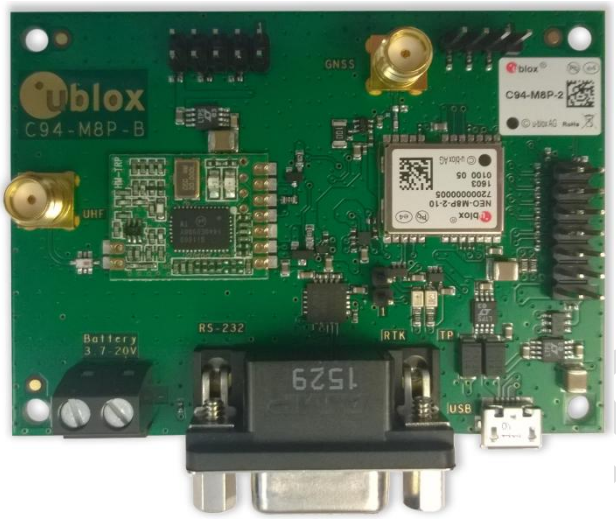
POSITIONING

C94-M8P

u-blox RTK Application Board Package

User Guide



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Abstract

This document describes the structure and use of the C94-M8P RTK application board package and provides information for evaluating and testing the u-blox NEO-M8P high precision positioning modules.

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Document status explanation	
Objective Specification	Document contains target values. Revised and supplementary data will be published later.
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Early Production Information	Document contains data from product verification. Revised and supplementary data may be published later.
Production Information	Document contains the final product specification.

This document applies to the following products:

Product name	Type number	ROM/FLASH version	PCN reference
C94-M8P	C94-M8P-1-00	FLASH FW3.01 HPG1.20	N/A
C94-M8P	C94-M8P-2-00	FLASH FW3.01 HPG1.20	N/A
C94-M8P	C94-M8P-3-00	FLASH FW3.01 HPG1.20	N/A

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Preface

Using this guide

This guide assumes, the user has basic computer skills and is familiar with the Windows Graphical User Interface (GUI) and GNSS receiver environments.

The following symbols are used in the document to highlight information:

⚠ A warning symbol indicates actions that could negatively impact or damage the device.

☞ An index finger points out key information pertaining to device operation and performance.

Warnings and certifications

CAUTION! IN THE UNLIKELY EVENT OF A FAILURE IN THE INTERNAL PROTECTION CIRCUITRY THERE IS A RISK OF AN EXPLOSION WHEN CHARGING FULLY OR PARTIALLY DISCHARGED BATTERIES. REPLACE THE BATTERY IF IT NO LONGER HAS SUFFICIENT CHARGE FOR UNIT OPERATION. CONTROL THE BATTERY BEFORE USING IF THE DEVICE HAS NOT BEEN OPERATED FOR AN EXTENDED PERIOD OF TIME.

Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC and Directive 2011/65/EU of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

C94-M8P application board is RoHS compliant.

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1 Introduction

1.1 Overview

The C94-M8P application board package provides the means for efficient integration and evaluation of NEO-M8P, u-blox's M8 high precision GNSS modules.

The NEO-M8P module series introduces the concept of a "Rover" and a "Base Station". By using a data stream from the Base Station, the Rover can output its relative position with stunning cm-level accuracy in good environments.

The C94-M8P board integrates the NEO-M8P-2 module with both Base Station and Rover functionality. The C94-M8P includes a UHF radio link, allowing for easy setup and fast prototyping. The board also provides connector pins for u-blox C027 and other application boards, enabling communication alternatives using u-blox cellular and short-range technologies.

The C94-M8P application board package comes in four variants, each with an individually configured radio link to meet different radio frequency requirements in different regions:

- C94-M8P-1-00 for China (433 MHz)
- C94-M8P-2-00 for USA and Canada (915 MHz)
- C94-M8P-3-00 or C94-M8P-3-10 for Europe (433 MHz)
- C94-M8P-4-10 for Japan (920 Mhz)

A label showing the application variant (ordering code) is located at the top-right corner of the board. For C94-M8P-3-10 and C94-M8P-4-10 User guide, refer to C94-M8P u-blox RTK Application Board Package (PCB Version D) User Guide [7]

1.2 C94-M8P package includes

The C94-M8P package includes:

- 2 application boards (both with a NEO-M8P-2 module)
- 2 external UHF antennas
- 2 external active GNSS antennas
- 2 antenna ground planes
- 2 USB cables

1.3 Software requirements

For the instructions and examples in this document, we require the following software:

- The latest version of u-center for Windows (currently version 8.23). You can download it from https://www.u-blox.com/en/product/c94-m8p
- Serial console terminal, for example Putty

1.4 System requirements

For the instructions and examples in this document, we have the following system requirements:

- PC with USB interface
- Operating system: Windows Vista onwards (x86 and x64 versions)
- GNSS USB drivers are automatically installed when installing u-center.

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2 Specification

Parameter	Specification
Interfaces	1 USB port for GNSS data and power supply
	1 RS232, for radio link configuration
	Connection pins for UART communication (e.g. C027), 3.3 V
SMA connector	External GNSS antenna and UHF antenna
Dimensions	75 mm x 55 mm
Weight	35 g
Power Supply	5 V via USB or externally powered by battery (5.05 mm pitch 2-pin, 3.7 V – 20 V) powered
	1 battery connector
Normal Operating temperature	-40°C to +65°C

Table 1: C94-M8P application board specification

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3 Getting started

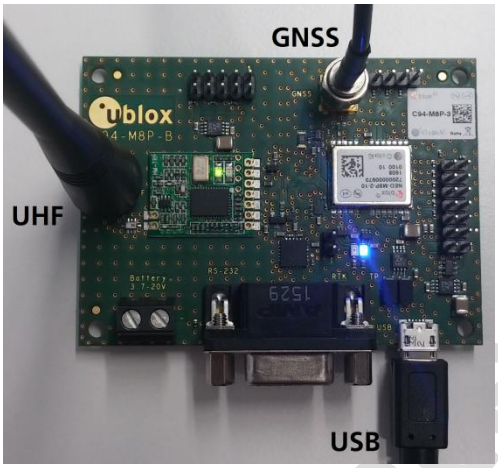
3.1 Software installation

The latest version of u-center (currently version 8.23) is needed for the examples and instructions described in this document. Internet access is also required during the software installation to ensure that the most up-to-date components are installed on your system. After installation, the u-center application can be found in the "u-blox" folder in the Start->Program menu.

3.2 Hardware installation

To test and evaluate the benefits of u-blox's Real Time Kinematic (RTK) technology, two C94-M8P application boards – the "Base" and the "Rover" – need to be set up as described below.

- Connect the UHF antenna to the SMA connector marked with "UHF"
- Connect the GNSS antenna to the SMA connector marked with "GNSS"
- Connect the micro USB cable to the micro USB port on the board (for power and configuration)
- Depending on the evaluation purposes, the test connectors may be used differently



☞ The two boards are identical. Select one of the boards to act as a "Base" and one as a "Rover".

3.2.1 GNSS antenna considerations

In order to optimize the benefit of u-blox's Real Time Kinematic (RTK) technology and achieve high accuracy performance, the placements of the antennas are extremely important. The recommendations for the GNSS antenna used with the system are:

☞ The antenna needs to be placed in an open sky environment with unobstrucked visibility to the sky.

