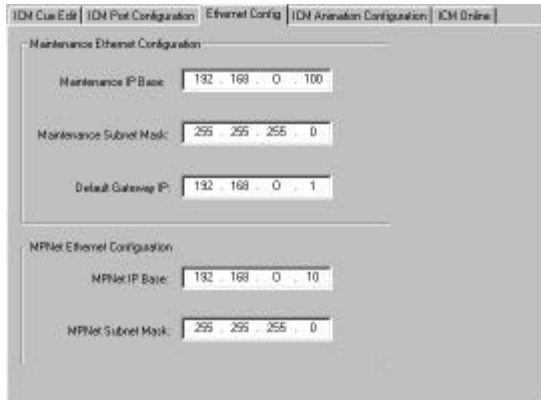

This brief is intended for Control Engineers and Technicians who are installing, programming and maintaining a MediaPro Control System that communicates on an Ethernet network. It is assumed that you have some understanding of MediaPro 4000 Systems, Show Control, Ethernet IP Networking and Windows PCs.



Internet Protocol (IP) addresses are 32 bit addresses represented as four decimal numbers separated by periods (.).

ICM-4020E IP configuration (in Rack 0 config tab set only)

Although, the EtherNet Config tab only exists in Rack 0's config screens, the information entered is included in the config download to all racks.

Maint IP Base: This is the IP address that the Rack 0 ICM will use on its Maintenance EtherNet Port. All other racks will be automatically configured as an incremental IP address above this base.

i.e. if the base is 192.168.0.100,
 Rack 0 will be 192.168.0.100,
 Rack 1 will be 192.168.0.101,
 Rack 2 will be 192.168.0.102, ...

MediaPro Systems currently reserve 52 contiguous Maint IP addresses, which will be available for each show's configuration.

Maint Subnet Mask: The Subnet mask identifies what portion of the IP address represents the Sub network and what part represents the Hosts (PC, ICM, ...) Subnet masks are contiguous 1 bits filled from the most significant bit downward.

A mask of 255.255.255.0 would be a /24 (slash 24, the top 24 bits on).

If the bit is on (1) in the Subnet mask, the corresponding bit in an IP address is part of the Sub network identification.

If the bit is off (0) in the Subnet mask, the corresponding bit in an IP address is part of the Host identification.

i.e. With an IP Base of 192.168.0.100 and a Subnet mask of 255.255.255.0 the range of IP addresses for the Subnet would be 192.168.0.0 through 192.168.0.255.

The first IP address in a Subnet is reserved to identify the Sub network itself.

The last IP address in a Subnet is reserved for Subnet Broadcast (a message to all IP addresses in the same Subnet address range).

i.e. 192.168.0.0 would be the Subnet IP address, 192.168.0.255 would be the Broadcast IP address, and Hosts could use IP addresses 192.168.0.1 through 192.168.0.254.

Maint Default Gateway:

In most cases the Default Gateway will not need to be used (0.0.0.0) since all hosts involved will be on the same LAN in the same Subnet. Gateways connect individual physical networks into a system of networks. When a host needs to communicate with a host on another network, a gateway transfers the data between the two networks. The Default Gateway (Router) is the IP address that a host would send any messages to if the destination IP address were not in the host's Subnet. Typically, (but not always) this is the first Host IP address in a Subnet (i.e.: 192.168.0.1).

i.e. With a IP Base of 192.168.0.100 and a Subnet mask of 255.255.255.0, if the destination IP address were not between 192.168.0.0 through 192.168.0.255 then the message would instead be sent to the Ethernet MAC address of the Default Gateway and with the original destination IP address.

MP Net Base IP and Subnet Mask: The MP Net Ethernet Configuration fields are similar to the Maint IP fields. They provide the address information used by the MP ENet (Control Network that connects all the racks in a show together).

This is the IP address and Subnet mask that the Rack 0 ICM will use on its MP ENet EtherNet Port. All other racks will be automatically configured as an incremental IP address above this base.

i.e. if the base is 192.168.0.10,
 Rack 0 will be 192.168.0.10,
 Rack 1 will be 192.168.0.11,
 Rack 2 will be 192.168.0.12, ...

MediaPro Systems currently reserve 52 contiguous MP ENet IP addresses, which will be available for each show's configuration.

About now, you may be asking **what all this means to me, why do I have to know this?**

In order for two (or more) Ethernet devices (Hosts, PCs, ICMs, ...) to communicate with each other, they not only must be connected to each other on an Ethernet network, they must also have protocol (IP, UDP, TCP, ...) configurations in common.

For example, you want to set up 2 MediaPro Racks on the same MP-ENet control network, and also download cues, etc., from a PC via the Maint ENet, both of the ICMs' Maint ENet and the PC's EtherNet adapter need to be properly configured, each with different IP addresses in the same Subnet.

