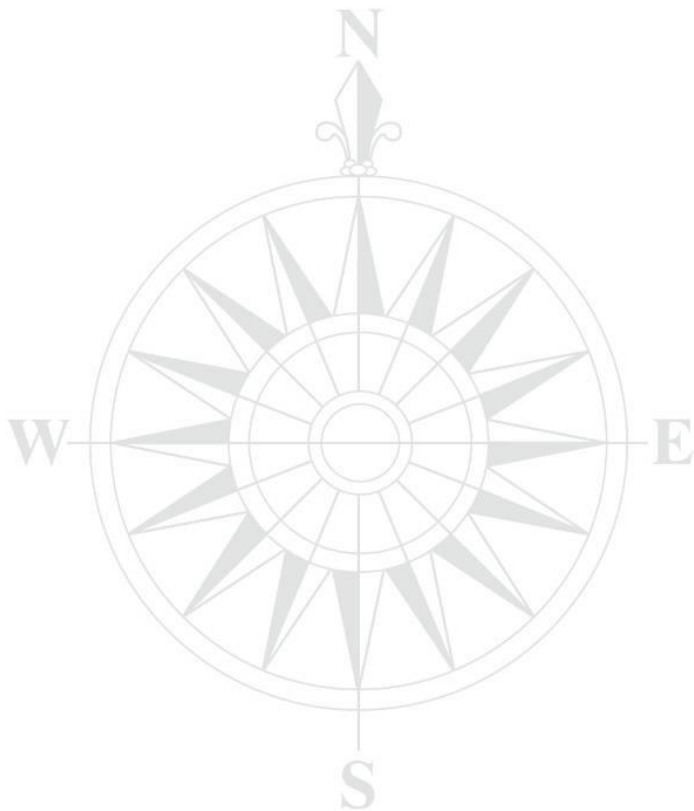


# AsteRx3 Product Family Hardware Manual

---

Version 2.5.0



## AsteRx3 Product Family Hardware Manual

Version 2.5.0  
December 13, 2013

© Copyright 2000-2013 Septentrio nv/sa. All rights reserved.

Septentrio Satellite Navigation  
Greenhill Campus, Interleuvenlaan 15G  
B-3001 Leuven, Belgium

<http://www.septentrio.com>

support@septentrio.com

Phone: +32 16 300 800

Fax: +32 16 221 640

# Table of contents

<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>1 ASTERX3_HDC .....</b>	<b>7</b>
1.1 Connectors .....	8
1.2 Cables .....	10
1.3 Stand-By Mode .....	12
1.4 SD Memory Card Usage .....	12
1.5 Applicable Software Package .....	12
1.6 Hardware Specifications .....	12
1.6.1 Power Consumption .....	12
1.6.2 Environmental .....	12
<b>2 ASTERX3_OEM .....</b>	<b>13</b>
2.1 Mechanical Drawings.....	13
2.2 Antenna Connector .....	15
2.3 80-pin Connector .....	15
2.4 Frequency Reference Selection.....	19
2.5 Ethernet.....	19
2.6 Stand-By Mode .....	19
2.7 SD Memory Card Usage .....	20
2.8 Applicable Software Package .....	20
2.9 Hardware Specifications .....	21
2.9.1 Power Consumption .....	21
2.9.2 Temperature Range.....	21
<b>APPENDIX A LED STATUS INDICATORS.....</b>	<b>22</b>

## CE NOTICE

Receivers of the AsteRx3 family 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.

## ROHS/WEEE NOTICE



Receivers of the AsteRx3 family comply with European Union (EU) Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).



Receivers of the AsteRx3 family comply with the European Union (EU) Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). The purpose of this Directive is the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. If purchased in the European Union, please return the receiver at the end of its life to the supplier from which it was purchased.

## SAFETY INFORMATION



Statement 0000/WARNING: IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger and indicates that you are in a situation that may result in body injury and physical damage. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and familiarize yourself with standard practices for preventing accidents. Use the statement number provided at the beginning of each warning to locate its translation in the translated safety warnings that accompanied this device.

---



Statement 0001/WARNING: 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 0003/WARNING: Ultimate disposal of this product should be handled according to all national laws and regulations.

---



Statement 0005/WARNING: The equipment and all the accessories included with the product may only be used according to the specifications in the delivered release note, in the manual and in all other documents delivered with the receiver.

---



Statement 0007/WARNING: Never place the equipment in direct sunlight.

---



Statement 0008/WARNING: The outside of the instrument may be cleaned using a clean, lightly dampened cloth. Do not use any cleaning liquids containing alcohol, methylated spirit, ammonia etc.

---

## WARNING: Handling of ESD Sensitive Devices

Electrostatic discharge is a sudden flow of current from one object to another either object or to ground. Electrostatic charges can accumulate on common items such as polystyrene drinking cups, cellophane tape, synthetic clothing, untreated foam packaging material, and untreated plastic bags and work folders, to name but a few.

Electronic components and assemblies, such as Septentrio OEM receivers, can be permanently damaged or destroyed when near or in contact with electro-statically charged objects. When you handle components or assemblies that are not in protective bags and you are not sure whether they are static-sensitive, assume that they are static-sensitive and handle them accordingly.

Everyone who is working with ESD-sensitive devices must be aware of these rules.



### General rules

Always test your ground strap, bench mat, conductive work surface, and ground cord before either removing components and assemblies from their protective bags or before beginning any disassembly or assembly procedures. Perform all service procedures in a static-protected environment. Always use techniques and equipment designed to protect personnel and equipment from electrostatic discharge.