☞ Care should be taken to minimize multipath. This can be achieved by using a ground plane, which is supplied with the application board package for the GNSS antenna, and placing it above nearby buildings or other obstructions.

- If the installation does not provide a natural ground plane, such as a car roof, using a ground plane is strongly recommended. The ground plane should have a minimum diameter of 10 cm. If better performance is required due to multipath, then a larger ground plane will improve the performance. Moving to a lower multipath environment might be required.
- For more information, refer to Achieving Centimeter Level Performance with Low Cost Antennas [6].

☞ Correct operation requires a static Base Station.

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3.3 Updating firmware on C94-M8P

Before starting evaluation, please check that the application boards are using the latest firmware. Information on the latest firmware is published on the u-blox web site. For updating the firmware, follow the steps described in chapter 9.1.1 Firmware Update u-blox 5-8 in u-center User Guide [4].

☞ Do not use USB alternative update method with C94-M8P. Select Enter Safeboot instead

☞ All the changes in configuration are lost when application boards are updated. Base and Rover must be re-configured after updating

☞ Do not have more than one application board connected to your computer while updating

3.4 Configuration

The C94-M8P package includes two identical boards featuring u-blox NEO-M8P-2 modules. You will configure one of the boards to act as a Base Station, and the other will operate as a Rover.

3.4.1 GNSS module configuration

The NEO-M8P-2 positioning module on the C94-M8P application board is a concurrent GNSS receiver and can receive and track multiple GNSS systems. The NEO-M8P module is configured by default for concurrent GPS and GLONASS reception, where both constellations will be used in an RTK solution. Other available configurations are GPS-only and GPS+BeiDou reception. A GPS-only setup can be used if higher RTK update rate is of interest.

☞ The default GNSS constellation is GPS+GLONASS. For most users this is the optimal configuration and no further configuration is needed.

☞ If the configuration is changed – the changes need to be made for both boards as Base and Rover should use the same GNSS systems.

For GNSS module configuration, use the micro-A USB port to connect with a PC running u-center. Once it is connected, configure the module on u-center (View -> Message View -> UBX-CFG-GNSS) as shown in Figure 1. For more information, refer to the u-center User Guide [4], the u-blox 8 / u-blox M8 Receiver Description including Protocol Specification [1], and Protocol Specification Addendum for HPG1.20 [5].

☞ Always remember to store configuration changes by sending the UBX-CFG-CFG message in u-center, which can be done with the shortcut, .

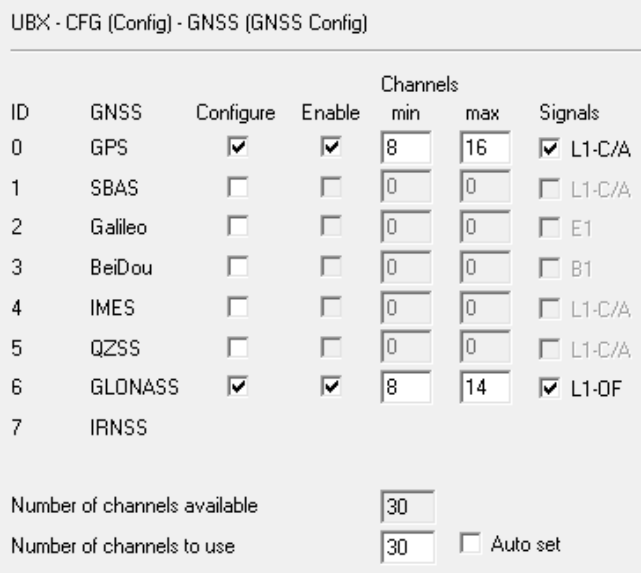

Figure 1: Configuration of the NEO-M8P-2 GNSS module on C94-M8P application board

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3.4.2 Base Station configuration

The board that is selected to operate as Base needs to be configured as described below.

Setting up RTCM messages

A Base device needs to allow RTCM messages 1005 (Station coordinates), 1077 (GPS observations) and 1087 (GLONASS observations) to go through the UART1 port on the receiver module. UART1 refers to the connection between the NEO-M8P-2 GNSS module and the UHF radio module on the application board. To do this, use the UBX-CFG-MSG messages as shown in **Error! Reference source not found.**. .

- RTCM messages should be configured to be output at 1Hz. The output rate must be the same as the Navigation Rate of Base station, which is 1Hz by default.
- RTCM messages do not need to be configured differently even if the Navigation Rate of the Rover is configured differently, e.g. to have a higher output rate than the default 1 Hz
- Individual RTCM messages should be configured at the same rate
- The throughput of the RTCM communications link must be considered with respect to the amount of bytes required for the enabled RTCM messages and message rates

☞ If BeiDou is used, allow RTCM message 1127 instead of 1087 (GLONASS).

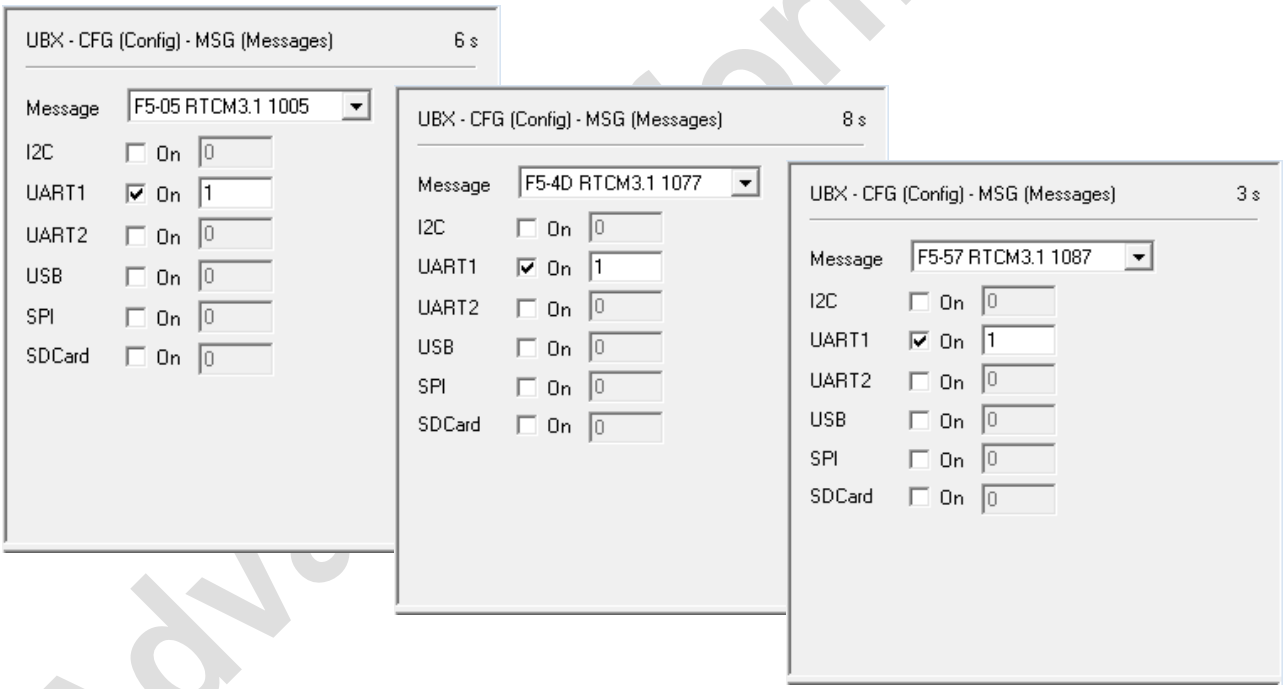

Figure 2: For a GPS+GLONASS setup, enable the RTCM messages 1005, 1077 and 1087 on UART1 port

Base radio link

The radio link needs to be configured on the Base. Use the UBX-CFG-PRT message to set "Protocol in" to "none", as shown in Figure 3.

