

BEAM documentation

version 1.2 (last updated 2016/04/24)

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Notes about this document

- In all the URLs provided in this document, {IP} is the IP address you assigned to your BEAM, such as http://192.168.0.200.
- In most cases the URLs and parameters are **CASE SENSITIVE!**

Setup and installation

When you first get your BEAM it will not know how to connect to your local Wifi and must be configured to give it the SSID and password needed to connect to your router.

See also video tutorial: [BEAM Prototype Setup](#).

1. Plug in the BEAM using a **high quality** 5 volt 1 amp micro-USB phone charger (not included). **It is important that it be exactly 5 volts output.** Cheap USB chargers are not recommended. If BEAM crashes unexpectedly or Wifi is not reliable, then try using a better power supply. A supply rated for one amp or more is recommended so that the BEAM is supplied with a steady 5 volts even when doing multiple operations that require current. The Wifi, RGB lights, and transmission and reception of IR and RF can sometimes add up to a substantial amount of peak current and it is important that the power supply does not dip below 5 volts when this happens. During normal operation the BEAM uses very little power though. Measured at the wall the BEAM will show 0 watts of power consumption.
2. BEAM's RGB lights will normally turn yellow during startup. If it hasn't yet been configured or is unable to connect to your router, then it will turn blue to indicate that it is hosting its own Wifi hotspot.
 - The hotspot will normally have an SSID of "BEAM".
3. Connect to the wireless network named BEAM using a mobile device or computer with Wifi capabilities
 - At this phase it is sometimes difficult to connect to the BEAM. Try to connect multiple times if necessary and if you still can't connect, power cycle the BEAM (unplug, then replug the power) and try again. Sometimes you will connect on the first try and other times it requires some patience!
 - Once configured the BEAM should connect quickly and reliably to your Wifi network.
4. Using a web browser, navigate to the main web page of the BEAM using the address **192.168.4.1**
5. Click on the button labelled: DEVICE SETUP (ADMIN)
6. Wait for the entire page to load, including the list of "Available Networks".
7. Find the SSID of your home Wifi network in the list and verify that the signal strength is adequate. If the signal strength is too low consider moving the BEAM closer to your

Configuration

Device Settings		Available Networks:							
Device Name: <input type="text" value="Beam"/> IR Events: <input type="checkbox"/> RF Events: <input type="checkbox"/> SSID: <input type="text" value="TP-LINK_4955A8"/> Password: <input type="password" value="*****"/> DHCP: <input type="checkbox"/> IP: <input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="0"/> . <input type="text" value="200"/> Netmask: <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="0"/> Gateway: <input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="0"/> . <input type="text" value="1"/> <input type="button" value="SAVE"/>		Networks Found: 1 <table border="1"> <thead> <tr> <th>Name</th> <th>Quality</th> <th>Enc</th> </tr> </thead> <tbody> <tr> <td>TP-LINK_4955A8</td> <td>100%</td> <td>*</td> </tr> </tbody> </table> <input type="button" value="REFRESH"/>		Name	Quality	Enc	TP-LINK_4955A8	100%	*
Name	Quality	Enc							
TP-LINK_4955A8	100%	*							
Status: CONNECTED SSID : TP-LINK_4955A8 IP : 192.168.0.200 <input type="button" value="REFRESH"/>									

router, at least for the initial setup. Once configured you can experiment with the maximum reliable distance from the router that can be obtained.

8. Click the SSID (name) of your home Wifi network. This will copy the SSID into the SSID field in device settings.
9. Enter the password for your home Wifi network
10. Select DHCP if you want to let your router automatically assign an IP address to the BEAM. We recommend that you do not do this, but instead enter the IP and other information manually as follows
 - **IP:** Assign the BEAM a static IP address. Use an IP that is not used by another device in your LAN (local area network). The first 3 numbers should match the IP of your router.
 - **Netmask:** Usually 255.255.255.0
 - **Gateway:** This is the IP address of your router.
11. Click the “Save” button. BEAM will restart and if you have entered everything correctly it will automatically connect to your home Wifi network. If the BEAM turns blue again after restarting, this means that it was unable to connect and has gone back into a mode where it is hosting a Wifi hotspot. Return to step 3. Make sure your BEAM is within range of your router and check your settings and password again.

RGB lights

To set the RGB lights we can use an URL like this:

`{IP}/rgb?c=DD0055&method=solid` to set the color,

Or we can do an animation like this:

`{IP}/rgb?c=003355&method=chase&speed=40&n=5`

to do colour animations.

Parameters:

c is the color as a 6 digit RGB hex. This is the same method used in html but **do not** include the # sign

method can be one of:

- solid
- wipe
- chase
- chaser
- chase2
- chase2r
- flash

n is the number of times to perform the animation (does not apply to solid)

speed is a delay used in the animation so smaller values will animate faster

The order you put the parameters into the url is not important.

