

RackInjector Firmware Operation Manual

Firmware Version 2017-09-03

Manual Revision 9/11/2017

NOTE: *This is a 'rough draft' of this manual. We would appreciate any feedback about places where the manual is unclear or lacking. We have not taken the time to 'pretty up' this manual yet, as it is still in progress.*

This manual describes the operation of the web interface on the RackInjector. Because the software operation will vary from version to version, this manual does not contain information about setting up the hardware itself – that information is contained within the Hardware Installation manual.

In addition to this manual, you will need to refer to the appendixes for the injection boards which you have installed in the RackInjector system. The appendixes document both the hardware and software operation specific to a particular card. This manual refers to those appendixes when you need to refer to them.

Initial Login

Prior to login, you should have wired at least one power source to the RackInjector and powered the RackInjector on. In addition, you should have connected a computer with a web browser to the Ethernet port.

NOTE: *We develop using several modern web browsers: Mozilla Firefox, Google Chrome, Microsoft Edge, and Opera. Because of subtle differences between web browsers, some portions of the web interface may display differently or operate slightly differently. If you discover an incompatibility with a specific, modern web browser please let us know so we can work on improving compatibility with all web browsers.*

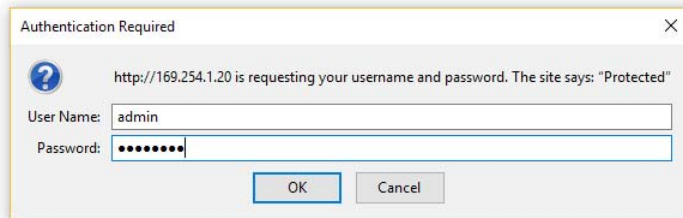
The factory setting for the RackInjector is as follows:

IP Address:	169.254.1.20
Netmask:	255.255.0.0
Default Gateway:	169.254.1.1
Admin User Name:	admin
Admin Password:	password

NOTE: *Be sure to change the admin password of the RackInjector before connecting it to an active network. With the prevalence of hacker activity today, failure to do so is likely to result in an unauthorized user gaining access to the RackInjector.*

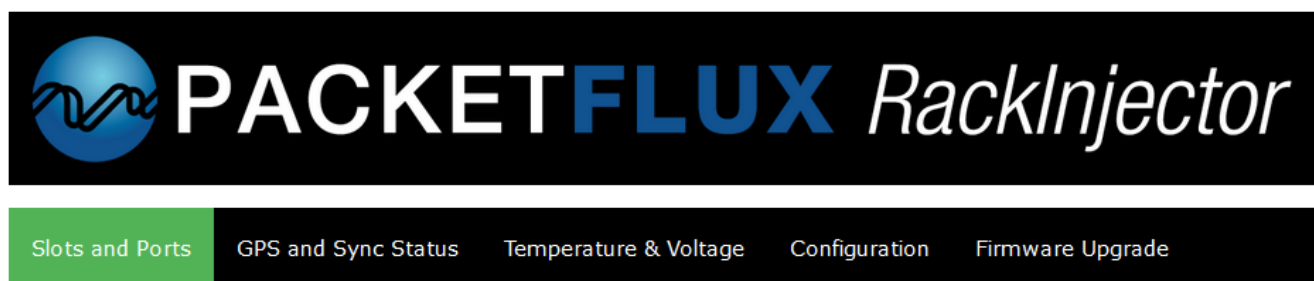
Configure your computer to be able to connect to the IP address above. For some computers, they may automatically do this if powered on without being attached to a network. Others will require you to set the IP address manually to an IP address in the 169.254.x.x range (other than the addresses listed above).

Once you have configured your computer and connected it to the Ethernet interface, you should be able to reach the web interface by browsing to the IP address above. Upon initial connection, a window will pop up asking you for your user name and password. Please enter the admin user name and password and click on OK or whatever the equivalent button is in your web browser. The format of this screen will vary from browser to browser.



Once you have successfully logged in, the main user interface for the RackInjector will display.

RackInjector Menu Interface



Across the top of the interface (just below the logo) are several menu options. The selected menu option is always shown with a green background.

