The RUC-02's original design concept intended to make an intelligent UPB controller. However, there are other devices that would be nice for the RUC to control. Many other intelligent systems can be controlled using POST / GET commands over a local area network. For example, here are some devices that can be controlled with the RUC-02 using POST / GET commands:

- AV Receivers
- WLED RGB Christmas Lights
- Control a second RUC from a first RUC

You can have the RUC send POST / GET commands based on schedules, buttons, or by detecting UPB commands on the powerline. Due to the complexity of POST / GETs, we're going to organize this Application Note a bit differently than our other App Notes. We'll address all three Receive Types first, then talk about the Send Command types and provide multiple examples.

In order to setup this control, we will use what we refer to as Triggers using an IF THIS THEN THAT procedure. We will go through all three trigger types, but let's start with the Schedule Trigger. From the Home Page, click on the Trigger item on the left hand menu. Notice there are two sections—Receive and Send.

# Schedule Triggers

Sending a command based on a schedule is one of the primary purposes for the RUC-02. One example might be to have the RUC send out a command to turn on landscape Lights at Sunset and then turn them off at 11 PM.  Another example might be to turn on WLED RGB Christmas Lights to a certain pattern at 7 PM, then switch the pattern at 8 PM, and then turn them off at 10 PM.

For a Scheduled Trigger, use the dropdown on the left side of the Receive block and select Sched (Sched is the default setting and will come up when the Trigger menu item is selected.  Here is what the Receive block with Schedule selected looks like:

## Triggers

| | Receive Command | |
|---|---|---|
| | Trigger Name: | Landscape Lights On |
| | H: 0   (24 hr clock) | |
| | M: 0 | |
| | Use Hrs and Mins as: | |
| | ○ Actual Time | |
| | ○ Time before sunrise | |
| | ○ Time after sunrise | |
| | ● Time before sunset | |
| Command Type: | ○ Time after sunset | |
| (S) Sched ▾ | ☑ Sun (S)  ☑ M (M)  ☑ Tue (T) | |
| | ☑ W (W) | |
| | ☑ Thu (R)  ☑ F (F)  ☑ Sat (U) | |
| | ● Send on schedule | |
| | ○ Random (+/- 30 min) | |
| | ○ Home | |
| | ○ Vacation | |
| | ● Both | |

First, you must give the Trigger a name.  Pick something descriptive so that you know what it means later. Then, you need to select the TIME  you want the Trigger to activate.  This is the IF THIS part of the equation.  For example, IF it is SUNSET, THEN do something.  Or IF IT IS 11:15 PM, THEN do something. NOTICE that the Hours (H) use a 24 hour clock.  11 PM would be 23:00.  For SUNRISE, either pick Time Before Sunrise or Time After Sunrise.  One you pick one of those, then the Hours / Minutes allow you to select the amount of time before sunrise or the amount of time after Sunrise that the trigger activates.  For example, if you selected Time Before Sunrise and set Hours to 0 and Minutes to 15, the trigger would fire 15 minutes before sunrise.  Same with SUNSET. You can select which days of the week the trigger will fire by checking or unchecking the days of the week.

There are two other options:

- You can decide to send the trigger command on Schedule, or Randomize the time (+ / - 30 minutes). When you send On Schedule, it will send out the command exactly at the time you selected, for example SUNSET or 11:15 PM. If you Randomize (typically not used for email triggers), then the command can be sent anytime within the range of + / - 30 minutes and it will be different each time it triggers.
- You can also set up Triggers to only run in the HOME or the AWAY modes (or both). By default, the MODE is set on the Device Configuration page (with the default being HOME mode). If the system is in the HOME mode, then only Triggers set to run in the HOME mode or BOTH will run. VACATION mode triggers will not run in this mode.

- NOTICE that this example trigger has a name of Landscape Lights On and is set to run at SUNSET (since the Hours and Minutes are set to 0), every day of the week, ON SCHEDULE, and in BOTH Modes (Home and Vacation).

- As I mentioned, we're going to skip over the Send Command section for the moment. So, now, let's move to Button triggers  Receive types. Again, referring to IF THIS, THEN DO THAT, a Button Trigger would be IF THIS Button is pressed then, do this action.

