# Application note
Connecting to e100 products from a remote location

AN00202

Rev B (EN)

This application note is intended as a guide to explain how to access the NextMove e100, MotiFlex e100 or MicroFlex e100 from a remote location. It describes the network setup needed to achieve this including how to use an Ethernet POWERLINK (EPL) router and covers the basics of using a VPN (Virtual Private Network) client to connect to a remote network.
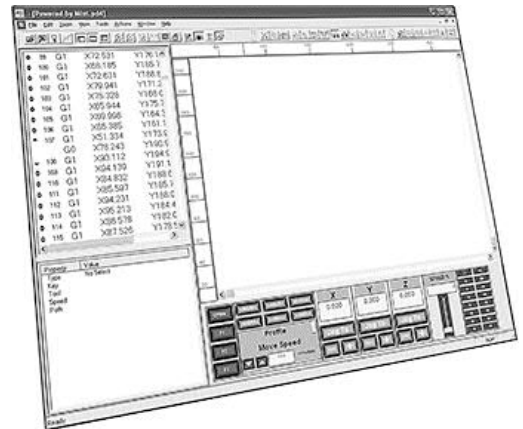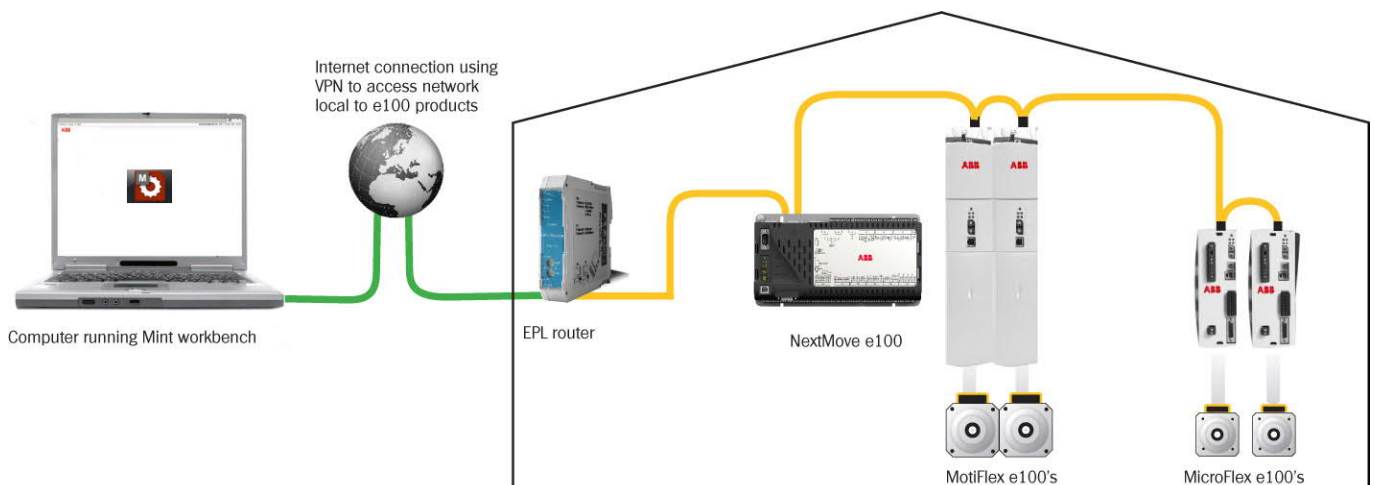

Introduction

By using this guide you should be able to connect Mint WorkBench to a correctly configured e100 product from anywhere you have an internet connection.

Hardware setup and considerations
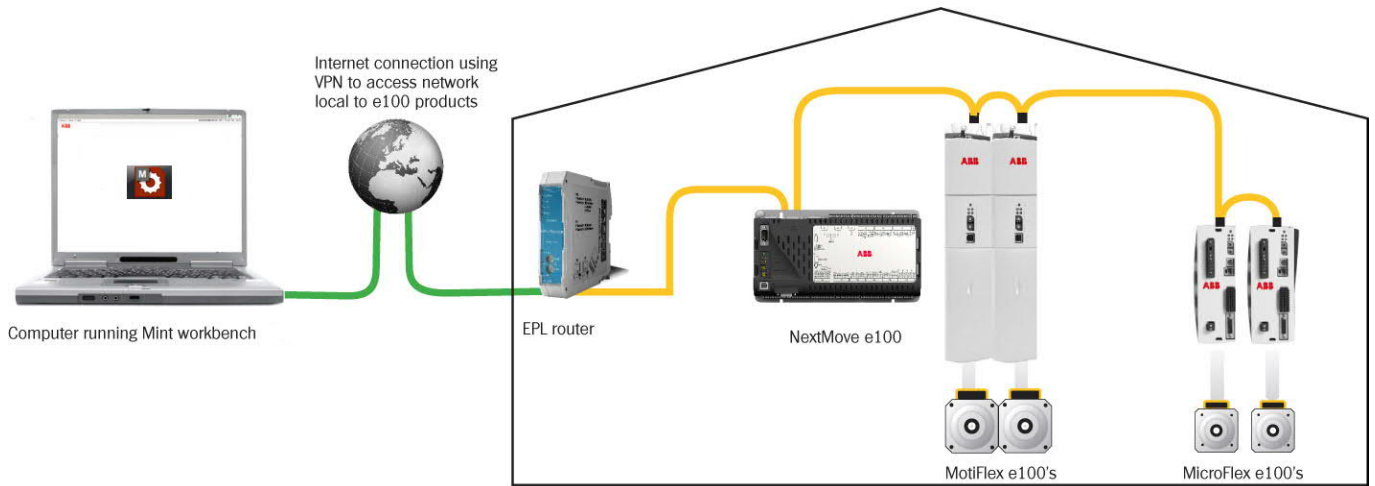
▬ Ethernet TCP/IP
▬ Ethernet POWERLINK (EPL)

