192.168.50.1
Authentication	None
Password	0
Connect Timeout	60 s
Activity Timeout	600 s

Press "OK" to apply the changes.

It is possible to require authentication when establishing the connection. To enable authentication, you will need to choose either the PAP or the CHAP protocol as shown in Figure 5-30. PAP will use Password Authentication Protocol and CHAP will use Challenge Handshake Authentication Protocol. When authentication is enabled, a password needs to be set in order to successfully configure this feature.

Mode	Server
Port	COM1
Client IP	192.168.50.2
Server IP	192.168.50.1
Authentication	PAP
Password	•••••• • •
Connect Timeout	60 s
Activity Timeout	600 s



Figure 5-30: Enabling P2PP authentication

Finally, Connect Timeout determines the maximum amount of time, in seconds, that a connection attempt may consume before being refused. Meanwhile, Activity Timeout sets the maximum time, in seconds, that a connection may be idle (no data transfer) before it is disconnected. When a timeout occurs, the receiver will shut down the P2PP server and restart it. When a server is enabled, and the configuration is correct, the receiver will start the P2PP server within a maximum of 30 seconds.

Figure 5-29: Configuring P2PP



5.8 CloudIt

CloudIt offers an alternative to FTP for RINEX or SBF file submission from the PolaRx5TR receivers and supports OpenAM for authentication. To learn more about the CloudIt feature and learn how to set it up, please check the knowledge base on the Septentrio website.



6 Receiver monitoring

6.1 Basic operational monitoring

The 'Overview' page of the web interface in Figure 6-1 shows at a glance a summary of the PolaRx5TR's operational status.



Figure 6-1: Overview page of the web interface

1 The main information bar at the top of the window gives some basic receiver information: receiver type, serial number and position. The length of time since the last power cycle (Uptime) and the total number of satellites in tracking is also given. The temperature of the receiver board and the voltage supplied is also shown.

2 The icons to the right of the information bar show that, in this example, the position of the receiver is fixed, the overall signal quality is Excellent (5 out of 5 bars) and the receiver is logging both internally (Int. Logging) and to an external USB memory device (Ext. Logging). The Corrections icon indicates that differential corrections are being sent out to a rover receiver. The active WiFi icon shows that the on-board WiFi modem is turned on and the clock icon shows that in this case, the receiver is using its own internal clock[†].

In the case of the PolaRxS receiver, this icon will indicate that an External clock is being used

🗧 septentrio



The Quality indicators gives a simple overview of signal quality, RF antenna power and CPU load of the receiver.

The GNSS field details how many satellites for each constellation are being tracked and used in the position solution (PVT). A green line indicates that at least one satellite in the constellation is being used in the PVT, a blue line indicates that satellites are being tracked but not used and a grey line that there are no satellites from that particular constellation in tracking. More information can be found in the **Satellites and Signals** page on the 'GNSS' menu.



The Logging field summarizes the current logging sessions and disk capacities. The complete logging information and configuration windows can be found via the **Logging** menu.

6 The **Data Streams** field gives and overview of the data streams into (green lines) and out from (blue lines) the receiver. In this example, the receiver is logging SBF data to the internal memory (DSK1) and an external device (DSK2). The receiver is also sending out RTCMv3 differential correction data over the IPS1 port.



6.2 AIM+: Detecting and mitigating interference

The PolaRx5TR is equipped with a sophisticated RF interference monitoring and mitigation system (AIM+). To mitigate the effects of narrow-band interference, three notch filters can be configured in either auto or manual mode. These notch filters effectively remove a narrow part of the RF spectrum around the interfering signal. The L2 band being open for use by radio amateurs is particularly vulnerable to this type of interference. The effects of wideband interference both intentional and unintentional can be mitigated by turning on the WBI mitigation system. The WBI system also reduces, more effectively than traditionally used pulse-blanking methods, the effects of pulsed interference.

The spectrum view plot

In the Spectrum window of the GNSS menu, you can monitor the RF spectrum and configure three separate notch filters to cancel out narrowband interference. Figure 6-2 shows the L2 frequency band with the GPS L2P signal at 1227.60 MHz indicated. Different bands can be viewed by clicking on the 'Show table' button as shown. The spectrum is computed from baseband samples taken at the output of the receiver's analog to digital converters.



Figure 6-2: The RF spectrum of the L2 Band



6.2.1 Narrowband interference mitigation

Configuring the notch filters

In the default auto mode of the notch filters, the receiver performs automatic interference mitigation of the region of the spectrum affected by interference. In manual mode as shown configured for Notch1 in Figure 6-3, the region of the affected spectrum is specified by a centre frequency and a bandwidth which is effectively blanked by the notch filter.

Mode	auto	۲	auto	t au	to 🔻				
Gain	35	dB	35	dB 3	65 dB	_			
Baseb	and S	amplin	g Conf	figuration)		
Basel	and s	amplin	ig mod	le 🔍 Befo	oreIM 🖲	AfterIM			
)		
	merile services					_			
Notch	Filters	5	_						
Notch	Filters	5	-	Notch1		Notch2		Notch3	
Mode	Filters	5		Notch1 manual	T DOD MH	Notch2 auto	T	Notch3 auto	•
Mode Cente	Filters er freq	uency		Notch1 manual 1235	• 000 MHz	Notch2 auto	▼ 000 MHz	Notch3 auto 1100	• 000 MHz

Figure 6-3: Configuring the first notch filter Notch1 at 1235 MHz

With the **Notch1** settings as shown in Figure 6-3, the L2-band after the notch filter (After IM) is shown in Figure 6-4 with the blanked section clearly visible.



Figure 6-4: The RF spectrum of the L2 Band after applying the notch filter at 1235 MHz



6.2.2 Wideband interference mitigation

Wideband interference of GNSS signals can be caused unintentionally by military and civilian ranging and communication devices. There are also intentional sources of interference from devices such as chirp jammers. The wideband interference mitigation system (WBI) of the PolaRx5TR can reduce the effect of both types of interference on GNSS signals.

Configuring WBI mitigation

The Wideband Interference Mitigation system (WBI) can be enabled by selecting **on** as shown in Figure 6-5. Enabling WBI will increase the power consumed by the PolaRx5TR by about 160 mW.

-Notch Filters			
	Notch1	Notch2	Notch3
Mode	manual 🔹	auto 🔹	auto 🔹
Center frequency	1235.000 MHz	1100.000 MHz	1100.000 MHz
Double-sided bandwidth	80 kHz	30 kHz	30 kHz
Wideband Interference Mi Enable WBI mitigation	off • on		
Default Ok			

Press "OK" to apply the changes.

Figure 6-5: Select **on** to enable Wideband Interference Mitigation then 'OK' to apply the new setting



WBI mitigation in action

The GPS L1 band interference shown in Figure 6-6 is produced by combining the GNSS antenna signal with the output from an in-car GPS chirp jammer.



Figure 6-6: Simulated wideband interference in the GPS L1 band using an in-car chirp jammer

When WBI mitigation is enabled the effect of the interference is dramatically reduced to the extent that the small signal bump at the GPS L1 central frequency of 1575 MHz is clearly visible as Figure 6-7 shows.

