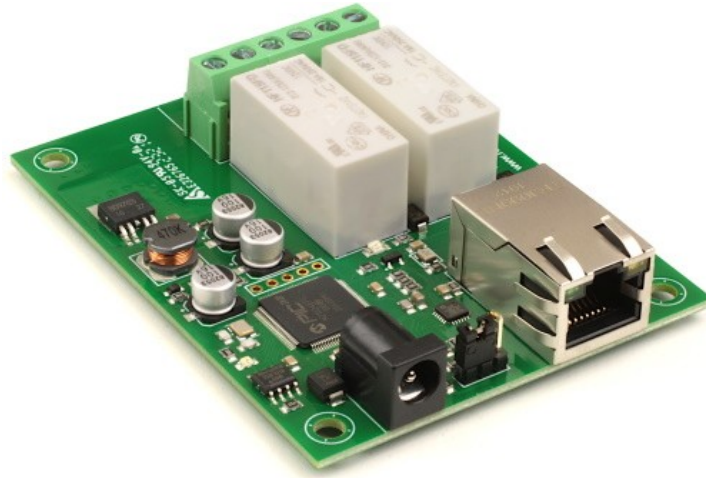


ETH002-B

Technical Documentation



Overview

The ETH002-B is a drop in update of the ETH002 with additional upgrades.

The ETH002-B provides two volt free contact relay outputs with a current rating of up to 16A. 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 500mA at 12vdc. The relays are SPCO (Single Pole Change Over) types with the normally open, normally closed and common pins all available on the screw terminals.

New features and improvements over the ETH002 are:

100mb full duplex Ethernet connection (ETH002 was 10mb half duplex)

Hostname is now configurable

MQTT with optional TLS encryption

Operating temperature

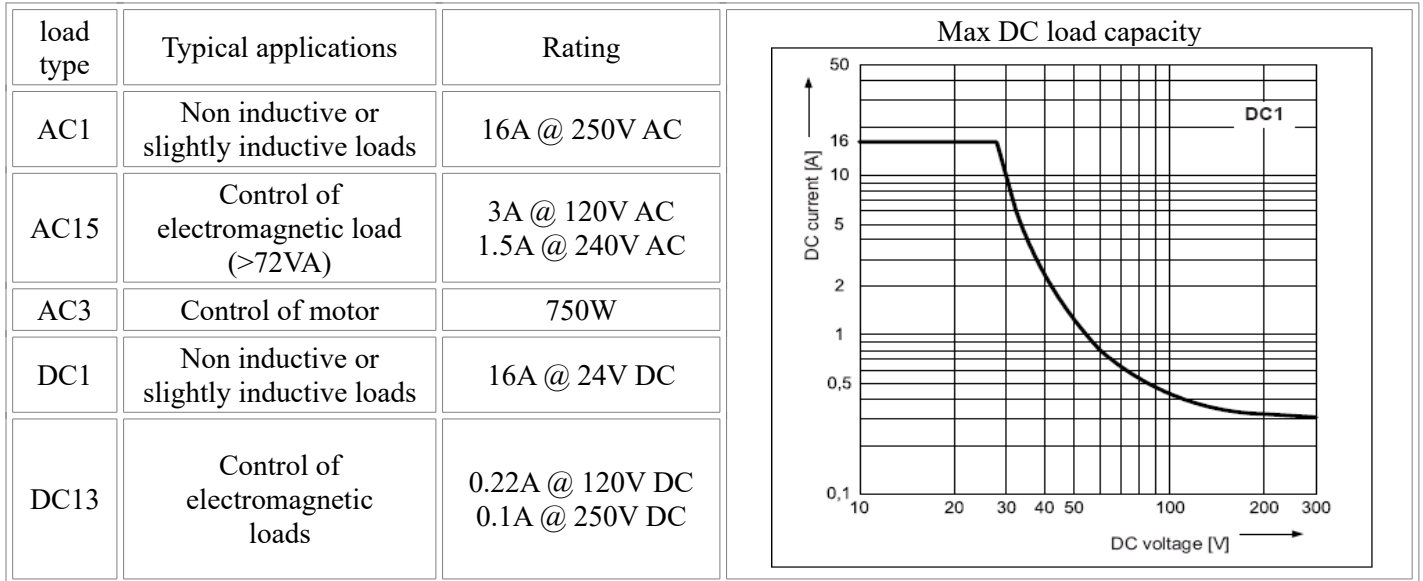
-40C to +70C

LED indication

The ETH002-B 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 just above the processor.

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.

