ashtech
A TRIMBLE COMPANY

ABX Series

Reference Manual

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Introduction to the ABX Series

ABX100, ABX800 and ABX802 (pictured) are state-of-the-art GNSS receivers intended for general-purpose, real-time, high-accuracy, absolute positioning applications, with additionally accurate heading measurements and relative positioning for some of the available models.

All receivers from the ABX series share the same weatherproof, lightweight, small-sized and rugged enclosure capable of accommodating either one GNSS MB100 board (ABX100), one GNSS MB800 board (ABX800) or two GNSS MB800 boards (ABX802).

Each receiver from the ABX series is fitted with a built-in power supply extending the input voltage range to between 9 and 36 V DC while maintaining a low power consumption regardless of the power input voltage.

Built in a weatherproof, rugged and small-size unit, the ABX receivers can be operated in harsh environments while requiring a minimum of space for their installation.

As lightweight units, all ABX receivers are also compatible with airborne applications for which weight considerations are critical.

ABX receivers are smart GNSS receivers built around the GPS/GLONASS/SBAS, single- or dual-frequency MB100 or MB800 board recently introduced in the market. Embedded Z-Blade™ technology in the board ensures powerful performance and a patented way to use multiple GNSS constellations for high-accuracy positioning solutions:

- Fast initialization and accuracy at long-range,
- Patented multi-constellation signal processing,
- Advanced multi-path mitigation and robust signal tracking,
- RTK solution maintained if data link is briefly dropped,
- Interoperability with any vendor's reference station transmitting GPS+GLONASS L1/L2 signals,
- “GNSS-centric” operation.

The table below gives an overview of the different features offered by the receivers from the Ashtech ABX series.

Features: / Models:	L1	L2	GPS	GLONASS	SBAS	Raw Data	RTK Base	RTK Rover	Internal Heading	UHF Radio
ABX100 P/N 990669-10	✔		✔		✔	✔				
ABX100 P/N 990669-11	✔		✔		✔	✔			✔	
ABX100 P/N 990669-12	✔			✔	✔	✔				
ABX100 P/N 990669-13	✔		✔	✔	✔	✔				
ABX100 P/N 990669-14	✔	✔	✔		✔	✔				
ABX800 P/N 990673-01	✔	✔	✔		✔	✔	✔			
ABX800 P/N 990673-02	✔	✔	✔		✔	✔	✔	✔	(external only)	
ABX800 P/N 990673-03	✔	✔	✔	✔	✔	✔	✔			
ABX800 P/N 990673-04	✔	✔	✔	✔	✔	✔	✔	✔	(external only)	
ABX800 P/N 990673-01-U	✔	✔	✔		✔	✔	✔			✔
ABX802 P/N 990673-20	✔	✔	✔		✔	✔	✔	✔	✔	
ABX802 P/N 990673-21	✔	✔	✔	✔	✔	✔	✔	✔	✔	
ABX802 P/N 990673-20-U	✔	✔	✔		✔	✔	✔	✔	✔	✔

Typical applications of ABX100 and ABX800 are:

- “Office” GNSS base station, used in conjunction with RTDS software or equivalent.
- “Field” base station connected to an external radio transmitter and a battery.
- On-board standalone GNSS rover in SBAS DGPS mode.
- On-board GNSS rover connected to its internal UHF option or an external communication device (radio, GPRS, CDMA) and used in DGPS, Flying RTK or RTK mode.
- ABX100 is also a low-cost solution for vector determination applications.

Typical applications of the ABX802 are:

- GNSS heading measurements for marine, military and civil (antenna pointing) applications, possibly combined with the delivery of an absolute RTK position.
- Relative positioning, delivering the accurate components of the baseline vector, possibly combined with the delivery of an absolute RTK position (machine guidance & control).
- Relative movement monitoring, heave compensation, wing deformation, etc.

List of Items

The tables below give an overview of the different items that may be delivered with your equipment. Depending on your purchase, only some of the listed items may have been shipped. Please refer to the packing list for an accurate description of the items that were ordered.

Ashtech reserves the right to make changes to the list of items given below without prior notice.

ABX100 Basic Supply

Item	Part No.	Picture
ABX100, L1 GPS+SBAS Configuration (Raw data, DGPS base & rover, 5-Hz output rate), includes: • MB100 board enclosure (pictured) • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [N]: GPS tracking – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [C]: Advanced multipath mitigation	990669-10	
ABX100, L1 GPS+SBAS Vector Configuration (Raw data, DGPS base & rover, 5-Hz output rate), includes: • MB100 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [N]: GPS tracking – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [C]: Advanced multipath mitigation – [D]:Internal heading NOTE: Option [D] enables heading determination on top of DGPS positioning.	990669-11	

Item	Part No.	Picture
ABX100, L1 GLONASS Configuration (Raw data, DGLONASS base & rover, 5-Hz output rate), includes: • MB100 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [G]: GLONASS tracking – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [C]: Advanced multipath mitigation	990669-12	
ABX100, L1 GPS+GLONASS Configuration (Raw data, DGPS base & rover, 5-Hz output rate), includes: • MB100 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [N]: GPS tracking – [G]: GLONASS tracking – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [C]: Advanced multipath mitigation	990669-13	
ABX100, L1/L2 GPS Configuration (Raw data, DGPS base & rover, 5-Hz output rate), includes: • MB100 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [N]: GPS tracking – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990669-14	

Optional Firmware Upgrades:

Item	Part No.
[G]: L1 GLONASS upgrade for MB100 / ABX100	680610
[N]: L1 GPS upgrade for MB100 / ABX100 (Only applicable to L1 GLONASS-only board.)	680669
[S]+[P]: L2 GPS upgrade for MB100 / ABX100	680611
[D]: Internal heading for MB100 / ABX100 (Allows the MB100 to compute L1 GPS+SBAS heading on top of standalone or SBAS positioning.)	680671
[K]: RTK base capability for MB100 / ABX100	680612
[F]: Flying RTK for MB100 / ABX100 (Allows MB100 to provide a float solution with decimeter-level accuracy. Does not allow ambiguity fixing.)	680672
[J]+[V]+[H]: RTK Rover for MB100 / ABX100 Includes RTK with Moving Base capability, as well as the capability to perform heading measurements if associated with an external device.	680613
[I]: RAIM (Ashtech proprietary RAIM)	680614
[T]: 10-Hz position/raw data update rate for MB100 / ABX100	680615
[W]: 20-Hz position/raw data update rate for MB100 / ABX100	680616

ABX800

Basic Supply

Item	Part No.	Picture
ABX800, L1/L2 GPS - RTK Base Configuration (Raw data, DGPS base & rover), includes: • MB800 board enclosure (pictured) • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [T]: 10-Hz output rate – [N]: GPS tracking – [K]: RTK Base – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-01	

Item	Part No.	Picture
ABX800, L1/L2 GPS - RTK Base & Rover Configuration (Raw data, DGPS base & rover), includes: • MB800 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [T]: 10-Hz output rate – [N]: GPS tracking – [K]: RTK Base – [J]: RTK Rover – [V]: RTK with Moving Base – [H]: Heading function – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation NOTE: Option [D] enables heading determination on top of SBAS positioning.	990673-02	
ABX800, L1/L2 GPS+GLONASS - RTK Base Configuration (Raw data, DGPS base & rover), includes: • MB800 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [T]: 10-Hz output rate – [N]: GPS tracking – [G]: GLONASS tracking – [K]: RTK Base – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-03	

Item	Part No.	Picture
ABX800, L1/L2 GPS+GLONASS RTK Base & Rover Configuration (Raw data, DGPS base & rover), includes: • MB800 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [T]: 10-Hz output rate – [N]: GPS tracking – [G]: GLONASS tracking – [K]: RTK Base – [J]: RTK Rover – [V]: RTK with Moving Base – [H]: Heading function – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-04	

Optional Firmware Upgrades:

Item	Part No.
[G]: L1 GLONASS upgrade for MB800 / ABX80x	680673
[F]: Flying RTK for MB800/ABX80x (Allows MB800 to provide a float solution with decimeter-level accuracy. Does not allow ambiguity fixing.)	680674
[J]+[V]+[H]: RTK Rover for MB800 / ABX80x Includes RTK with Moving Base capability, as well as the capability to perform heading measurements if associated with an external device.	680675
[W]: 20-Hz position/raw data update rate for MB800 / ABX80x	680676
[I]: RAIM (Ashtech proprietary RAIM)	680677
[O]: GALILEO upgrade for MB800 / ABX80x	680678
[Q]: GPS L5 upgrade for MB800 / ABX80x	680679

ABX800 With Internal UHF Radio

Basic Supply

Item	Part No.	Picture
ABX800, L1/L2 GPS - RTK Base Configuration with Internal UHF Transceiver (Raw data, DGPS base & rover), includes: • MB800 board enclosure (pictured) with internal **Pacific Crest XDL Micro TRx** (410-470 MHz, 12.5- or 25-kHz channeling, up to 0.5 W radiated power, UHF antenna ordered separately; see table below). • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options: – [T]: 10-Hz output rate – [N]: GPS tracking – [K]: RTK Base – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-01-U	

Choice of UHF antennas

Item	Part No.	Picture
Ashtech UHF whip antenna, TNC adaptor, band 410-430 MHz	C3310190-INT	
Ashtech UHF whip antenna, TNC adaptor, band 430-450 MHz	C3310196-INT	
Ashtech UHF whip antenna, TNC adaptor, band 450-470 MHz	C3310188-INT	

Optional Firmware Upgrades: Same as other ABX800 models.

ABX802 Basic Supply

Item	Part No.	Picture
ABX802, L1/L2 GPS Configuration (raw data, DGPS base & rover), includes: • Dual-MB800 board enclosure (pictured) • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options for each MB800 board: – [T]: 10-Hz output rate – [N]: GPS tracking – [K]: RTK Base – [J]: RTK Rover – [V]: RTK with Moving Base – [H]: Heading function – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-20	
ABX800, L1/L2 GPS+GLONASS Configuration (raw data, DGPS base & rover), includes: • Dual-MB800 board enclosure (pictured): • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options for each MB800 board: – [T]: 10-Hz output rate – [N]: GPS tracking – [G]: GLONASS tracking – [K]: RTK Base – [J]: RTK Rover – [V]: RTK with Moving Base – [H]: Heading function – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-21	

Available Firmware Options:

Item	Part No.
[G]: L1 GLONASS upgrade for MB800 / ABX80x	680673
[W]: 20-Hz position/raw data update rate for MB800 / ABX80x	680676
[O]: GALILEO upgrade for MB800 / ABX80x	680678
[Q]: GPS L5 upgrade for MB800 / ABX80x	680679

ABX802 With Internal UHF Radio

Basic Supply

Item	Part No.	Picture
ABX802, L1/L2 GPS Configuration (raw data, DGPS base & rover), includes: • Dual-MB800 board enclosure (pictured) with internal **Pacific Crest XDL Micro TRx** (410-470 MHz, 12.5- or 25-kHz channeling, up to 0.5 W radiated power, UHF antenna ordered separately; see table below). • Standard accessories (see *Standard Accessories on page 11*). • Pre-installed firmware options for each MB800 board: – [T]: 10-Hz output rate – [N]: GPS tracking – [K]: RTK Base – [J]: RTK Rover – [V]: RTK with Moving Base – [H]: Heading function – [L]: 1PPS output – [E]: External event (event marker) – [Y]: SBAS tracking – [S]: GPS L2CS tracking – [P]: GPS L2 tracking – [C]: Advanced multipath mitigation	990673-20-U	

Choice of UHF antennas

Item	Part No.	Picture
Ashtech UHF whip antenna, TNC adaptor, band 410-430 MHz	C3310190-INT	
Ashtech UHF whip antenna, TNC adaptor, band 430-450 MHz	C3310196-INT	
Ashtech UHF whip antenna, TNC adaptor, band 450-470 MHz	C3310188-INT	

Available Firmware Options:Same as other ABX802 models.

