

# RackInjector Hardware Installation Manual

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 steps you need to go through to set up the RackInjector Hardware. It does not contain information about operation of the web interface – that information is contained within the Firmware Operation Manual.

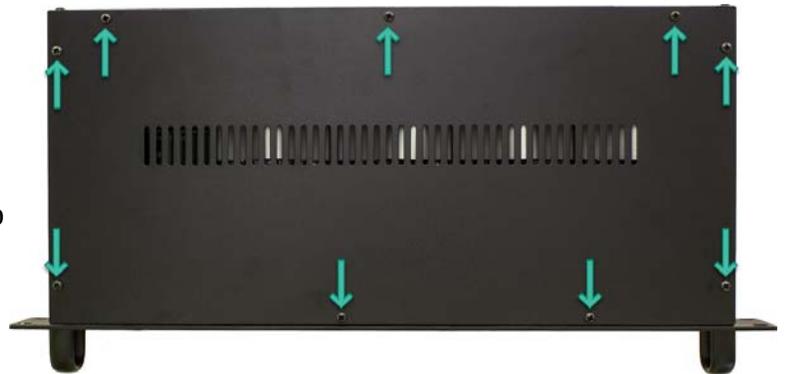
In addition to this manual, you will need to refer to the appendixes for the injection boards which you have installed in the RackInjector system. The appendixes document both the hardware and software operation specific to a particular card. This manual refers to those appendixes when you need to refer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

## Unpacking the RackInjector and Internal Configuration

Because of the flexible nature of the RackInjector, some setup is needed to ensure that the RackInjector is configured to meet your needs.

### Step One: Unpack the RackInjector and Open the Top Panel

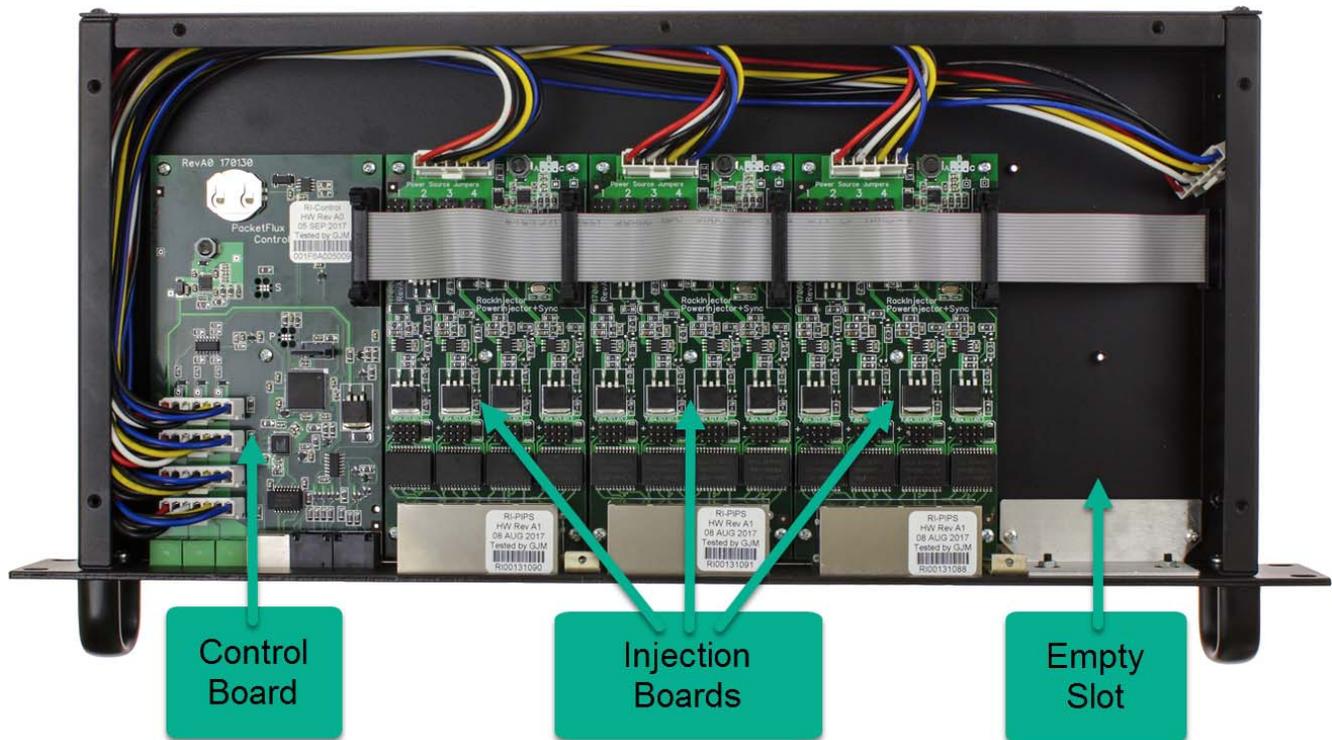
1. Remove the RackInjector from the packing material.
2. Set on a flat surface, oriented such that the labels on the front panel are right side up.
3. Remove the 9 screws which hold the top panel in place.
4. Remove the top panel and set aside.
5. Remove the bags of connectors and jumpers from inside the enclosure.