The diagram above shows an example of a remote connection to a network of e100 products (A NextMove e100, 2 MotiFlex e100's and 2 MicroFlex e100's). As there is an EPL network setup an EPL router is required to route between the Ethernet TCP/IP network and EPL network. If there was only one e100 product there would be no EPL network and the EPL Router would not be required, a direct Ethernet TCP/IP connection could be made to the standalone e100 product.

If there is more than one EPL network set up at the remote location an EPL Router would be needed to connect to each individual EPL network. This is because the EPL master (the NextMove e100) on each network will have the same EPL network address of 192.168.100.240 so the different EPL networks must be kept separated.

Software setup

You will need to be running Mint WorkBench build 5700 or later on a suitable computer with access to the internet. You will need to be able to access the network local to the e100 product you are connecting to, this is usually achieved using a VPN client. VPN clients are the most common way to achieve access to remote networks but others are available and the type used largely depends on access requirements (Speak to your IT/IS department if you have any questions regarding your access to the remote network). You will require static IP addresses for each of the e100 products you want to connect to and two for the EPL Router as well (Once again speak to your IT/IS department about getting static IP addresses assigned for this purpose).

■ Ethernet TCP/IP
■ Ethernet POWERLINK (EPL)

|	PC	Router (Ethernet TCP/IP side)	Router (EPL side)	NextMove e100	MotiFlex e100's	MicroFlex e100's
External IP	192.168.1.6	192.168.1.254	192.168.1.5	192.168.1.240	192.168.1.1 and 192.168.1.2	192.168.1.3 and 192.168.1.4
Local EPL IP	n/a	n/a	192.168.100.254	192.168.100.240	192.168.100.1 and 192.168.100.2	192.168.100.3 and 192.168.100.4

The diagram and table above shows the network addresses we are going to configure in this app note as an example of a typical EPL network connected from a remote location. The external IP addresses will be used to connect to the various devices from the remote PC. The Local EPL IP addresses shown are those used by the local EPL network.

EPL router setup

The EPL router Installation manual (MN1958) gives full details of the EPL router set-up, we will just cover some key points in this application note to ensure it is correctly set up for our example. If there is no EPL network to connect to, only a stand-alone e100 device there is no need for an EPL router and we can connect to the e100 device directly using Ethernet TCP/IP. If this is true of your setup please jump straight to the final section untitled 'Ethernet TCP/IP Connection'.

The easiest way to configure the EPL Router is when you are connected directly to it although it is possible to do using remote access if you know the IP address of the EPL router. We will describe the configuration as if it is connected locally to our PC as shown below. This simplifies things as we do not need to get involved with remotely accessing a different network. We will also assume that the e100 EPL network is correctly configured and working and that we are only adding in the EPL router to the existing network.

■ Ethernet TCP/IP
■ Ethernet POWERLINK (EPL)
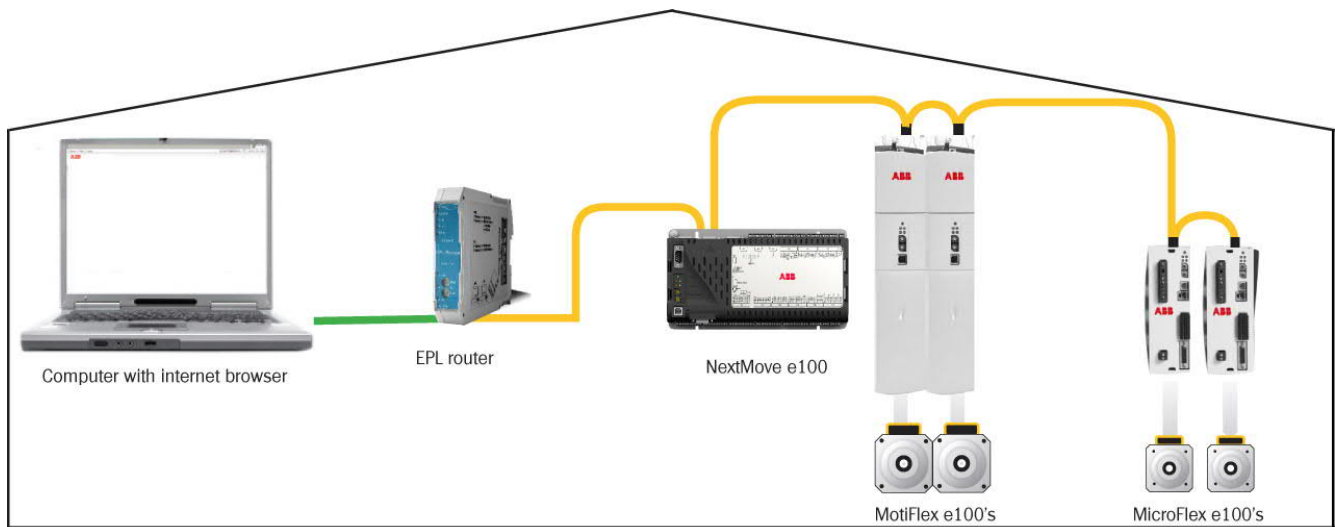
Connecting to the EPL router

