Piksi User Getting Started Guide

THIS DOCUMENT IS ONLY APPLICABLE TO THE PIKSI v2 RECEIVER

The Piksi Multi Getting Started Guide is at <u>http://support.swiftnav.com/customer/en/portal/articles/2771182-</u>piksi-multi-getting-started-guide.

Welcome to the Getting Started Guide for the Swift Navigation Piksi® RTK GPS Receiver! This guide is intended for first time Piksi users and provides an overview of how to install the required software, connect to and configure Piksi and acquire position solutions.

Note: This guide was tested on:

- Windows 7 and 10
- OS X (10.8.5)
- Ubuntu Linux (12.10 32-bit, kernel version
- 3.5.0-17)

By the end of this guide, you will be able to acquire a fixed RTK solution using two Piksi receivers. The steps in this guide should take you about two hours in total, and the last two steps need to be performed outdoors.

Guide Content:

- Piksi RTK Kit Contents
- Piksi GPS Receiver Connectors and Indicators
- Installing the Piksi Console
- Running the Piksi Console
- Simulation Mode
- Antenna Placement Guidelines
- Standalone GPS Position
- GPS RTK Position

It is useful to start by watching the 5 minute Getting Started Video that covers the topics in this guide at a high level. If anything in this guide is incorrect or unclear, please contact us (https://www.swiftnav.com/contact-us) and give us your feedback!



915 MHz RTK Kit Contents:

- 1. Two GPS antenna ground planes
- 2. Two micro USB cables
- 3. Four radio antennas (see Notes)
- 4. Two radio modems (see Notes)
- 5. Four spare UART cables

6. Two GPS antennas

- 7. Two Piksi RTK GPS receivers
- 8. Two radio cables (see Notes)

Notes:

- 915 MHz kits shipped before May 2016 were containing 3DR radios and two antennas
- 433 MHz kits use 3DR radios and two antennas

Piksi GPS Receiver Connectors and Indicators



Caution: Piksi board is sensitive to electrostatic discharge (ESD). Handle board with caution to prevent damage.

- 2. GPS antenna input
- 3. Green LED
- 4. Red LED
- 5. Reset button 6. Micro USB
- 7. JTAG debug
- 8. Debug and expansion port
- 9. UART B

3. OAITI D

Warning: Piksi maximum supply voltage is 5.5V. Higher voltage will permanently damage the receiver.

The Piksi Datasheet (http://docs.swift-nav.com/pdfs/piksi_datasheet_v2.3.1.pdf) provides a more detailed description of Piksi hardware.

1

Installing the Piksi Console

This can be done indoors and requires an Internet connection.

The Piksi Console is a Graphical User Interface (GUI) program that runs on your computer and allows you to communicate with Piksi. It displays the position and other status information. To run the Piksi Console, you need to install the Piksi USB drivers and download the Piksi Console Installer.

Installing the Piksi USB Drivers

Windows

Install FTDI's VCP drivers (http://www.ftdichip.com/Drivers/CDM/CDM21216_Setup.exe) to communicate with Piksi over USB.

Notes:

• Two drivers are available: VCP and D2XX. You only need the VCP driver. Do not install D2XX driver.

Mac OS X

Install version 2.2.18 of FTDI's VCP driver (http://www.ftdichip.com/Drivers/VCP/MacOSX/FTDIUSBSerialDriver_v2_2_18.dmg).

Notes:

- Two drivers are available: VCP and D2XX. You only need the VCP driver. Do not install D2XX driver.
- Piksi requires FTDI driver version 2.2.18, not version 2.3.
- When you run the installer, choose the option for OS X versions 10.4—10.7 (not 10.3).
- On Mac OS X 10.7.5 or later, you may need to open the driver .dmg file as explained here (https://support.apple.com/kb/PH14369) if Gatekeeper (https://en.wikipedia.o rg/wiki/Gatekeeper_(OS_X)) displays an "unidentified developer" warning and prevents the driver from installing.

After installing the FTDI VCP driver, you must unload the Apple driver and load the FTDI driver by running the following commands from the Terminal application:

sudo kextunload /System/Library/Extensions/IOUSBFamily.kext/Contents/PlugIns/AppleUSBFTDI.kext sudo kextload /System/Library/Extensions/FTDIUSBSerialDriver.kext

After unloading the Apple driver, you might get one of the messages below in your command window.

Caution: Running the Piksi Console on a virtual machine (e.g. VMWare, VirtualBox, Parallels) is strongly discouraged. This is due to imperfections in the USB pass-through functionality, which can lead to symptoms such as freezing during firmware updates and glitches in regular operation.

