Tech Tip

Setting the IP Address on CTI Products

SUMMARY

In order to use any CTI product with Ethernet connectivity, you must first set its IP address. This Tech Tip will provide simple instructions for setting IP addresses for both initial use as well as replacement use for the following products:

- 2572-A
- 2572-B
- 2500P-ECC1
- 2500P-ACP1
- 2500-Cxxx CPU

More detailed instructions can also be found in the respective user manuals for each of the products.

Before You Get Started

All of the above CTI Ethernet-connected products require a fixed IP address. Before installing your module, you need to determine its IP address. If you are connecting to an existing network, you should obtain an unused static IP address and the network subnet mask from the network administrator. If you are establishing your own IP addresses, you should select IP addresses from a block of 'private" addresses established by the Internet Assigned Numbers Authority (IANA).

The private address blocks are:

- 10.0.0.0 through 10.255.255.255 (Class A)
- 172.16.0.0 through 172.31.255.255 (Class B)
- 192.168.0.0 through 192.168.255.255 (Class C)

These addresses will not be forwarded by the Internet backbone routers; therefore, you are free to use any address in this group as long as it does not conflict with addresses already in use at your local facility.

Please note that some methods for setting IP addresses described here require your PC to share the same network address and subnet mask (but not host address) as the module connected to it and that the ECC1 and ACP1 (if using data cache or CAMP client) require that your CPU/host controller have the same subnet mask and network address as the module in order to function properly. For a quick and easy way to differentiate between network address and host address in most situations, please see the following table:

Class	First Octet Value*	Network portion	Subnet/host portion
A	1-126	First Octet	Last 3 Octets
B	128-191	First 2 Octets	Last 2 Octets
C	192-223	First 3 Octets	Last Octet

For more information on IP addressing, please see Appendix B of this Tech Tip.

2572-A and 2572-B

For both the 2572-A and the 2572-B, you may choose to manually set the IP address or you may choose to set the IP address using the PLC. We generally recommend using the PLC to set the IP address even though it requires a bit of additional programming in your PLC on the front end, because it has the advantage of ensuring that any future replacement modules will automatically have the correct IP address. If you prefer to set the IP address manually, you may use the webserver or CTI Diag (2572-A only) to set network parameters. Instructions for each of the methods will be explained below.

In summary, your options for setting the IP Address for either a 2572-A or 2572-B are:

1) Setting the IP address using the PLC program (PLC START mode)
2) Setting the IP address manually using one of the following methods (AUTOSTART mode):
   - Use the Webserver
   - Use CTIDiag (2572-A only)

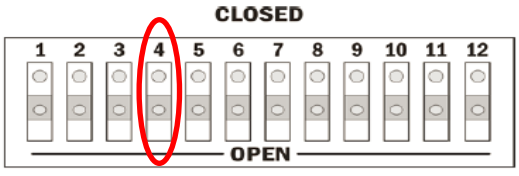
Setting the IP Address from the PLC Program

Because setting the network parameters from the PLC requires more knowledge and instruction than can be contained in a tech tip covering multiple products, you will need to follow the link below to a Tech Tip specific to setting the IP Address using the PLC, or you may follow the abbreviated instructions below that will require you to consult your *Installation and Operation Guide* in order to perform all necessary steps.

www.controltechnology.com/files/common-documents/tech-tips/ethernet/Setting-IP-address-using-the-PLC-Tech-Tip-FINAL

In General:

In order to use the PLC program to set the IP Address, you must run your module in PLC START mode. SW4 must be in the Open position.



In the PLC START position, the module will wait for the PLC START Network Server command before starting the network services. This command block is what sets the IP Address and other network parameters for the module.

Abbreviated Instructions:

1) Select an IP Address for your module
2) Log in the module to the base and read Appendix C of the *2572-A Installation and Operation Guide* or Appendix B of the *2572-B Installation and Operation Guide* to understand how the module is controlled by the PLC program and how it reports its status.
3) Using the information in Chapter 4 of the *2572-A Installation and Operation Guide* or Chapter 8 of the *2572-B Installation and Operation Guide*, enter your Start Network Server Command Block in V-memory according to the instructions and follow the example to enter rungs into your ladder to execute the command block.