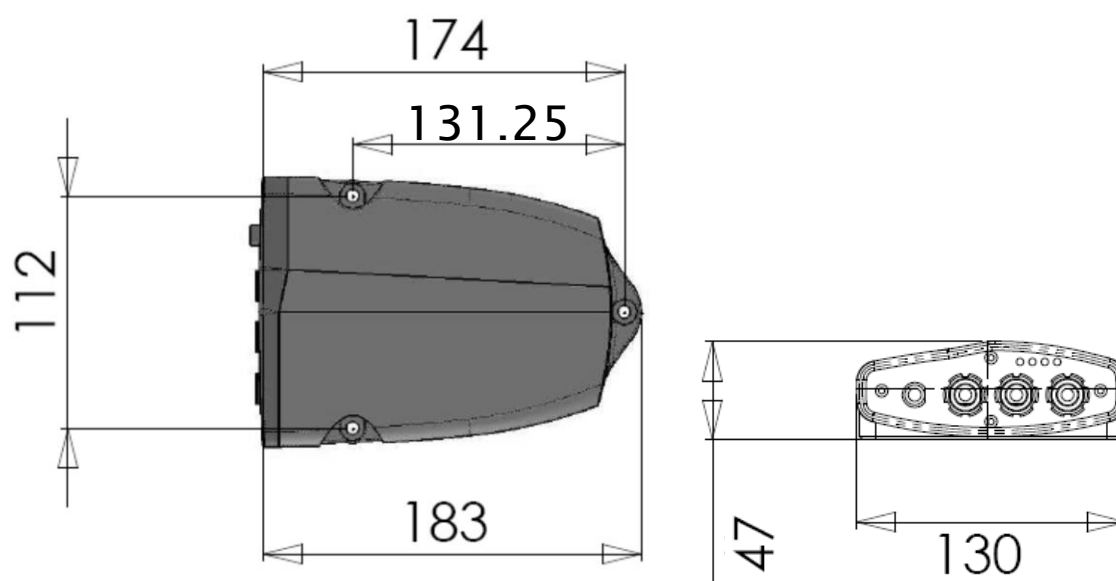
### Handling

- Remove static-sensitive components and assemblies from their static-shielding bags only at static-safe workstations - a properly grounded table and grounded floor mat - and only when you are wearing a grounded wrist strap (with a resistor of at least 1 mega-ohm in series) or other grounding device. Avoid having non-ESD safe material on the workbench. Clear the work station of static generators like e.g. polyethylene, vinyl's, foam, notebooks, document holders, etc.
- Use only grounded tools when manipulating static-sensitive components and assemblies.
- Place and seal static-sensitive components and assemblies in their original static-shielding bags before removal from static-protected areas.
- Stacking of board assemblies should be avoided to prevent physical damage to devices.

### Transport & Storage

- Limit as much as possible the manipulation of ESD-sensitive devices and components.
- Handle ESD-sensitive parts as far as possible in their (original) protective packaging.
- Protect ESD-sensitive components against dust as this is a possible carrier of static loads. Assembled printed circuit boards (PCB's) must always be placed in an anti-static shielding bag, box or PCB containers during transport between workplaces or to a warehouse.

## 1 AsteRx3\_HDC

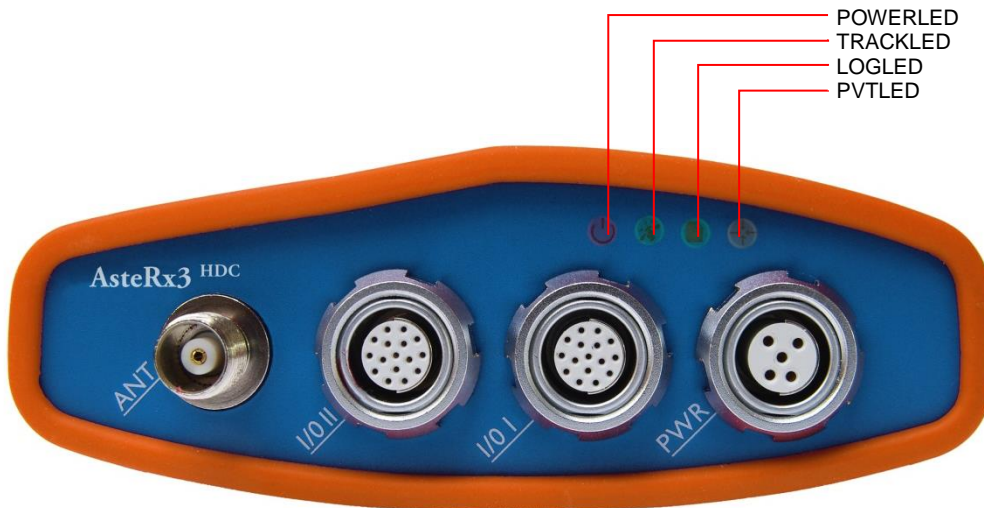


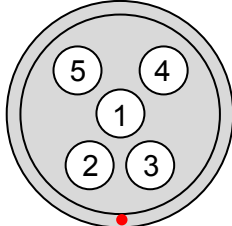
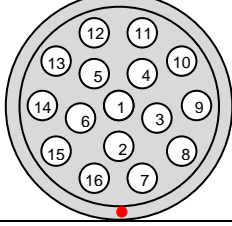
All dimensions expressed in millimeters.

Mounting holes:      hole diameter: 6mm.  
                             max diameter of screw head: 11mm.

Weight: 500g

## 1.1 Connectors



Connector	Type
PWR	ODU MINI-SNAP Series F, 5 pins, part number male connector: S42F1C-T05MPHO-90CP  Pinout of the female connector.
I/O I I/O II	ODU MINI-SNAP Series F, 16 pins, part number male connector: S42F1C-T16MFDO-90CS  Pinout of the female connector.
ANTENNA	TNC

**!** The functionalities marked yellow in the tables below are only available if the input/output board inside your receiver is of type BIO0019x. If it is of type BIO0008x, the pins are reserved and must be left unconnected. Please check your input/output board version in the hardware release note shipped with your receiver (document “AsteRx3 Product Group Hardware Release Notes.pdf”, section “Hardware Deliverables”).

PWR				
Pin#	Name	I/O type	Level	Comment
1	Ground	P	0V	
2	Power1_In	P	9 – 30V	Main power input
3	Power2_In	P	9 – 30V	Backup power input. The receiver automatically switches to Power2_In when the voltage at Power1_In drops below 7V.
4	Reserved			To be tied to ground for proper operation.
5	Vantenna	P	0 – 12 V	If not connected, a 5-V DC supply is applied to the central conductor of the TNC antenna connector. If Vantenna > 4V, the applied voltage is transferred to the antenna connector. Max current: 200mA.

Note: I/O type: I=input, O=output, P=power.