Note: Parameters and animations are subject to change in future versions.

Deprecated method from before version 0.933:

We can set the RGB lights using the basic URL:

`{IP}/rgb/solid?r=<0-255>&g=<0-255>&b=<0-255>`

If any of the parameters (r, g, or b) is omitted it will be assumed to be 0. For example, to turn the BEAM red you can use `{IP}/rgb/solid?r=50` and to turn it orange you can use `{IP}/rgb/solid?r=100&g=80`

**** IMPORTANT NOTE ABOUT RGB LIGHTS ****

RGB lights must be **turned off** when trying to receive RF signals (either using RF events or learning raw RF codes with the Beam plugin for VoxCommando).

Stealth Mode (prevent RGB lights from illuminating)

Stealth mode can be turned on and off with {IP}/stealth?mode=on or {IP}/stealth?mode=off

We recommend that you **keep stealth mode off** until you have the BEAM configured and working as desired.

About IR and RF

IR (Infrared)

- BEAM can understand many common infrared protocols for consumer devices such as the Sony, NEC, Samsung, and Panasonic protocols.
- If there is no protocol for your device, you can learn almost any IR code using raw codes.

RF (Radio Frequency)

- Protocols
 - BEAM can currently only understand the protocols supported by the RCSwitch library. See: <https://github.com/sui77/rc-switch/wiki> and specifically https://github.com/sui77/rc-switch/wiki/List_KnownDevices
 - BEAM can now learn raw RF signals (recently added feature), but only by using a special BEAM plugin for VoxCommando. We have released a video tutorial demonstrating how to use the plugin. Tutorial: <https://www.youtube.com/watch?v=o9uAoFFSxTY>
 - Please note: the BEAM plugin is in early development and features are likely to be added and changed. VC versions 2.2.1.7 or later will include the plugin. There is also a link to download the plugin on our [IR/RF Device wiki page](#).
- Frequency band: 315Mhz or 433Mhz
 - Usually devices for light switches in North America will use the 315Mhz band and in Europe 433Mhz is used, but this is not an absolute rule.
 - When you order your BEAM you should specify which frequency band you intend to use. However, you can buy receiver/transmitter chips on ebay and you can easily remove and replace the chips from the headers on the BEAM PCB.
 - Simultaneous broadcast in both frequency bands may be possible (we are investigating this), but receiving (learning) must be done in only one band. You may learn codes for all your 315Mhz devices, and then replace the receiver chip with a 433Mhz chip and learn all your codes for your 433Mhz devices.
 - RF can be used to generate events, however depending on a number of factors the range for receiving RF codes can vary from 100 feet (30m) under ideal circumstances to as little as a few inches. For this reason, using RF for generating events may not be a practical use of the BEAM at this point. We are investigating ways to extend the range of RF reception.

- Sending RF seems to have a more reliable range but it will still depend on many factors, including walls and other sources of RF interference. The RF chips used to send signals are currently being powered by the same 5 volts as the rest of the BEAM, but in theory you could attach a supply of up to 12 volts to the RF send chip to increase the strength of the transmitted signal.
- In theory, other carrier frequency bands could be used but it is difficult to find the hardware to do this. There are some devices (such as my ceiling fan) that use a frequency of 303Mhz. Even if we were to find an RF chip capable of sending and receiving in this band, it is not certain if the device uses a protocol supported by RCSwitch.

Learning IR protocol codes

- Whenever possible you should learn IR codes using protocols because they are shorter and easier to work with.
- Currently, learning protocol codes requires a program like VoxCommando that can listen to UDP messages.
- Enable events on the BEAM and then look in your history window in VoxCommando for the events that are generated when you press buttons on your device. Protocols and codes will appear as payload values in each event generated.
 - Turn on IR and/or RF events using {IP}/events?ir=<on,off>&rf=<on,off>
- There is a detailed [video tutorial](#) demonstrating this process. It is long (~30 mins), but we strongly recommend that you sit down with your favourite beverage and watch it.

Events

All events generated will use the device name which is set in the Admin Settings at: {IP}/config
The default name of the device is Beam.

IR events will be of the form:

<DeviceName>.IR.<protocol>.<code>

and will have 2 payloads.

- {1} = protocol
- {2} = the button code
- The Panasonic protocol includes a 3rd payload for "Address"

For example, an event might look like:

Beam.IR.SONY.0x409 with payloads {1} = SONY, {2} = 0x409

RF events will be of the form:

<DeviceName>.RF.<code>

and will have 4 payloads. The 3rd and 4th protocol aren't really used yet.

