

ETH8020 - 20 Relays at 16A, 8 Analogue Inputs



The ETH8020 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 theETH8020 can be controlled from the inputs on the ETH484. 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.

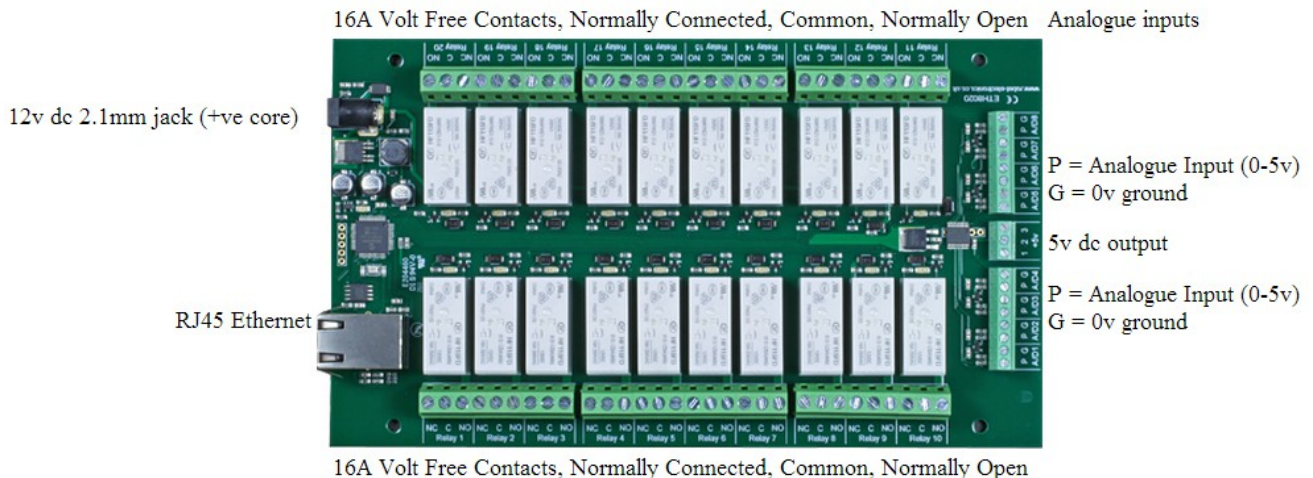
Operating Temperature

-40C to +70C

LED Indication

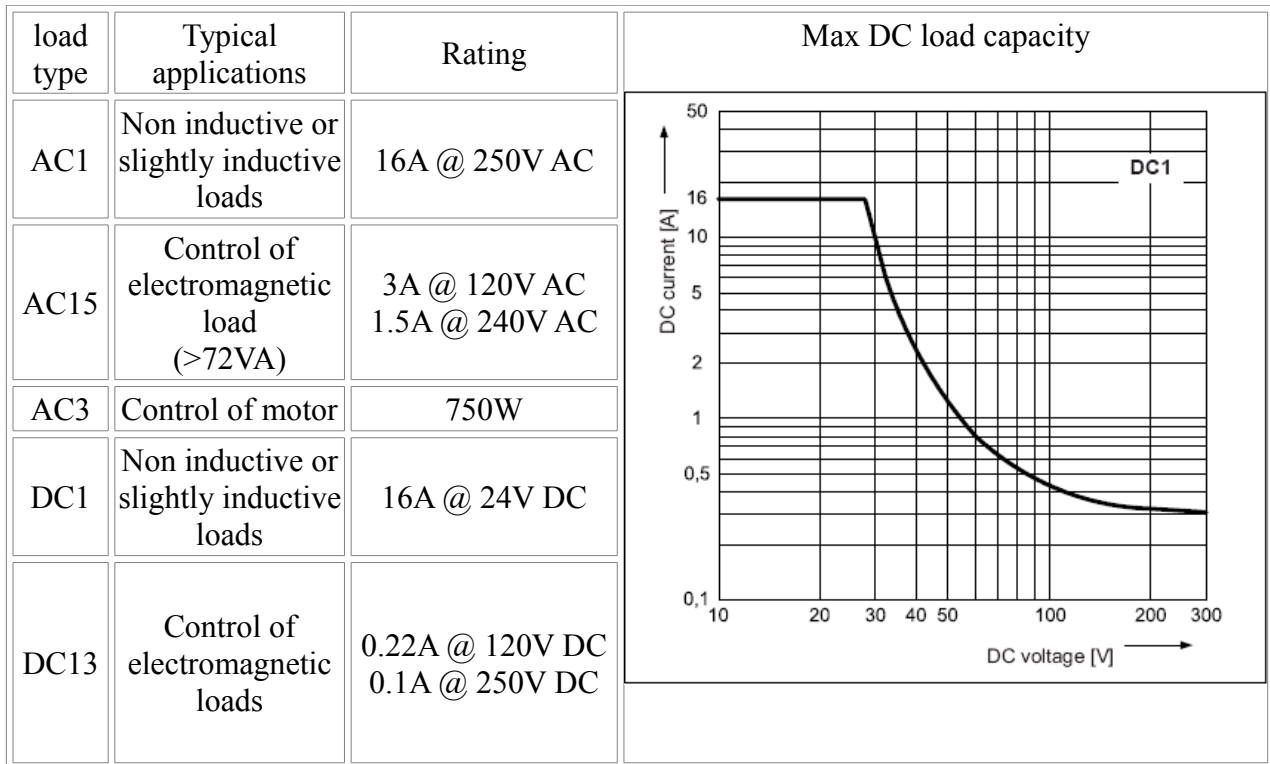
The ETH8020 provides a red LED mounted immediately next to each relay to indicate whether it is in a powered state (LED on), there is also two LED's mounted in the Ethernet connector which will flash with Ethernet traffic. Finally there is a green power LED next to the processor.