# Button Triggers

For a Button Trigger, use the dropdown on the left side of the Receive block and select Button. Here is

## Triggers

| Receive Command | |
|---|---|
| Command Type:<br>(B) Button ▾ | Trigger Name: [_____]<br>Page #: [1 ▾]<br>Button #: [1 ▾]<br>Display Text: [_____] |

First, just like with a Schedule trigger, you must give the Trigger a name.  Pick something descriptive so that you know what it means later.  Now, we need to discuss what the Page #s and Button #s refer to.

When you enter a Button Trigger, you are creating a button that will show up on the Control Panel (on the left hand menu on the RUC User Interface (UI), right under Triggers).  The Control Panel serves two purposes.  First, the Control Panel gives you a simple user interface from any browser to quickly and manually control UPB devices and scenes.  Second, the Control Panel is how our mobile app for the RUC is set-up—the buttons that show up on the Control Panel are the buttons you see on the app, albeit with a prettier interface.  The Control Panel has 10 pages and you can have 10 buttons per page, for a total of 100 buttons.  Just remember that in many cases, you will need an Activate (or ON) button and also a Deactivate (or OFF) button for each device and or Scene.

Buttons can be used to create Button triggers that send out any of the command types listed as Send Types (UPB Direct, UPB Link, Email, Ethernet, GET / POST, or MODE).  As an example, you could easily set-up a Button Trigger to change the mode from Home to Vacation and back again.

Here is screenshot showing the Control Panel with multiple trigger types:
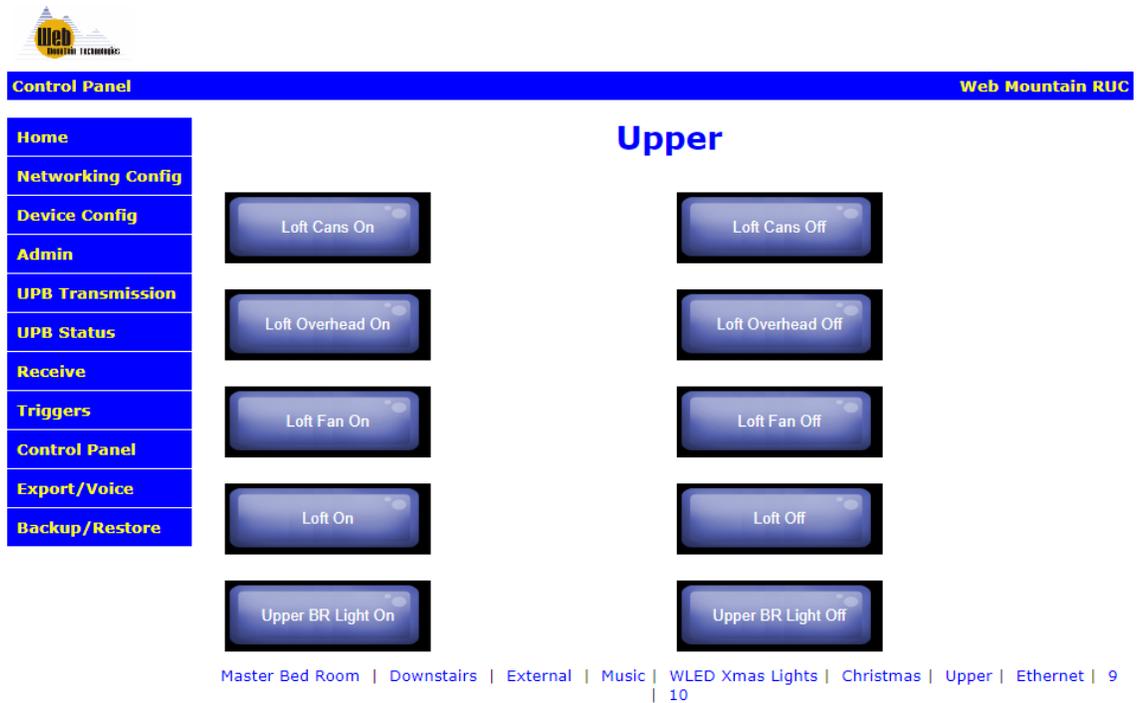
Here is a screenshot of what the Control Panel looks when mirrored into our mobile app:



Notice that the buttons that were added to the Control Panel are identical to what shows up on the app. This is how you design the user interface on the mobile app.

Also, notice that the pages on the Control Panel are listed as 1—10, but you can relabel the numbers to names for greater clarity.