In this particular test, the interference signal caused the receiver to fall back to the less precise DGNSS or standalone positioning modes. With WBI mitigation enabled however, the receiver was able to maintain an RTK fix position throughout.



Figure 6-7: Enabling WBI interference mitigation greatly reduces the effect of the interference caused by the chirp jammer



6.3 How to log data for problem diagnosis

If the PolaRx5TR does not behave as expected and you need to contact Septentrio Support Department, it is often useful to send a short SBF data file that captures the anomalous behavior, as well as a Diagnostic Report from the receiver.

6.3.1 Support SBF file

Step 1: Configuring a new logging session

On the menu bar select 'Logging' then the 'Log Sessions' window where you can define a new logging session.

Overview	GI	VSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Sea	ssions						Log Sessions	
- Dis	sk Hsane						Disk Contents	
	ok osuge		h Di (15.1	(1)	> 5.4		Global Log Settings	
		In	used (0% 88.0 K	(GB)	External D	ISK		
			free (100%, 15.1	GB)) 🗌 Disk not	present		
	Unmount	Format						
)		
Log	g Sessior	ns						
	ID	Name	Data A	uto-Delete Disk	FTP			
	LOG1	Unused 🦲	eate)					
	LOG2	Unused Co	eate					
	LOG3	Unused Con	eate					
	LOG4	Unused Con	eate					
	LOG5	Unused Co	eate					
	LOG6	Unused Con	eate					
	LOG7	Unused Con	eate					
	LOG8	Unused Co	eate					

Figure 6-8: Click on the 'Create' button to start defining a new logging session

Step 2: Select to log the Support data blocks

In the 'Edit Session' window click on 'SBF Logging' and 'New SBF stream' as usual. In the final 'Edit SBF Stream' field, make sure to select the 'Support' option as shown in Figure 6-9. This option automatically selects all the SBF blocks that are useful for the Support Department to help diagnose receiver problems.



Session name	support file				
Disk	Internal	•			
Auto-delete	Never	•			
	OkCanc	Edit Session Session Streams	SBF NMEA RI	INEX BINEX RTCM-M	SM
		There a	re currently no SE	BF streams defined.	
		New	SBF stream	Edit SBF Stream	
				Interval 1 sec	
				PostProcess	
			-	Rinex	0
			Ok	Rinex (meas3)	
				Hide detailed selection	
				+ Measurements	
				Meas3	
				RawNavBits	
				# GPS	
				B GLO	
				GAL	
				B GEO	1
				GEO BDS	

Figure 6-9: Configure a logging session selecting 'Support' in the 'Edit SBF Stream' field

When logging has been correctly configured, the 'Log Sessions' window will show the newly defined session as active as indicated in Figure 6-10.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Ses	sions					Log Sessions	
CUISK	Usage					Disk Contents	
		nternal Disk (15.1	GB)	External Dis	(1.8 GB)	Global Log Settings	
		used (15%, 2.3 G	B)	used (2%,	36.4 MB)		
		free (85%, 12.9 G	iB)	/ 🗖 free (98%,	, 1.8 GB)		
	L L	ogging SBF					
Unr	nount Format D	50 MB/day [uncomp	ressed] Unmount Form	nat			
Log S	Sessions						
	ID Name	Data Au	to-Delete Disk I	TP			
	LOG1 support_file	SBF	Never Internal	🕘 🖹 🗙 💽			
Concession of the local division of the loca	LOG2 Unused 💽	reate					
	LOG3 Unused 🦲	reate					
	LOG4 Unused 🦲	reate					
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	LOG5 Unused C	reate					
	LOG6 Unused 💽	reate					
	LOG7 Unused	reate					
	LOG8 Unused	reate					

Figure 6-10: The 'Log Sessions' window showing an active logging session





Step 3: Downloading the logged SBF file

The logged SBF file can be downloaded on the 'Disk Contents' page as shown in Figure 6-11. Click on the download icon **()** next the SBF file you want to download.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Logging > Log Ses	sions					Log Sessions	
Disk	Usage					Disk Contents	
		Internal Disk (7.5 G	B)	Externa	l Disk	Global Log Settings	
		🔲 used (9%, 688.8 I	1B)	Disk	not present	-	
		free (91%, 6.9 GB					
	mount Format						
Int	ernal Disk Ex	ternal Disk					
Nar	ne	Size					
🥯 Ir	nternal Disk (7.5	GB) 688.8 MB					
	LOG1_support_	file	<				
۲	15343		<				
	log.sbf	452.6 MB 🔿 🕽	<				
Po	frosh						
- NG	iresi						

Figure 6-11: Click on the green download icon to next to the file you want to download

6.3.2 Diagnostic Report

A **Diagnostic Report** can be generated under the **Admin/About** tab on the Web interface as shown in Figure 6-12 and saved to your PC.



Figure 6-12: Generate a Diagnostic Report



1

6.4 Activity logging

The PolaRx5TR reports various events in the 'Receiver Messages' window of the 'Admin' menu that can be used to check the receiver operations. The example in Figure 6-13 shows that four, 15 minute SBF files have been successfully FTP pushed to a remote location.

Overview		GNSS	Station	Communication	Corrections	Data Output	Logging	Admin	
Admin > Receiv	er Messa	ges			1			Configurations	
								Reset	
ſ	Receiver	Messages -	1.53.24] Last shu	tdown caused by comm	and			Upgrade	
	[0:Tue 2019-06-18 11:53:24] Last shutdown caused by command [1:Tue 2019-06-18 11:53:29] Mount : Success on mounting internal disk in 3s								
	[2:Tue 2 [3:Tue 2	019-06-18 1	1:53:31] CPU Over	load occurred at 91.	17%			Expert Control	
	[4:1ue 2	019-06-18 1	1:53:37] Stored 1	nitial position (402	1427.084m,332892.	359m,4923028.700m)		Receiver Messages	
							1	About	
				Clear	Freeze				

Figure 6-13: Receiver events reported by the PolaRx5TR in the Receiver Messages window

6.5 How to use the Monitoring feature to configure the receiver to power down on low voltage

The monitoring feature allows the receiver to turn itself off when the external voltage supply is below a certain threshold. Note that the monitoring feature only considers the external voltage supplied to the 3-pin PWR connector and will not consider the voltage when the receiver is powered using Power over Ethernet or through the internal battery (in case of the PolaRx5e). While in standby mode, the power consumption of the receiver is reduced to approximately 0.22W.

6.5.1 Configuring the monitoring feature

Step 1: Define a voltage threshold and standby time

On the menu bar, select 'Station' and then 'Power Mode'. Next, click on the 'Monitoring'-tab. Here you can configure the voltage threshold and define how long the receiver should remain in standby before attempting to wake up again as shown in Figure 6-14. If the voltage level is still below the threshold value when the receiver tries to wake up, it will remain in standby and will periodically (as defined by the standby duration) check the voltage level until the voltage is at a sufficiently high level for the receiver to wake up.

Scheduling Monitoring Standby Now
Monitoring Settings
Standby duration 20 minutes Supply Voltage Threshold
External supply voltage threshold 10.5V
If the changes to the settings are saved:
The receiver will go in standby when the external (Vin) power supply voltage drops below 10.5 V.
The receiver will recheck after 20 min of standby.
Default Ok

Press "OK" to apply the changes.

