

WIFI8020 - 20 Relays at 16A, 8 Analogue Inputs

Technical Documentation



Overview

The WIFI8020 provides 20 volt free contact relay outputs with a current rating of up to 16Amp each and 8 analogue inputs. The module is powered from a 12vdc supply which can be regulated or unregulated. The DC input jack is 2.1mm with positive core polarity, DC supplies are required to supply at least 1A at 12vdc. The relays are SPCO (Single Pole Change Over) types. The normally open, normally closed and common pins are all available on the screw terminals. The Relays on the WIFI8020 can be controlled from the inputs on the WIFI484. This offers the opportunity to construct a system where an input can control an output anywhere on the earth provided both locations are connected to the network/internet.

Operating Temperature

-20C to +70C

LED Indication

The WIFI484 provides an LED to indicate each of the relay states and three for board status, these are:

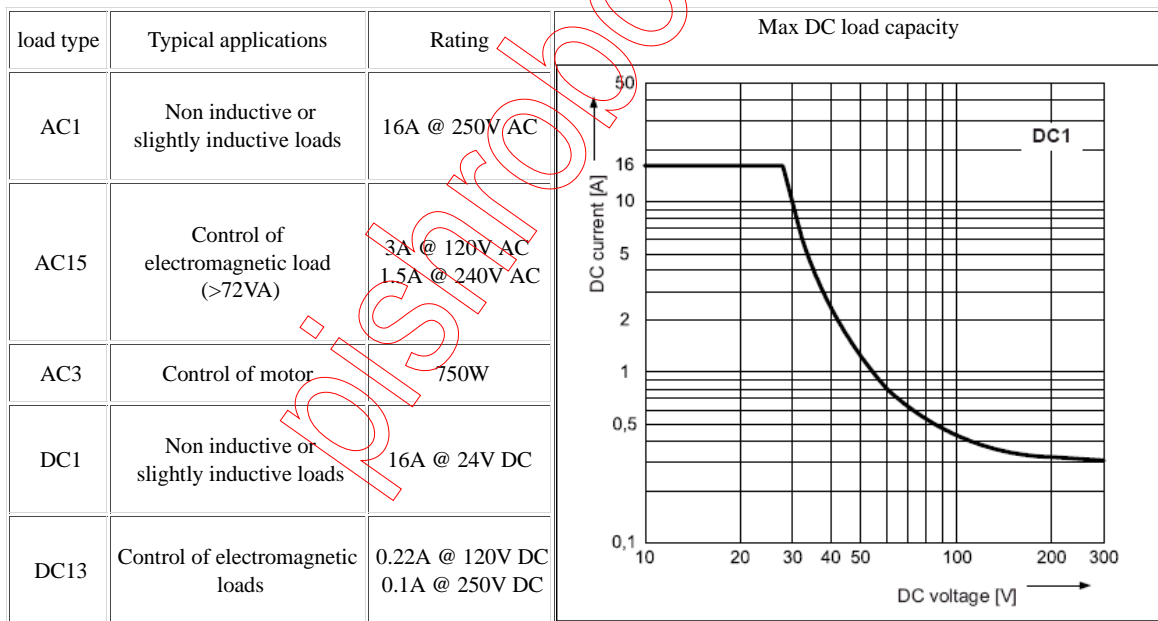
Board power - red LED

WIFI connected - yellow LED

USB connected - green LED

Relay Power Rating

If the contact load voltage and current of the relay are in the region enclosed by the solid and dotted lines in the figure below, the relay can perform stable switching operation. If the relay is used at a voltage or current exceeding this region, the life of the contacts may be significantly shortened.

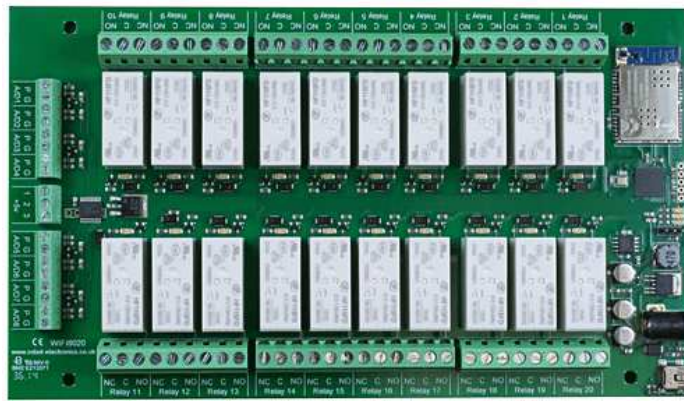


A full datasheet for the relays used on the WIFI8020 is here: [HF115FD datasheet](#)