I/O I				
Pin#	Name	I/O type	Level	Comment
1	Ground	P	0V	
2	COM1_RX	I	RS232	Serial COM 1 receive line (as seen from receiver side)
3	COM1_TX	O	RS232	Serial COM 1 transmit line (as seen from receiver side)
4	USB_D+	I/O	USB	USB data signal positive D+
5	USB_D-	I/O		USB data signal negative D-
6	USB_Vbus	I	$4.35V \leq V_{high} \leq 5.25V$	USB Power. Cannot be used to power the receiver.
7	nRST_In	I	LVTTL, PU	Pulling this pin down for at least 1ms and then releasing it resets the receiver.
8	ETH_TX+	I/O	Ethernet	Ethernet_TX+
9	ETH_TX-	I/O		Ethernet_TX-
10	ETH_RX+	I/O		Ethernet_RX+
11	ETH_RX-	I/O		Ethernet_RX-
12	Ground	P	0V	
13	GPLED	O	LVTTL	General-purpose status indicator, see Appendix A.
14	PVTLED	O	LVTTL	PVT status indicator, see Appendix A.
15	TRACKLED	O	LVTTL	Tracking status indicator, see Appendix A.
16	PowerOut	P	5V	Power output, maximum current 200mA

Note: I=input, O=output, P=power, PU=pull up, PD=pull down.

I/O II				
Pin#	Name	I/O type	Level	Comment
1	Ground	P	0V	
2	COM2_RX	I	RS232	Serial COM 2 receive line (as seen from receiver side)
3	COM2_TX	O	RS232	Serial COM 2 transmit line (as seen from receiver side)
4	EventA	I	BIO0008: LVTTL, PD BIO0019: 0-30V	Event A input (see Firmware User Manual for operation instructions)
5	EventB	I	BIO0008: LVTTL, PD BIO0019: 0-30V	Event B input (see Firmware User Manual for operation instructions)
6	Reserved			
7	Button	I	LVTTL, no pull up/down	“Button” pin of the receiver (see Firmware User Manual). High to low transitions are detected as “button pressed” events.
8	COM3_RX	I	RS232	Serial COM 3 receive line (as seen from receiver side)
9	COM3_CTS	I	RS232	Serial COM 3 CTS line
10	COM3_TX	O	RS232	Serial COM 3 transmit line (as seen from receiver side)
11	COM3_RTS	O	RS232	Serial COM 3 RTS line
12	Ground	P	0V	
13	nRST_Out	O	LVTTL	This line is tied to ground when the receiver is resetting, and left in tri-state in normal operation
14	Reserved			
15	xPPS_Out	O	5V-TTL	Pulse per second output, see Firmware User Manual. Pulse duration: 1.2ms.
16	PowerOut	P	5V	Power output, maximum current 200mA

Note: I=input, O=output, P=power, PU=pull up, PD=pull down.

## ANTENNA

The gain of the antenna element together with its low noise amplifier and cable losses summed up until receiver connector must be between 15 and 50 dB.

The receiver provides a 5V DC supply by default (see also the Vantenna pin of the PWR connector). Maximum current is 200mA.

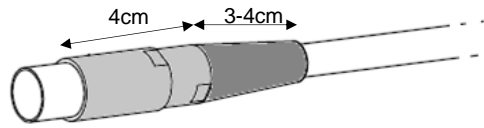
Never inject a DC voltage into the ANT connector as it may damage the receiver. For instance, when using a splitter to distribute the antenna signal to several receivers, make sure that no more than one output of the splitter passes DC. Use DC-blocks otherwise.

## LEDs

The functionality of the LEDs is described in Appendix A.

## 1.2 Cables

When installing the receiver, make sure to allow space for the connectors and cables. At least 10cm free space is needed in front of the receiver front panel to avoid excessive cable bending. The length of the male ODU connector and of the bend relief is shown below.



Cable Name: CBL*_HDC_PWR_OE	Part #: 201045
-----------------------------	----------------

Open-ended power cable. Check section 1.1 for the ODU pinout.

ODU Pin#	Pin Name	Wire Color
1	Ground	Black
2	Power1_In	Green
3	Power2_In	White
4	Reserved	Brown
5	Vantenna	Blue



For proper operation, the brown wire (pin#4) must be tied to ground (i.e. to the black wire).

Cable Name: CBL*_HDC_USB	Part #: 201043
--------------------------	----------------

USB cable to be connected to I/O I.

Cable Name: CBL*_HDC_COM	Part #: 201042
--------------------------	----------------

This cable can be connected to either I/O I or I/O II, corresponding to COM1 and COM2 respectively. The GND (pin 5), Tx (pin 3) and Rx (pin 2) of the 9-pin female DSUB9 connector are connected to respectively pins 1, 2 and 3 of the 16-pin ODU connector. Other pins are not connected.

Cable Name: CBL*_HDC_COM1_USB_GPIO	Part #: 201214
------------------------------------	----------------

This cable must be connected to I/O I and gives access to COM1 and USB. RTS/CTS handshaking is not supported on COM1.

Next to the two serial and USB connectors, this cable features the following open-ended wires (Check section 1.1 for the ODU pinout):

ODU Pin#	Pin Name (I/O I)	Wire Color
7	nRST_In	Green
12	Ground	Black
13	GPLED	Purple
14	PVTLed	Brown
15	TRACKLED	Yellow
16	PowerOut	Red

Cable Name: CBL*_HDC_COM2_COM3_GPIO	Part #: 201213
-------------------------------------	----------------

This cable must be connected to I/O II and gives access to COM2 and COM3. RTS/CTS handshaking is only available on COM3.

Next to the two DSUB9 connectors, this cable features the following open-ended wires (check section 1.1 for the I/O II ODU pinout):

ODU Pin#	Pin Name (I/O II)	Wire Color
4	EventA	Red
5	EventB	Purple
6	Reserved	Green
12	Ground	Black
15	xPPS_Out	Brown



Do not leave the red, purple and green wires floating. Tie them to ground if not used. This is to avoid crosstalk effects that could lead to spurious level transitions on the EventA and EventB inputs.

