PiFace Digital

Getting started with PiFace Digital ...in less than 10 minutes!

PiFace Digital is a quick and easy way to connect your Raspberry Pi to the real world. Follow this guide and your Raspberry Pi will be reacting to switches and controlling motors and lights in less than ten minutes.

Features at a glance

- Plugs directly onto Raspberry Pi GPIO socket
- 2 changeover relays
- 4 tactile switches
- 8 digital inputs
- 8 open-col lector outputs
- 8 LED indicators
- Easy to program in Python, Scratch and C
- Graphical emulator and simulator

Attaching PiFace Digital to Raspberry Pi

PiFace Digital을 Raspberry Pi에 부착

PiFace Digital sits neatly above the Raspberry Pi and connects using the expansion connector. Take care to ensure all expansion pins are lined up with the holes on the PiFace socket. Check the alignment for left and right and front and back and never force the boards together if they don't slide smoothly.

PiFace Digital 은 라즈베리파이보드위에 바로 얹어서 부착한다. 핀이 모두 맞았는지를 확인하고 잘 들어가지 않을때는 서로가 맞지 않았는지 확인후 부착한다.

Installing the software

소프트웨어 설치

The fastest way to get started is to download a prepared operating system image and copy it to an SD card. Images are available from:

아래의 링크에서 소프트웨어를 SD카드로 다운로드하여 복사합니다.
http://pi.cs.man.ac.uk/download/

Alternatively, you can install the necessary libraries to your own Raspbian image with the instructions below.

또는 ,필요한 라이브러리를 당신의 RASPBIN image에 설치할 수 있습니다. 다음에 설명됩니다.

Installing the software manually in Raspbian

수동으로 Raspbian에 소프트웨어를 설치하기

PiFace Digital communicates with the Raspberry Pi using the SPI interface. The SPI interface driver is included in the later Raspbian distributions but is not enabled by default.

PiFace Digital은 SPI 인터페이스를 통하여 라즈베리파이와 소통합니다. SPI 인터페이스는 최신의 Raspbian distribution에 포함되어있으나 기본적으로 활성화 되어있지는 않습니다.

You can always enable the SPI driver, or you can load it by hand when required.
To always enable the SPI driver:

SPI 드라이버는 언제나 활성화 시킬수 있습니다. 다음과정을 수행하면 됩니다.

- After logging in, edit/etc/modprobe.d/raspi-blacklist.conf

By typing:

sudo nano /etc/modprobe.d/raspi-blacklist.conf

- Insert a hash (#) at the start of the line blacklist spi-bcm2708

It should read:

#blacklist spi-bcm2708

Alternatively, to load the SPI driver by hand (will not be loaded on reboot):

- Type in a terminal:

sudo modprobe spi-bcm2708

Next, you we need to install the PiFace Digital libraries and change the permissions of the SPI interface. The following script automates this into one command.

To install and setup the software, ensure your Raspberry Pi can access the internet and type:

sudo apt-get update
wget -0 - http://pi.cs.man.ac.uk/download/install.txt | bash

The software will complete installing in a few minutes.
Reboot your Raspberry Pi by typing:

sudo reboot

Testing

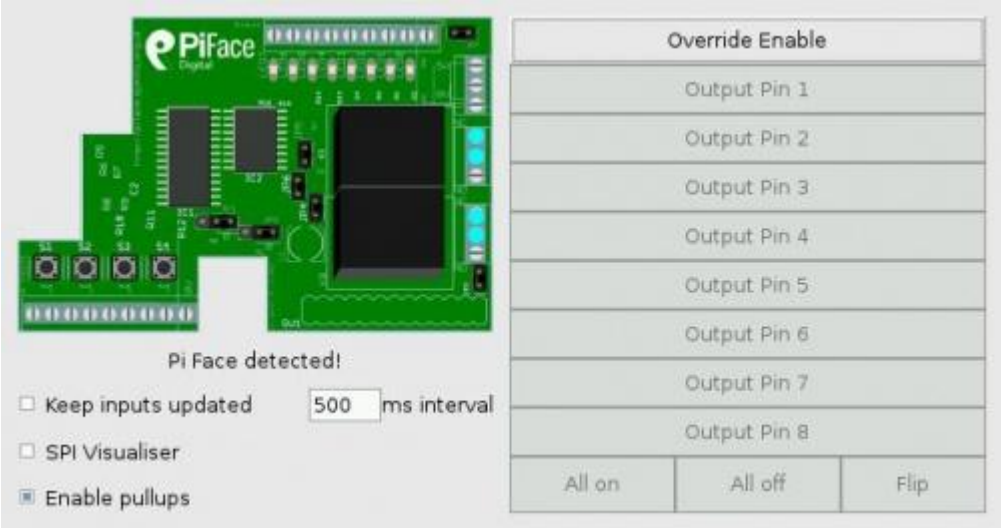
After installing the software and restarting, login and type startx to launch the desktop environment.
소프트웨어를 설치후 재식작,로그인 한후 다음을 타이핑하여 데스크탑환경을 시작하세요

