

ETH0621

6 digital inputs, 2 x 24V 5A digital output, 24V motor output at 5A and 2 x Relay outputs at 240vac 16A

Technical Documentation



Overview

The ETH0621 offers 6 digital inputs (accepting 10V - 24V), 2 independently switched 24V 5A outputs and a 24 volt, 5A motor controller that effortlessly integrates motion control over Ethernet. The ETH0621 also includes a motor surge protection circuit that shuts the motor down in the event of the current exceeding 22A.

Operating Temperature

-40C to +85C

LED Indication

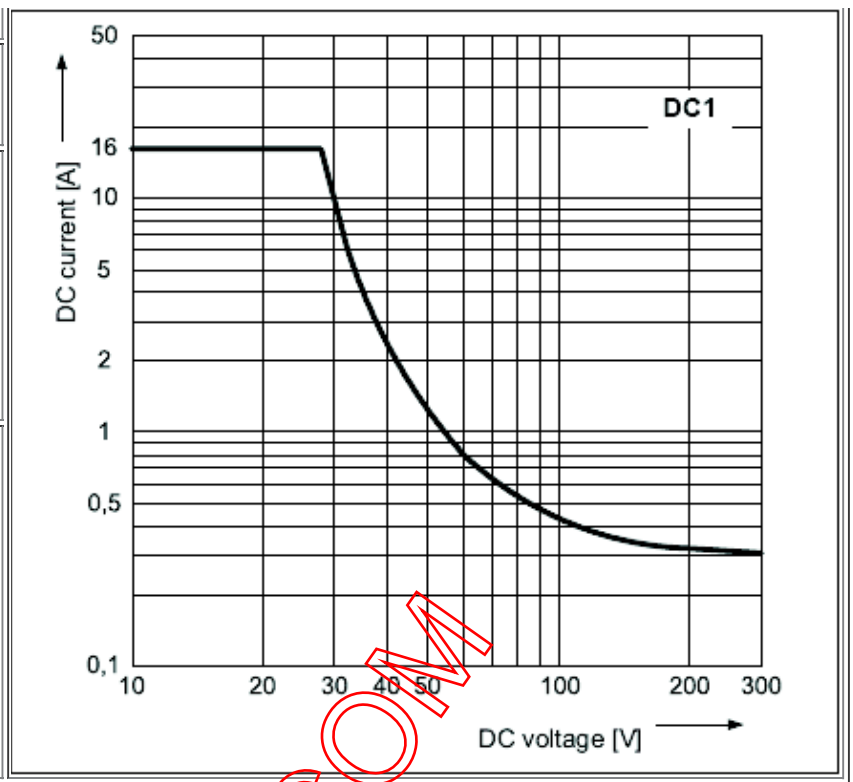
The ETH0621 provides a blue LED for indication of power to the board, this will pulse quickly in the event of the firmware being updated and for 400ms every 2 seconds in the event that the board has detected a current surge and shut the motor down. There are red LED's mounted next to the digital outputs and relays to indicate their state. Green LED's are mounted next to each of the 6 inputs to indicate active inputs.

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.