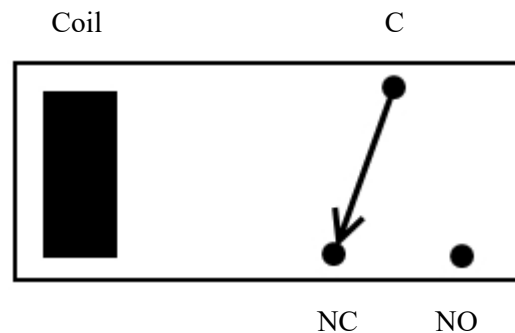


A full datasheet for the relays used on the ETH002-B is here: [HF115FD datasheet](#)

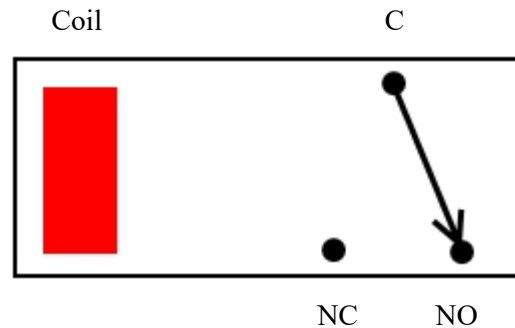
Power relays

Two 16A volt free contact relays are provided for switching a common input between a normally closed output and a normally open output. The relay coil is powered by the 12vdc incoming supply on user command.

Relay in passive state



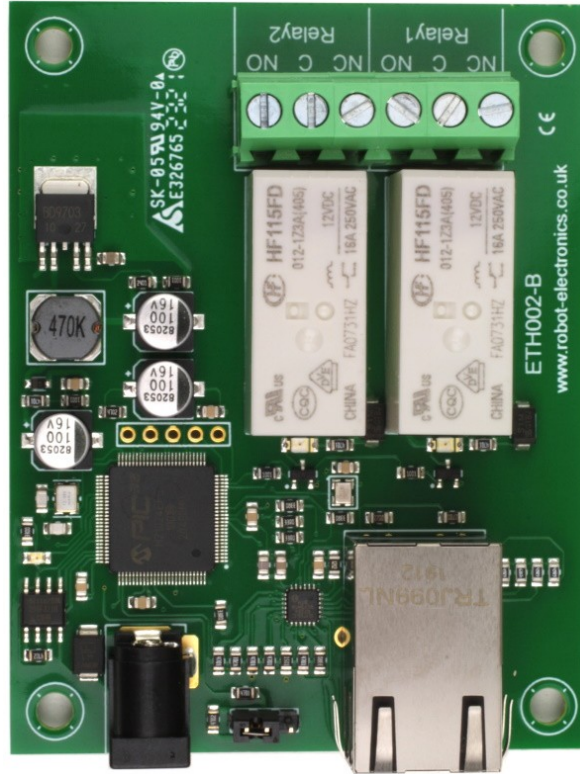
Relay in powered state



Connections

16A VFC (Volt Free Contacts)

NC = normally connected, C = common, NO = normally open



12v dc
2.1mm jack
(+ve core)

Factory reset
Left pair - run
Right pair - reset
Read at power up

RJ45 Ethernet

Network connection and Http access

IP Addresses & DHCP Servers

The easiest way to use the ETH002-B is to connect it to a network with a DHCP server. In this case the ETH002-B 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 ETH002-B 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 ETH002-B 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

Accessing the ETH002-B from your browser

Having plugged in your 12vdc power supply and Ethernet connection the board will power up and request an IP address from the dhcp server, if no server is present then the board will default to IP address 192.168.0.200. Now please start up your web browser and type `http://eth002` 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:

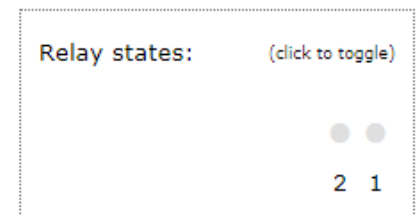
ETH002-B Test Application

Below you will see the current status of the eth002-B board. Click the bullets to toggle the relays 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	V20	Module id	18
Hardware	V2	Input voltage	12.1v

[Technical Documentation](#)
[Configuration](#)
[Mqtt](#)



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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 links to this technical documentation page and the network configuration.

Configuration

By clicking the configuration link it's possible to configure the ETH002-B IP address and subnet mask together with the ability to set a password for entry to control screens. 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. There is also a latched outputs option, this will automatically save any permanent relay state changes (not pulsed) and restore them following power loss.