Connections

Analogue input 16A Volt Free Contacts, Normally Connected, Common, Normally Open

P = Analogue Input (0-5v)
 G = 0v ground
 5v dc output
 P = Analogue Input (0-5v)
 G = 0v ground



12v dc 2.1mm jack (+ve core)
 USB Configuration

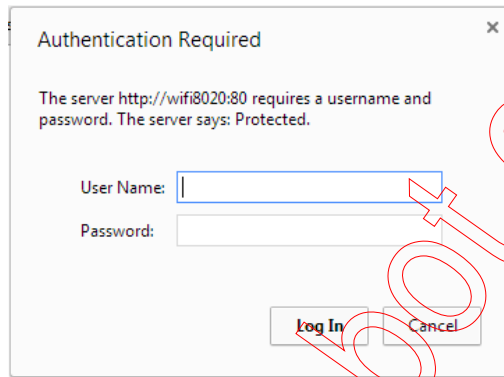
16A Volt Free Contacts, Normally Connected, Common, Normally Open

Connection of the WIFI8020 to your network

The WIFI8020 is configured to connect to your network by means of a USB connection and configuration program. For Windows the guide page and program is [here](#) An Apple Mac version is also available [here](#)

First Test

Having plugged in your 12vdc power supply and Ethernet connection, start up your web browser and type **http://WIFI8020** into the address bar, please note this only works in windows. You will be prompted for a password as shown below:



The default login is:
 Username: admin
 Password: password

The ability to change these settings is shown in the configuration section

You should now see the following web page:

WIFI8020 Test Application

Below you will see the current status of the WIFI8020 board, Relay1 is on the right hand side. Click the bullets to toggle the relays or turn change the output states on the board.

The status is updated in real time. You will see this page automatically update when changing states with commands over TCP/IP.

Firmware V4	Module Id 24	Technical Documentation	
Hardware V1	input voltage 12v	Configuration	

ADC1 1023
ADC5 1023

ADC2 1023
ADC6 1023

ADC3 1023
ADC7 1023

ADC4 1023
ADC8 1023

Relays: (click to toggle)

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This web page will allow you to switch the relays on and off by clicking the relay buttons (the red/gray circles). It also contains a link to this technical documentation page.

Configuration

By clicking the configuration link it's possible to configure the WIFI8020 IP address and subnet mask together with the ability to set a password for entry to control screens. Gateway address and DNS address is configurable and is used with mapped inputs which are described in section below. The configuration page also offers the option to set a password that will be required to change any of the relay states or digital outputs using TCP IP commands, this is explained in the TCP/IP password section.

All settings are saved to memory so be careful to remember the username and password! Default password settings are shown in the picture below.

Board Configuration

This section allows the configuration of the board's network settings.

CAUTION: Incorrect settings may cause the board to lose network connectivity.

MAC Address	00:1E:C0:14:8C:83
Host Name	WIFI8020
<input type="checkbox"/> HTTP authentication	
Username:	admin
Password:	password
Port	17494
<input checked="" type="checkbox"/> Enable DHCP	
IP Address	192.168.0.15
Subnet Mask	255.255.255.0
<input type="checkbox"/> TCP/IP Password	password
<input type="checkbox"/> Latched outputs	
<input type="button" value="Save Config"/>	

Factory Reset

Should it be necessary to reset the WIFI8020 to its shipped condition then the end two contacts of the row of 5 holes near the large chip on the side nearest the Ethernet connection must be shorted together at board power up. Keep the pins shorted until the green power LED starts to flash, this will take up to 5 seconds. The green LED will flash as the settings are reset, please wait until the LED finishes flashing and do not remove power during this period.

Firmware Updates

The firmware is fully updateable by re-flashing the board using our custom windows program. Section will be updated when feature updates are available.

WIFI8020 Command Set

The command set designed to provide consistent expansion and new features, they are sent over TCP/IP on port 17494 (0x4456). This is the default port, it can be changed in the configuration settings.

Five connections are allowed at any one time, these are independently protected but all using the same password as defined in the board configuration.

