V-Controller user manual

Version 20171011

By Catrinus Feddema
(sixeight at vguitarforums.com)

Features:

- Advanced midi foot controller with 16 switches, 13 displays and 12 RGB LEDs.
- Two serial midi ports. Midi 1 has a midi out port with midi in and power on extra pins and a separate midi in port. Midi port 2 with parallel RRC2 port (for VG99)
- USB connector for MIDI and firmware updates.
- Connections for four expression pedals or dual switches. Automatically detects the type of pedal connected including if it is a normally open or normally closed external switch(es).
- Option slot for extra hardware. Currently developed:
    - Raspberry pi board which will add four USB host ports!
- Currently supported devices:
    - Boss GP-10
    - Roland VG-99
    - Roland GR-55
    - Zoom G3
    - Zoom MS70-cdr
- Features for these devices:
    - Automatic detection when connected or disconnected
    - Reading of patch names from these devices.
    - Control of a number of parameters. For the most common parameters the names and current states are read from the devices.
    - Control and active reading of assigns (Boss/Roland only)
    - Colour coded effect types
    - Global Tap Tempo: all devices pick up the tempo from the V-Controller. There is the option to keep this tempo on all patches on all devices.
    - Global tuner for most devices (not possible on GR-55 or Zoom G3)
    - US-20 simulation: smart muting of GP10, GR55 or VG99 by switching off the COSM guitar/synth/normal PU on the devices that are not active.
- The VController has the following switch types:
    - Patch select
    - Patch select in bank
    - Bank up/down
    - Previous patch / next patch
    - Direct select
    - Parameter control (momentary, toggle, three state, four state, five state, range, updown)
    - Assign control (through cc or FC300 emulation for VG99)
    - Mute/unmute
    - Global tap tempo and set tempo
    - Global tuner
    - Select page
    - Select next device
    - Page up/down
    - Midi PC/CC/note on/off
- Autobass mode: sends a CC message with the number of the lowest string that is being played (CC #15)
- Internal Raspberry Pi option slot or external Raspberry Pi box.

Making connections:

- USB – Use this port to connect the VController to a PC or Mac. The VController will act as a "class compliant" MIDI device. This USB port is also used for firmware upgrades.

- EXP1-4 / CTRL 1-8 – External input jacks. These support:
  - An expression pedal (tested with Roland EV-5 and Roland DP-10)
  - A normally closed single or dual switch.
  - A normally open single or dual switch.

  The type of pedal or switch is detected during power on of the VController. Make sure no external footswitch is pressed when switching on the VController.

- MIDI 1 OUT and IN – To connect to an external MIDI device.
- MIDI 2 IN/OUT and RRC – Midi 2 has in and out wires to the same connector. Details are below. RRC2: use only to connect to a VG-99. Do not connect anything to MIDI-2 in/out when RRC2 is in use!

- DC power jack: connect a "Roland-style" power supply rated at 9 V. The basic VController draws less than 1A. But with an internal or external Raspberry Pi, you will need more power, especially when the Raspberry Pi also powers other devices over USB. To be on the safe side a 2-3A power supply is recommended.

Power can be supplied through the DC power jack, through the RRC2 connector (from the VG99) or through the MIDI 1 or MIDI 2 7-pin connectors.

Always connect MIDI in and MIDI out as communication between the VController and the devices is bi-directional.

Wiring of midi connectors:

Midi 1 OUT/IN and midi 2 OUT/IN:

1. MIDI IN PIN +
2. Ground/Shield
3. MIDI IN PIN -
4. MIDI OUT PIN +
5. MIDI OUT PIN -
6. Power Positive (+9V)
7. Power Negative (GND)

Midi 1 IN:

1. No connection
2. No connection
3. No connection
4. MIDI IN +
5. MIDI IN -

Here is how you can connect the devices the VController supports:

Device	Connection
Boss GP-10	USB host port on Raspberry Pi Serial midi via Primova MIDX-10/20
Roland GR-55	Two serial midi cables to MIDI1 Midi splitter cable to MIDI1 out or MIDI2 out USB host port on Raspberry Pi
Roland VG-99	RRC2 cable Two serial midi cables to MIDI1 in and out Midi splitter cable to MIDI1 out or MIDI2 out Serial midi to USB cable to Raspberry Pi (USB to Raspberry Pi does not work for FC300 assigns!)
ZOOM G3	USB host port on Raspberry Pi
ZOOM MS70-cdr	USB host port on Raspberry Pi

Note: Connecting the VG99 with a single USB cable to the Raspberry Pi has the limitation that the FC300 assigns do not work! For these assigns the VController mimics the FC300. The VG99 does not expect an FC300 to be connected to the USB host port, and therefore it does not work. As a solution you can connect the VG99 via a MIDI-to-USB adapter to the Raspberry Pi. Then the FC300 assigns work fine.