(kernel) Kext com.apple.driver.AppleUSBFTDI not found for unload request. Failed to unload com.apple.driver.AppleUSBFTDI (libkern/kext) not found.	
or	
Can't open CFBundle for /System/Library/Extensions/IOUSBFamily.kext/Contents/PlugIns/AppleUSBFTDI.kext.	

Ignore those messages and load the FTDI driver. The Piksi Console will still work as it should.

Linux

Recent versions of Linux (kernel > 3.0) have built-in native kernel support for the FTDI devices and do not require the above drivers.

Getting the Piksi Console Installer

Windows

Download and install the "Windows Console Installer" from the link below:

https://www.swiftnav.com/downloads

Mac OS X

Download and install the "OS X Console Installer" from the link below:

https://www.swiftnav.com/downloads

Be sure to drag the Piksi Console application into your Applications folder. Later when you try to run the console, launch it from the Piksi Console icon located in your Applications Folder.

Linux

Recent versions of the Piksi and Swift console are distributed as binaries for Linux. The process for installing are as follows:

1. Obtain the package for the console from the website: http://support.swiftnav.com/customer/en/portal/articles/2492795-swift-console-piksi-console-

2. Untar the package

1. tar xvfz piksi_console_*.tar.gz

3. Configure your permissions on the piksi device for read and write access (chmod 777 /dev/ttyUSB9)

4. Configure file permissions for the console executable for execute permissions (chmod 777 console)

5. run the console

./console

You can also consider running from source: HOW-TO: Running the Piksi Console from source.

Running the Piksi Console

This step can be done indoors and requires an Internet connection.

With the USB driver and Piksi Console installed, the first thing to do is to connect the receiver to your computer and check the firmware version.

Hardware Setup

Connect Piksi into your computer via the micro-USB cable.



Starting the Console Software

With the Piksi connected to your computer, launch the Piksi Console using the installed icon.



When the console starts, it will prompt you to select which port to use. Select the port that corresponds to Piksi from the drop down menu:



Verify Firmware Versions

If new firmware is available, the console displays a dialog box like the one below. The console automatically checks for firmware and software updates over the Internet.



Whether or not you see this dialog box, open the Firmware Update tab of the Console and check for updates.

- Check to see if you have the latest version of the Console (1). The versions in these boxes should match. If they don't, close the Console and follow the instructions above to install the latest Console.
- Check to see if you have the latest NAP (Navigation Acceleration Processor) firmware (2). The versions in these boxes should match. If they don't, update this firmware
 as described below.
- Check to see if you have the latest STM (ST microcontroller) firmware (3). The versions in these boxes should match. If they don't, update this firmware as described below.

If new STM or NAP versions are needed follow this procedure:

- Click Download Newest Firmware Files button (4). This may take a few seconds. Wait until the Update Status dialog box has two messages, one for STM and one for NAP, reading "Saved file to.....hex"
- Click Update Piksi STM and NAP Firmware (5) and wait until all the updates are installed. This may take a few minutes. Wait until you see the confirmation stating all updates are installed in the Update Status box.

Repeat above for each Piksi you own. Always update all of your Piksis when new firmware is available.

Piksi Console Version v0.27 - PK642	167				_ 0 🗾	8
Testing Setting Sectors St		Energy Indate data and	1			
STM Firmware Version	servations Settings	NAP Firmware Version		Piksi Console Version		-
Orrest: v0.31		Ourrent: up 16		Oursect: v0.37		
Contenti 10.21				1		
Latest: v0.21		Latest: v0.16		Latest: v0.27	·	
Local File: Please choose a file		Local File: Please choose a file				
Update STM Erase STM flash (recommended):		Update NAP				
		Download Newest	Firmware Files			
		Update Piksi STM an	3 NAP Firmmare			
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Jun 17 2016 09:47:27 0	CONSOLE Num	ber of settings loaded 77				ч
Jun 17 2016 09:47:27 0	CONSOLE Load	ed settings yaml file from	path settings.yaml			-
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Simulation Mode

This step can be done indoors and does not require an Internet connection.

Goal

Simulation mode will allow you to become familiar with the Piksi Console operation before testing outside with Piksi receiving real GPS signals. In simulation mode, Piksi will output simulated position solutions, status information and differential corrections as if Piksi was mounted on a vehicle flying in a large circle.