Connections



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.



First Test

Having plugged in your 12vdc power supply and Ethernet connection, start up your web browser and type <http://ETH8020> 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:

ETH8020 Test Application

Below you will see the current status of the ETH8020 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 V1	Module Id 21	Technical Documentation
Hardware V1	input voltage 12v	Configuration

ADC1 1023	ADC2 1023	ADC3 1023	ADC4 1023
ADC5 1023	ADC6 1023	ADC7 1023	ADC8 1023

Relay's: (click to toggle)

Copyright © 2013 Devantech Ltd.

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 ETH8020 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. Thealso 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.

Version 2 now offers a latched outputs option, this will automatically save any permanent output changes (not pulsed) and restore them following power loss.

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	00:04:A3:48:F8:5E
Host Name	ETH8020
Username:	admin
Password:	password
Port	17494
<input checked="" type="checkbox"/> Enable DHCP	
IP Address	192.168.0.4
Subnet Mask	255.255.255.0
Gateway address	192.168.0.1
DNS address	192.168.0.1
<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 ETH8020 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.

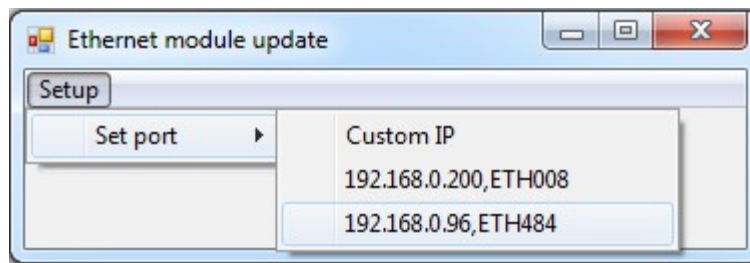
Firmware Updates

The firmware is fully updateable by re-flashing the board using our custom windows program. The updates currently available are:

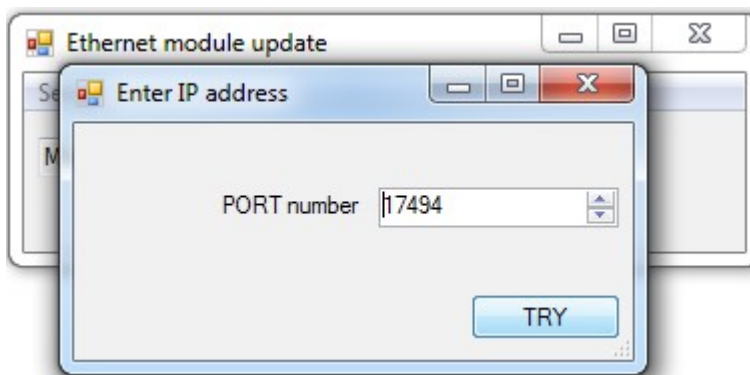
V2 - 07/02/2014 - DNS and Gateway string lengths corrected in http config page, new latching function added to config and board name now appears correctly on NBNS (WINS) meaning routers display board name.

