

TUTORIAL

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Subject: Additional Installs for RPI HMI
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Purpose

The purpose of this tutorial is to outline the additional software installations on the Raspberry Pi 3 (rpi) that are required for, or useful to, the RPI HMI project. This includes: Matchbox Keyboard, SMBUS, I2C, the Adafruit ADS1x15 library, and the configuration of USB drives to run executable code.

Note: \$ indicates rpi terminal and is not actually typed by user. ↵ indicates pressing enter.

Requirements

- rpi
- Internet connection for downloads
- A way to enter rpi text commands (keyboard / VNC)

Install Matchbox Keyboard

Matchbox Keyboard, which is a virtual screen based keyboard, is useful because the touchscreen will not have a keyboard normally attached to it and this application will still allow text input.

1. Download and install Matchbox Keyboard:

```
$ sudo apt-get install matchbox-keyboard ↵
```

2. After a reboot, a 'keyboard' application should be available under:
MENU >> Applications
3. If not, it can be added by going to:
MENU >> Preferences >> Main Menu Editor

NOTE: At this time, opening the keyboard freezes the desktop / file manager. As such, it's main use is to find the IP address of the pi via terminal command 'ifconfig' for remote VNC.



Install SMBUS

SMBUS is required for reading and writing bit registers over the I2C bus.

1. In terminal type:

```
$ sudo apt-get install python3-smbus ↵
```

2. It is possible that the library is already up to date.

Enable I2C

I2C is required for communication to the GPIO expanders and the ADC.

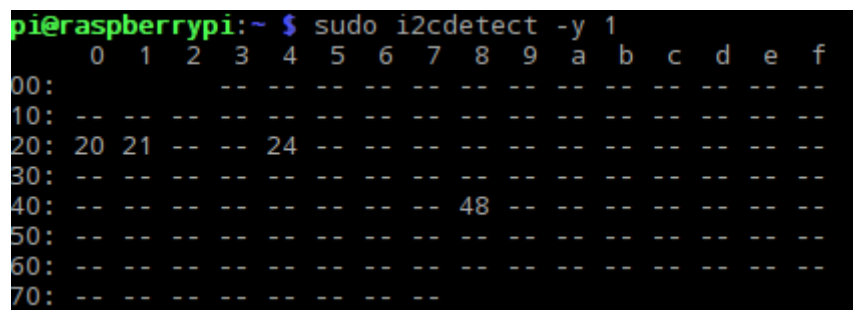
1. In console type:

```
$ sudo raspi-config ↵
```

2. In the newest version of rapsbian: select '5 Interfacing options'.
Older versions have I2C configuration under 'Advanced Options'.
3. Then select 'Enable I2C' and reboot.
4. After reboot to check I2C bus functionality type:

```
$ sudo i2cdetect -y 1 ↵
```

If everything is connected properly the terminal display should match the image below.



```
pi@raspberrypi:~$ sudo i2cdetect -y 1
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
10: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
20: 20 21 --- --- 24 --- --- --- --- --- --- --- --- --- ---
30: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
40: --- --- --- --- --- --- --- 48 --- --- --- --- --- ---
50: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
60: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
70: --- --- --- --- --- --- --- --- --- --- --- --- --- ---
```

Install the ADS1x15 Library

The Adafruit ADS1x15 library is used to communicate with the ADC. This library greatly simplifies the process of collecting voltage data and is open source.

1. Install git and various dependencies in order to clone the library.

```
$ sudo apt-get install build-essential python-dev python-smbus git ↵
```

2. Download and install library:

```
$ cd ~ ↵  
$ git clone https://github.com/adafruit/Adafruit_Python_ADS1x15.git ↵  
$ cd Adafruit_Python_ADS1x15/  
$ sudo python3 setup.py install
```

3. Correct installation can be checked if the following terminal commands produce no errors:

```
$ python3 ↵  
>>> import Adafruit_ADS1x15 ↵
```

Allow Executables from USB drives

In order to allow for easier transfer of log files, the code has been designed to be executed from a removable drive where the log files will also be stored. In order to allow code to be executed from the thumb drive the following code must be entered:

```
$ sudo sed -i -e 's|showexec|\x00\x00\x00\x00\x00\x00\x00\x00|g' /usr/lib/udisks2/udisksd  
$ sudo killall udisksd  
$ sudo /usr/lib/udisks2/udisksd &
```

Upon completion of the last line of code a variety of text will scroll through the terminal. This is normal.

Closing Notes

This may, or may not, work for you.

Version History

00	January 16, 2017	Initial writing.
01	March 14, 2017	Addition of USB execution code.