Start the PiFace emulator by typing in a terminal:

piface/scripts/piface-emulator

Outputs

We want to manually control the outputs, so in the PiFace Emulator window, click
출력을 수동으로 콘트롤하고져하면 PiFace Emulator window 에서 아래를 클릭하세요
Override Enable.



Toggle **Output Pin 1** on by clicking on it. The PiFace interface will click as the relay turns on and the corresponding LED will illuminate. Notice the graphic onscreen updates to show the LED being on, the contacts have changed over on the relay and the first output pin is on.

Output Pin 1 을 클릭하면 토글됩니다. 즉 릴레이를통하여 관련된 LED 를 켜줍니다.온스크린 그래픽은 LED 가 켜진 것을 보여줍니다.

The LEDs are in parallel with the outputs terminal connectors and indicate when the output is enabled.
LED는 출력단자와 수평적으로 연결되어서 해당단자가 ENABLE되었다는 것을 보여줍니다.

Inputs

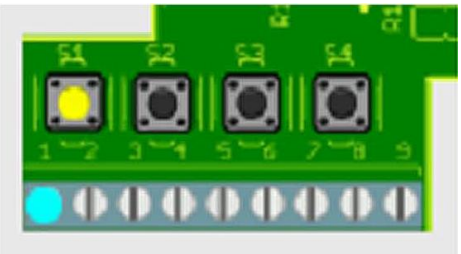
We want to observe the inputs so click **Keep inputs updated** checkbox so the emulator reads the buttons and updates the screen. The interval sets how often the inputs are read, for most cases, it is fine to leave it on 500 ms.

Keep inputs update를 선택하면 emulator는 선택된 주기만큼 입력을 읽을수 있습니다. 가장 정교

한 단위는 500ms 입니다.

Press one of the tactile buttons on the bottom left of PiFace. Notice how the on-screen representation changes to indicate the switch has been pressed.

왼쪽바닥부분의 택트 스위치를 누르면, 선택된 스위치를 온스크린상에 표시하여줍니다.



First steps with Python

아래는 Piface를 Python과 함께사용하기위한 첫 단계입니다.

To use Piface with Python import the piface.pfio module:

import piface.pfio

Before use, the board must be initialised with a call to **initQ.**

There are three main functions to control the interface:

• **digital_read(pin_number)**
returns 1 or 0 depending on the state of the input numbered pin_number

• **digitaiMfl/riteCpinjiumberj state)**
sets the output numbered pin_number to state 0 or 1. State 1 turns the LED on and enables to open collector to sink current

• **digital_write_pullup(pin_numberJ state)**
sets a 10k pullup on input numbered pin_number to be state 0 or 1. State 1 is pullup enabled

Simple Python examples

간단한 Python예제

1. Controlling an output (turn a relay on)

To turn the relay on function as shown below. If a button is pressed the function returns a 1, otherwise it returns a 0.

Start a new python interpreter and type the following:

```
import piface.pfio as pfio
pfio. initQ
pfio.digital_read(l)
```

2. Flashing a LED

```
from time import sleep
import piface.pfio as pfio
pfio. initQ
while(True):
    pfio.digital_write(0.,l) #turn on
    sleep(l)
    pfio.digital_write(0.,0) #turn off
    sleep(l)
```