- $\{1\}$ = code
- $\{2\}$ = bit-length
- $\{3\}$ = delay
- $\{4\}$ = protocol

Learning raw IR codes

- From the main menu click “LearnUI” or enter the URL: {IP}/learnUI
- You can use Firefox or Chrome, or a mobile web browser. DO NOT use Internet Explorer.
- At the top you can switch between Infrared and Radio Frequency.
- Click the “Learn IR” button and then press the button on your remote control that you want to learn.
- Aim the IR remote directly at the front of the BEAM.
- Usually you should press the remote control’s button quickly (do not hold it down for a long time).
- Raw codes will appear in the box. Usually you should see the same line repeated several times with only slight variations in the numbers. In this case you can usually keep just one line.

Trim, Repeat, and Lines

- Codes are usually made up of several “lines” of on and off pulses. The BEAM tries to find the end of a line by the longer pause found there.
- Setting the “Trim” slider to 3 before learning a code will ask the BEAM to automatically disregard lines after the first 3 lines. Some devices require multiple lines and sometimes they are not actually identical so you must experiment a bit with different devices. However, the majority of devices only require one line.
- When you are learning raw codes for a new device you should start with a higher value for the trim until you are familiar with the types of codes that the device uses. Try to spot the pattern. Once you are more familiar you may decide to set the trim to 1.
- If a device requires two identical lines you may use a trim of 1 and then set the lines parameter to 2, so that BEAM will send the line twice.
- “Repeat” is similar to lines except the BEAM will pause between repeats, which is often required for your device to register multiple button presses. For example, to increase the volume on a Sony device 5 times, you might set trim to 1 to learn only the first line, but set the lines to 2 and set the repeat to 5. BEAM will then send the line that was learned twice, then pause, then send it twice, etc. until 5 sets of 2 lines have been sent.

List of URLs

In all the URLs provided in this document, {IP} is the IP address you assigned to your BEAM, such as <http://192.168.0.200> (the scrape action in VC requires http:// before the IP address)

Basic UI pages

- {IP}/config
- {IP}/learnUI

Enable / Disable events

- {IP}/events?ir=<on,off>&rf=<on,off>

Upload new firmware .bin file

(caution: uploading an invalid file could brick your BEAM)

- {IP}/update

A link for the most up-to-date firmware .bin file can be found at:

http://voxcommando.com/mediawiki/index.php?title=IR/RF_Device

Other

- {IP}/restart
- {IP}/status

Setting RGB colours

- {IP}/rgb/solid?r=80&g=20&b=40
- {IP}/rgb/solid?r=0
- {IP}/rgb/solid?b=120

Stealth mode (turn on to prevent blinking)

- {IP}/stealth?mode=<on/off> (switch all LED functions ON or OFF)

Send RF

- {IP}/sendRF?n=<repeat>&code=<RF-code>&bits=<bit>
- {IP}/sendRFnew?n=<# repeat>&pwr=<on/off>&fam=<a-p>&grp=<1-4>dev=<1-4>

Send IR using protocol

- {IP}/sendIR?n=<repeat digit>&p=<protocol name>&code=<IR-code>

Send IR using raw codes

The best way to see the proper format for these URLs is to go to the learnUI page, learn an IR code, adjust settings for “Trim”, “Lines”, and “Repeat” and BEAM will generate the correct URL.

- {IP}/sendIR?n=<repeat digit>&l=<repeat lines>&f=<36-42>&code=<comma separated list>
- f (frequency in KiloHertz) is optional, and defaults to 38
- Raw codes must end with a comma.
- Example URL for sending a raw code:
{IP}/sendIR?n=1&l=2&f=38&code=24,48,24,48,24,48,24,48,24,24,24,48,24,24,48,24,24,48,24,24,24,24,24,24,990,
- Raw codes use timings similar to iTach and iTach codes can be used by adjusting the format of the URL a bit. From the iTach code, remove the initial “sendir,1:1,1,40000,1,1,” and you will have the raw code.

Learn IR raw

- {IP}/learnIR?trim=<1-5>
- Trim is optional and specifies how many “lines” of raw codes to return.

Learn RF

- {IP}/learnRF

Note: *You must use VoxCommando’s BEAM plugin if you want to learn RF codes.*

Voice commands, maps, etc.

To be continued...

Tutorials with sample XML will probably be shared on the VoxCommando forum and/or wiki.

All of the above URL commands can of course be sent from VoxCommando using the standard Scrape action. Using the Scrape action is equivalent to entering the URL into a web browser.

When using the URLs in the Scrape action, be sure to precede your BEAM IP address with http:// ...

e.g. <http://192.168.0.200/events?ir=on&rf=off>