### Step Two: Become Familiar with the Parts of the RackInjector

The RackInjector is designed to be flexible, field-repairable, and field-upgradeable. To accomplish that, inside the RackInjector there are several circuit boards, each of which can be removed and replaced.

The illustration below shows the key components of the RackInjector.



### Step Three: Understanding Power Distribution in the RackInjector

On the front panel, there are three green colored power inputs, labeled “Pwr A”, “Pwr B”, and “Pwr C”. Each of these inputs is designed such that it can accept a different voltage. All of the power inputs share a common return – they are not isolated from each other.

Each input is designed to handle voltages from -48VDC to +48VDC nominal, with a  $\pm 60$ VDC absolute maximum. Exceeding  $\pm 60$ V will likely damage the unit.

In a typical setup, you will use more than one of these inputs to provide power to the RackInjector and the PoE powered devices attached to the RackInjector. It is important to understand that each of these inputs connect directly to each of the injection boards, and that the RackInjector **does not** convert the voltage. If you connect 24VDC to Pwr A and 48VDC to Pwr B, then Power A on all boards will be 24VDC and Power B on all boards will be 48VDC. Each injection board will be able to select one or more power sources to use – see the board instructions for more information, and what voltage range each board supports.

**Important:** At least one of the power sources must be of positive polarity – the current revision of the RackInjector control board needs at least one positive voltage in order to operate. If multiple positive power sources are available, it will pull power from the input with the highest voltage.

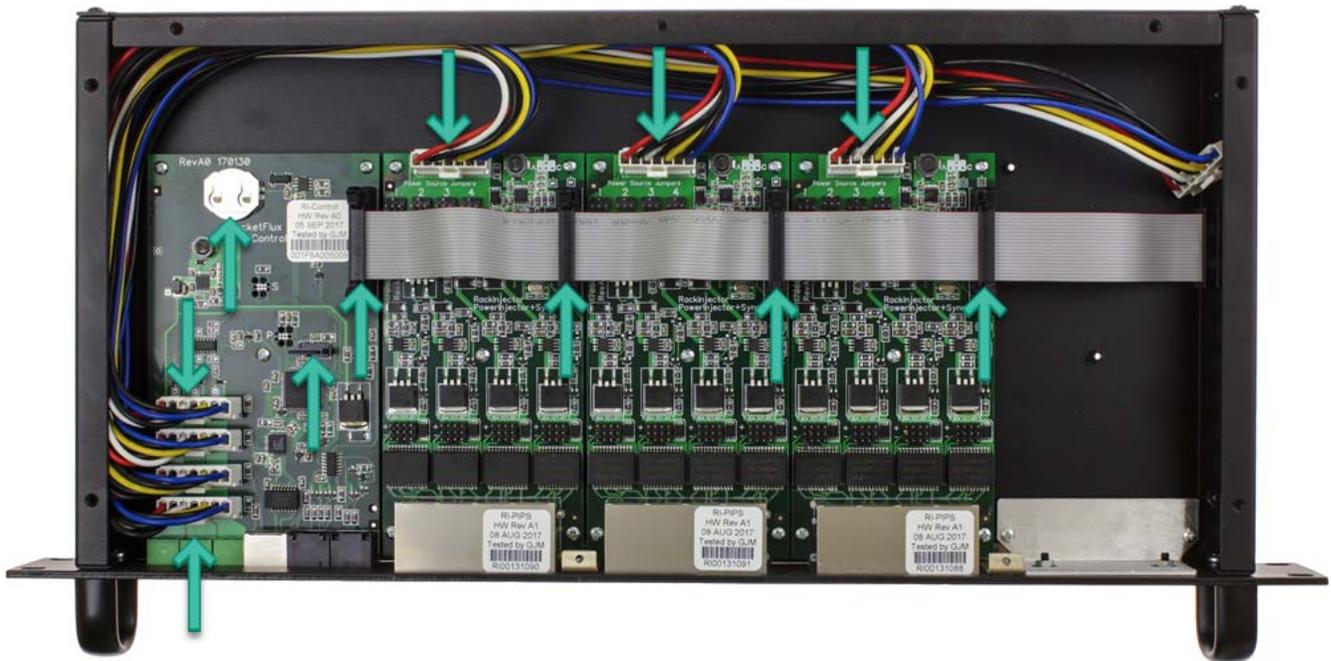
Each input is capable of carrying a maximum of 10A. Keep this in mind when determining the configuration of your RackInjector. Depending on your configuration, you may need to connect power sources of the same voltage to more than one input to ensure you have sufficient current available at that voltage.