Enabling Simulation Mode

Connect Piksi to your computer, start Piksi Console program, open the Settings tab and do the following:

- In the Simulator section, you will see a value for enabled (1). Click on this.
- Set the value of enabled to True by selecting True (2) on the selection at the right part of the tab.

Piksi Console, Version: v0.27	: PK64267								
Tracking Solution Baseline	e Observations Se	tings Firmware Update	Advan	ced					
Name		Value		-	C	÷	A		
simulator				Ŀ	Reload Sav	e to Flash	Reset to Defaults		
enabled	True				aw Advanced	Settings:	1		
base ecef x	-2700303.10144			T	Setting				
base ecef y	-4292474.39651				Name	sim lator en	ahlert		
base ecef z	3855434.34087				Value	The			
speed	4		_		value	irue •	4		
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speed sigma	0.15000000596		_						
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pseudorange sigma	4		_						
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solution					Noter	the Local Pi	ksi moving in a circle around the base station The simulator is intended		
elevation mask	0		_		140468	 to aid in sys faith 6 dbc size 	stem integration by providing realistic looking outputs but does not		
soln freq	10		-			reno monty se	mate every aspect of vervice up a avoid		
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Your Piksi will now be running in a Simulation Mode. If you view the Tracking, Solution and Baseline tabs, you can now see the simulated output.

Viewing Position Solutions

In this simulated set of solutions, the simulated rover is traveling counter-clockwise around the simulated base station in a 100 meter radius circle. The way to view these results are through three primary screens in the Piksi Console: Tracking Tab, Solution Tab and Baseline Tab.

<u>**Piksi Console manual**</u> provides a complete description of the program.

Tracking Tab

This tab shows the satellites Piksi is tracking (receiving signal). Each satellite is represented by a colored line on the graph, and the line's position on the graph represents the strength of the satellite's signal over time. The *x* axis is the last 200 messages that Piksi sent to the Console and the *y* axis is *Carrier to Noise Ratio* (C/No), in dB-Hz, which is the signal strength of the satellite. The most recent time is on the right hand side and the graph scrolls to the left. This simulation shows that you are tracking 9 satellites; you know this because you will see consistent C/No of over 33 dB-Hz.



Solution Tab

This tab shows Piksi's Single Point Position, a standard GPS position solution with an absolute position accuracy of several meters and RTK Position, a few centimeters high-accuracy GPS position. The graph shows blue dots (Single Point Solution) and an orange line (RTK Solution). The blue dots will have less precise positions and therefore will appear as a noisy cluster around the orange RTK line.

Piksi Con	sole, Versi	on: v0.27 : PK	64267											- D - X
Tracking	Solution	Baseline	Observations	Settings	Firmware Update	Advance	ed							
Single Point	Position	RTK Position					Ш	× :::	0					
RTK Positi	n													
Item				Value				37.431						
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Lng	-122.	172157646							. A.					
Alt	69.82	78669886					~	. 37 4 3035	1					
Flags	0x01						es		7					
Mode	Fixed	RTK					e.	1 3						
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								- 37,429			and the second second	4000000000	Propriet .	
It is necessa	ry to enter slute RTK R	the Surveyed	Position" setting	s for the bas	e station in order to v	iew the		1745	-122.13	74	-122,1735	-122.173	-122,172	
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Baseline Tab

This tab shows Piksi's RTK Baseline, a high-precision GPS position solution, with a relative position accuracy of few centimeters. This data visualization will show the base station as a red cross and the rover path in orange or blue. The Piksi that is connected to the Console is always the *Rover* and the remote Piksi (not directly connected to this Console) is always the *Base*. Also, the base is always considered to be at coordinate [0,0,0]. The rover position data is a relative vector between the base and the rover, given as a distance North (graphed on the vertical axis, in meters), East (graphed on the horizontal axis, in meters), and Down (not graphed). Here you will notice that the rover path is the same exact circle as shown in the Solution tab, but it is much more precise than the path shown by the Single Point Position solution.



Disabling Simulation Mode

Disable the simulation mode by changing the *enabled* value (1) back to *False* (2) on the *Settings* tab.

