S100 RTK RECEIVER USER GUIDE

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1 Overview

1-1 Introduction

S100 is a high performance dual-frequency RTK receiver with Bluetooth and USB interface. It offers centimeter-level positioning accuracy suitable for surveying, mapping, and GIS data collection.

By default, S100 is shipped as RTK rover to accept RTCM3.x message or SkyTraq carrier phase raw measurement data from an RTK base, and provides centimeter-level accurate position result relative to the RTK base in standard NMEA message format.

S100 can also be configured as a RTK base to provide RTCM3.x message or SkyTraq carrier phase raw measurement output.

S100 has two major interface for different applications: USB and Bluetooth. The USB interface is mainly for configuration, monitoring, and supplying power. With Bluetooth V2.1+EDR function built-in, S100 can be used as external Bluetooth RTK receiver for Android Mobile Device to provide higher accuracy positioning than internal GPS.

1-2 RTK Operation Guideline

To provide centimeter-level RTK accuracy, S100 requires much better operating condition than conventional meter-level accuracy GPS receiver:

- Baseline distance between base and rover should be under 30Km.
- > Open sky environment without interference and signal blockage
- Received signal level should be no less than 40dB/Hz.
- > 10 or more satellites with elevation angles over 15 degrees
- Good satellite geometry with satellites spread over four quadrants of the sky.

1-3 S100 RTK Receiver Features

- Base or Rover Mode Configurable Using Polaris Connect App
- Supports GPS/QZSS L1/L2C, Beidou B1I/B2I, Galileo E1/E5b, GLONASS L1/L2 RTK Operation
- Supports USB and Bluetooth V2.1+EDR Interface
- On-Board 256MByte Flash Memory for Data Logging Post Processing
- RTK Position Horizontal Accuracy 7mm + 1ppm, Vertical Accuracy 14mm + 1ppm
- Maximum RTK Update Rate 10Hz
- Supports RTCM 3.x Messages
- NMEA Output
 - Update Rates : 1 / 2 / 4 / 5 / 8 / 10 Hz for RMC / GGA / VTG / PSTI-030
 - Messages : GGA / GLL / GSA / GSV / RMC / VTG / ZDA / PSTI
- Baud Rate
 - Bluetooth : 115200
 - USB: 4800 / 9600 / 19200 / 38400 / 57600 / 115200, default 115200
- Power Consumption
 - 280 mA @ 5V
- ➢ Weight ∶ 460 g

2 USB Interface



Figure 2-1

Connect S100's 4-pin socket (Figure 2-1 a) with the included accessory USB cable (Figure 2-1 b). The S100 USB cable is used for

- 1. Supplying power from power bank (Figure 2-1 d)
- 2. Firmware update using Windows PC (Figure 2-1 c)

3 Preparing for First-Time Use

A tutorial video showing the process of setting up S100 to perform RTK surveying with Mobile

Topographer from very beginning can be found here

https://www.youtube.com/watch?v=6FXFHmigboE

3-1 Install "Polaris Connect" App

Install Android app "<u>Polaris Connect for S100 RTK Receiver</u>" from Google Play. It can be found with this QR Code.



3-2 Install USB Driver

USB driver needs to be installed before updating S100 Receiver firmware. Download it from: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

3-3 Check S100 Receives Satellite Signal

Below steps bring up S100 as a normal USB-interface GNSS receiver to receive satellite signal:

- 1. Place S100 at a location having good sky view. Connect S100 with PC using the included USB cable.
- 2. Pair phone with the S100, which has a Bluetooth device name starting with "S100". See Figure 3-1.



3. Launch Android app "Polaris Connect", and selected the paired S100 device. See Figure 3-2.



Figure 3-2

4. Start "USB Input Rover" mode. The app closes when S100 is configured to USB Rover. See Figure 3-3.



Figure 3-3

5. On a PC, install and open <u>\$100 Viewer</u>. In \$100 Viewer, a dialog box for COM port and baud rate will appear. Click "Connect". See Figure 3-4.

E S100 Viewer V1.0.0.1 FW-S11.07.31 K03.00.0	1 R20200703 CRC_7144		_	Х
Viewer Updates Help				
COM Port COM11 V Baud Rate 115200 V Connect Pos. Fix 3D. TTFF 0	Message \$GNGLL,2447.0934405,N,12100.5227061,E,023214.000,A,A*4C A \$GNRMC,023214.000,A,2447.0934405,N,12100.5227061,E,000.0,00 \$GNVTG,000.0,T_M,000.0,N,000.0,K,A*13 \$GNZDA,023214.000,13,07.2020,00,00*4B \$P\$5T1,030,023214.000,A,2447.0934405,N,12100.5227061,E,104.539, \$P\$5T1,032,023214.000,130720,V,*4A ¥	Response COM11 removed COM11 plugged-in		

Figure 3-4

6. NMEA output should be seen on the Message screen. If having good sky view with sufficient number of satellites tracked, the signal bar will turn solid and have position fix. See Figure 3-5.

S100 Viewer V1.0.0.1 Viewer Mode		- o ×
Viewer Updates Help		
COM Port Pos. Fix 3E	Message \$GNGLL,2447.0874645,N,12100.5250950,E,055512.000,A,A*44	Response
Baud Rate 115200 V Disconnect	SGNRMC,055512.000, A,2447,0874645, N,12100.5250950,E,000.0,00 SGNVTG,000.0,T,,M,000.0,N,000.0,K,A*13 SGNZDA,055512.000,11,08,2020,00.00*46 SPSTI,030,055512.000,A,2447.0874645,N,12100.5250950,E,92.930,0 SPSTI,032,055512.000,110820,V,*47 ♥	
Date / Time / Location		
Date Time 2020/08/11 05:55:12:000 Latitude Longitude 24*47*5.24787* N 121*031:50570' MSL Altitude Ellipsoidal H 92:93 M 112:53 M Information RTK Info. FW Info	GPS L1 L2 4 77 47 991 401 1 2 5 6 9 12 13 GLONASS G1 G2	Scatter View (m) 2 N 1 M C C C C C C C C C C C C C C C C C C
Direction Speed 0.00° 0.00 km/h	444-315-504 65 72 87	- <u>2</u> S S
NDOF ODOF 0.50 0.90 PDOP Revision 1.00 WGS84 X VBGS84 X WGS84 Y	BEIDOU BII BII BZI	Earth View
Command Hot Start Cold Start	6 7 10 13 16 19 21 22 29 35 GALILEO LL DE5a 4 9 11 12 19 33	

Figure 3-5

4 RTK Rover Operation

S100 RTK rover works with carrier phase measurement, using fractional part of ~19 centimeter wave length GNSS signals and differential principles to achieve centimeter-level position accuracy relative to the RTK base.