#### Step Four: Configure Power Injection Board(s)

Each type of power injection board is a bit different as to how you configure it for use. As a result, there is a separate appendix for each type of power injection board. Please find the appendix for each power injection board in your system and review it to configure it for your PoE devices.

#### Step Five: Verify RackInjector is Ready to Close and Replace Top Panel

1. Verify all circuit board mounting screws are tight (do not over tighten, as this will damage the boards)
2. Verify all connectors are firmly attached
3. Verify Micro SD card is seated
4. Verify coin cell battery is fully in its socket
5. Verify jumpers are correctly installed as per the appendix for each injection board
6. Replace the top panel and 9 screws



# Wiring the RackInjector

**NOTE:** *The following includes all of the steps to get a RackInjector ready for deployment. For bench testing, we expect many customers will only wire enough of the device to power up the device and connect an Ethernet device. It is perfectly acceptable and probably safer to take this approach. If you'd like to do this, simply wire one power supply (positive voltage) to the RackInjector and connect the Ethernet port as described below and proceed to the Firmware Operation Manual. Once you are done with the initial testing and configuration, return to this chapter for the remaining steps needed to complete the configuration of your RackInjector.*

## Step Zero: Mounting

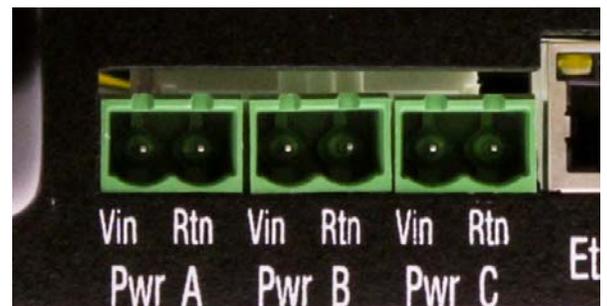
This manual does not cover mounting of the RackInjector other than to mention that the RackInjector can be mounted in a standard 19" rack just like any other 19" rackmount equipment.

When deploying the RackInjector (as opposed to bench testing it), we recommend you mount the RackInjector before completing the steps below.

## Step One: Wire the Power Sources

At this point you should have determined (during board configuration) which voltage should be on which input. Wire each power source to an input while keeping the following in mind.