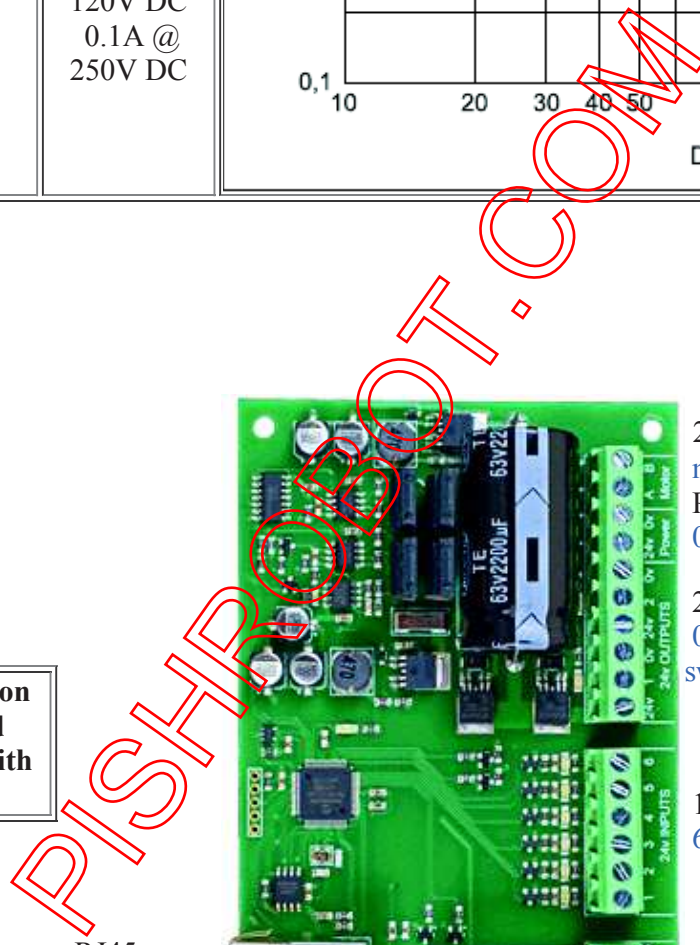
load type	Typical applications	Rating	Max DC load capacity
AC1	Non inductive or slightly inductive loads	16A @ 250V AC	
AC15	Control of electromagnetic load (>72VA)	3A @ 120V AC 1.5A @ 240V AC	

AC3	Control of motor	750W
DC1	Non inductive or slightly inductive loads	16A @ 24V DC
DC13	Control of electromagnetic loads	0.22A @ 120V DC 0.1A @ 250V DC



Connections

Note - There is no fuse on the PCB. You should provide a fuse in line with the +24v terminal.



RJ45 Ethernet

24V DC motor power output
motor side A and B
Power input
0V ground and 24V DC

24V DC digital outputs
0V ground, 24V DC and
switched output 1/2

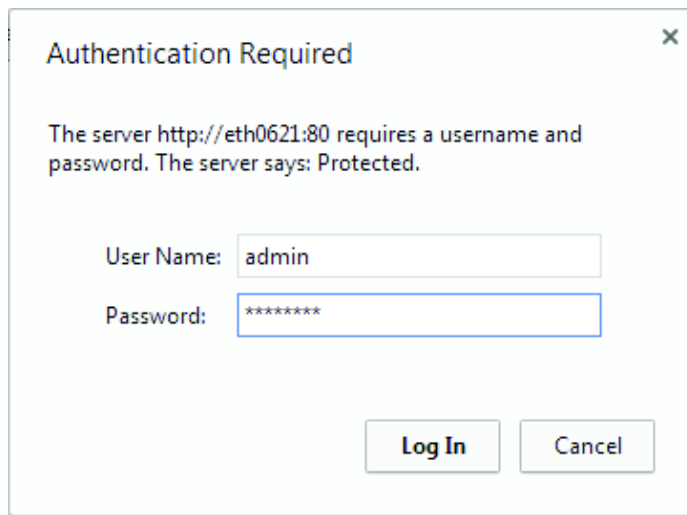
10V DC - 24V DC inputs
6 individual labeled inputs