🆩 Piksi Console, Version: v0	27 : PK64267						x
Tracking Solution Bas	eine Observations	Settings Firmware Update	Advance	ed			
Name		Value	*	0	*	A	
simulator				Reload	Save to Flash	Reset to Defaults	
enabled	False			1 on Adv	anced Settings:	m	
base ecef x	-2700303.1014	4		Setting			
base ecef y	-4292474.3965	1			lama: cim dator	renabled	
base ecef z	3855434.34087				varie: sinuator.		
speed	4				Value: Faise •		
radius	100			Descr	ption: Toggles t	the Piksi internal simulator on and off	
pos sigma	1.5		1	Default	value: false		
speed sigma	0.15000000596						
cn0 sigma	0.30000001192	1					
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solution					the Pikai	i simulator will provide simulated outputs of a stationary base station I Piksi moving in a circle around the base station The simulator is inter	nded
elevation mask	0		_	L '	votes: to aid in s	system integration by providing realistic looking outputs but does not	t
soln freq	10		_		raithrully	smuate every aspect or device operation.	
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dqnss solution mode	Low Latency						
known baseline n	0		_				
known baseline e	0		_				
known baseline d	0		_				
surveyed positio	n		*				
II × Console Log						Log level filter: WAR	NDNG 🔹
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Jun 17 2016 09:47:27	CONSOLE	Number of settings	loaded 7	77			1
Jun 17 2016 09:47:27	CONSOLE	CONSOLE Loaded settings vamI file from path settings vamI					
e							

Antenna Placement Guidelines

For all outdoor testing, you must use the **external antenna** and a **ground plane**. Using the screws provided in the kit, mount the antenna on top of the ground plane. Position the antenna as indicated by the blue marker, at a spot with a sky view that is unobstructed above 30 degrees up from the horizon in every direction. For the best results, install the antenna on the top of a tripod or other stable structure.

Piksi's high-precision GPS antenna is sensitive to its environment. Since Piksi needs to track carrier phase information from GPS satellites, it is much more sensitive to obstructions than standard consumer GPS of the type found in, for example, smartphones. Thus, the Piksi antenna must be kept away from *any* obstructions to its sky view.

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- Do place the ground plane underneath the antenna.
- Do place the antenna on a tripod.
- <u>Do not</u> test inside a building.
- Do not place the antenna near buildings.
- <u>Do not</u> place the antenna near trees and other cover.
- Do not stand near the antenna or put your hand over the antenna during testing.
- <u>Do not</u> place an open laptop near the antenna so that the laptop itself is blocking the sky view.



Antenna on a ground Not indoor plane

Not near buildings

Not near trees

Not near people

Not near laptop

Standalone GPS Position

This test must be performed outdoors and does not require an Internet connection.

Goal

In this section, you will use one Piksi to display a Single Point Position on the Piksi Console.

Hardware Setup

- Place the antenna on a ground plane and secure it on a tripod or on other stable structure with an unobstructed sky view (follow the <u>Antenna Placement Guidelines</u> in section above).
- Connect the antenna cable to the Piksi board.
- Connect Piksi into your computer via the micro-USB cable.

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Running the Console Software

- Launch the Piksi Console using the installed icon as described in the previous section.
- Ensure that you have simulation mode disabled, per the instructions from the previous section.

Note: A **Single Point Position** solution is a standalone autonomous GPS position solution, with an accuracy of few meters. This is an absolute position and only one Piksi is required to calculate it.

Checking Satellite Signals

Open the Tracking tab. If a satellite has been successfully acquired, it will be assigned to a tracking channel and transitioned to tracking. In the Tracking tab you will see a line added to the plot indicating the signal strength of that satellite. Wait until at least 4 satellites are tracking with signal strengths above 33 dB-Hz, as indicated by the red line in the image below.



Viewing Position Solutions

Once at least 4 satellites are tracking, the green LED light on Piksi will start flashing. The green LED light will flash the number of satellites Piksi has successfully tracked, then pause and repeat. Piksi will receive the data it needs to compute the position solution from the satellites. This data is called the *ephemeris* and it takes approximately 30 seconds to collect. Open the Solution tab and you should see Piksi outputting position solutions represented as a cloud of blue points on the graph.



GPS RTK Position

This test must be performed outdoors and does not require an Internet connection.

Goal

In this section, you will setup two Piksis outdoors. One will work as a base station (stationary) and another as a rover (moving). You will be able to display a rover RTK position solution on the Piksi Console.

Base Station Setup

- Place the antenna on a ground plane and secure it on a tripod or on other stable structure with an
 unobstructed sky view (follow the <u>Antenna Placement Guidelines</u> in section above).
- Connect the antenna cable to the Piksi board.
- Connect the radio antennas to the radio modem.
- Connect the radio modem to the Piksi UART A port.
 - If your kit contains RFD900+ radios, follow the RFD900+ Radio Integration Guide.