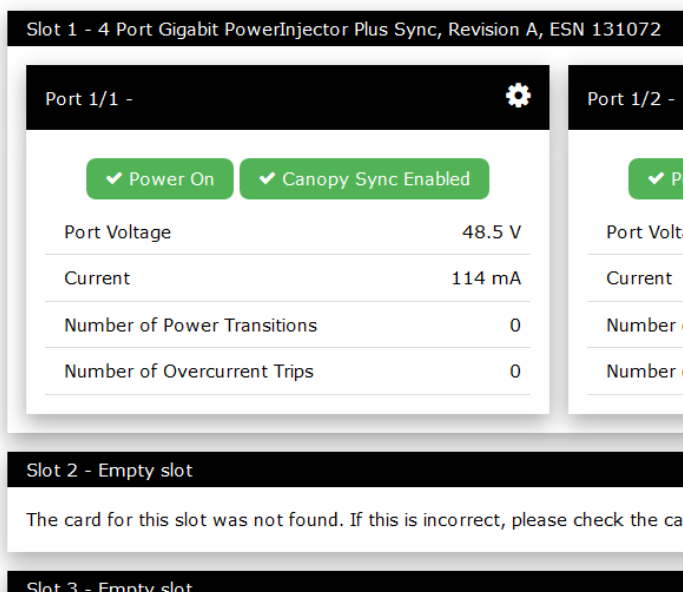
Hovering over a particular menu item will turn it red, indicating it can be clicked on. Clicking on each menu option will then switch to the page indicated by the description.

The function of each page will be covered in detail below.

Slots and Ports Page

This page displays data about each slot and port on the RackInjector. It is organized in a hierarchical fashion, using graphical elements to indicate the slots and ports within the RackInjector.

Each slot (which corresponds to a single injection board) is indicated separately on the page.



If a slot is empty (doesn't contain a board), then the web interface will display this fact.

If a slot contains a board, the type of the board and serial number is displayed. In addition, each port controlled by that slot is displayed.

The operation for each port varies based on the type of board installed. For clarity, the description of the operation of the web interface for the ports is contained in the documentation for the board. For more information on the portion of the web interface for a port, see the appendix for the type of board installed.

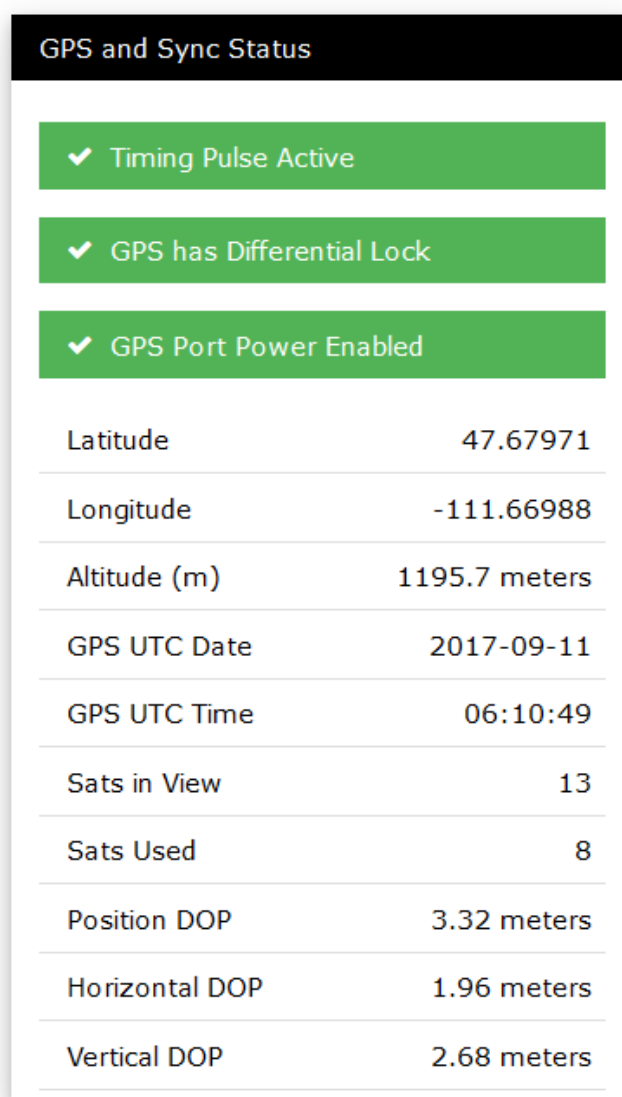
GPS and Sync Status page

If a PacketFlux GPS receiver is attached to the RackInjector, the "GPS and Sync Status" page will display data about the status of the GPS receiver and sync pulse.

Like the Slots and Ports page, the page is subdivided into several sections:

GPS and Sync Status Section: This section provides basic information about the GPS receiver and an overview of the sync status.

- **Timing Pulse Status Indicator.** This indicator shows the status of the sync pulse coming from the GPS. It will show green and say "Timing Pulse Active" if the sync pulse is currently being received. It will turn red and say "No Timing Pulse" if the sync pulse has been lost.
- **GPS Lock Indicator.** This indicator shows the status of the lock of the GPS receiver. It will be green if the lock is sufficient to provide a good quality synchronization pulse.
- **GPS Port Power Indicator and Button.** This indicator shows the status of the power output to the GPS receiver. If the power is active it will be green and read "GPS Port Power Enabled". If the power has been shut off or an over current has been detected, this button will change to orange or red, and display the current status. Clicking on this button will pop up a screen which will permit you to change the status of the GPS power.
- **Latitude, Longitude, Altitude.** These fields show the position of the GPS receiver in 3D space.



