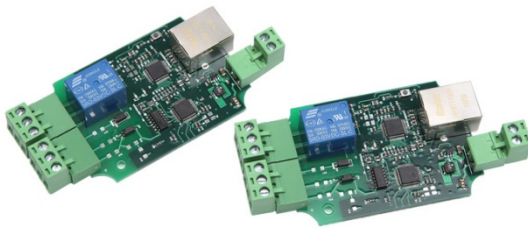


BrickElectric Ethernet Relay Pair

BE-M401

Excellent network building block - unlimited connection



Features

- Peer to peer control
- WEB control
- Software update via Internet
- Hardware Reset
- 5 - 24 VDC power supply
- EasyBus - simple solution
- LAN mode
- DHCP - Plug and play
- Internet mode
- Password Protection

Introduction

BE-M401 is an Wide Supply Input, Ethernet Remote Relay Pair. Each pair includes 2 relay modules(A1 and A2), and each module is equipped with 1 output channel and 1 input channel. BE-M401 provides with both enclosed and open type housing. Its Ethernet connector provides 10/100baseT interface.

It supports peer to peer control, EasyBus-TCP, HTTP control, Internet control protocols, and is able to work without any external servers or computers. Switch contact at one module input of BE-M401, the other module output will act in the same manner.

With DHCP and Internet functionality, it doesn't need to make any settings anymore in field. So *just plug and play*, power it on and then enjoy your remote control.

BE-M401 transmit on/off signal remotely through Ethernet/Internet, with this module you don't need to use any controller or computer.



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1. Device Overview

1.1 General Ratings

Power Consumption	3W max.
Operation Temperature	-30°C to +85°C
Module Size	75mmx50mmx20mm
Weight	-

1.2 Connection Diagram

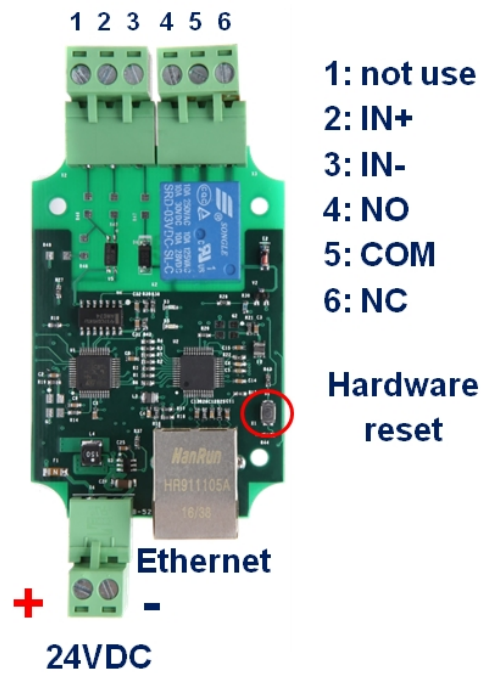


Fig. 1.1

2. Specifications

2.1 Recommended Operating Conditions

Parameters At T = 25°C, V _{supply} = 5V unless otherwise specified.	Symbol	Values			Unit
		Min.	Typ.	Max.	
Operating voltage	V _s	5	-	24	V
Contact closure input	-	-	-	-	
5V logic input high	V _{IH}	3	5	7	
5V logic input low	V _{IL}	0	0	2	
12V logic input high	V _{IH}	7	12	15	
12V logic input low	V _{IL}	0	0	5	
24V logic input high	V _{IH}	18	24	28	

24V logic input low	V _{IL}	0	0	12	
Operating current					
5V logic sink current	I	5	7	10	mA
12V logic sink current	I	5	7	10	
24V logic sink current	I	5	7	10	
Output Relay Rating	-	250VAC/10A			-
		125VAC/10A			
		24VDC/10A			
		12VDC/10A			

2.2 Default Software Settings

Default Settings

- **IP Setting - A1(server):**
 IP address: 192.168.1.105
 Subnet Mask: 255.255.255.0
 Gateway: 192.168.1.1
 DHCP: disable
- **HTTP function**
 State: Enable
 Port: 80
- **IP Setting - A2(client):**
 IP address: 192.168.1.106
 Subnet Mask: 255.255.255.0
 Gateway: 192.168.1.1
 DHCP: disable
- **Internet Control**
 State: Disable

Note : Mirror control in LAN is free, but Internet mirror control costs additional 1USD per pair/year

First 2 year is free of charge for Internet mirror control

3. Easy Starter

A Practical step-by-step operation guide for starters

This part is a step-by-step tutorial explaining how to start with BE-M401. We'll not discuss too much details here. The only idea here is to make it work by minimum steps. For more information, please refer to later chapters.