Ensure the EPL router is correctly powered and connected according to the installation manual MN1958. To connect to the EPL router ready to set it up we need to know the IP address it is set to. There is a small switch under the Ethernet (EN) port which allows you to set the IP address of the EPL router to a known IP address of 10.10.10.10 and a known subnet mask of 255.255.255.0. See picture on the right.

Once this is set we now need to set our computer to use the same network ID (the first 3 octets e.g. 10.10.10.x) and a different host ID (the 4th octet e.g. 10.10.10.8) for its IP address and the same subnet mask.
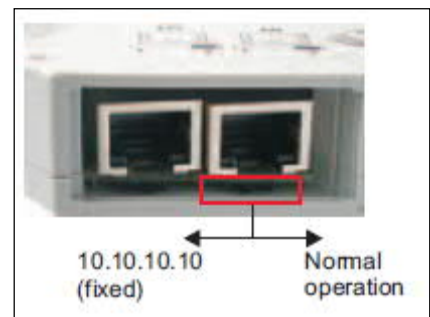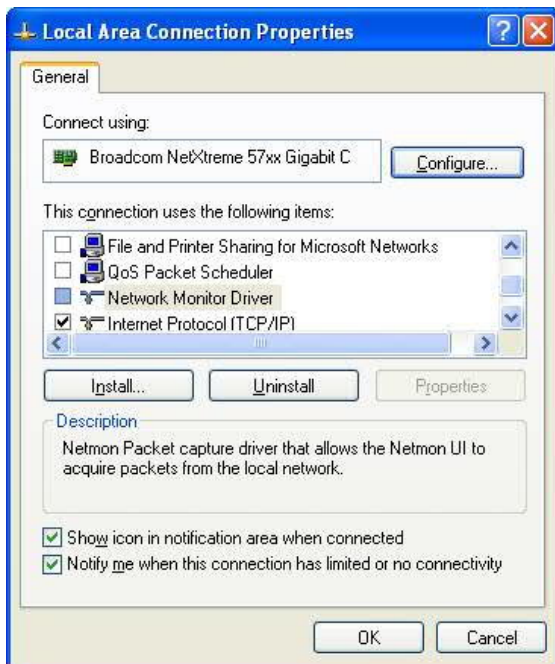
To do this you need to go to 'Network Connections' and select the properties on the correct local area connection. You will see the window shown on the left.

To connect to the EPL router it is advisable to turn off (untick) all the protocols apart from the 'Internet protocol (TCP/IP)' as they can sometimes interfere with the connection. Once this is done highlight the 'Internet protocol (TCP/IP)' and click the properties button.

After clicking properties you will see the window shown on the right. You need to select 'use the following IP address' and enter the data shown. Then click OK.
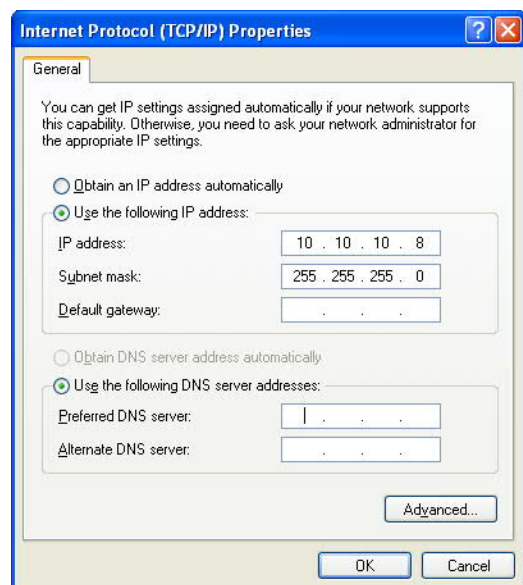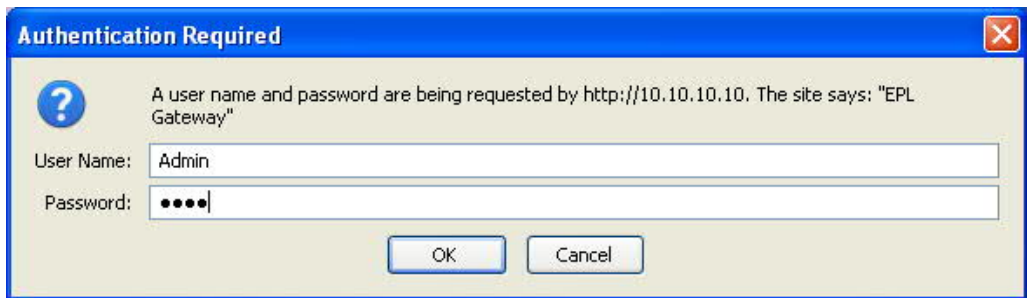
Configuring the EPL router