Recommended Antennas

ABX100	ABX800	ABX802	Item	Part No.	Picture
✔	✔		ASH-660 L1 GNSS antenna, gain: 38 dB	802133-INT	
✔	✔	✔	ASH-661 L1/L2/L5 GNSS antenna, gain: 38 dB	802135-INT	
✔	✔	✔	GNSS Machine/ Marine Antenna, 38-dB gain	111407-INT	
✔	✔		Compact L1 GNSS Drone & Machine Antenna (43-dB gain)	111874	

Standard Accessories

The items listed below are provided as standard with any of the receivers from the ABX series.

Item	Picture
AC/DC power kit	
Receiver-to-PC RS232 cable	
Mounting parts (consists of two sliding bars)	
Transport bag	
Battery power kit, includes primary SAE-terminated power cable + choice of two cable extensions to battery terminals, one with alligator clips, the other with screw terminals; both equipped with in-line, car type, 5-A fuse.	

Optional Accessories

The items listed below are made available as options for any of the receivers from the ABX series.

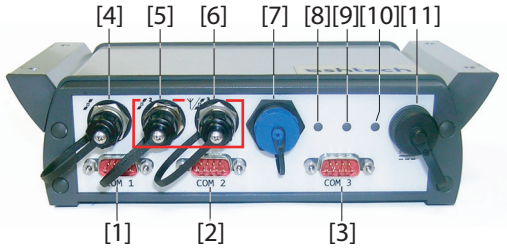
Item	Part No.	Picture
Receiver-to-PC RS232 cable	730049	
10-meter TNC-TNC coaxial cable	700439-INT	
30-meter, low-loss, LMR-240, TNCm-TNCm GNSS cable	702455-INT	
2-meter, USB/mini-B, USB/A waterproof cable	111632	

Software Utility

A software utility called “Ashtech Communicator” is available from Ashtech to help you perform the required settings on your unit. To download this software, go to ftp://ftp.ashtech.com/OEM,%20Sensor%20&%20ADU/Utility%20Software/Ashcom/.

Front Panel

(Pictured: ABX802)



[1]: Serial port COM 1

Model	COM 1 connected to
All ABX100 models	Not connected
All ABX800 models	MB800 board, port A
All ABX802 models	MB800 board #1, port A

[2]: Serial port COM 2

Model	COM 2 connected to
All ABX100 models	MB100, port A
All ABX800 models	MB800 board, port B
ABX802 models, except for ABX802 with UHF radio	MB800 board #1, port B
ABX802 with UHF radio	Not connected

[3]: Serial port COM 3.

Model	COM 3 connected to
All ABX100 models	MB100, port B
ABX800 models, except for ABX800 with UHF radio	MB800 board, port D
ABX800 with UHF radio	Not connected
All ABX802 models	MB800 board #2, port B

[4] : GNSS input #1 (TNC-f connector, fitted with protective cap, to be used to maintain watertightness when the connection is not used). Available on all models.

[5] : GNSS input #2 (TNC-f connector, fitted with a protective cap, to be used to maintain watertightness when the connection is not used). Available on all ABX100 and ABX802 models.

[6] : UHF antenna input (TNC-f connector, fitted with a protective cap, to be used to maintain watertightness when

the connection is not used). Only available an ABX800 and ABX802 models fitted with an internal UHF radio..

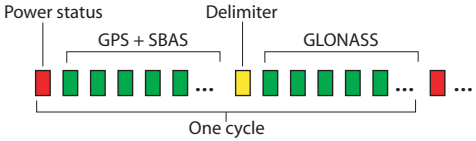
[7]: Standard USB 2.0 port in a protective circular connector

Model	USB port connected to
All ABX100 models	MB100, port C
All ABX800 models	MB800 board, port C
All ABX802 models	MB800 board #1, port C

[8] and **[9]**: GNSS indicator lights allowing you to monitor the power status and constellations of satellites for the one or two GNSS boards used. **[8]** refers to board #1 (GNSS input #1) and **[9]** to board #2 (GNSS input #2).

- The indicator lights use different colors within one cycle of monitoring:

Color	Meaning
Red	Power
Green	GNSS reception
Yellow	Delimiter between GPS/SBAS and GLONASS



- The sequence of red, green and yellow flashes describes the following:
  1. One red flash: Means the board is powered properly.
  2. Green flashes: The number of green flashes is equal to the number of GPS and SBAS satellites tracked and locked.
  3. One yellow flash: Ends the first sequence of green flashes (GPS+SBAS).
  4. Green flashes: The number of green flashes is equal to the number of GLONASS satellites tracked and locked.

     One red flash: Ends the second sequence of green flashes (GLONASS) and resumes the whole of the above sequence of flashes from the beginning.

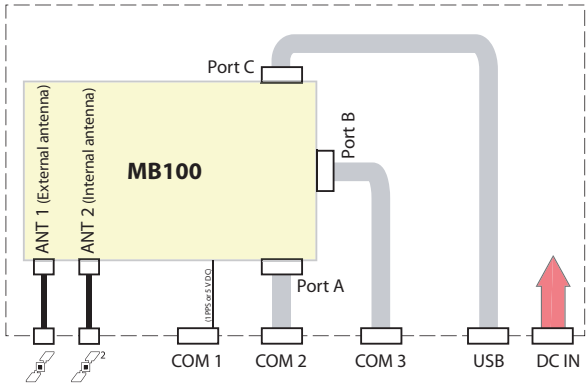
[10]: UHF indicator light: flashes red when data are transmitted, flashes green when data are received. Only used in ABX800 and ABX802 models fitted with an internal UHF radio.

[11]: DC input (9-36 V DC)

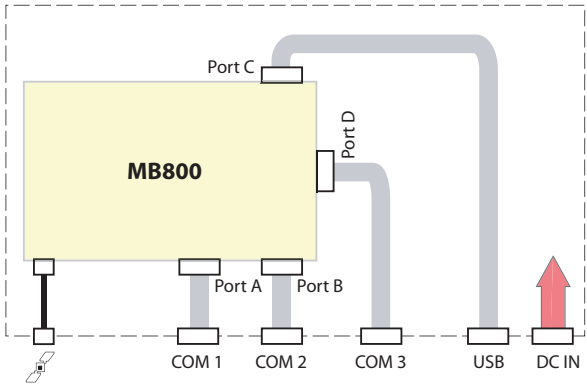
Internal Connections

The diagrams below give the internal structure and connections for each of the available models.

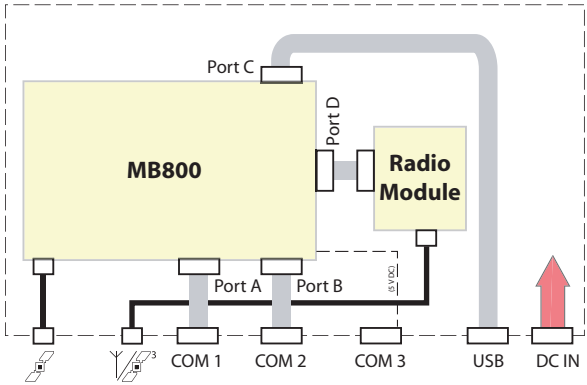
ABX100 Models:



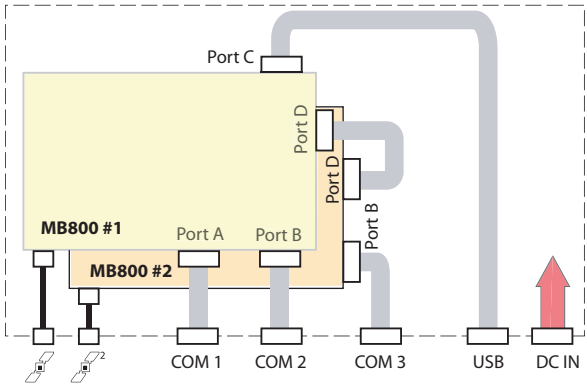
ABX800 Models:



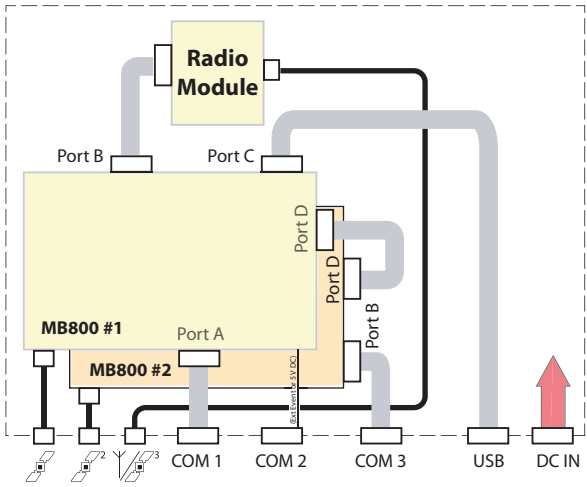
ABX800 With Internal UHF Radio:



ABX802 Models:



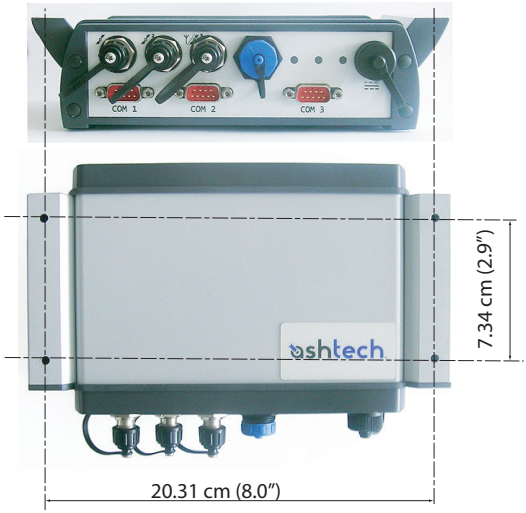
ABX802 With Internal UHF Radio:



ABX Receiver

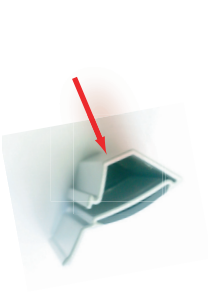
The ABX receivers can be mounted onto any flat support after you have secured the provided wall fitting kit onto the case. The kit consists of two identical sliding bars.