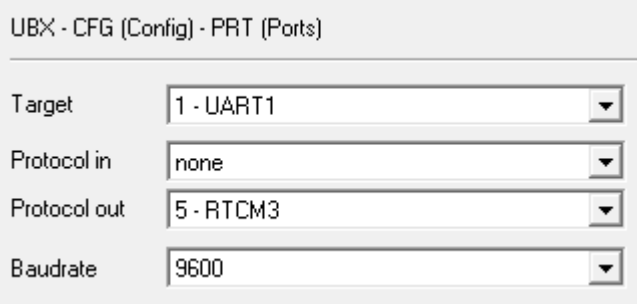

Figure 3: Configuring Base radio link

Base station operation

When the NEO-M8P functions as a Base Station, the receiver uses measurements from all available satellites to broadcast corrections. By sending the UBX-CFG-TMODE3 message, the Base Station can be configured to operate in a Fixed position mode or to self Survey-in its position, depending on the user's knowledge of the Base Station's antenna reference position.

☞ The Base Station must be configured with a Fixed position or have completed a Survey-in operation before it will be able to output the RTCM reference station position message needed by the Rover.

☞ The current firmware requires five ambiguities to attempt fixing. In the GPS-only or GPS/GLONASS set-up, a minimum of six GPS satellites is therefore required to reach RTK fixed. In the GPS/BeiDou set-up, the RTK fixed status can be reached when either of the following requirements is fulfilled: 1) six GPS satellites are available, 2) six BeiDou satellites are available, or 3) a total of 8 or more GPS and BeiDou satellites are available.

☞ Disable NMEA (disable child messages) in u-center to see TIME mode displayed in u-center.

Fixed position mode

In Fixed position mode, specify the Base Station's antenna reference point with ECEF or Lat/Lon/Alt coordinates. The corresponding fields are available via u-center, as shown in Figure 4. The coordinates can be specified with 0.1 mm resolution. For more information, see the Protocol Specification Addendum for HPG1.20 [5].

The accuracy of the specified coordinates will reflect directly in the absolute accuracy of the Rover's position.

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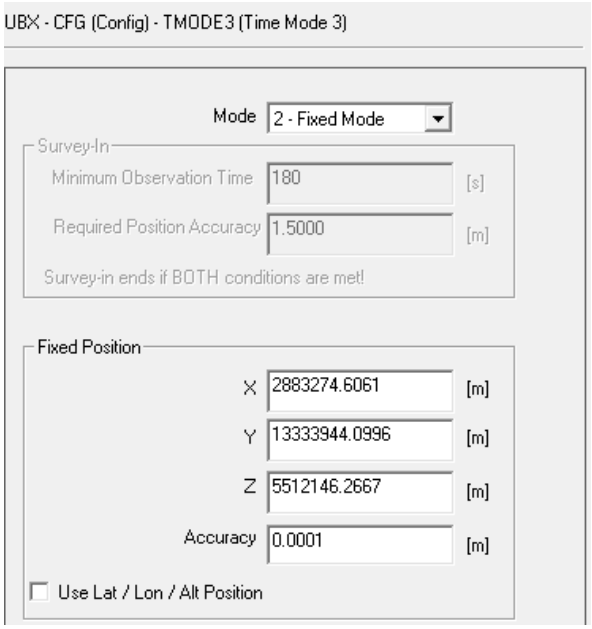

Figure 4: Configure to Fixed Position Mode for a Base Station

Survey-in mode

If the coordinates of the Base Station antenna are not known with very good accuracy, the Base Station should be configured to operate in Survey-in mode. When working in Survey-in mode the Base Station will determine its own position by building a weighted mean of all valid 3D position solutions.

The UBX-CFG-TMODE3 message has two fields to fill in for survey-in mode, as shown in Figure 5. The first field, "Minimum Observation Time", defines a minimum amount of observation time regardless of the actual number of valid fixes that were used for position calculation. Reasonable values range from one day for applications that require high absolute accuracy, to a few minutes for applications that only require high relative accuracy.

The second field, "Required Position Accuracy", forces the calculated Base station position to be of at least the given 3D position accuracy.

☞ Navigation Rate (UBX-CFB-RATE) should be 1 Hz during Survey-in.

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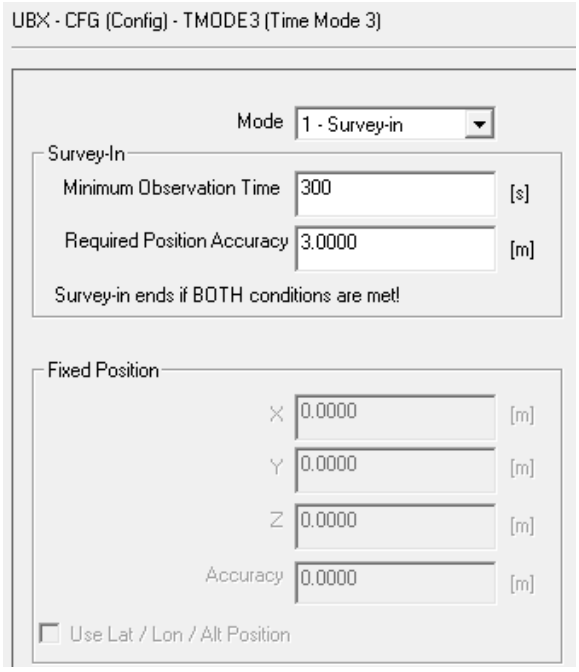

Figure 5: Configure to Survey-in Mode for a Base Station

In operation, after both requirements are fulfilled, the Base station finishes the Survey-in mode and enters Fixed mode automatically. Through the UBX-NAV-SVIN message, the Base operation status from Survey-in to Fixed can be monitored, as shown in Figure 6.

