Using the Console

The GUI Console is a visual representation of what's happening inside your Piksi. It displays information and allows you to adjust the settings on your hardware.

Installation

The GUI Console can run on Windows, Linux, and OSX platforms. For detailed instructions on installing and opening the GUI Console on your computer, please see the Piksi User Getting Started Guide.

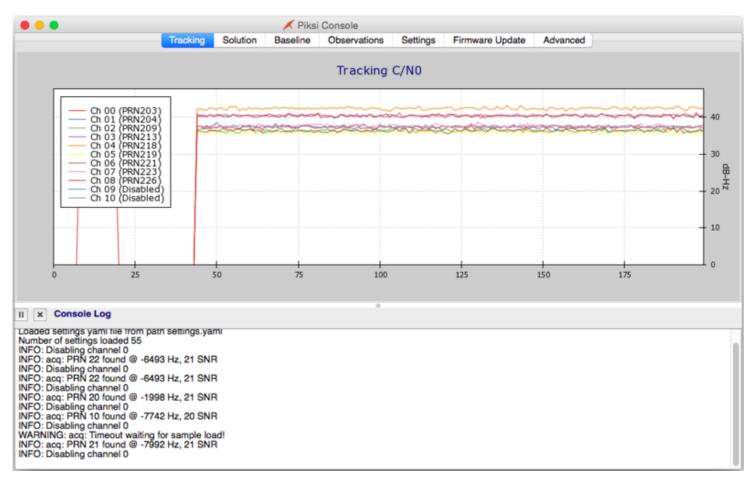
The Tabs

The GUI Console consists of seven tabs:

- 1. Tracking: shows which satellite signals your Piksi is tracking.
- 2. Solution: provides the absolute position of your Piksi.
- 3. Baseline: gives the high-accuracy RTK vector between your two Piksis.
- 4. Observations: shows the information that your two Piksis are sending to each other.
- 5. Settings: allows you to view and modify the device settings of your Piksi.
- 6. Firmware Update: allows you to view and update the versions of your Piksi software.
- 7. Advanced: provides a few specialized functions for advanced users (System Monitor, SBP Relay, Python Console).

Tracking

This tab shows the satellite signals your Piksi is tracking.



Graph Description

Each colored line on the graph represents a satellite, and the line's position on the graph represents the strength of that 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 Density Ratio (C/No), in dB-Hz, which is the signal strength of the satellite. The higher the value on the y axis, the stronger the signal.

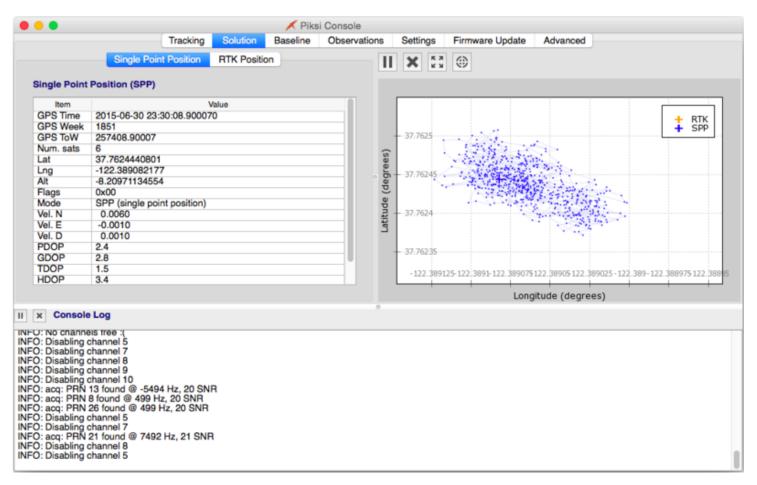
Console Log

The console log provides two types of debugging information to the user:

- Standard Output and Standard Error from the console application.
- All SBP_MSG_PRINT messages from the Piksi device. These messages provide debugging output from the device and have the following four levels of severity listed in the table below:
 - INFO
 - DEBUG
 - WARNING
 - ERROR

Solution

This tab shows Piksi's absolute position, which is Piksi's location on Planet Earth (longitude, latitude, and altitude). If you input geodetic coordinates for your base station Piksi in the **Settings** tab, this tab can also display the RTK position of your rover Piksi, which is the relative distance between base station Piksi and rover Piksi.