3. Reading an input

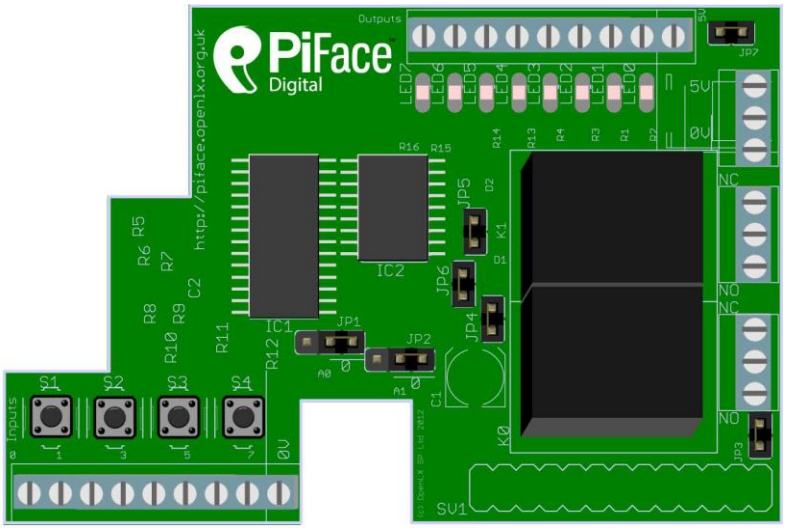
To read the state of an input use the **pfio.digital_read(pin)** function as shown below. If a button is pressed the function returns a 1, otherwise it returns a 0.

1. Start a new python interpreter and type the following:

```
import piface.pfio as pfio
pfio.initQ
pfio.digital_read(1)
```

2. Python prints 0.
3. Hold down switch number **1** (marked **SI)** and type **pfio.digital_read(l)** again.
4. Python prints 1.

Tour of the PiFace Digital / **PiFace Digital둘러보기**



Input ports

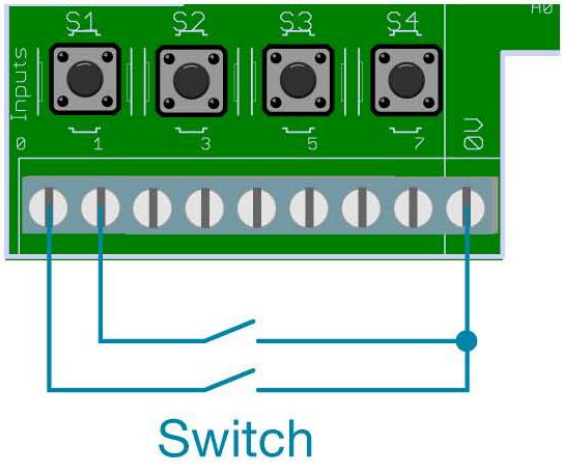
입력단자들

The 8 inputs are found on the bottom left of the board and are used to detect if a switch or contact is open or closed. An input will register if the input pin is connected to 0V. The inputs are numbered 0 to 7 from left to right. The right most pin is 0V.

왼쪽아래부분에 8 개의 입력단자가 있으며 스위치 또는 접점이 열리고 닫힌 것을 감지하는데 사용됩니다.입력단자가 0V 에 연결되어지면 입력이 등록됩니다. 입력단자는 왼쪽부터 0 에서 7 까지 넘버링되어 있습니다. 가장오른쪽은 0V 입니다.

The four switches, numbered S1 to S4 are connected in parallel to the first four (0-3) inputs)

example connection:



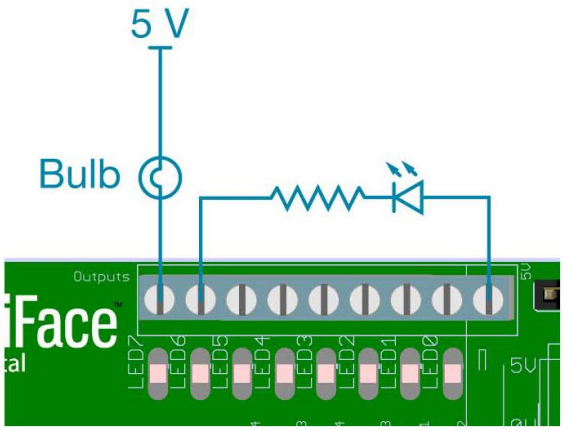
Output ports

출력단자들

The 8 open-collector outputs found at the top of board can be used to control devices, such as lights motors or relays. Because the outputs are 'open-collector', they do not output any

