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.

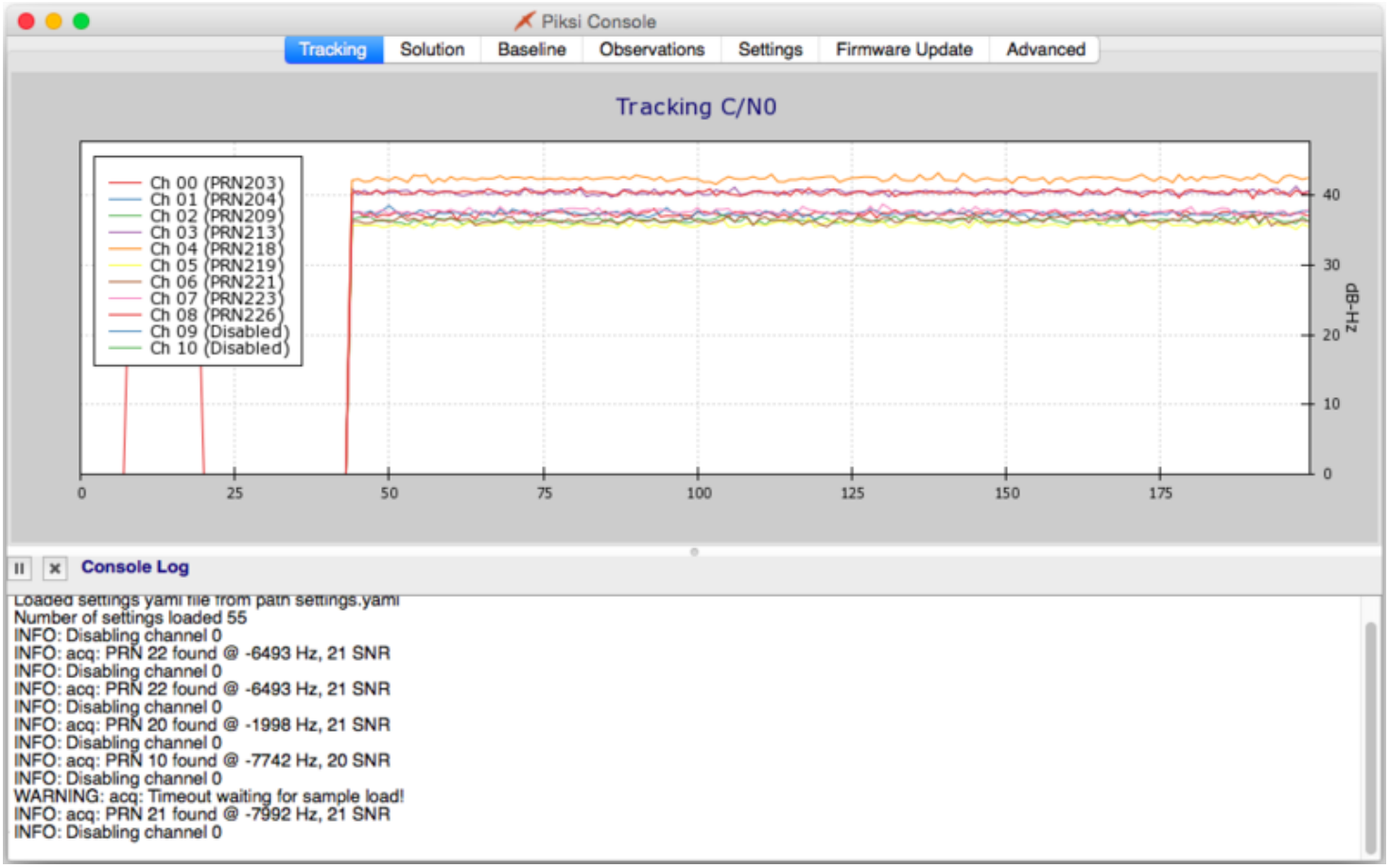
The Tabs

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.