At this point, you should give some thought as to how you want to layout the Control Panel User Interface. Consider making a page refer to devices or scenes in a room and then relabel that page to a room name, for example, Kitchen, or Master Bedroom, or Outside. Then, add Button triggers to that page that correspond to that room. However, you can organize them as you desire.

Next, the layout of the buttons on the pages are 1—5 in the first column, then 6—10 in the second column.

So, you've given some thought as to how you want the buttons laid out—now it's time to create the buttons. You've already given the Trigger a name, so now use the Page # dropdown and select the page where you want your new button to be located (pages will be shown as #s if you haven't labeled them or will show the label name if you did give the page a name). Then, use the Button # dropdown and select the button location where you want this button.

Now, you get to create the label or name that goes on the actual button. Normally, this will match the label you provided for the Trigger Name above, but it doesn't have to— just realize that long names will wrap on the button making it harder to read the button label—shorter and sweeter is better.

# Command Triggers

Ok, now let's show you how to setup a Command Trigger. Again, referring to IF THIS, THEN DO THAT, a Command Trigger would be IF THIS UPB COMMAND IS RECEIVED ON THE AC POWERLINE then do some action (in this case, send out a POST or GET command).

While the RUC-02 is normally used as a Transmitter to send commands out to control devices and scenes, it can also monitor the powerline and detect any command that might be sent from another device on the UPB network. It can then use those commands to trigger sending out a different command (on the powerline or over Ethernet).

**NOTE:** The RUC cannot trigger based on a Command it sends itself—it must be triggered by a command it detects on the powerline, meaning it had to come from another device.

Here is the Receive section for a Command Trigger:

## Triggers

| Receive Command | | |
|---|---|---|
| Command Type: <br> (C) Command ▾ | Trigger Name: | |
| | Regex: | |
| | Delay | H 0   M 0   S 0 |

The Command Trigger Receive section is very simple from a UI standpoint but more complicated from a user standpoint. As always, you first start by giving the Trigger a name that describes its function.

However, the next step is entering in the Regex. The Regex refers to the actual UPB command as denoted in its ASCII format. For example, a good example of a Regex is 87000101FF2058. A few words on the structure of a UPB command are called for now.

A very simple UPB command is built like follows (there are much more complicated options):

> A prequel (in most cases, a hex 0x14)
> 4 characters that describe some UPB options
> > (starts with 0/1 for devices, 8/9 for links)
> 2 character (hex) NID
> 2 character Destination ID (hex) - who you're sending it to
> 2 character Source ID (hex) - who's sending the command
> 2 character checksum for error checking
> A suffix (normally a hex 0x0D, hex for a carriage return)

So, let's break down our sample Regex, 87000101FF2058.

We don't need to add the leading 0x14 or the trailing 0x0D.  The RUC will add those automatically for you.  So, just concentrate on the command in between those two.

The 8700 indicates it's a Scene command and it's only sent one time (other info that I won't go into)

The next 01 is the UPB NID

The next 01 is the Destination ID, in this case it refers to Scene 001, since it's a Scene command.

The FF is the source ID.  FF normally indicates some kind of controller (like the RUC).  If it the command is sent from a UPB device, this will show the Device ID of that device.

The "20" indicates an Activate command.  A "21" would be a Deactivate command.

The 58 is the checksum.

So, now you're asking yourself "How in the world would I figure out what command to use for the Regex?"

There are two ways.  First, you can generate it yourself.  We have a UPB command calculator we can provide that will allow you to generate the command.  But, the second method is much easier.

Setup the device that you're going to use to generate the command.  Then, create the conditions and send the command (press a button, cause a sensor to send the command, etc). Now, go to the RUC User Interface and select the left hand menu item Receive.  Look at the last received command—that should be the command you're looking for.  If you need help, email us at sales@webmtn.com and we'll help you out.

So, when would you use a Command Trigger?  Here's an example:

You are using a UPB IO module, such as the Web Mtn CM-01, to detect when your garage door opens. When it opens, the CM-01 detects this and sends out a command (say 87000101FF2058) to turn on Scene 1 and turn on the hallway lights. However, you can also trigger a second trigger to send out an email telling you that the garage door has opened.

That brings us to the Delay part of the Receive section of a Command Trigger. Notice that you can add delay in hours, minutes and seconds. So, here is where you setup the delay. You can only have 23 hours, 59 minutes, or 59 seconds of delay. For sending an email, the delay isn't important but you can add a small dealy is you desire.