Using the Ethernet module update:

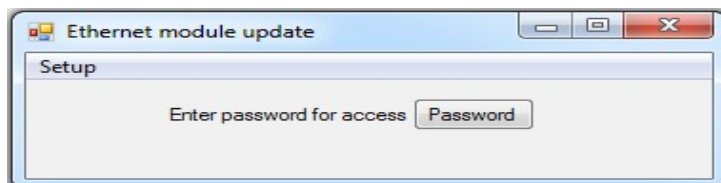
First you need to connect to the board, the program will scan the local network and provide any boards in a list that it can see.



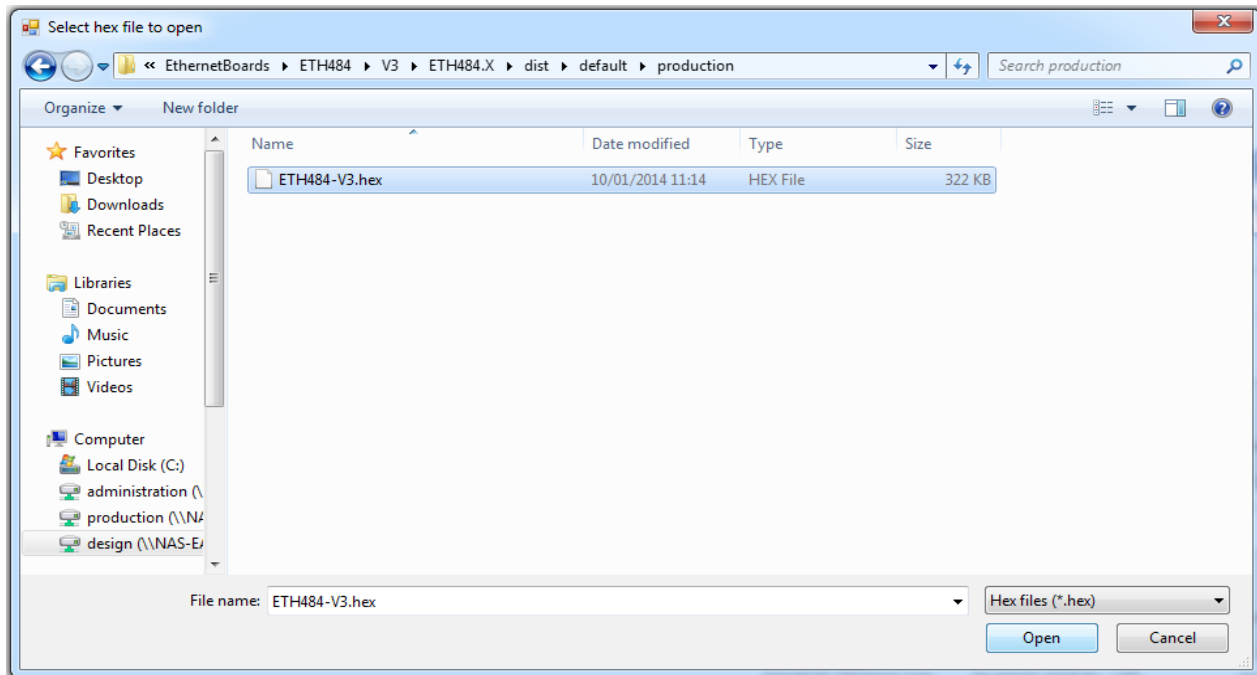
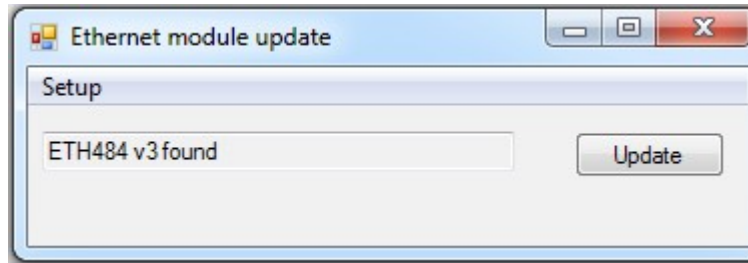
Next you will need to specify what port the board is located on, this will be 17494 unless you have changed it in the settings.



