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 Ethernet commands over a local area network. For example, there are some AV devices that can be controlled directly from Ethernet. One example is the Global Cache IP to IR convertor but there are others.

You can have the RUC send Ethernet commands based on schedules, buttons, or by detecting UPB commands on the powerline. Due to the complexity of Ethernet control, we're going to organize this Application Note a bit differently from most of our other App Notes. We'll address all three Receive Types first, then talk about the Ethernet Send Command type 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:

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 what the Receive block with Button selected looks like:

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 setup—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 setup 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:
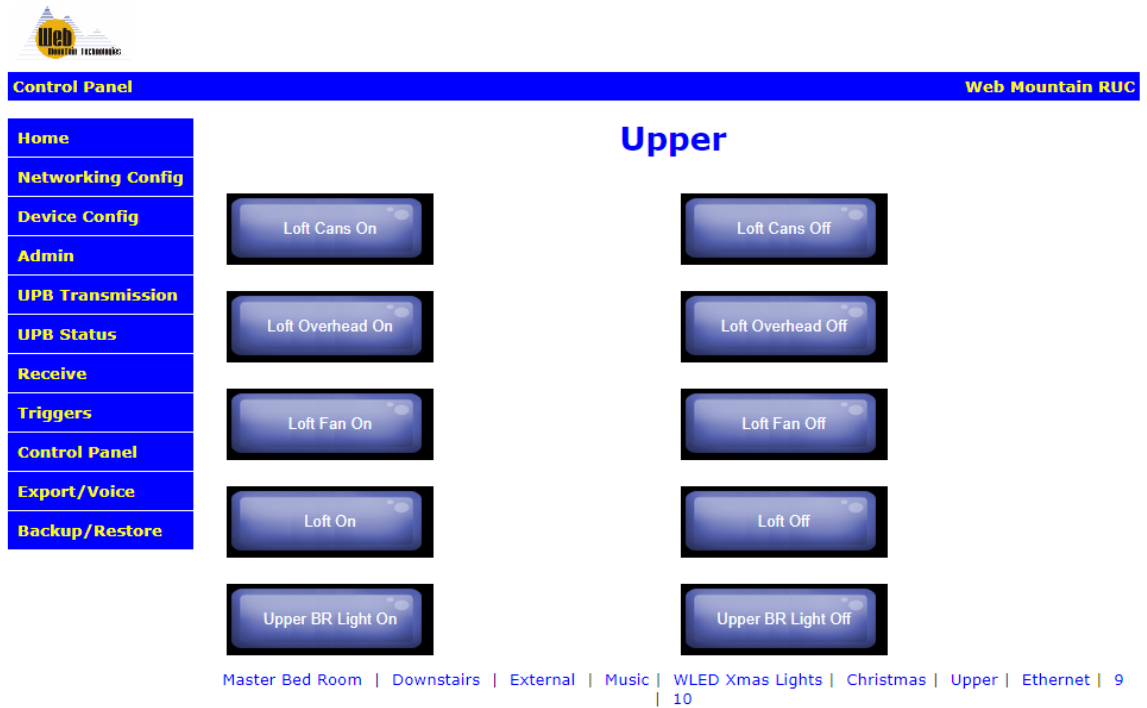
Here is a screenshot of what the Control Panel looks when mirrored into our mobile app:
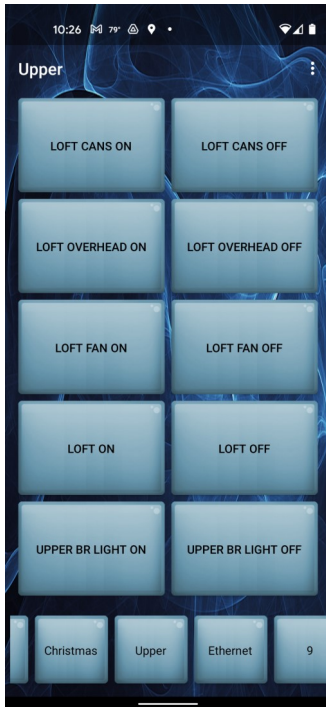
Notice that the buttons that were added to the Control Panel are identical to what shows up on the app. This is how you design the user interface on the mobile app.