**NOTE**: Delays of less than 5 seconds or so won't be all that accurate, due to the processor timing.

Now, I'm sure you have another question. What happens if I want to have a command trigger that might come from many different devices? For example, I want to trigger on a UPB command, NID of 1, LID of 1, and an Activate command, but this command could come from more than one device?

That's where Wild Cards come in……….

# Wild Cards for use with Command Triggers

So, let's say that you have two UPB wall controllers located in different spots of your home. And, both are programmed with a button that will send the same command, let's say turn on outside spots lights. So, if you hear a noise outside, you can go to either of these wall controllers and turn on the outside spot lights. And, then after 10 minutes, you want the lights to turn off. Each of these controllers will send basically the same command, but their Source ID is going to be different. Rather than setting up two different command triggers, we can use Wild Cards and only make one Command Trigger. Let's take an example using our old favorite standby Regex, 87000101FF2058.

Wild cards use periods and asterisks to represent ignore characters. For example, you could represent the above string using wild cards like this:

PU8…0101..20.*.

The "." character means "don't care – it can be any character". The "*" wild card means ignore any characters after the last one. Using wild cards, you can ignore some of the more esoteric functional characters (# of times to send, the source ID, etc) and make the capture command easier to determine. YOU DO NEED TO PUT the period (.) after the *.

So, now the Command Trigger is going to trigger when it receives a link command from any source for a NID of one and a LID of one and an Activate command.

Another example using wild cards:
Original command                     A90401010220FFFF31
Using wild cards                     A…0101..20.*
Now you know you're looking for a trigger command that is a link command, NID=1, LID=1, and command = Activate. We don't care about any of the other characters in the original command.

# The POST / GET Types in the Send Section

Ok, now we know how to setup the Receive section of a POST / GET Trigger for Schedules, Buttons, and Commands. Now, let's setup the SEND section. This is where the fun begins.

Again, using the IF THIS, THEN THAT analogy, the Send section sets up the THEN THAT part of the process. For POST / GET types, that means that when THIS happens (scheduled time, button press, or command reception), THEN send out a POST or GET command on the local area network.

Notice that we're saying POST & GET. We also have the ability to send out a PUT or a DELETE command, but so far, we've not run into any equipment or devices that use those two commands, so we have no examples and we have not tested these. They should work but we don't have actual equipment to test with.

Because of the many various types of equipment and the fact that each one uses different programming, we'll show how to do this by using examples. In many cases, it's not going to be totally obvious how to do the programming, so there will probably be some experimenting involved.

## Example 1: Using a RUC-02 to tell a RUC-01 to send out a UPB command.

First off, why would you ever want to do this? There are two instances I can think of for this application:

- You are adding more devices to your UPB Network and you're going over the limit of 250 devices per network, and you already own a RUC-01 (the RUC-01 was obsoleted with the RUC-02).

- You have a situation where you have an out-building on a property where you want to control UPB devices but the building is too far away for UPB signals to propagate over the powerline and again, you have a RUC-01 and have acquired a new RUC-02 to resolve this situation.

So, to implement a solution for both of these situations, we're going to setup the RUC-02 to be the main controller and the RUC-01 will be a remote. Both RUCs must be connected to the same Local Area Network.

Let's also assume for the moment that the RUC-01 has been programmed with multiple button triggers on its own. There are two commands we can send from the RUC-02 to the RUC-01:

- Direct commands using ASCII (i.e., 87000101FF2058)

- Commands to run a button on the RUC-02 (i.e. run Button # 2 on Page 3—just to remind everyone, the RUC-01 only supports 4 pages of 10 buttons each for a total of 40 buttons as compared to the RUC-02 which handles 10 pages of 10 buttons each, or 100 buttons total.

When setting up the RUC-02 to send a POST or GET command, you need two pieces of information—the URL of the server or device being contacted and the data to be delivered. The RUC-01 will act on the command when the URL takes this form:

http://<IP Address>/qSend.htm

And the Data takes this form:
command = 87000101FF2058      to run a specific command directly or
id= x & page = y      to run a button on the RUC-01
         For the button, the id parameter is 1 less than the button # (0 –9)
         But the  page # matches the actual page number

So, here's what the Send Section would look like when sending a command directly (headers, User, and Password are not required in this example):



Where 192.168.1.29 is the IP address of the RUC-01. Also, you can't see the full URL, but it would read "http://192.168.1.29/qSend.htm", and the Data reads "command = 87000101FF2058".