Now using a web browser (such as Internet explorer or Firefox) we can connect to the EPL router. Open up your web browser and type in the IP address of the EPL router in the address line, 10.10.10.10, and select go.

You may then be presented with a prompt for a username and password. This feature has been removed in the later router firmware releases, versions 0.95 RC1 onwards. We will go through checking the firmware version in the next section. If you are using an older firmware version enter the following info:

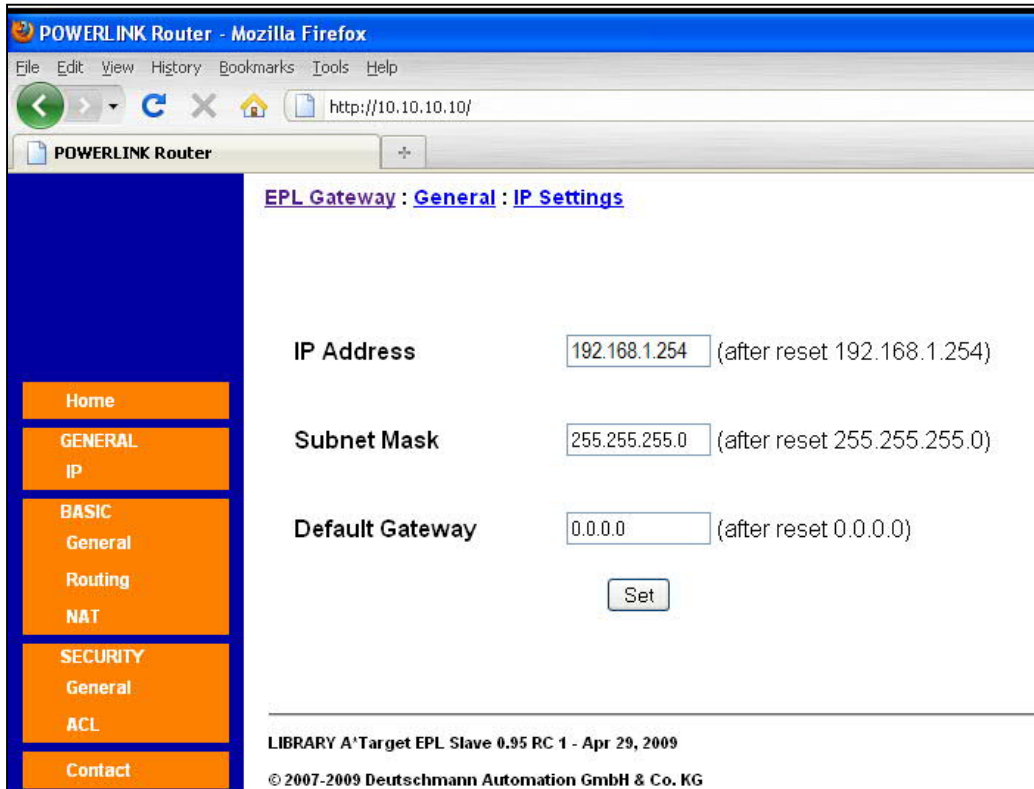**Username: Admin**
Password: 1234

If you do not get to the web configuration utility please check your hardware set up as described in the EPL router installation manual (MN1958). You need to be using the correct type of Ethernet cable (crossed or not crossed). If this all appears correct please check your local area connection settings as outlined previously.

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Setting the IP address of the EPL router

After entering the correct username and password you will get to the web configuration utility for the EPL router. The first page you will see is shown below, this screen allows you to set the IP address and subnet mask the EPL router will use when the switch is switched from its current 10.10.10.10 setting and the EPL router is power cycled.

The first thing to check on this screen is that you have the latest firmware installed on the EPL router. You can read the firmware revision at the bottom of the screen, it should have 'EPL slave 0.95 RC 1 – Apr 29, 2009' or later installed. If it does not refer to application note 'AN00165-000 updating the firmware on an EPL router' to find out how to update the firmware.


Once you have the correct firmware installed you will need to give the EPL router an IP address provided to you by your IT/IS department (a static IP address that will not be assigned to any other devices) and a suitable subnet mask for the network. Once you have entered these values click the set button.

In this example we have given the EPL router an IP address of 192.168.1.254 and left the subnet mask at its default value of 255.255.255.0. This new IP address will not become active until the EPL router is power cycled.