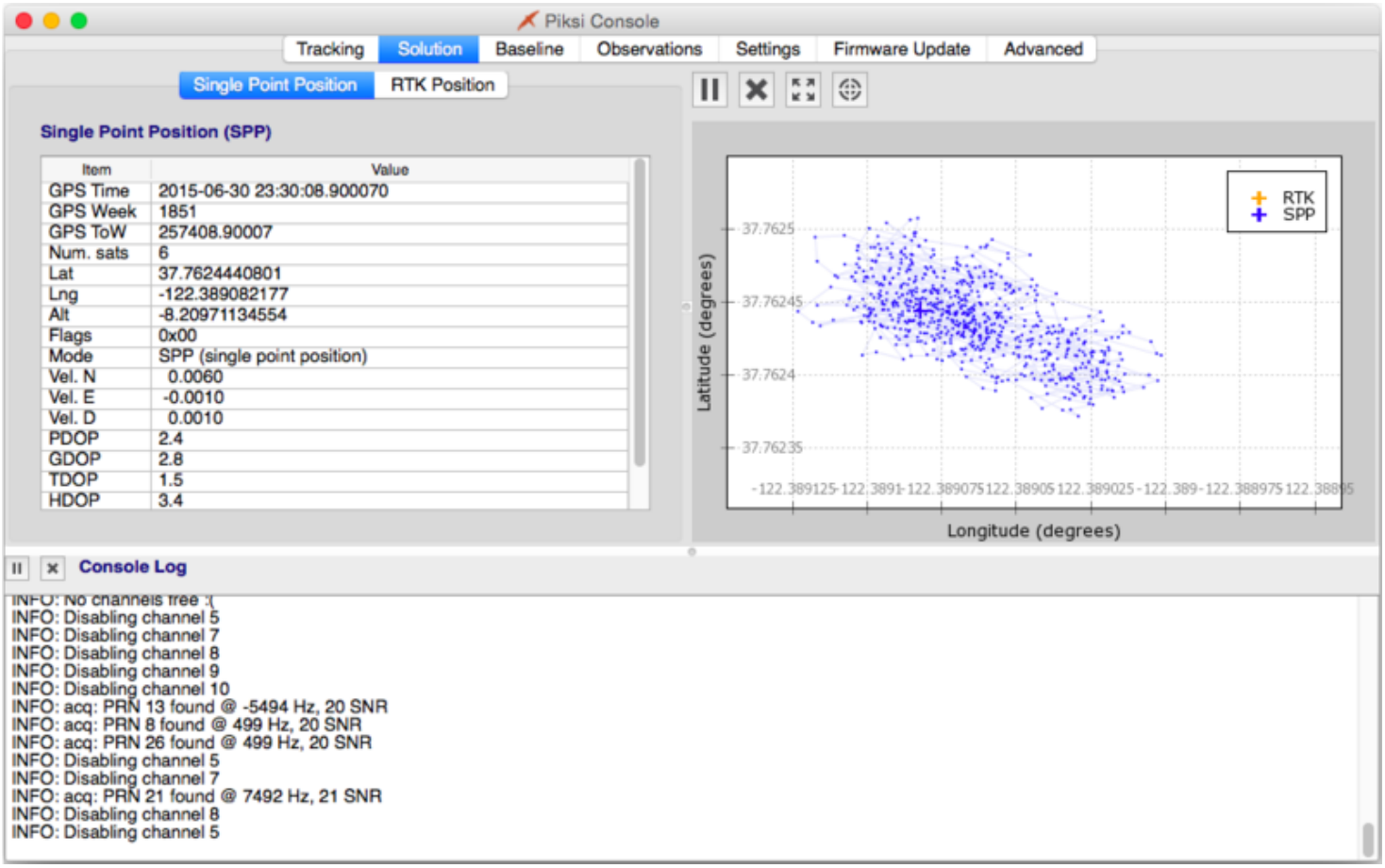
Console Log

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 *surveyed position* 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:

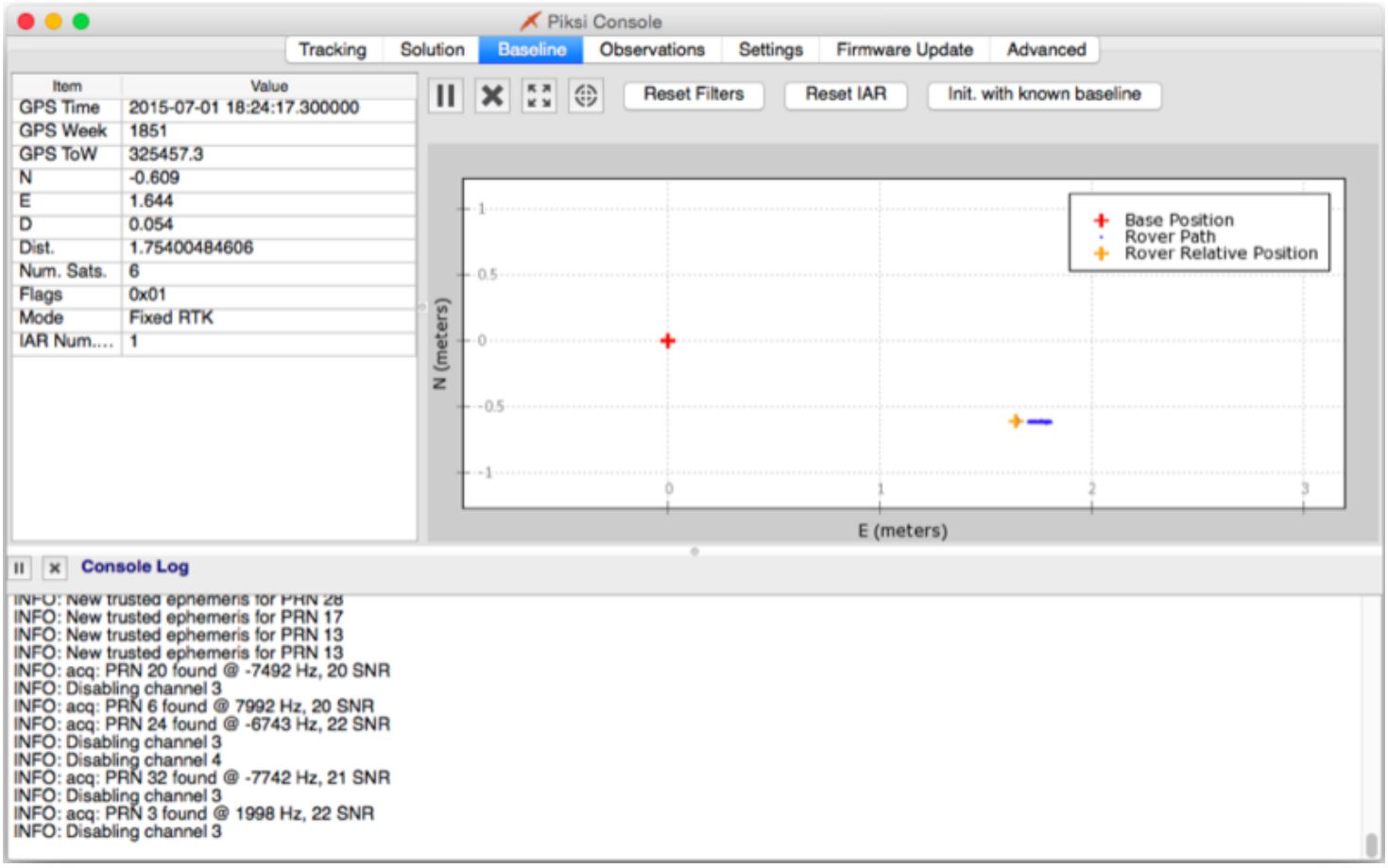
Item	Description of Values [units]
GPS Time	Displays the current GPS time.
GPS Week	Gives the number of whole weeks since the first epoch.
GPS Time of Week	Gives the number of whole seconds since the beginning of the week.
Number of Satellites	Shows the number of satellites Piksi is tracking.
Latitude	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:

Item	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_12245568_difference-between-rtk-fix-rtk-float.html))
IAR Number	Gives the Integer Ambiguity Resolution Number. A lower number is correlated with higher accuracy.