Raspberry Pi

One option is to have a Raspberry Pi (RPi) in the VController option slot. The internal MIDI3 connection is used to connect the RPi to the VController.

It is also possible to put the RPi with the VCBridge software in a separate box.

The external Raspberry Pi has the following connections:

- Midi IN/OUT is mainly used for MIDI IN, but has MIDI OUT and POWER OUT on extra pins. Always use this port to connect the VController with one wire!

- Midi OUT/IN is mainly used for MIDI OUT, but has MIDI IN and POWER IN on extra pins.
- DC POWER: use this pin to connect a Roland style power supply (9V, 1 Amps)
- Ethernet port: can be used to program the Raspberry Pi.
  Do NOT use this port to connect to the RRC2 port of the VG99 or VController!
- Four USB host ports. You can connect these to GP10, GR55, GP10, G5 or MS70cdr. Also a USB to MIDI adapter can be connected here. The Raspberry Pi has not been tested with a USB host.
- 5V micro USB port. This port can also power the Raspberry Pi. It is not possible to remote power the VController through this port. You have to use the main 9V DC Power input for that
- HDMI. You can connect a HDMI monitor here. Together with a USB keyboard the Raspberry Pi can be programmed this way as well.
- 3,5 mm headphone jack. Is not used by the VController software.

When the Raspberry Pi is built inside the VController, only the Ethernet port and the USB ports are available on the outside. Power and MIDI are connected internally. The HDMI and headphone jack are not accessible.

You can hotplug devices to the USB ports or the serial MIDI ports. The RPi is actively detecting the connection of new USB devices.

Basic operation
The VController is switched on by pressing the top left switch. It is switched off by holding that switch for three seconds. Alternatively it can be switched on and off by a separate switch at the back. This is an extra hardware option.

The Raspberry Pi (RPi) is powered together with the VController when it is built in. With the RPi in a separate enclosure, the RPi is powered as soon as power is connected to it. After power is applied it will take around 20 seconds before the Linux operation system of the RPi has booted. A green LED will come on when the VCbridge software is running and the RPi is ready to pass on MIDI data to the VController.

Whenever a supported device is connected to the VController, it will connect automatically as long as both MIDI in and MIDI out are connected. A USB connection is always bi-directional . The VController automatically reads the relevant patch names and parameter states of this device.

Multiple devices can be connected at the same time. It is best to use a different port for every device. All the USB ports on the RPi are seen as separate ports!!!

The VController sends midi data only to the port where the device is detected. This avoids midi buffer overruns when a lot of devices are connected. Also on the Raspberry Pi (internal or external) the midi data is only sent to the USB port that has a device connected. General MIDI data can be sent to all ports.

The VController has 16 internal switches and 8 external switches. Every switch can execute any number of commands on press. The configuration of all the switches is stored in a page. The VController has a number of fixed pages and a number of programmable pages.

The internal switches are numbered 1 to 16:

Switch 13	**Switch 14**	**Switch 15**	**Switch 16**
Switch 9	Switch 10	Switch 11	Switch 12
Switch 5	Switch 6	Switch 7	Switch 8
Switch 1	Switch 2	Switch 3	Switch 4

By default switch 13 – 16 have the following functions. This can be programmed otherwise:

Switch	Press	Long press
13	Bank down (patch/parameter select) Patch down (assign page)	Open direct select Extra long press – power down
14	Bank up (patch/parameter select) Patch up (assign page)	Open direct select
15	Select next connected device	Open select page for programmed pages or menu
16	Select next page of current device*	Open select page for programmed pages or menu

Select next page of current device: For every device three pages can be set. This switch toggles through the three pages. By default these are set to patch select, parameter select, assign select for Boss/Roland devices. For Zoom there is only one default page. In the device menu, you can change these device pages.

When you connect devices to the VController the first time, check if the midi channel of the device matches the settings on the VController.