3.1 Peer to peer control

This chapter is a basic instruction of how peer to peer control works.

Make sure your network setting is compatible with the default setting of BE-M401 (if your target network setting is incompatible with BE-M401 default settings, you may change the network settings in BE-M401, this will be introduced in the following chapters), and then connect BE-M401 A1 and A2 with your routers via a standard Ethernet cable so they're in the same local network.

Power both modules of BE-M401 on, with 5 - 24VDC power supply. (see **fig.1.1 at page 2**)

Switch the contact closure at the input terminal of one module, relay output channel at the output terminal of the other module will be triggered to have the same status, Congratulations!



3.2 HTTP mode

This chapter is a basic instruction of how to use web control to change module configuration, for example to change module IP address.

1. Connect BE-M401 A1 and A2 with your routers via a standard Ethernet cable. And then power it on with 5 - 24VDC power supply.(see **fig.1.1 at page 2**)
2. Open any Browser, for example Chrome is used here as demonstration. The default parameter setting for board A1Please enter URL : `http://192.168.1.105/ipaddr=192.168.1.101`. BE-M401 will be set to IP address 192.168.1.101.



3.2 LAN mode

This chapter is a basic instruction of how to use TCP socket control to change module configuration, for example to change module IP address.

1. Connect BE-M401 with your routers or computer by Ethernet cable, and then power it on with 5 - 24VDC power supply.(see **fig.1.1** at page 2)
2. Open any TCP test tool(if you don't have any, or you don't know what a TCP test tool is, you can use **BE-Manager**, it is within our software package). Open it and see the following **Fig.1.2**:

