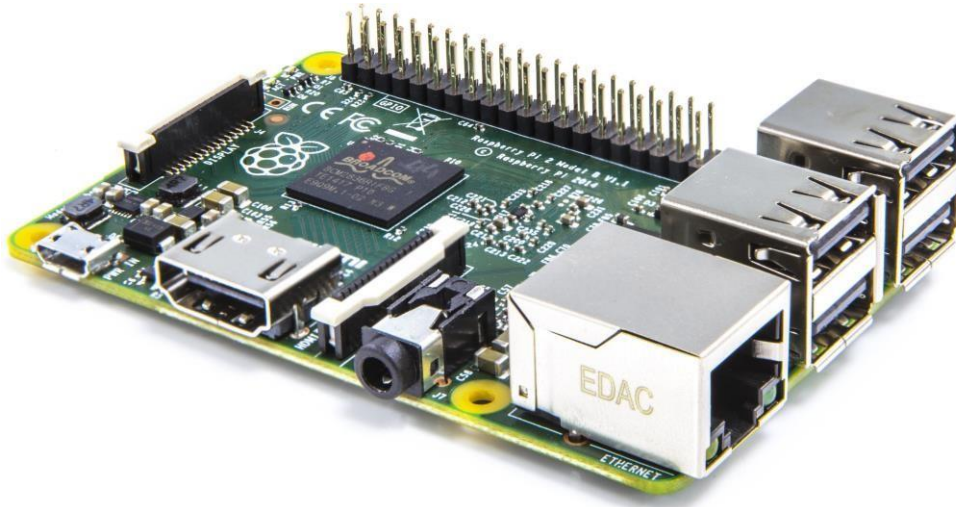




FLOWCODE

Using Raspberry Pi With Flowcode 9

Raspberry Pi as a Flowcode target



Raspberry Pi is an inexpensive board level target with digital I/O but also internet functionality built in. As such it provides an ideal base for diverse applications including IoT (the Internet of Things). For the first time, Flowcode 8 enables users to target this hugely popular Raspberry Pi family of boards. Flowcode is an intuitive way to program, either at home, in the classroom or for industrial uses.

Alongside this, our E-blocks2 hardware platform also supports the Raspberry Pi and the Raspberry Pi Shield is perfect for those who wish to integrate their Pi into the E-blocks system.

Flowcode is chip independent and the Raspberry Pi is just one target of 33 different families of microcontroller that we support. Hence most projects can easily be ported from one target device to any other.

There are many advantages to creating Flowcode applications on Raspberry Pi, here are just a few:

- The huge library of Flowcode components can be used
- Remote download of the Flowcode generated applications via WiFi or Ethernet
- The Flowcode generated programs run on the Raspbian Linux operating system
- Flowcode generated applications can be called up from other programs
- Multiple Flowcode applications can be run simultaneously on the Raspberry Pi
- Debug message capability directly from the Raspberry Pi to a console window on the PC
- When used in conjunction with the Matrix hardware the Ghost features of Flowcode are available

Using Raspberry Pi with Flowcode 9

SD cards supplied with Matrix products are pre-programmed with the Raspbian image, in this case please go to the “Configuring Raspberry Pi for use with Flowcode” section.

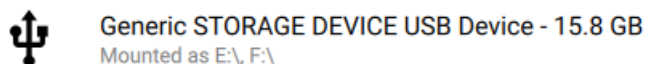
Help can be found at <https://www.raspberrypi.org/learning/software-guide/quickstart>

Creating a Raspberry Pi OS on a micro SDHC card

- Download& install the Raspberry Pi Imager from the [Raspberry Pi website](#)
- With the minimum size of 16gig SD card, connected to your PC via an SD and ignore/close any warning about card not being formatted if there is already an old Pi OS on it.
- Run the R Raspberry Pi Imager:



- Left-click **CHOOSE OS** and select **Raspberry Pi OS (32-bit)**
- Left-click **CHOOSE STORAGE** and select the popup.
- With a 16GB SD micro card should look like:



