

Guide for Setting Up the ILI9340 Display on BeagleBone Green

Authors:

Alex Ramirez

Shenyu Gu

Jacky Lim

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Contents

1) Introduction	2
2) Configure SPI on your BeagleBone Green	2
3) Confirm that you now see spidev files	2
4) Modify the uEnv.txt file	3
5) Example of connecting the ILI9340 display to the BeagleBone Green	4
6) Bonus: tips on displaying text	6
7) Troubleshooting	7

I, Alex Ramirez, hereby grant Dr. Brian Fraser the copyright permission to post my guide, "Guide for Setting Up the ILI9340 Display on BeagleBone Green", online for future students to access.

1) Introduction

The reason for this guide is that it wasn't quite clear how to setup the ILI9340 display. This guide aims to have the user be able to setup the device and have it work properly.

It would be useful to review these 3 guides:

<https://opencoursehub.cs.sfu.ca/bfraser/grav-cms/cmpt433/links/files/2022-student-howtos-ensc351/SPI-On-BBG.pdf>

https://opencoursehub.cs.sfu.ca/bfraser/grav-cms/cmpt433/links/files/2023-student-howtos/Adafruit2.2Inch18-BitColorTFTLCDBreakoutBoardViaBBG_ILI9340.pdf

<https://cdn-shop.adafruit.com/datasheets/ILI9340.pdf>

The last guide is the driver chip's data sheet and is more than 200 pages long. Perhaps just look for specific information about the display that you are interested in.

2) Configure SPI on your BeagleBone Green

On the BeagleBone (bbg) \$ enter the following commands:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

```
sudo apt-get install python3
```

```
sudo apt-get install python3-pip
```

```
sudo pip3 install spidev
```

```
sudo apt-get install python3-spidev
```

```
sudo apt-get install build-essential
```

3) Confirm that you now see spidev files

On the BeagleBone (bbg) \$ enter the following commands:

```
cd /dev
```

```
ls
```

Now verify that you can see the spi directory and the spidev0.0, spidev0.1, spidev1.0, spidev1.1 files

4) Modify the uEnv.txt file

On the BeagleBone (bbg) \$ enter the following commands:

```
cd /boot
```

```
ls
```

nano uEnv.txt Your uEnv.txt file should look like this:

```
GNU nano 5.4 uEnv.txt
Docs: http://elinux.org/Beagleboard:U-boot_partitioning_layout_2.0

uname_r=5.10.168-ti-r77
#uuid=
#dtb=

###U-Boot Overlays###
###Documentation: http://elinux.org/Beagleboard:BeagleBoneBlack_Debian#U-Boot_Overlays
###Master Enable
enable_uboot_overlays=1
###
###Override capes with eeprom
uboot_overlay_addr0=/lib/firmware/BB-SPIDEV0-00A0.dtbo
uboot_overlay_addr1=/lib/firmware/BB-SPIDEV1-00A0.dtbo
#uboot_overlay_addr2=<file2>.dtbo
#uboot_overlay_addr3=<file3>.dtbo
###
###Additional custom capes
#uboot_overlay_addr4=/lib/firmware/BB-BONE-AUDI-02-00A0.dtbo
#uboot_overlay_addr5=<file5>.dtbo
#uboot_overlay_addr6=<file6>.dtbo
#uboot_overlay_addr7=<file7>.dtbo
###
###Custom Cape
#dtb_overlay=<file8>.dtbo
###
###Disable auto loading of virtual capes (emmc/video/wireless/adc)
#disable_uboot_overlay_emmc=1
disable_uboot_overlay_video=1
disable_uboot_overlay_audio=1
#disable_uboot_overlay_wireless=1
#disable_uboot_overlay_adc=1
###
###Cape Universal Enable
enable_uboot_cape_universal=1
###
###Debug: disable uboot autoload of Cape
#disable_uboot_overlay_addr0=1
#disable_uboot_overlay_addr1=1
#disable_uboot_overlay_addr2=1
#disable_uboot_overlay_addr3=1
###
###U-Boot fdt tweaks... (60000 = 384KB)
#uboot_fdt_buffer=0x60000
###U-Boot Overlays###

console=ttyS0,115200n8
cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_core.default_quality=100 quiet

#In the event of edid real failures, uncomment this next line:
#cmdline=coherent_pool=1M net.ifnames=0 lpj=1990656 rng_core.default_quality=100 quiet video=HDMI-A-1:1024x768@60e

#Use an overlays on top of a read-only root filesystem:
```