Referring to figure 4-1, S100 receives RTK base correction data over Internet via NTRIP Client running on the Android phone. S100 uses this correction data along with signals received from satellites to calculate its precise position and output position / velocity / time information in NMEA-0183 format.



Figure 4-1

The most common way to use S100 for RTK surveying is to adopt a 3rd party RTK correction service, then only one S100 RTK receiver is needed.

S100 is configured as RTK rover and connects to an Android smartphone via Bluetooth. User can then run the free "Polaris Connect" app, or "Lefebure NTRIP Client" app, on the smartphone for retrieving 3rd-party RTK base correction data over Internet and sending it to the S100 RTK receiver. *With "MOCK Location" option enabled on the Android smartphone, 3rd party GIS app for survey data collection can be used, achieving centimeter-level RTK accuracy.*

The S100 can be used as Bluetooth RTK rover or USB RTK rover. The operations to configure and start RTK rover are described in this section.

For Bluetooth RTK rover, user can choose to use Polaris Connect app's built-in NTRIP client feature (section 4-1) or third-party NTRIP client like Lefebure NTRIP Client app (section 4-2).

For USB RTK rover, the operations are described in section 4-3..

Other possible but less used RTK usage scenarios are described in Appendix A-1.

4-1 Bluetooth RTK Rover to Work with App-Built-In NTRIP Client

The S100 RTK Receiver, when configured as a Bluetooth RTK Rover, can receive RTK correction data from RTK correction service, going through Polaris Connect app, as previously shown in Figure 4-1. Follow below steps to configure S100 to receive correction data via Bluetooth interface with built-in NTRIP client of the Polaris Connect app.

- 1. Switch to Rover tab in the app. See Figure 4-2 a
- 2. Click Settings (Figure 4-2 b) and configure NTRIP log-in information (Figure 4-2 c). The log-in information should be obtained from RTK correction service provider.



Figure 4-2

- 3. Click Start of "Bluetooth Rover with NTRIP Client" and then app starts receiving correction data. See
 - Figure 4-3 a b.

17:38 🖬 🖘 🛛	¥{ ͡∿ "∥ 92% û	16:06 🏾 📲 🖘 📶 100%
Use S100 as Rover		Data Reception
		Rover Satellite Reception
RTK Rover		
Bluetooth Rover with NTRIP Cl For CORS/VRS, Use This	ient	20 0 10 10 10 10 10 10 10 10 10 10 10 10
This Phone S100 Rover		50 40 20 10 0 7 7 6 GLONASS
(j) (Ö) (\mathbf{F}	S0 40 20 10 40 10 10 40 10 10 40 10 10 40 10 10 40 10 10 10 10 10 10 10 10 10 10 10 10 10
More Info. Settings	Start	50 40 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Bluetooth Rover For Lefebure NTRIP Client, Use	This	RTK Correction Data Received
This Phone S100 Rover		10.487 KB Stop
Rover Base	tility	
	<	III O <
а		b
	Figur	re 4-3

4-2 Bluetooth Rover to Work with Third-party NTRIP Client App

The S100 RTK Receiver, when configured as a Bluetooth RTK Rover, can receive RTK correction data from RTK correction service, going through a third-party NTRIP client service, e.g. Lefebure NTRIP Client app, as shown in Figure 4-4.



Follow below steps to configure S100 to receive correction data from third-party NTRIP client app like Lefebure NTRIP Client, via Bluetooth. The Polaris Connect app closes as soon as the S100 starts to work as Bluetooth RTK rover.

- 1. Switch to Rover tab in the app. See Figure 4-5 a
- 2. Click Start of "Bluetooth Rover"; the app Polaris Connect will be closed. See Figure 4-5 b
- 3. Start third-party NTRIP client app to receive RTK correction data, sends it to S100, and receive position data stream from S100. See Figure 4-5 c.
- 4. If needing more information on how to use Lefebure NTRIP client app, refer to Appendix A-2-4.



Figure 4-5

4-3 USB Rover

The S100 RTK Receiver, when configured as USB RTK Rover, can receive RTK correction data from NTRIP client running on a PC, e.g. strsvr of RTKLIB, as shown in Figure 4-6.



Figure 4-6

Follow below steps to configure S100 to receive correction data via USB interface. The app closes when the S100 starts to work as USB RTK rover.

- 1. Make sure S100 is connecting with PC via USB interface.
- 2. Switch to Rover tab in app. See Figure 4-7 a
- 3. Click Start of "USB Input Rover"; the Polaris Connect app will close. See Figure 4-7 b
- 4. Start third-party tool, e.g. strsvr of RTKLIB, to receive RTK correction data, sends it to S100, and receive position data stream from S100. See Figure 4-7 c.

Use S100 as Rover USB Input Rover For RTKLib or Radio+Lefebure Connection, Use This PC S100 Rover USB USB Over USB Input Rover For RTKLib or Radio+Lefebure Connection, Use This PC S100 Rover USB USB USB Input Rover For RTKLib or Radio+Lefebure Connection, Use This Radio Module S100 Rover This Phone () USB Input Rover For RTKLib or Radio+Lefebure Connection, Use This USB Input Rover ISB Input Rover ISB Input Rover ISB Input Rover For RTKLib or Radio+Lefebure Connection, Use This ISB Input Rover ISB Input Rover ISB Input Rover For RTKLib or Radio ISB Input Rover ISB Input Rover ISB Input Rover ISB Input Rover For RTKLib or Radio+Lefebure Connection, Use This ISB Input Rover ISB Input Rover ISB Input Rover For RTKLib or Radio ISB Input Rover ISB Inpu	% 🗎	¥≹ 🗟 .⊪l 100%.	18:32 🖬 🖘 🛛	💐 🕾 "il 100% 🗎	2	18:32 🖬 🖘 오
USB Input Rover For RTKLib or Radio+Lefebure Connection, Use This $PC \qquad S100 \text{ Rover} \\ \hline USB \\ USB \\ \hline U$		Rover	Use S100 as Ro		as Rover	Use S100 as
More Info. Start		SVER r Radio+Lefebure USB USB S100 Rover S100 Rover This Phone BT BT More Info. Start	USB Input Rov For RTKLib or I Connection, US PC US Radio Module (P) USB	This Phone BT	ut Rover ib or Radio+Lefebrion, Use This S100 Rover USB USB USB USB USB More Info.	USB Input For RTKLik Connectio
Rover Base Utility Rover Base Utility	1	Base Utility	Rover	C Utility	A Base	Rover
a h		h	111	`	a	

STR	STRSVR ver.demo5 b33b									
20	20/07/09 0	8:20:23 GPS	Т		0	Conne	ect Time:	0d 0	0:00:13	;
	Stream	Туре		Opt	Cmd	Conv	By	/tes	Bps	;
	(0) Input	NTRIP Client	\sim				8,	480	5,799)
	(1) Output	Serial	\sim				8,	480	5,583	;
	(2) Output		\sim					0	0	
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	(0) 210.241.63	. 193	/GNS	S_Tai	wan (1) COM3			?
	■ S <u>t</u> op		ť,	‡ <u>O</u> pt	ions			Exit		
				c						

Figure 4-7

5. COM port splitter program will be needed to enable another program to share the same COM port to use the NMEA output.

5 Raw Measurement Recording and Post Processing

Raw measurement data logged on S100 RTK receiver is used for PPK and PPP processing. Sections 5-1 and 5-2 relate to these two types of post processing. How to obtain raw measurement data from S100 is described in section 5-3.