Subtabs

Subtab	Function
Single Point Position	This subtab displays information on the table and the graph, once single point position solutions are available.
RTK Position	This subtab displays information for the pseudo absolute position. The table on this subtab will be blank unless the geodetic coordinates for the base station Piksi are entered and broadcast is set to true on the <i>surveyed position</i> group of the Settings tab.

Graph Description

The Latitude parameter graphed on the vertical axis describes the angular distance north or south of the Earth's equator, in decimal degrees. The Longitude parameter graphed on the horizontal axis describes the angular distance east or west of the Prime Meridian, in decimal degrees. During operation, each Piksi will automatically output its single point position represented as blue points on the graph. Single Point Position is a standard GPS position solution with an absolute position accuracy of several meters. Piksi will also output an orange line when RTK position is available. An RTK Position Solution is a high precision GPS position solution, with an accuracy of several centimeters. The blue dots will have less precise positions and will therefore appear as a noisy cluster around the orange RTK line.

Table

The table to the left on the **Solution** tab displays various metrics on the state of the Piksi module:

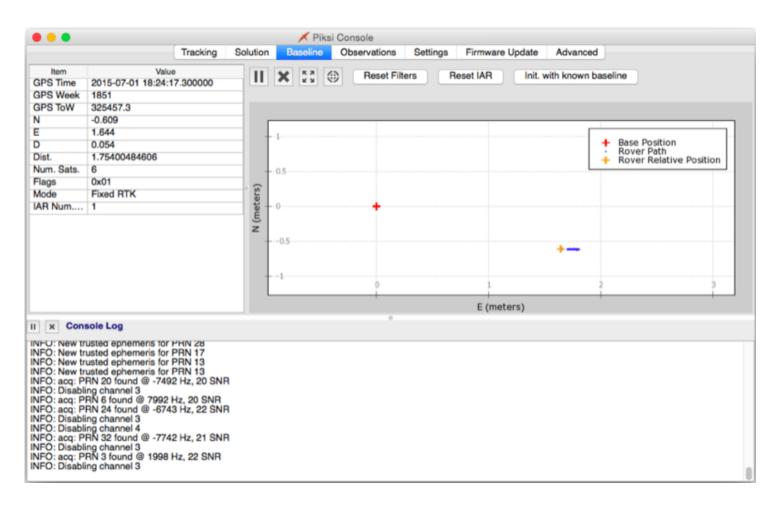
ltem	Description of Values [units]
GPS Time	Displays the current GPS time.
GPS Week	Gives the number of whole weeks since the first epoch.
GPS Time of Week	Gives the number of whole seconds since the beginning of the week.
Number of Satellites	Shows the number of satellites Piksi is tracking.
Latitude	Represents the angular distance north or south of the Earth's equator.
Longitude	Represents the angular distance east or west of the Prime Meridian.
Altitude	Represents height [meters].
Flags	Describes current Piksi mode. 0x00 indicates float mode, 0x01 indicates fixed mode.
Mode	Displays single point position, float, or fixed mode (difference between float and fixed explained here (http://www.ehow.com/info_12245568_difference-between-rtk-fix-rtk-float.html)).
Velocity North	Represents Piksi's Northern velocity [meters per second].
Velocity East	Represents Piksi's Eastern velocity [meters per second].
Velocity Down	Represents Piksi's vertical "down" velocity [meters per second].
Position Dilution of Precision	Describes the relationship between the error in Piksi's position and the error in satellite position.
Geometric Dilution of Precision	Describes relationship between changes in output position and changes in measured data.
Time Dilution of Precision	Represents the measurement of position accuracy through clock offset.
Horizontal Dilution of Precision	Represents the measurement of position accuracy through two horizontal coordinates.
Vertical Dilution of Precision	Represents the measurement of position accuracy through height.

Buttons

Button	Function
Pause	Pauses the output of position solutions on the graph.
X	Erases previous plotted position solutions and starts over plotting new position solutions.
Full Screen	Encompasses all position solutions to be displayed on the graph.
Center Piksi	Centers the current position solution on the center of the graph.

Baseline

This tab shows the relative RTK vector between the two Piksi units.



Graph Description

This graph will show the base station as a red cross, the rover as an orange cross, and the path of the rover as blue dots. Note that, in the Piksi Console, the Piksi that is connected to the Console is always the Rover and the unit not connected to the console is always the Base. The base is always considered to be at coordinate [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).