Note: Do not set the IP address to 192.168.100.0 as this will prevent communication with the EPL router.

Setting up the NAT table

Using the links in the orange boxes down the left hand side we can set other important information. We have already looked at GENERAL-IP the next link to click is BASIC-General. This screen lets us enable network address translation (NAT), if enabled the screen will look like the one shown below. If the enable button is active click it to enable NAT.
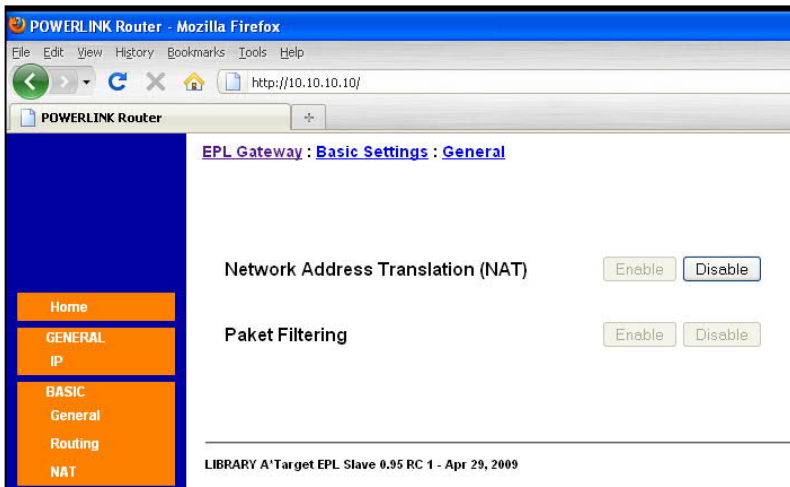

The next link we want to look at is the BASIC-NAT link. This lets us set up Ethernet TCP/IP network addresses that are translated to a set EPL network address. When you first click on the link there should be nothing in the NAT table. Below is a table of the devices we will add to the NAT table and their EPL network addresses.

Device type	EPL network address
NextMove e100 – EPL master, Node 0xf0	192.168.100.240
MotiFlex e100 – Node 0x01	192.168.100.1
MotiFlex e100 – Node 0x02	192.168.100.2
MicroFlex e100 – Node 0x03	192.168.100.3
MicroFlex e100 – Node 0x04	192.168.100.4
EPL Router – Node 0xfe	192.168.100.254

We need a static IP address on the local network for each of these devices, ask your IT/IS department for these. We have been given the following IP addresses for our example 192.168.1.1 – 192.168.1.5 and 192.168.1.240.
Your IP addresses may be completely different, for example 10.55.0.71 - 10.55.0.76, all in one block. It is up to you to decide how you are going to assign the addresses and keep track of them for future use.
The EPL network address of the device is set by its node number (set using the rotary switches on the device). EPL network addresses are always in the format 192.168.100.x where x is the node number in decimal.
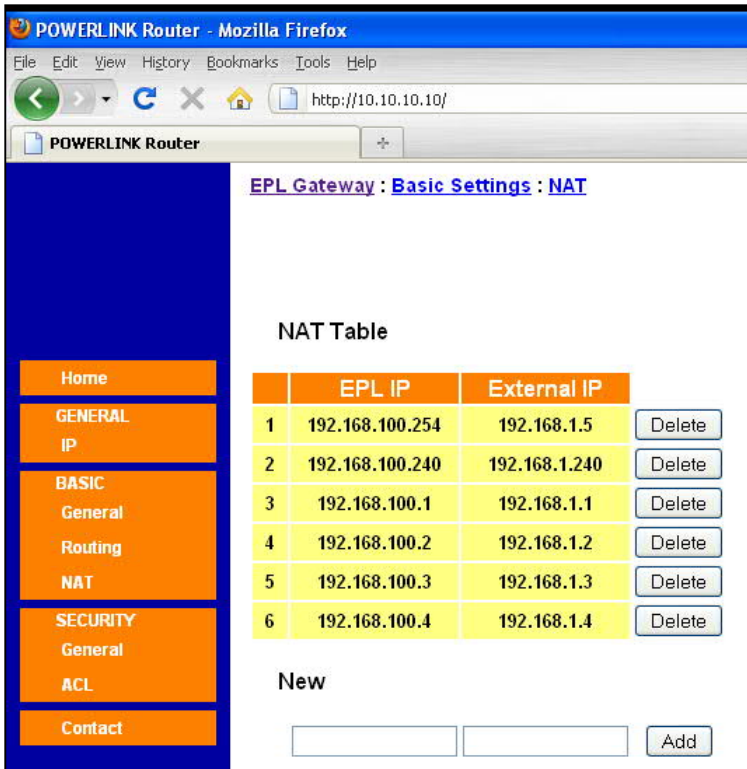
The screen shot below shows the NAT table, to make things less confusing we have used 192.168.1.1 - 192.168.1.4 for the matching node numbers on the EPL network (the various axes).