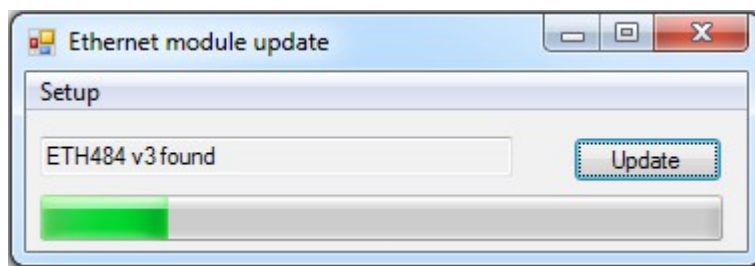
If there is a TCP/IP password the program will require it to be entered by clicking the password button.



Following a successful connection you will now be able to click the update button to select a file



Once the file has been opened the programming sequence will now begin, it's fairly short and following it's completion the board will reset (automatically) and the LED will flash quickly while the programming sequence completes. Do not turn the power off in this sequence.



ETH8020 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 (21 for ETH8020), 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 ETH8020 will respond with 2 bytes to form an 16-bit integer (high byte first)
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.

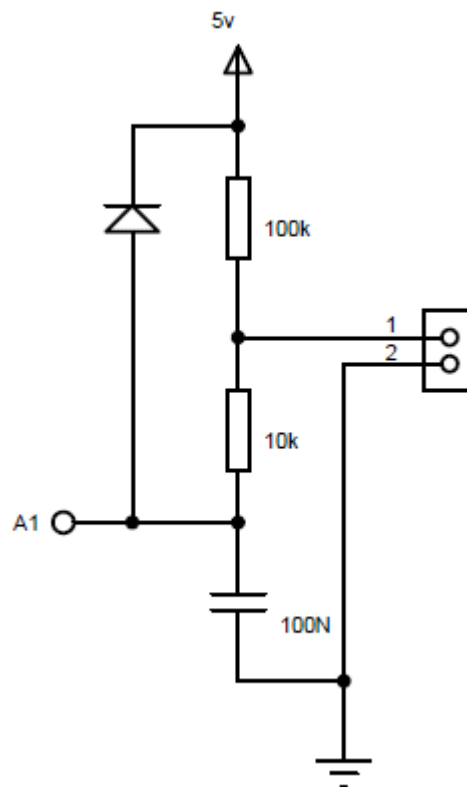
Digital inputs

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 two bytes 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.

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 ETH8020 to indicate password entry
- 'a' (0x61) - 2nd byte in frame
- '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 ETH8020 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.

IP Addresses & DHCP Servers

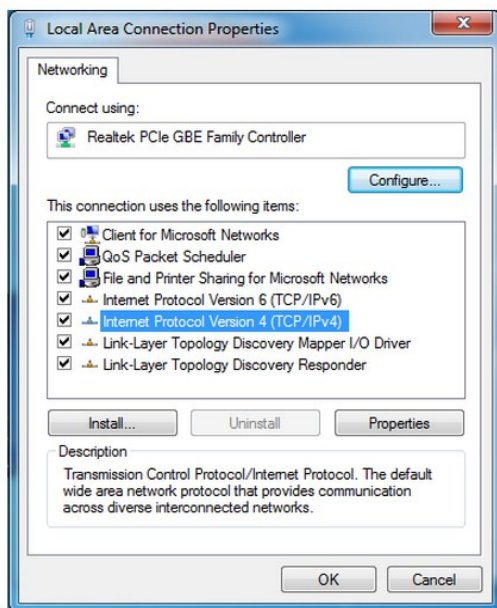
The easiest way to use the ETH8020 is to connect it to a network with a DHCP server. In this case the ETH8020 will have its IP address assigned automatically by the DHCP server.

If there is no DHCP server on the network, then a fixed IP address of 192.168.0.200 is used. To control the ETH8020 using this fixed IP address your computer MUST be on the same subnet.

The next step is to set your computer's IP address to 192.168.0.x where x is in the range of 1 to 255 but not 200 (the ETH8020 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

The default gateway is likely to be the IP address that the internet connection is located at and the DNS server can be either your router address or google provide a DNS service at 8.8.8.8..