voltage, instead they enable or disable current to flow to ground. This gives greater flexibility as different outputs can control devices that operate at different voltages (since the PiFace doesn't supply the voltage). An open-collector can be thought of as a switch that connects the output pin to ground, and so the circuit must be constructed taking this into account.
8개의 오픈컬렉터 출력단자는 보드의 상단에 위치하며 조명장치,모터 또는 릴레이를 콘트롤하는데 사용됩니다.출력단자는 오픈-컬렉터 타입으로 어떻한 전압도 출력되지 않으며, 대신에 전류를 이용하여 스위칭하게됩니다. 이방식은 대단히 유용한데 서로다른 전압에서 동작하는 다양한 장치를 콘트롤할 수 있습니다(이유는 PiFace는 전압을 공급하지 않습니다) 오픈-컬렉터는 출력핀이 접지단자로 연결되는 스위치로 생각할 수 있으며, 회로는 이와 같은 방식으로 구성되어야합니다.

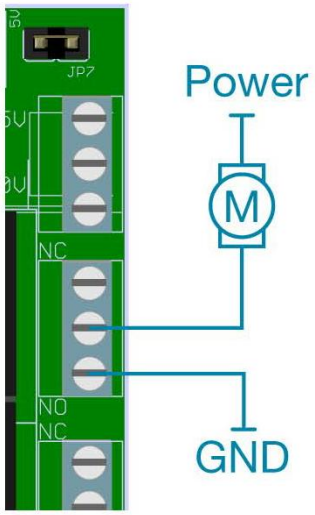
N.B. If the outputs are to be used for devices that operate at greater than 5V then jumpers must be set appropriately to avoid damage.
많일 출력이 5V이상에서 동작하는 장치를 위하여 사용되어진다면, 손상을 방지하기위하여 적당한 점퍼 세팅을 해주여야합니다.
example connection:



Relay outputs

릴레이출력

There is a changeover relay in parallel with the first two outputs. The bottom set of three contacts correspond to the relay connected to output 0 and the top set to output 1. For each set, the centre terminal is common, the top being normally closed and the bottom being normally open. i.e. when the relay is off the centre terminal is connected to the top terminal, and when the output is enabled, the relay changes over so that the centre terminal is connected to the bottom terminal.
N.B. The relays may be deactivated by removing the appropriate jumper as detailed in Jumper settings.
릴레이는 점퍼를 제거하면 비활성화 될수있습니다.



Power Connections

전원 연결

PiFace has flexible power configurations. PiFace requires 3.3 V to supply the integrated circuit (which requires negligible current), which it always takes from the Raspberry Pi. The relays require 5V to operate. The output connector block contains a terminal, which is used to supply power, which by default supplies 5 V.

PiFace 는 IC 에 전원을 공급하기위하여 3.3v 가 필요하며, 이것은 항상 라즈베리파이 본체로부터 옵니다. 릴레이는 동작을 위하여 5V 가 필요합니다.터미널단자가 포함된 출력단블럭은 전원을 공급하는데 사용되며 기본적으로 5V 입니다.

N.B. As discussed in the Output ports section PiFace does not supply power on its open-collector output pins or relay contacts.

출력포트 관련자료에서 논의되었듯이 PiFace 는 오픈-컬렉터 출력핀 또는 릴레이 접점에 전원을 공급하지 않습니다.

Piface can be configured to operate on an independent 5V power supply, or be connected to the Raspberry Pi 5 V pin. In this case it can take power from the Raspberry Pi, or supply the Raspberry Pi with 5 V.

Piface 는 독립적은 5v 전원공급으로 동작하도록 구성할 수 있습니다. 또는 라즈베리파이의 5V 핀에 연결할 수도 있습니다. 이경우는 라즈베리파이로부터 전원을 공급받거나 또는 5v 를 라즈베리파이로 공급할 수 있습니다.

The top set of terminals on the right of the board is used to supply or take power, with the top pin being 5 V and bottom two ground. In many applications these do not need to be connected to anything, as the PiFace will be powered by the Raspberry Pi. These terminals may be unsoldered and replaced with a barrel jack by the user.

보드 위쪽의 오른쪽부분의 전원입력단자(Power input)는 5v전원을 공급하거나 공급받는데 사용됩니다.(윗쪽의 핀이 5v이고 아래쪽이 접지입니다). 많은 경우에 이 전원입력단자는 필요치 않습니다. 이유는 라즈베리파이의 전원을 사용합니다. 이 터미널은 제거가능합니다.

