



## **White Paper**

# **How to Remotely Access Ethernet I/O Over the Internet**

ACROMAG INCORPORATED  
30765 South Wixom Road  
P.O. BOX 437 Wixom, MI 48393-7037 U.S.A.

Tel: (248) 295-0880  
Fax: (248) 624-9234

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# How to Remotely Access Ethernet I/O Over Internet

This white paper details the steps needed to access your I/O module remotely over the internet. This can be done with Ethernet-enabled I/O modules that have the capability to display built-in webpage-based output monitoring. In other words, if your I/O module can serve a webpage over Ethernet, and the network it is connected to has internet access, then you can set it up to view your I/O from any internet connection around the world.

## Getting Started

This white paper makes a few assumptions to simplify the steps needed to connect an Ethernet-enabled I/O module to the internet:

- You are connecting your I/O module to your company's existing LAN network, which has access to the internet.
- Your company's server or router, also connected to the network and internet, with either static or dynamic IP address assigned by the Internet Service Provider

## The Layers between Your I/O and the Internet

To make an Ethernet-enabled module accessible from the internet, a rudimentary understanding is required of basic network architecture. A basic understanding of the structure of the internet is also very helpful.

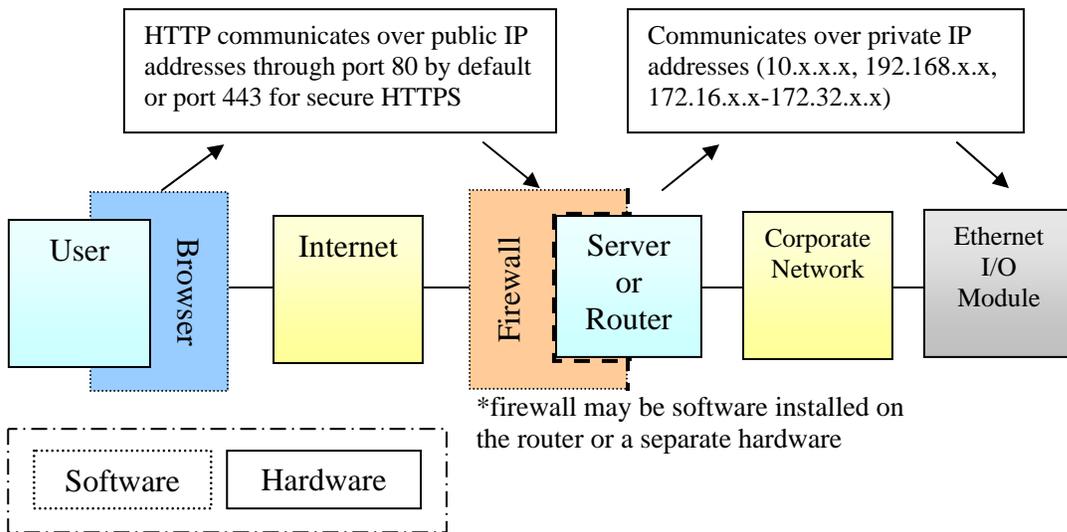


Figure 1: The path from the module to the user

## The Internet

The internet is essentially a group of servers all connected together in a mesh configuration, each serving files, usually in HTML format, to the network.

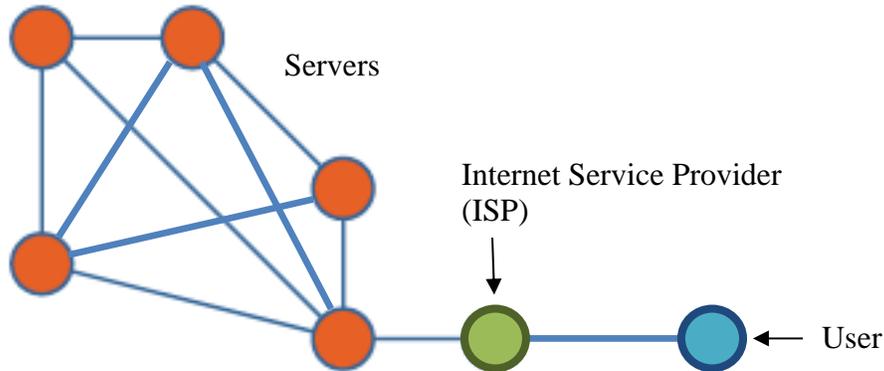


Figure 2: Mesh configuration of the internet

To communicate on the internet, computers must have unique identifiers in order to differentiate one computer from another. This is accomplished through the assignment of an IP address. An IP address is a 32-bit identifier comprised of 4 octets (8-bits), with each octet a number from 0 to 255 and separated by a decimal point. For example, Acromag Series 9xxEN I/O Modules use a default IP address of 128.1.1.100. Every host on a network must have at least one unique IP address. (“Connecting Acromag Series 900EN Modules to Your PC”, page 3)