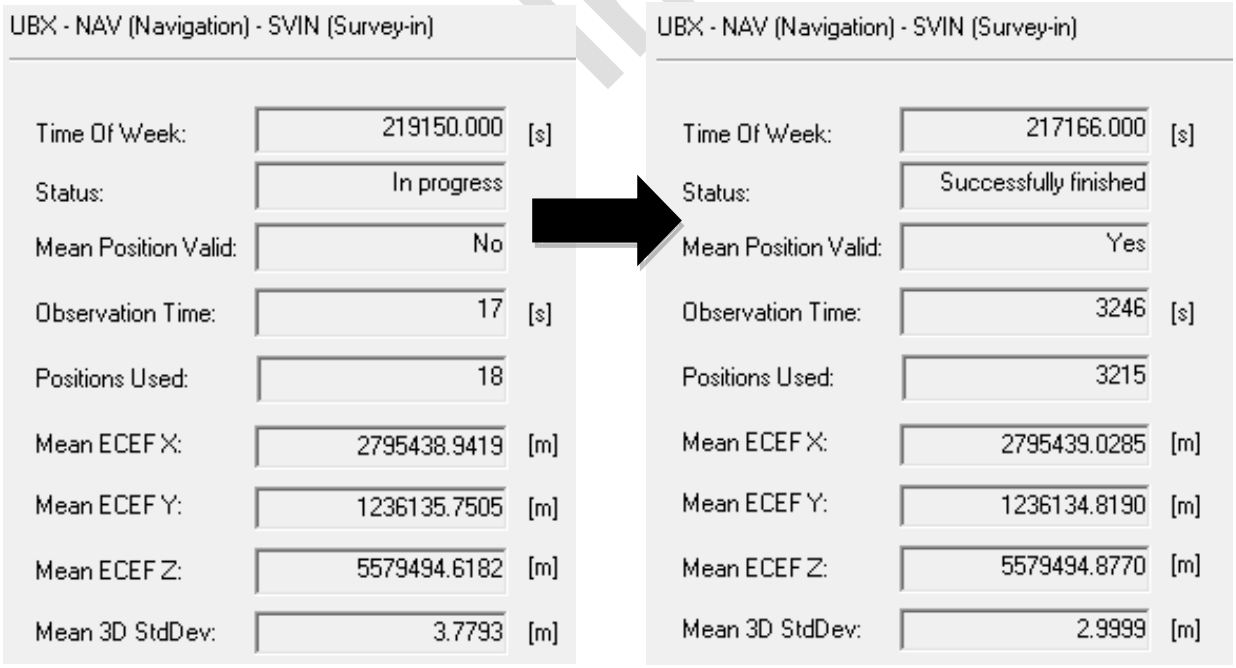

Figure 6: Base Station moving from Survey-in Mode to Fixed Mode

☞ As the Base Station position error is inherited by the Rover absolute position error, users should carefully evaluate the Rover absolute accuracy requirement and set up and choose the Base station mode accordingly.

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3.4.3 Rover configuration

In its default mode, the Rover will automatically apply the RTCM corrections it receives. In effect, it will immediately enter RTK float mode and, assuming circumstances allow for it, eventually reach RTK fixed mode.

In order to mitigate position jumps when switching between fixed and float modes, you can use RTK float-only mode. Select it using the u-center message UBX-CFG-DGNSS. In this mode, the Rover will estimate the ambiguities as float but will not attempt to fix them.

Rover radio link

Radio link needs to be configured on the Rover. Use UBX-CFG-PRT message to set Protocol out to "none", as shown in Figure 7.

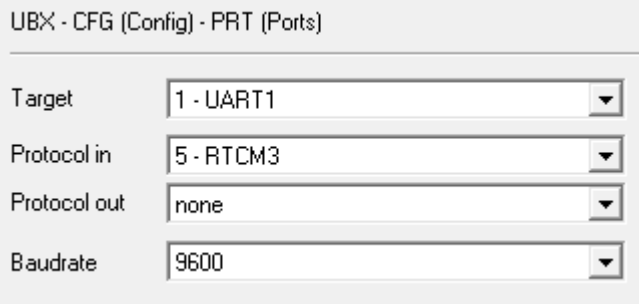

Figure 7: Configuring Rover radio link

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4 Operation

4.1 Base in operation

When the Base device is in normal operation, by enabling message UBX-NAV-STATUS, the Data View in u-center shows "TIME" fix mode.

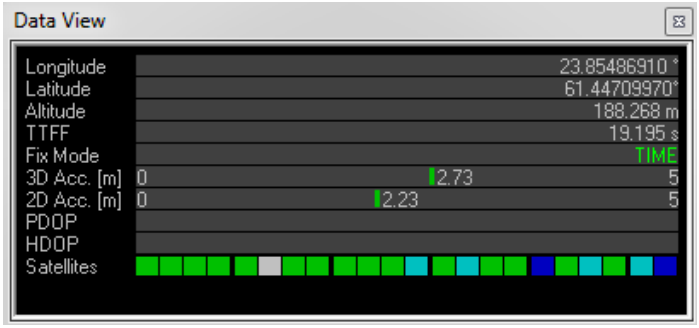

Figure 8: Data View shows "TIME" when Base is in FIXED mode

4.2 Rover in operation

When the Rover device is in normal operation, the Data View in u-center shows "FLOAT" or "FIXED" to indicate the current operation mode.

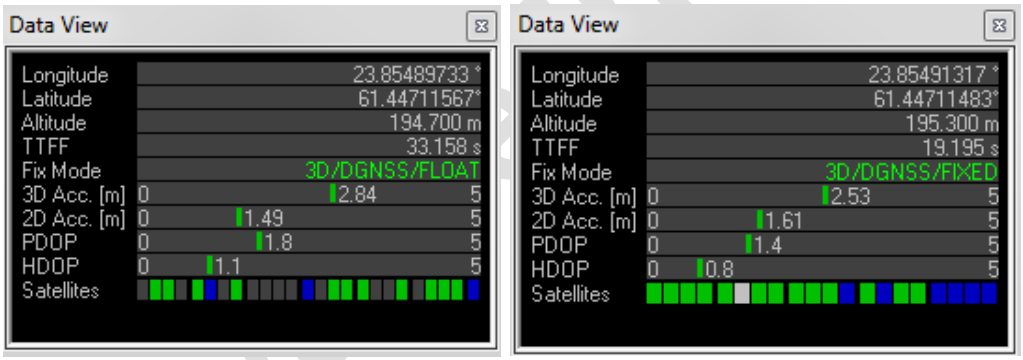

Figure 9: Data View shows "FLOAT" or "FIXED" on Rover

Additionally, the message "UBX-NAV-RELPOSNED" in u-center shows more details about relative positions and accuracies. For more information, refer to the u-center User Guide [4], the u-blox 8 / u-blox M8 Receiver Description including Protocol Specification [1], and Protocol Specification Addendum for HPG1.20 [5].