This leaves 192.168.1.5 for the EPL router and 192.168.1.240 for the NextMove e100. We do not use 192.168.1.254 for the EPL router as we have already used this IP address for the Ethernet TCP/IP side of the router.

Now this table is set up the EPL router will connect network address calls of any of the External IP addresses shown (on the right) to the EPL network address (on the left).

Below is a summary table of all the addresses we are using.

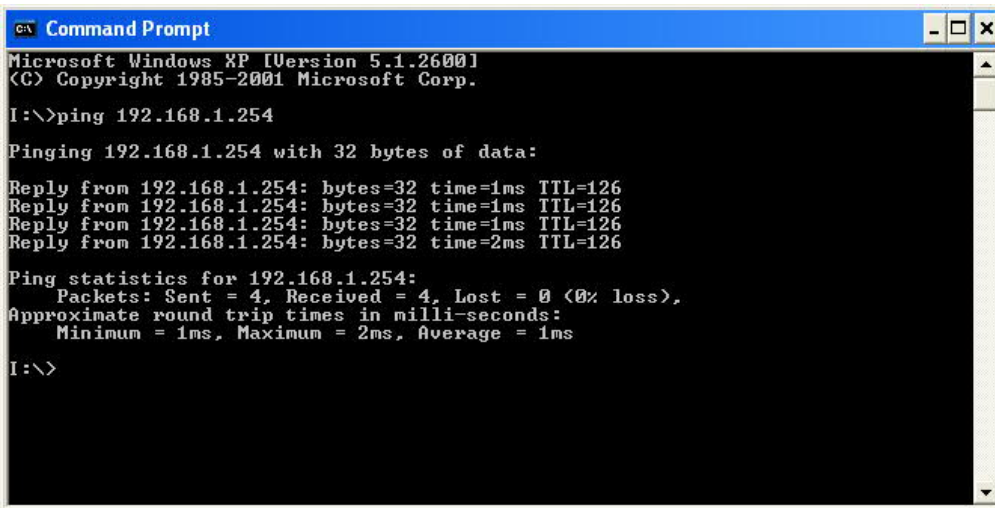| External IP	EPL IP	Device	Purpose
192.168.1.254	n/a	EPL Router	External IP used to access the Ethernet TCP/IP side of the router
192.168.1.5	192.168.100.254	EPL Router	External IP used to access the EPL side of the router
192.168.1.240	192.168.100.240	NextMove e100 – Node 0xf0	External IP used to access the NextMove e100
192.168.1.1	192.168.100.1	MotiFlex e100 – Node 0x01	External used to access the MotiFlex e100
192.168.1.2	192.168.100.2	MotiFlex e100 – Node 0x02	External IP used to access the MotiFlex e100
192.168.1.3	192.168.100.3	MicroFlex e100 – Node 0x03	External IP used to access the MicroFlex e100
192.168.1.4	192.168.100.4	MicroFlex e100 – Node 0x04	External IP used to access the MicroFlex e100

Confirm you can access the devices

Now we have set up the EPL router we can set the switch back to normal operation (user defined IP address). Once you have moved the switch over power cycle the EPL router to update it to use the configuration we have just set up. The EPL router is now using the IP address we set earlier of 192.168.1.254.

We also need to set the IP address of our PC to use the same network ID as the EPL router. In this example we are going to use 192.168.1.6 so we enter this in the internet protocol (TCP/IP) properties page as described previously (when we set it to 10.10.10.8).

To confirm we have connections with the various devices we can quickly and easily use a command prompt to ping the devices. Firstly we will ping the Ethernet TCP/IP side of the EPL router, open a command prompt and type 'ping 192.168.1.254'
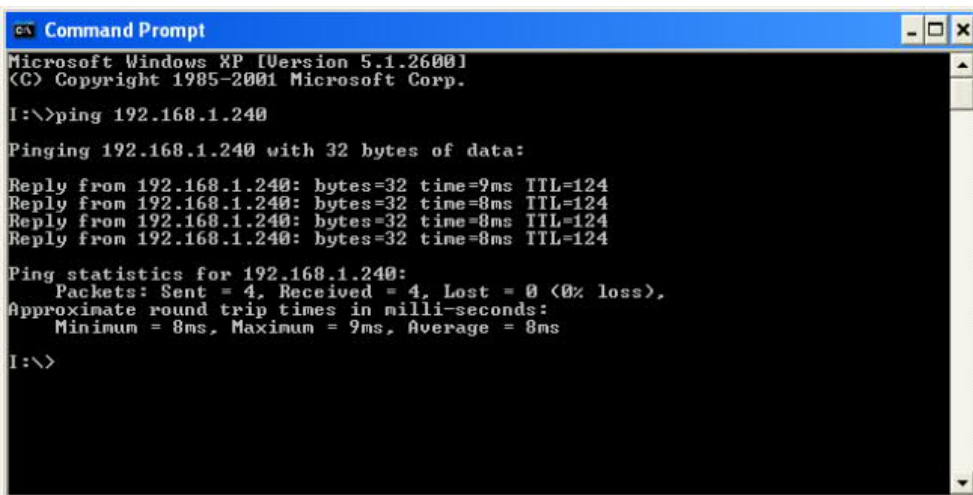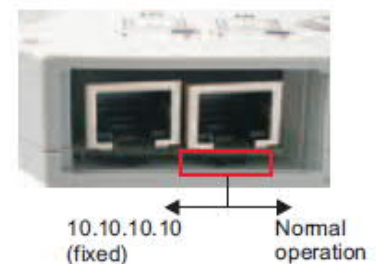
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You should see 3 replies similar to the above screenshot. If you do not get replies from the EPL router or they take longer than 20ms check that you have correctly set the local area connection settings to the correct subnet.

