Quick start guide for Raspberry Pi 2 and FLIR Lepton v3

This guide will help you get GroupGets custom pylepton application running on your Raspberry Pi2 with FLIR's Lepton thermal imager in conjunction with a Raspberry Pi Camera. It will also provide some troubleshooting tips, as well as some example code to help you start hacking. We hope that you will find new and interesting things to do with a FLIR Lepton thermal imager on Raspberry Pi2.

Guide:

First remove the tape from around the Raspberry Pi case, then remove the lid from the case. You will see a Raspberry Pi Camera and ribbon cable inside.
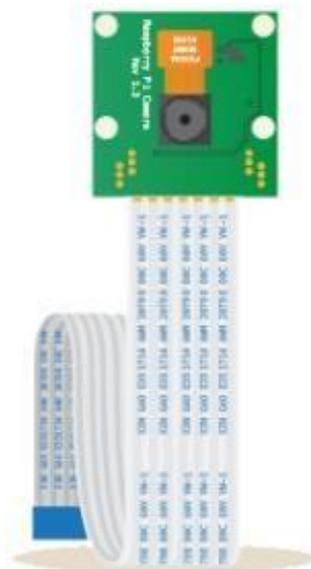

Figure 1 - A drawing of a Raspberry Pi Camera Board.

If you would like to re-place the lid, lay the cable flat and parallel with the Raspberry Pi. There is a gap around the lid. Making sure to not pinch the ribbon cable, re-place the lid with the camera outside of the case.
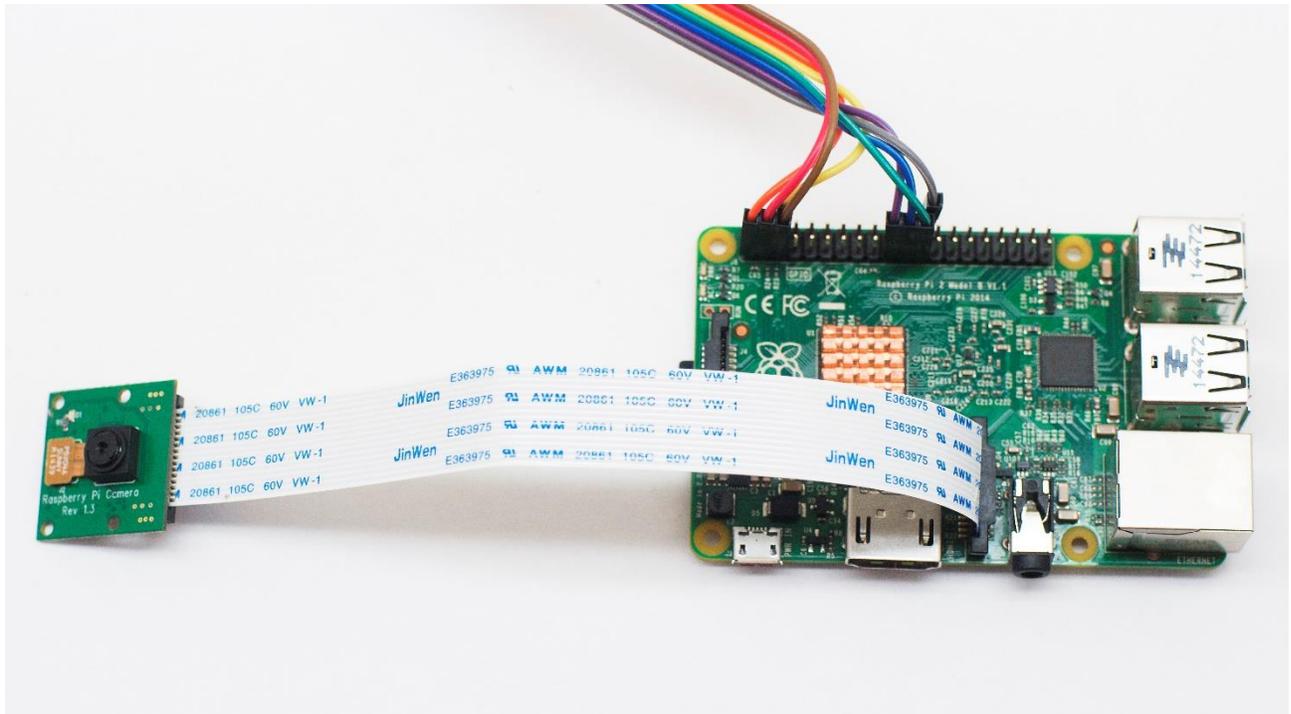

Figure 2 - A Raspberry Pi2 with Pi Camera Board and jumper wires attached to it.