Table

The table to the left on the **Baseline** tab displays various metrics on the state of the Piksi RTK system:

ltem	Description of Values [units]
GPS Time	Displays the current GPS time.
GPS Week	Gives the number of whole weeks since first epoch.
GPS Time of Week	Gives the number of whole seconds since the beginning of the week
N (North)	Displays the north-south relative offset between the base and rover modules of the RTK system [meters].
E (East)	Displays the east-west relative offset between the base and rover modules of the RTK system [meters].
D (Down)	Displays the up-down relative offset between the base and rover modules of the RTK system [meters].
Distance	Displays the magnitude of the relative vector between the base and the rover modules of the RTK system [meters].
Num. Sats.	Gives the number of common satellites that both modules of the RTK system are simultaneously tracking.
Flags	Describes the current Piksi mode. 0x00 indicates float mode, 0x01 indicates fixed mode.
Mode	Displays float or fixed mode (difference between float and fixed explained here (http://www.ehow.com/info_122455 68_difference-between-rtk-fix-rtk-float.html))
IAR Number	Gives the Integer Ambiguity Resolution Number. A lower number is correlated with higher accuracy.

Buttons

The first four buttons are described in the **Solution** tab section. The three remaining buttons on the right side of the console are described below:

Button	Function
Reset Filters	Resets both the "float filter" and the "integer ambiguity test filter".
Reset IAR	Resets only the "integer ambiguity test filter".
Init. with known baseline	Notifies the system that your Piksis are directly next to each other- a "known baseline", which helps you achieve a Fixed RTK lock in a shorter amount of time.

Observations

This tab displays information about the data that your two Piksis are sending to each other.

• •		📈 Piksi Co	onsole						
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2	22926340.72		1604313	3.22656		50.5		Recor	
6	23775925.88			3.13672		48.0			
10	25433853.55		323270			12.75			
12	22980000.0		261598			50.25			
17	26924951.77			8.65625		36.75			
24	24213777.99		-206466	6.71875		46.5			
			0						
se									
PRN	P	seudorange		Carrier P	hase		C/N0	B	
2	22980000.0			199219	4	48.0			
3	23829587.57		-318311	.980469	4	47.25 40.0 50.75 39.25			
10	25487507.89		495197	511719	4				
12	23033661.81		412328	5					
17	26978607.18		-464846	.285156					
24	24267436.07		-355954	-355954.410156			46.0		
			0						
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x Console Log									
U: acg: PHN 31 Tound @ R	243 HZ, 22 SNH								
U: acg: PHN 31 Tound @ R	5243 HZ, 22 SNH								
O: acq: PRN 31 tound @ 6 O: Disabling channel 7 O: acq: PRN 16 found @ 2	5243 Hz, 22 SNH 249 Hz, 21 SNR								
D: acq: PRN 31 tound @ 0 D: Disabling channel 7 D: acq: PRN 16 found @ 2 D: Disabling channel 8	5243 Hz, 22 SNH 249 Hz, 21 SNR								
O: acq: PHN 31 tound @ 6 O: Disabling channel 7 O: acq: PRN 16 found @ 2 O: Disabling channel 8 O: Disabling channel 7	249 Hz, 21 SNR								
0: acq: PHN 31 toung @ 8 0: Disabling channel 7 0: acq: PRN 16 found @ 2 0: Disabling channel 8 0: Disabling channel 7 0: acq: PRN 1 found @ 42	249 Hz, 21 SNR 245 Hz, 20 SNR								
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O: acq: PHN 31 tound @ 6 O: Disabling channel 7 O: acq: PRN 16 found @ 2 O: Disabling channel 8 O: Disabling channel 7 O: acq: PRN 1 found @ 42 O: acq: PRN 29 found @ 4 O: Disabling channel 7 O: Disabling channel 8 O: acq: PRN 13 found @ 5	249 Hz, 21 SNR 245 Hz, 20 SNR -4995 Hz, 21 SNR 5244 Hz, 22 SNR								
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O: acq: PHN 31 10und @ 8 O: Disabling channel 7 O: acq: PRN 16 found @ 2 O: Disabling channel 8 O: Disabling channel 7 O: acq: PRN 1 found @ 42 O: acq: PRN 29 found @ 4 O: Disabling channel 7 O: Disabling channel 8 O: acq: PRN 13 found @ 5	249 Hz, 21 SNR 245 Hz, 20 SNR -4995 Hz, 21 SNR 5244 Hz, 22 SNR								

Tables

The two tables each correspond to a Piksi module in your RTK system. The columns are as follows:

Column	Meaning
PRN	Represents the PseudoRandom Number, which is the unique identifier of each satellite.
Pseudorange	Displays the raw measurement of the range to the satellite (uncorrected for clock error), measured in meters.
Carrier Phase	Displays the raw value of the offset of the wavelengths from a nominal value, measured in wavelengths.
C/N0	Gives the carrier to noise ratio, measured in dB-Hz.