Prepare the support by drilling the required four holes (dia. 4 mm). The four holes form a rectangle of 20.31 cm in width and 7.34 cm in depth (see diagram below).



To secure each of the two sliding bars onto the case, turn the slide to the case as shown on the picture below, inserting the lower part first into the groove, then just push the bar against the case. This will securely fasten the bar onto the side of the case.

If for some reason you need to remove a bar, squeeze it as shown on the picture below. By squeezing the bar, you temporarily deform the aluminum plate thus releasing it from the case:



UHF Antenna

Consider the following installation instructions for the UHF whip antenna delivered with ABX800 P/N 990673-01-U or ABX802 P/N 990673-20-U.

- For best performance, the UHF antenna should always be installed in vertical position.
- For best coverage, the UHF antenna should always be installed as high as possible. This means the antenna should never be connected directly to the front panel connector, but through a standard coaxial cable, with a maximum length of 5 meters, in order to limit signal loss in the cable. For longer distances, a low-loss coaxial cable should be used.

  Choosing the appropriate bracket to securely install this antenna is left to the user's responsibility.
- Special care should be taken in the choice of the site where you install a base that uses its internal UHF radio to broadcast corrections.

  The purpose is to optimize the radio coverage in the directions in which rovers will have to pick up corrections.

  Prefer locations overhanging the working area with no, or a minimum of obstructions along the direct propagation path. The requirements in terms of installation site for best radio performance and coverage are normally those that also offer the best GNSS reception conditions for the base.

Whatever the power source used, always use the power cable provided. The cable end fitted with a 4-pin plug should be connected to the DC power input on the ABX receiver. Fully tightening the plug onto the DC power input will make the power connection waterproof.

If you are using the power line, simply connect the other end of the power cable to the end of the cable coming out of the AC/DC power unit. Then connect the AC/DC power unit to the power line.

If you are using another external DC power source, like a battery for example, you may not need the connector fitted at this end of the cable. Get rid of it by simply shortening the cable using pliers. Then strip the wires and connect them to the type of connector you wish to use (alligator clips or banana pins for example).

In all cases, it is advisable to fit the power source used with a circuit breaker (1-A fuse).

Using Serial Commands

Serial commands ($PASHS.., $PASHQ,..) can be run from a personal computer to customize the configuration of your receiver. Commands are sent via any of the available receiver ports –including the USB port– using the appropriate data cable.

The first time you connect your ABX receiver to a computer through a USB link, you will be asked to install the USB driver. This driver can be found on the Ashtech-oem web site (www.ashtech-oem.com).

With ABX802 models, **your commands should necessarily be sent directly to the concerned board**, through one of its ports accessible from the receiver front panel. None of the two boards can be used to forward a command from your computer to the other board.

On your computer, use a communication tool to type and send your serial commands. For example you may use "Ashtech Communicator" (this software can be downloaded from the Ashtech-oem web site as well), or any other terminal emulation program, such as HyperTerminal (a standard Windows communication accessory).

When using HyperTerminal, perform the following settings after creating a new connection and before typing your first command:

- In the HyperTerminal menu bar, select **File>Properties**.
- Click on the **Settings** tab.
- Click on the **ASCII Setup** button.
- Enable the following two options: **Send line ends with line feeds** and **Echo typed characters locally**. This will automatically complete all your command lines with <cr><lf> characters and allow you to see in real time the commands you are typing.
- Click **OK** twice to close the Properties window.

Precautions to Be Taken at Power-Off

Whenever you send a $PASHS command (set command) in your ABX receiver, you must be aware that the resulting change is not saved to backup memory instantly, but only after a certain delay, which is estimated to be not greater than 120 seconds. There is a requirement behind this operating mode, which is to extend the chip's life cycle as much as possible by reducing the number of write operations in the memory chip.

Because the $PASHS commands causing the receiver to re-start (i.e. INI, RTS, CFG, POP, PWR, etc.) are also part of the "delayed" commands (seen from the backup memory), it is therefore recommended that you run $PASHS,PWR,OFF about 2 to 3 seconds before you turn off the receiver or you initiate a power cycle or reset:

$PASHS,PWR,OFF*43

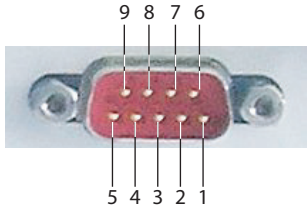
This command is used to prepare the receiver to be powered off by saving all your recent settings and parameters to the non-volatile memory. This command DOES NOT switch off the receiver.

If your ABX receiver is fitted with two boards and $PASHS commands have been applied to both of them, then the $PASHS,PWR,OFF command should be run in each of them.

Port Pinouts

Serial Data Ports

COM 1, COM 2 and COM 3. Three waterproof DB9 connectors, type 4STD09PBU99R40X.



RS232 Configuration (all ports):

Pin	COM 1	COM 2	COM 3
1	NC	NC	NC
2	Receive Data (RX)	Receive Data (RX)	Receive Data (RX)
3	Transmit Data (TX)	Transmit Data (TX)	Transmit Data (TX)
4	NC	NC	NC
5	Ground	Ground	Ground
6	NC	NC	NC
7	Request To Send (RTS)	Request To Send (RTS)	NC
8	Clear To Send (CTS)	Clear To Send (CTS)	NC
9	1PPS / 5V DC	Ext. Event input / 5 V DC	NC / 5 V DC

NOTE: Pin 9 on the three ports may alternately be used to deliver 5 V DC. This requires the use of a jumper on each port. Please contact the Ashtech Technical Support for more information. Inserting the jumper relevant to COM1 means you remove the 1PPS output from this port. Inserting the jumper relevant to COM2 means you remove the external event input from this port. When the 5 V DC is made available on either of these ports, remember the total DC current taken from the 5 V DC should not exceed 1 Amp. If for example, the device connected to COM 1 consumes 700 mA, then only 300 mA can be shared between the other two ports.

1PPS Signal Output:

- Available on COM 1, pin 9 (on ALL ABX models).
- On ABX802 models, provided by board #1.

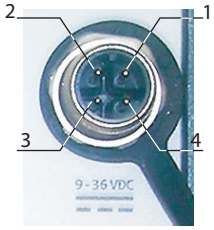
External Event Signal Input:

- Located on COM 2, pin 9 (on ALL ABX models).

- On ABX802 models, applied to board #1.

Power In

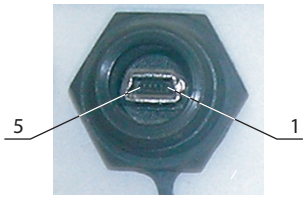
4-C Connector, type 99-3431-601-04, fitted with a sealing cap.



Pin	Description
1	Ground
2	Power Input (9-36 V DC)
3	Power Input (9-36 V DC)
4	Ground

USB Port, Device

USB Mini-B, 5 contacts, type PX0446, embedded in a protective circular connector, fitted with a sealing cap.



Pin	Signal Name
1	NC
2	D-
3	D+
4	NC
5	Ground

NOTE: Pin 1 is usually dedicated to carrying a +5 VDC power voltage for the USB device. In ABX receivers, the USB port is powered from the unit itself, thus making useless the need for providing an external +5 VDC via this pin.

Physical Characteristics (sliding bars included):

- Overall dimensions (W x H x D): 221.5 x 58 x 160 mm (8.72 x 2.28 x 6.3")
- Weight:
  - ABX100: 1.225 kg (2.70 lb)
  - ABX800: 1.247 kg (2.74 lb)
  - ABX800 with internal UHF radio:1.312 kg (2.89 lb)
  - ABX802: 1.316 kg (2.90 lb)
  - ABX802 with internal UHF radio: 1.381 kg (3.04 lb)

Environmental characteristics:

- Operating temperature: -30° to +60°C (-22° to +140°F)
- Storage temperature: -40° to +70°C (-40° to +158°F)
- Humidity: 100% condensing
- Sealing: IP67
- Shock: MIL-STD 810F, Fig. 516.5-10 (40 g, 11 ms, sawtooth)
- Vibration: MIL-STD 810F, Fig. 514.5C -17

Power requirements:

- Input voltage range: 9-36 V DC (must be SELV, for "Safety External Low Voltage")
- Power input protected from overvoltages (70 Volts max.)
- Protected from accidental polarity reversal
- Protected against electrical disturbances of vehicles with 12V and 24V supply voltages (ISO 7637 standard)
- Typical power consumption with 12-V DC input and GNSS antenna(s) connected:
  - ABX100: 2.1 W (one antenna); 2.4 W (two antennas)
  - ABX800: 3.05 W (one antenna)
  - ABX800 with internal UHF radio receiver: 3.55 W
    ABX800 with 1-W transmitting UHF radio: 6.5 W
  - ABX802: 5.8 W (two antennas)
  - ABX802 with internal UHF radio receiver: 6.26 W
- GNSS antenna(s) powered from 5 V DC (±10%); DC current: 100 mA max., 5 mA min.
- AC/DC power unit: GLOBTEK, model GTM41060-2512
  Input rated 100-240 V, 50-60 Hz, 0.6 A
  Output rated 12 V DC, 2.08 A.

For more information on how to communicate with the ABX100 using proprietary $PASH commands, see *MB100 Reference Manual*. This manual provides all the syntax details you need to know to use these commands, and also more explanations on the various functions offered by the board.

⚠

Important! All ABX100 models are shipped from Ashtech with a reset configuration (the $PASHS,RST command is run in all receivers before shipping). At some point in the future, if there is some doubt about the configuration running your ABX100, Ashtech recommends you first run the $PASHS,RST command before you start working on the design of a new configuration for your receiver.

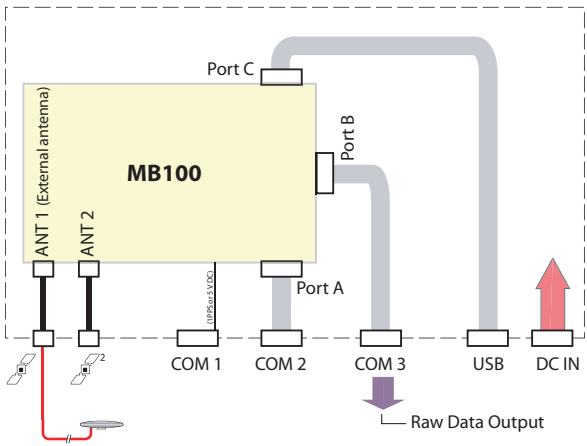
Rover Delivering Raw Data

Applicable to any standard ABX100 model.