Figure 6-14: Defining a voltage threshold and standby time. In this example, the receiver is configured to go into Standby mode when the voltage level drops below 10.5V and to check the voltage after 20 minutes.



Step 2: Save the configuration

Press "OK" to apply the changes. Since the receiver will load the boot configuration when waking up again after having gone into standby due to low voltage, make sure to save the configuration to boot as shown in Figure 6-15. Note that, if the current voltage is lower than the threshold value defined in step 1, the receiver will not go into standby immediately but will display a warning and wait for 30 seconds, allowing the user to save the configuration to boot or increase the threshold value.



Figure 6-15: Saving the configuration to boot after configuring the Monitoring feature

Note that the receiver will not attempt to wake up to check the voltage levels during time periods for which scheduled sleep is enabled. For more information see Section 6.6.



6.6 Scheduled sleep

The Scheduled Sleep feature allows users to configure the receiver in such a way that it will sleep for a predefined amount of time and/or during a number of predefined intervals.

6.6.1 Configuring scheduled sleep

Step 1: Configure a new Wake-Up Schedule

On the menu bar select 'Station' and then 'Power Mode'. Next, click on the 'Scheduling'-tab. Here you can configure a full 'Wake-Up Schedule' as shown in Figure 6-16.

Scheduling Moni	itoring Standby Now							
-Wake-Up Schedul	le							
Awake duration	Stay awake □ 10 minutes ▼							
Repetition period	No repetition 1 hours							
Schedule start								
The receiver will not enter sleep automatically again.								
efault Ok								

Figure 6-16: Overview of the Wake-Up Schedule

The Wake-Up schedule allows you to configure both the length of the period the receiver should be awake and whether or not this wake-up period should recur, and if so, how frequently (See Figure 6-17).



Scheduling Monitoring Standby Now						
Wake-Up Schedule						
Awake duration O Stay awake I 0 minutes						
Repetition period Or repetition						
Image: Schedule start At 2020-01-01 00:00:00 In 10 minutes						
If the changes to the schedule are saved:						
If put to sleep now, the receiver would wake up at:						
GNSS time: Wed 2020-01-01 00:00:00						
Local time: Wed 2020-01-01 00:59:42 UTC+01:00						
Time left: 8 days and 15 hours						
The receiver will enter sleep at:						
GNSS time: Wed 2020-01-01 00:10:00						
Local time: Wed 2020-01-01 01:09:42 UTC+01:00						
Time left: 8 days and 15 hours						
The receiver will stay awake for 10 min.						
The schedule repeats every 1 hour.						
During sleep, the receiver can be awakened by sending input to its $\ensuremath{\textbf{COM1}}$ port.						
Default Ok						

Press "OK" to apply the changes.

Figure 6-17: Example of a fully configured Wake-Up schedule.

Step 2: Determine the awake duration

To determine how long the receiver should stay awake, fill in the desired time span in the Awake duration field. In the example shown in Figure 6-17, this is set to 10 minutes.

Step 3: Define the repetition period

Next, determine how often the receiver needs to wake up for the previously configured period of time. If you wish for the receiver to wake up just once, leave the Repetition Period option at its default value of 'No RepetitionâĂŹ. The example shown in Figure 6-17 shows a receiver which is configured to wake up for 10 minutes every hour.



Step 4: Choose when the schedule should start

Finally, define a time in the Schedule Start field to choose when you want the Wake-Up Schedule to start taking effect. This effectively corresponds to the first time the receiver will attempt to wake up from standby mode for the period of time defined in the 'Awake DurationâĂŹ field.

Step 5: Save the configuration

After pressing 'Ok' to apply the changes, the receiver will suggest to copy the current configuration to boot. This is because when waking up from standby or sleep, the receiver will apply the boot configuration which at this point does not contain the recently configured changes (Figure 6-18).



Figure 6-18: Upon applying the changes, the receiver will show a warning suggesting to copy the current configuration to boot

Note that you can also configure the receiver to wake up at a certain point in the future and then just stay awake. To do this, simply leave both the Awake duration and Repetition Period options at their default setting and define when the receiver should wake up by choosing an appropriate Start Schedule time as shown in Figure 6-19.



Scheduling Monit	toring Standby Now				
Wake-Up Schedule	<u>.</u>				
Awake duration	Stay awake 10 minutes				
Repetition period	No repetition 1 hours				
● At 2020-01-01 00:00:00 ○ In 10 minutes					
If the changes to t	he schedule are saved:				
If put to sleep now, t	the receiver would wake up at:				
GNSS tim	ne: Wed 2020-01-01 00:00:00				
Local tim	e: Wed 2020-01-01 00:59:42 UTC+01:00				
Time left	:: 8 days and 14 hours				
After waking up, the	receiver will not enter sleep automatically again.				
During sleep, the rec port.	eiver can be awakened by sending input to its COM1				

Figure 6-19: Example of how to configure the receiver to wake up at a certain point in the future and then just stay awake. In this example, the receiver is set to wake up at the first of January 2020

6.6.2 Combining the Monitoring and Scheduling features

It is possible to combine the monitoring feature with a Wake-Up Schedule. In this case, when the receiver is scheduled to be awake, but the voltage level is below the threshold value defined in the monitoring tab, the receiver will remain in standby but will periodically attempt to wake up in order to check the voltage level. Conversely, during time periods for which the receiver is scheduled to sleep, the receiver will not attempt to wake up to check the voltage levels. An example illustrating this behavior is shown below in Figure 6-20.



Planned Awake for Scheduled Sleep:

I	I	I
Threshold(s) met:		
I	I	
Receiver Awake:		
I	I	I

Figure 6-20: Combining the monitoring feature with a Wake-Up Schedule will lead the receiver to remain in standby but periodically check the voltage level when the receiver is scheduled to be awake, but the voltage level is below the threshold value. When the receiver is scheduled to sleep, the receiver will not attempt to wake up to check the voltage levels.



7 Security

7.1 How to manage access to the PolaRx5TR

You can manage the access that users have to the PolaRx5TR in the 'User Administration' window of the 'Admin' menu.

By default, the web interface, file transfer and communication ports are all assigned User-level access as shown in Figure 7-1. 'User' level allows full control of the receiver while 'Viewer' level only allows viewing the configuration. The File Transfer is by default at the âĂŹViewerâĂŹ level such that anonymous users can only read files.

Overview	GNSS		Station	Co	ommunication	Corrections	Data Output	Logging	Admin
Admin > User Ad	ministration								Configurations
CU	sers								Reset
Т		anth, no	usara dafir						Upgrade
	Now usor		users uem	ieu.					User Administration
	New user								Expert Control
CD	efault Access	s Level P	er Interfac	e)				Receiver Messages
V	/eb	\bigcirc none	OViewer	🔍 User					About
F	ile Transfer	\bigcirc none	 Viewer 	OUser					
I	^o ports	\bigcirc none	OViewer	 User 					
C	OM ports	\bigcirc none	○ Viewer	 User 					
U	SB ports	Onone	○ Viewer	 User 					
De	fault Ok								

Figure 7-1: The default access levels of the PolaRx5TR

In the example shown in Figure 7-2:

Web Interface: Anonymous users (without password) can connect to the receiver via the web interface as Viewers. They can browse the various windows but cannot change any of the settings.