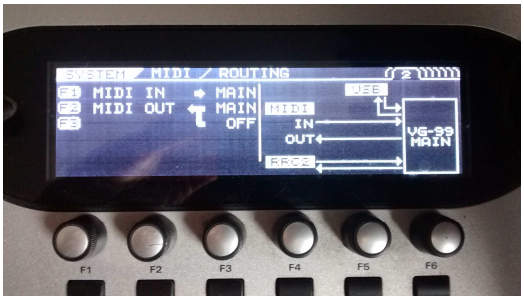
Here are the default midi channels of the devices as set on the VController:

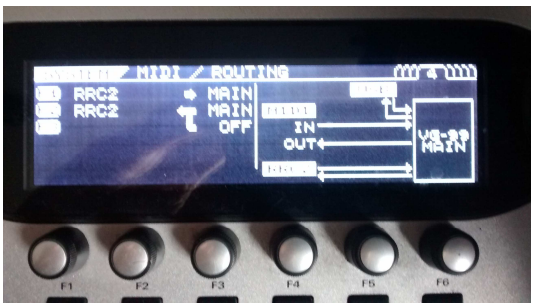
Device	MIDI channel
Boss GP-10	1
Roland GR-55	8
Roland VG-99	9
ZOOM G3	1
ZOOM MS70-cdr	1

You can also change the MIDI channel on the VController in the device menu. To get to the device menu long press switch 15, then press MENU (switch 12) followed by Device Settings (switch 10). Note that the GP-10 only works on midi channel 1 and not on other channels. This is a bug in the GP-10. On Zoom devices the MIDI channel cannot be changed.

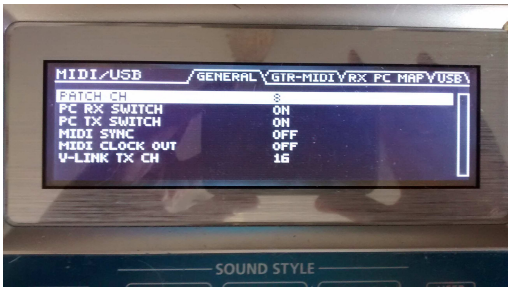
Once the midi channels match, you should be able to select patches on your devices from the VController.

Here are the MIDI settings I use on the VG99:





And here are my MIDI settings on the GR-55:



Pressing switches
The VController will detect the press and release of all its switches (also external).
Some functions are triggered by long pressing a switch, holding it for 1 second.
Powering down the VController is done by holding switch 13 for 3 seconds.
It is possible to hold switches that are programmed to control a parameter or cc. The speed of change is increasing as the switch is held down.

Navigating the VController

The VController is programmed with a number of fixed pages and with a number of programmable pages.

With the fixed pages it is possible to select a device (switch 15) and switch between the patches, parameters and assigns of this device (switch 16)

On a patch page switch 13 and 14 control BANK DOWN and BANK UP.
On a parameter page switch 13 and 14 will select the previous or next page of parameters.
On an assign page switch 13 and 14 will select the previous or next patch.

Direct select mode
Long pressing BANK UP or BANK DOWN will take you to direct select mode. Here you can type the number of the patch you want to go to. For devices with many patches (VG99) you can press bank up and down to move forward and backward 100 patches in direct select mode.

Controlling parameters
On a parameter page a select number of parameters are available to be changed. The memory of the VController is insufficient to support all possible parameters of a device. More parameters can be added in future firmware updates.
Parameters can the following types:

Type	Description
Momentary	Press activates and release deactivates parameter
Toggle	Activation and deactivation are toggled
Three state	Run through three values of the parameter
Four state	Run through four values of the parameter
Step	Run through any number of values with a programmable step size
Updown	Pressing will change direction. Holding it will change the value
Range	Used for expression pedals to change the value of the parameter between a minimum and maximum value

The switches on the fixed parameter pages are always of type toggle, step or up/down.

Controlling assigns

The VController can control assigns on the GP10, GR55 and VG99. Zoom devices do not have any assigns.

On all three devices assigns can be programmed. The VController activates the assigns through CC messages. The cc number of the assign on the device has to match the cc number of the assign on the VController.

Once the cc values match, the assign parameter will be read. When the parameter is known to the VController, its name will be shown on the display. If a parameter is unknown, it can still be controlled, but its name will not be displayed. Instead the assign number is shown.

For the VG99 a lot of extra assigns can be controlled. The FC300 CTL1 – 8 assign, the FC300 EXP1, EXP2, EXP SW1 and EXP SW 2 assigns can be programmed and controlled.

From the VG99 assign page you can choose “More assigns.” Here you can see the parameters that are set to all the internal assigns of the VG99. But these assigns cannot be controlled.

Navigating programmable pages
Long pressing switch 15 or 16 will take you to SELECT USER PAGE. Here you see the first 10 user pages and a switch for the MENU.