Please note that if you trigger the Start Network Server command while the command block contains invalid data, the module will return an error code and then halt. To recover, you must correct the command block entry and reset the module.

Setting the IP Address Manually

To manually set the IP parameters to correspond to your networking requirements, you must choose the AUTOSTART option using SW4. Be sure that SW4 is in the Closed position.

Network Startup	Position SW4
AutoStart	Closed
PLC Start	Open

1) Using the Webserver

To set the IP parameters using the embedded web server, you must first ensure that your PC is on the same IP subnet as the module. The default IP address for both the 2572-A and 2572-B is 169.254.1.1 and the default subnet mask is 255.255.0.0, so your PC must have an IP address that starts with 169.254 and does NOT end with 1.1 (For example, an IP address of 169.254.1.2 would be acceptable). The subnet mask for the PC must be the same as the subnet mask for the 2572-A/B.

You can set a static IP address for your PC using Control Panel (or Settings in Windows 10), or you may cause your PC to generate its own compatible address, if DHCP (Dynamic Host Configuration Protocol) is being used to obtain its IP address.

To cause the PC to generate its own compatible address, do the following:

1. Connect an Ethernet cable directly between your PC and the 2572-A or 2572-B module
2. Reboot the PC

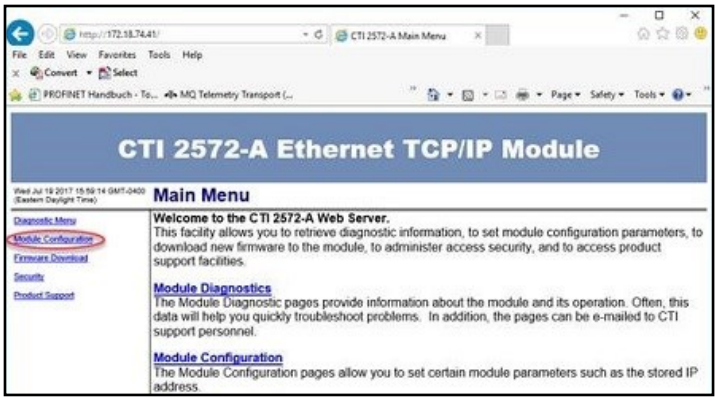
* Please also note that when using the PLC START option, the PLC must be in RUN mode before the module will start

When a Windows PC is unable to obtain an IP address from DHCP, it automatically generates a link local address using a feature called Automatic Private IP Addressing. It may take several minutes before the PC will stop trying to contact a DHCP server and generate a Link Local address that is compatible to the IP address of the module which is also a link local IP address.

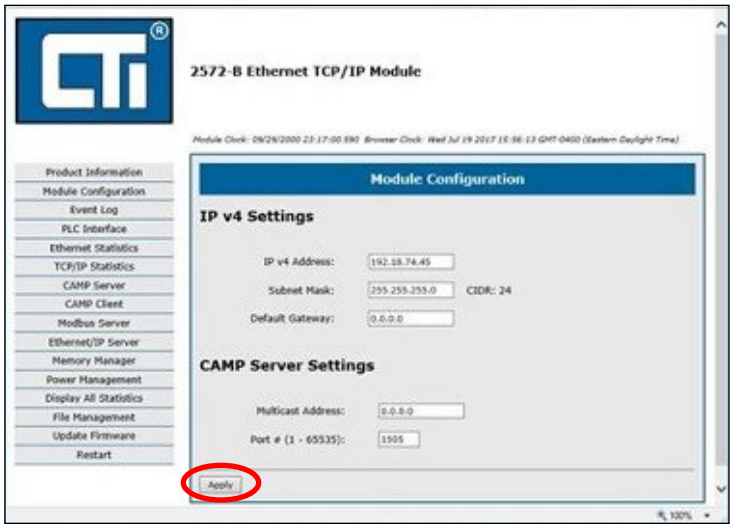
Once the link local IP address is generated, or once you have set a compatible static IP address for your PC, you can connect to the module and change the network parameters to meet your requirements.