Board Configuration

MAC Address	<input type="text" value="e8:eb:1b:d4:4e:70"/>
Host Name	<input type="text" value="ETH002"/>
<input checked="" type="checkbox"/> HTTP authentication	
Username:	<input type="text" value="admin"/>
Password:	<input type="text" value="password"/>
Port	<input type="text" value="17494"/>
<input checked="" type="checkbox"/> Enable DHCP	
IP Address	<input type="text" value="192.168.0.191"/>
Subnet Mask	<input type="text" value="255.255.255.0"/>
<input type="checkbox"/> TCP/IP Password	<input type="text" value="password"/>
<input type="checkbox"/> Latched outputs	
<input type="button" value="Save"/>	<input type="button" value="Save + Reset"/>

MQTT

Allows relays and outputs to be controlled from a MQTT broker

There are optional username and password fields depending on the broker settings. Port should be 1883 for no encryption or port 8883 for a TLS encrypted link (the ETH module will automatically use TLS for port 8883).

Mqtt configuration

Link a relay or IO to a mqtt server

Broker	<input type="text" value="192.168.0.9"/>
Port	<input type="text" value="1883"/>
Client ID	<input type="text" value="MQTT_NET_Client"/>
Username	<input type="text" value="MQTT_NET_User"/>
Password	<input type="text" value="MQTT_NET_Pass"/>
<input checked="" type="checkbox"/> Enable Power up message	
Power up Publish topic	<input type="text" value="Power up topic"/>
<input type="checkbox"/> Enable LWT	
LWT topic	<input type="text" value="status"/>
LWT message	<input type="text" value="lost"/>
<input checked="" type="checkbox"/> Enable heartbeat	
Heartbeat Publish topic	<input type="text" value="Publish heartbeat topic"/>
Choose a relay:	<input type="text" value="Relay 1"/>
<input checked="" type="checkbox"/> Enable Subscribe	
Subscribe state topic	<input type="text" value="RELAY 1"/>
<input checked="" type="checkbox"/> Enable Subscribe pulse time	
Subscribe pulse time topic	<input type="text" value="TIME 1"/>
<input checked="" type="checkbox"/> Enable Publish	
Publish topic	<input type="text" value="state 1"/>
<input type="button" value="Save Config"/>	

Power up message – publishes a message at power up containing the MAC address, IP address, software and hardware versions.

LWT – Last Will and Testament, the broker will publish the message after no contact for 5 minutes.

Heartbeat – Publishes an incremented count once a minute, giving the up time, count is reset on socket loss.

Subscribe state – Reads a message of “1” or “0” to control the output state

Subscribe pulse time – Reads a message of “1” to “255” and will pulse the relay on for that number of 100ms units

Publish – writes a message to the broker with a state of “1”, “0” or the Analogue value (boards with analogue inputs only)

HTTP commands DOAx and DOIx

A 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 1 second.

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

192.168.0.200/io.cgi?DOI1=10

If you wish to pass a username and password with the request you can do so like this (example uses default credentials):

admin:password@192.168.0.200/io.cgi?DOA1=10

To set the relay with no timer (it will remain in state you can just pass a 0 value for the timer:

192.168.0.200/io.cgi?DOA1=0

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.

TCP access and commands

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	0x10	Get Module Info - returns 3 bytes. Module Id (18 for ETH002), Hardware version, Firmware version.
32	0x20	Digital Active - follow with 1-2 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	0x21	Digital Inactive - follow with 1-2 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	0x23	Digital Set Outputs - will set all relays states, All on = 255 (xxxxxx11) All off = 0 Board will return 0 for success, 1 for failure
36	0x24	Digital Get Outputs - returns 1 bytes, corresponding with relays being powered
58	0x3A	ASCII text commands - allows a text string to switch outputs, see section below
119	0x77	Get Serial Number - Returns the unique 6 byte MAC address of the module.
120	0x78	Get Volts - returns relay supply voltage as byte, 125 being 12.5V DC
121	0x79	Password Entry - see TCP/IP password, board will return 1 for success or 2 for failure
122	0x7A	Get Unlock Time - see section below
123	0x7B	Log Out - immediately re-enables TCP/IP password protection, board will return 0 for success

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 output number, 1-2 for the relays.

Third byte is the on time. Set this to zero for non pulsed mode, or 1-255 for a pulse in 100ms intervals (100ms to 25.5 seconds).

For example:

0x20 - turn the relay on command

0x02 - relay 2

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 .

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 ETH002-B to indicate password entry

'a' (0x61) - 2nd byte in frame (ASCII hex equivalent in brackets, <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 ETH002-B 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

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

255 - TCP/IP password is not enabled.

ASCII text commands DOA and DOI

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 output1 for 5 seconds is formatted using comma separated variables with the following syntax:

":DOA,1,50,password"

To break this down ":" (0x3A) 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 (50 * 100ms) 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 ":" (0x3A) 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 (30 * 100ms) and finally the TCP password (if applicable). Assuming no password is used the previous command would simply be:

":DOI,2,30 "

Access from the Internet

The ETH002-B 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 ETH002-B 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 DG834 router.