Volt free contact relay
outputs

Normally closed, common
and normally open

First Test

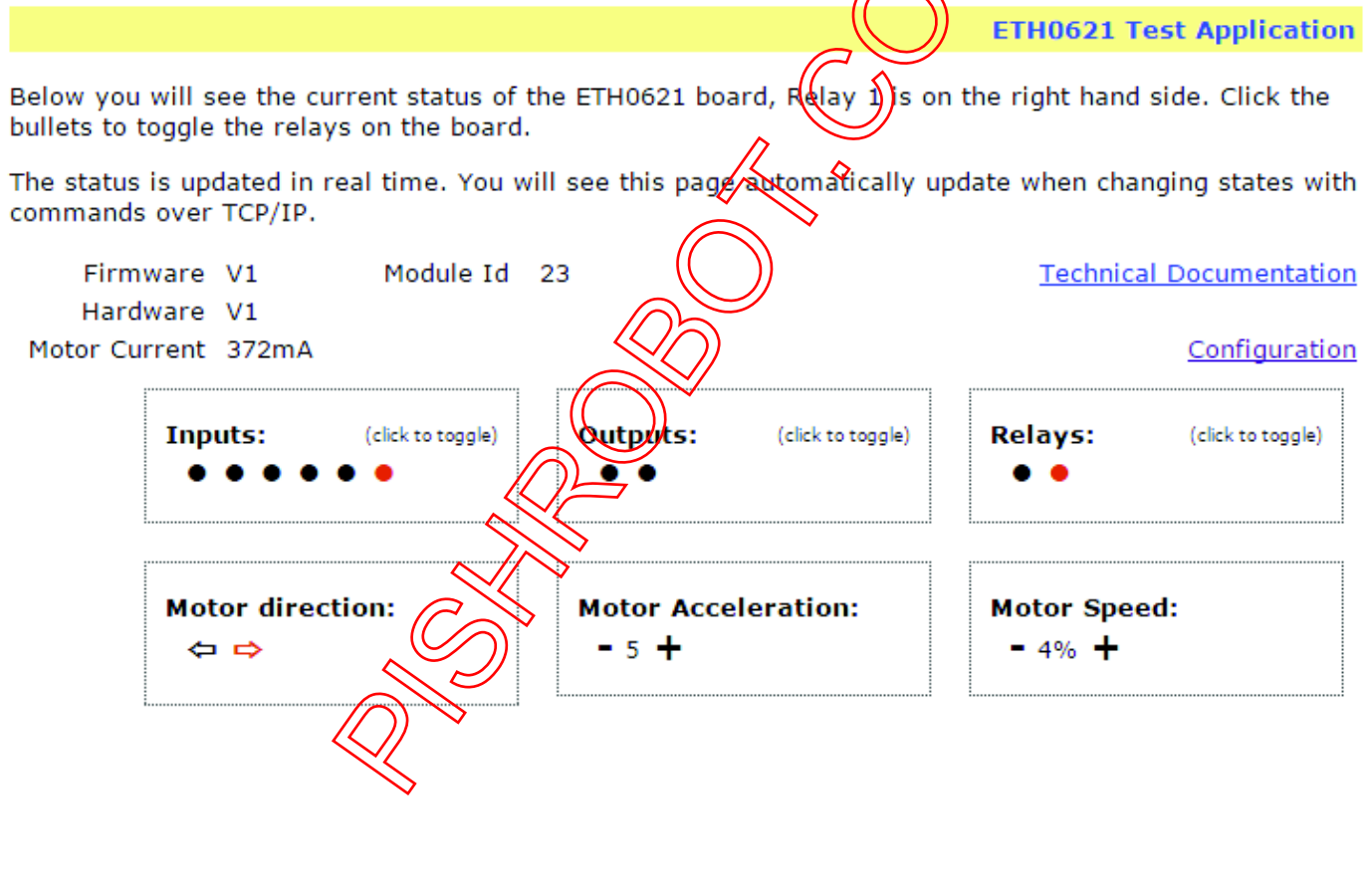
Having connected your 24vdc power supply and Ethernet connection, start up your web browser and type <http://eth0621> into the address bar, please note this only works in windows. You will be prompted for a password as shown below:



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:



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This web page will allow you to control the motor with the relevant buttons, switch the two relays, switch the two outputs and also monitor the inputs.

Configuration

By clicking the configuration link it's possible to configure the ETH0621 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, digital outputs or motor settings 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:C0:94:3A:60
Host Name	ETH0621
<input checked="" type="checkbox"/> HTTP authentication	
HTTP Username:	admin
HTTP Password:	password
Port	17494
<input checked="" type="checkbox"/> Enable DHCP	
IP Address	192.168.0.65
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 ETH0621 to its shipped condition then the end two contacts of the row of 5 holes nearest the Ethernet connection must be shorted together at board power up. The blue LED should then 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, this section will be expanded upon new firmware availability.