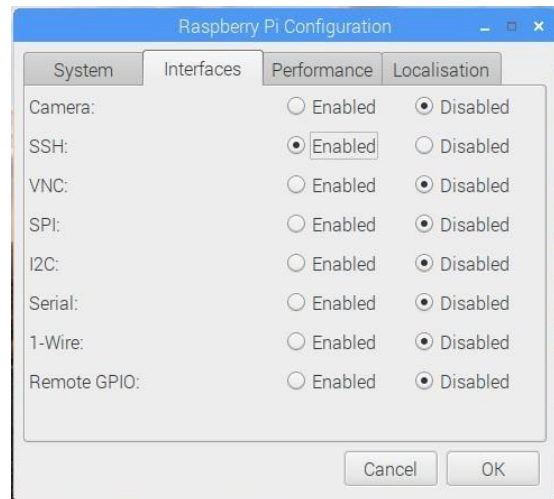
- **WRITE** should now be available to select.

Configuring Raspberry Pi for use with Flowcode

Flowcode uses secure shell, SSH, to transfer user applications to the Raspberry Pi.

SSH is easily enabled on the Raspberry Pi from the desktop.

Alternatively, this can be done by using **raspi-config** from the terminal.



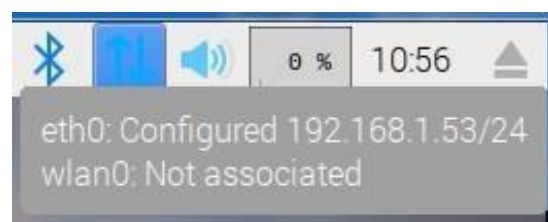
From the Raspberry Pi menu, in the top left corner of the desktop, select “Raspberry Pi Configuration” from the “Preferences” menu. In the “Interfaces” tab, select “Enabled” for SSH and click OK. With SSH remote access enabled it is recommended that you to consider changing the default pi user password (initial default is raspberry).

For wireless connections, click and set the “Set WiFi Country” in the “Localisation” tab. Click the OK button and close the dialog.

Then click on the network activity icon in the top right of the desktop and connect to your WiFi access point.

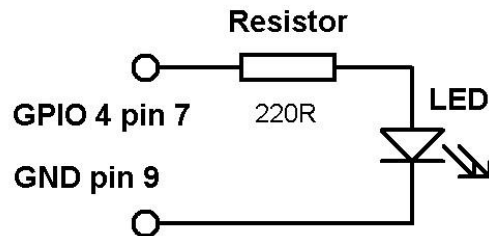
Flowcode projects require the setting of the IP address of the Raspberry Pi, as configured by your network.

Once you have your Raspberry Pi connected to your network, its IP address can be seen by hovering the mouse over the desktop network activity icon. In the example shown the IP address of this Raspberry Pi is 192.168.1.53



Creating your first Flowcode 9 Raspberry Pi project

For this example project we will use a Raspberry Pi 3B+ with simply a LED and resistor attached to GPIO 4 to demonstrate digital output.



		Pin Number			
	3V3	1	2	5V	
SDA	GPIO2	3	4	5V	
SCL	GPIO3	5	6	GND	
220R	GPIO4	7	8	GPIO14	TX
LED K	GND	9	10	GPIO15	RX
	GPIO17	11	12	GPIO18	
	GPIO27	13	14	GND	
	GPIO22	15	16	GPIO23	
	3V3	17	18	GPIO24	
MOSI	GPIO10	19	20	GND	
MISO	GPIO9	21	22	GPIO25	
CLK	GPIO11	23	24	GPIO8	CE0
	GND	25	26	GPIO7	CE1
I2C	DNC	27	28	DNC	I2C
	GPIO5	29	30	GND	
	GPIO6	31	32	GPIO12	
	GPIO13	33	34	GND	
	GPIO19	35	36	GPIO16	
	GPIO26	37	38	GPIO20	
	GND	39	40	GPIO21	