Note: The **RTK Position Solution** is a highprecision GPS position solution, with an accuracy of a few centimeters. This is a relative position between two Piksi receivers, which are both required to calculate the solution.

To learn more about RTK technology read Understanding Piksi RTK GPS Technology article. If your kit contains 3DR radios, follow the 3DR Radio Integration Guide.

- It is recommended to secure Piksi and radio together and attach them to the antenna tripod or a mast.
- Connect the Piksi board to your computer with the USB cable.

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• Start the console software and connect to the Piksi receiver.

> Select serial device								
Select Piksi device:								
COM6 ·								
	ОК	Cancel						

Checking Base Station Satellite Signals

Open Tracking tab. Wait until at least 5 satellites have signal strengths above 33 dB-Hz. The green LED light on Piksi will flash slowly once it has a Single Point Position solution.



Configuring Base Station Messages

In the RTK system, the Base Station is transmitting its observations to the Rover. Open *Settings* tab, set UART A *sbp message mask* (1) to 64 (2) and click Save to Flash button (3). This will enable transmission of the base observations and this value is configured by default.

> Piksi Console, Version: v0.27	: PK64267								
Tracking Solution Baseline	e Observations S	ettings Firmware Update	Advanc	ed					
Name		Value	-	0					
hw revision	piksi_2.3.1			Reload	d Save to Flash 5 to Defaults				
nap version	v0.16		_	Show Ad	dvanced Settings:				
nap channels	11		_	Setting	10 III III III III III III III III III I				
nap fft index bits	13		_		Name: unit units dos marrasa made				
system monitor					name: Uar Coarta.sop_message_mask				
heartbeat period milli	1000		_		Value: 64				
watchdog	True		_	Des	scription: Configure the message mask for SBP messages on UART				
telemetry radio					Units:				
configuration string	AT&F,ATS1=57,A	TS2=64,ATS5=0,AT&	W,	Defau	ult value: 64 (decimal), 0x0040 (hex)				
uart ftdi			_						
mode	SBP		-						
sbp message mask	65535		-						
baudrate	1000000		-						
uart uarta									
mode	SBP		_		The default message mask on this UART (0x0040) is appropriate for a radio to				
sbp message mask	64			<u>.</u>	Notes: communicate observation messages to another Piksi. The out-of-the box				
configure telemetry r	True			configuration uses UART A for Piksi to Piksi communication.					
baudrate	57600								
uart uartb			- 1						
mode	SBP								
sbp message mask	65280								
configure telemetry r	Irue								
baudrate	115200			J					
II × Console Log					Log level filter: WARNING				
Host timestamp	Log level				Message				
Jun 23 2016 15:57:14	CONSOLE	Number of tracking	channe	ls chan	nged to 11				
Jun 23 2016 15:57:14	CONSOLE	Number of settings	loaded	77					
<i>ϵ</i>									

RTK GPS provides a very precise baseline measurement between the base station and the rover. For the rover to provide precise latitude, longitude and altitude, however, the base station must be programmed with its own location. Accuracy of the computed rover's location directly depends on the base station position accuracy. For the best results, position of the base station antenna should be surveyed. To enter the base station location, open *Settings* tab and in *Surveyed Position* section (1) enter latitude, longitude, altitude and set broadcast to True (2). After setting all values click Save to Flash button (3).

Tracking Solution	Baseline	Observations	Settings	Firmware Update	Advanc	ced					
Name			Value	e		-	0	± A			
solution						R	eload S	ave to Flash Cat to Defaults			
elevation mask)				sh	ow Advanc	ced Settings:			
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known baseline e		0			_	Π.	Descripto	on: Broadcast surveyed base station location			
known baseline o	1	0			_	11	Default valu	ue: faise			
surveyed pos	ition				_						
broadcast		frue									
surveyed lat		37.8040293				2					
surveyed lon		122.4608316			_	Y					
surveyed alt		5.7						This flan ultimately determines whether the GID message with identifier			
system info							MSG_BASE_POS_ECEF will be calculated and sent. Logically, setting this attribute				
serial number		54267					Note	to "true" sets the Local Piksi as a base station and configures the unit to send its			
firmware version	1	/0.21								1404	communicating. If "true", the remote Piksi that receives the surveyed position will
firmware built		Nov 25 2015 2	3:51:21		_			calculate and communicate a pseudo absolute RTK position based upon the			
hw revision		oiksi_2.3.1			_			received position.			
nap version	1	/0.16			_						
nap channels		11			_						
nap fft index bits		13			_						
system monit	or										
heartheat neriod	milli	1000				1					
II × Console Log								Log level filter: WARNING			
Host timest	amp	Log level						Message			
Jun 23 2016 16:0	1:32	WARNING	False	phase lock det	ect PRN	10	err=62	2.099968			
Jun 23 2016 16:0	1:31	WARNING	False	phase lock det	ect PRN	10	err=63	3.151573			

Note: if the surveyed position is not available, you can use latitude, longitude and altitude from a *Single Point Position* on Solution tab. However, please remember that this is not a very accurate location and therefore your rover position will also not be very accurate.