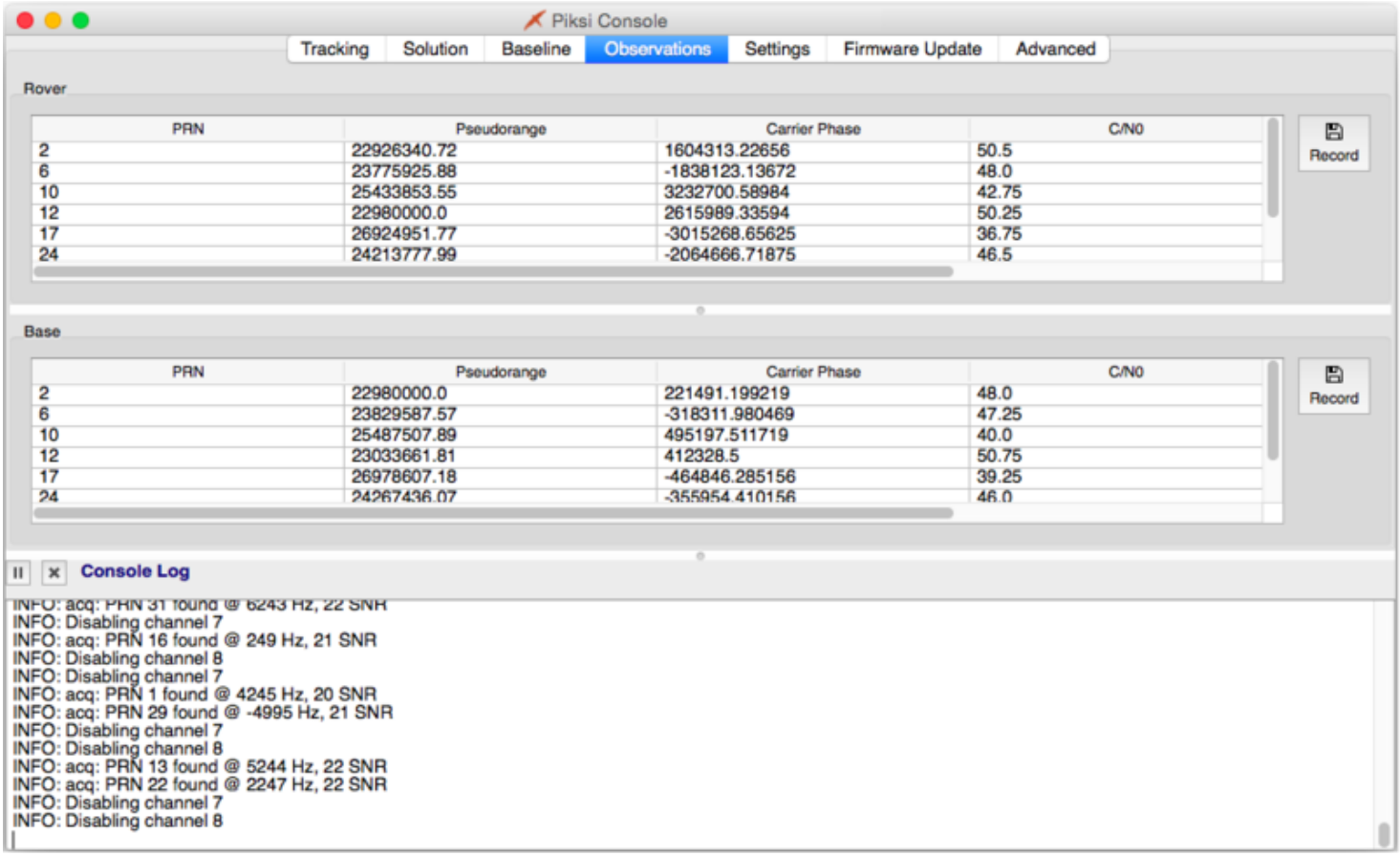
Buttons

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.