Command		Action
dec	hex	
16	10	Get Module Info - returns 3 bytes. Module Id (24 for WIFI8020), Hardware version, Firmware version.
32	20	Digital Active - follow with 1-20 to set relay on, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent Board will return 0 for success, 1 for failure
33	21	Digital Inactive - follow with 1-20 to turn relay off, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent Board will return 0 for success, 1 for failure
35	23	Digital Set Outputs - follow with 3 bytes, first byte will set relays 1-8, All on = 255 (0xFF), All off = 0, 2nd byte for relays 9-16, 3rd byte for relays 17-20 Board will return 0 for success, 1 for failure
36	24	Digital Get Outputs - returns 3 bytes, the first corresponds with relays 1-8, 2nd byte for relays 9-16, 3rd byte for relays 17-20
37	25	Digital Get Inputs - returns 4 bytes, the first three bytes are always 0, the 4th bytes bits correspond with the 8 digital inputs, a high bit meaning input is active (driven low)
50	32	Get Analogue Voltage - follow with 1-8 for channel and WIFI8020 will respond with 2 bytes to form an 16-bit integer (high byte first)
58	3A	ASCII text commands (V4+) - allows a text string to switch outputs, see section below
119	77	Get Serial Number - Returns the unique 6 byte MAC address of the module.
120	78	Get Volts - returns relay supply voltage as byte, 125 being 12.5V DC
121	79	Password Entry - see TCP/IP password
122	7A	Get Unlock Time - see section below
123	7B	Log Out - immediately re-enables TCP/IP password protection

Digital Active/Inactive Commands

These are 3 byte commands:

The first byte is the command, 32 (active means on) or 33 (inactive).

Second byte is the relay number.

Third byte is the on time. Set this to zero for un-timed operation, or 1-255 for a pulse in 100mS intervals (100mS to 25.5 seconds).

For example:

0x20 - turn the relay on command

0x03 - relay 3

0x32 (50) - 5 seconds (50 * 100ms)

Board will return 0 for success, 1 for failure

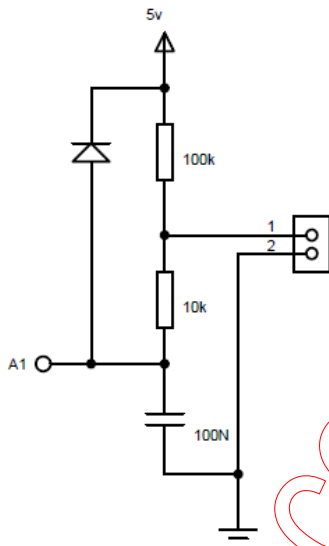
Note - All bytes in a command must be sent in one TCP/IP packet.

Digital inputs

The 8 analogue inputs are used to create 8 digital inputs. When you request digital inputs a threshold is applied to the 8 analogue inputs. Above 3v will read as low (inactive), below 2v will read as high (active). The region from 2v to 3v is the hysteresis and does not change the previous reading. There are weak pull-up resistors on the inputs which are designed to allow you to directly connect a VFC (Volt Free Contact). This could be from other relay contacts, thermostat contacts, alarm contacts etc. When the contacts are closed the input will read as active. In fact anything that pulls the input pin down to 0v will read as active. Do not think of the inputs in terms of a high or low voltage input. Think of it in terms of Active (or on, something is actively driving the input), or inactive (or off, nothing is driving the input). Command of 0x25 returns 4 bytes. The first 3 bytes are always 0. The 4th byte returned will be encoded with each bit corresponding to whether the input is active or inactive. A high bit means the pin is being pulled low (active) by an external device pulling low. Bit 0 represents AD1 through to bit 7 (AD8). For example 0xED (11101101) would mean inputs AD2 and AD5 were active.

Analogue Inputs

Eight (8) analogue inputs of 0v-5V at 10-bit resolution are provided. The conversion is performed when you send the "Get Analogue Voltage" command 0x32 and the channel number. The resulting 16 bit integer will be transmitted back in two bytes (high byte first), combine these for the result. The 10-bit conversion will be in the lower 10 bits of the 16 bit integer with the upper 6 bits being 0. There is a 5v supply available on the 3-pin terminal block between the analogue inputs .



Representative Analogue Input Schematic.

TCP/IP Password

If this option is enabled in the http configuration page then a password will be required to be entered before relay states can be changed. In the following example the password was set to "apple":

0x79 - 1st byte in frame sent to WIFI8020 to indicate password entry

'a' (0x61) - 2nd byte in frame (ASCII hex equivalent in brackets, full table is available at <http://www.asciitable.com/>)

'p' (0x70) - 3rd byte in frame

'p' (0x70) - 4th byte in frame

'l' (0x6C) - 5th byte in frame

'e' (0x65) - 6th byte in frame

These 6 bytes are then transmitted in the same transaction to the WIFI8020 and if the password is correct then 1 will be transmitted back, a failure will send 2.