GNSS raw data can be output in three different ways:

- Legacy Ashtech raw messages
- Ashtech proprietary ATOM messages
- Standardized RTCM 3 messages

The resulting files can then be converted into RINEX format.



Raw Data Output in Legacy Ashtech Format

Run the series of commands below to enable the output of raw data messages in the legacy Ashtech format on COM 3 (internal port B):

$PASHS,RAW,PBN,B,ON

$PASHS,RAW,MPC,B,ON
$PASHS,RAW,SNV,B,ON
$PASHS,RAW,SNG,B,ON
$PASHS,RAW,SNW,B,ON
$PASHS,RAW,ION,B,ON
(default output rates for PBN and MPC: 1 second)
(default output rates for SNV, SNG and ION: 900 seconds)
(default output rate for SNW: 120 seconds)

To disable all these messages, run the following command:

$PASHS,RAW,ALL,B,OFF

Raw Data Output in Ashtech Proprietary ATOM Format

Run the series of commands below to enable the output of raw data messages in the Ashtech proprietary ATOM format on COM 3 (internal port B):

$PASHS,ATM,RNX,B,ON,1,&SCN,0
$PASHS,ATM,NAV,B,ON
$PASHS,ATM,ATR,B,ON
(Default output rates are 300 seconds for ATM,NAV, and 30 seconds for ATM,ATR)

To disable all these messages, run the following command:

$PASHS,ATM,ALL,B,OFF

Raw Data Output in Standardized RTCM 3 Format

Run the series of commands below to enable the output of raw data messages in standardized RTCM 3 format on COM 3 (internal port B):

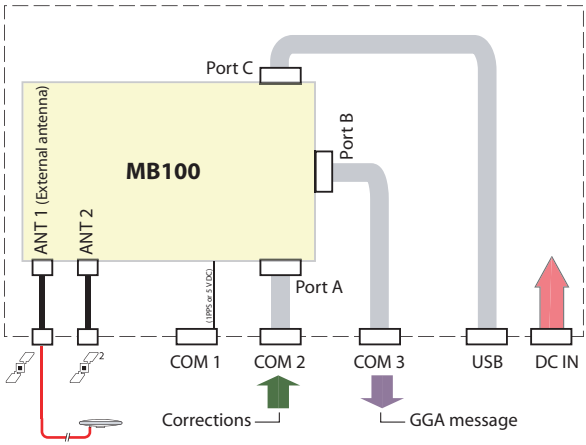
$PASHS,RT3,1004,B,ON
$PASHS,RT3,1006,B,ON
$PASHS,RT3,1012,B,ON
$PASHS,RT3,1013,B,ON
$PASHS,RT3,1019,B,ON
$PASHS,RT3,1020,B,ON
$PASHS,RT3,1033,B,ON

To disable all these messages, run the following command:

$PASHS,RT3,ALL,B,OFF

Rover Delivering Flying RTK Position

Applicable to any ABX100 model with [F] firmware option added.



1. Run the following command to choose COM 2 (internal port A) as the port acquiring incoming differential corrections (this is the case by default).

   $PASHS,DIF,PRT,A

2. Feed the corrections stream (in RTCM 2, RTCM 3, ATOM, CMR, CMR+, DBEN or LRK -TOPAZE- format) into the ABX100 through COM 2 (A).
3. Run the following command to ask the board to indefinitely deliver a float solution of the “Flying RTK” type:

   $PASHS,CPD,AFP,0

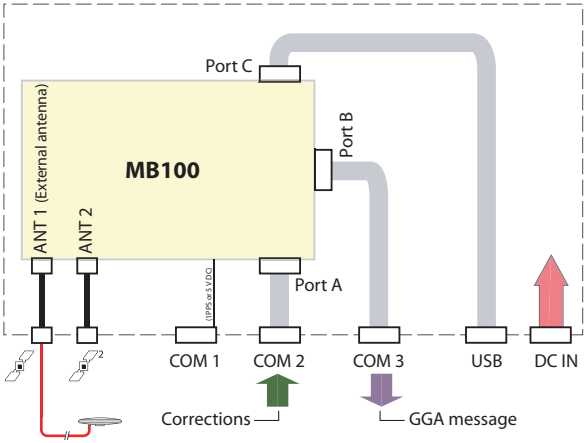
4. Run the following command to enable the output of the position result on COM 3 (B) as a standard NMEA GGA message, at 10 Hz for example:

   $PASHS,NME,GGA,B,ON,0.1

NOTE: In this application, the baseline length can be as long as 1000 km without affecting the decimetric accuracy and reliability accuracy of the position solution. Flying RTK is a powerful alternative to L-band solutions without additional costs, provided a cellular connection can be implemented through an external modem connected locally to the ABX100.

Rover Delivering RTK Position

Applicable to any ABX100 model with [J]+[V]+[H] firmware options added.



1. Run the following command to choose COM 2 (internal port A) as the port acquiring incoming differential corrections (this is the case by default).

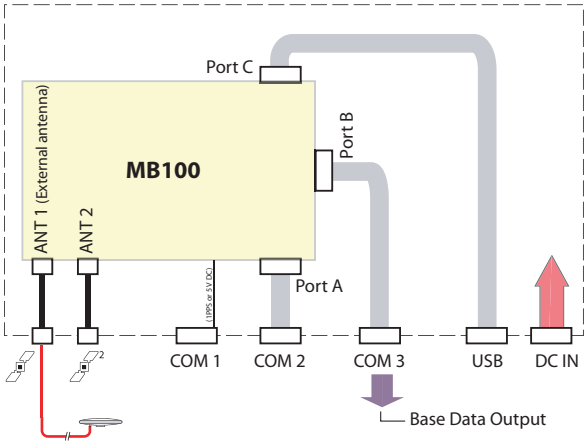
   $PASHS,DIF,PRT,A

2. Feed the corrections stream (in RTCM 2, RTCM 3, ATOM, CMR, CMR+, DBEN or LRK -TOPAZE- format) into the ABX100 through COM 2 (A).
3. Run the following command to enable the output of the position result on COM 3 (B) as a standard NMEA GGA message, at 10 Hz for example:

   $PASHS,NME,GGA,B,ON,0.1

Setting ABX100 as an RTK Base

Applicable to any ABX100 model with [K] firmware option added.



Enter the receiver's known position using the $PASHS,POS command. For example, run this command if your position is lat 55°39.358908'N, lon 37°31.607218' E and height 268.26 m:

$PASHS,POS,5539.358908,N,3731.607218,E,268.26

If the base position is unknown, you can use one of the two commands below if you wish to use respectively the current or averaged autonomous position, as provided by the receiver.

$PASHS,POS,CUR

or

$PASHS,POS,AVG,<averaging time in seconds>

The first command picks up the position solution at the moment you run the command and makes it the base position, whereas the second one averages that position over the requested time (max. one day) and then makes the resulting averaged position the base position.

Then the ABX100 can be configured as:

- RTCM 2.3 base
- RTCM 3.1 base
- ATOM base
- CMR base
- CMR+ base

Setting up the ABX100 as an RTCM 2.3 Base

Run the series of commands below to enable the output of the required RTCM 2.3 messages on COM 3 (B):

$PASHS,RT2,18,B,ON
$PASHS,RT2,19,B,ON
$PASHS,RT2,24,B,ON,13
$PASHS,RT2,23,B,ON,31
(Default output rates for message types 18 and 19: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,RT2,ALL,B,OFF

Setting up the ABX100 as an RTCM 3.0 Base

Run the series of commands below to enable the output of the required RTCM 3.0 messages on COM 3 (B):

$PASHS,RT3,1004,B,ON
$PASHS,RT3,1012,B,ON
$PASHS,RT3,1006,B,ON,13
$PASHS,RT3,1033,B,ON,31
(Default output rates for message types 1004 and 1012: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,RT3,ALL,B,OFF

Setting up the ABX100 as an ATOM Base

Run the series of commands below to enable the output of standard ATOM messages on COM 3 (B):

$PASHS,ATM,RNX,B,ON,1
(or $PASHS,ATM,RNX,B,ON,1,&SCN,4)
$PASHS,ATM,ATR,B,ON,31

For the base to generate compact ATOM data (instead of standard data, as described above), run the following commands:

$PASHS,ATM,RNX,B,ON,1,&SCN,100
$PASHS,ATM,ATR,B,ON,31

For the base to generate super-compact ATOM data (instead of standard or compact data, as described above), run the following commands:

$PASHS,ATM,RNX,B,ON,1,&SCN,101
$PASHS,ATM,ATR,B,ON,31

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,ATM,ALL,B,OFF

Setting up the ABX100 as a CMR Base

Run the series of commands below to enable the output of the required CMR messages on COM 3 (B):

$PASHS,CMR,0,B,ON
$PASHS,CMR,3,B,ON
$PASHS,CMR,1,B,ON,13
$PASHS,CMR,2,B,ON,31
(Default output rates for CMR 0 and 3: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,CMR,ALL,B,OFF

Setting up the ABX100 as a CMR+ Base

Run the series of commands below to enable the output of the required CMR+ messages on COM 3 (B):

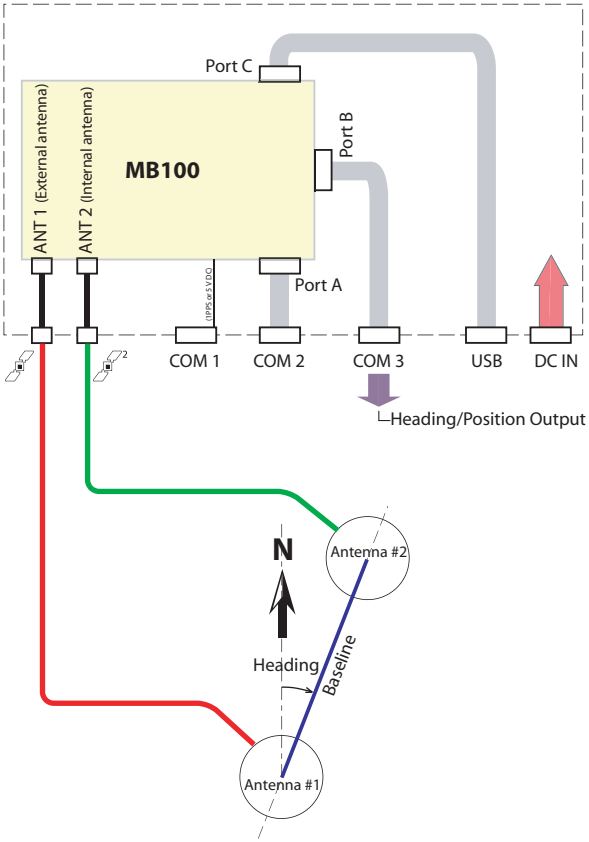
$PASHS,CMP,0,B,ON
$PASHS,CMP,3,B,ON
(Default output rates for CMP 0 and 3: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,CMP,ALL,B,OFF

Setting ABX100 to Deliver Heading Measurements

Applicable to standard ABX100 P/N 990669-11 or any ABX100 model with [D] firmware option added.