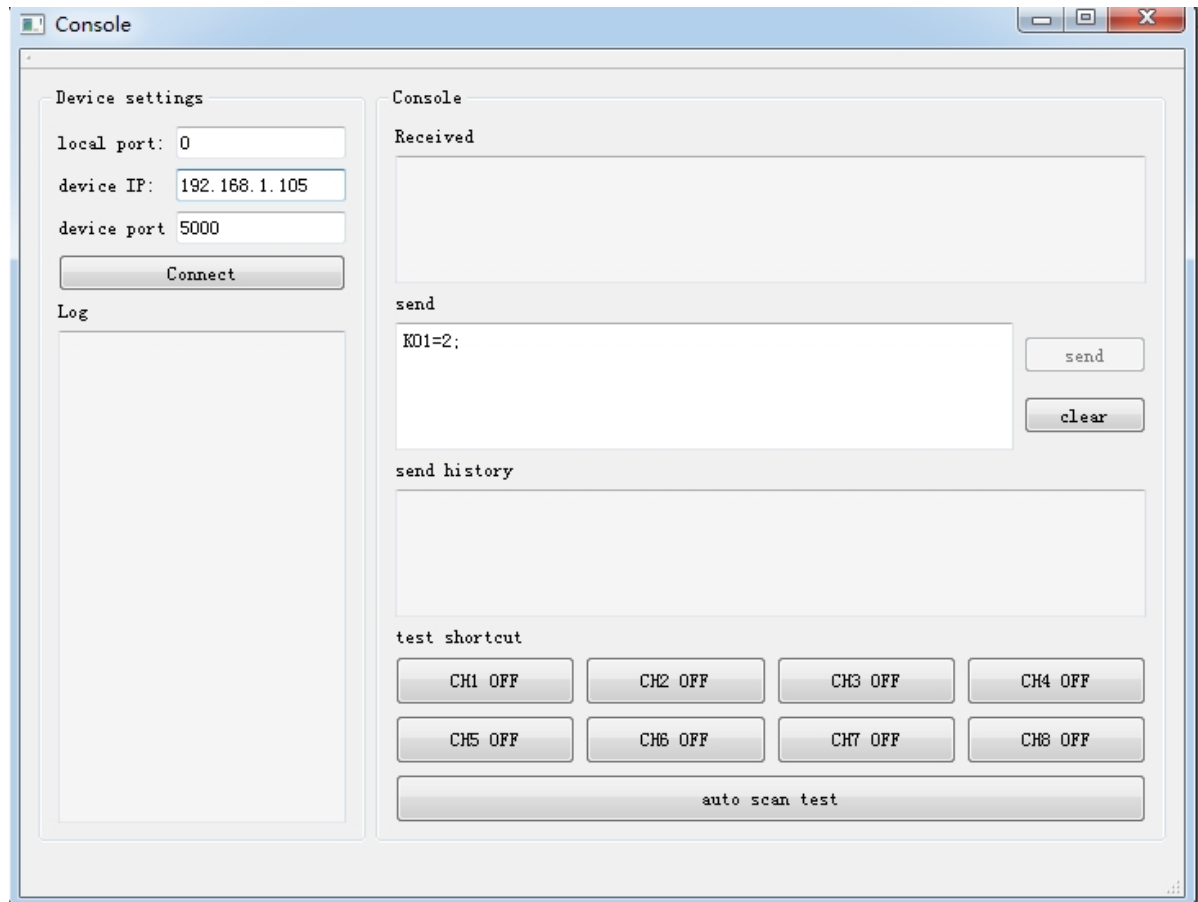


Fig.1.2

3. Click "**Connect**" button, and wait for module connected. Then, it is able control the relay module. To change module IP address, at **Send** area enter "**IPADDR = 192.168.1.101;**" and then click **Send**, a feedback will show up at **Received**: "**IPADDR=192.168.1.101;**", this means the relay module has received your message and executed it correctly. See **Fig.1.3**