The board will now accept changes from the device that entered the password. If communication becomes idle for more than 30 seconds then the password protection is re-enabled. There is also a log-out command of 0x7B to enable the protection immediately.

Get Unlock Time

Returns TCP/IP password protection status:

0 - password protection is enabled and password entry is required before changes can be made

1 to 30 - seconds until TCP/IP password protection is re-enabled. All authorised commands set the timer back to 30 seconds (including this one).

255 - TCP/IP password is not enabled.

ASCII text commands DOA and DOI (V4+ firmware needed)

Following customer request we have added a feature that allows the outputs to be switched using an ASCII string, devices like a Mobotix camera can now switch relays with simple strings.

The string for activating output 1 for 5 seconds is formatted using comma separated variables with the following syntax:

":DOA,1,50,password"

To break this down ":" (hex 3A) at the start of the string indicates that there is an ASCII message to follow, "DOA" is digital output active, "1" is the output number, then "50" for 5 seconds (50x100ms) and finally the TCP password (if applicable).

If I wanted to make output 2 inactive for 3 seconds I would use:

":DOI,2,30,password"

To break this down ":" (hex 3A) at the start of the string indicates that there is an ASCII message to follow, "DOI" is digital output inactive, "2" is the output number, then "30" for 3 seconds (30x100ms) and finally the TCP password (if applicable).

Assuming no password is used the previous command would simply be:

":DOI,2,30 "

HTML commands DOAx and DOIx (V4+ firmware needed)

Another customer requested feature, allowing the digital outputs to be switched by the http get function such as used in some voice over ip phones (VOIP). You can use the http get function to write to the io.cgi file with the following syntax:

192.168.0.200/io.cgi?DOA2=10

This would use the default address (192.168.0.200) and make output 2 active for 10 seconds.

Another example would be to set output 1 inactive for 10 seconds:

192.168.0.200/io.cgi?DOI1=10

You can test these functions by typing them directly into the address bar of most internet browsers. Also be aware that you may need to disable http authentication in the http configuration if your control device does not support it.

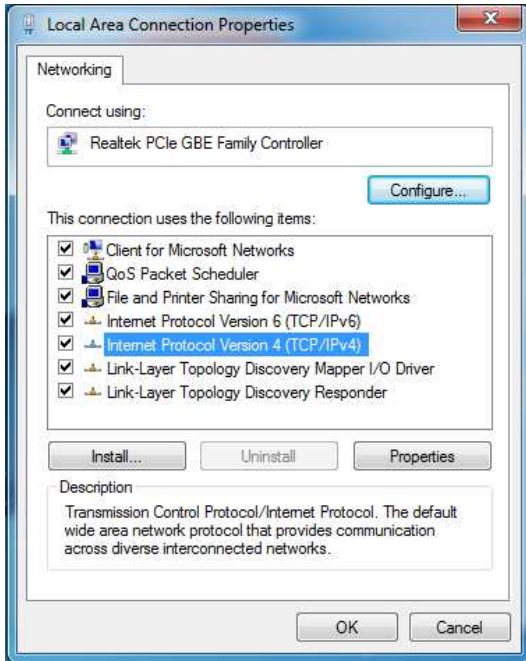
IP Addresses & DHCP Servers

The easiest way to use the WIFI8020 is to connect it to a network with a DHCP server. In this case the WIFI8020 will have its IP address assigned automatically by the DHCP server.

If there is no DHCP server on the network, then a fixed IP address of 192.168.0.200 is used. To control the WIFI8020 using this fixed IP address your computer MUST be on the same subnet.

The next step is to set your computers IP address to 192.168.0.x where x is in the range of 1 to 255 but not 200 (the WIFI8020 is there!) or any other used IP addresses on the network.

The subnet mask dictates what IP addresses the PC can communicate with, we set this to 255.255.255.0 so the PC can talk to any module with an IP address of 192.168.0.x



This image is for a PC running Windows 7.