Tables

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

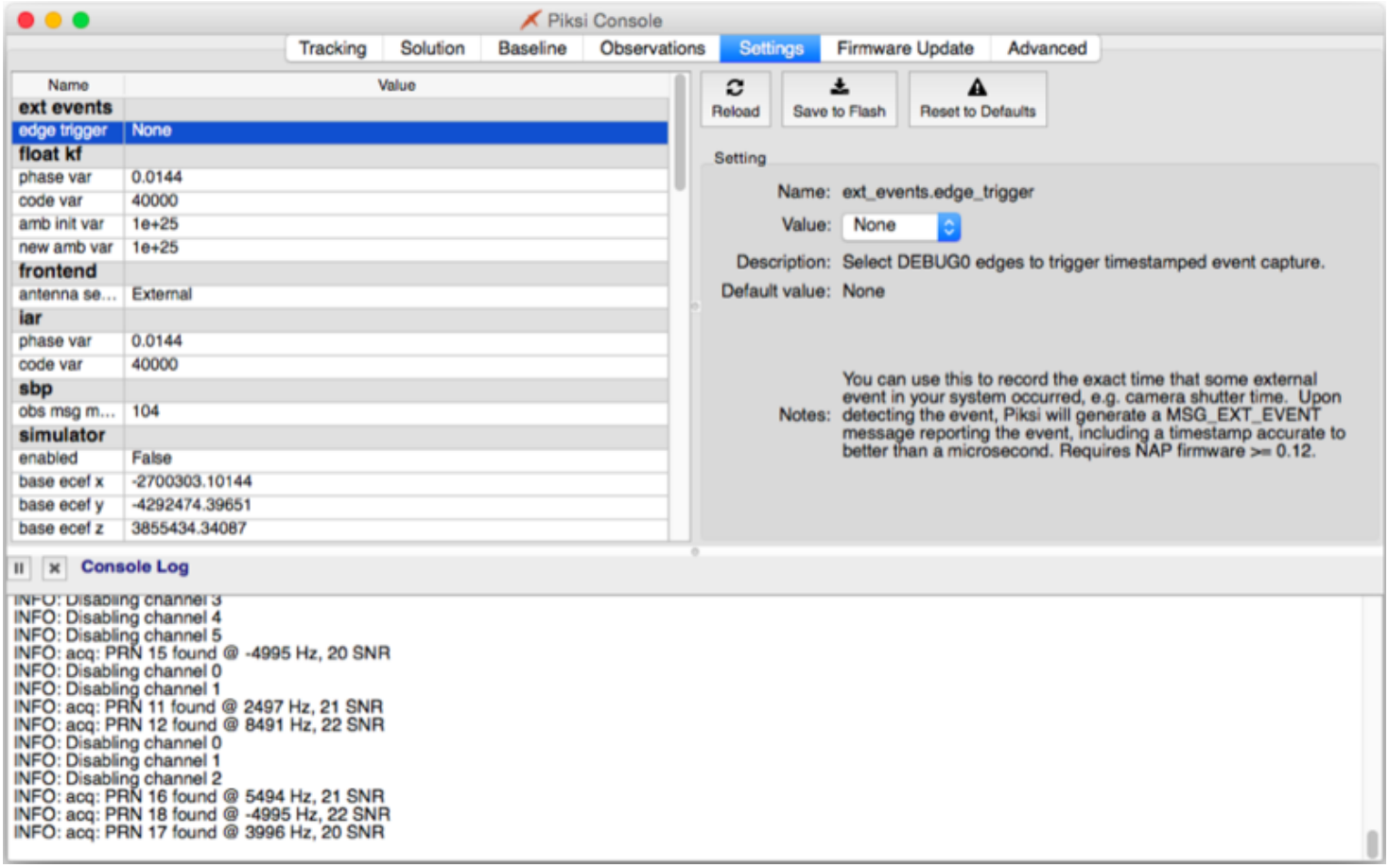
Column	Meaning
PRN	Represents the PseudoRandom Number, which is the unique identifier of each satellite.
Pseudorange	Displays the raw measurement of the range to the satellite (uncorrected for clock error), measured in meters.
Carrier Phase	Displays the raw value of the offset of the wavelengths from 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.