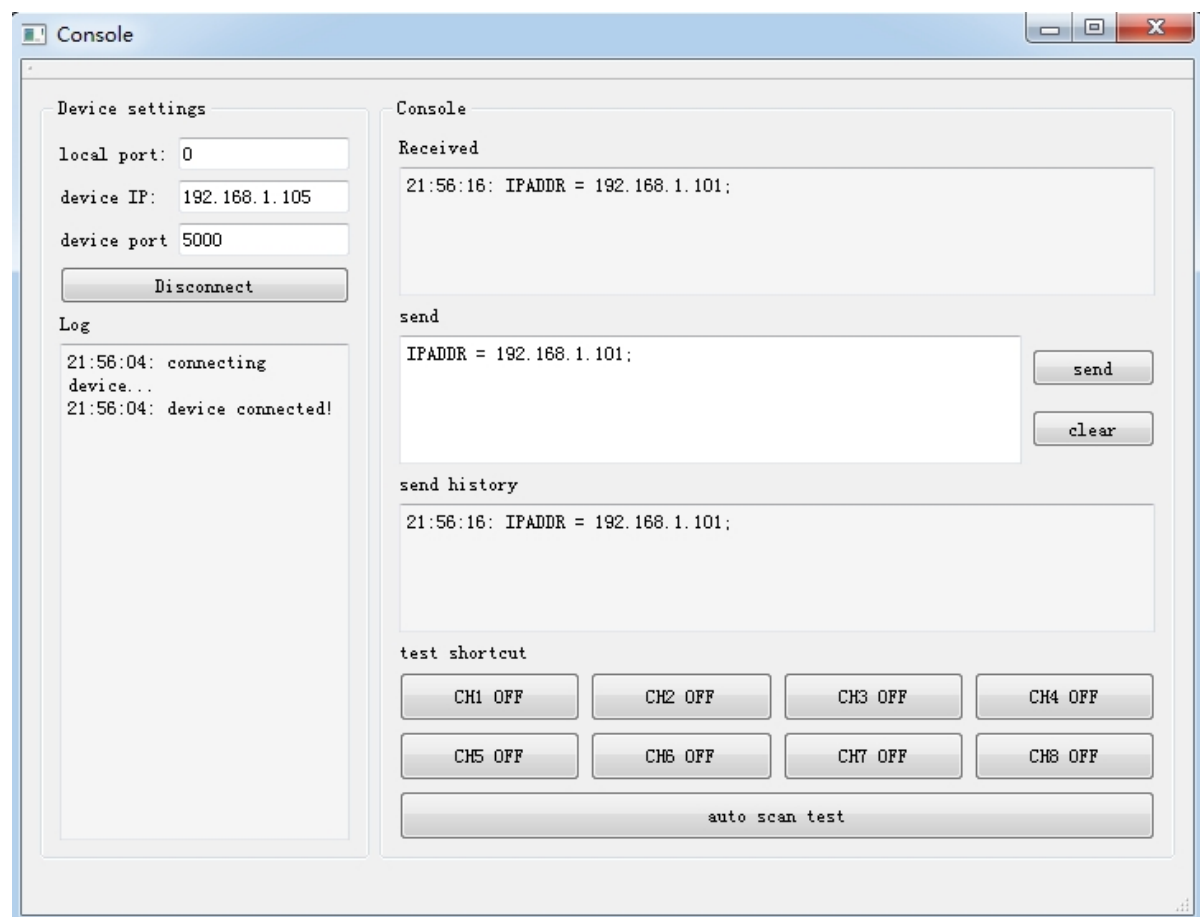


Fig.1.3

4. General Functionality

4.1 Basic Network Communications

The main method of communication to BE-M401 is a standard Ethernet communication. This communication protocol makes use of Network Sockets or HTTP protocol to create point to point tunnels that data can flow through bi-directionally. In this way the computer that is controlling the relay can send commands and shortly thereafter receive the response through the same Socket/Web Page.

Communications

In most programming languages all you have to do to open a socket is import the appropriate plug-in, build the socket object, and connect the socket using the IP Address and Port Number of the target device. Once the request for connection reaches the target device via the IP Address as a physical address of an office building and the port number as the number of the particular off you are trying to reach.

MAC Address

You can find the MAC Address of the module at the simple starter manual delivered together with module package.

4.2 Save Parameters

After power recycle, BE-M401 will lost parameter modifications if you don't actively require it to save modified parameters into internal nonvolatile memory. For examples, IP Address, Gateway address and Net mask.

Assuming module current IP Address is 192.168.1.105 for all the following commands.

Save parameters

To save parameters:

Web access URL:

<http://192.168.1.105/save=1>

Socket command text:

[save=1;](#)

4.3 Reboot

Send the module a restart signal so it will restart itself. **Some parameters modifications are only effective after a reboot or power recycle.** Relay contact outputs are still in control during reboot process, under default setting, module will be keep the contact status unchanged during this reboot process. Parameters modifications will be lost if you don't save them before reboot operation.

Assuming module current IP Address is 192.168.1.105 for all the following commands.

Reboot

To reboot device:

Web access URL:

<http://192.168.1.105/reboot>

Socket command text:

reboot;

4.3 DHCP Function

BE-M401 supports both DHCP and static IP Addressing. For communications reliability, especially via Remote Access, we recommend using a Static IP Address when you feel comfortable doing so. This will ensure that the device will always be where you expect it to be when you try to connect to it.

DHCP stands for Dynamic Host Configuration Protocol and basically means that your router will assign the first available IP Address in the list of IP Addresses and assign that to your device. This technology makes network devices very easy to use, but it is not as reliable because in certain circumstances it will cause the IP Address it assigns to change. DHCP mode is recommended when you only use Internet control, or your local software is able to detect module IP changes.

Assuming module current IP Address is 192.168.1.105 for all the following commands.

Enable/Disable DHCP

Note: modification only effective after parameter saving and module reboot.

To Enable DHCP:

Web access URL:

<http://192.168.1.105/dhcp=1>

Socket command text:

dhcp=1;

To Disable DHCP:

Web access URL:

<http://192.168.1.105/dhcp=0>

Socket command text:

dhcp=0;

4.4 Static IP Address

This technology is the antithesis of DHCP in that it is manually set and does not dynamically change without direct action. The disadvantage of this method is that, if done incorrectly, can make the module unreachable through any standard means. This usually happens when an IP Address is statically set to an IP Address outside of the range of the router, or another device on the network obtains this IP address via DHCP. If this happens, see the section of this guide titled "Reset Function". This method is the preferred

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and more reliable way to handle network IP Address allocation. For improved reliability the IP Address assigned to this Module should be reserved on your router.

To work correctly in static IP address mode, you need to set correct IP address, gateway address and subnet mask. The following content describes how to modify each of them.

If module is currently in DHCP mode, to set a new static IP address you need to disable DHCP mode at first. After settings are done, please save parameters and reboot the device to make it effective.

Assuming module current IP Address is 192.168.1.105 for all the following commands.

Set static IP Address

Note: modification only effective after parameter saving and module reboot.

To set static IP Address to 192.168.1.100:

Web access URL:

<http://192.168.1.105/ipaddr=192.168.1.100>

Socket command text:

[ipaddr=192.168.1.100;](#)

Set static Gateway Address

Note: modification only effective after parameter saving and module reboot.