When one device communicates with another on a network, it must also specify a port number which specifies where a given communication will be received by the end device on the Transport Layer protocol. By default, HTTP (HyperText Transfer Protocol) and HTTPS (secure HTTP) internet protocols are sent and received through port 80 and 443, respectively.

When you open your browser to access the internet from your PC, you typically do not type in the IP address of the server that hosts the website you would like to visit, though. Instead, you type an alphanumeric moniker, known as a Universal Resource Locator (URL), that refers to the website you’d like to visit (such as [www.google.com](http://www.google.com) or [www.acromag.com](http://www.acromag.com)). When you do this, your ISP first communicates with one of many special servers on the network called Domain Name Servers (DNS), which hold master tables that correlate every domain name in existence to their appropriate IP address. Your ISP then directs your browser to the corresponding IP address for the entered domain.

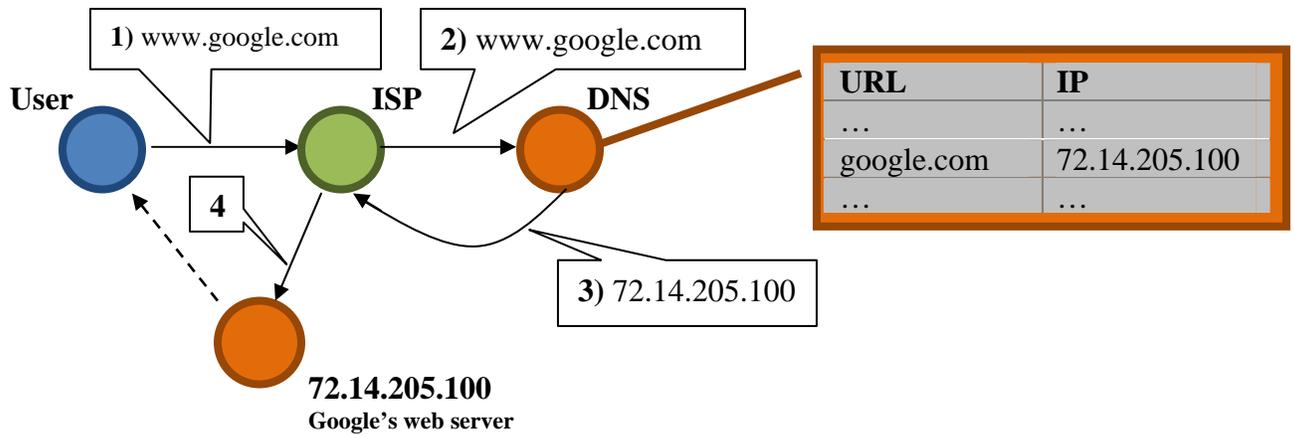


Figure 3: Flowchart of requesting a website

### Static IP vs. Dynamic IP Address

As previously mentioned, every device connected to a network has an IP address. While devices connected to a LAN have a local IP address, devices connected to the internet, like the router that connects your LAN to the internet, have an IP address assigned by the ISP. Each ISP has a finite amount of IP addresses that it can assign to its customers. For most home and small business accounts, the ISP puts these IP addresses into a queue and assigns them as needed to a customer when that customer goes to access the internet. This is called a dynamic IP address, because it is assigned on a per-use basis and may change day to day or even from session to session. Since all of the ISP's customers are not accessing the internet at the same time, this allows the ISP to maximize the number of customers it can serve with each IP address. ISP's are able to assign IP addresses dynamically much the same way routers assign dynamic local IP addresses to devices on a LAN, according to Dynamic Host Configuration Protocol (DHCP).

However, customers may request to have one or more static IP addresses reserved for them by the ISP. This means that when the customer (or anyone on the network for that ISP account) will always have the same IP address assigned and that no other customer can be assigned that IP address. Because this takes that IP address out of the queue that the ISP can assign to other customers, this option usually comes at an additional monthly price. In return, it makes it easy for other devices to locate that computer over the internet, which creates the ability to remotely access computers and devices on the company's network from outside the physical network.