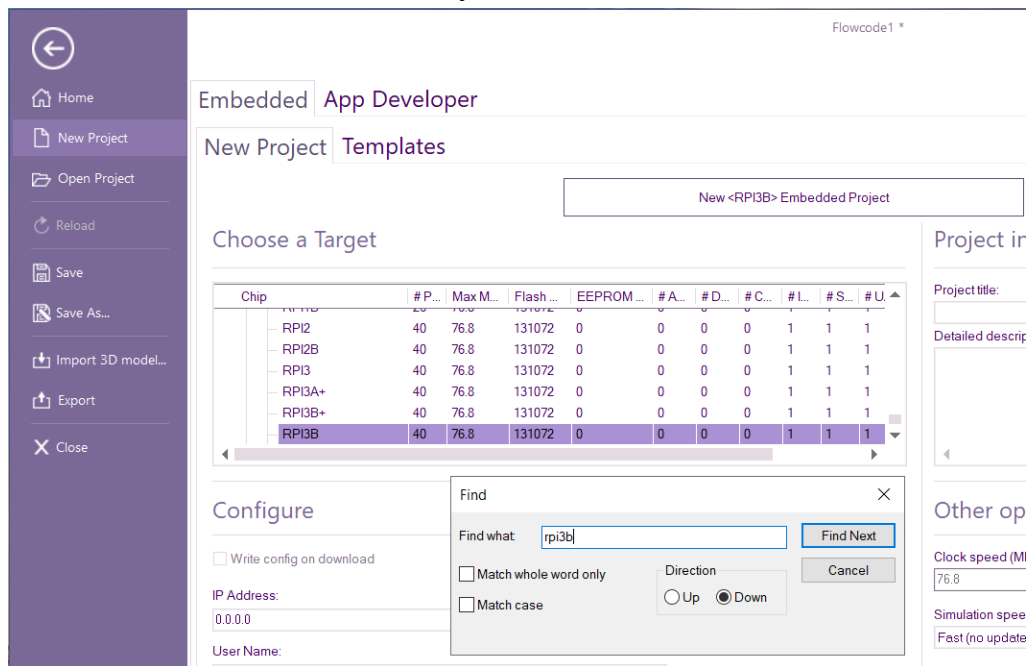
Run Flowcode 9 and select New project.

Under **Choose a Target** right-select on any target device & select **Search**.

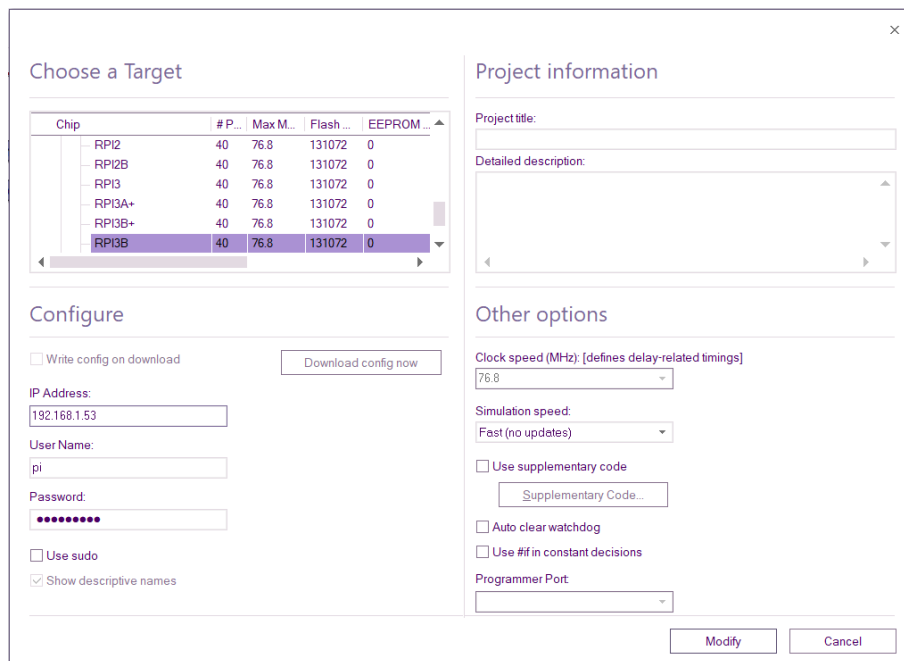
Within the search box, enter rpi then what version you have e.g rpi3b or rpi3b+ etc.