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).

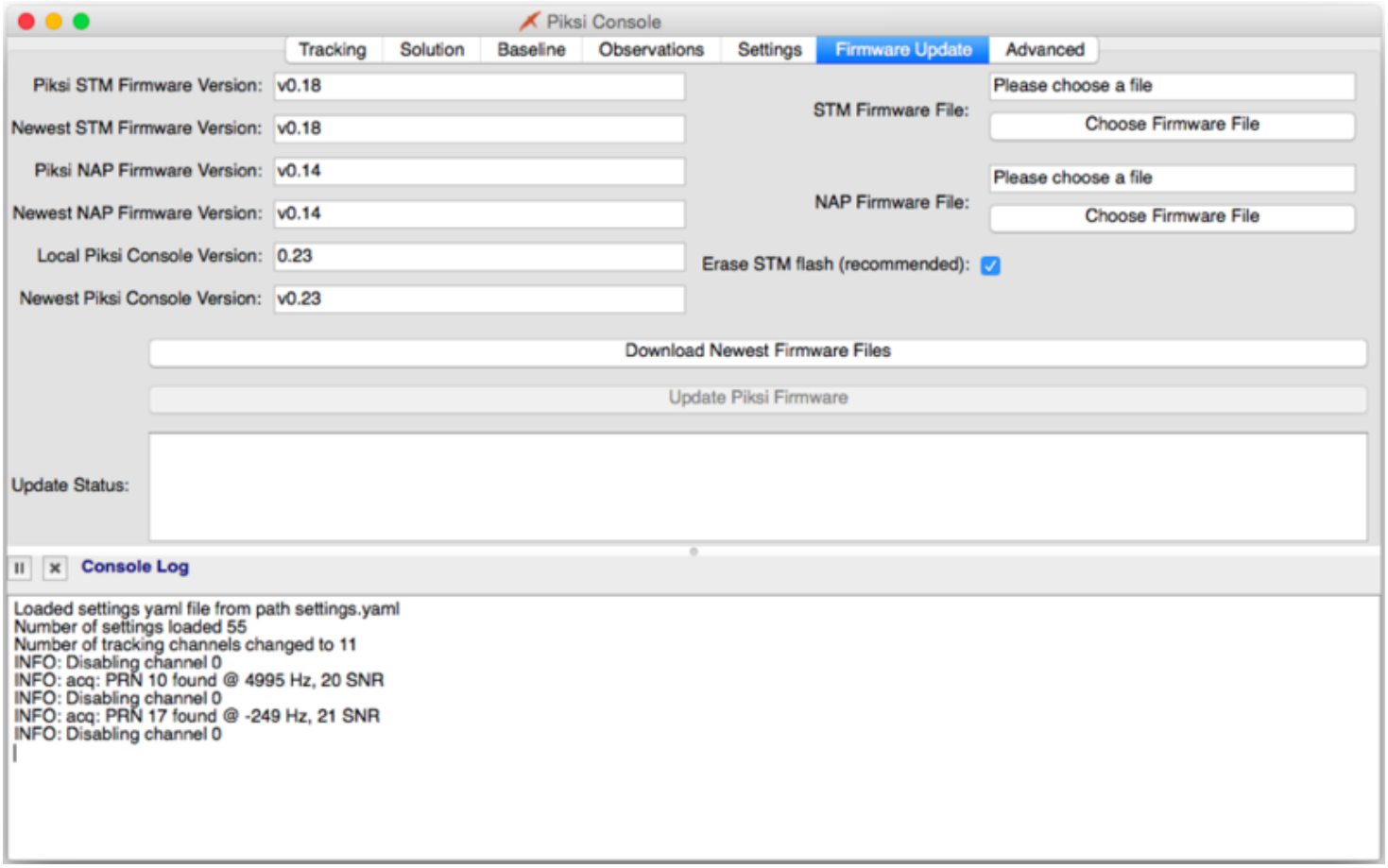
Buttons

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 Piksi User Getting Started Guide.