Finishing Base Station Setup

At this point the Piksi base station setup is complete. Close Console, disconnect Piksi from the computer and power it up with a Power Pack. The green LED will flash when Piksi is receiving GPS signals.

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Rover Setup

- Place the antenna on a ground plane and secure it on a monopod or on other structure with an unobstructed sky view (follow the <u>Antenna Placement Guidelines</u> in section above).
- Connect the antenna cable to the Piksi board.
- Connect the radio antennas to the radio modem.
- Connect the radio modem to the Piksi UART A port.
 - If your kit contains RFD900+ radios, follow the RFD900+ Radio Integration Guide.
 - If your kit contains 3DR radios, follow the 3DR Radio Integration Guide.
- It is recommended to secure Piksi and radio together and attach them to the antenna monopod or a mast.
- Connect the Piksi board to your computer with the USB cable.

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Start the console software and connect to the Piksi receiver.



Checking Rover Satellite Signals

Open Tracking tab. Wait until at least 5 satellites have signal strength above 33 dB-Hz and Piksi computes a Single Point Solution. The green LED on Piksi will flash slowly once it has a solution (fix).



Configuring Rover Radio Messages

In the RTK system, the Rover is only receiving observations (corrections) from the Base Station. Open *Settings* tab, set UART A *sbp message mask* (1) to 0 (2) and click Save to Flash button (3). This will disable transmission of the rover observations.

Piksi Console, Version: v0.2	7 : PK64267					
Tracking Solution Baselin	ne Observations	Settings Fire	mware Update	Advanc	ed	
Name		Value			1	
hw revision	piksi_2.3.1				Rela	oad Save to Flash weet to Defaults
nap version	v0.16				Show	a Advanced Settions:
nap channels	11				Set	ting
nap fft index bits	13			_		Newsy west wests also measure much
system monitor						Name: bart barta.sop_message_mask
heartbeat period milli	1000					Value: 0
watchdog	True			_	1	Description: Configure the message mask for SBP messages on UART
telemetry radio						Units:
configuration string	AT&F,ATS1=57,	ATS2=64,A	TS5=0,AT&\	N,	Def	fault value: 64 (decimal), 0x0040 (hex)
uart ftdi						
mode	SBP			_		
sbp message mask	65535			_		
baudrate	1000000			_		
uart uarta						
mode	SBP			_	1	The default measure much as this (1807 (0-0040) is supporting for a cardia to
sbp message mask					1	Notes: communicate observation messages to another Piksi. The out-of-the box
configure telemetry r	True				Π.	configuration uses UART A for Piksi to Piksi communication.
baudrate	57600					
uart uartb						
mode	SBP					
sbp message mask	65280					
configure telemetry r	True					
baudrate	115200				<u></u>	
II × Console Log						Log level filter: WARMING
Host timestamp	Log level					Message
Jun 23 2016 16:36:08	WARNING False phase lock detect PR					err=62.529663
Jun 23 2016 16:36:04	WARNING	False pha	ase lock dete	ect PRN	19: e	err=-50.940857
×				_	_	,

Checking Communication Between Piksis

The red LED on Piksi will flash when it correctly receives an observation data from the other Piksi (base station). Open Observations tab. You will see the rover's (Piksi connected directly) observations in the upper *Rover* table, and the observations that have been received over the radio from the other Piksi in the lower *Base* table. Wait until you can see at least 5 satellites in common between the Base and Rover.