Buttons

By default, the GUI Console will log the RTK relative vector data in a CSV file on your computer. This can be found in the GUI Console application package contents. The *Record* buttons to the right of the tables will prompt the console to also save the raw GPS satellite data into CSVs in the same folder as the baseline data. For more information on types of logs, logging initiation, log locations and log descriptions, see Logging Data from the Console.

Settings

This tab lets you customize various settings on your Piksi module to suit your application. If you change any value in this section, the change will only apply while the console is still running, unless you save the changes to the flash memory by pressing the "Save to Flash" button near the top of the screen.

•••	🗡 Piksi Conso										
		Tracking	Solution	Baseline	Observati	ons	Setti	ngs	Firmware	e Update Advance	ed
Name		V	alue		-	וה	C		±.	A	
ext events							Reload	Save	to Flash	Reset to Defaults	
edge trigger	None						Theread	Cure			
float kf							Setting				
phase var	0.0144						_				
code var	40000					1		Name:	ext_eve	nts.edge_trigger	
amb init var	1e+25							Value:	None	0	
new amb var	1e+25						Deer	det en e	Colort F		
frontend										DEBUG0 edges to trig	gger timestamped event capture.
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iar						Ĩ					
phase var	0.0144										
code var	40000								Vaulaan	upp this to report th	e exact time that some external
sbp											d, e.g. camera shutter time. Upon
obs msg m	104							Notes:	detectin	g the event, Piksi will	generate a MSG_EXT_EVENT
simulator									messag	e reporting the event	, including a timestamp accurate to lequires NAP firmware >= 0.12.
enabled	False				_				better th	an a microsecond. H	equires NAP firmware >= 0.12.
base ecef x	-2700303.10144										
base ecel y	-4292474.39651				_						
base ecel z	3855434.34087										
	sole Log										
INFO: Disabli INFO: Disabli INFO: acq: PI INFO: Disabli INFO: Disabli INFO: Disabli INFO: Disabli INFO: acq: PI INFO: acq: PI	nğ channel 4 ng channel 5 RN 15 found @ -4995 ng channel 0 ng channel 1 RN 11 found @ 2497 H RN 12 found @ 8491 H ng channel 0 ng channel 1	Iz, 21 SNR Iz, 22 SNR Iz, 21 SNR Iz, 21 SNR Hz, 22 SNR									

Clicking any setting on the table to the left on the tab will bring up a description in the right side of the Console. A complete list of the settings - with descriptions - can be found here (https://github.com/swift-nav/piksi_firmware/blob/master/docs/settings.pdf).

Buttons

The three buttons in the right side of the Console are described below:

Button	Function
Reload	Reloads settings on Piksi Console.
Save to Flash	Saves settings to Piksi flash memory - the changes in settings will stay even when Piksi is restarted.
Reset to Defaults	Erases all settings and resets the device to factory defaults.

Firmware Update

Swift Navigation periodically releases firmware updates to add features and boost performance. In this tab, you can check if you have the latest versions of the Piksi firmware and Piksi console. If the firmware on your Piksi is out of date, the Console will automatically prompt you to download and install the latest files. If you need to update your firmware or console, follow the instructions in the <u>Piksi</u> User Getting Started Guide.

			📈 Piks	i Console			
	Tracking	Solution	Baseline	Observations	Settings	Firmware Update	Advanced
Piksi STM Firmware Version:	v0.18			Please choose a file			
Newest STM Firmware Version:	v0.18					STM Firmware File:	Choose Firmware File
Piksi NAP Firmware Version:	v0.14						Please choose a file
Newest NAP Firmware Version:	v0.14					NAP Firmware File:	Choose Firmware File
Local Piksi Console Version:	0.23			E	rase STM fla	sh (recommended):	2
Newest Piksi Console Version:	v0.23						
				Download 1	Newest Firm	ware Files]
				Updat	te Piksi Firm	ware	
Update Status:							
II x Console Log				0			
Loaded settings yaml file from pa Number of settings loaded 55 Number of tracking channels cha INFO: Disabling channel 0 INFO: acq: PRN 10 found @ 499 INFO: Disabling channel 0 INFO: acq: PRN 17 found @ -24 INFO: Disabling channel 0	anged to 11 95 Hz, 20 SNR	I					

Advanced

Additional options for advanced users are available and are listed below. These areas are for specialized projects like integrating Piksi with autopilot platforms such as Pixhawk.