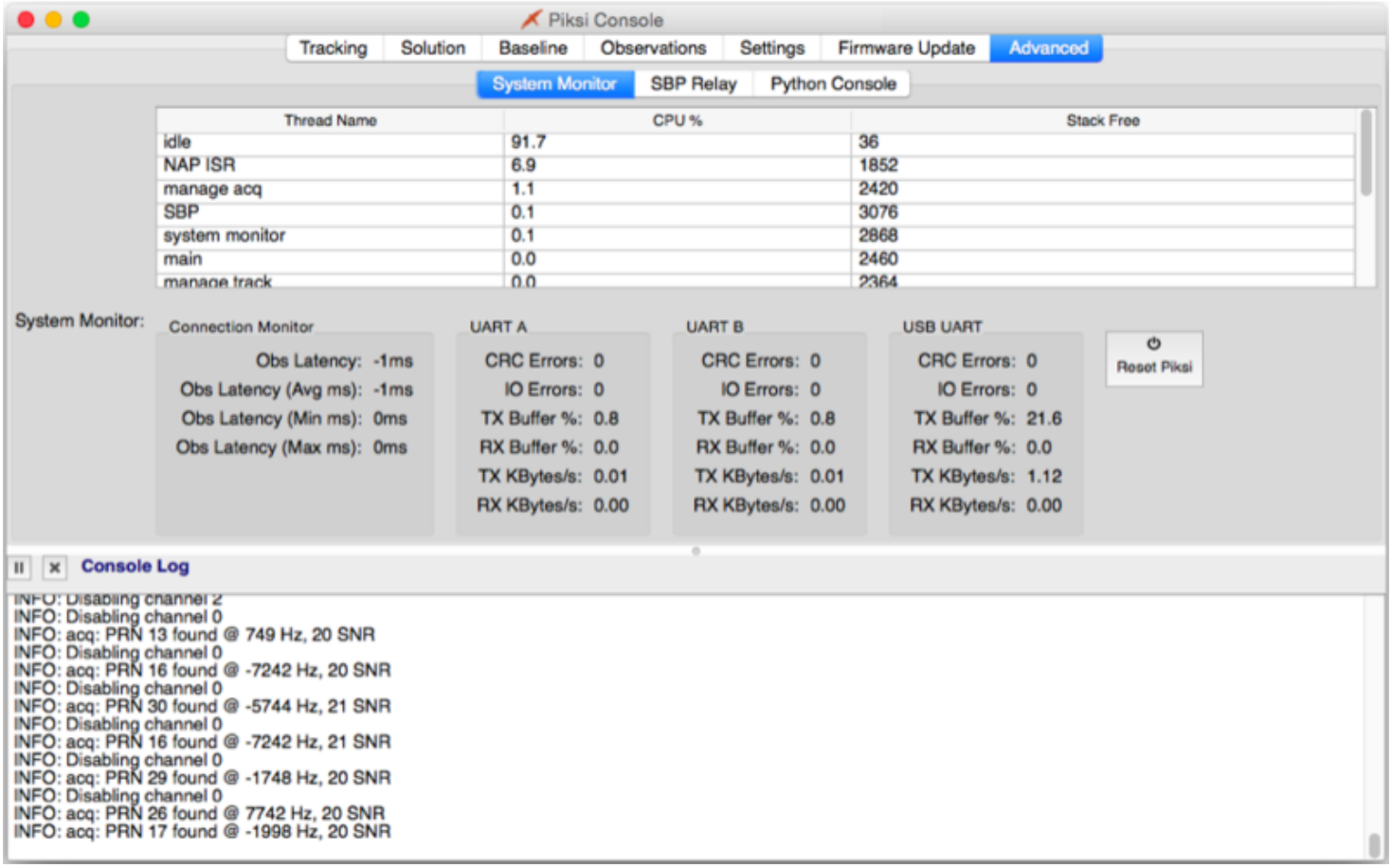
Advanced

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.