1) Type the IP address of the module in your browser's URL box (unless the default IP address has been changed, it should be http://169.254.1.1). Please note that the IP address is displayed by the LED display on the front panel of the 2572-B module after power-up (the 2572-A does not have this feature). To restart the 2572-B with the CTI factory default address described above, you may hold down the reset button for 10 seconds or more (this does not work for the 2572-A).

2) From the list of pages on the left hand side of the web page, select the *Module Configuration* page. The graphic shown below is for the 2572-A, but the 2572-B page has the same option on the left-hand side. Unless you have bypassed password protection, you will be asked for a User ID and Password. The default User ID and default password are both *config*.



3) When the configuration page is displayed, enter the new IP address information in the appropriate fields. The 2572-A will ask for "Module IP Address" and "Network Address Mask." The 2572-B will ask for "IP v4 Address" and "Subnet Mask." Do not worry about the "Default Gateway" at this time. It is an optional setting that can be entered at a later time. Once your desired values have been entered, press the *Update Module* button for the 2572-A or the *Apply* button for the 2572-B (as depicted above).



2) Use CTIDIAG (2572-A ONLY)

Another way to manually set network parameters on the 2572-A (this does not work for the 2572-B) is to use a serially attached PC and a configuration program from CTI called CTIDIAG. The CTIDIAG program used with the 2572 module will work in this application. It may be downloaded from the CTI web site (www.controltechnology.com/downloads).

1) Install CTIDIAG on your computer.

2) Connect the computer to the module serial port using a serial cable wired for RS-232. The serial cable that you use with your PLC programming software should work properly.

3) Select the COM port and set the baud rate to correspond to the selection you made for your module. The default baud rate is 9600. Set the remaining port parameters as follows: Parity = Odd, Data Bits = 7, and Stop Bits = 1.

Baud Rate	Position	
	SW1	SW2
1200	Closed	Closed
2400	Closed	Open
9600	Open	Open
19200	Open	Closed

4) Under the Commands menu item select SET NETWORK PARAMETERS.

5) Follow the instructions on the screen for setting the network parameters.

6) Reset the module for the changes to take effect. The module will restart using the parameters you just entered.

2500P-ECC1

In order to set an IP address on the 2500P-ECC1, you must use the *CTI 2500P-ECC1 Configuration Program* which can be downloaded from the CTI Web site. Once the IP address has been configured using the program, you will transfer the configuration files from your PC to your ECC1 using an SD card.

The following procedure provides a quick means for creating a configuration that loads an IP address to the ECC1. It consists of the following steps:

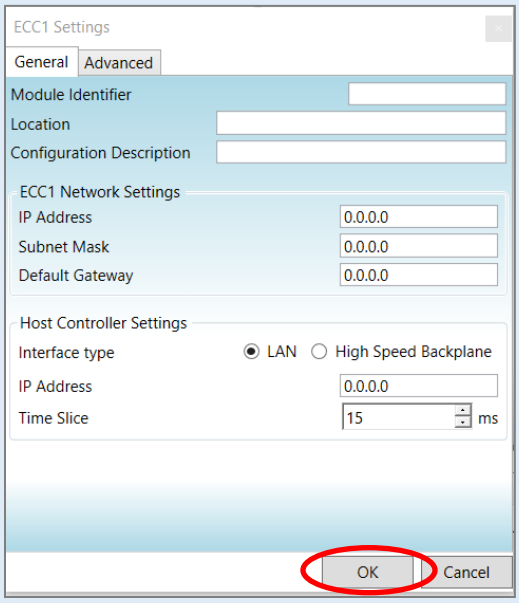
1) Starting the configuration program

2) Entering the IP address and subnet mask of the ECC1 module. (You may also enter the IP address of the Host Controller at this time if desired.)

3) Saving the configuration to an SD card and inserting the SD card into the module

Starting the configuration program:

- After starting the configuration program, you should be presented with a dialog box that asks you to Start a New Project, Open an Existing Project, or Cancel.
- Select the "Start a New Project" option. If the dialog box does not appear, select File/New from the menu bar.
- Once you have created a new project, you will be presented with the ECC1 Settings dialog box.