To set static Gateway Address to 192.168.2.1:

Web access URL:

<http://192.168.1.105/gateway=192.168.2.1>

Socket command text:

[gateway=192.168.2.1;](#)

Set static Net Mask

Note: modification only effective after parameter saving and module reboot.

To set static net mask to 255.255.0.0

Web access URL:

<http://192.168.1.105/netmask=255.255.0.0>

Socket command text:

[netmask=255.255.0.0;](#)

4.5 Peer to peer setup

Peer to peer control will automatically transmit on/off signals between two modules, and the work in both directions. But in order to help the modules find each other correctly, some settings maybe need to be done according to your network settings.

Set target IP address

Target IP address is only need for BE-M401 A2 module, it's the IP address of the A1 module which you want to connected with. For example, BE-M401 contains 2 modules A1

and A2. If A1 is located at 192.168.1.105 and A2 is located at 192.168.1.106, then you need to set A2 target IP address to 192.168.1.105.

To set target IP address to 192.168.1.105

Web access URL:

[http://192.168.1.106/setpara\[199\]=192&setpara\[200\]=168&setpara\[201\]=1&setpara\[202\]=105](http://192.168.1.106/setpara[199]=192&setpara[200]=168&setpara[201]=1&setpara[202]=105)

Socket command text:

[setpara\[199\]=192;setpara\[200\]=168;setpara\[201\]=1;setpara\[202\]=105;](#)

Set target DNS name

Sometimes in a network, IP address is not fixed due to DHCP functionality, so in order to have a stable connection between two modules, BE-M401 can use DNS name to find the correct target IP address. Target DNS name is only need for BE-M401 A2 module, it's the DNS name of the A1 module which you want to connected with. For example, BE-M401 contains 2 modules A1 and A2. If A1 is located at www.BE-M401-A1.com and A2 is located at 192.168.1.106, then you need to set A2 target DNS name to www.BE-M401-A1.com.

To set target DNS name to www.BE-M401-A1.com

Web access URL:

[http://192.168.1.106/setpara\[203\]=www.BE-M401-A1.com](http://192.168.1.106/setpara[203]=www.BE-M401-A1.com)

Socket command text:

[setpara\[203\]= www.BE-M401-A1.com;](#)

Internet peer to peer control

When Internet peer to peer control is activated, BE-M401 modules is able to communicated with each other at any locations provided that they both has access to Internet. In default mode Internet peer to peer is disabled, you need to set both module Internet activated to make it effective.

To activate Internet peer to peer:

Web access URL:

[http://192.168.1.105/setpara\[204\]=1](http://192.168.1.105/setpara[204]=1)

Socket command text:

[setpara\[204\]= 1;](#)

To deactivate Internet peer to peer:

Web access URL:

[http://192.168.1.105/setpara\[204\]=0](http://192.168.1.105/setpara[204]=0)

Socket command text:

[setpara\[204\]= 0;](#)

4.6 Password protection

Password protection function is used for protecting the device from un-authorized access. Once enabled, user can only send effective command when they're able to provide correct 6-bit length access password.

In the following contents, assuming current IP Address is 192.168.1.105. And device password is "123456", which is also the default password.

Enable/Disable Password Protection

To Enable password protection:

Web access URL:

<http://192.168.1.105/pwenable=1>

Socket command text:

[pwenable =1;](#)

To Disable password protection, you need also firstly input correct password:

Web access URL:

<http://192.168.1.105/pw=123456&pwenable=0>

Socket command text:

[pw=123456&pwenable=0;](#)

Change Password

To change password to "abcdef", you need also firstly input previous correct password:

Web access URL:

<http://192.168.1.105/pw=123456&newpw=abcdef>

Socket command text:

[pw=123456&newpw=abcdef;](#)

4.7 Http port setting

In default conditions, HTTP port is always 80 if you enter directly in web browser a URL without any additional parameters. But in some applications different port number is needed for port forwarding or any other reasons. For example, you can force your web browser to access http content at port 8080, to do so you need to enter <http://url:8080>.

This module is able to customized http access port to realize such functions. In the following contents, assuming current IP Address is 192.168.1.105.