Use the following command to configure the ABX100 in internal heading mode. This will re-start the ABX100.

$PASHS,CFG,DUO

Use the following command to set the internal port H allowing corrections to be applied within the ABX100:

$PASHS,DIF,PRT,H

Run the heading mode:

$PASHS,CPD,ARR,MOD,ON

Auto-calibration is recommended using the command below:

$PASHS,CPD,ARR,LEN,0

Use one or more of the commands below to let the ABX100 generate the desired output messages on COM 3 (port B), at a 1-second output rate for example:

- Heading information in NMEA HDT message:
  $PASHS,NME,HDT,B,ON

- Heading information in NMEA ATT message:
  $PASHS,NME,ATT,B,ON

- Attitude information in ATOM message ATM,PVT (HPR block):
  $PASHS,ATM,PVT,B,ON,1,&HPR

NOTES:

All the data delivered in these NMEA/ATOM messages are tagged to Antenna #2.

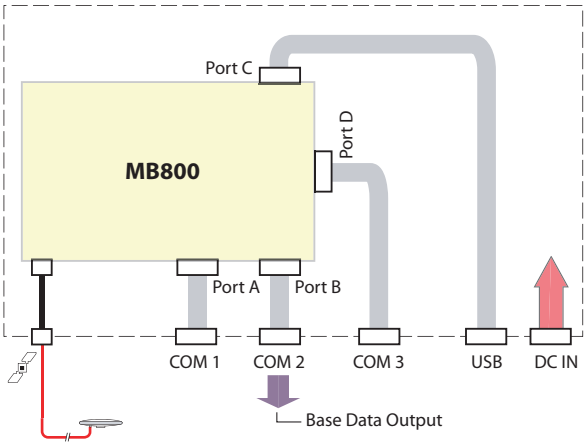
Refer to *Appendix on page 58* for more information on how ABX100 starts delivering heading measurements.

For more information on how to communicate with the ABX800 using proprietary $PASH commands, see *MB800 Reference Manual*. This manual provides all the syntax details you need to know to use these commands, and also more explanations on the various functions offered by the board.

⚠ **Important!** All ABX800 models are shipped from Ashtech with a reset configuration (the $PASHS,RST command is run in all receivers before shipping). At some point in the future, if there is some doubt about the configuration running your ABX800, Ashtech recommends you first run the $PASHS,RST command before you start working on the design of a new configuration for your receiver.

RTK Base

Applicable to any standard ABX800 model.



Enter the receiver's known position using the $PASHS,POS command. For example, run this command if your position is lat 55°39.358908'N, lon 37°31.607218' E and height 268.26 m:

$PASHS,POS,5539.358908,N,3731.607218,E,268.26

If the base position is unknown, you can use one of the two commands below if you wish to use respectively the current or averaged autonomous position, as provided by the receiver.

$PASHS,POS,CUR

or

$PASHS,POS,AVG,<averaging time in seconds>

The first command picks up the position solution at the moment you run the command and makes it the base position, whereas the second one averages that position over the requested time (max. one day) and then makes the resulting averaged position the base position.

Then the ABX800 can be configured as:

- RTCM 2.3 base
- RTCM 3.1 base
- ATOM base
- CMR base
- CMR+ base

Setting up the ABX800 as an RTCM 2.3 Base

Run the series of commands below to enable the output of the required RTCM 2.3 messages on COM 2 (B):

$PASHS,RT2,18,B,ON
$PASHS,RT2,19,B,ON
$PASHS,RT2,24,B,ON,13
$PASHS,RT2,23,B,ON,31
(Default output rates for message types 18 and 19: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,RT2,ALL,B,OFF

Setting up the ABX800 as an RTCM 3.0 Base

Run the series of commands below to enable the output of the required RTCM 3.0 messages on COM 2 (B):

$PASHS,RT3,1004,B,ON
$PASHS,RT3,1012,B,ON
$PASHS,RT3,1006,B,ON,13
$PASHS,RT3,1033,B,ON,31
(Default output rates for message types 1004 and 1012: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,RT3,ALL,B,OFF

Setting up the ABX800 as an ATOM Base

Run the series of commands below to enable the output of standard ATOM messages on COM 2 (B):

$PASHS,ATM,RNX,B,ON,1

(or $PASHS,ATM,RNX,B,ON,1,&SCN,4)
$PASHS,ATM,ATR,B,ON,31

For the base to generate compact ATOM data (instead of standard data, as described above), run the following commands:

$PASHS,ATM,RNX,B,ON,1,&SCN,100
$PASHS,ATM,ATR,B,ON,31

For the base to generate super-compact ATOM data (instead of standard or compact data, as described above), run the following commands:

$PASHS,ATM,RNX,B,ON,1,&SCN,101
$PASHS,ATM,ATR,B,ON,31

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,ATM,ALL,B,OFF

Setting up the ABX800 as a CMR Base

Run the series of commands below to enable the output of the required CMR messages on COM 2 (B):

$PASHS,CMR,0,B,ON
$PASHS,CMR,3,B,ON
$PASHS,CMR,1,B,ON,13
$PASHS,CMR,2,B,ON,31
(Default output rates for CMR 0 and 3: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,CMR,ALL,B,OFF

Setting up the ABX800 as a CMR+ Base

Run the series of commands below to enable the output of the required CMR+ messages on COM 2 (B):

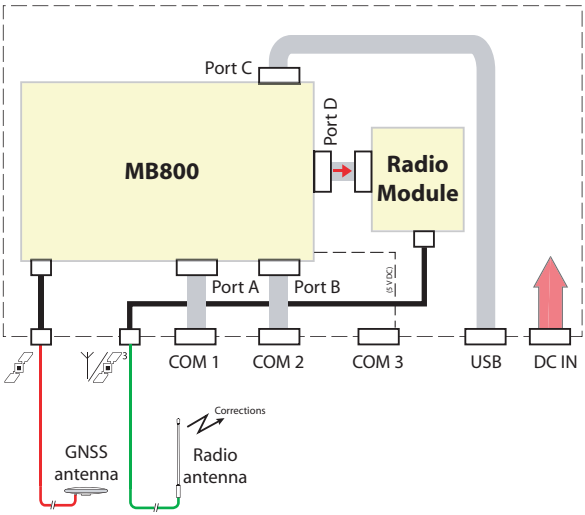
$PASHS,CMP,0,B,ON
$PASHS,CMP,3,B,ON
(Default output rates for CMP 0 and 3: 1 second)

Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:

$PASHS,CMP,ALL,B,OFF

RTK Base With UHF Radio

Applicable to standard ABX800 model P/N 990673-01-U.



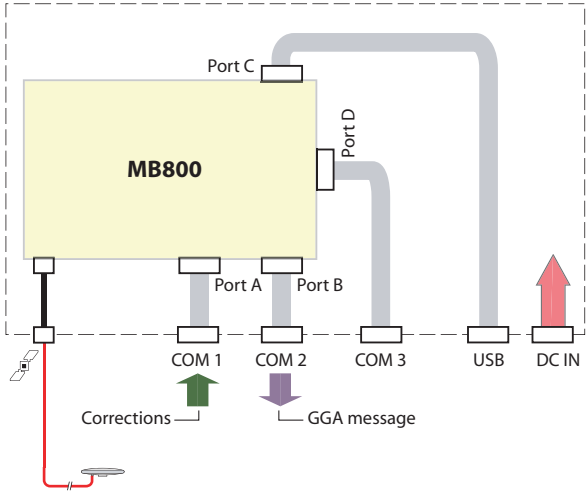
Follow the same configuration instructions as those provided for *RTK Base on page 35*, except that the generated corrections messages should be routed to the internal radio via MB800 port D. For example, run this script to set an RTCM3.0 base:

$PASHS,RT3,1004,D,ON
$PASHS,RT3,1012,D,ON
$PASHS,RT3,1006,D,ON,13
$PASHS,RT3,1033,D,ON,31

(Default output rates for message types 1004 and 1012: 1 second)

RTK Rover

Applicable to standard ABX800 models P/N 990673-02 and P/N 990673-04 or any other ABX800 model with [J]+[V]+[H] firmware options added.



1. Run the following command to choose COM 1 (internal port A) as the port acquiring incoming differential corrections (this is the case by default).

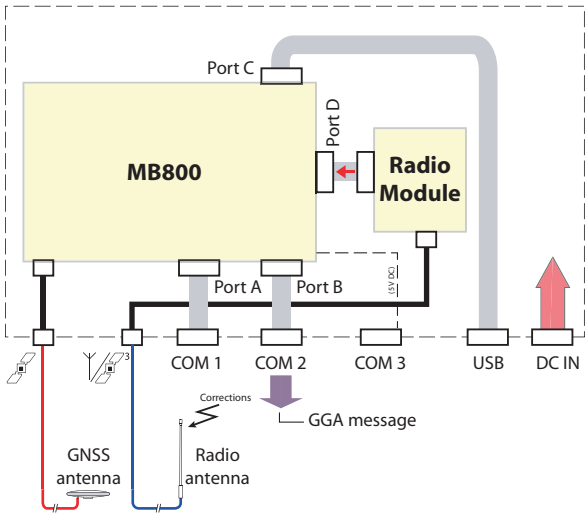
   $PASHS,DIF,PRT,A

2. Feed the corrections stream (in RTCM 2, RTCM 3, ATOM, CMR, CMR+, DBEN or LRK -TOPAZE- format) into the ABX800 through COM 1 (A).
3. Run the following command to enable the output of the position result on COM 2 (B) as a standard NMEA GGA message, at 10 Hz for example:

   $PASHS,NME,GGA,B,ON,0.1

RTK Rover With UHF Radio

Applicable to standard ABX800 model P/N 990673-01-U with [J]+[V]+[H] firmware options added.



