How to access Jetson TX2 GPIO pins

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# Basic info

There are many ways to access GPIO hardware from programs. Linux kernel uses a **sysfs interface** for basic GPIO control. Sysfs is a pseudo filesystem provided by the linux kernel that makes information about various kernel subsystems, hardware devices, and device drivers available in user space through virtual files. GPIO devices appear as part of sysfs.

EX1 rover Lights Control System (LCS) is defined in the following way:

* ON : 0 V (low)
* OFF: > 2.9 V (high)

The following pins from the Jetson TX2 J21 Header Pinout are used for the LCS.

**Function in LCS | Pin# | Connector Label | Sysfs GPIO**

GND (Pin 1) | 39 | GND | n.a

ON/OFF LEDs right eye (Pin 2) | 37 | GPIO26 (3.3V) | gpio388

ON/OFF LEDs left eye (Pin 3) | 35 | GPIO19 | gpio395

ON/OFF LEDBar (Pin 4) | 33 | GPIO13 | gpio389

# Quick testing of GPIO pins from userspace

The following instructions describe how to manually activate and control the output of the GPIO pins. First of all, open a new terminal and enter root user mode.

$ sudo su

In root mode, go to the following directory:

$ cd /sys/class/gpio

If you were to check the contents of this directory, you will notice folders with names such as *gpiochip216*. These *gpiochip* directories are device names for the GPIO controllers and we won’t use them directly.

First thing we need to do to activate certain pins is to export them using the following command:

$ echo *sysfs\_gpio\_number* > export

Make sure to substitute *sysfs\_gpio\_number* for the GPIO number of the pin you would like to activate. For instance, if we would like to activate pin 37 (i.e., gpio388 in sysfs) in the J21 pinout of the Jetson TX2, the command would be:

$ echo 388 > export

Once exported, a new folder called gpio388 was created inside the gpio directory. From this new folder, we will be able to read and modify the functionality and properties of this GPIO pin.

Two properties are relevant to us: direction (in or out) and value (high or low, 1 or 0).

To read them use the following command within the general gpio directory:

$ cat gpio388/direction

$ cat gpio388/value

To modify its properties, use the following command:

$ echo out > gpio388/direction

$ echo 1 > gpio388/value

Once you are done testing unexport the pin:

$ echo 388 > unexport

And exit root mode:

$ exit

*Notes:*

*In the actual code used to operate EX1, we used a C++ library containing functions that call the export, direction, and value operations of the sysfs interface. The header file can be found under the src folder of the teleop package.*