ETH0621 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 (23 for ETH0621), Hardware version, Firmware version.
17	11	GET MODULE STATUS - returns 1 byte currently bit 0 (LSB) will be set if motor output is disabled due to surge detection (22 amps approx)
32	20	DIGITAL ACTIVE - follow with 2 bytes below 1-2 to set relay states, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent or 9-10 for digital outputs, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent or 17 for motor direction, then a byte of 0 (ignored but must be transmitted) Board will return 0 for success, 1 for failure
		DIGITAL INACTIVE - follow with 2 bytes below

33	21	<p>1-2 to set relay states, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent</p> <p>or</p> <p>9-10 for digital outputs, then a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent</p> <p>or</p> <p>17 for motor direction, then a byte of 0 (ignored but must be transmitted)</p> <p>Board will return 0 for success, 1 for failure</p>
35	23	<p>DIGITAL SET OUTPUTS - follow with 3 bytes</p> <p>1st bytes lower 2 bits sets the relays, the 2nd bytes lower 2 bits will set the digital outputs and the lowest bit of the 3rd byte sets the motor direction</p> <p>Board will return 0 for success, 1 for failure</p>
36	24	<p>DIGITAL GET OUTPUTS - returns 3 bytes</p> <p>1st bytes lower 2 bits contain relay states, the 2nd bytes lower 2 bits correspond with active digital outputs and byte 3 has the motor direction in the LSB</p>
37	25	<p>Digital Get Inputs - returns 4 bytes, the first three will all be 0 and the 4th encodes the digital inputs into the lower 6 bits</p>
48	30	<p>SET VARIABLE OUTPUT - follow with 3 bytes below</p> <p>Set motor speed, 2nd byte send 1, then 0-100 for the % power and finally a time for pulsed output from 1-255 (100ms resolution) or 0 for permanent</p> <p>or</p> <p>Set motor acceleration, 2nd byte we send 2, then 1-20 for the acceleration level and finally a 0 byte.</p> <p>Board will return 0 for success, 1 for failure</p>
49	31	<p>GET VARIABLE OUTPUT - follow with 1 byte</p> <p>sending 1 will request the current motor speed setting</p> <p>or</p> <p>sending 2 will request the current acceleration setting</p> <p>Board will return 2 bytes, 0 in the first byte and speed/acceleration in the second</p>
4A	32	<p>GET VARIABLE INPUT - follow with 1 byte</p> <p>send 1 to request rough current measurement drawn by the motor in mA (this is very rough at low currents, but gets more accurate at higher levels)</p> <p>Board will return 2 bytes with the high byte first which form a 16-bit integer.</p>
119	77	<p>GET SERIAL NUMBER - Returns the unique 6 byte MAC address of the module.</p>
121	79	<p>PASSWORD ENTRY - see TCP/IP password</p>
122	7A	<p>GET UNLOCK TIME - see section below</p>
123	7B	<p>LOG OUT - immediately re-enables TCP/IP password protection</p>

Active and Inactive I/O - What do we mean by that?

The ETH0621 offers simple dedicated output and input ports, an active relay will be in the powered condition, an active input will be getting over 10v on the input.

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, 9 - 10 for digital outputs or 17 for the motor direction. 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), this is ignored in the case of motor direction.

For example:

0x20 - Digital active command (on)

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.

Surge protection

If a current in excess of approx 22A is detected the ETH0621 will disable the motor output and set the LSB in the module status byte. To return the ETH0621 module to normal operation requires a power cycle after investigation of the cause.