Cable Name: CBL*_HDC_OE	Part #: 201044
-------------------------	----------------

This open-ended cable can be connected to either I/O I or I/O II. Check section 1.1 for the ODU pinout:

Pin#	Pin Name (I/O I)	Pin Name (I/O II)	Wire Color
1	Ground	Ground	Brown/Red
2	COM1_RX	COM2_RX	Orange
3	COM1_TX	COM2_TX	Red
4	USB_D+	EventA	Green
5	USB_D-	EventB	Yellow
6	USB_Vbus	Reserved	Blue
7	nRST_In	Button	Grey
12	Ground	Ground	Brown/Blue
13	GPLED	nRST_Out	White/Black
14	PVTLED	Reserved	Black
15	TRACKLED	xPPS_Out	Brown
16	PowerOut	PowerOut	White/Yellow



When connecting this cable to the I/O II connector, do not leave the green and yellow wires floating. Tie them to ground if not used. This is to avoid crosstalk effects that could lead to spurious level transitions on the EventA and EventB inputs.

Cable Name: CBL*_HDC_ETH_MS	Part #: 201238
-----------------------------	----------------

Ethernet cable (straight) to be connected to I/O I.

Cable Name: CBL*_HDC_ETH_MX	Part #: 201237
-----------------------------	----------------

Ethernet cable (crossed) to be connected to I/O I.

## 1.3 Stand-By Mode

The receiver can be put in stand-by mode by entering the command “**exePowerMode, standby**” (see Command Line Interface Reference Guide).

After having requested to enter stand-by mode, it takes up to 0.5 seconds for the receiver to actually enter low-power state. This time is required to unmount the SD memory card and stop all software activities.

Putting the receiver in stand-by mode is mandatory before shutting down the power supply if internal logging is active.

## 1.4 SD Memory Card Usage

The receiver incorporates a SD memory card for internal logging. Refer to the “How-to...” section of the Firmware User Manual to learn how to use this feature.



Before unplugging the power connector or resetting the receiver, it is needed to put the receiver in stand-by mode and to wait at least 0.5 seconds for the SD card to be cleanly unmounted (see also section 1.3). Failing to do so can lead to file corruption.

## 1.5 Applicable Software Package

The AsteRx3\_HDC is compatible with Septentrio’s SSR3 Software Packages.

## 1.6 Hardware Specifications

### 1.6.1 Power Consumption

Nominal operation:	4.3W
Stand-by mode :	0.55 W

### 1.6.2 Environmental

Temperature Range:	-40 to +60 °C (operational)
	-55 to +85 °C (storage)
Protection Class:	IP65

## 2 AsteRx3\_OEM



### 2.1 Mechanical Drawings

Weight: 76g

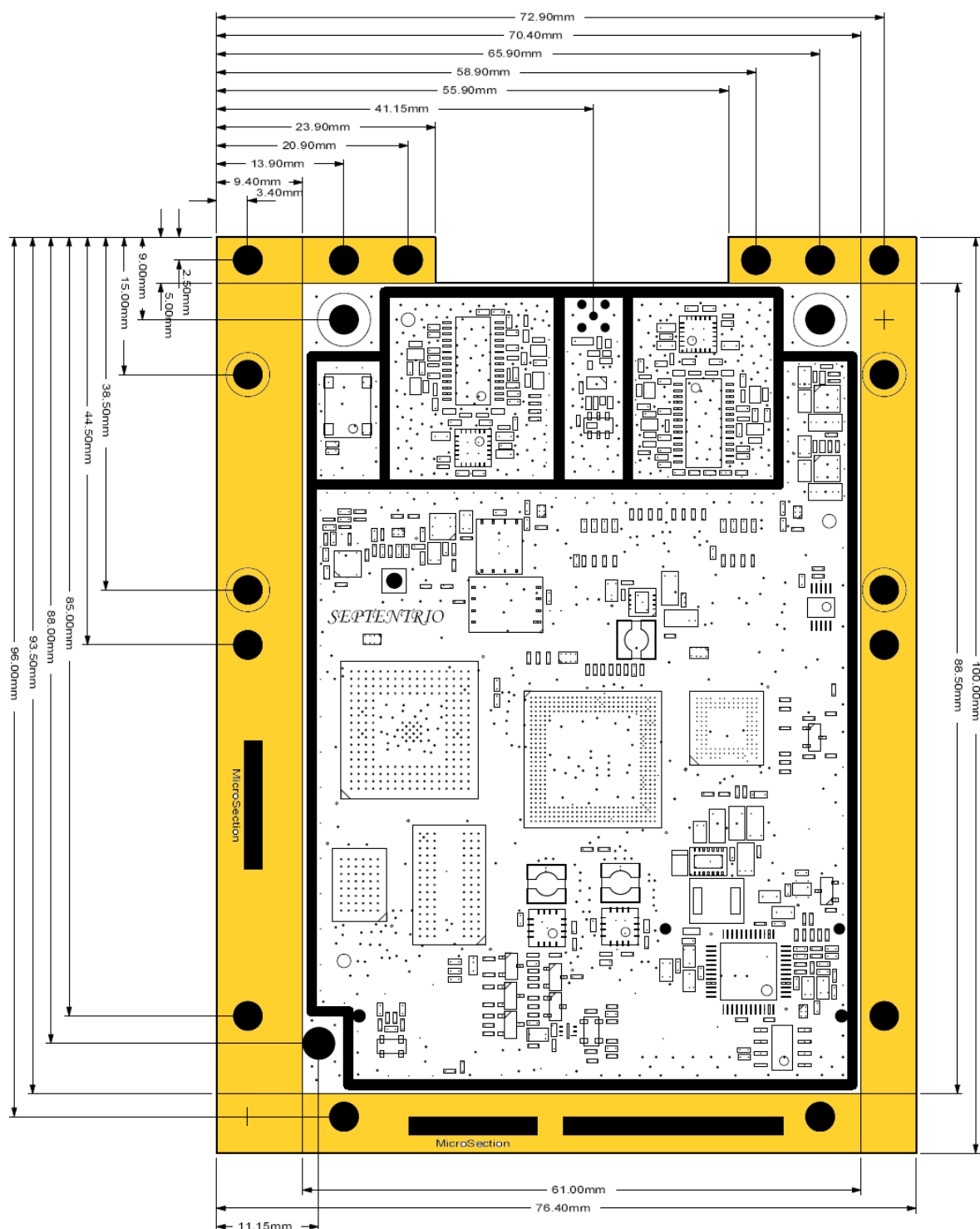
Height:

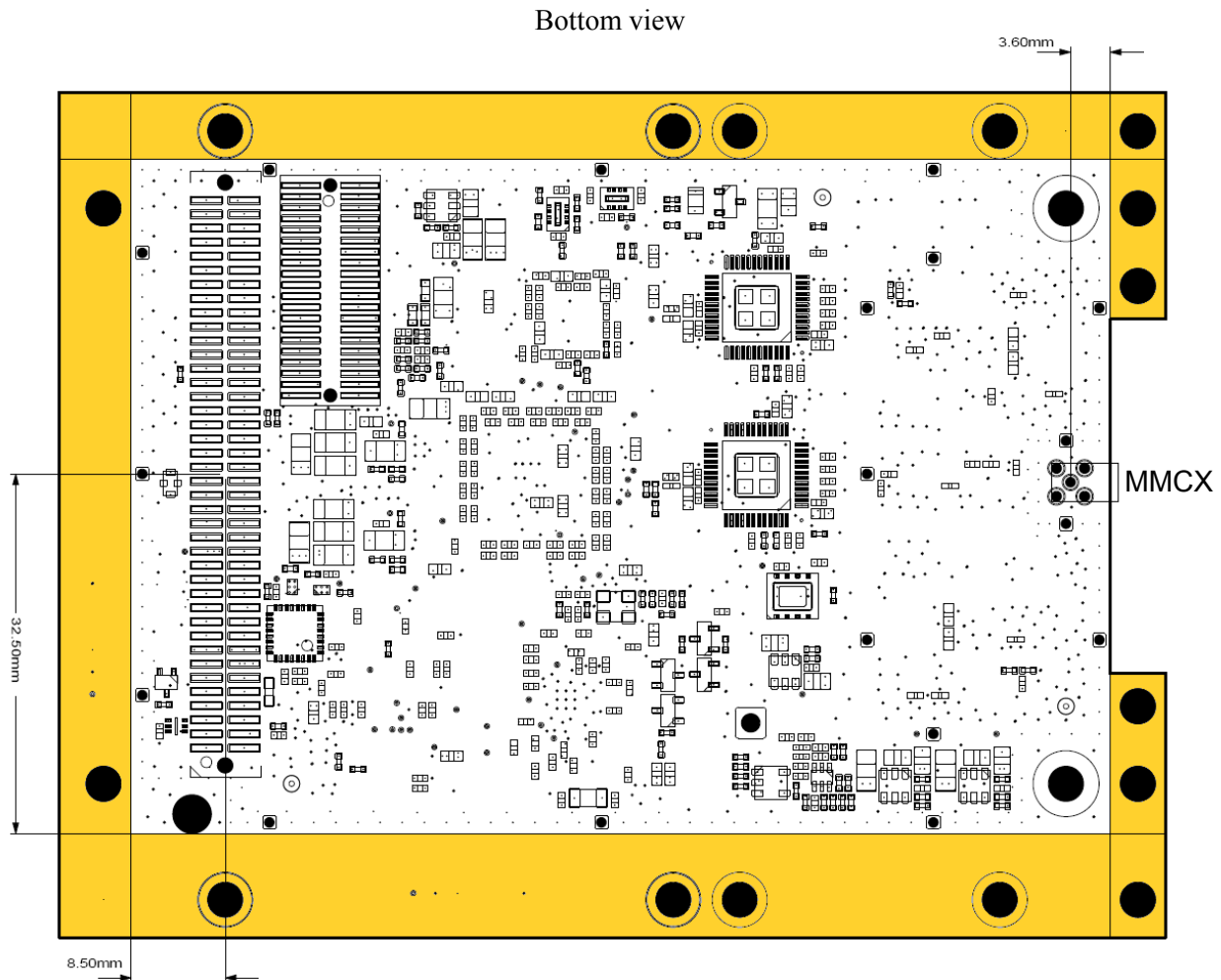
- Bottom-side components:
  - 80-pin connector: 4.57mm
  - MMCX connector: 3.70mm
  - Bottom-side shield: max 4.00mm
- Top-side shield height: max 4.40mm
- PCB width: max 1.65mm

All mounting holes have an inner diameter of 3.2mm (intended for M3 screws).

The drawings below show the dimensions of the printed-circuit board. The parts painted yellow only contain mounting holes and can be cut away.

Top View





Pin#1 of the 80-pin connector is at the bottom left (marked by the light-gray circle) in the above drawing. Pin#2 is at the bottom right.

The right-angle MMCX connector is mounted on the bottom side of the board and protrudes 1.2mm beyond the edge of the PCB.

## 2.2 Antenna Connector

Type: MMCX, right angle  
 DC voltage: As provided by pin#14 of the 80-pin connector  
 Gain range: 15 dB to 50 dB (antenna gain minus cable losses)



Never inject a DC voltage into the antenna connector as it may damage the receiver. For instance, 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.

## 2.3 80-pin Connector

Connector type: SFM-140-02-SM-D

Conventions:

- Pin Type: I=Input, O=Output, P=Power line, LVTTTL=3V3 Low Voltage TTL.
- LVTTTL means  $V_{IL} \leq 0.8V$ ,  $V_{IH} \geq 2.0V$ ,  $V_{OL} \leq 0.4V$ ,  $V_{OH} \geq 2.4V$ .



To avoid board damage, all input pins (type “I”) must be driven low or left floating (source impedance  $\geq 10k\Omega$ ) when the receiver is in sleep or power-off mode, with the exception of pins #8 (nPWR\_TOGGLE), #10 (nRST\_IN), #76 (RS232\_RX1) and #80 (RS232\_RX2). Sleep/off mode can be detected by the fact that the voltage at pin#29 (VCC\_3V3\_OUT) is zero. Pin#29 can be used as an “enable” for the drivers driving the input pins.



When pull-up resistors are needed,  $10k\Omega$  is recommended. Always pull-up to 3.3V even when using another voltage at the Vin pins. It is recommended to connect the pull-up resistors to pin#29 (VCC\_3V3\_OUT).