Add Services

Service Definition

Name:	<input type="text" value="ETH002"/>
Type:	<input type="text" value="TCP"/>
Start Port:	<input type="text" value="17498"/>
Finish Port:	<input type="text" value="17498"/>

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 ETH002's port address for both the start and finish ports. Click "Apply".

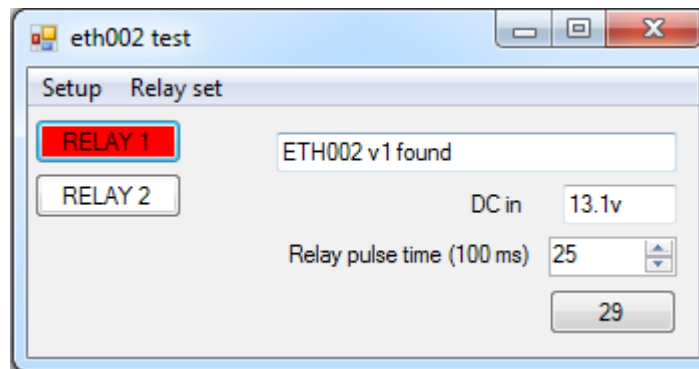
Inbound Services

Service	<input type="text" value="ETH002(TCP:17498)"/>
Action	<input type="text" value="ALLOW always"/>
Send to LAN Server	<input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="0"/> . <input type="text" value="98"/>
WAN Users	<input type="text" value="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	<input type="text" value="Always"/>

Now go to the "Firewall Rules" menu and click "Add" in the Inbound services section. Select the ETH002-B service and ALLOW always. The "Send to LAN Server" IP address is the ETH002-B's IP address, 192.168.0.96 in the example above but check what it is on your network. Click "Apply" and that's it. The ETH002-B 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.

TCP Test program and example source code

To get the ETH002-B up and running in the minimum amount of time we have put together an [example program](#) and also full [source code](#) for this program. You may examine this code or use it as a starting point for your own application.



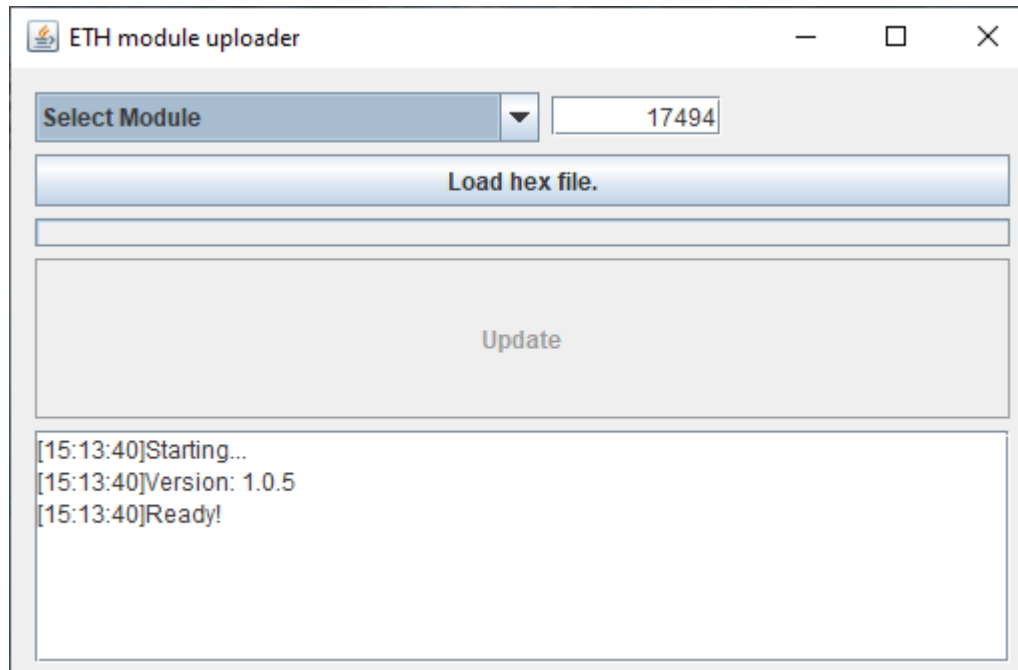
Visual studio express is provided free from Microsoft: <http://www.microsoft.com/exPress/download/>

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.

Software updates

With our [software update tool](#) you can upgrade the firmware to get the latest features



Latest firmware

[V26](#) – Added Optional features to MQTT:

Welcome message containing MAC address, IP address, software and hardware versions

New pulse output feature, subscribe to a topic and publish a message of “0” to “255” to get the output to pulse in 100 ms units.

Heartbeat added, the heartbeat publishes an incremented count once a minute that is reset on socket loss, essentially its the up time of the link in minutes.

Board dimensions