5-1 Preparing for PPK

For Post-Processed Kinematic (PPK) calculations, both **base data** and **rover data** need to be available. The base data can be (1) stored RTCM data received from RTK correction service or (2) stored RTCM data received from another S100 RTK base; the rover data is the stored RTCM data from S100 RTK rover. Refer to section 5-3 on how to log and obtain RTCM data on S100 receiver.

To perform PPK, files in standard RINEX format are needed. The logged RTCM data can be converted to RINEX formats (2.01 - 3.03) using <u>RTKLIB</u>'s RTKCONV program. See Figure 5-1 a, b. For reference Options window of RTKCONV is shown in Figure 5-1 c.

TKCONV V	ver:demo5 b33b					👕 RTKCONV ver:demo5 b33b — 🛛	
Time Start (GP	ST) ?	Time End (GPST)	? Interval	Uni 24	it H	Time Start (GPST) Time End (GPST) Interval Unit 2000/01/01 ↓ 00:00:00 ↓ 1 v s 24	t H
RTCM, RCV RAW	or RINEX OBS ?					RTCM, RCV RAW or RINEX OBS ?	_
C: \Users \jimjl \Do	cuments\RTKLIB\Ro	over-2020-08-13-09	93921-pt1.rtcm	~ 🗉		C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.rtcm \lor	
Output Directory			Forma	t	-	Output Directory Format	-
			··· RTCM	3	~	RTCM 3	~
RINEX OBS/NAV/	GNAV/HNAV/QNAV/	LNAV and SBS	CONTRACT AND			RINEX OBS/NAV/GNAV/HNAV/QNAV/LNAV and SBS	
	pocuments (KTKLIB	Kover-2020-08-13	-093921-pt1.0bs File P				***
C: Users (jimji)	pocuments (RTKLIB)	Rover-2020-08-13	-093921-pt1.nav			C: Users (jim) Documents (R IKLIB/base-2020-08-13-093906-nome.nav File C	
C:\Users\jimjl	Documents (RTKLIB)	Rover-2020-08-13	8-093921-pt1.gnav			C: \Users \jimjl\Documents \RTKLIB\Base-2020-08-13-093906-home.gnav	+++-
C:\Users\jimjl	Pocuments (RTKLIB)	Rover-2020-08-13	-093921-pt1.hnav		***	C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.hnav	
C:\Users\jimjl	Pocuments RTKLIB	Rover-2020-08-13	-093921-pt1.qnav		***	C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.qnav	
C:\Users\jimjl\	Documents\RTKLIB	Rover-2020-08-13	8-093921-pt1.lnav			C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.lnav	
C:\Users\jimjl\	Documents\RTKLIB	Rover-2020-08-13	-093921-pt1.cnav			C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.cnav	***
C:\Users\jimjl\	Documents (RTKLIB)	Rover-2020-08-13	1-093921-pt1.inav			C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.inav	1115
C:\Users\jimjl	Documents (RTKLIB)	Rover-2020-08-13	8-093921-pt1.sbs			C:\Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.sbs	
	2020/08/1	13 09:44:07: O=20	0 N=36		?		?
1 Plot	Process	Options	► <u>C</u> onvert	Exit		Plot Process Process Qptions Convert Exit	
		а				b	
			Options			×	
			RINEX Ver 3.02	~ [Sep I	NAV Station ID 0000 RINEX2 Name	
			RunBy/Obsv/Agency				
			Comment				

Maker Name/#/Type Rec #/Type/Vers Ant #/Type

Ant Delta H/E/N

Receiver Options

Approx Pos XYZ 0.0000

Time Torelance (s) 0.005 Debug OFF

0.0000

ØGPS ØGLO ØGAL ØQZS ØSBS ØBDS □IRN

с

0.0000

0.0000

 \sim

ОК

Scan Obs Types Half Cyc Corr Iono Corr Time Corr Leap Sec

 Observation Types
 Frequencies

 Image: C Image

0.0000

0.0000

Excluded Satellites

Cancel

Converting the RTCM file with rtkconv.exe, user can get a RINEX file with extension "**obs**" and a RINEX file with extension "**nav**". The three files (two OBS files and either one of the two NAV files) are used in RTKLib PPK tool "rtkpost.exe". See Figure 5-2.

🗱 RTKPOST ver.demo5 b33b —		×			
Time Start (GPST) Time End (GPST) Interval Unit 2000/01/01 ↓ 00:00:00 ↓ 00:00:00 ↓ 0 ∨ s 24 H					
RINEX OBS: Rover ?	٢	=			
C: \Users \jimjl\Documents \RTKLIB\Rover-2020-08-13-093921-pt1.obs File A		~			
RINEX OBS: Base Station	۲	=			
C: \Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.obs File B		~			
RINEX NAV/CLK, SP3, FCB, IONEX, SBS/EMS or RTCM	=	=			
C: \Users\jimjl\Documents\RTKLIB\Base-2020-08-13-093906-home.nav File C		~			
		~			
		×			
		~			
Solution Dir					
C:\Users\jimjl\Documents\RTKLIB\Rover-2020-08-13-093921-pt1.pos					
		_			
		1			
⊕ Plot E View KML/GPX Qptions Execute Execute	E	ġt			

Figure 5-2

5-2 Preparing for PPP

For some online Precise Point Positioning (PPP) service, older RINEX 2.11 format data is required; a minor modification on converted RINEX file may be needed. Follow below steps to prepare RINEX file for sending to online PPP service.

- 1. Log and obtain RTCM data (see section 5-3)
- Use v.2.4.3 RTKLib's RTKCONV program to convert the logged RTCM data to RINEX 2.11. Select proper constellations and frequency bands the online PPP service uses; will then get a RINEX format file *.obs. See Figure 5-3 a.
- 3. Edit the output *.obs file, and modify the string "C2" to "P2" on about 13th line. See Figure 5-3 b.