To get to the TCP/IP properties screen, go to:

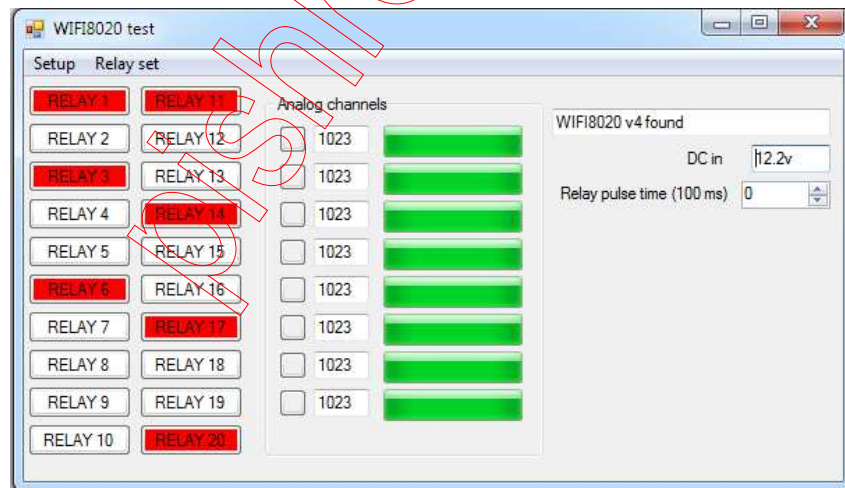
Control Panel->Network and Sharing Center->Local Area Connection->Properties.

Select Internet Protocol Version 4(TCP/IPv4) from the scroll box and click Properties.

That gets you to the dialog box shown left.

Test program and example source code

To get the WIFI8020 up and running in the minimum amount of time we have put together an example program to demonstrate the functionality of the module. We provide the full source code for this program. You may examine this code to see how it works or use it as a starting point for your own application.



Visual studio express C# examples

The test program is available as Visual C# express ready built installation files [here](#), or as Visual C# express project with source files [here](#).

Visual studio express is provided free from Microsoft: <http://www.microsoft.com/exPress/download/>

Access from the Internet (Port forwarding)

The WIFI8020 can be controlled over the internet almost as easily as on your local network. Your network will most likely be connected to the internet with a broadband router. This will provide NAT (Network Address Translation) and Firewall services. To access the WIFI8020 from the internet you will need to open up port 17494 (0x4456) to allow incoming TCP connections. Be careful not to open up any other ports. There are a wide variety of routers and we cannot give details for all of them. If in doubt ask your system administrator for assistance. The following shows how to open up a port on a Netgear WNR2200 router

ADVANCED Home

Setup Wizard

WPS Wizard

▶ Setup

▶ USB Storage

▶ Security

▶ Administration

▼ Advanced Setup

Wireless Settings

Wireless Repeating Function

Port Forwarding / Port Triggering

Dynamic DNS

Static Routes

Remote Management

USB Settings

UPnP

IPv6

Traffic Meter

Ports - Custom Services

Cancel

Apply

Service Name:

Protocol:

External Starting Port: (1~65534)

External Ending Port: (1~65534)

Use the same port range for Internal port

Internal Starting Port: (1~65534)

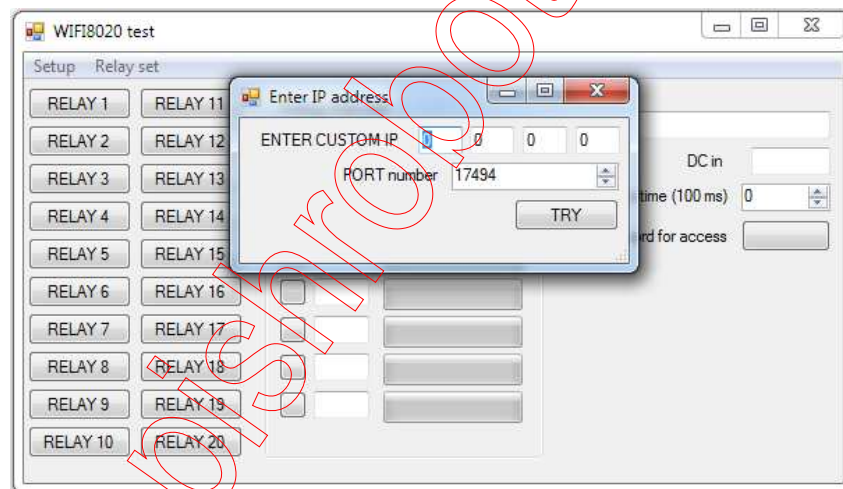
Internal Ending Port:

Internal IP address: . . .