Change Http Port

To change http port to 8080:

Web access URL:

<http://192.168.1.105/webport=8080>

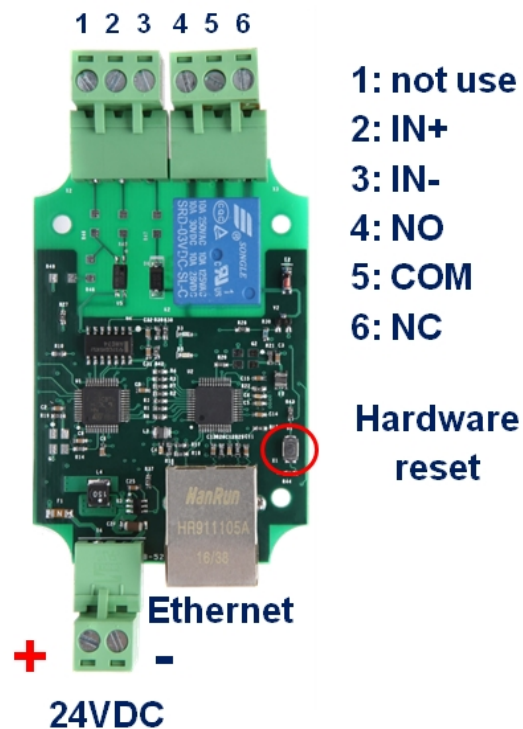
Socket command text:

[webport=8080;](#)

4.8 Hardware reset button

Hardware reset button is used for situations when you want to reset the device to factory settings. For example if you set a incorrect IP Address and the device is no longer detectable in your network. Two different level of reset are provide in this module. Level-1 only reset parameters, i.e. network settings, time settings and so on, while Level-2 will

reset on-chip app, i.e. for firmware updating/reload.



Hardware reset Level-1 (Parameter reset)

To reset parameters, press the hardware reset button in above pictures until green and red LEDs are both on, then release the button. Module will set all parameters to their default values.

Hardware reset Level-2 (Firmware update/reload)

To update firmware, press the hardware reset button in above pictures until green and red LEDs are both on, then continue to press the button for 10 seconds. Module will erase its firmware and try to download latest firmware from Internet. Please connect to internet when you do this operation.

6. Fast Program Reference

6.1 Easybus Specifications

EasyBus use more friendly language to control the relay module. With "easy to understand" grammar and similarity to OS command lines, it's extremely easy to work with it. Read the following materials and you will be ready to go with every details in 10 minutes.

Not like any other field bus, you don't need to be an expert of automation or learn programming to use it. This saves time for many people who wants to focus on more creative works, and they can start to create application with BE-M401 immediately, rather than spend lots of time on learning the old-fashioned and very detailed industry automation communication protocol before they can really start to do anything.

How to send a correct switch command?

Example - switch on relay channel 1:

K01 = 1;

Rules: To switch a relay, use the assignment: **element = expression;**

Explanation of switch elements:

In BE-M401, elements(or variables) are basic control keywords(or so called "reserved variable name"), they're mapped internally to system functions. Assign an element with a value and then the system will recognize it and execute expected actions. The following table is the general description of all elements available:

Elements	Descriptions
K01	Relay Ch1.
K02	Relay Ch2
K01T1	Relay Ch1, time elements T1, range: 0 - 4294967295, default = 1000.
K01T2	Relay Ch1, time elements T2, range: 0 - 4294967295, default = 1000.
K02T1	Relay Ch2, time elements T1, range: 0 - 4294967295, default = 1000.
K02T2	Relay Ch2, time elements T2, range: 0 - 4294967295, default = 1000.
K01U1	Relay Ch1, T1 unit element, 0 = millisecond, 1 = second, default = 0 (millisecond)
K01U2	Relay Ch1, T2 unit element, 0 = millisecond, 1 = second, default = 0 (millisecond)
K02U1	Relay Ch2, T1 unit element, 0 = millisecond, 1 = second, default = 0 (millisecond)
K02U2	Relay Ch2, T2 unit element, 0 = millisecond, 1 = second, default = 0 (millisecond)
DHCP	dhcp function, 0 = dhcp disabled, 1 = dhcp enabled, default = 0(disabled)
SAVE	Save parameters, 1 = save parameters in flash.
REBOOT	Restart BE-M401, 1 = restart
WEBPORT	Http port, you can change it to any number for port forward. default value: 80
PWENABLE	Password protection activate. 1 = enable, 0 = disable
PW	Password input, 6 bit length, default value = 123456. Example: pw = 123456
NEWPW	New password, 6 bit length. Example: newpw = abc123
IPADDR	IP address, this is the fixed IP of BE-M401 when dhcp function is disabled. default