Septentrio AsteRx1\_OEM, AsteRx2\_OEM and AsteRx3\_OEM receivers share the same 80-pin interface and are electrically compatible, with the following important exception: the voltage range at the Vin connector of the AsteRx3\_OEM is 3.0 to 5.5V, while AsteRx1\_OEM and AsteRx2\_OEM only support 3.3V. If compatibility with these receivers is required, you must supply 3.3V at the Vin pins.



Pin#	Name	Type	Level	Description	Connection Tips
1	Gnd	Gnd	0	Ground.	All ground pins must be connected.
3	USB_D-	I/O	USB	USB data signal negative D-.	Leave unconnected if USB not used.
5	USB_D+	I/O	USB	USB data signal positive D+.	Leave unconnected if USB not used.
7	Gnd	Gnd	0	Ground.	All ground pins must be connected.
9	Reserved			Reserved for future use	Leave unconnected.
11	Reserved			Reserved for future use	Leave unconnected.
13	Reserved			Reserved for future use	Leave unconnected.
15	Vin	P	3.0V <Vin <5.5V	Main power supply input.	Both Vin pins (pin#16 and pin#15) must be tied together.
17	Gnd	Gnd	0	Ground.	All ground pins must be connected.
19	SCOM_RX1	I	LVTTL	Serial COM 1 receive line (inactive state is high). Disabled when pin#69 is tied to ground.	Pull up to 3.3V if not used.
21	SCOM_RX2	I	LVTTL	Serial COM 2 receive line (inactive state is high). Disabled when pin#69 is tied to ground.	Pull up to 3.3V if not used.
23	SCOM_RX3	I	LVTTL	Serial COM 3 receive line (inactive state is high)	Pull up to 3.3V if not used.
25	SCOM_RX4	I	LVTTL	Serial COM 4 receive line (inactive state is high).	Pull up to 3.3V if not used.
27	Gnd	Gnd	0	Ground.	All ground pins must be connected.
29	VCC_3V3_OUT	P	3.3V	3.3V power supply output (10mA max), or 0V if the receiver is in sleep or stand-by mode.	See warning at the beginning of this section.
31	Reserved			Reserved for future use	Leave unconnected.
33	Gnd	Gnd	0	Ground.	All ground pins must be connected
35	EVENT_B	I	LVTTL	Event B input (see Firmware User Manual for operation instructions)	Tie to ground if not used.
37	Gnd	Gnd	0	Ground.	All ground pins must be connected.
39	REF_O	O	LVTTL	Output depends on the EXTREF_STAT pin level: EXTREF_STAT left open: 10-MHz square wave output from the internal frequency reference. EXTREF_STAT tied to ground: REF_O is disabled.	See also section 2.4.
41	Gnd	Gnd	0	Ground.	All ground pins must be connected.
43	REF_I	I	LVTTL	10-MHz square wave frequency reference input. Input ignored when EXTREF_STAT is left open.	Leave unconnected when using the internal TCXO reference. See also section 2.4.
45	SCOM_CTS2	I	LVTTL	Serial COM 2 CTS line	Tie to ground if not used.
47	SCOM_CTS3	I	LVTTL	Serial COM 3 CTS line	Tie to ground if not used.
49	LOGLED	O	LVTTL	Internal logging status indicator, see Appendix A.	Leave unconnected if not used. Max output current: 8mA.
51	TRACKLED	O	LVTTL	Tracking status indicator, see Appendix A.	Leave unconnected if not used. Max output current: 8mA.
53	GP1	O	LVTTL	GP1 in <b>setGPIOFunctionality</b> command.	Leave unconnected if not used. Max output current: 8mA.
55	EXTREF_STAT	I	LVTTL	Sets the source of the 10-MHz frequency reference (internal or external).	Leave unconnected to use the internal frequency reference, or tie to ground otherwise (see also section 2.4). Internally pulled-up.
57	Gnd	Gnd	0	Ground.	All ground pins must be connected.
59	Reserved			Reserved for future use	Leave unconnected.
61	SPI1_MOSI	O	LVTTL	µC SPI1 Master Out Slave In. The receiver is the SPI master. Max data rate 25Mbit/s.	Leave unconnected, or connect to SI of a SPI slave device.
63	SPI1_SCK	O	LVTTL	µC SPI1 SCK. The receiver is the SPI master. Max data rate 25Mbit/s.	Leave unconnected, or connect to SCK of a SPI slave device.
65	Reserved			Reserved for future use	Leave unconnected.
67	Gnd	Gnd	0	Ground.	All ground pins must be connected.
69	TTLnRS232	I	LVTTL	TTL vs RS232 selection for COM1 and COM2	Leave unconnected to enable COM1&2 RX lines on pins #19 and #21. Tie to ground to enable COM1&2 RX lines on pins #76 and #80.
71	Reserved			Reserved for future use	Leave unconnected.
73	ETH_TX+	O	10Base-T	Ethernet TX+	Leave unconnected if not used. See section 2.5 otherwise.
75	ETH_TX-	O	10Base-T	Ethernet TX-	Leave unconnected if not used. See section 2.5 otherwise.
77	ETH_RX+	I	10Base-T	Ethernet RX+	Leave unconnected if not used. See section 2.5 otherwise.
79	ETH_RX-	I	10Base-T	Ethernet RX-	Leave unconnected if not used. See section 2.5 otherwise.