Once we have confirmed we can communicate to the Ethernet TCP/IP side of the EPL router we can attempt to ping the devices on the EPL network (the NextMove e100 and e100 drives). To do this we ping the following addresses:

|	
NextMove e100	192.168.1.240
MotiFlex e100 – Axis 1	192.168.1.1
MotiFlex e100 – Axis 2	192.168.1.2
MicroFlex e100 – Axis 3	192.168.1.3
MicroFlex e100 – Axis 4	192.168.1.4

The above screen shot shows the ping to 192.168.1.240 (the NextMove e100). The replies when pinging this device take longer than shown in the previous screenshot. This is because the messages now have to be sent in the asynchronous slots of the EPL communication to the NextMove e100.

If you cannot ping any of the devices on the EPL network try to ping the EPL side of the router, in our example that means we need to ping 192.168.1.5. If this does not work check the settings of the switches on the EPL router and refer to the EPL router installation manual (MN1958) for further details.

The next thing to check is that you can still access the devices when not directly plugged into the EPL router. Firstly connect the EPL router directly to the local network by plugging a network cable from it to a network port on the wall. Now connect your computer to the same network (via wireless or wired connection to another network port). Now that we are connecting the computer to the local network we can set the Internet protocol (TCP/IP) properties to 'Obtain an IP address automatically' as shown below. The computer will be given an IP address on the same subnet (but not one of the static IP addresses we have been assigned), something like 192.168.1.x in our example. The exact address it receives does not matter.
Also set the properties to 'obtain DNS server automatically'.

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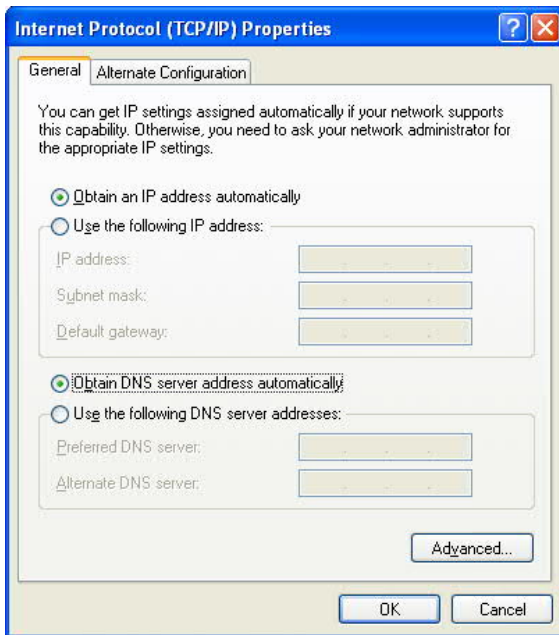
Using this setup we should still be able to connect to the e100 devices via the local network and then the EPL router. Try pinging an e100 device to prove this.

VPN Connection

To be able to access a remote network (for example at a customer site) where there is an EPL router connected to an EPL network we want to connect to we will most likely need to set up a VPN client connection. As mentioned before how you connect to the remote network will depend on the local IT/IS department. There are other ways to access remote networks and your IT/IS department can assist you with this.

Timeout changes

Before we can access the remote e100 devices we need to increase the ICM timeouts used by Mint WorkBench. This is so that the increased delay caused by connecting to the e100 device via the internet does not cause a timeout in Mint WorkBench.
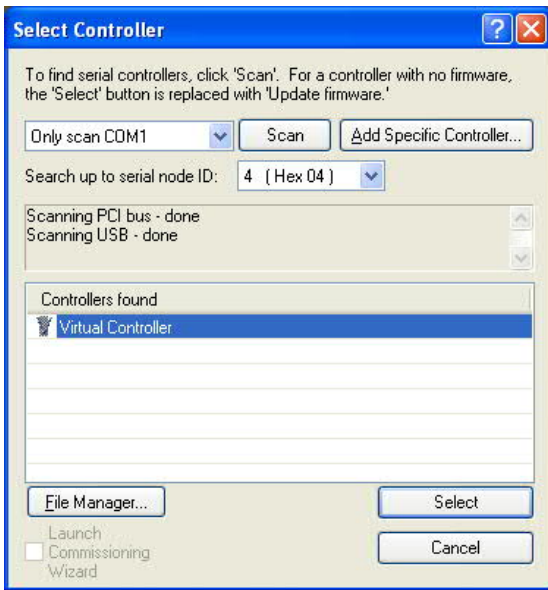
To make the changes we need to open Mint WorkBench and select start new project. This will open the window seen on the left; press the select button to connect to the virtual controller.