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: (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

(typically 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 Ethernet Command Type in the Send Section

Ok, now we know how to setup the Receive section of an Ethernet 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 an Ethernet type, that means that when THIS happens (scheduled time, button press, or command reception), THEN send out an Ethernet command on the local area network.

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 Global Cache Ethernet to IR convertor to control an AV Receiver from the RUC-02

Wouldn't it be nice to tap a button on the RUC's mobile app and turn on your stereo? However, many legacy AV devices can't be controlled by any means except through an IR remote. You pick up the remote, press the power button, and the receiver turns on. So, how do we send out a command from the RUC to turn on the receiver when the receiver only responds to IR? We can use a Global Cache Flex IP to IR convertor. This convertor connects to a local area network, accepts commands over the network and converts them into an appropriate IR command which it sends out using an IR emitter cable.

First, when you buy a GC device, you get access to their library of IR commands. Try looking in their library and finding the appropriate commands for your particular AV device. However, if you can't find the commands, GC also offers a product called an IR learner that you can use to determine the appropriate commands by "learning" the commands when you press a button on your remote and point it towards the learner. I won't go into that process but it's well documented.

In our particular example, we're going to use a Sherwood AV receiver. GC has a long format command and a short format command. We're going to use the short format command. In our case, the power button on the Sherwood remote control is a toggle button, so anytime the button is pressed, the receiver responds by toggling the power. Here is the command representation for pressing the Power button:

sendir,1:1,1,38004,1,1,342,170,21,64,22,21BC,21,21CBCB,22,64DCDCDEBCDCBCDEDEBEDEBC,21,1602 followed by a Carriage return.

Here is the screenshot showing how this is implemented within the RUC-02 in the Send section:

Where 10.0.0.239 is the IP address of the Global Cache unit. Also, you can't see the full URL because we limit the number of characters we display, but it would read:

sendir,1:1,1,38004,1,1,342,170,21,64,22,21BC,21,21CBCB,22,64DCDCDEBCDCBCDEDEBEDEBC,21,1602\x0D

We allow up to 500 characters in the Data field, but only show a limited number—you'll need to scroll to see the remainder.

Notice the \x0D at the end. This is the hex representation for a carriage return which the GC unit requires as a terminator. If you need any special characters, use the appropriate hex value to represent it.

Also, notice that in order to communicate to the GC device, we use port 4998. This information will come from the manufacturer of the device you're communicating with.

So, now, if we had setup a Button trigger, all you would have to do is press a button in order to mimic pressing the power button on your remote. Similarly, you could mimic any button from the remote using a similar command on the RUC.

Some wall mount air conditioners use an IR remote for control. You could setup schedule triggers in the RUC to turn the AC on or off at a selected time. Or you could use a Command trigger so that pushing a button on a UPB wall mount controller could turn on the AV receiver and play radio.

Example 2: Controlling a device that only uses hex codes in its command

In some instances, a network device to be controlled requires the use of hex codes in its command. Here's an example, using the Onkyo AV protocol, for a POWER ON command:

ISCP\x00\x00\x00\x10\x00\x00\x00\x08\x01\x00\x00\x00!1PWR01\x0D\x0A

This protocol requires a carriage return (x0D) plus a new line (x0A) to terminate the command. It also uses port 60128 for communication. So, here's an example of how this would be implemented in the RUC -02 Send Section of a Trigger:

Send Command		
	Send Data in an embedded Ethernet packet to a remote device.	
Command Type: (E) Ethernet	Remote Host Name / IP Address:	10.0.0.139
	Port:	60128
	Data:	ISCP\x00\x00\x00\x10
	*If you need a special character, use the hex value. For example, a carriage return should be entered as \x0D	
	Add Trigger	

Where the data string is the one from above.

NOTE:
Do NOT

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 an Ethernet command at a similar time to another action, setup two separate triggers spaced one minute apart.

Here is a screenshot showing a Ethernet trigger commands under Trigger List:

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

Summary—Setting up Ethernet Triggers on the RUC-02

Well, we did it. We showed you how to create Schedule, Button, or Command Triggers in order to send an Ethernet command. The process for creating an Ethernet Trigger is fairly straightforward—the biggest issue you're going to run into is figuring out what the Port 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!