This image is for a PC running Windows 7.

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

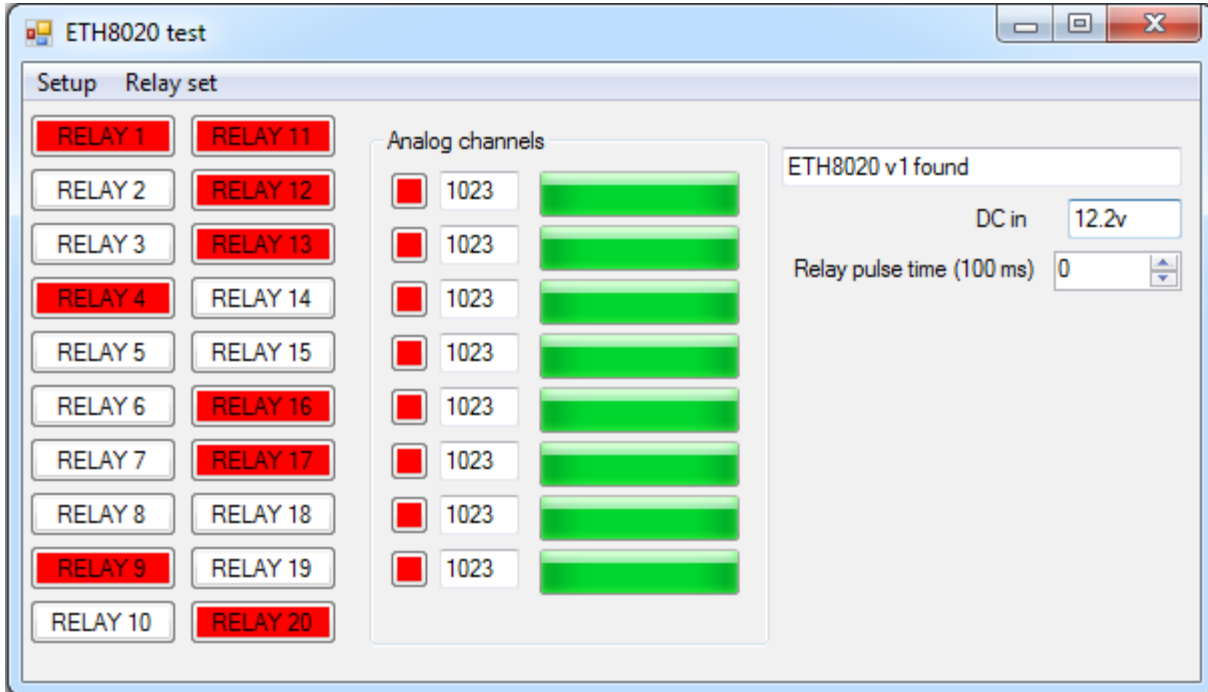
Control Panel->Network and Sharing Center->Local Area Connection->Properties.

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 ETH8020 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, or as Visual C# express project with source files.

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

Access from the Internet

The ETH8020 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 ETH8020 from the internet you will need to open up port 17494 (or whichever port you have your module set to - you can select any port you wish) 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 DG834 router.

Add Services

Service Definition

Name:	ETH8020 x
Type:	TCP v
Start Port:	17497
Finish Port:	17497

Apply Cancel

After logging on to your routers setup page, the first thing to do is create a new service. Click on the "Services" menu then "Add Custom Service". Enter a name for the service, select TCP and enter the ETH8020's port address for both the start and finish ports. Click "Apply".

Inbound Services

Service	ETH8020(TCP:17497) ▼
Action	ALLOW always ▼
Send to LAN Server	192 . 168 . 0 . 97
WAN Users	Any ▼
start:	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
finish:	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>
Log	Always ▼

Now go to the "Firewall Rules" menu and click "Add" in the Inbound services section. Select the ETH8020 service and ALLOW always. The "Send to LAN Server" IP address is the ETH8020's IP address, 192.168.0.97 in the example above but check what it is on your network. Click "Apply" and that's it. The ETH8020 is now accessible over the internet. Before you close the routers setup pages, go to the "Router Status" menu and make a note of its ADSL port IP address. This is the routers internet facing IP address.