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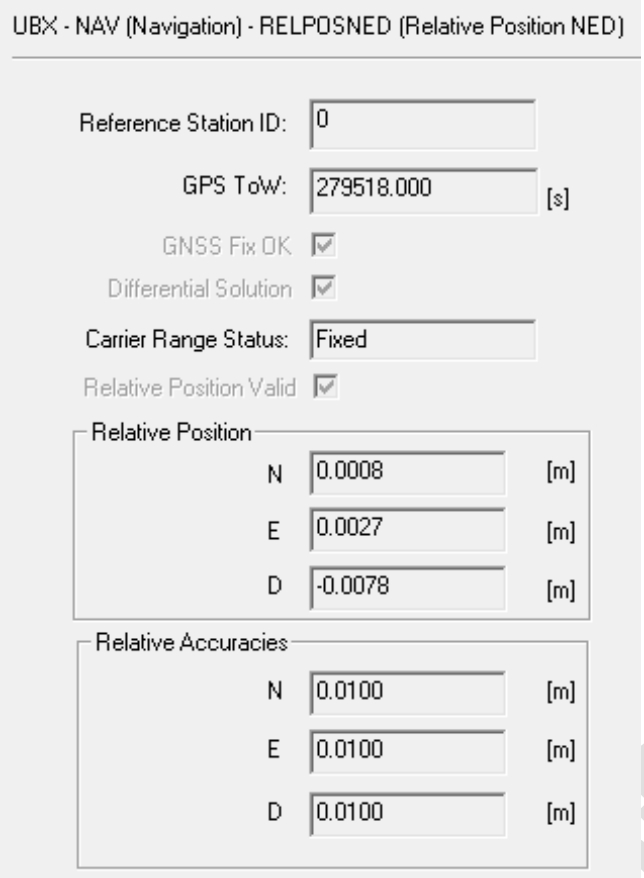
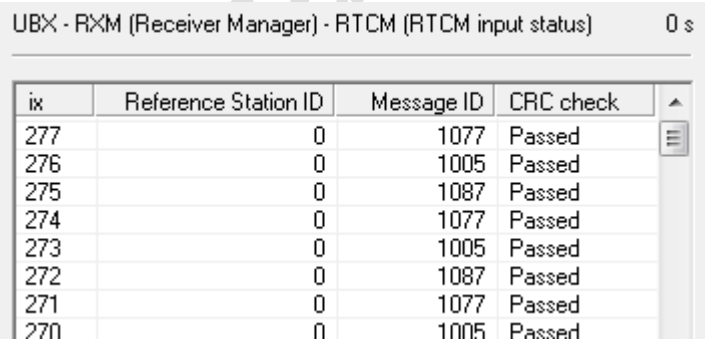


Figure 10: UBX-NAV-RELPOSNED in u-center for Rover

☞ To achieve the expected accuracy of positioning with u-blox RTK technology, continued carrier phase tracking is important.

4.2.1 Monitoring the quality of the RTCM stream

You can monitor the quality of the RTCM stream that the Rover receives. Use UBX-RXM-RTCM message to see station ID, message type and CRC status.



☞ Low latency (< 5 s) of the RTCM3 stream is critical for achieving a RTK FLOAT/FIXED solution at the Rover. Any communication issues will prevent RTK FLOAT/FIXED being achieved.

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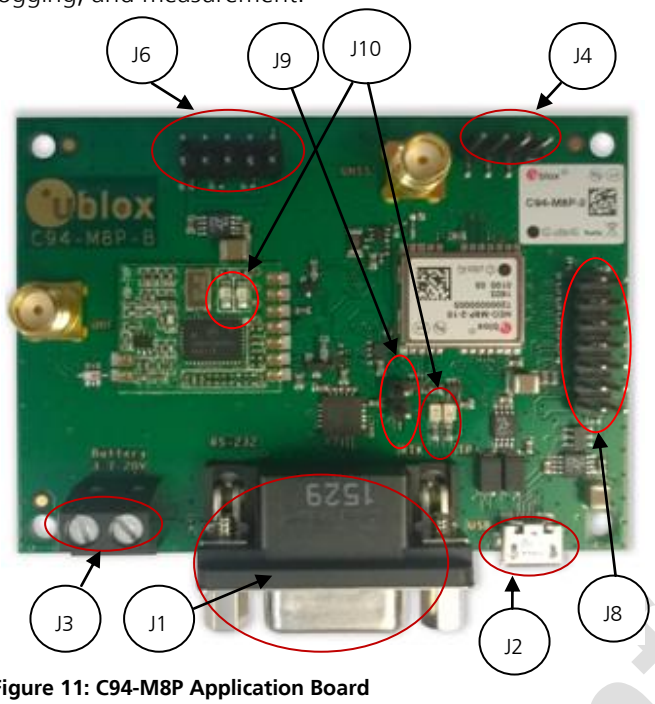
5 Evaluation interfaces

The C94-M8P application board provides the specified interfaces as mentioned in section 2, for configuration, logging, and measurement.



- J1: RS232 – UART M8P/Radio
- J2: USB – M8P
- J3: External battery / DC connector
- J4: Interface to u-blox C027
- J6: Debugger interface for radio module
- J8: Test & Production interface
- J9: Geofence and RTK status
- J10: Indicator LEDs

Figure 11: C94-M8P Application Board

5.1 RS232/UART Interface

There are two purposes for the UART interface on the board:

- For configuring the radio module with AT commands
- On the Rover board, to log the data stream (RTCM messages) sent from the radio module to the GNSS module

☞ Before configuring the radio module, the UART output of the GNSS module needs to be disabled.

☞ See section Appendix B for radio communication link configuration.

5.2 USB interface

The C94-M8P board provides one micro-A USB interface, which is used for:

- Configuring the GNSS NEO-M8P-2 module
- Logging data sent out from the GNSS module, including UBX, NMEA messages.

5.3 J9 connector

The J9 connector is the monitor interface for the Geofence status and the RTK status, which correspond to pin 15 and pin 16 on the NEO-M8P-2 module. The pin assignments of this 2-pin connector are shown in Table 2. For more information, refer to the NEO-M8P Data Sheet [2].

Pin Nr.	Assignment
1	GEOFENCE_STAT, monitor Geofence status
2	RTK_STA, monitor RTK status

Table 2: Pin assignments of J9

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5.4 J4 connector

The J4 connector is the interface for connecting to u-blox C027 and other application boards. It enables communication alternatives using u-blox cellular and short-range technologies. The pin assignments of this 4-pin connector are shown in Table 3. For more details about C027, see https://www.u-blox.com/product/c027.

Pin Nr.	Assignment
1	GND
2	TXD
3	RXD
4	3.3 v

Table 3: Pin assignments of J4

5.5 Battery connector

There is a 2-pin battery connector available on C94-M8P for connecting the board to an external battery or DC supply. This uses a standard 5.05 mm pitch 2-pin connector for supplying a 3.7 – 20 VDC source or external battery. The pin assignments of this 2-pin connector are shown in Table 4.

Pin Nr.	Assignment
1	V_BAT, battery "+"
2	GND, battery "-"

Table 4: Pin assignments of battery connector

5.6 LED

There are four indicator LEDs mounted on the C94-M8P application board:

- Blue LED shows the time pulse output signal from the NEO-M8P-2 module. The LED starts flashing one pulse per second during a GNSS fix. If there is no GNSS fix, the LED will light up without flashing.
- Yellow LED indicates geofence status
- Red LED is flashing when the radio module is transmitting
- Green LED is blinking when radio module is ready to receive

5.7 Antenna connectors

5.7.1 Radio antenna connector

The radio antenna SMA connector on each board is used for connecting a UHF antenna. This connector is marked with the text "UHF" on the board.

5.7.2 GNSS antenna connector

The GNSS module SMA connector on each board is used to connect the external active GNSS antenna. This connector is marked with the text "GNSS" on the board.