Options					
RINEX Ver 2.11 V	Sep NAV Sta	tion ID 0000	RINEX2 Name		
RunBy/Obsv/Agency					
Comment					
Maker Name/#/Type					
Rec #/Type/Vers					
Ant #/Type					
Approx Pos XYZ	0.0000	0.0000	0.0000		
Ant Delta H/E/N	0.0000	0.0000	0.0000		
Scan Obs Types			Corr Leap Sec Excluded Satellites		
Observation Types Frequencies					
MC ML MD MS	✓L1 ✓L2/E5b	✓L5 E6	E5ab S Mask		
Receiver Options					
Time Torelance (s) 0.00	5 Debug OFF	~ ОК	Cancel		

а



b

Figure 5-3

5-3 Obtaining Log Data from S100

The steps to generate, access, and manage log data with \$100 are described below.

To generate log data of base and rover, follow below steps.

- 1. In rover or base tab, click the black REC button to start S100 to record raw measurement data in its flash memory. See Figure 5-4 a, b.
- 2. When S100 start to record raw measurement data, the REC button becomes red and flicks. See Figure 5-4 c.
- 3. Click red REC button again to stop recording.





To check the log data in S100's flash memory, follow below steps.

- 1. Click Utility and Browse. See Figure 7-5 a.
- 2. The information of recorded measurement data, including the start time, base or rover and file size, is then displayed. See Figure 7-5 b.

16:42 🖬 🕈 🕲 • 📲 🖘 📲 100% 🛢	Correction Data Logs in S100
S100 Utilities	
Log of Correction Data	Download Browse Erase All Logs Selected Logs
Access RTK Correction Data in S100	2020/07/03 08:39:55 (UTC)
During	Base Data 4.096 KB
Browse	2020/07/03 08:39:36 (UTC)
	Rover Data 2.048 KB
Utilities	2020/07/03 06:29:37 (UTC)
Restart RTK Module	Rover Data 4.096 KB
Cold Start	2020/07/03 06:04:48 (UTC)
	Rover Data 4.096 KB
Pole Length	2020/07/03 05:49:22 (UTC)
2.m	Rover Data 4.096 KB
3 m 0 cm Set	2020/07/02 08:52:29 (UTC)
	Rover Data 8.192 KB
Rover Base Utility	
	III O <
а	b
-	-

Figure 7-5

To download the log data to smartphone, follow below steps.

- Select the log data to download by clicking its date field. The selected files are then marked. See Figure 7-6 a.
- 2. Click "Download Selected Logs". See Figure 7-6 b.
- A pop-up window shows how to connect to S100 via WiFi connection. Read the instructions and click Next. See Figure 7-6 c.
- You'll be brought to system's WiFi configuration screen. Select the WiFi AP whose name starts with "S100" and make sure the phone is connected with it (no Internet capability during log file transfer). See Figure 7-6 d.
- 5. Click Back button. See Figure 7-6 e.
- 6. The file transfer starts, and you will be prompted when it finishes. See Figure 7-6 f.



Figure 7-6

To check the downloaded log data on smartphone's memory, follow below steps.

- 1. Click "Browse Downloaded Logs". See Figure 7-7 a.
- 2. The downloaded raw measurement base data is then displayed. See Figure 7-7 b.
- 3. Click "Rover Logs" to check rover raw measurement data. See Figure 7-7 c.

Correction Data	Logs in S100	/storage/emulated/0	/PolarisGNSS	/storage/emulated/0	/PolarisGNSS
↓		Base Logs	Rover Logs	Base Logs	Rover Logs
Download Selected Logs D	Browse Erase All Logs Dowloaded Logs	Base-2020-06-18-02	2:15:11.bin	Rover-2020-06-17-0	8:58:58.bin
2020/06/24 08	B:44:33 (UTC)				
Base Data	2.048 KB	Base-2020-06-02-07	7:27:53.bin		
2020/06/24 08	8:30:19 (UTC)				
Rover Data	2.048 KB				
2020/06/17 08	8:58:58 (UTC)				
Rover Data	30.720 KB				
111		III C) <	III C) <
	а	b		C	
		Гia	uro 7 7		

Figure 7-7

To access the raw measurement data from PC, follow below steps.

- Connect the phone with PC, then select the folder "PolarisGNSS" in the popped-out File Explorer. See Figure 7-8
- 2. Copy/Move/Delete operation can be performed on the measurement data.

> Galaxy A7 (2018) > Phone > PolarisGNSS	ۍ م	<i>م</i>
Name ^	Туре	Size
4 Base-2020-06-02-07:27:53	BIN	16 KB
4 Base-2020-06-18-02:15:11	BIN	2 KB
🚱 Rover-2020-06-17-08:58:58	BIN	30 KB

Figure 7-8

To erase all the recorded raw measurement data on S100, follow below steps.

- 1. Click "Erase All Logs". See Figure 7-9.
- 2. All log files will be eased.



Figure 7-9

6 Software and Firmware Update

S100 Viewer is a PC software for S100 RTK Receiver firmware update. It can be downloaded form http://www.polaris-gnss.com/s100/s100-viewer.zip

Occasionally, for improved product performance and user experience, there may be updates for

- 1. S100 Viewer software
- 2. S100 RTK receiver firmware
- 3. S100 Bluetooth module firmware

User can manually check and update them using Polaris Connect app and S100 Viewer on computer with Internet connection.

6-1 S100 Viewer Software Update

Select "Check S100 Viewer Update" from the Viewer pull-down menu and follow the instruction to update S100 Viewer if an update is released.



Figure 8-1

6-2 S100 RTK Receiver Firmware Update

Videos showing procedure of updating S100 RTK Receiver firmware can be found here:

https://www.youtube.com/watch?v=WrAUKF84KZU(1/2) https://www.youtube.com/watch?v=A3NPLYP_EKA(2/2)

Follow below steps to update S100 firmware.

- USB driver needs to be installed for updating S100 receiver firmware. Download it from: <u>https://www.silabs.com/products/development-tools/software/usb-to-uart-b</u> <u>ridge-vcp-drivers</u>
- 2 Connect S100 with PC and start S100 Viewer software on PC. See Figure 6-2.





3 On Polaris Connect app, click Connect button on Utility-Version screen, this enables S100 RTK Receiver's firmware to be updated. The app will then be closed. See Figure 6-3.

17:26 🖼 🖗 🕒 🛛 🙀 🛸 🖬 100% 🛍
S100 Utilities
0 m 0 cm Set
Version
RTK Version 20200703 To upgrade RTK module firmware, connect \$100 with PC, start '\$100 Viewer' software and click below Connect button. This app will be closed.
Connect
Bluetooth Version 01.00.00.01 Bluerooth firmware is up to date.
Upgrade
App Version 1.03
More Info. Polaris
Rover Base Utility

Figure 6-3

4 From S100 Viewer "Updates" pull-down menu, select "Check Firmware Update", then a message box showing "checking for updates" will pop up. See Figure 6-4.