1. Run the following command to choose internal port D as the port acquiring incoming differential corrections.

   $PASHS,DIF,PRT,D

2. Set port D to operate at 38400 Bd:

   $PASHS,SPD,D,7

3. Run the following command to enable the output of the position result on COM 2 (port B) as a standard NMEA GGA message, at 10 Hz for example:

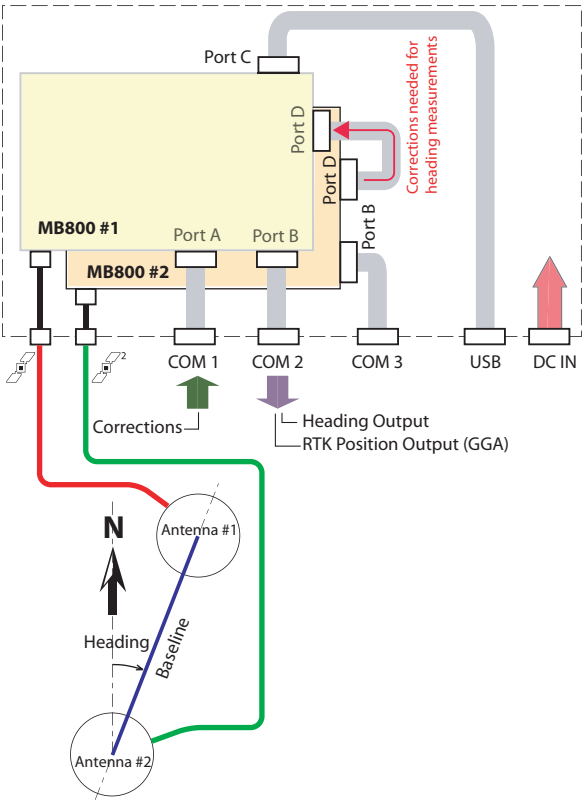
   $PASHS,NME,GGA,B,ON,0.1

For more information on how to communicate with the ABX800 using proprietary $PASH commands, see *MB800 Reference Manual*. This manual provides all the syntax details you need to know to use these commands, and also more explanations on the various functions offered by the board.

Important! All ABX802 models are shipped from Ashtech with a reset configuration (the $PASHS,RST command is run in all receivers before shipping). At some point in the future, if there is some doubt about the configuration running your ABX802, Ashtech recommends you first run the $PASHS,RST command on each board before you start working on the design of a new configuration for your receiver.

Delivering Heading Measurements + RTK Position

1st Case: ABX802 Without an Internal UHF Radio



Heading Output. Make sure you are sending your commands directly to board #2 through **COM 3** (default baud rate: 115200).

Board #2 needs to be configured as a moving base delivering the data (in ATOM format) required by board #1 to make heading measurements.

1. By default, port D is set to 115200 Bd. Keep this setting. If the baud rate was changed, use the following command to restore this setting:

   $PASHS,SPD,D,9

2. Allow board #2 to use a moving position as the reference position, thus making it a moving base. This is achieved using the following command sent to this board:

$PASHS,POS,MOV

3. For example, to have board #2 generating **ATOM base data at 10 Hz on its port D**, run the following commands:

   $PASHS,ATM,ATR,D,ON,31
   $PASHS,ATM,RNX,D,ON,0.1,&SCN,204
   (ATR for ATOM attribute data at 31 s and RNX for GPS/GLONASS data at 10 Hz.)
   Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:
   $PASHS,ATM,ALL,D,OFF

Now that board #2 has been set up as a moving RTK base, make sure you are sending your commands directly to board #1 through one of its serial ports (**COM 2** for example; default baud rate: 115200).

1. Set port D to be the port receiving incoming differential corrections:

   $PASHS,DI2,PRT,D
   (Second RTK engine is used for heading determination)

2. Let board #1 know that it is using data from a moving base by running the following command:

   $PASHS,CP2,BAS,1

3. When base data from a moving base are used, it's better to have Vector Output mode="Time-Tagged" as long as the required output rate does not exceed 10 Hz and there is no particular latency requirement. Run the following command to choose this mode in board #1:

   $PASHS,VEC,TT
   (Or else $PASHS,VEC,FST for output rates from 1 Hz to 20 Hz and shortest possible latency.)

4. You may need to use the $PASHS,CPD,ARR,OFS command if the two GNSS antennas are not at the same height and/or they are not aligned with, or perpendicular to the vehicle axis. See NOTES below.
5. Enable the heading mode in board #1:

   $PASHS,CP2,ARR,MOD,ON
   $PASHS,CP2,MOD,HED

6. Follow one of the procedures below, depending on whether the baseline length is known or not:
   – If the baseline is unknown, or known but with not enough accuracy, start the auto-calibration process by

simply running the following command (this procedure is recommended in all cases):

$PASHS,CP2,ARR,LEN,0

Through this command, the baseline length is forced to "0" thus starting the auto-calibration process. The two antennas should remain static throughout the auto-calibration process.

On completion of the auto-calibration phase, board #1 will automatically start delivering real-time heading measurements. See also *Appendix on page 58*.

Remember this process should be run every time you need to change the baseline length while the arrow mode is on.

– Or, if the baseline length is accurately known (for example 1.585 m), just type the following command and then board #1 board will automatically start delivering heading measurements, provided output messages have been defined (see next step):

(Example with baseline length= 1.585 m):

$PASHS,CP2,ARR,LEN,1.585

7. Define the output messages you would like board #1 to deliver. Typically, in heading mode, you will want to output the ATT (attitude) or HDT (heading) message, depending on your application:

$PASHS,NME,ATT,B,ON[,x]
$PASHS,NME,HDT,B,ON[,x]

Where "x" is the output rate. See NOTES below for more information about "x".

NOTES:

– The ATT message is output for all epochs and includes an RTK "fixed/float" flag. The HDT message is output only for fixed ambiguity epochs.

– The ATT message includes heading and pitch or heading and roll. The HDT message only includes heading.

– If the baseline elevation and azimuth offset with respect to the vehicle center line are known, the user can enter these values, in which case vehicle attitude, instead of baseline attitude, will be output.

– If "x" is omitted, HDT and ATT are output at a 1-Hz rate (default). "x" should preferably be equal to the moving base data interval.

– The heading determination process can be restarted at any time in board #1 using the $PASHS,CPD,RST command.

8. In adverse operating conditions, you may need to change the maximum error permitted in the determination of the baseline length. The recommended value is 0.01 m. Use the following command to change this parameter:

   (Example with tolerated baseline length error= 0.02 m):
   $PASHS,CPD,ARR,PAR,,0.02

RTK Position Output. Make sure you are sending your commands directly to board #1 through one of its serial ports. Assuming board #1 is receiving corrections on its port A (via COM 1 on the ABX802 front panel) from a static base, do the following:

- To accept incoming corrections on COM1, use the following command:

  $PASHS,DIF,PRT,A
  (First RTK engine is used for RTK position determination)
  (Default board setup for differential corrections: port A)
  (If needed, use $PASHS,SPD to change the baud rate setting on the chosen port.)

- Let board #1 know that it is using data from a static base by running the following command:

  $PASHS,CPD,BAS,0
  (By default, the board is set to use corrections from a static base. So you may not have to run this command.)

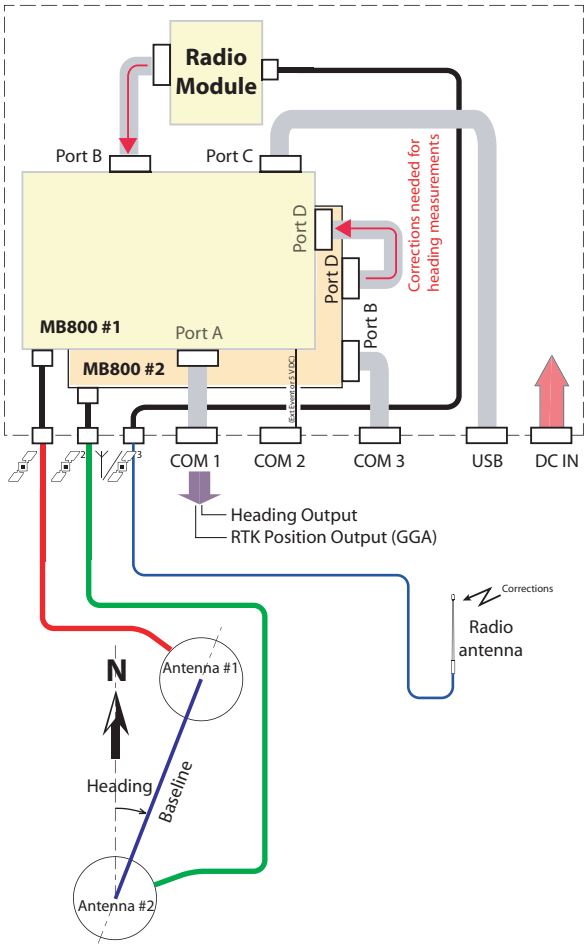
- Define the output messages you would like board #1 to deliver on its port B (COM 2). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,B,ON[,x]

  Where “x” is the output rate. If “x” is omitted, GGA is output at a 1-Hz rate (default).

  Important! The RTK position is tagged to **Antenna #1**.

2nd Case: ABX802 Fitted with an Internal UHF Radio



Heading Output. Make sure you are sending your commands directly to board #2 through **COM 3** (default baud rate: 115200).

Board #2 needs to be configured as a moving base delivering the data (in ATOM format) required by board #1 to make heading measurements.

1. By default, port D is set to 115200 Bd. Keep this setting. If the baud rate was changed, use the following command to restore this setting:

   $PASHS,SPD,D,9

2. Allow board #2 to use a moving position as the reference position, thus making it a moving base. This is achieved using the following command sent to this board:

   $PASHS,POS,MOV

3. For example, to have board #2 generating **ATOM base data at 10 Hz on its port D**, run the following commands:

   $PASHS,ATM,ATR,D,ON,31
   $PASHS,ATM,RNX,D,ON,0.1,&SCN,204
   (ATR for ATOM attribute data at 31 s and RNX for GPS/GLONASS data at 10 Hz.)
   Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:
   $PASHS,ATM,ALL,D,OFF

Now that board #2 has been set up as a moving RTK base, make sure you are sending your commands directly to board #1 through one of its serial ports (**COM 2** for example; default baud rate: 115200).

1. Set port D to be the port receiving incoming differential corrections:

   $PASHS,DI2,PRT,D
   (Second RTK engine is used for heading determination)

2. Let board #1 know that it is using data from a moving base by running the following command:

   $PASHS,CP2,BAS,1

3. When base data from a moving base are used, it's better to have Vector Output mode="Time-Tagged" as long as the required output rate does not exceed 10 Hz and there is no particular latency requirement. Run the following command to choose this mode in board #1:

   $PASHS,VEC,TT
   (Or else $PASHS,VEC,FST for output rates from 1 Hz to 20 Hz and shortest possible latency.)

4. You may need to use the $PASHS,CPD,ARR,OFS command if the two GNSS antennas are not at the same height and/or they are not aligned with, or perpendicular to the vehicle axis. See NOTES below.

5. Enable the heading mode in board #1:

   $PASHS,CP2,ARR,MOD,ON
   $PASHS,CP2,MOD,HED

6. Follow one of the procedures below, depending on whether the baseline length is known or not:
   - If the baseline is unknown, or known but with not enough accuracy, start the auto-calibration process by simply running the following command (this procedure is recommended in all cases):

     $PASHS,CP2,ARR,LEN,0

     Through this command, the baseline length is forced to "0" thus starting the auto-calibration process. The two antennas should remain static throughout the auto-calibration process.