Plug in cable with the tape into pin labeled CS on the Lepton Breakout Board. Keeping the cables in order plug the other 7 cables into the Lepton Breakout Board, starting with the cable next to the taped cable that you previously plugged in. *Note your cables may be different colors.*
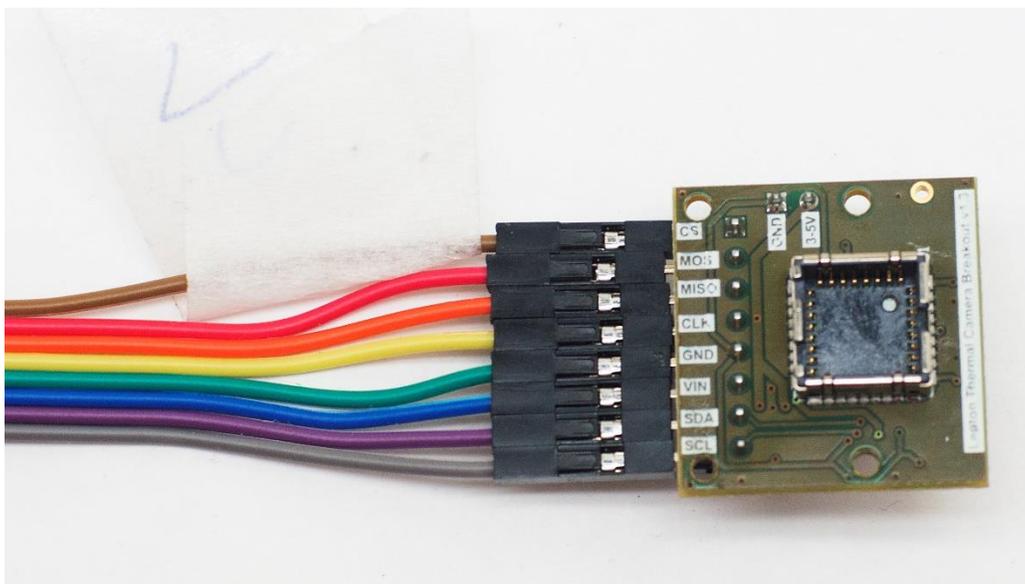

Figure 3 - A Pure Engineering/GroupGets Lepton Breakout Board and jumper wires attached.

Now plug in the HDMI cable, keyboard, and mouse into the Raspberry Pi. Then connect the HDMI cable to your monitor. Afterwards plug in the USB cable into wall adapter then plug that into an outlet. Next plug in the Micro-USB end of the cable into Raspberry Pi.

Wait for Raspberry Pi to load, you should see most of the text in the table below. Enter the login information as shown in the table.

Raspberry Pi Login Screen
Raspbian GNU/Linux 7 raspberry pi tty1   Raspberrypi login: pi   Password: raspberry

If graphical user interface is desired type *startx* (not required), if you choose the GUI you will need to open terminal to continue with the code bellow.

You should now see most of the text in the table below, enter `pylepton_overlay -a 155` as shown below. *Note that there is a space between overlay and -a*

Raspberry Pi Screen after Login
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.   `pi@raspberrypi ~ $` pylepton_overlay -a 155

Congratulations if you can see the regular image and lepton image overlaid then you have successfully started pylepton overlay on your Raspberry Pi. To close the overlay hold ctrl+c.

Figure 4 - A screenshot of pylepton software running on a Raspberry Pi2.

Now that you are up and running I will show you some straightforward code to capture frames from the FLIR Lepton on your Raspberry Pi2:

	Code to capture frames from FLIR Lepton on Raspberry Pi2
1	`import numpy as np`
2	`import cv2`
3	`from pylepton import Lepton`
4	
5	`with Lepton() as l:`
6	`   frame_ushort,frame_id = l.capture()`
7	
8	`frame_byte = np.empty(frame_ushort.shape, np.uint8)`
9	`cv2.normalize(frame_ushort, frame_byte, 0, 255, cv2.NORM_MINMAX, dtype=cv2.CV_8UC1)`
10	`cv2.imwrite("output.jpg", frame_byte)`

"Note that the image data returned from capture() is 12-bit and non-normalized (it's raw sensor data). You probably want to contrast extend this as demonstrated above, since the signal bandwidth is typically narrow over that range. Subsequently fitting this data into 8 bits is not strictly necessary to save the image with OpenCV but just shown here for demonstration purposes.