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 ETH0621 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 ETH0621 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

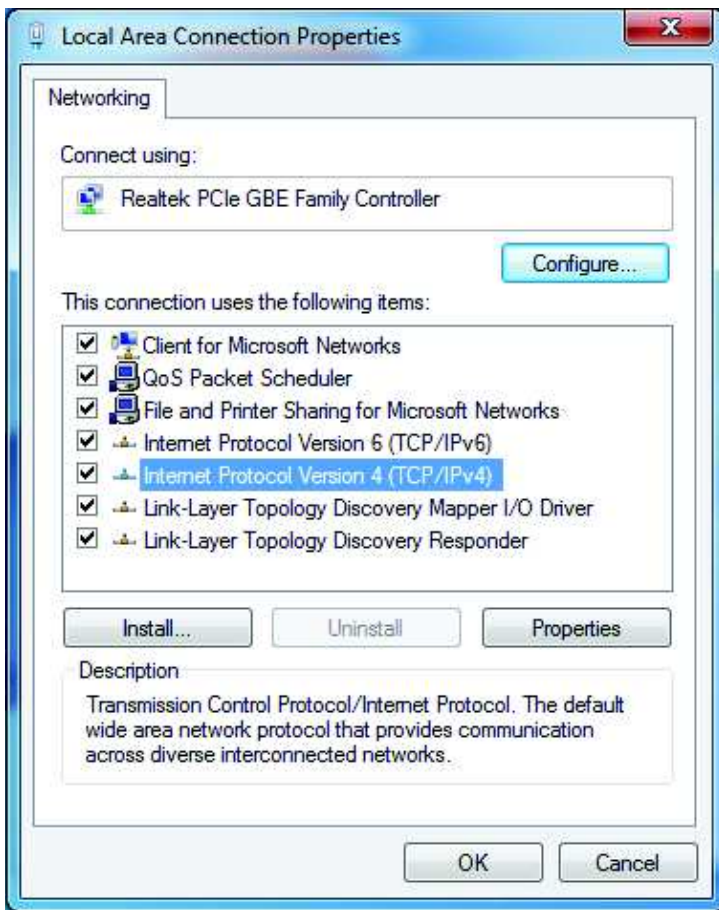
The easiest way to use the ETH0621 is to connect it to a network with a DHCP server, in this case the ETH0621 will have its IP address assigned automatically by the DHCP server.

If there is no DHCP server on the network, then a fixed IP address of 192.168.0.200 is used. To control the ETH0621 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 ETH0621 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..

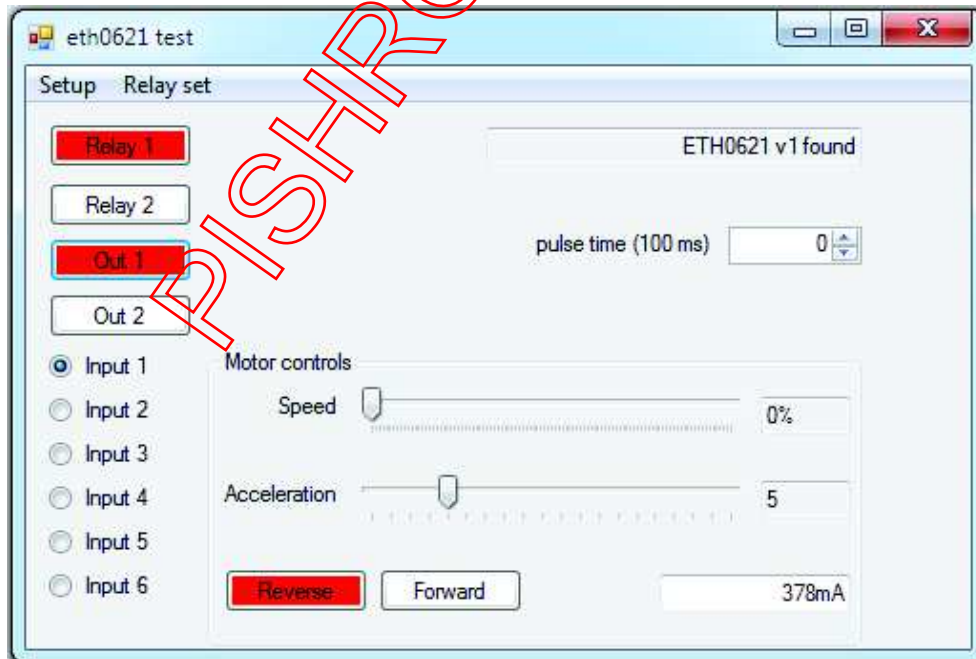


This image is for a PC running Windows 7. To get to the TCP/IP properties screen, go to: Control Panel->Network and Sharing Center->Local Area Connection->Properties. Select Internet Protocol Version 4(TCP/IPv4) from the scroll box and click Properties.