     On completion of the auto-calibration phase, board #1 will automatically start delivering real-time heading measurements. See also *Appendix on page 58*.

     Remember this process should be run every time you need to change the baseline length while the arrow mode is on.
   - Or, if the baseline length is accurately known (for example 1.585 m), just type the following command and then board #1 board will automatically start delivering heading measurements, provided output messages have been defined (see next step):

     (Example with baseline length= 1.585 m):
     $PASHS,CP2,ARR,LEN,1.585

7. Define the output messages you would like board #1 to deliver. Typically, in heading mode, you will want to output the ATT (attitude) or HDT (heading) message, depending on your application:

   $PASHS,NME,ATT,B,ON[,x]
   $PASHS,NME,HDT,B,ON[,x]

   Where "x" is the output rate. See NOTES below for more information about "x".

   NOTES:
   - The ATT message is output for all epochs and includes an RTK "fixed/float" flag. The HDT message is output only for fixed ambiguity epochs.

- The ATT message includes heading and pitch or heading and roll. The HDT message only includes heading.
- If the baseline elevation and azimuth offset with respect to the vehicle center line are known, the user can enter these values, in which case vehicle attitude, instead of baseline attitude, will be output.
- If "x" is omitted, HDT and ATT are output at a 1-Hz rate (default). "x" should preferably be equal to the moving base data interval.
- The heading determination process can be restarted at any time in board #1 using the $PASHS,CPD,RST command.

8. In adverse operating conditions, you may need to change the maximum error permitted in the determination of the baseline length. The recommended value is 0.01 m. Use the following command to change this parameter:

   (Example with tolerated baseline length error= 0.02 m):

   $PASHS,CPD,ARR,PAR,,0.02

RTK Position Output. Make sure you are sending your commands directly to board #1 through COM 1. Board #1 is receiving corrections on its port B from the internal radio module (XDL). Do the following:

- To accept incoming corrections on port B, use the following command:

  $PASHS,DIF,PRT,B

  (First RTK engine is used for RTK position determination)

- Set the baud rate on port B:

  $PASHS,SPD,B,7

- Let board #1 know that it is using data from a static base by running the following command:

  $PASHS,CPD,BAS,0

  (By default, the board is set to use corrections from a static base. So you may not have to run this command.)

- Define the output messages you would like board #1 to deliver on its port A (COM 1). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,A,ON[,x]

  Where "x" is the output rate. If "x" is omitted, GGA is output at a 1-Hz rate (default).

  Important! The RTK position is tagged to **Antenna #1**.

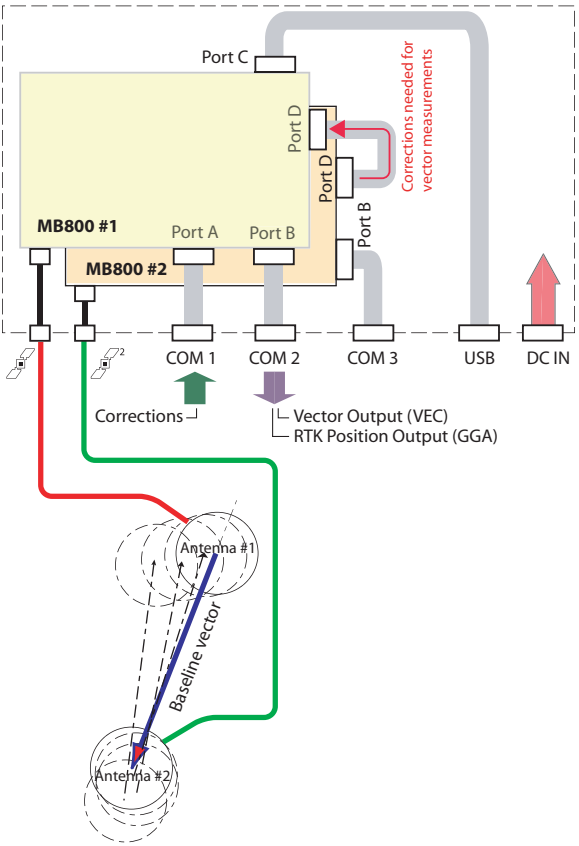
Delivering Vector Measurements

In this application, the ABX802 provides the three components of a changing vector between the two GNSS antennas connected to the ABX802 (relative positioning). From these three measurements, both the module and direction of the vector can accurately be determined.

Because the two antennas are connected to the same system, they can only have limited movements with respect to each other (less than one meter up to several tens of meters).

This kind of setup can be used in machine control for example to constantly monitor the distance and direction between two separate tools installed on the same machine or vehicle (the two antennas move independently from each other).

1st Case: ABX802 Without an Internal Radio



Vector Output. Make sure you are sending your commands directly to board #2 through **COM 3** (default baud rate: 115200).

Board #2 needs to be configured as a moving base delivering the data (in ATOM format) required by board #1 to make heading measurements.

1. By default, port D is set to 115200 Bd. Keep this setting. If the baud rate was changed, use the following command to restore this setting:

   $PASHS,SPD,D,9

2. Allow board #2 to use a moving position as the reference position, thus making it a moving base. This is achieved using the following command sent to this board:

   $PASHS,POS,MOV

3. For example, to have board #2 generating **ATOM base data at 10 Hz on its port D**, run the following commands:

   $PASHS,ATM,ATR,D,ON,31
   $PASHS,ATM,RNX,D,ON,0.1,&SCN,204
   (ATR for ATOM attribute data at 31 s and RNX for GPS/GLONASS data at 10 Hz.)
   Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:
   $PASHS,ATM,ALL,D,OFF

Now that board #2 has been set up as a moving RTK base, make sure you are sending your commands directly to board #1 through one of its serial ports (**COM 2** for example; default baud rate: 115200).

1. Set port D to be the port receiving incoming differential corrections:

   $PASHS,DI2,PRT,D
   (Second RTK engine is used for vector determination)

2. Let board #1 know that it is using data from a moving base by running the following command:

   $PASHS,CP2,BAS,1

3. When base data from a moving base are used, it's better not to use Vector Output mode="FAST". Always use "Time-tagged". Run the following command to choose this mode in board #1:

   $PASHS,VEC,TT

4. Define the output messages you would like board #1 to deliver. Typically, in heading mode, you will want to output the VEC (vector) message, depending on your application:

   $PASHS,NME,VEC,B,ON[,x]

   Where "x" is the output rate. If "x" is omitted, VEC is output at a 1-Hz rate (default).

RTK Position Output. Run the following commands:

- Set port A to receive corrections from the radio:

  $PASHS,DIF,PRT,A

- Set the baud rate to 38400 on port A (example) :

  $PASHS,SPD,A,7

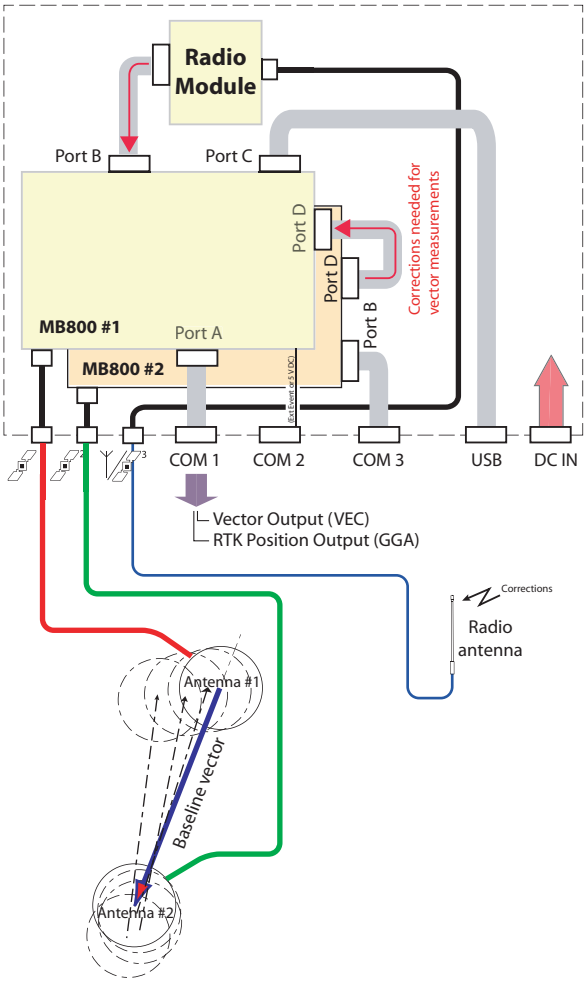
- Define the output message you would like board #1 to deliver on its port B (COM 2). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,B,ON[,x]

  Where "x" is the output rate. If "x" is omitted, GGA is output at a 1-Hz rate (default).

  Important! The RTK position is tagged to **Antenna #1**.

2nd Case: ABX802 With an Internal Radio



Vector Output. Make sure you are sending your commands directly to board #2 through **COM 3** (default baud rate: 115200).

Board #2 needs to be configured as a moving base delivering the data (in ATOM format) required by board #1 to make heading measurements.

1. By default, port D is set to 115200 Bd. Keep this setting. If the baud rate was changed, use the following command to restore this setting:

   $PASHS,SPD,D,9

2. Allow board #2 to use a moving position as the reference position, thus making it a moving base. This is achieved using the following command sent to this board:

   $PASHS,POS,MOV

3. For example, to have board #2 generating **ATOM base data at 10 Hz on its port D**, run the following commands:

   $PASHS,ATM,ATR,D,ON,31
   $PASHS,ATM,RNX,D,ON,0.1,&SCN,204
   (ATR for ATOM attribute data at 31 s and RNX for GPS/GLONASS data at 10 Hz.)
   Remember that disabling all these messages (if for some reason you need to do so) can be done through the following single command:
   $PASHS,ATM,ALL,D,OFF

Now that board #2 has been set up as a moving RTK base, make sure you are sending your commands directly to board #1 through one of its serial ports (**COM 1** for example; default baud rate: 115200).

1. Set port D to be the port receiving incoming differential corrections:

   $PASHS,DI2,PRT,D
   (Second RTK engine is used for vector determination)

2. Let board #1 know that it is using data from a moving base by running the following command:

   $PASHS,CP2,BAS,1

3. When base data from a moving base are used, it's better not to use Vector Output mode="FAST". Always use "Time-tagged". Run the following command to choose this mode in board #1:

   $PASHS,VEC,TT

4. Define the output messages you would like board #1 to deliver. Typically, in heading mode, you will want to output the VEC (vector) message, depending on your application:

   $PASHS,NME,VEC,B,ON[,x]

   Where "x" is the output rate. If "x" is omitted, VEC is output at a 1-Hz rate (default).