In order to be able to remotely access your I/O device from the internet, you will either need to have a static address assigned to you by your ISP, or you will need to register with a dynamic DNS service. When you create and setup an account with a dynamic DNS service, your ISP notifies this account when your IP address changes to a newly assigned IP address and updates your account information on the dynamic DNS service. Any time you wish to access your I/O module remotely, you will first need to login to your dynamic DNS service account to obtain your company's current IP address.

## Corporate Network

A corporate Network, also known as a Local Area Network (LAN) is generally setup in a Star configuration. Just as a home PC accesses the internet through their ISP, servers and LAN's also access the internet through an ISP.

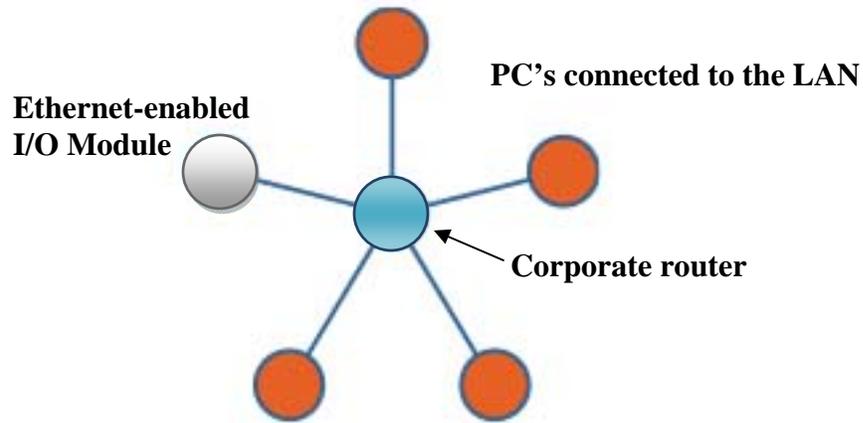


Figure 4: Star network configuration

Generally speaking, if a PC can access the internet, then the internet can also access that PC. This is why a firewall is so important. Theoretically, if a PC on a LAN accesses the internet through the corporate server or router, which in turn accesses the internet through the ISP, then anyone else on the internet could access any PC on your company's LAN through the same path. This is why servers, routers, and PC's generally have a firewall installed. A firewall restricts the traffic that is allowed to pass through all ports.

## Security

It should be noted that when making an Ethernet I/O module available online, anyone with access to the internet can access that module, unless additional security measures are taken to restrict access through the corporate router or firewall. It is best to consult your company's IT before making any sensitive data or controls available online.

## Steps to Connect I/O to Internet

1. Connect the Ethernet module to a Local Area Network
2. Assign internal static IP (should begin with digits 10.x, 192.168.x, or 172.x) to module from router. See **Figure 5** for an example of how this might look in your router or firewall's configuration interface.

### Address Reservation

Address Reservation Table

	#	IP Address	Device Name	MAC Address
<input type="radio"/>	1	192.168.1.2	INSPIRON6000	00:00:00:00:00:00
<input type="radio"/>	2	192.168.1.5	MACBOOK	00:00:00:00:00:00
<input type="radio"/>	3	192.168.1.4	--	00:00:00:00:00:00

IP Address

MAC Address

Device Name

.  .  .

The local static IP you'd like to assign to the Ethernet I/O module

The MAC address of the Ethernet I/O module

The name you would like to give to the module on the network

Figure 5: Assigning a static IP address to your Ethernet I/O module

*From this point, follow the “a” steps if you are accessing your I/O module from a specific static IP address assigned to you by your ISP. Follow the “b” steps if you are accessing your I/O module through a specific port with your dynamic IP address assigned by your ISP. If you are connecting the module to a home network, you will most likely need to follow the “b” steps.*

	a. Using a Static IP Address	b. Using a Dynamic IP Address
3. Setting up router or firewall	Setup router or hardware firewall that connects the LAN to the internet to accept connection requests from the internet from a public static IP address currently not in use that has been assigned to you from your ISP. You will need to configure your router or firewall to accept these connection requests forward them to the assigned internal static IP address from step 2.	<p>Setup router or hardware firewall that connects the LAN to the internet to accept connection requests from the internet through a specific open port that is not already being used for communications on your network. For a list of registered ports for common services and software, see <a href="http://www.iana.org/assignments/port-numbers">http://www.iana.org/assignments/port-numbers</a>.</p> <p>You will need to configure your router or firewall to accept these connection requests and forward them to the assigned internal static IP address from step 2.</p> <p>Be sure that when you setup port forwarding on the router or firewall that the forwarded request is made through port 80, which is the standard port for HTTP needed if the Ethernet I/O module uses a web-based interface.</p> <p>See <b>Figure 6</b> for an example of how this might look in your router or firewall’s configuration interface.</p>