5 In case new update software is found, a dialog box will appear. Press "Download and Update" to update, or "No" to cancel update. See Figure 6-5.

🖳 Check Firmware Upda	te			×
	New Firm	ware	Found	
New firmware is r Would you like to onto it?	now available o download it	from	the server and upda	ite
S100 GPS+GLO+ Master Firmware	BDS+GAL			
Kernel Version S.W. Version Revision CRC	03.00.01 11.07.31 20200604 99D4			
	No		Download and Up	odate

Figure 6-5

6 S100 Viewer will download the new firmware from Polaris' server and load it to S100, with the message box indicating software update status shown in Figure 6-6.

🔛 Check Firmware Update	Х
Firmware Update	
WARNING! Firmware update is a critial operation. Please make sure the power stays on and do not disconnect the device before the update is complete.	
Master firmware updating	

Figure 6-6

7 When software update is in progress, **DO NOT** remove the USB cable until software update is completed. See Figure 6-7.

🔛 Check Firmware Updat	e	\times
	Firmware Update	
WARNING! Firmware update i power stays on an update is complet Restoring device s	s a critial operation. Please make sure the d do not disconnect the device before the e. Firmware update finished.	
	確定	

Figure 6-7

6-3 S100 Bluetooth Module Firmware Update

Bluetooth firmware is upgraded via WiFi connection. Follow below steps to update S100's Bluetooth module firmware.

- 1. If a new version of Bluetooth firmware is available, the Upgrade button on Polaris Connect app's screen Utility-Version-Bluetooth Version becomes clickable (Figure 6-8 a), otherwise it is unclickable (Figure 6-8 b).
- Clicking Upgrade button leads to Bluetooth firmware download page. Once the Bluetooth firmware is downloaded from server, a Next button appears. Click it to continue to do WiFi connection. See Figure 6-8 c.

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S100 Utilities		S100 Utilities		Bluetooth Firmware Upgrade
0 m 0 cm 	Set	0 m 1 m	0 cm Set	Upgrade Bluetooth Firmware
Version		Version		Next
RTK Version To upgrade RTK module firmware, with PC, start 'S100 Viewer' softw below Connect button. This app will be closed.	20200703 connect S100 are and click	RTK Version To upgrade RTK module with PC, start "S100 Viev below Connect button. This app will be closed.	20200703 firmware, connect S100 ver" software and click	
	Connect		Connect	
Bluetooth Version (New Bluerooth firmware is ready f	1.00.00.01 for upgrade.	Bluetooth Versic	on 01.00.00.01 to date.	
	Upgrade		Upgrade	
App Version	1.03	App Version	1.03	
More Info.	<u>Polaris</u>	More Info.	Polaris	
Rover Base	¢ Utility	Rover B	h ¢ ase Utility	
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а		b		с

Figure 6-8

- 3. A pop-up window shows how to connect to S100 via WiFi connection. Read the instruction and click Next. See Figure 6-9 a.
- You are brought to system's WiFi configuration screen. Select the WiFi AP whose name starts with S100 and make sure the phone is connected with it (without internet). Click Back button. See Figure 6-9 b c.
- 5. The Bluetooth firmware upgrade starts. You'll be prompted when it is in progress and finishes. See Figure 6-9 d e.

Correction Data Lans in C100		16:46 🖼 🎯 🗂	4 1 %	\$° ⊿I 100% ∎	16:46 🖬 🕲 🎦		NE™E
Connect to S100 WiFi	- E -	< Wi-Fi	Wi-Fi Di	irect :	< Wi-Fi	Wi-F	i Direct
Click Next and follow the steps to connect to S100 WiFi 1. Select S100 WiFi AP (S100_XX 2. Wait until WiFi state to be conn 3. Back to app) lected	On Current network		r , 🔹	On Current network		
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≪ ×5%4105%8 ≪ Wi-Fi Wi-Fi Direct 1	1	Connected		14	Connecte	d without internet	4
On 😒 🥌		Available networks			Available networks	5	
Terrecied I 🗘		🔶 S100_C4641FI	32			427	
<u>় \$100_C44CD23A</u> জ		<u></u>			(îg	ę97,96	
2 + 12 0- 11 17 # FORM			KTOP-4804	8FU.	(ja	узоезктор-на	olaru.
C Wi-Fi Wi-Fi Direct		+ Add network					
Current instruits Current instruits Currents without instrume. Available redevorus					+ Add ne	twork	
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	Bluetooth Firmwa	are Upgrade		Bluetooth Firi	mware Upgrade		
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7 Troubleshooting

Question #1: Why I'm unable to get RTK Fix when connecting to my local RTK correction service? Answer #1: RTK correction service has several mountpoint options to select from, mountpoint with compatible format need to be chosen to work correctly. The mountpoint to choose for S100 are Virtual Reference Station VRS type, Nearest Station NRT type, or basic RTCM3.x type supporting 1004 / 1012 sentence, or MSM4 / MSM5 / MSM6 / MSM7 messages, but <u>non-FKP, non-MAC, non-MAX, non-iMAX, non-SSR, non-CMR, non-CMR+ ones</u>.

Supported MSM4 messages are 1074, 1084, 1094, 1124.

Supported MSM5 messages are 1075, 1085, 1095, 1125.

Supported MSM6 messages are 1076, 1086, 1096, 1126.

Supported MSM7 messages are 1077, 1087, 1097, 1127.

Example 1. Newer MSM4 / MSM5 / MSM7 formats are preferred over older RTCM 3.1 format.

Mountpoint Information

The available data streams are listed in the sourcetable. All mountpoints contain the station 4character identifier followed by a number which indicates the type of data format.

SITE0	RTCM 3.1
SITE2	RAW
SITE4	RTCM 3.2 MSM4
SITE5	RTCM 3.2 MSM5
SITE7	RTCM 3.2 MSM7

Example 2. VRS (Virtual Reference Station) type is preferred over NRT (closest physical base station) type, as VRS has no operating range limit. S100 being GPS+GLO+GAL+BDS receiver, RTK base supporting more satellite constellation (GPS+GLO+GAL) is preferred over one supporting lesser satellite constellation (GPS+GLO).