Entering the IP addresses:

- Under "ECC1 Network Settings" heading, enter the IP address and the subnet mask for your ECC1 module. Please remember that you must assign an IP address and subnet mask to the ECC1 that is on the same IP subnet as the Host Controller for which it will provide communication services.
- Under the Host Controller Settings heading, enter the IP address assigned to the Ethernet port of your CTI 2500 Series® controller. (OPTIONAL — This step can also be completed at a later time.)
- When you have finished entering this information, click on the OK button.

Saving the configuration to an SD card:

- Click on the Save to File option in the toolbar to name and save the configuration project.
- Insert the SD card into your PC and click on the Compile/Save to SD Card. If your PC does not have an SD card slot, you will need to obtain a USB-to-SD Card adapter. These adapters are widely available at a nominal cost.
- After saving the configuration files to the SD card, insert the card into the SD card receptacle on the 2500P-ECC1 module.
- New settings are detected on module power-up and saved in non-volatile memory

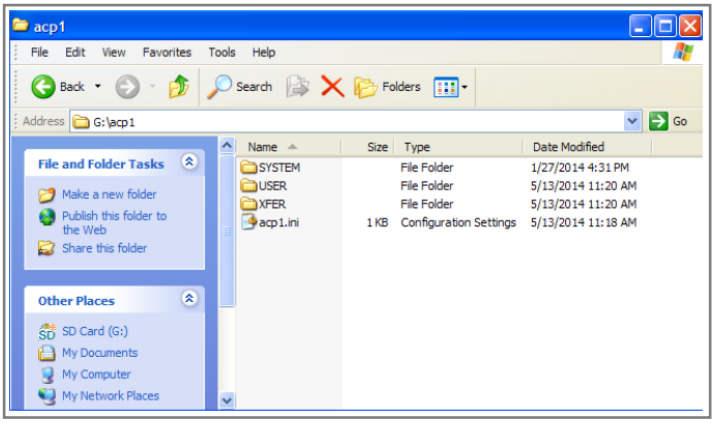
2500P-ACP1

There are two methods to assign an initial IP address for the 2500P-ACP1:

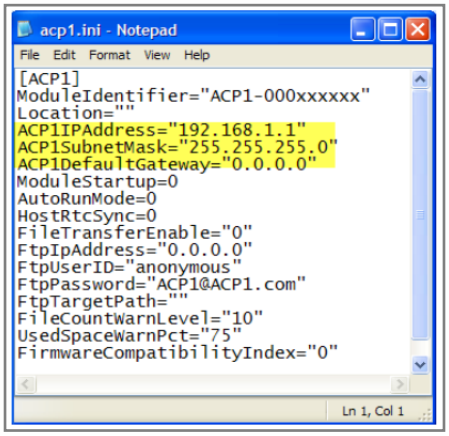
1) Modify the configuration file generated by the module
2) Offline configuration

METHOD 1: Modify the configuration file generated by the module

- Insert the ACP1 module into the base.
- Apply AC power so that the ACP1 module executes power-on reset.
- When Status LED starts blinking, remove ACP1 module from the base.
- Remove SD card from ACP1 and insert in PC card reader.
- Open drive letter assigned to SD Card and navigate to \acp1 folder



- Open ‘acp1.ini’ file with a text editor such as ‘Notepad’ and modify highlighted fields to match your network settings. All other items can be configured via the Web Server after the IP address is set.



- Save the modified file and return SD card to ACP1.
- Reinsert ACP1 module into base
- New settings are detected on module power-up and saved in non-volatile memory

METHOD 2: Offline Configuration

- Remove SD card from ACP1 and insert in PC card reader.
- Open a text editor such as ‘Notepad’ and copy/paste the text in the box below. Modify the bolded values (next to keywords) to the IP address you have selected and to your network subnet mask. All other items can be configured via the web server.

```
ACP1IPAddress="192.168.1.1"
ACP1SubnetMask="255.255.255.0"
ACP1DefaultGateway="0.0.0.0"
```

- Select ‘Save As’ option; then select drive letter assigned to SD Card.
- Press ‘Create New Folder’ icon and rename ‘New Folder’ as ‘acp1’.
- Enter file name as ‘\acp1\acp1.ini’ and press [Save].
- Remove SD card from PC and insert the card into the SD card receptacle on the 2500P-ACP1 module
- Insert ACP1 module into base.
- New settings are detected on module power-up and saved in non-volatile memory

To change an IP address, there is a third option: use the web browser.