Press the **Enter** key or select **Find Next**.

Select New<RPI3B> Embedded Project:



Select **Build** - ribbon, **Project Options**



Below **Configure**, enter the IP address for the Raspberry Pi together with the user name and password (usually pi and raspberry).

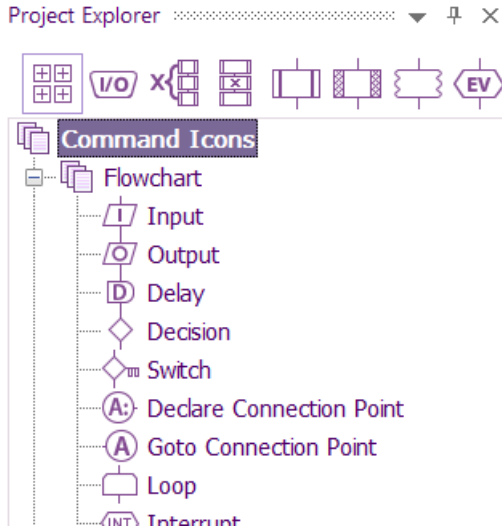
Note: The "sudo" checkbox only needs to be enabled if PWM is used in the project.

Select **Modify**

Add a LED component, from the **Components Libraries** ribbon, **Outputs** menu, onto the system panel. In the component properties window set the Connection property to PORTG,4 (this represents GPIO 4).

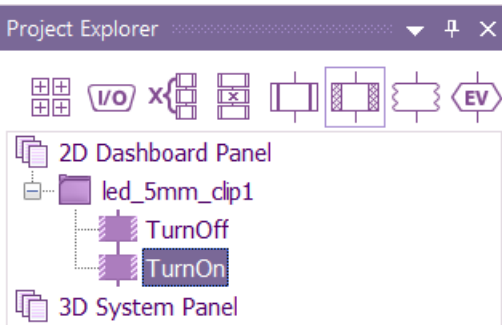
Enable the **Project Explorer** by selecting it from the **View** ribbon.

Icons for example Loop, calculation box & Delay etc can be selected by clicking on the four + on the far left of the project explorer.