Service	Mountpoint	Constellations Stream data f		
MAC RTCM 3.x	RTK_MAC/MAX_RTCM3	GPS+GLO	RTCM 3	
VRS Galileo	GAL_VRS_MSM5	GPS+GLO+GAL	RTCM 3 (MSM5)	
VRS RTCM 3.x	RTK_VRS_RTCM3	GPS+GLO	RTCM 3	
VRS RTCM 2.3	RTK_VRS_RTCM2	GPS+GLO	RTCM 2.3	
VRS CMR	RTK_VRS_CMR	GPS+GLO	CMR	
VRS CMR+	RTK_VRS_CMR+	GPS+GLO	CMR+	
iMAX Galileo	GAL_IMAX_MSM5	GPS+GLO+GAL	RTCM 3 (MSM5)	
iMAX RTCM 3.x	RTK_IMAX_RTCM3	GPS+GLO	RTCM 3	
FKP RTCM 2.3	RTK_FKP_RTCM2	GPS+GLO	RTCM 2.3	
NRT Galileo	GAL_NRT_MSM5	GPS+GLO+GAL	RTCM 3 (MSM5)	
NRT RTCM 3.x	RTK_NRT_RTCM3	GPS+GLO	RTCM 3	

Example 3. FKP, MAC, RTCM23, SSR, VRS23, RTCM2.2 ones are not to be used. RTCM 3.2 with 1071
GPS MSM1 and 1081 GLONASS MSM1 are of incompatible type, not be used.

Mountpoint	Identifier / Description	Format	Format Details (Rate)	Carrier Phase	GNSS
FKP2	FKP23	RTCM 2.3	1, 3(10), 14(60), 16(300), 20, 21, 22(10) 23(10), 24(10)	L1 L2	GPS
FKP2_raw	FKP23 raw	RTCM 2.3	1, 3(10), 14(60), 16(300), 18, 19, 22(10) 23(10), 24(10)	L1 L2	GPS+GLO
FKP3	FKP31	RTCM 3.1	1004, 1006(10), 1007(30), 1012, 1030(30), 1031(30), 1033(10), 1034(10), 1035(10)	L1 L2	GPS+GLO
MAC	MAC	RTCM 3.1	1004, 1006(10), 1007(10), 1012, 1014(10), 1017(10), 1030(30), 1031(30), 1033(60), 1039(10)	L1 L2	GPS+GLO
RTCM23	RTCM23	RTCM 2.3	1, 3(17), 14(61), 16(300), 20(1), 21(1), 22(17), 23(17), 24(17)	L1 L2	GPS
RTCM23_raw	RTCM23 raw	RTCM 2.3	1, 3(17), 14(61), 16(300), 18(1), 19(1), 22(17), 23(17), 24(17)	L1 L2	GPS+GLO
RTCM30	RTCM30	RTCM 3.0	1004(1), 1006(10), 1012, 1033(10)	L1 L2	GPS+GLO
SSR	SSR	RTCM 3.1	1004, 1006(10), 1007(30), 1012(1), 1030(30), 1031(30), 1032(60), 1033(60)	L1 L2	GPS+GLO
VRS2	VRS23	RTCM 2.3	1, 3(10), 14(60), 16(300), 20, 21, 22(10), 23(10), 24(10)	L1 L2	GPS
VRS2_raw	VRS23 raw	RTCM 2.3	1, 3(10), 14(60), 16(300), 18, 19, 22(10), 23(10), 24(10)	L1 L2	GPS+GLO
VRS3	VRS30	RTCM 3.0	1004(1), 1006(10), 1007(30), 1012, 1030(30), 1031(30), 1032(10), 1033(60)	L1 L2	GPS+GLO
DGNSS_NET_2	DGNSS_NET_RTCM2.2	RTCM 2.2	1, 3(10), 16(300), 31(1)	L1 L2	GPS+GLONASS
DGNSS_2	DGNSS_RTCM2.2	RTCM 2.2	1, 3(10), 16(300), 31(1)	L1 L2	GPS+GLONASS
DGNSS_NET_3	DGNSS_NET_RTCM3.2	RTCM 3.2	1006(10), 1007(10), 1071(1), 1081(1)	L1 L2	GPS+GLONASS
DGNSS_3	DGNSS_RTCM3.2	RTCM	1006(10), 1007(10), 1071(1), 1081(1)	L1 L2	GPS+GLONASS

Question #2: I've used correct mountpoint, but still unable to get RTK Fix, why? Answer #2: RTK require strong signal to work. Make sure S100 is used outdoors under clear open sky unblocked signal environment.

Although S100 is GPS/GLONASS/Galileo/Beidou quad-GNSS, only common set of satellite signals tracked by both base and rover are used for RTK computation, thus when used with GPS/GLONASS RTK base, effectively S100 is no different from GPS/GLONASS-only RTK receiver, and actual RTK used satellite number will be less than total tracked satellite number.

On initial use, it's good to choose time of day when there are more satellites overhead, avoid least number of satellite situation, because if blocked by distant trees then actual usable satellites becomes fewer, and it'll be more difficult to get RTK Fix. https://www.gnssplanning.com/



RTK is susceptible to interference. Normally the signal should fluctuate not more than 1dB-Hz in short period. If seeing signal fluctuating by several dB in short time, it means there is interference affecting RTK operation. A different location or different time of day without interference affecting RTK operation will get RTK Fix.

Appendix

A-1 More Usage Scenarios

A-1-1 Base-Rover RTK with PPP-Corrected Base





In places without RTK base correction service but with cellular phone network, one can do RTK surveying by setting up a mobile RTK base with initial approximate base position coordinates, later upload base measurement data to online PPP service to get accurate base position coordinates, then later correct rover collected data set by the offset determined from initial approximate base position and PPP derived accurate base position.

A pair of S100 RTK receivers is needed to perform this operation as shown in Figure A-1.

See section A-2-1 and A-2-3 on setting up mobile Bluetooth RTK base.

See this <u>blog</u> on working with online PPP service.

The procedure steps to do this:

- 1. Setup mobile RTK base to log data for later uploading to online PPP service to derive accurate base position. See Figure A-2 a.
- Setup mobile RTK base to work with RTK rover, with base having approximate position P₀. P₀ can be 1 minute automatic surveyed approximate position. See Figure A-2 b.
- 3. Perform RTK surveying
- 4. After RTK surveying is completed, continue data logging if data logging time duration is still insufficient.

- 5. Back in office, convert log file to RINEX format, and upload to online PPP service to obtain accurate position coordinate P_1 of the mobile RTK base.
- 6. The offset **delta** between approximate base position P_0 and PPP-derived accurate position P_1 is **delta** = $P_0 - P_1$
- 7. Subsequently correct all rover surveyed points by delta, i.e. $P'_{M} = P_{M} delta$

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Use S100 as Base	Use S100 as Base
028	
More Info.	Configure Base Position Automatic Survey Survey Duration 1 min Set
PPK Base	
Start logging Base correction data in S100 for usage of PPK later	User Specified Coordinates
Project	0.0
test 1	
	Longitude (Decimal Degrees)
	0.0
Configure Base Position	Altitude (m)
Automatic Survey	0.0
Survey Duration 1 min -	Set
Rover Base Utility	Rover Base Utility
III O <	III O <
а	b

Figure A-2

A-1-2 PPK with PPP-Derived Base



Figure A-3

At places where there is no cellular phone network, PPK post-processing can be performed to derive accurate position of the collected rover data logs.