METHOD 3: Web Browser

This method can be used if the ACP1 already has an IP address which is reachable from your PC.

- Connect to the web server from any computer with an Ethernet connection to the module by entering the module IP address into the navigation toolbar of any web browser. (The PC will have to have the same network and subnet mask addresses as the module.)
- Enter the desired module IP address, subnet mask, and default gateway in the appropriate fields.
- Press [Submit] to save changes to the module configuration.
- The module must be reset (or power cycled) to use the new parameter values. If you changed the IP address on your PC in order to connect to the ACP1, you may now change it back.

2500-Cxxx Processor

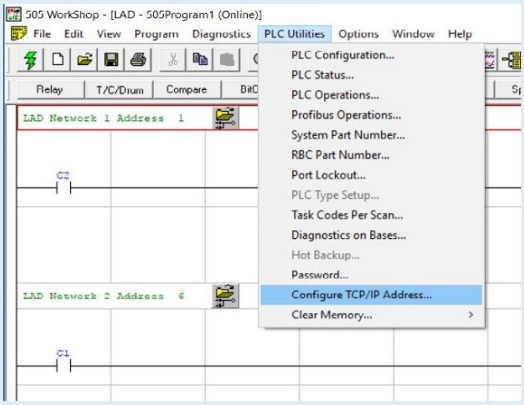
To set an IP address for a 2500-Cxxx Processor, you may either use the Serial or USB Port, or you may use the Ethernet Port.

Using the Serial or USB Port

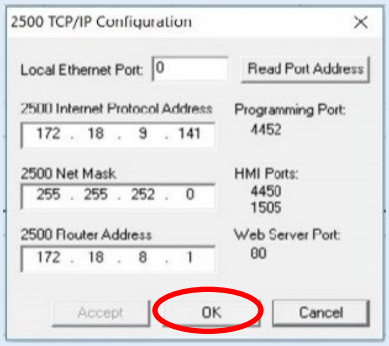
When connected to the serial or USB port, you can set the IP address and other IP parameters using 505 Workshop (V4.11 or greater) or using CPU_IPSET, a standalone utility that you can download from the CTI web site.

To use 505 Workshop:

- Start Workshop and connect to the CPU
- In Workshop, select PLC Utilities and Configure TCP/IP Address.



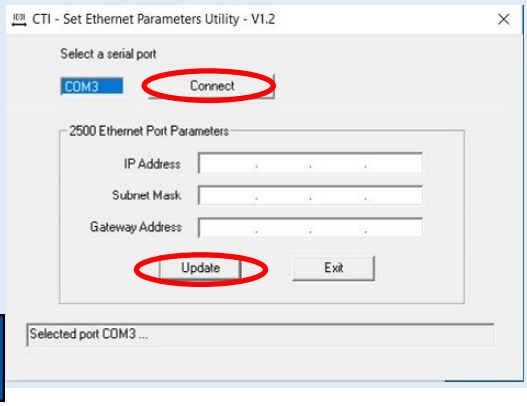
- In the dialog box, enter the IP address settings. Click OK.



- The IP address of the CPU will change immediately.

To use CPU_IPSET:

- Download CPU_IPSET from the CTI website.
- Run CPU_IPSET. It will display the following dialog box:



- Select your COM port and click Connect. CPU_IPSET will display the current IP address settings of the CPU.
- Enter the changes you want and click Update.