The screenshot shows the "GPS and Sync Status" page. At the top, there is a black header with the title "GPS and Sync Status" in white. Below the header, there are three green status bars, each with a white checkmark icon and text: "Timing Pulse Active", "GPS has Differential Lock", and "GPS Port Power Enabled". Below these bars is a table with two columns: the left column lists various GPS-related metrics, and the right column shows their corresponding values. The table has a white background and thin grey horizontal lines separating the rows.

GPS and Sync Status	
✓ Timing Pulse Active	
✓ GPS has Differential Lock	
✓ GPS Port Power Enabled	
Latitude	47.67971
Longitude	-111.66988
Altitude (m)	1195.7 meters
GPS UTC Date	2017-09-11
GPS UTC Time	06:10:49
Sats in View	13
Sats Used	8
Position DOP	3.32 meters
Horizontal DOP	1.96 meters
Vertical DOP	2.68 meters

- **GPS UTC Date and Time.** These fields show the date and time last received from the GPS receiver. If the GPS quits providing updates, this will quit updating, and is a good way to ensure that the data is up to date.
- **Sats In View and Used.** These fields display how many satellites are in view of the GPS receiver (could be used), and how many the GPS receiver is using to determine its 3D position and synchronization pulse.
- **Position, Horizontal and Vertical DOP.** These show the estimated accuracy of the position fix for the GPS receiver. The lower these numbers the better. If they seem high, you should check the GPS.

Sync Pulse Statistics: This section provides details about the sync pulses received from the GPS receiver. Each statistic describes a certain type of pulse received.

To better understand the statistics below, it is helpful to know that a correct sync pulse arrives once per second. No more, no less. The statistics try to categorize when each sync pulse arrived in comparison to when it was expected.

It is important to understand that an occasional 'incorrect' pulse will not affect the operation of the system. Only when incorrect pulses occur regularly will you see any negative effects.

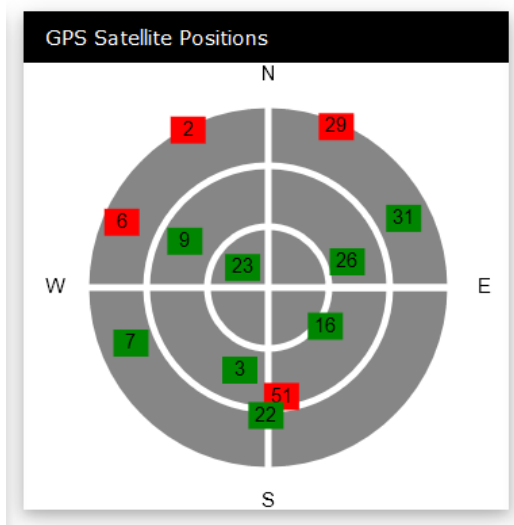
Sync Pulse Statistics	
Pulse Alignment	Count
Correct	5266
Missing	583
Missing In Row	0
Double	7
Very Early	10
Slightly Early	6
Slightly Late	6
Very Late	4
Total Failed Secs	565

[Click here to reset counters](#)

- **Correct.** This is the ideal type of pulse. This counts each pulse which was received exactly when it was supposed to be.
- **Missing.** This shows how many pulses the RackInjector has detected as missing. A missing pulse is counted whenever a pulse is not received for nearly two seconds, and then once per second thereafter.
- **Missing In Row.** In the condition where pulses are being continually missed, i.e. in a GPS receiver failure, it is helpful to know how long it has been since the most recent pulse. This counter counts how many pulses have been missed since the last correct pulse.
- **Double.** This counter counts how many pulses occur right after another. This type of pulse often is a result of coupling between the sync pulse being provided to the radios and the sync pulse being received from the GPS receiver, usually caused by bundling cables together. These pulses are ignored and should not affect the operation of the RackInjector. However, if

these occur regularly, then it would be prudent to examine the routing of the GPS receiver cabling to determine if it can be re-routed to limit the cross-coupling.

- **Very Early, Slightly Early, Slightly Late, and Very Late.** These count pulses which are received outside any of the windows above. Each should be fairly self-explanatory.
- **Total Failed Secs.** This counter counts the total number of seconds which are missing enough pulses to likely affect the attached radios in a negative fashion. If this counter regularly increments, it is likely an indication of a problem.
- **Click here to reset counters button.** Clicking on this section of the web interface will reset the counters. This is useful after an event or after the RackInjector has been running for a long time, so that the counters are more indicative of a problem as opposed to simply counters which have accumulated over a long time or as a result of a prior problem.