A pair of S100 RTK receivers are needed to perform this operation as shown in Figure A-3.

The procedure steps to do this:

- 1. The base logs data for longer time period for online PPP processing to derive accurate base position.
- 2. The rover logs data for a minute or two for each survey point.
- 3. Back in office, convert base log file to RINEX format, and upload to online PPP service to obtain accurate position coordinate P_1 of the mobile RTK base.
- 4. Use RTKLIB's RTKPOST to post-process each rover log file against base log file, using P_1 as base position, to derive accurate rover position. Do this for all survey point collected rover log files.

A-2 Other RTK Related Operations

NTRIP is a protocol to deliver RTK correction data from RTK Base to RTK Rover, which is comprise of three services (1) NTRIP Server (2) NTRIP Caster (3) NTRIP Client. The three services run on three internet-enabled machines which are apart from one another in most cases. The general structure of NTRIP can be illustrated in Figure A-4.



Figure A-4

Beside the RTK rover usage scenarios mentioned in section 4, user can also use S100 as a RTK base in the following scenarios:

- 1. Use App-built-in NTRIP Server on phone (section A-2-1) or
- 2. Use strsvr of RTKLIB on PC (section A-2-2)

Setup of NTRIP Caster is described in section A-2-3.

Usage of Third-Party NTRIP Client App (Lefebure NTRIP Client) can be found in section A-2-4.

A-2-1 Bluetooth RTK Base with App-Built-in NTRIP Server

The S100 RTK Receiver, when configured as a Bluetooth RTK base, can output RTK correction data with the NTRIP server built inside the "Polaris Connect" app, as shown in Figure A-5.





Follow below steps to configure S100 to send out RTK correction data via Bluetooth with built-in NTRIP server.

- 1. Click Base tab. See Figure A-6 a
- 2. Click Settings (Figure A-6 b) and configure NTRIP log-in information (Figure A-6 c).
- 3. Click Start of "Bluetooth Base with NTRIP Server". See Figure A-7 a.
- 4. The NTRIP server starts. See Figure A-7 b.

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Use S100 as Base	Use S100 as Base	NTRIP Server Login Settings
		NTRID Caster Hostname or ID
PTK Base	PTK Base	ntrip.polaris-gnss.com
KIK base	KTK base	NTRIP Caster Port
Bluetooth Base with NTRIP Server	Bluetooth Base with NTRIP Server	5000
		Mountpoint (Data Stream)
S100 Base This Phone	S100 Base This Phone	JIM_TEST
		NTRIP Server Password
BT	BT	
		Save Data
More Info. Settings Start	More Info. Settings Start	
USB Base	USB Base	
S100 Page DC	S100 Passa PC	
Rover Base Utility	Rover Base Utility	
а	b	C





Figure A-7

A-2-2 USB RTK Base

The S100 RTK Receiver, when configured as a USB RTK Base, can send out RTK correction data to a connected PC's NTRIP server software, e.g. strsvr of RTKLIB, as shown in Figure A-8.





Follow below steps to configure S100 to send out RTK correction data via USB. The app closes when S100 starts to work as USB RTK base.

- 1. Connect S100 with PC using the USB cable.
- 2. Click Base tab, select USB interface. See Figure A-9 a
- 3. Click Start of "USB Base"; the Polaris Connect app will close. See Figure A-9 b.
- 4. Start third-party NTRIP server tool, e.g. strsvr of RTKLIB, to send out RTK correction data. See Figure A-9 c.

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Use S100 as Ba	se		Use S100 as Base	9	
USB Base	S100 Base US S100 Base US US More Info.	PC Radio Module ((•)) B Start	USB Base	S100 Base	PC Badio Module ((*)) BB Start
PPK Base			PPK Base		
Rover	↑ Base	Ctility	Rover	♠ Base	Ctility
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С

Figure A-9

A-2-3 Setting Up NTRIP Caster

NTRIP requires a NTRIP Caster running on an Internet-connected computer with a fixed IP address so that both NTRIP Server and NTRIP Client can connect with it, thus making correction data delivery from NTRIP Server to NTRIP Client possible.

There are two ways to set up a NTRIP Caster.

1. The easiest method to set up a 24/7 running NTRIP Caster is subscribing to

SIX MONTH FLOATING IP RTK BASE REDIRECT SERVICE.

A subscriber will get NTRIP Caster login information: IP/port/mount point/user name/password, and simply use it with "Polaris Connect" or "Lefebure NTRIP Client" app.

2. The other approach is to have an Internet connection with Fixed IP address to use with strsvr of RTKLIB running on a PC.

Follow below steps to set up an NTRIP Caster.

a. Get RTKLIB binary from

http://rtkexplorer.com/downloads/rtklib-code/

- b. Run strsvr.exe
- c. Configure Input Stream to be Type NTRIP Caster, and set up its options (by clicking Opt).

STRSVR ver.demo5 b33b				
2020/07/09 1	1:56:09 GPST	Connect	t Time: 0d 0	0:00:00
Stream	Туре	Opt Cmd Conv	Bytes	Bps
🗌 (0) Input	NTRIP Caster $ \smallsetminus $		0	0
🗌 (1) Output	NTRIP Caster $ \smallsetminus $		0	0
🗌 (2) Output	~		0	0
🗌 (3) Output	~		0	0
				2
► <u>S</u> tart	: :	Options	E <u>x</u> it	

d. Set input stream **Port** to be an available port number on this PC, 9001 for example. Set
 Password to be your preferred NTRIP upload password. Then click OK.

NTRIP Caster Server Options			×	
NTRIP Caster Ho	ost	Port ~ 9001		
Mountpoint	User-ID	Password •••••		
String				
	Q	<u>Q</u> K <u>C</u> ancel		

e. Continue to configure Output Stream.

STRSVR ver.demo5 b33b				
2020/07/09 1	1:56:09 GPST	Connect	t Time: 0d 00	:00:00
Stream	Type	Opt Cmd Conv	Bytes	Bps
	NTRIP Caster V		0	0
(2) Output	~		0	0
(3) Output	~		0	0
				2
► <u>S</u> tart	: 4	Options	E <u>x</u> it	

f. Set output stream **Port** to be an available port number on this PC, 9000 for example (need to be different from input stream port). Set **Mountpoint/User-ID/Password** to be your preferred NTRIP download login information. Then click OK.