RTK Position Output. Run the following commands:

- Set port B to receive corrections from the radio:

  $PASHS,DIF,PRT,B

- Set the baud rate to 38400 on port B :

  $PASHS,SPD,B,7

- Define the output message you would like board #1 to deliver on its port A (COM 1). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,A,ON[,x]

  Where “x” is the output rate. If “x” is omitted, GGA is output at a 1-Hz rate (default).

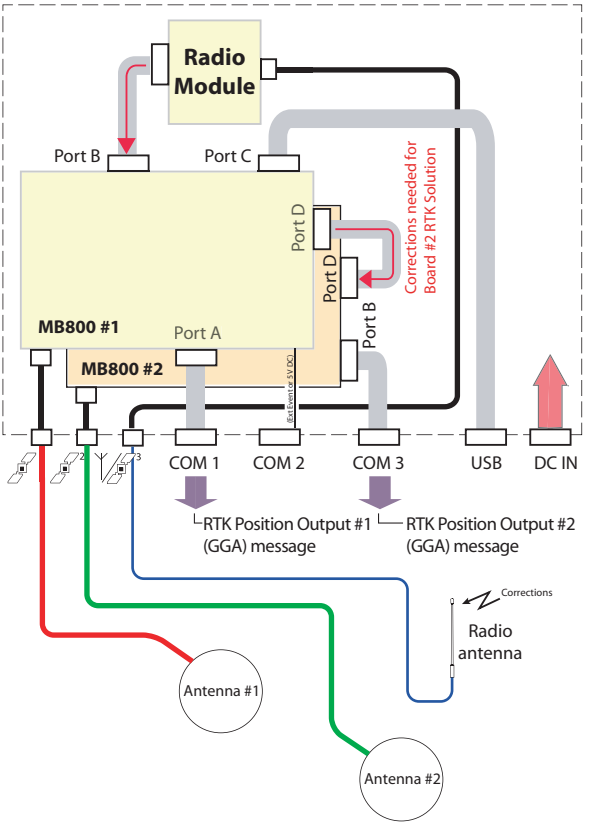
  I**mportant!** The RTK position is tagged to **Antenna #1**.

Delivering Two Independent Fast RTK Outputs

You may already have an external heading determination system and want to use it. What is therefore necessary in this case is feed your system with the two centimeter-accurate positions from the ABX802. From these two positions, your system will be able to compute the heading value.

In this application, the two built-in boards of the ABX802 work separately.

In the example presented below, an ABX 802 with internal radio is used. Base corrections, which are provided by the internal radio, are applied to port B on board #1 (for use in board #1),and then forwarded to board #2 via port D (board #1) and port D (board #2) for use in board #2. Forwarding corrections from one board to the other is possible using the P2P command.



Send the following commands to board #1 (port A) via COM 1:

- Set port B as the port receiving incoming differential corrections:

  $PASHS,DIF,PRT,B

- Set port baud rate to 38400 Bd:

  $PASHS,SPD,B,7

- Define the output messages you would like the board to deliver on its port B (COM 1). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,B,ON[,x]

  Where "x" is the output rate. If "x" is omitted, GGA is output at a 1-Hz rate (default).

- Set board #1 to let it forward corrections to board #2:

  $PASHS,P2P,B,Z

- Define the data format through which corrections are forwarded from board #1 to board #2:

  $PASHS,ATM,DAT,D,ON,&EXT

Send the following commands to board #2 (port B) via COM 3:

- Set port D as the port receiving incoming differential corrections (via virtual port Z):

  $PASHS,DIF,PRT,Z

- Define the output messages you would like the board to deliver on its port B (COM 3). Typically, you will want to output the GGA message,:

  $PASHS,NME,GGA,B,ON[,x]

  Where "x" is the output rate. If "x" is omitted, GGA is output at a 1-Hz rate (default).

Description of the Auto-Calibration Sequence

When setting the baseline length to "0" through the $PASHS,CPD,ARR,LEN,0 command, an auto-calibration sequence is run as explained below:

- A series of minimum three RTK initializations are run automatically to determine the distance between the two GNSS antennas (baseline length) with the required level of accuracy (baseline length determined to within ± 1cm). Each new RTK initialization takes place after a given period of time (typically 60 seconds).
- If the reception conditions are good, three RTK initializations are usually enough to determine the baseline length.
- In more difficult conditions of reception, more RTK initializations may be required until the baseline length is determined with the required accuracy. The auto-calibration sequence will consequently be longer than 3 minutes.
- **What can you do to detect the end of the auto-calibration process?** The best way is to regularly send the following query command to the board used in moving base mode (board #2):

  $PASHQ,PAR,RTK

  As long as in the response to that query, you get "CALIBRATING" after the value of baseline length, the auto-calibration process is still ongoing. When this word is replaced with "CALIBRATED", auto-calibration is complete.

  You can also monitor the value of "baseline RMS error" (**f6** field) provided in the ATT output message. For close monitoring, this message should be output at the same rate as, or faster than, the HDT message.

  After $PASHS,CPD,ARR,MOD has been set to "ON" and as long as **f6** in the ATT message stays strictly equal to 0.000, you can be sure the auto-calibration process is still in progress.

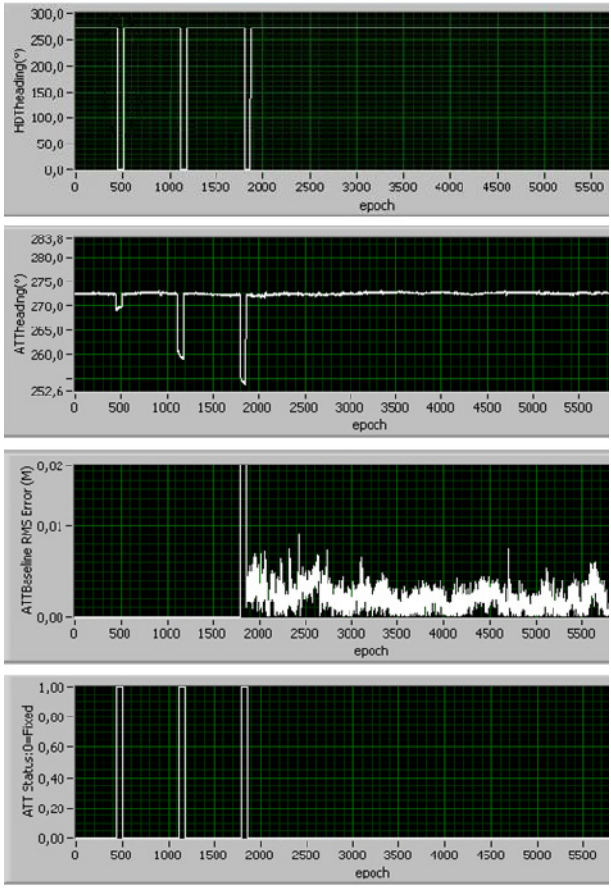
  As soon as **f6** is output with a different value, this means the auto-calibration is complete and the value of heading delivered by the HDT message is valid.

  Warning! The HDT message delivers invalid heading measurements during the auto-calibration process.

From the RTK initialization time to the ambiguity fixing time, the heading value is zero, then an estimated value of heading is provided until the next RTK initialization takes place, and so forth until the end of the auto-calibration process (see diagram below).

The diagram below is an example of a sequence of auto-calibration, for which the following output data are shown, from top to bottom:

- Heading output in HDT message
- Heading output in ATT message
- Baseline RMS in ATT message. This data clearly shows the end of the auto-calibration sequence.
- Fixed/float status in ATT message (Fixed: 0)



Heading Output After a Power Cycle

Calibration parameters are automatically saved when turning off the receiver.

Assuming that the positions of the two antennas relative to each other are kept unchanged after a power cycle, then the receiver will be able to quickly deliver heading measurements without any user intervention when you next turn on the receiver.

Comparative Data Throughputs for Different ATOM Scenarios

Data throughputs obtained with the RTCM-3 format are given for reference. All figures are estimations expressed in bytes/sec.

ATOM Scenario Designation	Senario Suffix Used in $PASHS,ATM,RNX Command:	GPS + GLONASS L1+L2 Data	GPS + GLONASS L1 Data	GPS L1/L2 Data
Full	..,&SCN,0	829	425	561
Standard	..,&SCN,4	317	205	193
Compact	..,&SCN,100	159	140	98
Super-compact	..,&SCN,101	86	75	70
RTCM-3	-	338 (1)	214 (2)	202 (3)

(1): Message types 1004 and 1012

(2): Message types 1002 and 1010

(3): Message type 1004

Configuring the XDL Radio

Useful Links

Use the *XDLConf* software provided by the manufacturer. XDLConf may be downloaded by clicking on the link below:

http://www.pacificcrest.com/support.php?page=updates

You can also download the user guide by clicking on the link below:

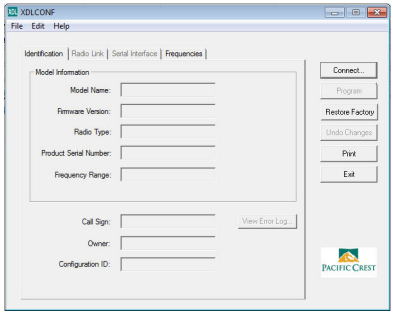
http://www.pacificcrest.com/resources.php?page=doc_library

Additional Instructions to Configure the XDL Radio Used in ABX800 or ABX802

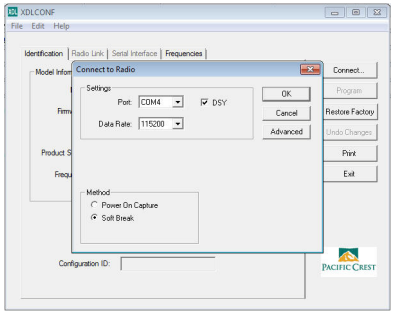
- Connect the computer running Ashtech Communicator and XDLConf to COM 1 on the ABX800 or 802 receiver.
- Run Ashtech Communicator to set the internal port to which the XDL radio is connected. Set the internal port baud rate to 38400 Bd using one of the $PASH commands below:

  ABX800 (Internal port D is used):
  $PASHS,SPD,D,7
  ABX802 (Internal port B is used):
  $PASHS,SPD,B,7

- Quit Ashtech Communicator and then run XDLConf. This opens the **XDLConf** window.



- Click on the **Connect** button. This opens the **Connect to Radio** window.



- Enable the **DSY** check box, select the **Soft Break** option, then click **OK**.

- Configure the radio as instructed in the XDLConf User Guide.

  The User mode allows you to set the reception frequencies only. With a USB dongle, you are also allowed to access the Dealer mode. In Dealer mode, you can also set transmission frequencies.

  In case of unintended disconnection from the ABX receiver while XDLConf was successfully communicating with the radio through COM 1 and the MB800 board, you won't be able to restore communication with the ABX receiver (i.e. with its MB800 board) until you run Ashtech Communicator to send the following command to the receiver via COM 1:

  $PASHS,DSY,OFF

ABX Series

Reference Manual

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