File Transfer: For the File Transfer argument, Viewer means that the anonymous user is allowed to download log files from the receiver using FTP, SFTP or rsync, but not to delete them. User means that the anonymous user can both download and delete files, and none disables anonymous accesses.

IP, COM and USB Ports: Only users with User access to the IP, COM and USB ports so can change receiver settings over these connections. Users with Viewer access to the IP, COM and USB ports so can only send commands to show the configuration. Anonymous users can neither change or view the receiver configuration over these connections.



-Default Acces	s Level Per	Interface						
Web	○ none (🛛 Viewer 💿 User						
File Transfer	Onone (Viewer OUser						
IP ports	Onone	- Edit User		_				
COM ports	Onone	User name	George					
USB ports	Onone	Password		0				
		Liser access level	Viewer					
		SSH Key						
Default Ok								
Default Ok								
Default Ok	,	Ok	Cancel		Jsers			-
Default Ok		Ok	Cancel		Jsers Jser Name	Access Level	SSH Kev	
Default Ok		Ok	Cancel		Jsers Jser Name George	Access Level	SSH Key No	

Figure 7-2: Defining user access levels

After defining the Users/Viewers and their access levels, they can login on the web interface by clicking on **Log in** on the upper-right corner as shown in Figure 7-3.

← → C △ ③ 192.	168.105.246				☆ : Not logged in	
Ş septentrio	Authentication Requ http://192.168.105.246 re Your connection to this si User Name: Georg Password: ******	ired quires a username and passw te is not private. ge	vord. 352:59	Fixed Status Overall Quality Int. Loggi Corrections Ext. Logg Wifi O Internal	Log in	
	PolaRx5-3013369 (SEPT) ← → C: ↑ ○ 192	Log In Can	cel			A
		Deceiver	Position	Status		Logged in as George Log out
	Ş	PolaRx5-3013369 (SEPT) IP Address (Eth): 192.168.105.246	Lat: N50°50'55.1018" N/A	Tracked Sats: 43 Time: 2016-11-10 13:33:23 Time: 45 65 - 10 12 10 mb	Fixed all Overall Quality Corrections	 Status Int. Logging Ext. Logging Internal

Figure 7-3: Logging in to the PolaRx5TR web interface



Users/Viewers can logout by clicking on **Log out** on the upper-right corner and leaving the 'User Name' and 'Password' fields of the pop-up empty as shown Figure 7-4.

http://192.168.105.246 re	equires a username a	nd password.
Your connection to this s	ite is not private.	
User Name:		
Password:		
		Cancel

Figure 7-4: Adding an SSH key

7.1.1 SSH key authentication

By default, anonymous users have full access over FTP, SFTP and rsync to the files logged on the PolaRx5TR. FTP, SFTP and rsync access can be limited by configuring user access, as described in Section 7.1. For added security, user authentication for SFTP and rsync access can be configured using an SSH public key. When an SSH key is defined, the configured user can download files using SFTP or rsync without entering a password provided of course, that the matching private key is known by the key agent running on the same PC.

You can generate public and private keys using for example, **PuTTY Key Generator** as shown in Figure 7-5.

PuTTY Key Generato	r		2			
le Key Conversions	Help					
Key						
Public key for pasting i	nto OpenSSH authorized_	keys file:				
ecdsa-sha2-nistp521			*			
AAAAE2VjZHNhLXNo +rEwQSDtLEpBwQ90	YTItbmlzdHA1MjEAAAAlt WWBh2HiiAOutB786E17a	omlzdHA1MjEAAACFBAF 5euao6T9ioHX4sGbfk/nSl	1rQTpH1zgK802a EHG9aoewGaYGN			
15AAL2EsHNVysLhX	rVRmDzA9WyAqUjgqO0	qZ4pflmbHxWJJ95zFu	THOSE CONCEPTION			
+Z1IUxR7VXb8AgffH//	AwyDemiKuhTC77kgadW	A== ecdsa-key-20161027	*			
Key fingerprint	Key fingerprint ecdsa-sha2-nistp521 521 2f49:b5:96:b2:8e:8c:be:53:61:ec:0e:64:ad:2b					
Key <u>c</u> omment	ecdsa-key-20161027					
Key p <u>a</u> ssphrase:	•••••					
Confirm passphrase:	•••••					
Actions						
Generate a public/priv	ate key pair	1	<u>G</u> enerate			
Load an existing privat	e key file		Load			
Save the generated ke	ey	Save public key	Save private key			
Parameters						
Type of key to general	ie:					
© <u>R</u> SA ©	DSA OECDS	SA © ED <u>2</u> 5519	SSH- <u>1</u> (RSA)			
Curve to use for generation	ating this key:		nistp521 👻			

Figure 7-5: Generating SSH keys using the PuTTY Key Generator. The public key is highlighted.



The generated public key is the highlighted text that can be pasted directly into the **SSH Key** field of the PolaRx5TR Web Interface as shown in Figure 7-6.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Admin > Use	r Administration						Configurations
	- Edit User						Reset
	User name	George]				Upgrade
	Password						User Administration
	User access level	User	~				Expert Control
	SSH Key	AAAAE2VjZHNhLXNo	oYTItb				Receiver Messages
	Ok	Cancel					About
l							



521-bit ECSDA keys offer the best security however, ECSDA 256 and 384-bit keys can also be used. Alternatively, RSA 512 and 1024 key encryption is also supported.


H

7.2 How to control access using the PolaRx5TR Firewall

You can control access to the PolaRx5TR using the receiver's firewall in the **Firewall** window. By default, all Ethernet and WiFi ports are open (i.e. those defined on the **IP Ports** menu).

In the example shown in Figure 7-7, Ethernet ports 2101, 2102 and 2103 are accessible but only from devices with the IP address 84.199.9.148. Similarly, all WiFi ports are open but only those from IP 84.199.9.148.

Please note that the firewall settings do not apply when connecting to the web interface using USB. In the case of WiFi, firewall settings only apply when the receiver is in WiFi client mode.

v	G	NSS		Station	Communication	Corrections	Data Output	Logging
					Ethernet			
Fire		attings-						
(The	wan De	Open po	rts	IP port list	Dynamic DNS			
Eth	nernet	PortList	•	2101 2102 2103	IP Ports			
WiF	Fi	all	۲		Firewall			
-			_	(separated by spac	Web Server			
Defa	ault: al	l ports op	en		NTRIP			
CIP A	Addres	s Filtering	_		NTRIP Caster			
Mo	de			● off ● on	Serial Port			
Allo	owed I	P address	es	84.199.9.148	Point-to-Point Protocol			
			(separated by space	es)			

Press "OK" to apply the changes.

Figure 7-7: Configuring the Firewall of the PolaRx5TR

8 Receiver administration operations

8.1 How to change IP settings of the PolaRx5TR

The IP settings of the PolaRx5TR can be configured in the Ethernet window of the Communication menu. By default, the PolaRx5TR is configured to use DHCP to obtain an IP address. You can specify a 'Static' address in the TCP/IP Settings field as shown in Figure 8-1.