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6 Block diagram

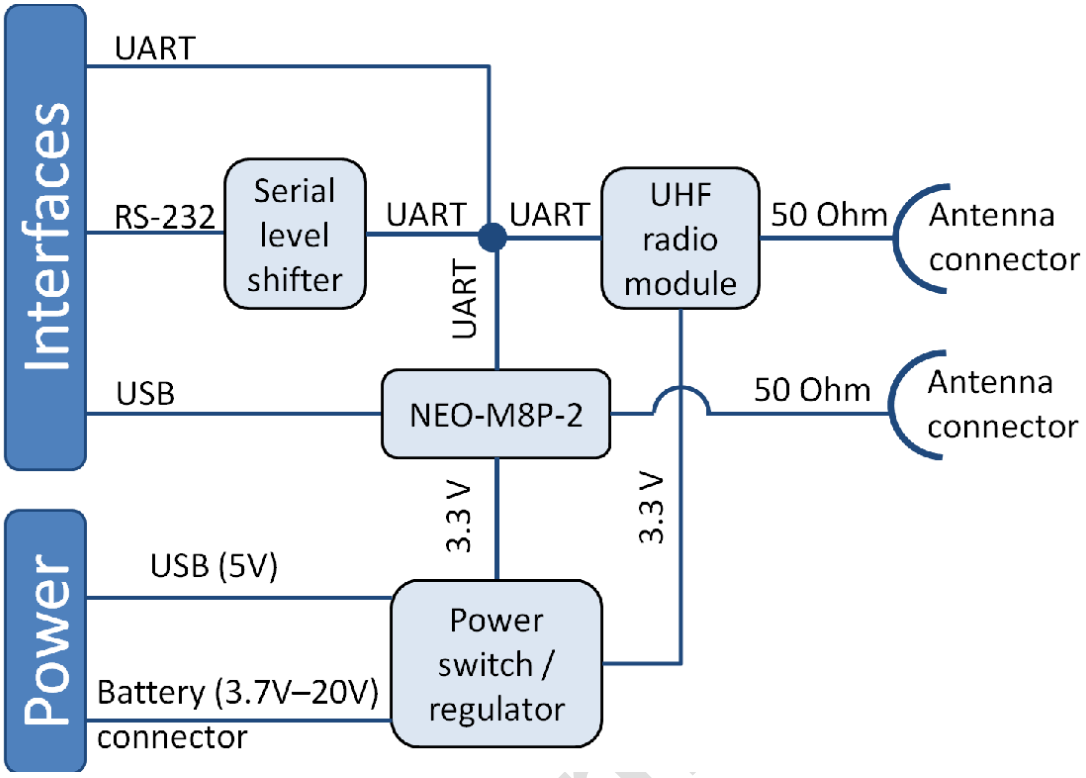

Figure 12: Block diagram of the C94-M8P application board

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7 Board layout

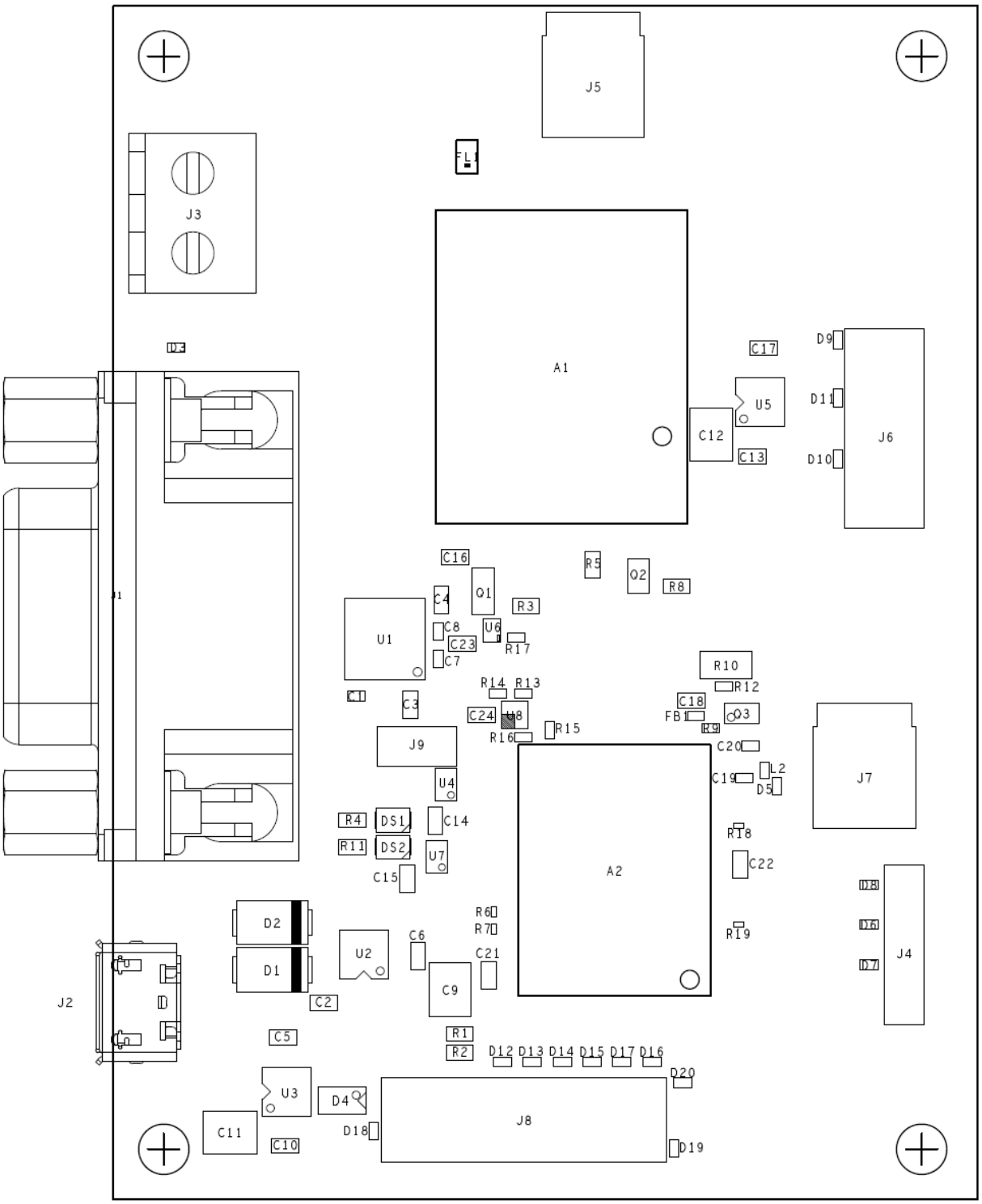

Figure 13: Board Layout of C94-M8P Application Board

8 Schematic

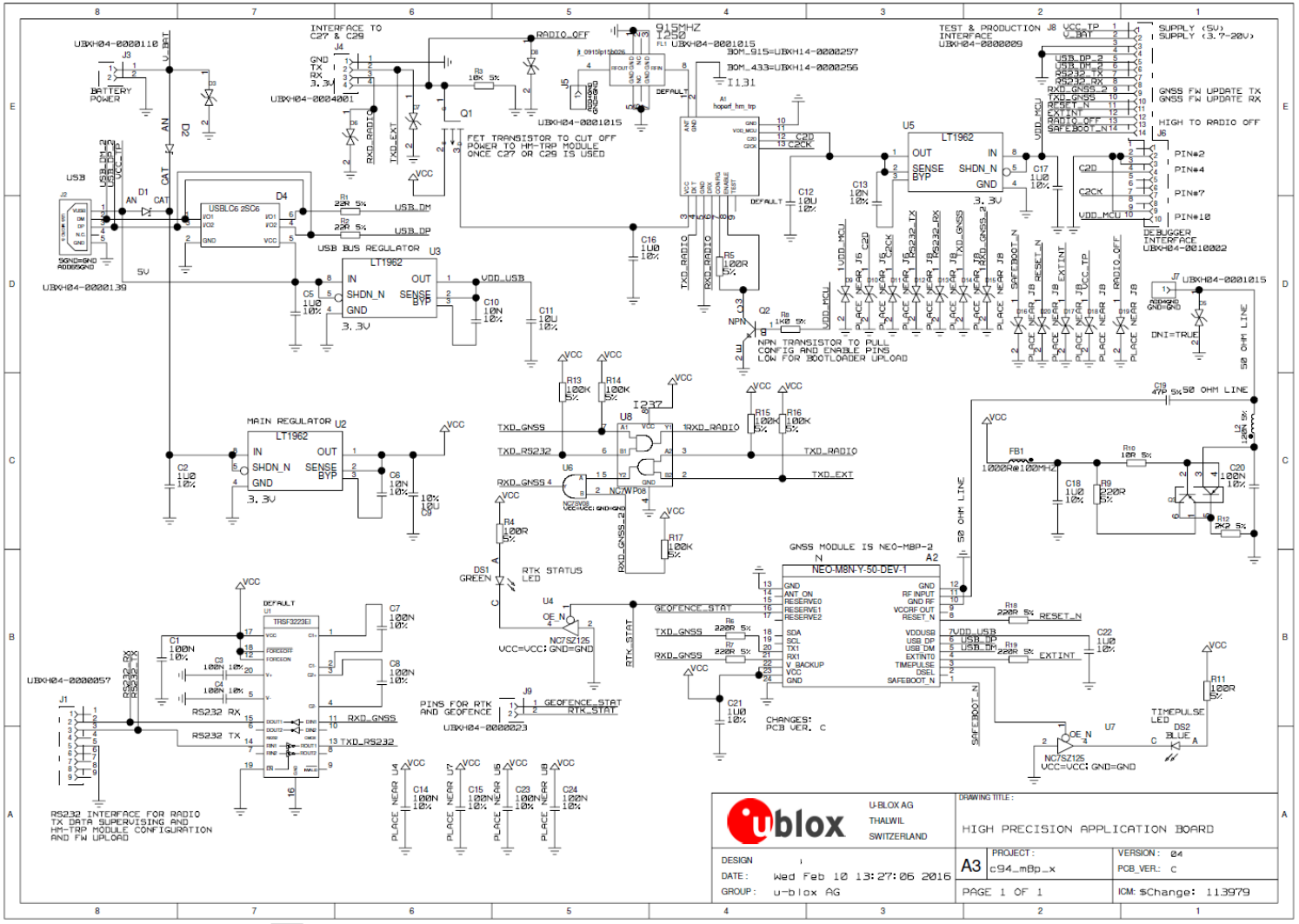

Figure 14: Schematics of C94-M8P application board PCB version C

Appendix

A Glossary

Abbreviation	Definition
BeiDou	Chinese satellite system
ECEF	Earth Center Earth Fixed format
GLONASS	Russian satellite system
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
PCB	Printed circuit board
PLL	Phase Locked Loop
PPS	Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
TTFF	Time To First Fix
UART	Universal Asynchronous Receiver/Transmitter

Table 5: Explanation of abbreviations used

B Radio communication link configuration

☞ By default, users do not need to do any configuration for the Radio communication link. The u-blox default configurations are tested and verified.

☞ Users need to take all responsibility for any changes against the default configuration.

By default, u-blox has configured the radio link module to meet local radio frequency requirements. The C94-M8P application boards are labeled according to different radio module variants as follows:

- C94-M8P-1 for China
- C94-M8P-2 for USA and Canada
- C94-M8P-3 for Europe

The default radio-link configurations in shipped C94-M8P boards are listed here:

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Parameters	C94-M8P-1 for China	C94-M8P-2 for USA/Canada	C94-M8P-3 for Europe
Minimum Frequency	433.180 MHz	902.5 MHz	433.230 MHz
Maximum Frequency	434.730 MHz	928.0 MHz	434.730 MHz