Using the Ethernet Port

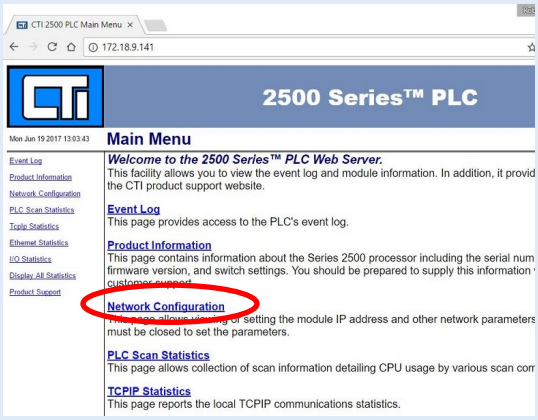
Firmware version 8.02 and above allows you to set the IP address and other IP parameters when connected to the Ethernet port. To enable this capability, SW11 must be set to the closed position. You can change the parameters using 505 Workshop (V4.11 or greater) or by accessing the 2500 controller embedded web server with your PC web browser.

To use 505 Workshop:

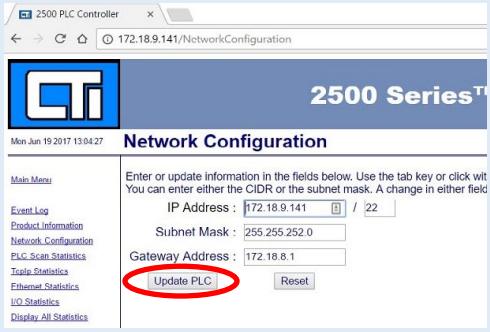
- Follow the same procedure as described above in "Using the Serial or USB Port"

To use a web browser:

- Note the IP address and subnet mask address (in CIDR format) presently being displayed on the front of the CPU
- If needed, change the IP and subnet mask addresses of your PC so that the PC is on the same IP subnet as the CPU
- Launch your web browser
- In the URL box of the browser, type the IP address of the CPU. The home page of the CPU will be displayed.



- Click "Network Configuration" to display the IP address configuration screen
- Enter your desired IP address settings and click Update PLC.



APPENDIX A: CTI Ethernet Products IP Addressing Reference Chart

	Features						Configurable from:			
	Ships w/default IP address assigned	Default IP Address	Default subnet mask address	Displays IP Address	CPU must have same network and subnet mask address	Supports multicast address	PLC Program	ini file on SD card	Webserver	Other
2572-A	yes	169.254.1.1	255.255.0.0	no	no	yes	yes	no	yes	CTIDIAG
2572-B	yes	169.254.1.1	255.255.0.0	yes	no	yes	yes	no	yes	
ECC1	no	n/a	n/a	yes	yes	yes	no	no	no	ECC1 Configuration Program
ACP1	no	n/a	n/a	yes	depends**	yes	no	yes	yes	
2500-Cxxx	no*	n/a	n/a	yes	n/a	no	no	no	yes	CPU_IPSET

* CTI 2500-Cxxx CPUs ship with no network parameters. When you connect the Ethernet port to a switch or PC, the controller will automatically generate a temporary Link Local IP address. ** If using data cache or CAMP client for ACP1 to communicate to CPU, both CPU and ACP1 must have same network and subnet mask addresses.

APPENDIX B: IP Addressing

Every host interface on a TCP/IP network is identified by a unique IP address. This address is used to uniquely identify the host device, such as a workstation or communications module, and the network to which the host belongs. Each IP address consists of 32 bits, divided into four 8 bit entities called octets. These octets are divided into a network portion of the address and a host portion with the help of a subnet mask (more on this below). An IP address is expressed in dotted notation, with each octet expressed as its decimal equivalent. The value in each octet ranges from 0 to 255 decimal or 00000000—11111111 binary. See the example below.

Notation	Octet 1	Octet 2	Octet 3	Octet 4
Binary	11000000	11011111	10110001	00000001
Decimal	192	223	177	1

Address Classes

IP Addresses are broken into different classes in order to accommodate networks of varying sizes. The network class can be discerned from the first octet of its IP address. The following table lists the three most common IP address classes along with the default subnet mask for each class and the total number of Network IDs and Host IDs for each address class. It also indicates which portion of its address is for network versus the portion used by network managers to divide into subnets and hosts.