By default the VController has four example user pages:

Name	Description
GP + GR	To show an example how to navigate two devices on one page. Switch 15 and 16 will do BANK DOWN and BANK UP for the currently selected device. Its name is shown in the main display.
GPVGGR	To show an example how to navigate three devices on one page. Switch 15 and 16 will do BANK DOWN and BANK UP for the currently selected device. Its name is shown in the main display.
FUNCTION TEST	Will show a number of functions that can be programmed to switches
GEN MIDI TEST	Will show the possibilities of using MIDI PC/CC and NOTE ON/OFF commands. Also some custom labels are set.

Select a user page from this menu. On all example user pages switch 16 is reserved to go to the next user page (using the command NEXT_PAGE). Switch 15 will take you to the patch page of the next device. (You may want to reprogram switch 15 to PREV_PAGE if you want more flexibility in navigating the user pages.)

The default user pages serve as an example. You can program your own user pages to tailor the VController for your specific setup.

Global tempo/tuner
Global tempo will update the tempo on all connected devices. When Glob. Tempo on PC is enabled in the settings, all patches will inherit this tempo.

Long pressing global tempo will enable global tuner. Here all connected devices will go in tuner mode. The GR55 and Zoom G3 (v2) do not support this feature. Tuner mode cannot be triggered through any midi command on these devices.

Press any switch on the VController to exit global tuner mode.

US20 emulation
This feature works for GP10, GR55 and VG99. I have these devices connected through a passive GK splitter. US20 emulation allows me to select a patch on one device and have the sound on the other devices switch off. Here the GP+GR and GPVGGR example pages come in handy. Any patch on any device can be selected.

Pressing the switch of the active patch will display “GP10 can be mute” or “GP10 always on.” When a device is “always on”, it will not be switched off by US20 emulation. This will allow several devices to sound at the same time.

Bass mode

With bass mode, you can allow the GP10, GR55 or VG99 to play only the lowest played string of your guitar. You need a patch with a number of specific assigns on these devices to trigger bass mode. Bass mode is always enabled on the VController. It will just

send a few cc messages to the device. In the patch you can determine through assigns if you want to act on those cc's or not.

Bass mode will keep track of the lowest string that is played and send the number of that string as a CC number to a device. By default CC 15 is used for bass mode. Guitar to midi has to be switched on on the device for bass mode to work. Guitar to midi has to be in mono mode, not poly! Also chromatic should be switched on.

Here are my settings on each of the devices that support guitar-to-midi:

GP-10	MIDI On/Off: ON Mode: MONO Chromatic: ON Pedal bend: OFF Data thin: OFF String Ch: 1 Dynamics: 10 Play Feel: FEEL 2 LowVeloCut: 4
GR-55	Switch: ON Mode: MONO Chromatic: ON String ch: 1 Data thin: OFF The rest does not matter…
VG-99	Gtr to midi: ON Patch/Mode: MONO Patch/Play feel: STRUM or FEEL4 Patch/Chromatic: TYPE2 System: Bend thin: OFF System: Basic Ch: OFF System: PC mask: OFF

The VController will use the device MIDI channel as has been set in MENU – DEVICE SETTNGS – MIDI channel

If you make the following assigns on the device, bass mode will switch the strings on and off, so that only the lowest string is heard.

Make five assigns that all have the following settings

Assign target	**Assign source**	**Target min**	**Target max**	**Source mode**	**Act range low**	**Act range hi**
String level 5	CC #15	100	0	MOMENT	5	6
String level 4	CC #15	100	0	MOMENT	4	5
String level 3	CC #15	100	0	MOMENT	3	4
String level 2	CC #15	100	0	MOMENT	2	3
String level 1	CC #15	100	0	MOMENT	1	2

Use these assigns to control the sound of a bass guitar and the bass note will be automatically added to the chord you are playing

If you only want to control three strings, only make the first two assigns and set the level of the top three switches to 0 in the patch.

You can download some example bass mode patches for GP10 / GR55 and VG99 from here:
https://github.com/sixeight7/VController_v3/tree/master/bass%20mode%20patches
To download right button mouse click and choose Save as…

In the GLOBAL SETTINGS you can make specific settings for Bass mode.

I have had the best experience with the GP-10 with velocity setting of 50 and the GR-55, with a velocity setting of 100 on the VController. Also it often helps to disable the assigns for the highest two or three strings (B-E or G-B-E) as they are not really bass notes. This helps to avoid false triggers.