1. Size power supplies based on the load.. Add all power requirements for all ports connected to each voltage input. The total power consumption will dictate what type of power source you need. Be mindful that each input can only handle 10A, so if you find that you are over 10A on any supply (for example, 480W on a 24V supply = 20A), you will need to adjust your configuration.
2. Each power input should be protected against over current.
  - a. If you are using a power supply that has built-in over current protection which roughly matches the 10A rating or less, then you should be able to connect it directly. For example, a 48V 500W power supply or a 24V 250W power supply.
  - b. If you are using a higher current power source (a high wattage supply or directly from batteries), then you will need to provide over current protection in the wiring from the power source to the injector. A 10A fast-blow fuse is ideal for this. Slow-blow fuses are generally too slow to protect the injector.
3. For each input, wire the power source wire to the Vin terminal, and the return wire to the Rtn terminal. A terminal block is provided for this purpose. For a positive voltage source (+24V, +48V) this means that the + wire will be on Vin, and the - wire will be on Rtn. For negative voltage sources (-48VDC), the - wire should be on Vin and the + wire should be on Rtn.
4. Understand that the return terminals on all inputs are connected together internally and are NOT fused. If you cannot safely wire together all of the wires you are planning on connecting to the return terminals, you should not



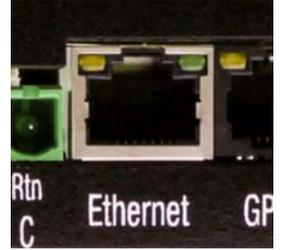
connect them to the return terminals, as the internal wiring in the RackInjector will effectively wire them together.

5. At least one of the power supplies needs to be positive, with a minimum of 12V. The control board will use whichever positive voltage is highest to power itself. It can't be powered from a negative power source.

For initial configuration you may want to hook up only a single (or temporary) power supply. If this is the case, after hooking up your test supply and finalizing configuration, return to this step to hook up additional power supplies.

## Step Two: Hook up the Management Ethernet Cable

The RackInjector is managed through a single Ethernet port on the front panel. To manage the device you will need to connect this port to a network connection using a straight through CAT5 cable. For ongoing management, this device can be connected to a LAN, but for initial configuration, we recommend connecting the device directly to a laptop or workstation.



## Step Three: (if required) Connect the GPS Receiver for Synchronization



The RackInjector is able to receive a synchronization signal from a PacketFlux GPS receiver (SyncBox or SyncPipe). If you are intending to utilize one of these devices with the RackInjector, it can be connected at this point. Simply use a straight through CAT5 cable from the GPS receiver to the GPS In port.

**NOTE:** *As of this writing, suitable PacketFlux GPS receivers are SyncBox 12, SyncBox Junior Basic and Deluxe Versions, and SyncPipe Basic and Deluxe, Rev H or later.*

If you have multiple RackInjectors at a site, each one does not require a separate GPS receiver. Instead, they should be connected together using a CAT5 cable from the first RackInjector's GPS Out port to the second's GPS In port.

## Step Four: Connect Radios or Other PoE Powered Devices

Please refer to the appendix for each type of injection board you have for instructions on how to complete this step.

## Where to go from here

Once the RackInjector Hardware is configured, you should refer to the RackInjector Firmware Operation Manual for information about how to configure and operate the firmware.

## Supplemental Information – Removing and Installing Boards

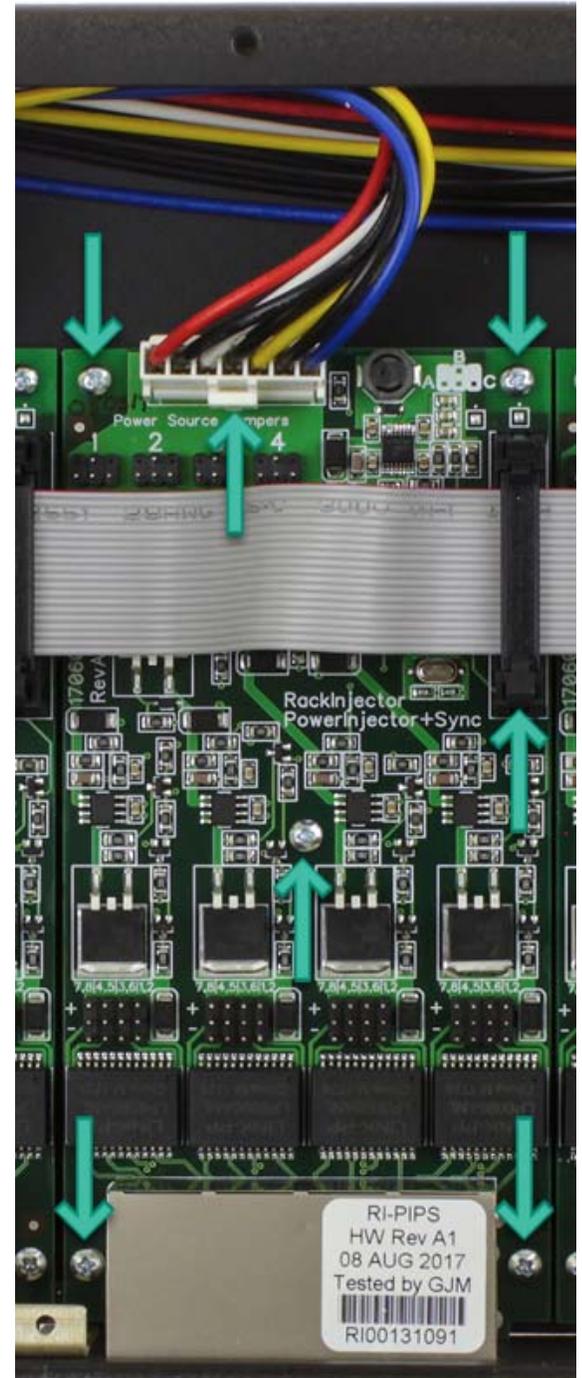
The boards in the RackInjector have been designed to be able to be replaced (or added) in the field.