Class	First Octet Value*	Default Subnet Mask	Network portion	Subnet/host portion	Number of networks	Number of hosts per network
A	1-126	255.0.0.0	First Octet	Last 3 Octets	126	16,777,214
B	128-191	255.255.0.0	First 2 Octets	Last 2 Octets	16,384	65,534
C	192-223	255.255.255.0	First 3 Octets	Last Octet	2,097,151	254

* Address 127 is reserved for loopback testing and inter-process communication on the local computer; it is not a valid network address. Addresses 224 – 239 are used for Class D (IP multicast). Class E (240 - 255) are reserved for future use.

Subnet Mask

Used alone, the designation of network classes is very inflexible. For example, a Class A network assigns a large number of host devices to the same IP network; potentially reducing performance, limiting topology, and compromising network security. An additional entity, the Subnet Mask, provides means of dividing a large IP network into a collection of smaller networks called subnets.

The Subnet Mask is a collection of 32 bits that distinguish the network ID portion of the IP address from the host ID. Like the IP Address, the resulting 32-bit value is expressed in dotted decimal notation. In binary form, however, it is easy to identify the network and host IDs: any bits which have corresponding mask bits set to 1 represent the network, and any address bits that have corresponding mask bits set to 0 represent the host ID. Or in decimal form, the octets of the IP address where the corresponding octet of the subnet mask is 255 belong to the Network ID and the octets of the IP address where the corresponding octet of the subnet mask is 0 belong to the Host ID.

Bits for Network Mask				Network Mask in Dotted Decimal
11111111	00000000	00000000	00000000	255.0.0.0 (default class A subnet mask)
11111111	11111111	00000000	00000000	255.255.0.0 (default class B subnet mask)
11111111	11111111	11110000	00000000	255.255.240.0 (subnetted class B network)
11111111	11111111	11111111	00000000	255.255.255.0 (default class C subnet mask)

For example: when the IP address is 172.54.177.97 and the subnet mask is 255.255.255.0, the Network ID is 172.54.177 and the Host ID is 97. If your subnet mask does not align with octet boundaries (for instance, 255.255.240.0), you will need to consult one of our user manuals for help in performing a bitwise “and” calculation (see the User Manual for the 2500P-ECC1) in order to determine the network and host IDs.

Final Reminder

When you are configuring the IP address of devices that must communicate on a local network, you must ensure that:

- The Subnet Mask of all devices are the same,
- The Network ID of all hosts are the same,
- The Host ID of each host is different.

APPENDIX C: Using the Product Display to Determine the IP Address and Subnet Mask

CTI products with front panel displays (2500-Cxxx processors, 2572-B, 2500P-ECC1, 2500P-ACP1) running recent firmware versions display the IP address in dotted decimal format followed by the subnet mask in CIDR format. The CIDR format is an alternate, more recent means of specifying the mask which simply designates the number of network ID bits.

See the conversion table to the right.

CIDR	Dotted Decimal	CIDR	Dotted Decimal
/1	128.0.0.0*	/17	255.255.128.0
/2	192.0.0.0*	/18	255.255.192.0
/3	224.0.0.0	/19	255.255.224.0
/4	240.0.0.0	/20	255.255.240.0
/5	248.0.0.0	/21	255.255.248.0
/6	252.0.0.0	/22	255.255.252.0
/7	254.0.0.0	/23	255.255.254.0
/8	255.0.0.0	/24	255.255.255.0
/9	255.128.0.0	/25	255.255.255.128
/10	255.192.0.0	/26	255.255.255.192
/11	255.224.0.0	/27	255.255.255.224
/12	255.240.0.0	/28	255.255.255.240
/13	255.248.0.0	/29	255.255.255.248
/14	255.252.0.0	/30	255.255.255.252
/15	255.254.0.0	/31	255.255.255.254*
/16	255.255.0.0	/32	255.255.255.255*

* Not allowed for CTI products

For Additional Help

Please do not hesitate to contact us if we can be of further assistance. You can reach our technical support line at +1.865.584.0440 or email us at support@controltechnology.com. We stand ready to assist you and appreciate your business.

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