VController menu's

Long pressing switch 15 or 16 will take you to SELECT USER PAGE. Here you can select MENU (switch 12.)

You can select the following menu's:

GLOBAL SETTINGS	
US20 Emulation	See US20 emulation
Glob. Tempo on PC	When enabled the global tempo will be written to all connected devices when a patch change is made. This way all patches will keep the same tempo even if you go from one patch to another.
Main display mode	Will determine if the second line of the main diplsay will show he PAGE NAME, PATCH NAME or PATCHES COMBINED. The last option shows a number of characters of all the patches that are currently active and on (in US20 emulation)
Bass mode G2M channel	The Guitar to midi channel (default: 1)
Bass mode device	The device that is used for bass mode
Bass mode CC	The cc number that is used to control bass mode on through assigns on the device (default CC #15)
Bass mode vl	The minimum velocity that is needed to activate a string. Set this value lower if Bass mode does not respond. Set this value higher if higher payed strings are not blocked through bass mode.
SAVE & EXIT	Save changes and exit
Cancel	Do not save changes and exit

DEVICE SETTINGS	
Select device	Will select a device.
Midi channel	Set the midi channel of the selected device. Note that GP10, G3 and MS70-cdr have to be on channel 1, otherwise patch change will not work.
Colour	Set the colour of patch select LEDs (or backlights) for this device
Is always on	Part of US20 mode.
Device page #1 Device page #2 Device page #3	Pressing switch 16 on the VController will toggle on default between patch/parameter and assign pages. Here you can set other pages (also user pages!) that will be selected by pressing switch 16.
SAVE & EXIT	Save changes and exit
Cancel	Do not save changes and exit

LED SETTINGS	
FX COLOUR MENU	Will open a menu where you can set the effect colours by effect category.
LED brightness	Will set the brightness of the neopixel LEDs. Usually set low as these can be very bright! 255 really hurts my eyes.
Backlight Bright	Brightness of RGB backlights (only works for RGB model)
Virtual LEDs	Show LED state in displays!
FX off is dimmed	When enabled an FX LEDs will dim when it is switched off. This way you can see the colour of the effect type. When disabled an FX LEDs will switch off when it is switched off.
Global colour	Colour used for page and menu selection
BPM colour	Colour of the tap tempo and set tempo LED
MIDI PC colour	Colour of a MIDI PC LED
MIDI CC colour	Colour of a MIDI CC LED
MIDI note colour	Colour of a Midi note LED
SAVE & EXIT	Save changes and exit
Cancel	Do not save changes and exit

PROGRAM SWITCHES See chapter Programming the VController for details

FIRMWARE MENU	
Init settings	Will initialize all menu settings to their default values
Init commands	Will initialize all programmed commands to the four example pages that were on the VController when you first got it.
Program mode	Will put the Vcontroller in firmware upgrade mode. See Firmware upgrade for details.
EXIT	Will exit this menu

Programming the VController

On the VController you can program 3000 commands on 200 user pages. Any switch can execute any number of commands. Both internal and external switches (and expression pedals) can be programmed

When you press a switch on the VController it will check if there are any commands programmed on the current page for this switch. If no commands are found, the VController will check if there is a command on the default page and execute that one.

I usually program the external switches on the default page. This way these switches will perform the same action on any page. But you do have the option to "override" default behavior on certain pages by programming a command for these switches on these pages. This allows for a very flexible setup.

PROGRAM SWITCHES	
PAGE	Select a page you want to edit. You can also choose the default page or a new page here.
SWITCH	Select the switch on the page. You can choose internal switches, external switches or "on page select" here.
COMMAND	The command you want to edit
EDIT PAGE NAME	Here you can edit the name of the selected page
EDIT SWITCH NAME	Here you can edit the label of the selected switch
EDIT COMMAND	Press this switch to edit the command
MORE…	To clear pages, switches, labels or commands
DECREASE VALUE	Will decrease the value of the last selected parameter (page, switch or command)
EXIT	Will exit this menu

Pressing EDIT COMMAND will take you to the following menu:

PROGRAM SWITCHES	
DEVICE	Common Functions, GP10, GR55, VG990, G3, MS70cdr or Current device. Use current device to make one page suitable for several devices.
COMMAND	Select a command
Parameters…	Depends on the command
DECREASE VALUE	Will decrease the value of the last selected parameter (device, command or parameter)
SAVE CMD	To save the command
EXIT	Will exit this menu

The VController has the following common functions:

Command	Parameters	Description
NO COMMAND	-	
SELECT PAGE	Page name	
PAGE UP	-	Go to the next user page
PAGE DOWN	-	Go to the previous user page
TAP TEMPO	-	Global tap tempo
SET TEMPO	BPM	Set global tempo to specified value
GLOBAL TUNER	-	Enable global tuner
MIDI PC	Program, channel, port	Send a MIDI program change message to the specified channel and port. Set port to ALL PORTS when port is unknown.
MIDI CC	Number, toggle type, max, min, channel, port	Send a MIDI continuous controller message to the specified channel and port. Set port to ALL PORTS when port is unknown. Toggle types: ONE SHOT: send max value on press, nothing on release MOMENTARY. Send max value on press and min value on release TOGGLE: Send max and min value on subsequent presses TOGGLE_ON: Same, but default LED state is on. RANGE: use this for expression pedals STEP: first press sends min value. Every subsequent press increases value by one until max value is reached. UPDOWN: change parameter between min and max value by holding the switch
MIDI note	Note, velocity, channel, port	Send a MIDI note message to the specified channel and port. Press sends note on message. Release sends not off message
NEXT DEVICE	-	Select the next connected device

Device commands:

Command	Parameters	Description
PATCH SELECT	Patch number, patch bank (100)	To select a patch. To select patch number 314 set patch bank to 3 and patch number to 14.
PARAMETER	Parameter, Toggle type, Value(s)	Control a fixed parameter on the device. Toggle types: MOMENTARY. Send max value on press and min value on release TOGGLE: Send max and min value on subsequent presses

		TRISTATE: Select one of three values to the device. FOURSTATE: Select one of four values to the device. STEP: first press sends min value. Every subsequent press increases value by the value entered under step until max value is reached. RANGE: use this for expression pedals UPDOWN: change parameter between min and max value by holding the switch
ASSIGN	Assign, trigger	To control an assign on a device. When selecting an assign a default trigger is given. You can choose other cc-numbers if you prefer, but for FC300 controls on the VG99 the default triggers have to be used.
PATCHBANK SELECT	Number, bank size	To select a patch in a bank. Command is used together with BANK UP and BANK DOWN
BANK UP	Bank size	Display the next bank of patches on the PATCHBANK SELECT switches
BANK DOWN	Bank size	Display the previous bank of patches on the PATCHBANK SELECT switches
NEXT PATCH	-	Go to the next patch
PREV PATCH	-	Go to the previous patch
MUTE	-	Mute the device (US20 mode)
SEL DEVICE PAGE	Page	Selects a page and sets the current device.
SEL PAGE PATCH	-	Go to DEVICE PAGE #1 (see Device settings)
SELECT PAGE PAR	-	Go to DEVICE PAGE #2 (see Device settings)
SELECT PAGE ASSIGN	-	Go to DEVICE PAGE #3 (see Device settings)

Firmware updates.

Find the latest firmware for the VController on Github:
https://github.com/sixeight7/VController_v3/tree/master/Firmware/Compiled

In this folder you can download a hex file. Right click on the hex file and select Save as…

To install the firmware on the VController you need the following tool:
https://www.pjrc.com/teensy/loader.html

Follow the instructions on the PJRC website to install the tool for you operating system.

To install the firmware, take the following steps:

1. Connect the VController to your computer using a USB cable
2. On the VController go to the MENU and choose FIRMWARE MENU – Program Mode. The VController is now ready to receive the firmware.
3. Start the Teensy loader. You should see the following three buttons:

4. Press the first button to open the hex file.
5. Press the second button to upload it to the VController
6. Press the third button to reboot the VController. This should reboot the VController with the new firmware.

The procedure above describes how to upload already compiled firmware to the VController. There will be a guide soon, that will show you how to install the full Arduino IDE and the procedure to compile and upload the firmware yourself.

Updating the Raspberry Pi

You can contact me to download a newer version of the RPi configuration. I am still developing a good way to offer these images online.

The default password for Debian Jessie is on the RPi (user: pi, password: raspberry). Proceed at your own risk.

Specifications

VController:

Weight	3.350 grams
Dimensions:	343 x 232 x 70 mm (depending on bends and switches)
DC power:	9V at 500mA (1A with internal RPi)
Measured current:	240 mA (basic model with Buydisplay displays)

RPi enclosure:

Weight:	175 grams
Dimensions:	114 x 85 x 33 mm
DC power:	9V at 500mA (1A with VController powered as well) 5V at 1A though the micro USB is also possible, but the VController cannot be powered this way.
Measured current:	150 mA (with no external devices connected)