In Static mode, the receiver will not attempt to request an address via DHCP but will use the specified IP address, netmask, gateway, domain name and DNS. DNS1 is the primary DNS and DNS2 is the backup DNS. In DHCP mode, the arguments IP, Netmask, Gateway, Domain, DNS1, and DNS2 are ignored.

Having entered the settings, click on 'Ok' then 'Apply And Reboot' in the pop-up dialog as shown, as the receiver needs to be reset for the new settings to become active.



Figure 8-1: Changing the TCP/IP settings of the PolaRx5TR



After reboot, the Ethernet Status field should now show the correct IP settings as shown in Figure 8-2.

-Ethernet Sta	tus
IP Address	192.168.105.246
Hostname	
Netmask	255.255.252.0
Gateway	192.168.104.1
MAC Address	00:50:C2:36:3B:EF

Figure 8-2: TCP/IP settings

Note that the IP settings will keep their value after a power cycle and even after a reset to factory default in order to avoid accidentally losing an Ethernet connection to the receiver.

8.2 How to configure Dynamic DNS

Dynamic DNS allows remote contact with the PolaRx5TR using a hostname.

When devices are connected to the internet, they are assigned an IP address by an internet service provider (ISP). If the IP address is *dynamic* then it may change over time resulting in a loss of connection. Dynamic DNS (DynDNS or DDNS) is a service that addresses this problem by linking a user-defined hostname for the device to whichever IP address is currently assigned to it.

To make use of this feature on the PolaRx5TR, you should first create an account with a Dynamic DNS provider (**dyndns.org** or **no-ip.org**) to register a hostname for your receiver. In the example shown in Figure 8-3, the hostname *polarx5.mine.nu* has been registered with dyndns.org. The *Bind* option, selected in this case, tells the Dynamic DNS provider only to update IP addresses assigned over an Ethernet LAN connection.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Communication > D	ynamic DNS						
Dyn	amic DNS-			namic DNS Sta	atus		
Pro	vider 🔍	off 🖲 dyndns.org 🔘 no	Dynamic DNS	tus	Off		
Use	ername ssr	ncom		or	No error		
Pas	sword	🧿		und IP address	N/A		
Hos	stname pol	arx5.mine.nu		-			
Bine	d 💿	auto 🔍 Ethernet 🔍 WiF					
Please	check the	Firewall Settings to mak	NTRIP Caster				
access	is enabled	to the required ports.	Serial Port				
Defa	ult Ok		Point-to-Point Protoco				
Press	"OK" to a	pply the changes.					

Figure 8-3: Configuring Dynamic DNS



8.3 How to upgrade the firmware or upload a new permission file

The PolaRx5TR firmware and permission files both have the extension .suf (Septentrio Upgrade File) and can be uploaded to the PolaRx5TR as shown in the steps below. Firmware upgrades can be downloaded from the Septentrio website and are free for the lifetime of the receiver. Permission files enable additional features on the PolaRx5TR and can be purchased from our sales department.

Step 1: Select the .suf file and start the upgrade

The upgrade procedure is started by clicking on the 'Choose file' button in the 'Upgrade' window of the 'Admin' menu and which is highlighted in Figure 8-4.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Admin > Upgrade							Configurations
							Reset
ſ	lpgrade Receiver F	irmware					Upgrade
S	elect upgrade (*.s	uf) file:					User Administration
	Choose file No file ch	nosen					Expert Control
	Start upgrade						Receiver Messages
c	Current firmware	version: 4.9.0					About
If th	you are upgrading vis WiFi network be	g the receiver usi ecomes available	ing its WiFi network, again after the upgr	please reconnect ade.	tonce		

Figure 8-4: Selecting the .suf file to upload to the receiver

Having already saved the .suf file to your PC, you can then select this file and click on the 'Start upgrade' button. The pop-up window shown in Figure 8-5 will show the progress of the upgrade.





Figure 8-5: The upgrade procedure

Step 2: Verifying the upgrade

If there were no problems with the upgrade, the message 'Upgrade successful' will appear. You can then check on the Admin/About window, as shown in Figure 8-6, that the new firmware version or permission file has been updated.



Figure 8-6: Checking the firmware and permission file versions

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8.4 How to set the PolaRx5TR to its default configuration

You can set the PolaRx5TR configuration to its default settings on the Configurations window of the Admin menu as shown in Figure 8-7. Select 'RxDefault' from the 'Source' drop-down list and either 'Current' or 'Boot' in the 'Target' menu. You will then be prompted to Save the new current configuration as the boot configuration so the receiver will boot up with saved configuration after a power cycle.

Overview	GNSS	Station	Communic	ation Correct	tions Data Or	utput	Logging	Admin
Admin > Configura	ations							Configurations
	ny Configuration F		-Receiver Con	figurations				Reset
50	Urce RyDefault		E Current	Different from	factory default	00		Upgrade
Ta	rget Current •		Boot	Different from	factory default	ŎŎ		User Administration
			User1	Equal to fa	ctory default	0		Expert Control
Defa	ault Ok		User2	Equal to fa	ctory default			Receiver Messages
Press	"OK" to apply the	changes.					/	About
			Save cur to boo Show	rent configurations t configurations Save Igno	ation on. e			

Figure 8-7: Setting the PolaRx5TR to its default configuration

8.5 How to reset the PolaRx5TR

If the PolaRx5TR is not operating as expected, a simple reset may resolve matters. The PolaRx5TR can be fully power-cycled by disconnecting then reconnecting the power supply. However, on the Admin/Reset window as shown in Figure 8-8 different functions can be reset individually. A 'Soft' level reset will cause the PolaRx5TR to boot up with its current configuration while a 'Hard' reset will use the configuration stored in the boot file.

Overview	GNSS	Station	Communication	Corrections	Data Output	Logging	Admin
Admin > Reset							Configurations
- P	eset Receiver						Reset
	eset Receiver	Coft @ Unud					Upgrade
	Config	Sort I Hard					User Administratio
P	VTData						Expert Control
S	atData 🛛	0					Expert Condor
B	BaseStations]					Receiver Message
V	ViFiAccessPoints						About
_)	-				
De	fault		Poset C	onfirmation			
Pres	ss "OK" to apply the	e changes.	Keset C	ommación			
			Are you s Doing so with the	sure you want to will result in the receiver.	reset the receiver? loss of the connection	'n	

Figure 8-8: Resetting the PolaRx5TR configuration to its boot configuration using a Hard reset



8.6 How to copy the configuration from one receiver to another

In the Admin/Configurations window, the configuration of a PolaRx5TR can be easily saved to a PC as a text file. A saved configuration can then be uploaded to any other PolaRx5TR.

Step 1: Downloading the configuration from a PolaRx5TR

Click the green download arrow **()** next the configuration you wish to download as shown in Figure 8-9. The configuration will be saved as a .txt file.