NTRIP Caster Client Options			
NTRIP Caster H	ost	Port	
Mariat	Lines TD	~ 9000	
Mountpoint	User-ID	Password	
TEST	✓ test	••••	
String			
		OK Canad	٦
		<u>O</u> K <u>C</u> ancel	

g. Click Start

STRSVR ver.demo5 b33b				
2020/07/09 1	1:56:09 GPST	Connect	t Time: 0d (00:00:00
Stream	Туре	Opt Cmd Conv	Bytes	Bps
🗌 (0) Input	NTRIP Caster $ \smallsetminus $		0	0
🗌 (1) Output	NTRIP Caster $ \smallsetminus $		0	0
🗌 (2) Output	~		0	0
🗌 (3) Output	~		0	0
				::: ?
▶ <u>S</u> tart	: 4	Options	Exit	:

A-2-4 Third-Party NTRIP Client App Operations

Follow below steps to use Lefebure NTRIP Client app to send RTK correction data to S100.

1. Install Lefebure NTRIP Client from Google Play Store, open it.



Figure 6-6

2. Select the gear setup icon on the upper right corner. Select "Receiver Settings".



3. For "Receiver Connection" select "External via Bluetooth". For "Bluetooth Device" select the "BT SPP xxxxxx" device. Check "GPS Mock Locations".

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Receiver Settings	Receiver Settings
Receiver Connection External via Bluetooth	Receiver Connection External via Bluetooth
Bluetooth Device	Bluetooth Device BT SPP A20BC5
Bluetooth Connection Method Insecure (Default)	Bluetooth Connection Method Insecure (Default)
A Choose Bluetooth Device	Auto-Enable Bluetooth Automatically switch bluetooth on/off
CANCEL	Auto-Configure Receiver No Auto-Config
Antenna Height No Offset	Antenna Height No Offset
Save GPS Data to File	Save GPS Data to File
Save NTRIP Data to File	Save NTRIP Data to File
GPS Mock Locations Allow external GPS data to be used by other Android Apps.	GPS Mock Locations Allow external GPS data to be used by other Android Apps.

4. Select "NTRIP Settings". Network Protocol select "NTRIP v1.0". Enter base station and account information for Caster IP / Caster Port / Username / Password / Data Stream. Report Location select "Get From External Receiver".

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NTRIP Settings	
Network Protocol NTRIP v1.0	
Caster IP	
Caster Port 5000	
Username	
Password	
Data Stream	
Reported Location Get from External Receiver	
Saved Profiles	

5. Enable phone's Mobile Data connection. Select the gear icon on upper right to enter phone Settings configuration page.

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Wi-Fi	Sound	Bluetooth	Auto rotate	
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Flashlight	Location	Mobile data	Airplane mode	
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Power saving	NFC	Mobile Hotspot	Blue light filter	
Android Syste	* ~			
Mobile Hotsp Tap here to set	oot or Tetherin up.	g is on		
	NOTIFICAT	TION SETTINGS	CLEAR ALL	
Lefebure Design				

6. Select "Developer Options" near the bottom of Settings page. Sliding down Developer Options page, select "Mock Location App".

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SETTI	NGS Q	<	DEVELOPER OPTIONS	Q
00	Apps Default apps, App permissions	0	Ν	
P	Lock screen and security Lock screen, Fingerprints	M Ru	Iultiprocess WebView un WebView renderers separately	
Ø	Cloud and accounts Samsung Cloud, Backup and restore	A	uto update system	
G	Google Google settings	D		
ŝ	Accessibility Vision, Hearing, Dexterity and interaction	U: De	SB debugging ebugging mode launches when USB is connected.	
\$ \$	General management Language and input, Date and time, Reset	R	evoke USB debugging authorizations	
ច្រ	Software update Download updates, Scheduled software updates	In	Include bug reports in power menu clude option in power menu for taking a bug report	
?	User manual User manual	M	tock location app ock location app: Bluetooth GPS	
(j)	About phone	V	iew attribute inspection	
(1)		S No	elect app to be debugged o application set to be debugged.	
{}	Developer options	V	/ait for debugger	

7. Select "Lefebure NTRIP Client".



8. Return to Lefebure NTRIP Client App, click "Connect" to connect with S100 RTK receiver via Bluetooth and RTK base station via Internet.



9. After connection is made, upper left screen will first show Invalid, denoting receiver does not have position fix yet. Next it'll show GPS or DGPS and number of satellites used, denoting receiver has meter-level accuracy position fix. Then it'll show FloatRTK for some time, denoting the receiver is trying to converge to centimeter-level accuracy position. When the receiver has centimeter-level accuracy position it'll show steady RTK status. Afterwards third party Data Collector Apps can next be used to record the position.



10. When surveying a group of locations within walking distance, can leave S100 powered up, taking the range pole or tripod to next location to survey. Switch to the Lefebure NTRIP Client App to check if S100 is in RTK Fix state before recording the next location position with Data Collector App. The setup procedure only needs to be performed once. Later use only need to run Lefebure NTRIP Client and connect.

A-3 Problem Reporting

In the rare case that connection is made to 3rd party RTK base, but unable to get RTK Fix, only getting RTK Float, follow the procedure steps shown in this video https://youtu.be/v3G3jGASJN8 to simultaneously log 15 minutes of (1) RTK base RTCM data and (2) S100 raw measurement data for us to analyze the issue. Upload the two log files to your Google Drive folder and send us a shareable link to info@polaris-gnss.com By default the log files are stored in the NTRIP directory of your phone. The steps are

- 1. Enable S100 to send out raw data by switching on Utility->Raw data for debug. See Figure A-11 a.
- 2. Make sure data format SkyTraq is selected. See Figure A-11 b.
- 3. Press Start of Base->Base Data Recording. The app will close afterwards. See Figure A-11 c.



Figure A-11

- In Lefebure app, enable "Save GPS Data" and "Save NTRIP Data" in "Receiver Settings". See Figure A-12 a.
- 5. Configure "NTRIP Settings -> Reported Location" to "Use Android GPS". See Figure A-12 b.
- 6. Start recording of Lefebure, and stop it after 15 minutes. The saved files can be found from connected PC browser. See Figure A-12 c.

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Receiver Settings	NTRIP Settings
Receiver Connection External via Bluetooth	Network Protocol NTRIP v1.0
Bluetooth Device S100_C4641FB2	Caster IP 210.241.63.193
Bluetooth Connection Method Insecure (Default)	Reported Location
Auto Enable Bluetooth	 Get from External Receiver
Automatically switch bluetooth on/off	O Manual Lat-Lon
Auto-Configure Receiver No Auto-Config	Use Android GPS
Antenna Height No Offset	O Use Android LocationManager
	Cancel
Save GPS Data to File	Use Android GPS
Save NTRIP Data to File /NTRIP/NTRIP-YYYY-MM-DD.txt	Saved Profiles
GPS Mock Locations Allow external GPS data to be used by other Android Apps.	
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Figure A-12

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