Using Multiple PiFaces

More inputs and outputs can be provided by stacking multiple PiFace interfaces using an appropriate connector (e.g. PiFace PiRack). To distinguish between interfaces a different address must be set (see section Jumpers).

Jumpers

In most cases all the jumpers can be left in place. 대부분의 경우 점퍼는 기존데로 사용하면됩니다.

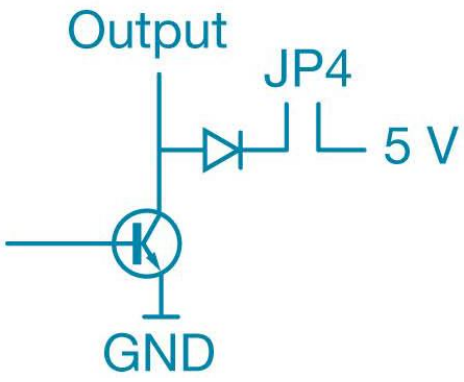
• JP1 and JP2 set the address of the board to enable multiple boards to be used together. The default is board address 0.

Board Number	JP1	JP2
0	0	0
1	1	0
2	0	1
3	1	1

• JP3 connects to 5 V rail on Raspberry Pi. With it, Raspberry Pi can be powered from the 5V connection on the PiFace, or the PiFace can be powered from the Raspberry Pi.

• JP4 connects the snubber diodes from the ULN2803A to 5 V (snubber diodes protect the driving transistors from the high voltages that occur when a coil e.g. a relay turns off). However, if the open-collectors are connected to > 5 V, these must be disconnected (else the diodes will conduct between the outputs and 5 V)

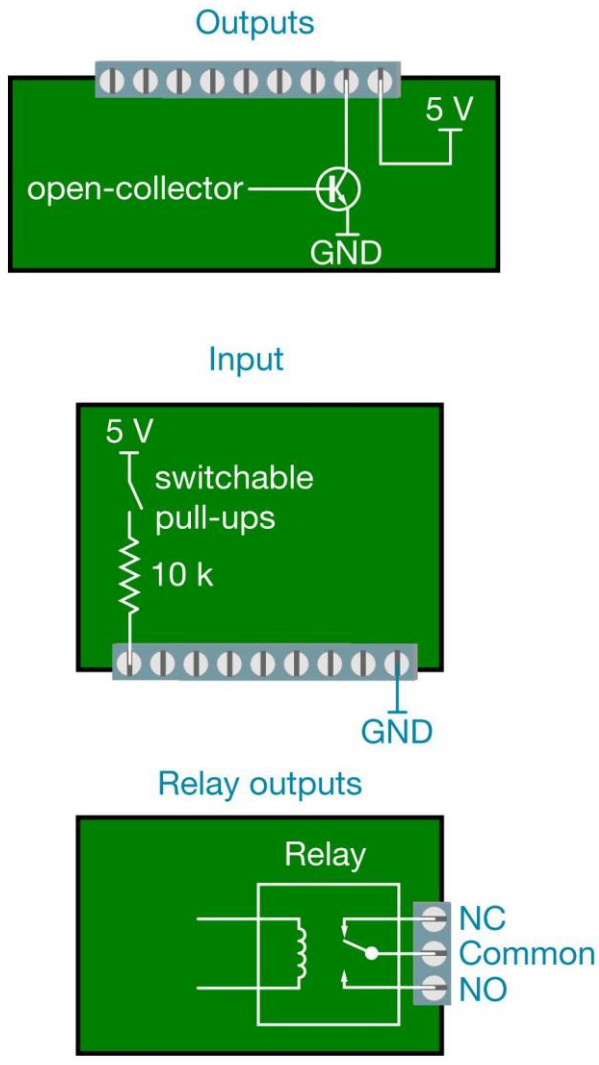
Snubber diode and jumper (JP4) circuit:



• JP5, JP6 are used to disconnect the relays (remove the jumpers to disable). This is useful if you just want to use the open collectors outputs.
• JP7 can be used to disconnect the power to all onboard outputs (i.e. disable the relays and leds).

Equivalent Circuits

The equivalent circuits for inputs and outputs on the PiFace can be expressed as shown;



PiFace Digital Home page

http://pifacedigital.wordpress.com/