Or select from currently attached devices

	IP Address
<input type="radio"/>	192.168.0.101
<input type="radio"/>	192.168.0.106
<input type="radio"/>	192.168.0.100
<input type="radio"/>	192.168.0.58
<input type="radio"/>	192.168.0.3
<input type="radio"/>	192.168.0.104
<input type="radio"/>	192.168.0.105
<input type="radio"/>	192.168.0.130
<input type="radio"/>	192.168.0.107
<input type="radio"/>	192.168.0.102

When applied you should now be able to talk to the router over the internet at the IP address designated by your internet provider. When a data packet arrives on port 17494 the router will pass the packet on to the local address on the network (192.168.0.93) on port 17494.



To test this you will need a computer that has its own internet connection and is NOT connected to the same network as the WIFI8020. Download and run the [test program](#) above and select Custom IP. In the pop-up box enter your routers internet facing IP address. Click on "Try IP" and it will connect you to the WIFI8020 just as if it were on your own network.

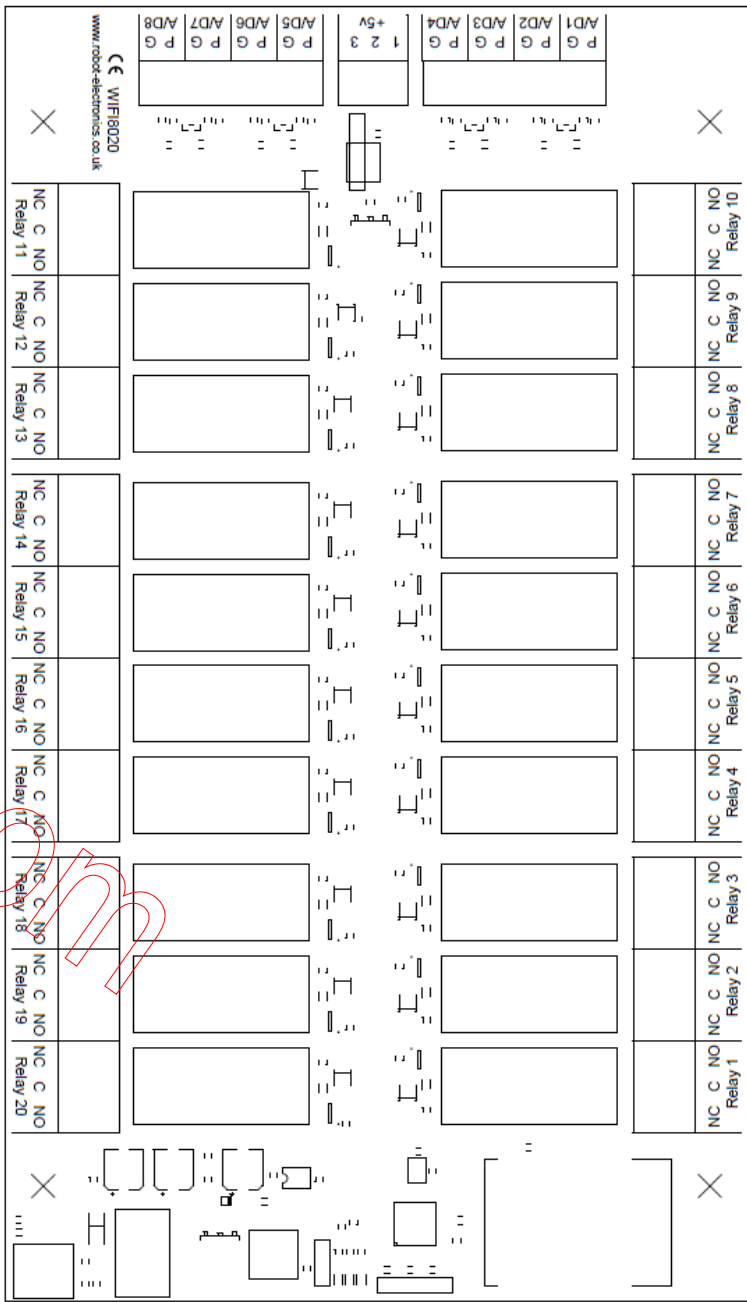
Android & iPhone Apps.

We have a free app **IO network** available for Android and iPhone to remotely control your relays, download from Google Play or iTunes. Search for "Devantech" and you will find the app.

Board dimensions

pishrobot.com

6.35mm (0.25") 110.49mm (4.35") 6.35mm (0.25")



16.51mm (0.65") 100.33mm (3.95")

19.05mm (0.75") 176.53mm (6.95") 19.05mm (0.75")

CE W1F18020
www.robo-electronics.co.uk