	= 192.168.1.105
GATEWAY	Gateway, this is the fixed IP of your gateway when dhcp function is disabled. default = 192.168.1.1
NETMASK	Netmask, this is the netmask of BE-M401 when dhcp function is disabled. default = 255.255.255.0

Explanation of switch modes expressions:

In BE-M401, each relay has 8 basic switch modes which are:

mode	Descriptions
0	mode 0, single off, to switch a relay off.
1	mode 1, single on, to switch a relay on.
2	mode 2, single toggle, the relay will go to opposite position to previous status.
3	mode 3, pulse off, switch off for a self defined time T1, then automatically switch on.
4	mode 4, pulse on, switch on for a self defined time T1, then automatically switch off.
5	mode 5, pulse toggle, toggle for a self defined time T1, then automatically toggle again.
6	mode 6, cycle mode, switch on for self defined time T1, and then automatically switch off for a self defined time T2, then switch on again in endless cycle.
7	mode 7, read current relay contact status.

Some examples:

To switch on relay channel 1 off:

K01 = 0;

To toggle relay channel 1:

K01 = 2;

To read relay channel 1 contact status:

K01 = 7;

Contact ON return : K01 = 1;

Contact OFF return : K01 = 0;

To set relay channel 1, T1 unit in second:

K01U1 = 1;

To set relay channel 1, T2 unit in millisecond:

K01U2 = 0;

To set relay channel 1, T1 period T = 5:

K01T1 = 5;

To set relay channel 1, T2 period T = 500:

K01T2 = 500;

To pulse on relay channel 1 for the pre-set time T1:

K01 = 3;

To cycle on and off relay channel 1 for the pre-set time T1 and T2:

K01 = 6;

To enable dhcp function:

DHCP = 6;

To save setting before reboot(if you want the modification to be still valid in next power on):

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SAVE = 1;

To change webport to 12345:

WEBPORT = 1;

To enable module password protection:

PWENABLE = 1;

To enable module password protection:

PWENABLE = 0;

Once password is enabled, each command line must contain a correct password input otherwise the command will be ignored. Default password will be 123456. Once the password is enabled, you need to input the correct password to disable it.

To input password:

PW = 123456;

This example is based on default password. After you have changed the system password, please input your own password here.

Example when password is activated, to input a valid command:

PW = 123456;K01 = 2;K02=2;

All the commands followed after password input will be valid. This only last until the end of this line. In every new input line a correct password is always needed.

To change input password:

NEWPW = abc123;

Once newpw is set, the system password will be changed. Attention, once you have activated password protection, you need to input correct password first and then you can set new password.

To change BEM401 IP address to 192.168.1.150:

IPADDR = 192.168.1.150;

6.2 Http Specifications

Http mode also use easy bus protocol, but use URL to control BEM401, and return message as html format. You can use any standard Browser to access BEM401, or you can use any programming language to realized http access, so that it is able customized your GUI or control logic.

The general elements and expression rules are the same with previous easybus description, so here only some examples of the URL command are listed for easy understanding. Examples below assuming default IP setting is used. If you changed IP settings please change the IP address in URL to the correct value.

To switch off relay channel 0:

URL: "**192.168.1.105/ K01=0**"

Return: "**K01 = 0;**"

To assign a new IP address, for example 192.168.1.100:

Send: "**192.168.1.105/ipaddr=192.168.1.100**"

Return: "**IPADDR=192.168.1.100;**"

To save the data you changed:

Send: "**192.168.1.105/save=1**"

Return: "**SAVE = 1;**"

To reboot the module:

Send: "**192.168.1.105/reboot**"

Return: "**REBOOT;**"

To enable dhcp functions:

Send: "**192.168.1.105/ dhcp=1**"

Return: "**DHCP = 1;**"

To modify HTTP port number for port forwarding:

Send: "**192.168.1.105/webport = 12345**" (replace 12345 with the port number you want)

Return: "**WEBPORT = 12345;**"

Notice: Once you changed the web port, please send your next command to the correct port number. For example when you changed it to 12345, you need the following address format:

Send: "**192.168.1.105:12345/k01=2**"

7. Support & Contact us

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