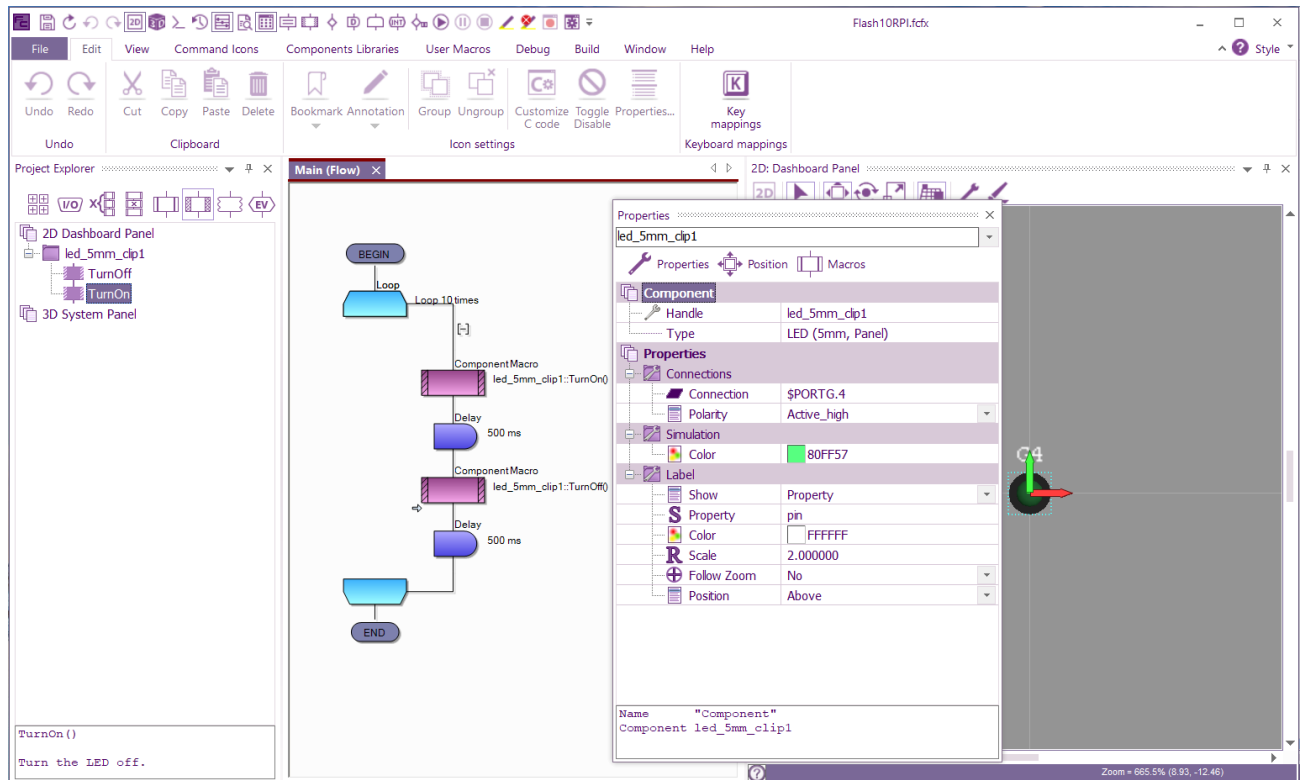


To the main flowchart add a loop of fixed count 10

Component icons can be selected by clicking on Component's icon of the project explorer.



Together with component icons to turn on and off the LED with 500ms delays as shown:



Save the project without any spaces (underscores are OK), and the flowchart can be simulated on screen by clicking the Run button.

To run the project on the Raspberry Pi click the **Build** ribbon, **Compile to Target...** icon. The project compilation window will display followed by a console (Putty) window whilst the program runs on the Raspberry Pi and flashes the LED 10 times.

Sample Flowcode 9 project for Raspberry Pi and E-blocks

For this example we will use an E-blocks 2 Raspberry Pi upstream board (BL0036), with Raspberry Pi 3B+ installed, and a Combo board (BL0114).

As with the previous example, Run Flowcode 9 and select New project.

Under **Choose a Target** right-select on any target device & select **Search**.

Within the search box, enter BL0036.

Press the **Enter** key or select **Find Next**.