5) Example of connecting the ILI9340 display to the BeagleBone Green

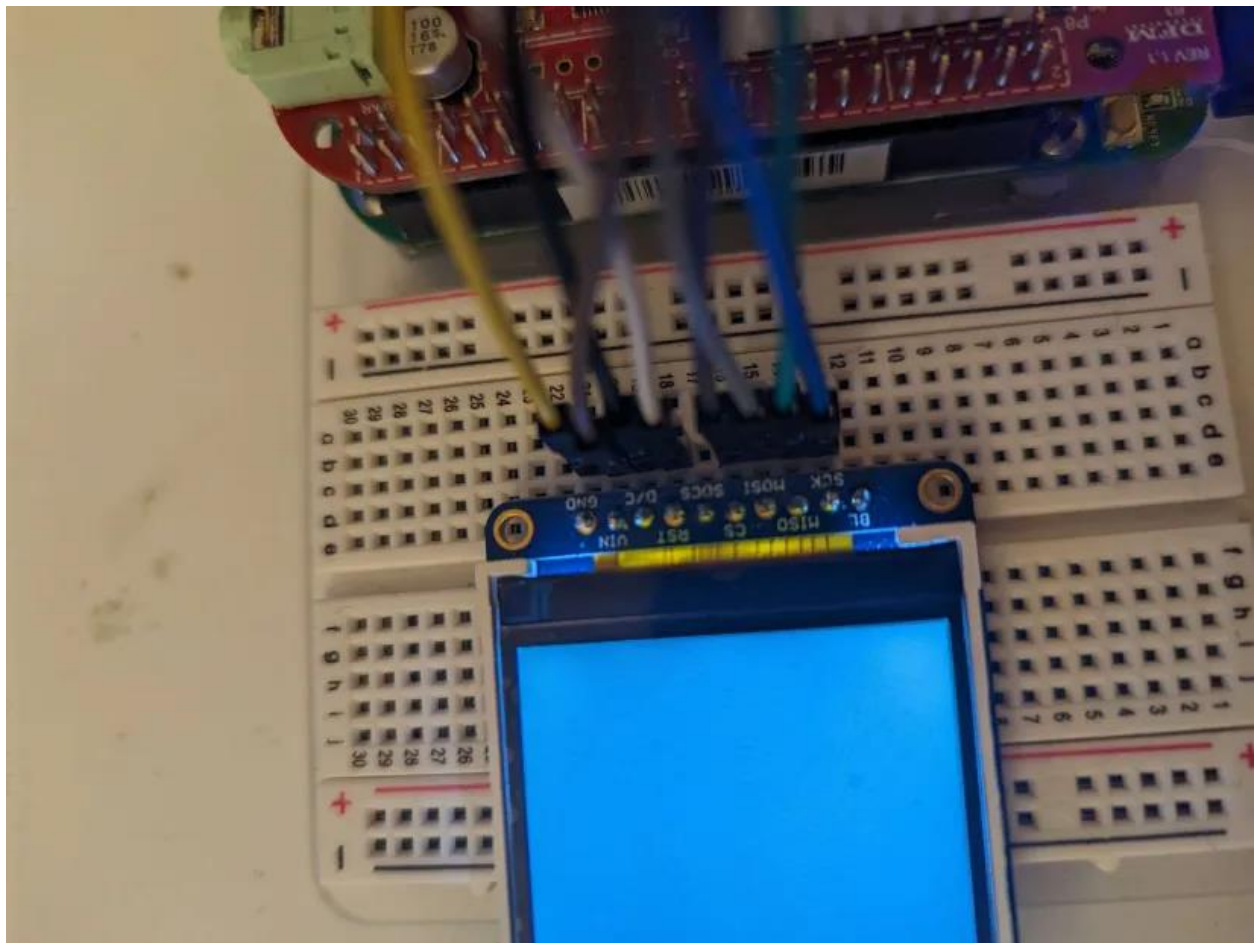
Insert the ILI9340 display on the breadboard

You can connect the display to the BeagleBone like this:

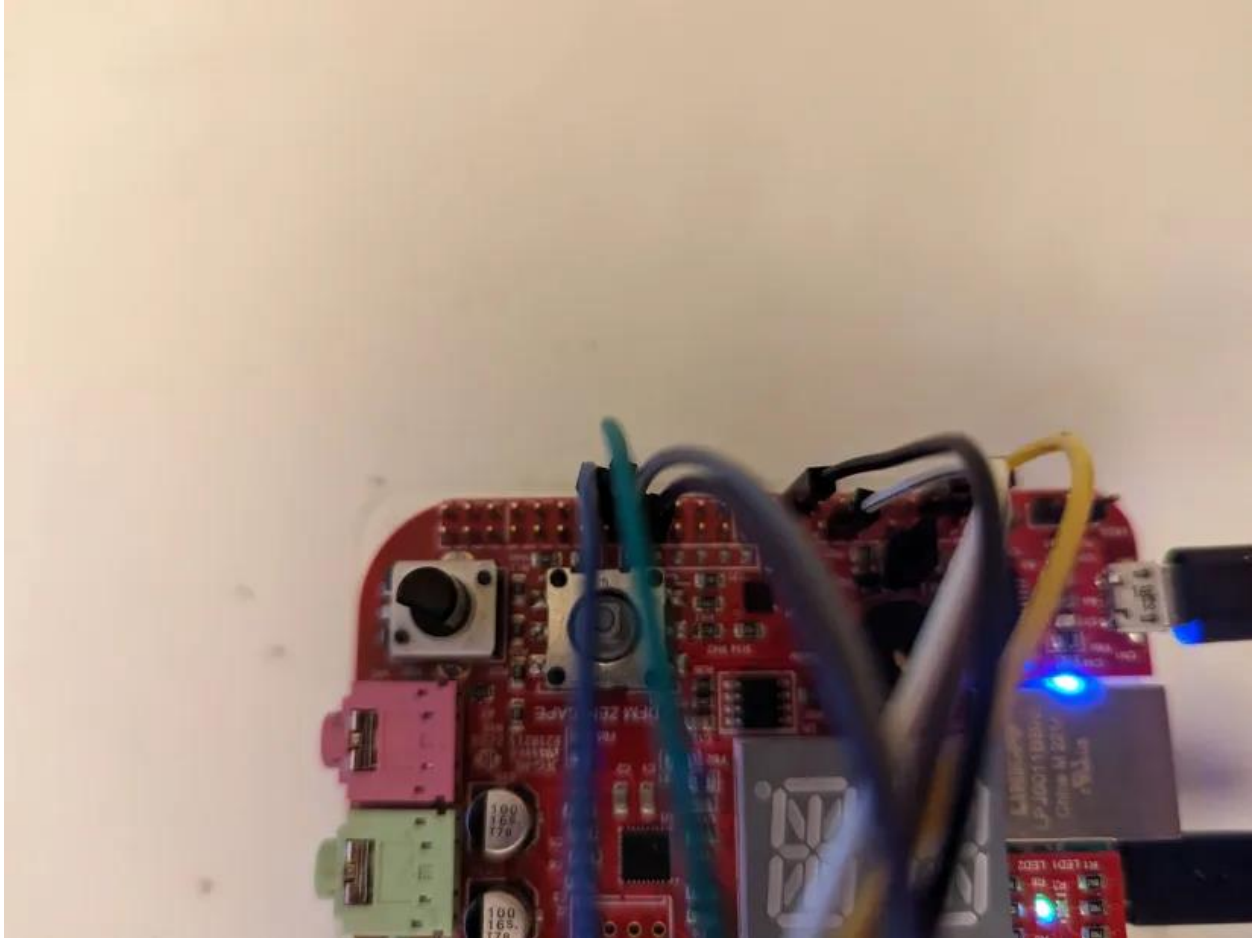
GND	VIN	D/C	RST	CS	MOSI	MISO	SCK
P9_1	P9_3	P9_15	P9_12	P9_28	P9_30	P9_29	P9_31

The pins that are in bold text must be connected to the P9 pins listed. Unless mistaken, GND would only work with P9_1 and P9_2 and VIN would only work with P9_3 and P9_4.

Below are some pictures of what the ILI9340 display connected to the BeagleBone Green would look like.







6) Bonus: tips on displaying text

I was not able to find a C alphabet library that was clear that would work on the BeagleBone Green so I wanted to give you an idea on how to create an alphabet library. Make sure to review the last page of this guide that I mentioned in the introduction:

https://opencoursehub.cs.sfu.ca/bfraser/grav-cms/cmpt433/links/files/2023-student-howtos/Adafruit2.2Inch18-BitColorTFTLCDBreakoutBoardViaBBG_ILI9340.pdf

as it explains the logic to generate output on the display. I suggest you make helper functions that would help simplify things.

The screenshot below is a function that displays the letter A on the display.

```

1 #include "alphabet.h"
2
3 // Note: All characters display a 5:7 aspect ratio (width:height)
4
5 // A
6 void A(int spiFileDesc, uint8_t cmd, uint8_t color, int fontSize, int xStart, int yStart, bool cond)
7 {
8     // Display left vertical line
9     displayRectangle(spiFileDesc, cmd, color, xStart, xStart + fontSize, yStart + fontSize, yStart + (fontSize * 7),
10 cond);
11
12     // Display the top horizontal line
13     displayRectangle(spiFileDesc, cmd, color, xStart + fontSize, xStart + (fontSize * 4), yStart, yStart + fontSize,
14 cond);
15
16     // Display the middle horizontal line
17     displayRectangle(spiFileDesc, cmd, color, xStart + fontSize, xStart + (fontSize * 4), yStart + (fontSize * 4),
18 yStart + (fontSize * 5), cond);
19
20     // Display the right vertical line
21     displayRectangle(spiFileDesc, cmd, color, xStart + (fontSize * 4), xStart + (fontSize * 5), yStart + fontSize,
22 yStart + (fontSize * 7), cond);
23 }

```

The helper function `displayRectangle(...)` contains some of the logic shown in the last page of the guide that I just mentioned.

7) Troubleshooting

By the end of following this guide, you should have your display turned on. If it is not turned on, try the following:

- Double-check that the cables are connected to the correct pins on the display and the correct pins on the BeagleBone
- Make sure that the cables pins are pushed well meaning that they are well connected
- Compare your `uEnv.txt` file to the one that is shown here
- Make sure that you entered all of the commands shown in the second step “Configure SPI on your BeagleBone Green”
- Go to the `dev` directory and confirm that you can see the `spi` directory and `spidev` files (`spi`, `spidev0.0`, `spidev0.1`, `spidev1.0`, `spidev1.1`)