Pin#	Name	Type	Level	Description	Connection Tips
2	Gnd	Gnd	0	Ground.	All ground pins must be connected.
4	USB_Vbus	P	4.35V $\leq V_{high} \leq$ 5.25V	USB Power. Cannot be used to power the receiver.	Leave unconnected if USB not used.
6	Gnd	Gnd	0	Ground.	All ground pins must be connected.
8	nPWR_TOGGLE	I	LVTTL	Power toggling input, active negative. Applying a negative pulse to this pin orders the receiver to enter stand-by mode if it was operating, and to start operation if it was in stand-by mode (see section 2.6 of this document).	Leave unconnected if not used (there is an internal pull-up). For proper operation, the duration of the negative pulse must be at least 200ms and no longer than 5s.
10	nRST_IN	I	LVTTL	Reset input, active negative. Receiver resets when driven low for at least 1ms.	Leave unconnected if not used.
12	Reserved			Reserved for future use	Leave unconnected.
14	Vantenna	P	3.15V <Vant< 12V	Antenna supply, max current per antenna 200mA. The voltage provided on this pin is transferred to the central conductor of the antenna MMCX connector.	
16	Vin	P	3.0V <Vin< 5.5V	Main power supply input	Both Vin pins (pin#16 and pin#15) must be tied together.
18	Gnd	Gnd	0	Ground.	All ground pins must be connected.
20	SCOM_TX1	O	LVTTL	Serial COM 1 transmit line (inactive state is high)	Leave unconnected if not used.
22	SCOM_TX2	O	LVTTL	Serial COM 2 transmit line (inactive state is high)	Leave unconnected if not used.
24	SCOM_TX3	O	LVTTL	Serial COM 3 transmit line (inactive state is high)	Leave unconnected if not used.
26	SCOM_TX4	O	LVTTL	Serial COM 4 transmit line (inactive state is high)	Leave unconnected if not used.
28	Gnd	Gnd	0	Ground.	All ground pins must be connected.
30	Reserved			Reserved for future use	Leave unconnected.
32	Gnd	Gnd	0	Ground.	All ground pins must be connected.
34	EVENT_A	I	LVTTL	Event A input (see Firmware User Manual for operation instructions)	Tie to ground if not used.
36	Gnd	Gnd	0	Ground.	All ground pins must be connected.
38	PPSout	O	LVTTL	PPS output. Polarity and rate user selectable. See Firmware User Manual for operation instructions. Pulse duration: 1.2ms.	Leave unconnected if not used.
40	Gnd	Gnd	0	Ground.	All ground pins must be connected.
42	Reserved			Reserved for future use	Leave unconnected.
44	Button	I	LVTTL	Input can be connected to a push button, typically used to enable and disable internal logging. High to low transitions are detected as "button pressed" events.	Debouncing must be done externally (no debouncing circuit on board). External pull up to 3.3V is necessary. Pull up to 3.3V if not used.
46	SCOM_RTS2	O	LVTTL	Serial COM 2 RTS line	Leave unconnected if not used.
48	SCOM_RTS3	O	LVTTL	Serial COM 3 RTS line	Leave unconnected if not used.
50	GPLED	O	LVTTL	General-purpose status indicator, see Appendix A.	Leave unconnected if not used. Max output current: 8mA.
52	GP3	O	LVTTL	GP3 in <b>setGPIOFunctionality</b> command.	Leave unconnected if not used. Max output current: 8mA.
54	GP2	O	LVTTL	GP2 in <b>setGPIOFunctionality</b> command.	Leave unconnected if not used. Max output current: 8mA.
56	PVTLED	O	LVTTL	PVT status indicator, see Appendix A.	Leave unconnected if not used. Max output current: 8mA.
58	Gnd	Gnd	0	Ground.	All ground pins must be connected.
60	Reserved			Reserved for future use	Leave unconnected.
62	SPI1_MISO	I	LVTTL	$\mu$ C SPI1 Master In Slave Out. The receiver is the SPI master. Max data rate 25Mbit/s.	Leave unconnected if not used, or connect to SO of a SPI slave device.
64	SPI1_nCS1	O	LVTTL	$\mu$ C chip select 1. This chip select corresponds to the SD memory card, see section 2.7.	Leave unconnected if not used.
66	Reserved			Reserved for future use	Leave unconnected.
68	Gnd	Gnd	0	Ground.	All ground pins must be connected.
70	Reserved			Reserved for future use	Leave unconnected.
72	Reserved			Reserved for future use	Leave unconnected.
74	RS232_TX1	O	RS232	Serial COM 1 transmit line (RS232 level)	Leave unconnected if not used.
76	RS232_RX1	I	RS232	Serial COM 1 receive line (RS232 level)	Leave unconnected if not used. This pin is active only if pin#69 is tied to ground.
78	RS232_TX2	O	RS232	Serial COM 2 transmit line (RS232 level)	Leave unconnected if not used.
80	RS232_RX2	I	RS232	Serial COM 2 receive line (RS232 level)	Leave unconnected if not used. This pin is active only if pin#69 is tied to ground.

## 2.4 Frequency Reference Selection

The receiver can get its 10-MHz frequency reference from its internal TCXO, or from an external reference source. The clock selection is controlled by the EXTREF\_STAT pin (pin#55), as follows:

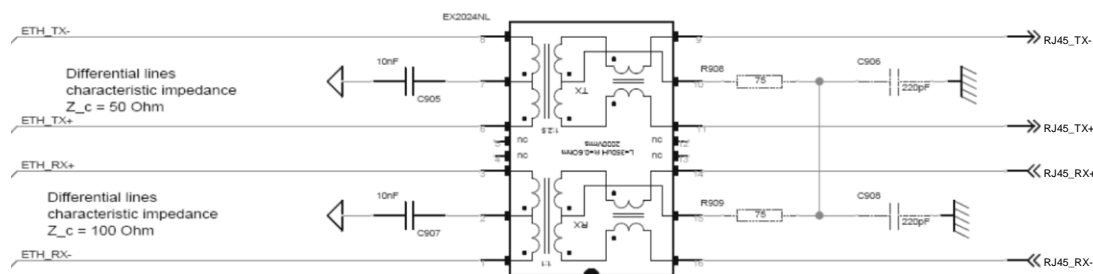
EXTREF_STAT pin level	Reference clock source	Signal at REF_O pin (pin#39)
Pin left open (there is an internal pull-up)	Internal TCXO	10-MHz square wave from the internal TCXO.
Pin tied to ground	REF_I pin (pin#43)	None. Output is disabled.

## 2.5 Ethernet



There is no isolation transformer in the AsteRx3\_OEM.

An exemplary 10Baset-T application circuit with isolation transformer is shown below. The four lines at the left are connected to the pins#73, #75, #77 and #79 of the 80-pin connector. The four lines at the right can be connected to a RJ-45 plug.



## 2.6 Stand-By Mode

In stand-by mode, the receiver consumes a fraction of its nominal power.

There are two ways to request the receiver to enter stand-by mode:

1. by using the command “**exePowerMode**” (see Command Line Interface Reference Guide);
2. by shortly driving pin#8 (nPOWER\_TOGGLE) low as indicated in section 2.3.

After having requested to enter stand-by mode, it takes up to 0.5 seconds for the receiver to actually enter low-power state. This time is required to unmount the SD memory card and stop all software activities.