That gets you to the dialog box shown left.

Test program and example source code

To get the ETH0621 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

The ETH0621 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 ETH0621 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. The example is for a board on the network at 192.168.0.96 and port 17494, although these values are easily altered.

Add Services

Service Definition

Name:

Type:

Start Port:

Finish Port:

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 ETH0621's port address for both the start and finish ports. Click "Apply".

Inbound Services

Service:

Action:

Send to LAN Server: . . .

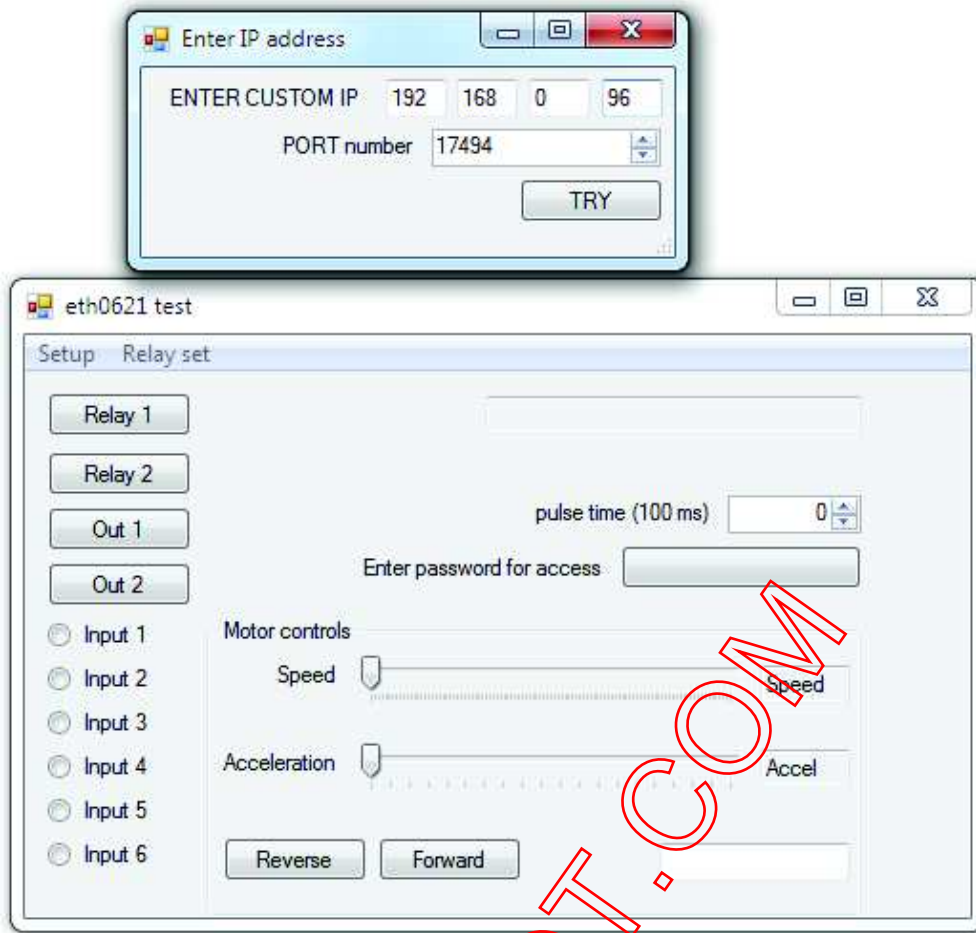
WAN Users:

start: . . .

finish: . . .

Log:

Now go to the "Firewall Rules" menu and click "Add" in the Inbound services section. Select the ETH0621 service and ALLOW always. The "Send to LAN Server" IP address is the ETH0621'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 ETH0621 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.



To test this you will need a computer that has its own internet connection and is NOT connected to the same network as the ETH0621. 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 ETH0621 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