- System Monitor: displays overall performance and health of your system.
- SBP Relay: broadcasts SBP information to other systems.
- Python Console: is a developer interface to run custom Python scripts for your system.

System Monitor

System monitor shows information about CPU percent utilization, free RAM on Piksi hardware, observation latency and status on the three UART (UART A, UART B, USB UART). The *Reset Piksi* button restarts the Piksi and has the same function as the *RESET* button on the Piksi board.

• • •			📈 Piksi	Console						
	Tracking	Solution	Baseline	Observa	ations S	ettings	Firmware I	Update 🗾	Advanced	
			System Mon	itor S	BP Relay	Python (Console			
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	Thread Name idle				PU %		36		Stace	k Free
	NAP ISR		91.7 6.9				1852			
	manage acq		1.1				2420			
	SBP		0.1				3076			
	system monitor		0.1				2868			
	main		0.0				2460			
	manage track		0.0				2364			
System Monitor:	Connection Monitor Obs Latency: - Obs Latency (Avg ms): - Obs Latency (Min ms): 0 Obs Latency (Max ms): 0	lms Ims ms 1	ART A CRC Errors: IO Errors: IX Buffer %: IX Buffer %:	0 0.8	IO E TX But	Errors: 0 Errors: 0 fer %: 0.8 fer %: 0.0	1	CRC Errors: IO Errors: IX Buffer %: IX Buffer %:	0 21.6	O Rosot Piksi
Console	Log		'X KBytes/s: IX KBytes/s:			rtes/s: 0.0 rtes/s: 0.0		X KBytes/s: X KBytes/s:		
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SBP Relay

SBP Relay is used to broadcast SBP information received by the console to other machines or process over User Datagram Protocol (UDP). With the *Observations* radio button selected, the console will broadcast the necessary information for a rover Piksi to achieve an RTK solution. You can also stream observations to a remote Piksi through aircraft telemetry via ground control software such as MAVProxy or Mission Planner.

			📈 Piksi	Console				
	Tracking	Solution	Baseline	Observations	Settings	Firmware Update	Advanced	
			System Mor	nitor SBP Rel	ay Pythor	n Console		
Messages to broadcast:	 Observations 	С	All	m	achines or pr	rocesses over UDP. V	nformation received by the console to other With the 'Observations' radio button selected, th	ne
IP Address:	127.0.0.1				onsole will bro plution.	oadcast the necessar	y information for a rover Piksi to acheive an R	ſΚ
Port:	13320			TI	his tab can be	e used to stream observed control softwar	ervations to a remote Piksi through aircraft re such as MAVProxy or Mission Planner.	
	Start	Stop						
II x Console Log								
INFO: acq: PHN 12 foun INFO: acq: PRN 14 foun INFO: Disabling channel INFO: Disabling channel INFO: Disabling channel INFO: Disabling channel INFO: Disabling channel INFO: acq: PRN 10 foun INFO: acq: PRN 32 foun INFO: acq: PRN 30 foun INFO: Disabling channel INFO: Disabling channel INFO: acq: PRN 15 foun	d @ -4495 Hz, 20 SN 0 d @ -6493 Hz, 21 SN 1 2 0 d @ -7492 Hz, 20 SN 0 d @ -999 Hz, 20 SNF d @ -3996 Hz, 21 SN 0 1	R R R R						0

Python Console

For advanced users, custom scripts can be run through the python console.

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	Tracking Solution Baseline Observations Settings Firmware Update Advanced	
	System Monitor SBP Relay Python Console	
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II x Console Lo	9	
INFO: Disabling char INFO: Disabling char INFO: Disabling char INFO: acq: PRN 10 f INFO: acq: PRN 32 f INFO: acq: PRN 30 f INFO: Disabling char INFO: Disabling char INFO: Disabling char INFO: acq: PRN 15 f	sole Log HN 17 YOUNG W-0493 HZ, 21 SNH Ing channel 1 Ing channel 0 HN 10 Yound W-7492 Hz, 20 SNR HN 10 Yound W-7492 Hz, 20 SNR HN 10 Yound W-7492 Hz, 20 SNR HN 12 Yound W-7492 Hz,	

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