Air Speed	16 kbps	16 kbps	16 kbps
Serial baud rate	9.6 kbps	9.6 kbps	9.6 kbps
TX Power	11 dBm	20 dBm	11 dBm
LBT_RSSI	0	0	71
Number of Channels	10	50	10
ECC	0 (off)	0 (off)	0 (off)
OpResend	0 (off)	0 (off)	0 (off)

Table 5: Default configuration for regional variants of the radio module on C94-M8P application boards

☞ The u-blox default configurations of the radio module regional variants are tested and verified. Users need to take all responsibility for any changes to the default configuration.

The C94-M8P application board uses a HM-TRP radio module with SiK open source firmware, which supports a subset variant of the Hayes "AT" modem commands for advance configuration.

Before configuring the radio module, the GNSS module UART output needs to be disabled via u-center (View -> Message View -> UBX-CFG-PRT), as shown in Figure 15**.** For more information, see the u-center User Guide [4], and the u-blox 8 / u-blox M8 Receiver Description including Protocol Specification [1].

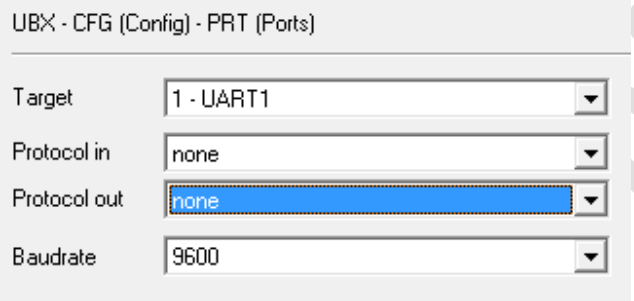

Figure 15: **Disable UART output of NEO-M8P-2 GNSS module on C94-M8P application board**

Use the serial-console application, Putty, on the PC to connect to the RS232/UART interface. Configure the serial connection with baud rate 9600 Bd and COM port number assigned by Windows OS, as shown in Figure 16. For more information about installing serial-console application, please see chapter B.1.

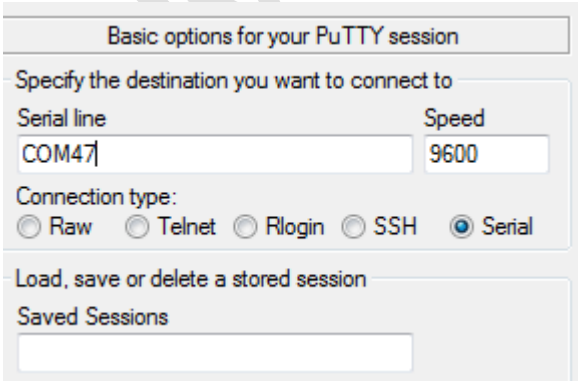

Figure 16: Configuration of serial connection for Radio Module on C94-M8P Application Board

Advance Information

Enable the AT command mode by sending sequence "+++" (quickly type "+++" and wait for 1 second) via the serial link. The radio module sends "OK" to indicate entering the AT command mode.