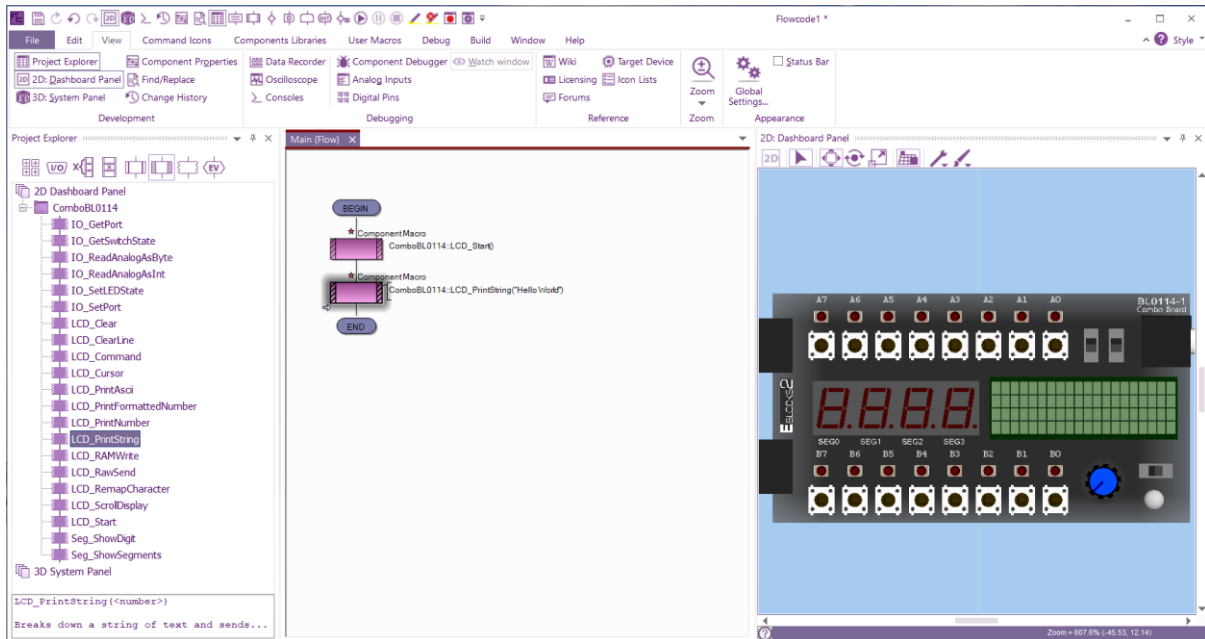
Select New< BL0036> Embedded Project

Select **Build** - ribbon, **Project Options**.

Below **Configure**, enter the IP address for the Raspberry Pi together with the user name and password (usually pi and raspberry).

Note: The “sudo” checkbox only needs to be enabled if PWM is used in the project.

Select **Modify**.



Select **Components Libraries** ribbon then select **Search**.

Enter bl0114 & left or right-click, **Add to 2D panel**

Combo BL0114 component will be added onto the dashboard.

From the Project Explorer window drag and drop a Start icon followed by a PrintString icon, set the text field to “Hello World”.

Save the project (no spaces) and click the “Compile to chip” button in the task bar.

The project compilation window will run followed by a console (Putty) window whilst the program runs on the Raspberry Pi target, and “Hello World” should appear on the display. (Note: Ensure that the BL0114 “LCD” switch is set to ON)

Running programs from the Flowcode IDE

Flowcode uses secure shell to transfer and run user applications, so whilst running you will see the shell console window on the host PC. Note that in the case of programs with a continuous loop this window will remain continuously present on the host PC.

Pressing CTRL and C in the window will abort the running program on the Raspberry Pi and exit the console window.

The Flowcode DebugPrint component can be used to output text to the console window for debugging or other purposes.

The shell console window runs concurrently with Flowcode such that ICD (In Circuit Debugging) can be done with the use of the Flowcode Ghost features of the Matrix E-blocks 2 Raspberry Pi upstream board or Flowkit v2.

Running your programs independently of Flowcode

Once you have used Flowcode to create, compile and transfer your program to the Raspberry Pi, it will exist in the home directory of the selected user e.g. /home/pi

From there the application can be run via a serial console such as Putty or virtual desktop such as VNC or RDP. VNC and SSH for Putty are enabled via the Raspberry Pi “Interface Configuration” dialog.

Your application can also be configured to run from start-up of the Raspberry Pi by adding a line to the /etc/rc.local file, but before the exit 0.

Editing this file must be done with root privileges, e.g. `sudo nano /etc/rc.local`

```
/home/pi/MyFlowcodeProject &
```

```
exit 0
```

Notes: It is vital that you do not use any spaces within the project name. If you do, the code will not autorun on start up. Underscores are allowed.

It is always best to add a space then & after the project name. If you don't then the Pi will not complete the boot process.

Using Raspberry Pi hardware peripherals

Hardware peripherals on the Raspberry Pi are limited to UART, SPI, I²C and PWM. To use these peripherals with Flowcode they must be first be enabled via the Raspberry Pi “Interface Configuration” dialog. There is no direct support for analogue or interrupts. Analogue inputs and outputs would be implemented via external devices.

Also note that (at the date of this document) PWM requires programs to be run with root privileges, for which Flowcode provides the option to run programs as sudo.

Flowcode provides software versions of SPI and I²C such that devices using these protocols can be connected to any free GPIO pins. Due to the RTOS operation of Raspberry Pi, the bit rate of these can depend upon other running processes. The same is the case for delays, these can vary, the relative deviation being greater for shorter delays.



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