Piksi Console, Version: v0.27 :	PK7951				- D -X
Tracking Solution Baseline	Observations Settings Fi	irmware Update Advanced			
Rover					
PRN	Pseudorange (m)	Carrier Phase (cycles)	C/N0 (db-hz)	Doppler (hz)	2
12 (L1CA)	26809641.69	5506975.15625	43.5	2826.48437484	Record
13 (L1CA)	26668273.38	-12824938.1914	40.0	-3154.66796857	_
15 (L1CA)	26847848.25	-4195900.96094	43.75	-2082.75390613	
17 (L1CA)	24281772.77	-2758591.82422	49.5	-1766.69921865	
19 (L1CA)	22980000.0	9495418.32812	54.25	-281.015624984	
2 (L1CA)	26708385.85	2232266.38281	42.5	3445.64453105	
24 (L1CA)	24572021.79	18480249.8164	45.75	2201.07421862	
28 (L1CA)	25683312.16	-7338238.42969	44.25	-1602.14843741	
6 (L1CA)	24586676.22	7904852.90234	52.5	2573.8476561	
PRN	Pseudorange (m)	Carrier Phase (cycles)	C/N0 (db-hz)	Doppler (hz)	
PRIN	Pseudorange (m)	Camer Phase (cycles)	C/N0 (db-hz)	Doppier (nz)	Record
12 (11CA)	20009027.04	124622211484	43-23	2007.1209/000	
15 (LICA)	2000027435	-12402321.1404	49.25	-3034.20230232	_
17 (11CA)	24281772 77	-2720836 28125	47.5	-2022/4414/015	_
19 (11CA)	22980000.0	10072105.4844	51.0	-220.371093737	_
2 (11CA)	26708387.57	1140691.55859	42.25	3506.3671873	_
24 (L1CA)	24572023.76	16381740.9453	47.5	2261.87499987	_
28 (L1CA)	25683316.64	-7000975.57812	43.5	-1541.40624991	_
6 (L1CA)	24586677.79	7989815.15625	43.5	2634.5507811	_
II × Console Log				Log level filt	er: WARNING
Host timestamp	Log level		Message		
lup 24 2016 12:21:40	WARNING random	Soud error restarting PM	0×41		
his 24 2016 13:31:40	MARNING random	Cood error restarting RNC	0.41		
Jun 24 2016 13:31:40	wakining random	: Seed error, restarting RNG	3 0841		

Viewing RTK Position Solution

Once at least 5 satellites are in common between the Rover and Base, Piksi will start producing differential solutions. Open the Baseline tab and you will see differential solutions being outputted. Initially Piksi will begin in *Float* mode (less accurate) and will eventually change to *Fixed* mode (most accurate). This transition should take about 10 minutes, but the exact time to get to Fixed will vary between a few minutes, up to 15 minutes. When this happens, your Piksi has a fixed RTK lock. You should now see a centimeter-accurate distance between your base Piksi and rover Piksi, visualized on the Baseline tab, like in the example shown below.



If the surveyed position was programmed on the base station and broadcasting was enabled (see <u>Configuring Radio Messages</u> in the Base Station setup above) you can see rover's position on the Solution - RTK Position tab.