In this situation, Headers, User, and Password are not required and are blank.

Now, when this command is sent by the RUC-02 to the RUC-01, the RUC-01 will send out 87000101FF2058 to its SPIM and put the command on to the powerline.

**NOTE:  Your SPIM must be connected to COM1 for this work—we assume COM1 as the connected SPIM.**

Now, let's have the RUC-02 tell the RUC-01 to run a button from it's Control Panel (Button 1 on Page 3).



Again, where 192.168.1.29 is the IP address of the RUC-01. Just like the earlier example, you can't see the full URL, but it would read "http://192.168.1.29/qSend.htm". You can see the full data.

In this situation, Headers, User, and Password are not required and are blank.

Now, when this command is sent by the RUC-02 to the RUC-01, the RUC-01 will run the action assigned to button 1 on Page 3. Notice that even though the id is equal to 0, it's actually running Button 1 (one less than its position on the Control Panel).

**NOTE:  Again, if sending a UPB command, your SPIM must be connected to COM1 for this work—we assume COM1 as the connected SPIM.**

# Example 2:  Using a RUC-02 to tell another RUC-02 to send out a UPB command.

Ok, this is the exact same situation that we described in Example 1, except you, the user does not have an older RUC-01 and instead need to use two RUC-02s (lucky you—we appreciate it!).  While the process is similar, there are some differences.  First, were going to use a GET command, rather than POST command.  Second, in most cases, everything including the data most of the time goes into the URL and the data field is left blank.  Also, you need to use the User and Password fields.

**NOTE:**
Do NOT put any spaces in the URL for the command= or id= statements

Here is a screenshot where the first RUC-02 tells a second RUC-02 to run Button #2 on Page 3 in the Control Panel of the second RUC-02.



Where the URL reads
http://10.0.0.205/qSend.htm?id=1&page=3
again, the id is one less than the actual button #

Now, let's have the first RUC-02 tell the second RUC-02 to immediately send out the UPB command 87000101FF2058.



Where the URL is
http://10.0.0.205/cgi-bin/cgi_upbtrans.cgi?command=87000101FF2058&port=1

# Example 3: Using a RUC-02 to tell a set of WLED Christmas Lights to change to a Red Blinking Pattern

WLED is a software program that is used to control a set of RGB Christmas Lights. WLED provides more than 50 different pre-set patterns for these lights, including flashing, blinking, chasing, etc with tremendous color options. WLED provides an API that allows you to send it a command over the LAN to turn the system on or off and to change patterns. In our testing, we used an ESP8266 Wifi controller running WLED as the controller. (Contact us if you want details on the hardware). Let's use the RUC to tell a WLED controlled set of Christmas Lights to go to a Red Blinking Pattern using a button trigger. Here's a screenshot:
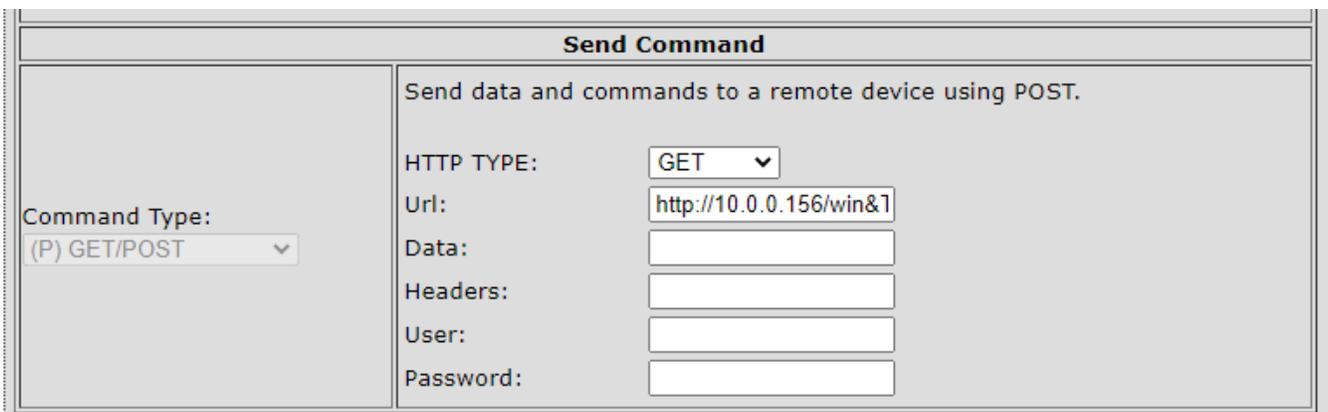
| Send Command | |
|---|---|
| | Send data and commands to a remote device using POST. |
| **Command Type:**<br>(P) GET/POST | **HTTP TYPE:** GET<br>**Url:** http://10.0.0.156/win&1<br>**Data:**<br>**Headers:**<br>**User:**<br>**Password:** |

Where the URL is:

http://10.0.0.156/win&T=1&A=128&FX=6&R=255&G=0&B=0&SX=175

10.0.0.156 is the IP address of the ESP8266.

