How -To connect and code 0.54” 14-segment LED HT16K33 Display to show real-time with Beagle-Bone Green

Introduction:

This guide will give you step by step instructions and tips to connect and show real time on two 2-digit 0.54” tall alphanumeric 14-seg display on the 14-segment LED HT16K33 backpack. The 14-seg display provides a wide range of options for display, not only for numbers but also to display alphabets.

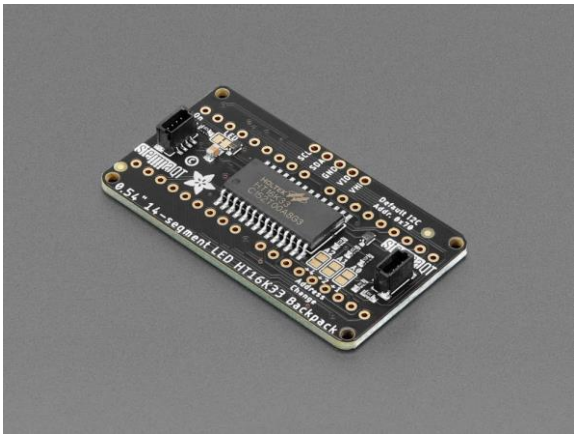


Figure 11 0.54" 14-segment LED HT16K33 Backpack [1]

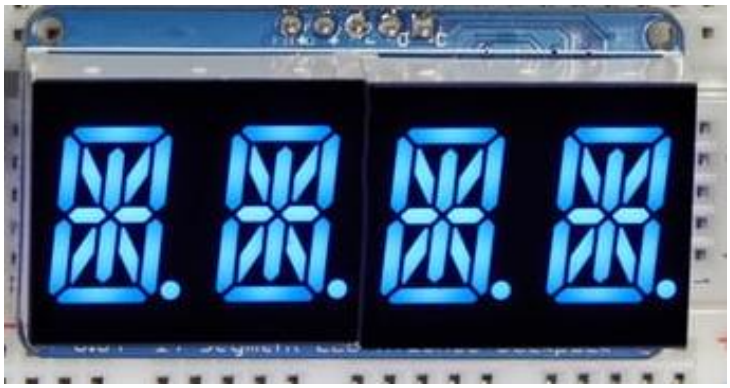


Figure 2 0.54" 14-segment LED display

The soldered component requires 18 pins (4 characters and 14 total segments each). To start using it, you just have to write data to it using the 2-pin I2C interface, explained in detail below.

In this guide:

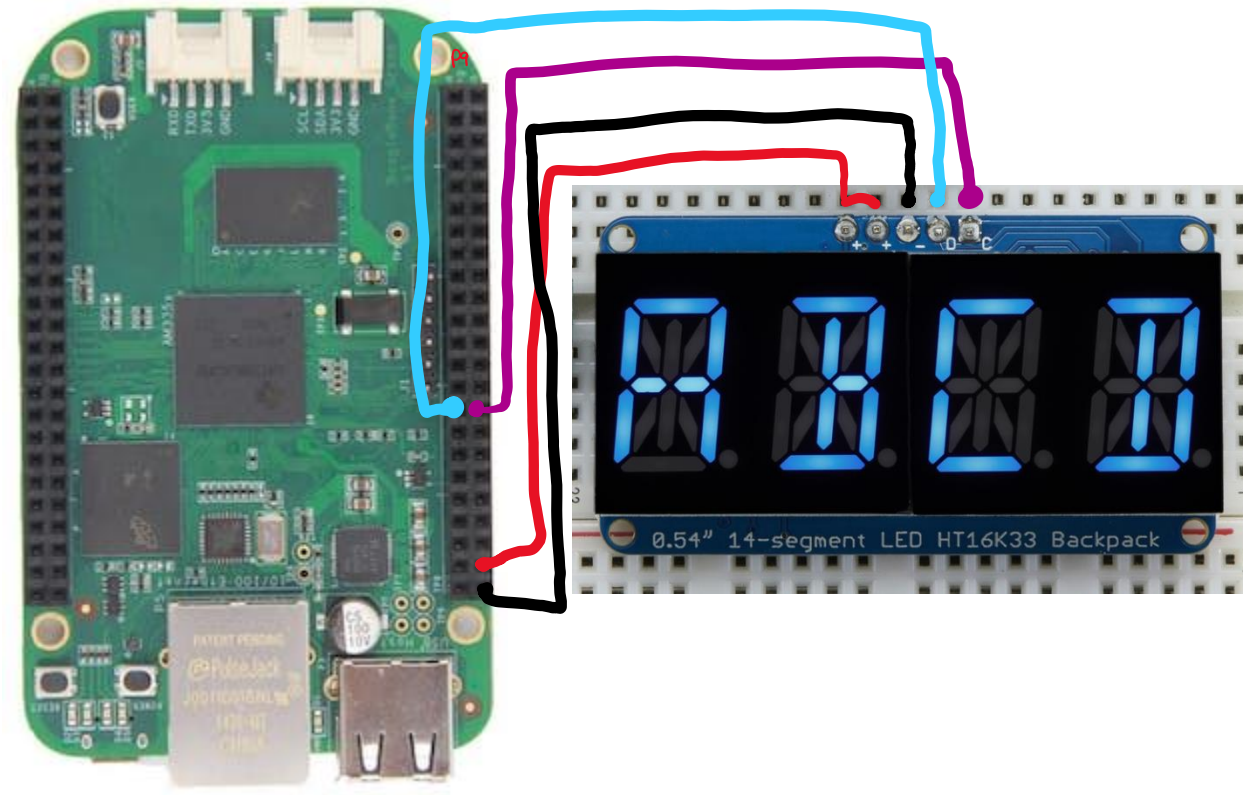
1. Display wiring
2. Register Addresses for different digits
3. Get Real-Time through Linux Command