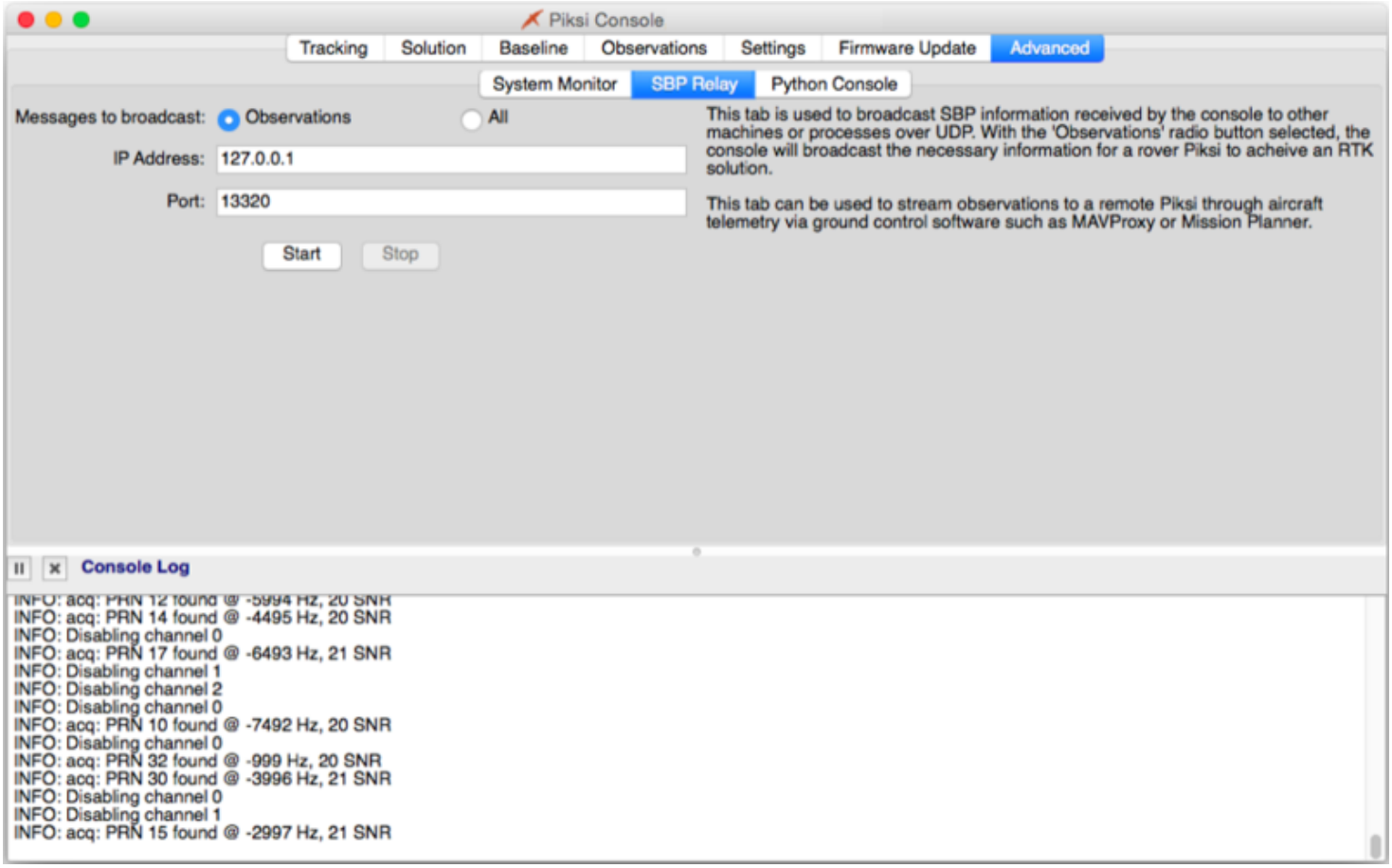
System Monitor

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.



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.



Python Console

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