

- 作業 1：實際練習 `/sys/class/gpio` 啟動 `gpio`，設定 `gpio` 接腳的狀態，並且卸載所啟動的 `gpio`。同時觀察卸載之後的 `gpio` 接腳，繼續送設定狀態的資料，將會發生什麼樣的狀態。

無法做任何動作

```
pi@neal:/sys/kernel $ echo 4 > /sys/class/gpio/unexport
pi@neal:/sys/kernel $ echo 0 > /sys/class/gpio/gpio4/value
-bash: /sys/class/gpio/gpio4/value: 沒有此一檔案或目錄
pi@neal:/sys/kernel $
```

- 作業 2：使用 `raspi-config` 啟動 `i2c`，觀察 `gpio2` 以及 `gpio3` 的變化，透過 `/sys/kernel/debug/gpio` 觀察改變的情形，嘗試重新做一次作業 1，針對 `gpio2` 以及 `gpio3` 操作，觀察在 `i2c` 啟動的狀態下，`gpio2` 以及 `gpio3` 相對 `gpio4` 有何不同。

沒有不同

```
gpio-0 (ID_SDA )
gpio-1 (ID_SCL |sysfs ) in hi
gpio-2 (SDA1 |sysfs ) in hi
gpio-3 (SCL1 |sysfs ) in hi
gpio-4 (GPIO_GCLK |sysfs ) in hi
gpio-5 (GPIO5 )
gpio-6 (GPIO6 )
gpio-7 (SPI_CE1_N |spi0 CS1 ) out hi ACTIVE LOW
gpio-8 (SPI_CE0_N |spi0 CS0 ) out hi ACTIVE LOW
gpio-9 (SPI_MISO )
gpio-10 (SPI_MOSI )
gpio-11 (SPI_SCLK )
gpio-12 (GPIO12 )
gpio-13 (GPIO13 )
gpio-14 (TXD1 )
```

```
pi@neal:~ $ sudo cat /sys/kernel/debug/gpio
gpiochip0: GPIOs 0-53, parent: platform/fe200000.gpio, pinctrl-bcm2835:
gpio-0 (ID_SDA )
gpio-1 (ID_SCL |sysfs ) in hi
gpio-2 (SDA1 |sysfs ) in hi
gpio-3 (SCL1 |sysfs ) in hi
gpio-4 (GPIO_GCLK |sysfs ) in hi
gpio-5 (GPIO5 )
gpio-6 (GPIO6 )
gpio-7 (SPI_CE1_N |spi0 CS1 ) out hi ACTIVE LOW
gpio-8 (SPI_CE0_N |spi0 CS0 ) out hi ACTIVE LOW
gpio-9 (SPI_MISO )
gpio-10 (SPI_MOSI )
gpio-11 (SPI_SCLK )
gpio-12 (GPIO12 )
gpio-13 (GPIO13 )
gpio-14 (TXD1 )
```

- 作業 3: 使用 raspi-config 啟動 spi, 觀察 gpio 各接腳的變化狀態, 嘗試將 spi 關閉之後, 透過 /sys/kernel/debug/gpio, 觀察可以使用 gpio 數量的變化情形。

差別在於腳位 7 和 8 未啟動

```
gpio-0 (ID_SDA )
gpio-1 (ID_SCL |sysfs ) in hi
gpio-2 (SDA1 |sysfs ) in hi
gpio-3 (SCL1 |sysfs ) in hi
gpio-4 (GPIO_GCLK |sysfs ) in hi
gpio-5 (GPIO5 )
gpio-6 (GPIO6 )
gpio-7 (SPI_CE1_N |spi0 CS1 ) out hi ACTIVE LOW
gpio-8 (SPI_CE0_N |spi0 CS0 ) out hi ACTIVE LOW
gpio-9 (SPI_MISO )
gpio-10 (SPI_MOSI )
gpio-11 (SPI_SCLK )
gpio-12 (GPIO12 )
gpio-13 (GPIO13 )
gpio-14 (TXD1 )
gpio-15 (RXD1 )
```

```
gpio-0 (ID_SDA )
gpio-1 (ID_SCL |sysfs ) in hi
gpio-2 (SDA1 |sysfs ) in hi
gpio-3 (SCL1 |sysfs ) in hi
gpio-4 (GPIO_GCLK |sysfs ) in hi
gpio-5 (GPIO5 )
gpio-6 (GPIO6 )
gpio-7 (SPI_CE1_N )
gpio-8 (SPI_CE0_N )
gpio-9 (SPI_MISO )
gpio-10 (SPI_MOSI )
gpio-11 (SPI_SCLK )
gpio-12 (GPIO12 )
gpio-13 (GPIO13 )
gpio-14 (TXD1 )
gpio-15 (RXD1 )
```