<p>4. Setting up DNS routing</p>	<p>If you would just like to access your I/O module directly with the static IP address you've setup, then you may skip this step. Otherwise, if you would like to access your I/O module from an easy-to-remember sub-domain (such as <a href="http://module.example.com">http://module.example.com</a>), create a DNS A-record from your DNS management interface to forward a sub-domain of your choice to the public static IP address assigned by your ISP that you configured in step 3.</p> <p>This DNS management interface is usually an online portal either where your company registered its domain name or where your company's website is hosted.</p> <p>*See NOTE:</p>	<p>Create a free account at a dynamic DNS service such as DynDNS.com and follow the instructions to enter your IP information. Make sure that the service you use is supported by your router or firewall.</p> <p>You will then need to configure your router or firewall with your login and password information for the service you chose. This information will allow your router/firewall to contact the dynamic DNS service to notify it whenever its assigned IP address changes. See <b>Figure 7</b> for an example of how this might look in your router or firewall's configuration interface.</p> <p>Any time your ISP updates or changes your company's dynamically assigned IP address, your account here will be updated to reflect the change so that you will know how to access your company's LAN.</p>
<p>5. Accessing I/O module from the internet</p>	<p>In your internet browser, browse to the sub-domain that you created a DNS record for in step 4 on your company's domain. This will be typed in the browser's address bar in the format of <a href="http://&lt;subdomain&gt;.&lt;domain&gt;.com">http://&lt;subdomain&gt;.&lt;domain&gt;.com</a>.</p> <p>If you skipped step 4 and are simply using the static IP address setup in step 3, then just type that IP address in the browser's address bar.</p>	<p>Login to your DynDNS.com (or other dynamic DNS service) account to find what your company's dynamic IP address currently is.</p> <p>Then in your internet browser, browse to your company's dynamic IP address through the port that you configured in step 3. The port is specified in the URL in the following format: <a href="http://&lt;dynamic IP&gt;:&lt;port number&gt;">http://&lt;dynamic IP&gt;:&lt;port number&gt;</a>. For example, <a href="http://72.14.205.100:8080">http://72.14.205.100:8080</a></p>

\*NOTE:

DNS records are copied to DNS servers all over the internet. You can never be sure which DNS server you will be connected to when accessing a webpage from your computer, and changes to DNS records may take up to 24 hours to propagate to all DNS servers. Because of this, you may need to allow 24 hours before step 5 will work.

### Ports - Custom Services

The screenshot shows the 'Ports - Custom Services' configuration interface. It includes the following fields and callouts:

- Service Name:** An empty text input field.
- Service Type:** A dropdown menu set to 'TCP/UDP'. Callout: 'Make sure TCP/UDP is selected'.
- Starting Port:** A text input field containing '(1-65534)'. Callout: 'The Starting Port should be the open port you configure in Step 3b.'
- Ending Port:** A text input field containing '(1-65534)'. Callout: 'The Ending Port should be set to 80.'
- Server IP Address:** A dotted IP address field with '192', '168', and '1' entered in the first three segments. Callout: 'This is the local static IP address you configured in Step 2'.
- Buttons:** 'Apply' and 'Cancel' buttons are located at the bottom of the form.

Figure 6: Configuring port forwarding

### Dynamic DNS

The screenshot shows the 'Dynamic DNS' configuration interface. It includes the following fields and options:

- Use a Dynamic DNS Service**
- Service Provider:** A dropdown menu set to 'www.DynDNS.org'.
- Host Name:** An empty text input field.
- User Name:** An empty text input field.
- Password:** An empty text input field.
- Use Wildcards**
- Buttons:** 'Apply', 'Cancel', and 'Show Status' buttons are located at the bottom of the form.

Figure 7: Configuring dynamic DNS