Admin > Configurations Configurations Receiver Configurations Reset Upgrade Source Current intarget boot Different from factory default interview Image: Configurations Expert Configurations Default Ok Different from factory default interview Image: Configurations Expert Configurations Befault Ok Different from factory default interview Image: Configurations Expert Configurations Befault Ok Different from factory default interview Image: Configurations Expert Configurations Befault Ok Different from factory default interview Image: Configurations Expert Configurations Befault Ok Different from factory default interview Image: Configurations Expert Configurations Image: Configuration from factory default Image: Configurations Image: Configurations Expert Configurations Image: Configuration from factory default Image: Configurations Image: Configurations Image: Configurations Image: Configuration from factory default Image: Configurations Image: Configurations Image: Configurations Image: Configuration from factory default Image: Configurations Image: Configurations Image: Configurations <th>Overview</th> <th>GNSS</th> <th>Station</th> <th>Communica</th> <th>tion</th> <th>Corrections</th> <th>Data Output</th> <th>Logging</th> <th>Admin</th>	Overview	GNSS	Station	Communica	tion	Corrections	Data Output	Logging	Admin
Copy Configuration File Surce Current T Different from factory default T Total T Surce Current from factory default T Surce Current T Surce Current from factory default T Surce Current F Surce Current from factory default T Surce Current F Surce Current from factory default T Surce Current F Surce Current from factory default T Surce Current for factory default for factory factory for factory factory for factory factory for factory for factory for factory for factory factory for fac	Admin > Configur	rations							Configurations
Copy Configuration File Surce Current v Upgrade Boot Different from factory default Upgrade Boot Different from factory default Upgrade User1 Equal to factory default Ot Octault Ok Ok Upgrade User2 Equal to factory default Ot Ot Vier22 Equal to factory default Ot Ot Vier22 Equal to factory default Ot Ot Vier2 Equal to factory default Ot Ot Vier22 Vier22 Equal to factory default Ot Vier22 Vier22 Vier22 Search configs Vier22 Vier22 Equal to factory Vieranti									Reset
Source Current Image: Boot Different from factory default Image: Boot	ſ	-Copy Configuratio	n File	eceiver Configu	irations	s)	Upgrade
Default Ok Save As Search configs Organize New folder Openize New folder Desktop Onnloads Documents No items match your search. Work No items match your search. Music Ok		Source Current	•	Current Di	fferen	t from factory o	default O O		User Administratio
Default Libraries Documents Configs Configs <td>L</td> <td>Target Boot</td> <td></td> <td>Jser1</td> <td>Eau</td> <td>al to factory defa</td> <td></td> <td></td> <td>Expert Control</td>	L	Target Boot		Jser1	Eau	al to factory defa			Expert Control
About		Default Ok	l	Jser2	Equ	al to factory defa	ult 🚺		Receiver Messagi
Save As Ibraries Organize New folder E Desktop Downloads Recent Places work Documents Documents Documents Name Type No items match your search.)	About
Save As Source + Configs Organize + New folder Favorites Desktop Downloads Recent Places work Documents Documents Documents Performance Provide Documents Distription Downloads Recent Places Work Documents No items match your search. Pictures Wasic Pictures									
Organize New folder Favorites DOcuments ibrary Desktop Documents library Downloads Arrange by: Recent Places Name Vork Documents Documents No items match your search.			G	Save As					
Organize ▼ New folder			C	🔍 🗢 🚺 🕨 Lib	raries 🕨	Documents + confi	gs 👻 47	Search configs	Q
Image: Space Image: Space Image: Space				Organize 🗙 Nei	w folder			8== •	
Favorites Desktop Desktop Documents library Arrange by: Folder Configs Name Type No items match your search. Ibraries Documents Documents Pictures Visit of the second									
Desktop E Downloads E Recent Places No items match your search. Ubraries No items match your search. Documents Music Pictures III				Y Favorites		Documents III	orary	Arrange by: Fold	ler 👻
Recent Places work Documents Pictures Vame Iype No items match your search. No items match your search. No items match your search.				Desktop	E	News	т		_
Work No items match your search. Documents Music Pictures * *				📃 Recent Places		Name	туре		
Cibraries Cibraries Documents Music Cibraries Pictures ← ∢ ☐ Ⅲ →				鷆 work			No items match you	r search.	
Clubates Documents Music Pictures *				😂 Librarian					
Music Pictures * * * * * * * * * * * * *				Documents					
Pictures				J Music					
				Pictures	- 4		ш		•
File name: PolaRx5_3010305_Boot_2015-12-10-122625.bxt 👻				File name:	PolaRx5	_3010305_Boot_2015-1	2-10-122625.txt		
Save as type: Text Document				Save as type:	Text Doo	cument			-
Hide Folders Save Cancel			6	Hide Folders				Save Ca	ncel

Figure 8-9: Saving a configuration from a PolaRx5TR as a text file



Step 2: Uploading the configuration to another PolaRx5TR

Again on the Admin/Configurations window, click on the blue upload arrow (), as indicated in Figure 8-10, to upload a configuration file stored on you PC. In this example, the saved file will be uploaded as the Boot configuration.



Figure 8-10: Uploading a configuration to a PolaRx5TR



A Front-panel port descriptions

The PolaRx5TR front panel features 8 ODU connectors which are described in the following sections. These connectors are all of type ODU MINI SNAP Series F. The pinout of the female connectors and the ODU part number of the corresponding male connectors are shown in Figure A-1.



Figure A-1: Pinout of the front-panel female connectors and the ODU part numbers of the corresponding male connectors

A.1 COM1

This 7-pin connector provides access to the first serial port (COM1). The receiver behaves as Data Terminal Equipment (DTE).

PIN #	Description
1	Not connected
2	Signal ground (GND)
3	Not connected
4	Not connected
5	Receive Data (RXD - input to the receiver)
6	Transmit Data (TXD - output from the receiver)
7	Not connected

A.2 COM2

This 7-pin connector provides access to the second serial port (COM2). The receiver behaves as Data Terminal Equipment (DTE).

PIN #	Description
1	+5V DC output
2	Signal ground (GND)
3	Clear To Send (CTS - input)
4	Request To Send (RTS - output)
5	Receive Data (RXD - input to the receiver)
6	Transmit Data (TXD - output from the receiver)
7	Not connected





A.3 COM3-4/USB

This 7-pin connector can be configured in two modes:

- COM3 and COM4
- USB device

The electrical level at pin#7 defines the operating mode.

COM3-4 device

This mode is selected by leaving pin#7 unconnected.

PIN #	Description
1	Not connected
2	GND
3	COM4 RX
4	COM4 TX
5	COM3 RX
6	COM3 TX
7	Leave unconnected

USB device

This mode is selected by applying 5V DC to pin#7.

PIN #	Description
1	Not connected
2	GND
3	USB D-
4	Reserved
5	USB D+
6	Reserved
7	USB Vbus

A.4 Ethernet

The receiver can be powered through the Ethernet port (Power-Over-Ethernet). Please note that the receiver supports mode A, as specified in the 802.3af standard.

PIN #	Description
1	TxD+
2	TxD-
3	RxD+
4	RxD-



A.5 OUT

PIN #	Description
1	Reserved
2	GND
3	GP1 output, 3.3V. Use the command setGPIOFunctionality to set the level of this pin.
4	GP2 output, 3.3V. Use the command setGPIOFunctionality to set the level of this pin.
5	nRST_OUT. Open-collector output, driven low when the receiver is resetting.