GPS Satellite Positions: This section of the screen is useful to determine if you are having visibility problems with a portion of the sky.

On this 'radar' screen each satellite in view is shown. The number of the satellite is drawn at the satellite's approximate position in the sky. The box around the number is colored green if that satellite is used by the GPS receiver in determining its position. A red box indicates that the satellite is visible but was not used.

In the event of a partial blockage, often you will find satellites within a portion of the 'sky' are never used. In this case, you can consider moving the GPS receiver to another location.

GPS Satellite Information: This section provides a detailed version of the data shown on the Position screen. For each satellite, the following information is shown:

- **Sat #.** This is the GPS PRN number of the satellite, which will correspond to the Satellite Position Chart.
- **Az and El.** This is the azimuth and elevation of the satellite, which places it in the sky. Azimuth is relative to north, and elevation is relative to the horizon.
- **SNR.** This is an indicator of the signal received from the GPS. Higher numbers are better.
- **Used?** This column indicates whether that satellite was used in the position fix.

GPS Satellite Information				
Sat#	Az	El	SNR	Used?
23	309	78	39	Y
16	116	58	36	Y
9	301	47	35	Y
26	67	47	0	N
3	197	42	33	Y
51	173	36	32	N

Temperature & Voltage Page

This page provides basic environmental information about the RackInjector:

Voltage and Temperature Status	
Input A	48.4 V
Input B	23.9 V
Input C	1.2 V
GPS Port	47.7 V
Board Temperature	29.2 °C
CPU Temperature	45.7 °C


- **Input A, B, and C.** This shows the voltage being received by the RackInjector control board on each of the three power inputs.
- **GPS Port.** This shows the voltage being sent out of the GPS port. It is normal for this value to be slightly lower than the highest positive voltage available to the RackInjector.
- **Board Temperature.** This shows the temperature of an on-board temperature sensor on the RackInjector. It is intended to show the temperature inside the RackInjector enclosure.
- **CPU Temperature.** This shows the temperature of the CPU silicon.

Configuration Page

This page is used to configure various portions of the RackInjector's operation. It is divided into two portions:

Network Configuration. This section allows you to display and set the network addresses for the RackInjector. It contains the following information:

- **IP Address, Netmask, Gateway.** These are the IP addresses currently active in the RackInjector.
- **MAC Address.** This is the MAC address/ESN of the control board in the RackInjector
- **Reset Reason.** This displays the reason for the last reset of the RackInjector – power failure, software request, watchdog timer, etc.

Network Configuration 	
IP Address	169.254.1.21
Netmask	255.255.0.0
Default Gateway	169.254.1.1
MAC Address	00:1f:6a:ff:00:01
Reset Reason	Power Failure

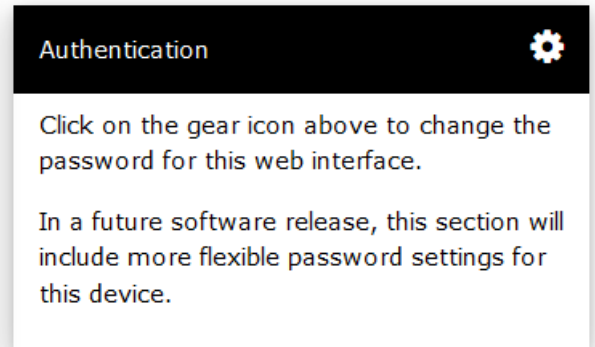
To change the network configuration, click on the gear icon in the upper right hand portion of the screen. A dialog box will pop up, asking you for the updated IP address. After you click 'Accept Changes', the IP address will be saved and will take effect immediately.

WARNING: We have discovered a minor bug in the initial shipping version of the RackInjector Firmware. It appears that the IP address change function does not work in Firefox for some reason. It does work correctly in all other browsers we have tested.

Authentication. This section allows the setting of the administrative password for the RackInjector.

Currently the RackInjector supports a single password for its administration. We expect this to change in an upcoming release to permit the creation of users with different sets of permissions (read only, reboot radios, or change configurations, etc).

For right now, clicking on the gear icon in this section of the interface will permit you to change the password of the web interface. The dialog box which pops up will prompt you for the current password, a new password, and a confirmation of the new password. Once you click accept, if all of the entries are correct (old password matches, new password is valid and matches confirmation), the password will take effect immediately and a new authentication window will pop up. If something has been entered incorrectly, it will silently fail.



Firmware Upgrade Page

This page permits the uploading of updated firmware to the RackInjector and making an already uploaded firmware active. Details on the operation of this page will be provided when we release a new version of the firmware for the RackInjector.