Notice that in many cases for GET commands, everything including the data needs to be embedded in the URL.

Also, notice that no User or Password is required.

## Example 4:  Using a RUC-02 to tell a Volumio system to start playing a playlist

Volumio is a music streaming app that runs from a Raspberry PI.  When equipped with an onboard sound amplifier, the unit can be used to drive whole house audio systems with speakers installed in ceilings.  Volumio provides an app where most control can be done but also provides an API so that controllers like the RUC-02 can control the system as part of a whole home automation system.  This API is very simple.  Here's a screenshot of the Send section for a Volumio controller telling to play the current selected playlist.

**Send Command**

Send data and commands to a remote device using POST.

| | |
|---|---|
| Command Type: | HTTP TYPE: GET |
| (P) GET/POST | Url: 10.0.0.209/api/v1/com |
| | Data: |
| | Headers: |
| | User: |
| | Password: |

Save Edits          Cancel

Where the URL is
10.0.0.209/api/v1/commands/?cmd=play

Notice that no User or Password is required.

Now that we've gone through 4 examples, let's wrap it up. Once you're happy with the Send part of the trigger, click on Add Trigger. That's it—you've created a trigger! As we showed you, that could be a Schedule, Button, or Command trigger.

To verify the Trigger, go to the bottom of the page , under Trigger List, and use the dropdowns to view the triggers you've added. Select Button to view your Button triggers, Schedule, to see any scheduled triggers, and Command, to view your Command triggers.

Also, there are three buttons where you can manually RUN the Trigger without having to wait for the Receive action (for example, a scheduled time), EDIT the trigger (for example, changing the time from 11:00 PM to 11:15 PM), and you can DELETE the trigger.

When you are in the EDIT mode, you will see that the Receive dropdown (Sched, Button, Command) and Send Dropdown (POST/GET) are grayed out. You can not edit these two items. To change those, you will need to Delete the trigger and re-enter it.

**One word of caution with Schedule Triggers. At the current time, the RUC cannot reliably run two schedule triggers at the same time. If you want to send a POST command at a similar time to another action, setup two separate triggers spaced one minute apart.**

## Trigger List

### Buttons - View Page(s) [3 ▽]

TestRunButtonCommand
Page: 3 Button: 1 Text: TestRunButtonCommand
GET: http://10.0.0.205/cgi-bin/cgi_upbtrans.cgi?command=87000101FF2058&port=1,     [Run] [Edit] [Delete]

TestGetRunButton
Page: 3 Button: 2 Text: TestGetRunButton
GET: http://10.0.0.205/qSend.htm?id=1&page=3,     [Run] [Edit] [Delete]

### Schedules - View [View None ▽]

### Commands - View [View None ▽]

This shows you the name of the Trigger, the page the button is on, the text for the button, and the details of GET commands. Also, just like with a Schedule or Command Trigger, you can Run, Edit, or Delete the Trigger.

# Summary—Setting up POST / GET Triggers on the RUC-02

Well, we did it.  We showed you how to create Schedule, Button, or Command Triggers in order to send a POST or GET command.  The process for creating a POST or GET Trigger is fairly straightforward—the biggest issue you're going to run into is figuring out what the URL  and Data should be.  You'll have to do your research looking at the device manufacturer's documentation and will then probably have to experiment some with different options in order to find the right combination.  While we might not have experience with your particular device, if you run into issues, let us know and we'll try to help you out.

The RUC-02 is a powerful UPB controller and offers many other options for control.  One of the most notable other options for UPB control is Voice Control using Amazon Alexa.  But, that's the topic of another Web Mtn Application Note!

If you need any help or further assistance with your RUC-02, just contact us at 303-627-1856 or sales@webmtn.com, and be sure to read through our other RUC-02 Application Notes!