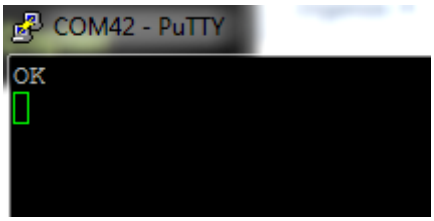

Figure 17: Radio module sends "OK" prompt through serial link when AT Command Mode is Enabled

In AT command mode, the radio module accepts AT commands and gives response correspondingly. In case of wrong AT commands, the radio module returns ERROR as the response.

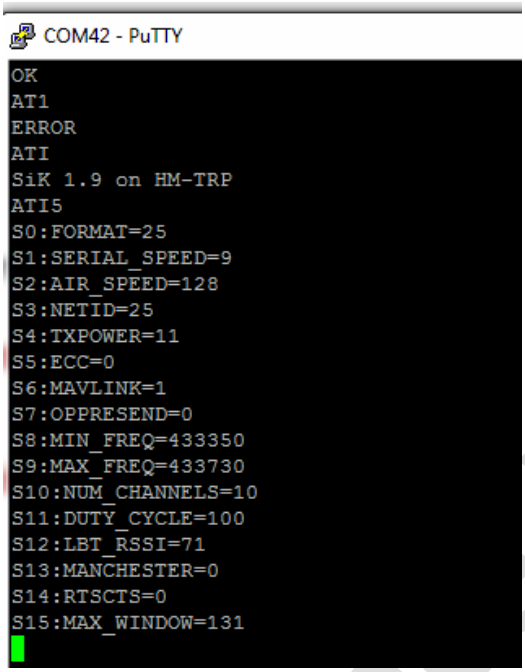

Figure 18: Send AT commands to Radio Module

- Table 6 shows the AT command set that is supported by the C94-M8P application board.
- Table 7 shows all radio parameters that are configurable. For more information about configuring the radio module used by C94-M8P, see http://copter.ardupilot.com/wiki/common-3dr-radio-advanced-configuration-and-technical-information/.
- UHF operation needs to be on licensed bands according to regions.
- Remember to enable GNSS module UART output on Base when finished with radio communication link configuration.

Advance Information

Commands	Description
ATI	Shows radio version
ATI2	Shows board type
ATI3	Shows board frequency
ATI4	Shows board version
ATI5	Shows radio parameters and the current settings.
ATI6	Displays timing report of TDM
ATI7	Displays signal report of RSSI
ATO	Exits from AT command mode
ATS<n>?	Displays radio parameter indicated by index number "<n>". "<n>" needs to specify by a user, which is listed in output of command ATI5.
ATS<n>=<X>	Set radio parameter indexed by <n> to "<X>". "<n>" and "<X>" need to specify by a user. "<n>" is listed in output of command ATI5.
ATZ	Reboots the radio module
AT&W	Writes the current parameters to EEPROM
AT&F	Resets all parameters to default factory settings
AT&T=RSSI	Enables debug reporting of RSSI
AT&T=TDM	Enables debug reporting of TDM
AT&T	Disables all debug reporting

Table 6: AT Command Set for Radio Module on C94-M8P application board

Index<n>	Parameter Name	Description
1	SERIAL_SPEED	Serial speed in "one byte form", e.g. 9 corresponds to 9600 Bd configured for the C94-M8P board.
2	AIR_SPEED	Air data rate in "one byte form". Must be same for a pair of radios.
3	NETID	Network ID. Must be same for the pair of C94-M8P boards. Must be same for a pair of radios.
4	TXPOWER	Transmit power in dBm, maximum value is 20 dBm.
5	ECC	Enables / disables the golay error correcting code. Must be same for a pair of radios.
6	MAVLINK	Configure MAVLink framing and reporting, • 0: no mavlink • 1: frame mavlink • 2: low latency mavlink
8	MIN_FREQ	Minimum frequency in kHz. Must be same for a pair of radios.
9	MAX_FREQ	Maximum frequency in kHz. Must be same for a pair of radios.
10	NUM_CHANNELS	Number of frequency hopping channels. Must be same for a pair of radios.
11	DUTY_CYCLE	Percentage of time to allow transmit
12	LBT_RSSI	Threshold of Listen Before Talk. Must be same for a pair of radios.
15	MAX_WINDOW	Maximum transmitting window in milli seconds, • default: 131 • for low latency: 33 Must be same for a pair of radios.

Table 7: Configurable radio parameters

B.1 Serial console terminal installation

Many serial console terminal programs are available, either as commercial software or from open source communities. In this user guide, the examples show the Putty terminal emulator running on Windows 7. Putty is an open source stand-alone application that runs on multiple operating systems. Download and uncompress the software package from http://www.putty.org, and then run the executable file.

For more information about Putty, see http://www.putty.org.

Advance Information

C Notes on FW3.01 HPG1.20

- Multiple Base stations sharing the same network ID is not supported.
- The Base station needs to be static.
- High multipath and poor or no groundplanes on the Base or Rover will prevent the Rover entering FIXED mode.

D Notes on hardware

Users should be aware that the C94 App board radio link latency can extend up to 550ms for a message content of 2k bits. e.g. with MSM7 messages this payload size would represent about 12 SVs, say 6 GPS and 6 GLO - a fairly typical scenario. Hence update rates beyond 1Hz should be contemplated carefully owing to the radio modem latency. In any event the modem interface rate of 9600 baud will present a hard limit depending on the number of SVs. e.g. approximately 4 Hz with 12 SVs.

Advance Information

Related documents

[1] u-blox 8 / u-blox M8 Receiver Description Including Protocol Specification (Public version), Docu. No. UBX-13003221

[2] NEO-M8P Data Sheet, Docu. No. UBX-15016656

[3] NEO-M8P Hardware Integration Manual, Docu. No. UBX-15028081

[4] u-center User Guide, Docu. No. UBX-13005250

[5] Protocol Specification Addendum for HPG1.20, Docu. No. UBX-16004304

[6] Achieving Centimeter Level Performance with Low Cost Antennas, Docu. No. UBX-16010559

[7] C94-M8P u-blox RTK Application Board Package (PCB Version D) User Guide, Docu. No. UBX-16016235

☞ For regular updates to u-blox documentation and to receive product change notifications, register on our homepage (http://www.u-blox.com)

Revision history

Revision	Date	Name	Status / Comments
R01	19-Feb-2016	yzha	Advance Information
R02	30-May-2016	jhak	Restructuring chapters, more details on Base/Rover configuration, FW3.01 HPG1.11 related information
R03	19-Aug-2016	jhak	Updated package contents, more details on GNSS antenna considerations and setting up RTCM messages
R04	14-Oct-2016	jhak	HPG1.20 update. Added chapter D Notes on Hardware

Advance Information

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