A.6 IN

PIN #	Description
1	Reserved, leave unconnected.
2	Ground
3	Reserved, leave unconnected.
4	nRST_IN. Driving this pin low resets the receiver. Internally pulled-up. Debouncing and deglitching is foreseen.
5	EVENTA input, 0-30V, pulled down. Input voltage should be at least 3V to be detected as high. First input for external event timing. Event polarity is controlled by the setEventParameters command.
6	EVENTB input, 0-30V, pulled down. Input voltage should be at least 3V to be detected as high. Second input for external event timing. Event polarity is controlled by the setEventParameters command.
7	 ANT_EXT, external antenna power. Can be used to apply an external supply voltage to the antenna. The voltage applied to ANT_EXT(V_{ANT}) determines the voltage source on the MAIN connector, as follows: if V_{ANT} < 2.0V or ANT_EXT left open, the antenna is powered by the internal 5V supply; if 3.0V < V_{ANT} < 4.0V, there is no power provided to the MAIN connector; if 5.0V < V_{ANT} < 12.0V, the antenna power supply is taken from ANT_EXT. Warning: Exceeding 12.0V for V_{ANT}, or drawing more than 200mA from the antenna connector can permanently damage the receiver.

A.7 USB Host

PIN #	Description
1	USB-H VBus (max current: 500mA)
2	Ground
3	USB-H D-
4	USB-H D+
5	Reserved



A.8 PWR

PIN #	Description
1	Power: 9 to 30V DC
2	Always ON. When this pin is tied to pin#1 the receiver is always on regardless of the state of the power button. Connect to Ground to enable the power button.
3	Ground



B Rear-panel connectors

The following sections describe the connectors on the rear-panel of the PolaRx5TR.

B.1 MAIN (TNC)

Connect an active GNSS antenna to this connector. The gain at the connector (antenna gain minus cable losses) must be in the range 15 to 50dB.

By default, the receiver provides a 5V DC supply on the MAIN connector to feed the antenna. Other voltages can be supplied through pin ANT_EXT of the IN connector on the front panel (see Appendix A.6). The maximum supported current is 200mA.



Never inject a DC voltage into the MAIN connector as it may damage the receiver. When using a splitter to distribute the antenna signal to several receivers, make sure that no more than one output of the splitter passes DC. Use DC-blocks otherwise.

B.2 PPS IN (BNC)

Use this connector to provide a one pulse-per-second signal to synchronize the receiver internal time with an external timing reference. The input signal level should not exceed 5.5V. V_{IH} >2.3V and V_{IL} <1.0V. There is an internal 10-K Ω pull down resistor.

More details on the use of the PPS IN signal can be found in section 4.1.

B.3 PPS OUT (BNC)

xPPS output (5V, output impedance 50- Ω). The rate and polarity of the xPPS output signal can be specified by the **setPPSParameters** command or on the Web Interface. The pulse duration is 5ms.

B.4 REF IN (BNC)

Use this connector to provide the receiver with an external 10 MHz frequency reference to be used instead of the internal oscillator. The reference signal should preferably be sinusoidal with a peak-to-peak amplitude (unloaded) ranging from 0.5V to 10V (-8dBm to +18dBm on a $50-\Omega$ load).

Connecting or disconnecting the external 10 MHz reference is preferably done with the receiver switched off. If the 10 MHz reference is connected or removed during operation, the receiver will reset.

Use of the REF IN signal is described more fully in 4.1.



B.5 REF OUT (BNC)

The REF OUT connector provides a 10 MHz output signal synchronized with the receiver's frequency reference. It is a sinusoidal signal with unloaded peak-to-peak amplitude of 1.1V and output impedance of 50 Ω .

If a 10 MHz reference is fed to the REF IN connector, REF OUT simply duplicates REF IN which allows to chain receivers using the same clock reference.

If REF IN is not used, the 10 MHz signal at the REF OUT connector is taken from the internal receiver clock.

Note that the REF OUT signal can be turned off with the **setREFOUTMode** command.

B.6 WiFi (SMA)

Connector for the WiFi antenna.



C Power consumption

The power consumption of the PolaRx5TR depends on its configuration. The following settings directly influence the amount of power consumed:

- Activation of the Ethernet interface: in power-critical applications, it is recommended to not use Ethernet and to turn off the associated hardware. This can be done with the **setEthernetMode** command.
- Activation of the WiFi interface: use the **setWiFiMode** command or press the WiFi button to turn the WiFi module off or on.

The following table shows the nominal power consumption measured when 12 VDC is supplied to the PWR connector:

Configuration	Power Consumption
All-in-view all-band tracking and PVT	3.5W
Enabling Ethernet	+650mW
Enabling WiFi	+450mW
Enabling REFOUT	+30mW
Enabling Wideband Interference Mitigation (WBI)	+160mW
Enabling internal logging at 1 Hz/10 Hz	+50mW/+70mW
Enabling the L-Band demodulator	+100mW



D Cables

Cable Name (Part #)	Details				
CBLe_COM_1.8_rev.1 (216374, replaces 200416)	COM1/COM2 either the C lines are onl	2 to PC OM1 or y availab	(DSUB9-female COM2 connec ile when conne	e). To be connect tor. Note that R ected to COM2.	cted to TS/CTS
CBLe_COM_DUO_7_rev.1 (216373, replaces 201204)	Dual COM3 connected f RTS/CTS is n	and CC to the C ot suppo	DM4 to PC (E COM3-4/USB (orted on these)SUB9-female). connector. Not ports.	To be e that
	Open-ended pinout in Ap	l cable to pendix A	be used with 5).	the OUT connect	or (see
		Pin #	Function	Wire Colour]
CBLe GPO OE 5 rev.1		1	Reserved	Blue	
(216367, replaces 201203)		2	Ground	Blue/Black	
		3	GP1 output	Orange	
		4	GP2 output	Green	
		5	nRST_OUT	Brown	
CBLe_GPI_OE (200419)	Do not leave them to grou that could le	Pin # Pin # 1 2 3 4 5 6 7 e the Bro und if no bad to sp	o be used with A.6). PPS_IN Ground IO1 RESET EVENTA EVENTB ANT_EXT wn and Green t used. This wi urious level tra	Wire Colour Blue Blue/White Orange Green Brown Green/White Orange/White White wires float Il avoid crosstalk	ing, tie effects vA and
	EvB inputs.				44165
CBLE_USB_rev.1 (216377, replaces 201202)	USB device connector.	cable to	o be connecte	ed to the COM3	-4/USB
CBLe_USB_HOST_rev.1 (216371, replaces 214935)	USB host cal	ole to be	connected to	the USB host con	nector.
CBLe_ETH_MS_rev.1 (216375, replaces 200418)	Ethernet to l the ETH con	nub/swit nector.	ch (straight) (R <u></u>	J45). To be conne	cted to