Taking Solution Baseline Observations Settings Primare Lipidate Advanced Server Earth Testition RTK Position	Piksi Console, Ve	rsion: v0.27 : PF	(7951					
Single Parel Relation: RTX Position It m Value (P5 Time 2016-06-34.23-4557.100012 (P5 Time 2016-06-34.23-4557.100012 (P6 Time) 2122.87895113 (Page) 0.01 Mode Faced RTK (Page) 0.01 (Page) 0.0	Tracking Solution	Baseline	Observations	Settings	Firmware	Update	Advance	
RTK Position Image: Street for Street	Single Point Position	RTK Position				II X	53 O	
Item Value GPS Time 2016-06-24 20:4557:100012 GPS Time 2016-06-24 20:4557:100012 GPS Time 5002 GPS Time 2016-06-24 20:4557:100012 GPS Time 2016-06-24 20:4557:100012 GPS Time 2016-06-24 20:4557:100012 GPS Time 2016 Time Minus sets 8 Let 37:762403 Ling -122:387985:13 At 5.8667146103 Flags 0x01 Mode Fixed RTK Mode Fixed RTK Line nocessary to enter the "parrened hostion" entropy of the base. Hit mode to leve the paulob-aboulus RTK Positions in the tab. Longitude (degrees) Ling 12:2:387985 -122:387985 Longitude (degrees) Ling 24 2016 13:455:38 WARNING random: Seed error, restarting RNG 0x41	RTK Position							
GPS Time 2016 66-94 30-95:57:100012 GPS Time 1902 GPS Time 1902 GPS Time 1902 GPS Town 1000 Num.sits 8 Let 37.762401 Att 5.8667416103 Flags 0.01 Mode Fixed RTK Flags 0.01 Mode Fixed RTK Stain in order to level the psued-absolute RTK Position's estimose for the base stain in order to level the psued-absolute RTK Position's estimose in this tab. Lix Censule Leg Log level filte: WARNING random: Seed error: restarting RNG 0x41 J1 24 2016 13:45:37 WARNING	Item		Value					
GPS Week 1992 Nam. sits 8 Let 37.706404043 Lig 122.287985133 An 5.86667406003 Flags 0x01 Mode Fared RTK Week the paucho-about RTK Position" settings for the base Lit a recessary to enter the "surveyed Position" settings for the base Lit a recessary to enter the "surveyed Position" settings for the base Lit a recessary to enter the "surveyed Position" settings for the base Lit a recessary to enter the "surveyed Position" actings for the base Lit a recessary to enter the "surveyed Position" actings for the base Lit a recessary to enter the Surveyed Position" actings for the base Lit a recessary to enter the Surveyed Position" actings for the base Lit a recessary to enter the Surveyed Position" actings for the base Lit a recessary to enter the Surveyed Position" actings for the base Lit X Console Log Log level filter: Most timestamp Log level filter: If X Console Log Message In 24 2016 13:45:38 WARNING random: Seed error, restarting RNG 0x41	GPS Time	2016-06-24 2	0:45:57.100012					+ RTK
GPS Tow 50073200022 Nam: sets 8 Let 37.762402 ar. 5.3566741033	GPS Week	1902						+ SPP
Num.sts 8 Let 37.76240433 Log	GPS ToW	506757.10001	12			37.	762402	
Let 377,524014043 Ling -122,387955 Plags 0.001 Mode Fixed RTX	Num. sats	8						
Log -122.287985113 Ait 5.866714(60) Flags 0.01 Mode Faced RTK Juit a recessary to enter the "surveyed Postoon" settings for the base station in order to view the post-obsolute RTK Postoon is the tab. -37.762401 It is necessary to enter the "surveyed Postoon" settings for the base station in order to view the post-obsolute RTK Postoon is the tab. -37.762401 It is necessary to enter the "surveyed Postoon" settings for the base station in order to view the post-obsolute RTK Postoon is the tab. -37.762401 It is necessary to enter the "surveyed Postoon" settings for the base station in order to view the post-obsolute RTK Postoon is the tab. -37.762401 It is necessary to enter the Surveyed Postoon is the tab. Longstrude (degrees) It is accessary to enter the Weather to view the post-obsolute RTK Postoon is the tab. Longstrude (degrees) It is accessary to enter to view the post-obsolute RTK Postoon is the tab. Longstrude (degrees) It is accessary to enter to view the post-obsolute RTK Postoon is in the tab. Log level filter: WARNING It is accessary to enter the station in order to view the post-obsolute RTK Postoon is cell error, restarting RNG 0x41	Lat	37.762401404	13					
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Mode Fixed RTK Mode Fixed RTK Bits increased holdow ¹ settings for the base station in order to view the pauedo-aboutus RTK Positions in the tab. 437,762463 Hit X Console Log Longitude (degrees) Hit X Console Log Longitude (degrees) Hott timestamp Log level filter Hott timestamp Log level filter Hott timestamp Log level filter Jose 24 2016 13:455:38 WARNING random: Seed error, restarting RNG 0x41	Flags	0x01				e e	/02/401	Stat William
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Host timestamp Log level Message un 24 2016 13:45:38 WARNING random: Seed error, restarting RNG 0x41 un 24 2016 13:45:37 WARNING random: Seed error, restarting RNG 0x41	II × Console Lo	9						Log level filter: WARNING.
un 24 2016 13:45:38 WARNING random: Seed error, restarting RNG 0x41 un 24 2016 13:45:37 WARNING random: Seed error, restarting RNG 0x41	Host time	stamp	Log level					Message
un 24 2016 13:45:37 WARNING random: Seed error, restarting RNG 0x41	lun 24 2016 13	45-38	WARNING	5 rande	om: See	l error	restartir	n RNG 0x41
In 24 2010 15:45:57 WARNING TO INTRODUCE OF OUT OF COMPANY AND A COMPANY	lup 24 2016 13	45.37	WARNING	5 rande	om: See	d error	restartin	a RNG 0x41
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Now you may take rover antenna, Piksi and computer to your hands and move around.

Error creating thumbnail: Unable to save thumbnail to destination

Congratulations! You now know how to setup and use Piksi. To learn more, read the documentation posted <u>here</u>. If you are a developer and want to setup the toolchain to build firmware for Piksi, see the <u>Piksi</u> Developer Getting Started Guide.

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