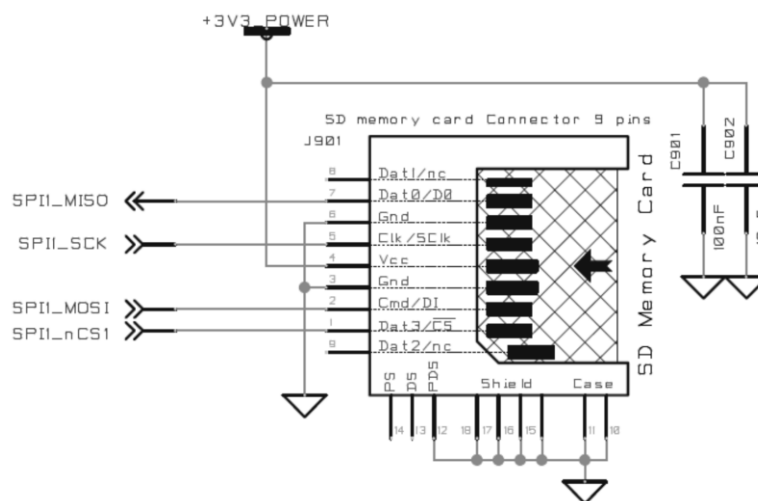
Waking up from stand-by mode is done in one of the following ways:

1. by sending one or more characters to the first serial port (COM1) at a baud rate lower than 4800baud;
2. by shortly driving pin#8 (nPOWER\_TOGGLE) low.

Note that if the receiver has been set in stand-by mode by the command “**exePowerMode, ScheduledSleep**”, it will wake up automatically after a prescribed amount of time.

## 2.7 SD Memory Card Usage

The receiver can interface to an external SD memory card through the SPI-related pins of the 80-pin connector. The recommended circuit to a 9-pin SD memory card socket is shown below. The four SPI lines connect to pins#61, #62, #63 and #64 of the 80-pin connector.



When using SD memory card logging, please take note of the following:

1. SDHC cards are not supported on firmware versions prior to 2.3.
2. The file system (FAT) is intended to not remove the card: the read-out of the data should be done through the serial, Ethernet, or USB interfaces.
3. To avoid data corruption, the card needs to be correctly unmounted before turning off the power supply. This can be done in two ways:
  - a. By entering the “**exePowerMode, StandBy**” command before turning off the receiver.
  - b. By having a sufficient reserve to power the receiver for at least 0.5 seconds after the disconnection of the main power (e.g. with capacitors). Using pin#8 (nPWR\_TOGGLE), an indication needs to be given that the power will be turned off.

All log files are stored in the directory /ssn/SSRC3 on the card.

Please note that some SD memory cards may not be compatible with Septentrio receivers. The following card types have been successfully tested:

XceedSD	SDHC 2GB
SanDisk	SDHC 4GB
Kingston	SDHC 16GB
STEC	SD 1GB
SMART	SD 1GB
SanDisk	SDHC 16GB
SanDisk	SDHC 32GB

## 2.8 Applicable Software Package

The AsteRx3\_OEM is compatible with Septentrio’s SSRC3 Software Packages.

## 2.9 Hardware Specifications

### 2.9.1 Power Consumption

Nominal operation: 3 W  
Stand-by mode : 15 mW

Max in-rush current: 1.3A at  $V_{in} = 3.3V$   
0.9A at  $V_{in} = 5.0V$

### 2.9.2 Temperature Range

Operational: -40 to +85 °C  
Storage: -55 to +85 °C

## Appendix A LED Status Indicators

LEDs (Light Emitting Diodes) report the status of key processes inside the receiver. On OEM boards, these LEDs are not present but output pins are reserved to drive external LEDs (max drive current 8mA).

It is assumed that the LED lights when the electrical level of the corresponding pin is high.

LED Name	LED Behaviour																
POWERLED	LED lights when the receiver is switched on.																
LOGLED	LED lights when data is being written to the internal SD memory card. If the logging rate is larger than 1 Hz, LED lights continuously.																
PVTLED	LED lights when a PVT solution is available.																
GPLED	General-purpose LED. The function of this LED is configured with the <b>setLEDMode</b> command. By default, this LED has the DIFFCORLED function (see below).																
DIFFCORLED	<p>Differential correction indicator. In rover PVT mode, this LED reports the number of satellites for which differential corrections have been provided in the last received differential correction message (RTCM or CMR).</p> <table> <tr> <th>LED behaviour</th><th>Number of satellites with corrections</th></tr> <tr> <td>LED is off</td><td>No differential correction message received</td></tr> <tr> <td>blinks fast and continuously (10 times per second)</td><td>0</td></tr> <tr> <td>blinks once, then pauses</td><td>1, 2</td></tr> <tr> <td>blinks twice, then pauses</td><td>3, 4</td></tr> <tr> <td>blinks 3 times, then pauses</td><td>5, 6</td></tr> <tr> <td>blinks 4 times, then pauses</td><td>7, 8</td></tr> <tr> <td>blinks 5 times, then pauses</td><td>9 or more</td></tr> </table> <p>The LED is solid 'ON' when the receiver is outputting differential corrections as a static base station.</p>	LED behaviour	Number of satellites with corrections	LED is off	No differential correction message received	blinks fast and continuously (10 times 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
LED behaviour	Number of satellites with corrections																
LED is off	No differential correction message received																
blinks fast and continuously (10 times 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																
TRACKLED	<table> <tr> <th>LED behaviour</th><th>Number of satellites in tracking</th></tr> <tr> <td>blinks fast and continuously (10 times per second)</td><td>0</td></tr> <tr> <td>blinks once, then pauses</td><td>1, 2</td></tr> <tr> <td>blinks twice, then pauses</td><td>3, 4</td></tr> <tr> <td>blinks 3 times, then pauses</td><td>5, 6</td></tr> <tr> <td>blinks 4 times, then pauses</td><td>7, 8</td></tr> <tr> <td>blinks 5 times, then pauses</td><td>9 or more</td></tr> </table>	LED behaviour	Number of satellites in tracking	blinks fast and continuously (10 times 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		
LED behaviour	Number of satellites in tracking																
blinks fast and continuously (10 times 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																