The capture() function includes a tuple that includes a pixel sum to be used for identifying unique frames (frames can update at ~27 Hz, but only unique ones are returned at ~9 Hz). Pylepton will be extended in the future to return a real frame ID here once support for frame telemetry is added." – Kurt Kiefer, pylepton video overlay – hack.io

 This concludes the Quick start guide for Raspberry Pi 2 and FLIR Lepton. Bellow you will find links to data sheets, a troubleshooting section, as well as other useful information. Now that you are up and running show us what you can do with FLIR Lepton thermal imaging on a Raspberry Pi2!

Datasheets & Links to more information

Pylepton github (feel free hack and expand this, post your creations to git!)

FLIR Lepton Datasheet

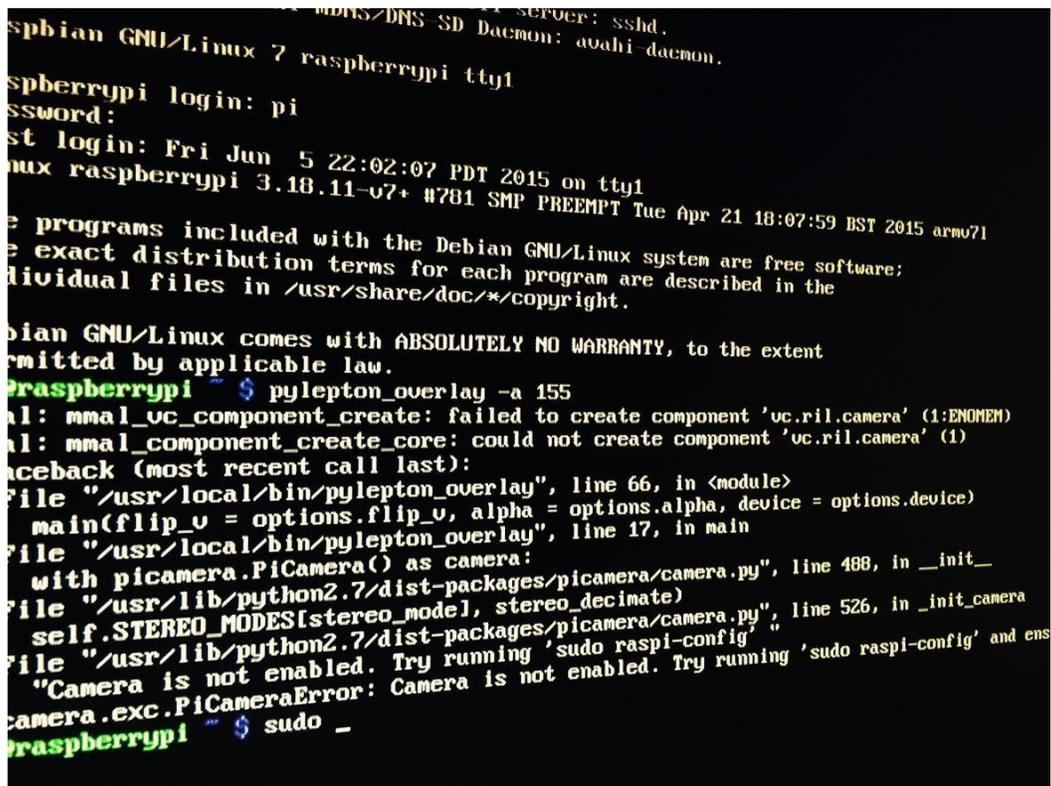Installation guide for Pure Breakout Board on Raspberry Pi 2

Interactive Raspberry Pi Pinout diagram

FLIR Lepton Google Group

PureEngineering's Homepage (has links to their github as well as additional information)

Troubleshooting

-If you get a *"mmal_vc_component_create: failed to create component 'vc.ril.camera' "* error the camera ribbon cable may have come out of alignment, or may not be installed correctly. The ribbon cable should be seated evenly within the camera socket, and the blue tab should be facing the USB and Ethernet ports (see images below).