Next go to Tools>Options and select the timeouts tab as shown below.

Adjust the timeouts in the Ethernet section so that they are values suitable for the application, values are scaled in milliseconds.
The values shown on the right are typical values for connection via the internet but you may find better values by playing around with these. You want the value to be large enough so that you don't get error messages due to timeouts but not so large that you have to wait too long to be informed of a real error.

You will then need to close Mint WorkBench and start it again for the changes to take effect.
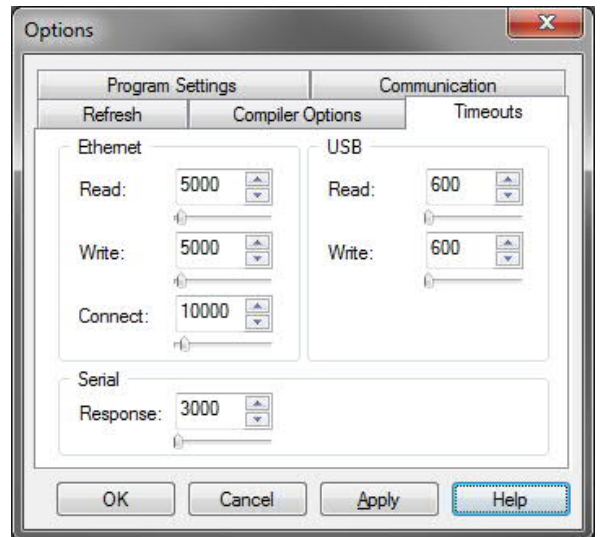
Connecting Mint WorkBench

We are now ready to try and connect Mint WorkBench to a remote e100 device. We will connect to the NextMove e100 in this example.

Firstly we make sure our VPN connection is present to the remote network using a VPN client (or similar method). If we are connected we can start Mint WorkBench, select 'start new project' to see the 'select controller' window shown previously. Now click on the 'add specific controller' button.
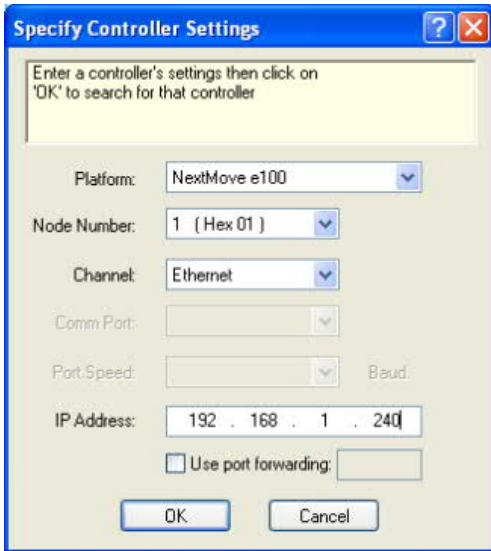
Enter the required information for the e100 device you are connecting to. The options for our NextMove e100 are shown on the left. Note: The node number drop down box has no affect when connecting to an Ethernet device.
click ok.

The 'select controller' window will now show the specific controller we have just added. Highlight this option in the list and click the 'select' button.

Assuming the ICM timeouts have been entered correctly Mint WorkBench should now be connected to the remote e100 device.
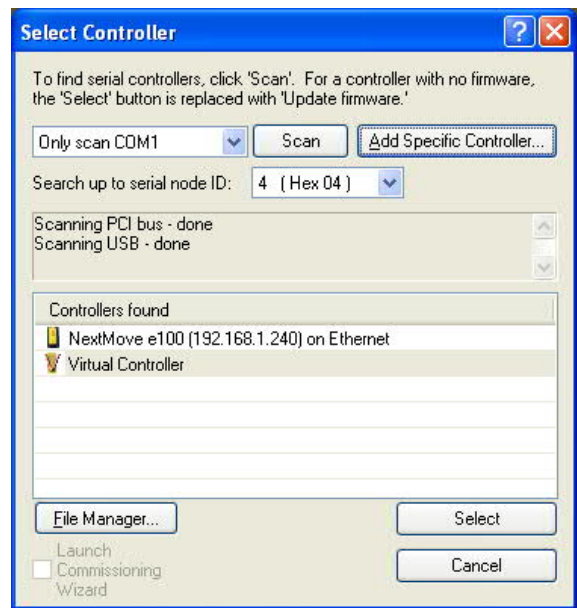
Ethernet TCP/IP connection

If there is no EPL network connected to the e100 device you are connecting to you do not need to use an EPL router. In this case you can either adjust the node ID by changing the rotary switches on the e100 device. The node ID then forms part of its network address in the form 192.168.100.x, where x is the node ID in decimal format. Your IT/IS department should be able to use the NAT functionality of their routers to give you a local static IP address that will connect to 192.168.100.x and hence the e100 device.

Contact us

For more information please contact your
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