### To remove an existing board, perform the following steps:

1. If not already open, open the enclosure using instructions found elsewhere in this manual.
2. Remove the ribbon cable entirely from the RackInjector. Instructions on how to work with the ribbon cable connectors are found below.
3. Remove the power connector(s) from the board you are replacing. This involves squeezing the tab on the side of the connector and pulling upward. If the connector does not pull off easily, then you are probably not correctly squeezing the tab. Note: If you are replacing the control board, be sure to label these connectors before removing them since the order matters.
4. Remove the 5 screws which hold the board in place.
5. Remove the board from the chassis.
6. If you are not going to install a replacement card, close the enclosure using instructions found elsewhere in this manual.

### To replace a board, perform the following steps:

1. If not already open, open the enclosure using instructions found elsewhere in this manual.
2. Place the board in the chassis, aligning the 5 screw holes which hold the board in place.
3. Install the 5 screws which hold the board in place. Be very careful NOT to overtighten as the boards are relatively fragile.
4. Connect the power connector(s) to the cable. On the control board, be careful of the ordering: the power connector nearest the front of the case should correspond to slot 4, and then the remaining 3 connectors are for slots 3, 2, and 1 respectively.
5. Reconnect the ribbon cable. Instructions on how to work with the ribbon cable connectors is found below.
6. Configure the board hardware if necessary. Once you are done inside the enclosure, close the enclosure using instructions found elsewhere in this manual.



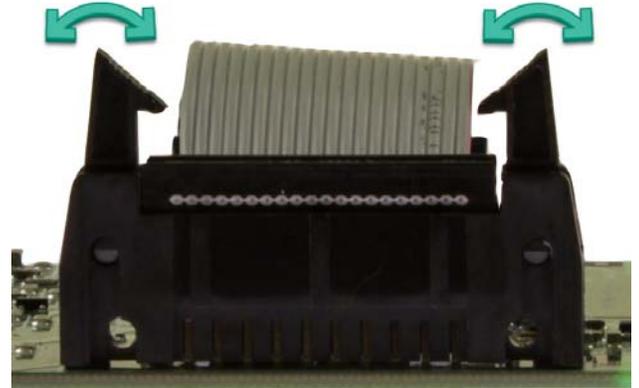
## Ribbon cable connector instructions.

The connectors for the ribbon cable utilize lifters to make the insertion and removal of the ribbon cable easy, assuming you know how to operate the connectors.

To remove a cable, push the two lifter handles outward. The connector on the ribbon cable itself should simply pop out.

To insert a cable, ensure the two lifter handles are pushed outward. Then center the ribbon cable connector in between the lifter handles and push firmly. The connector should easily go into place, and the handles should automatically move inward and click to place. You should hear a click as each connector snaps shut.

**Note:** *The ribbon cable may be polarized. If the cable does not easily go in the way you try first, try the other way (generally the stripe on the cable should be toward the rear).*



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