Cable Name (Part #)	Det	ails						
	Оре	en-endec	l cab	ole		for	the	PWR
	con	nector	(see	pin	out	in	Appendix	A.8).
		Pin #	Function		Wire	e Colou	ır	
CBLe_PWR_OE_rev.1 (216376_replaces_200422)		1	Power		Blue slee coni	e and ve (the nected	blue/white se two wire to Pin#1)	with red s are both
(210370, 1001003 200422)		2	ON/OFF		Orai	nge		
		3	Ground		Gree slee coni	en and ve (the nected	green/white se two wire to Pin#3)	with black s are both
PWRe_ADAPTER (200431)	Ap	ower ada	pter to be o	con	inecte	ed to PV	VR connector	



E LED behavior

LED name	colour	lcon	Behavior	
POWERLED	red	Ċ	Off : Receiver is powered of On : Receiver is powered or	f 1
LANLINKLED	green	垦	Off : No Ethernet connection Blinking : Sending or receive	on ing data over Ethernet
			Behavior	Number of satellites in tracking
			Blinks fast (10 per second)	0
	orange	X	Blinks once, then pauses	1, 2
INACILLD	orange	23	Blinks twice, then pauses	3, 4
		•	Blinks 3 times, then pauses	5, 6
			Blinks 4 times, then pauses	7, 8
			Blinks 5 times, then pauses	9 or more

By default, GPLED functions as DIFFCORLED but, it can also be configured as LOGLED using the **setLEDMode** command. In rover PVT mode, when acting as DIFFCORLED, this LED reports the number of satellites for which differential corrections have been provided in the last received differential correction message (RTCM or CMR).

GPLED

.

red

Behavior	Number of satellites
(configured as DIFFCORLED)	with corrections
Off	No diff corr received
On	The LED is solid 'ON' when the receiver outputs differential corrections as a static base station.
Blinks fast (10 per second)	0
Blinks once, then pauses	1, 2
Blinks twice, then pauses	3, 4
Blinks 3 times, then pauses	5, 6
Blinks 4 times, then pauses	7, 8
Blinks 5 times, then pauses	9 or more

Behavior (configured as LOGLED)	Logging status
Off	Not logging
On	Logging active



LED name	colour	lcon	Behavior
PVTLED	green		Off : No PVT available On : PVT available
WIFILED	red	((:-	 Off: WiFi disabled On: Access-point mode or client mode Blinking slowly: Establishing a connection in client mode Blinking quickly: Error, not connected



F RxTools

The RxTools is a suite of Graphical User Interface tools for advanced monitoring and configuration of the receiver. They can be used to log SBF (Binary Format) data files (including raw measurements) as well as analyze the logged SBF data files and convert them to various other formats. The RxTools manual contains detailed instructions on how to use the tools.



RxControl is a graphical user interface which allows configuration and monitoring of the receiver in real time. It offers numerous views for monitoring data and a simple logger for recording data files. RxControl can also be used to upgrade receiver firmware.



SBF Converter is a GUI for converting SBF data files to various other formats including ASCII, RINEX and KML.



SBF Analyzer allows users to generate time plots from SBF files for detailed analysis. It can also create standard reports for reporting purposes.



RxLogger allows flexible logging of SBF and NMEA data. Users can select multiple streams each with a different update rate.



RxPlanner is a Satellite Mission Planning software. It shows the satellite visibility and DOP at the user defined location over a selectable time period.

F.1 Installing RxTools

You can install the full suite of RxTools by running the RxTools Installer. The Installer file can be found on the memory stick provided with the receiver. The latest version of the Installer is also available for download from the Support section of the Septentrio website: http://www.septentrio.com/support

To run the Installer, double click on the executable file.



Figure F-1: Install the suite of RxTools by running the Installer file



G Connecting to the PolaRx5TR using RxControl

You can connect to RxControl over a serial, USB or internet connection. If you don't have the RxControl icon on your desktop, type 'RxControl' in the Start menu of your PC to locate the tool as shown in Figure G-1.

rograms (1)		
RxControl		

Figure G-1: Type RxControl in the Start menu of your PC

In the 'File' menu, select 'Change Connection...'. In the example shown in Figure G-2, a USB cable was used. The USB connection of the PolaRx5TR maps onto two virtual serial connections which are identified as 'USB COM Port 1' and 'USB COM Port 2'. Select one of these connections and give it a name. When connected to a receiver, the various information fields in RxControl will be filled as shown.

ا 🛞	&Control				×				
Eile	View Tools Logging Help								
*	Change Connection	Ctrl+N		3					
	Manage Connections	Ctrl+M							
B	Preferences Display Diagnostic Report Save MIB Description As Upload script	Ctrl+P Ctrl+C Ctrl+S Ctrl+U							
5	Show Receiver Configurations Upgrade Receiver using Current Connection							ſ	
0	Exit	Ctrl+W	IRNSS	L-Band					🕸 usb_polarx5tr.serial - RxControl - S/N 3013369
	COL CO2 CO3 CO4 CO5 CO6 CO2 CO8 (C13 C14 C15 C16 C12 C18 C19 C00 (C25 C26 C27 C28 C29 C30 C31 C32	609 G10 621 G22	G11 G12 G23 G24						Preston Velocity Coodetic φ: N 50.848639552° σ ₀ : +0.362m WGS84/ITRS k: E 004.7321336255° σ ₀ : +0.362m h: +129.090m σ ₀ : +0.630m
	Receiver Status Time RxClock DOP PL RAIM COVC DOP VI RAIM	Cr	ange Co	nnectio	ı	1			✓ Satellite Status GPS GLOBIACS Galileo BellPoul SRAS 0755 IENSS L-Band
•	UNDS UNDF: IV/A TDOP: IV/A HDOP: IV/A N/A HDOP: IV/A HDOP: IV/A offset to UTC IV/A VDOP: IV/A IV/A IV/A IBF Status DiffCorr ® ExEvent ® ExEvent ® ExEvent IV/A		Serial Co TCP/IP C SBF File	Con nnection onnection Connection	Cre Cre n: Sele	ion ate New • ect •	Change Connection	G.S. Guiness Gaine Debut Sec. V235 Pass Debut Gain Gain	
Cha	nge the connection to the receiver		Work Off	line	< <u>B</u> ac	k Next >	Specify the set	rial setting al USB COM Port 1	Search: 6 0G, 1R, 1E, 0C, 45, 0J, 0L, 0L Track: 35 12C, 8R, SE, 6C, 45, 0J, 0L, 0L Sync: 0 0G, 0R, 0E, 0C, 0S, 0J, 0L PVT: 25 10G, 8R, 3E, 4C, 0S, 0J, 0L V
							Advanced Settings Connection Name: usb_polar	rx5tr	Time RxClock DOP PL RAIM PVT Status GNSS time frame P00P: 0.87 Mode: EGNOS (\$136)
							Work Offline < <u>B</u> ack	Next >	Wed 16-Nov-2016 TDDP: 0.41 System: GFS+GLONASS+Galleo+BelDou 15:13:32.000 HDOP: 0.50 Info: LC+FC+1 +17s offset to UTC VDOP: 0.71 Corr Age: 1.60s
									🔹 SBF 🔹 Status 🔹 DiffCorr 🔹 ExEvent 🛎 ExSensor
									SSRC7 - PolaRx5TR - SEP

Figure G-2: Connecting to the PolaRx5TR over a USB connection using RxControl