Figure 5 – Screenshot of an error running the pylepton software due to a bad Raspberry Pi camera connection.
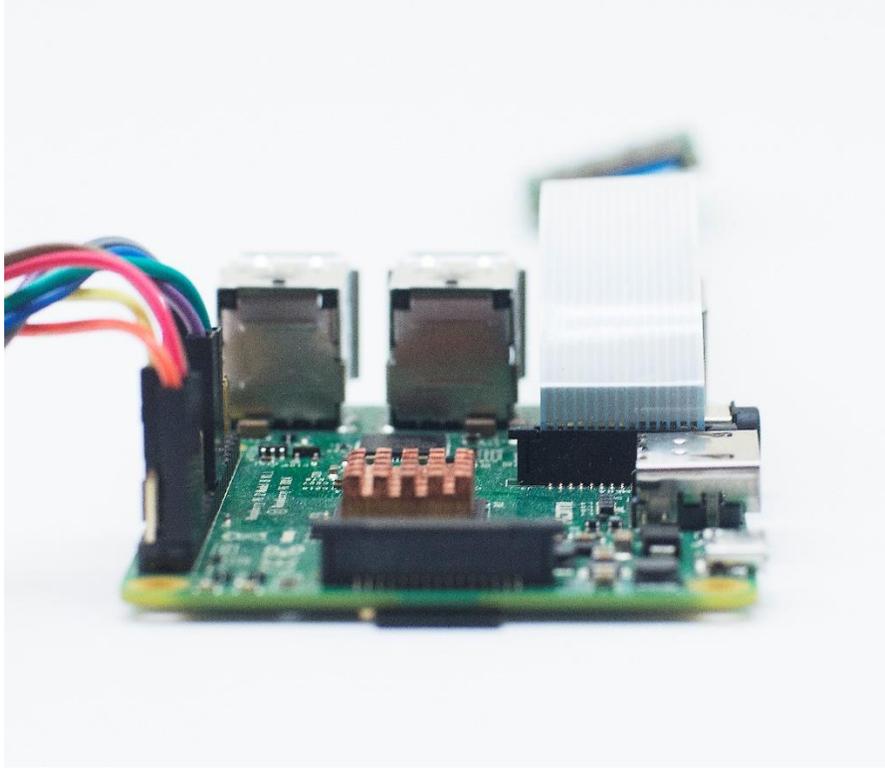
Figure 6 – An image of a Raspberry Pi2 with a camera ribbon cable evenly and correctly inserted into the socket.
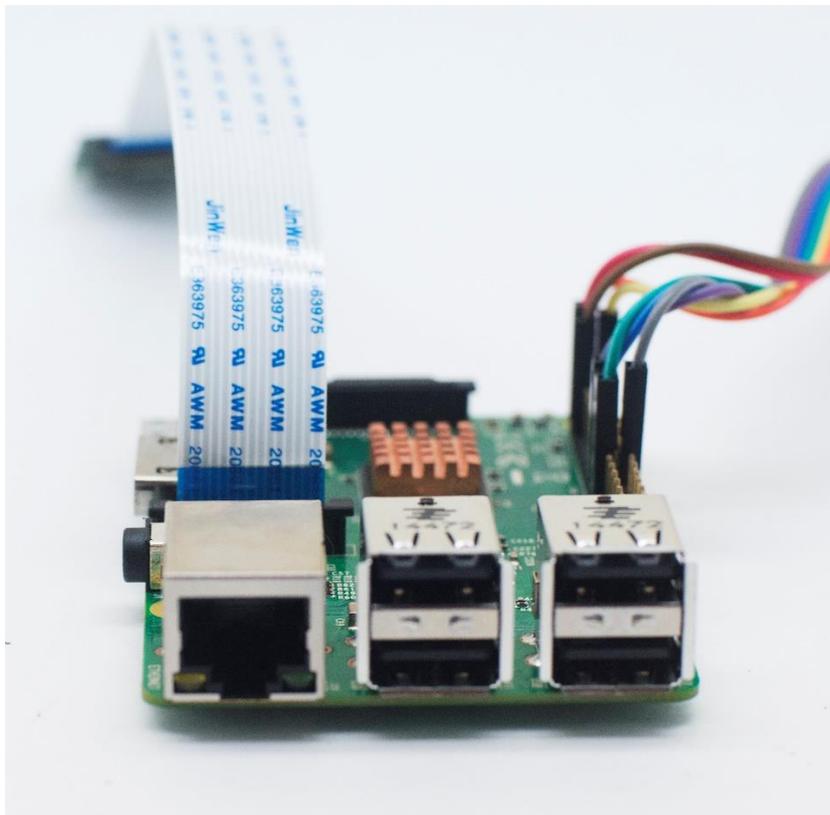

Figure 7 – Image of a Raspberry Pi2 with camera ribbon cable evenly and correctly inserted into the socket.

-If one of the colored cables has come out you can use the following to get them back in place, also use the [Interactive Raspberry Pi Pinout diagram](#):

CS -> Pin 24, CE0

MOSI -> Pin 19, MOSI

MISO -> Pin 21, MISO

CLK -> Pin 23, CLK

GND -> Pin 25, GND

VIN -> Pin 1, 3V3

SDA -> Pin 3, SDA

SCL -> Pin 5, SCL

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Questions? Feel free to contact me at Matt@GroupGets.com