Display Wiring

For wiring connect 3.3-volt VDD as circuits power source, negative to ground and I2C1's SCL and I2C1's SDA.

- P9.01 (Ground) to " – "on LED display
- P9.03 (3.3V) to " + " on LED Display
- P9.17 (SCL) to "C" on LED Display
- P9.18 (SDA) to "D" on LED Display

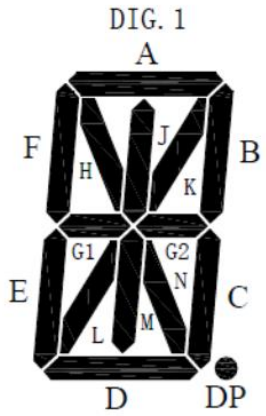
*Note: There are 2 power sources for the two alphanumeric displays, connect both positives to the power source. See wiring diagram below for reference.



This wiring will require you to configure the display to I2C1 bus, use the configure commands in the terminal or implement it in your code when running.

Register Addresses

The image below shows taken from [2] shows the segment map.

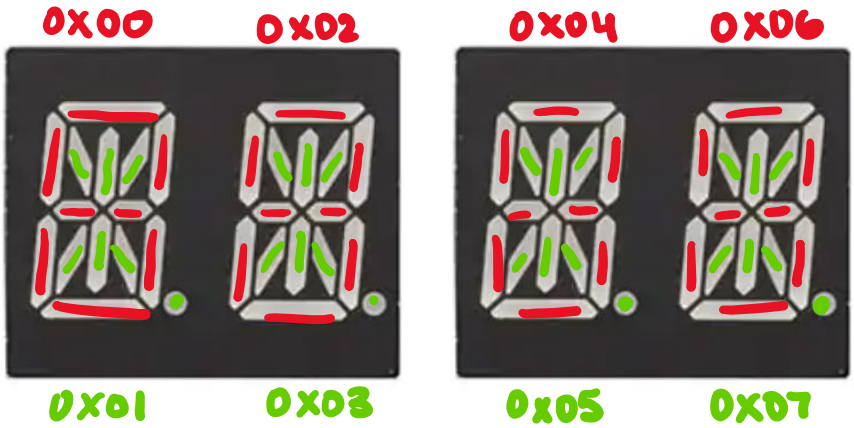


The device I2C address is 0x70 as default however the backpack provides 3 different address change ports to be soldered in combinations which allows one to change device to 7 different addresses. See https://learn.adafruit.com/adafruit-led-backpack/pinouts for more details on pinouts for address change if needed.

To display anything on the seg display use the command below on Linux terminal:

(bbg)$ i2cset -y 1 0x70 0x00 0x3F (this sets the first digit to 0 on the LED Display)

The position addresses determine which digit/part of the digit we wish to set. See below for address codes for each.



The display address is the unique address that tells what you want to display on the 14-seg display. Below are the addresses to represent numbers 0-9 on the display.

*Note: All numbers require you to use the even position code address except 1 which uses the odd code if you wish it to be centered on the display.

0 - 003F	5 - 00ED
1 - 0012	6 - 00FD
2 - 00DB	7 - 0007
3 - 00CF	8 - 00FF
4 - 00E6	9 - 00EF

When implementing this in the C code to display numbers, use a 2D buffer initialization and fill the first buffer with the position address and the second with the display address.

Get Real Time through Linux command

You can use the time.h library to get your local system time using c code on c compiler. See https://www.tutorialspoint.com/c_standard_library/c_function_localtime.htm for more details on c code.

Make sure you are connected to the internet. (see networking guide for more details), Run the commands below:

(host) sudo iptables --table nat --append POSTROUTING --out-interface ens33 -j MASQUERADE
(host) sudo iptables --append FORWARD --in-interface enx98f07bfe9155 -j ACCEPT
(host) echo 1 | sudo tee /proc/sys/net/ipv4/ip_forward

(bbg) sudo route add default gw 192.168.7.1
(bbg) echo nameserver 8.8.8.8 | sudo tee -a /etc/resolv.conf

Now, you need to configure your linux system with your computer's local time. To do so, simply run the following command in your linux terminal:

(bbg) sudo timedatectl set-ntp true

To check the date and time of linux terminal run:

(bbg) date

Once your time is configured on linux terminal, it will show the right time when running the c code through your linux terminal.

References

[1] https://www.adafruit.com/product/1910

[2] https://learn.adafruit.com/adafruit-led-backpack/0-54-alphanumeric-9b21a470-83ad-459c-af02-209d8d82c462