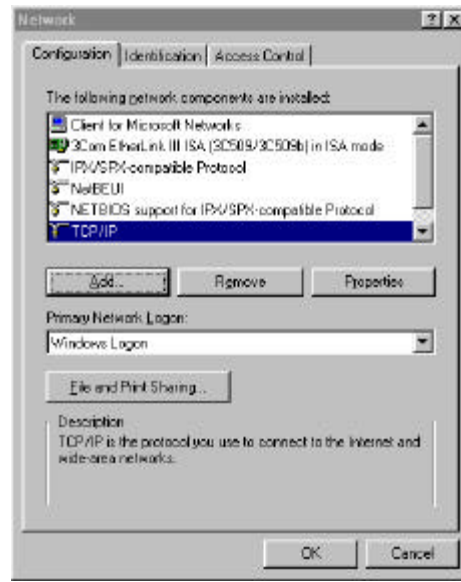
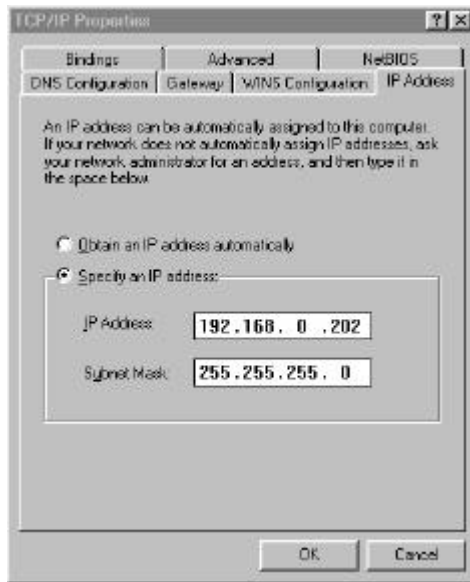
For instance, as with the previous examples,

The IP base is 192.168.0.100, with Subnet mask 255.255.255.0,
192.168.0.0 represents the Subnet,
192.168.0.1 through 192.168.0.254 assignable to devices (Hosts, PCs, ICMs, ...),
192.168.0.254 used for Subnet Broadcast.

MediaPro Systems reserve 52 contiguous IP addresses
starting at the base 192.168.0.100 through 192.168.0.151
192.168.0.100 (Rack 0)
192.168.0.101 (Rack 1)
through
192.168.0.131 (Rack 31)
and
192.168.0.148 (Console 0)
through
192.168.0.151 (Console 3)

The PC could use any of the below addresses, assuming that something else is not using some of them (like other PCs or Routers).

192.168.0.1
through
192.168.0.99
and
192.168.0.152
through
192.168.0.254



Either the PC(s) need to be configured into the same IP address Subnet as the MediaPro ICM Maint ENet, or the MediaPro ICM Maint ENet needs to be configured onto the same IP address Subnet as the PC(s).

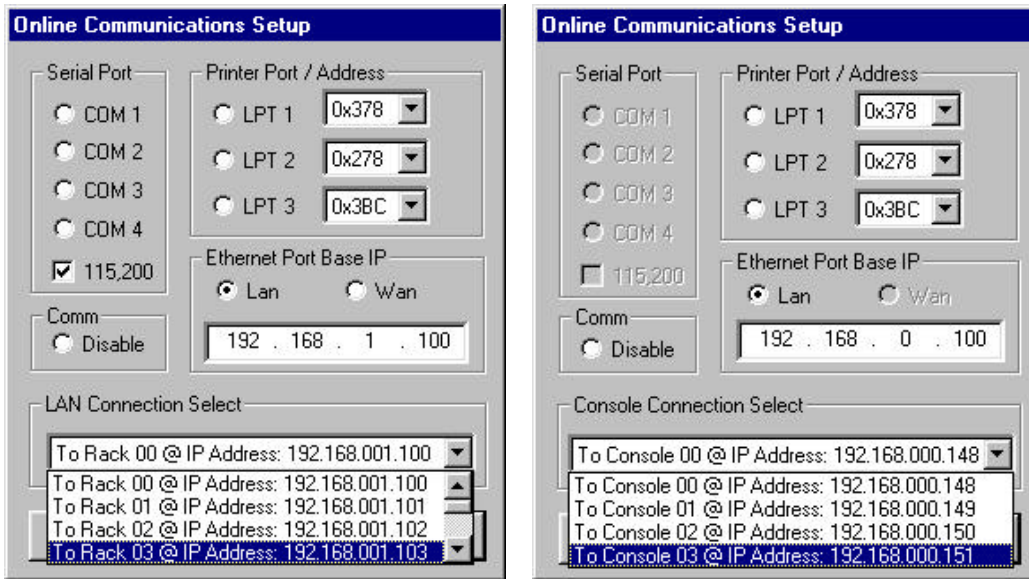
If the MediaPro ICM Maint ENet are never going to be connected to any existing, or future network that has any purpose except for communicating only between a PC and the ICM then the IP address range chosen does not matter too much.

If however, it will ever be connected to a network that allows Internet access, then it should probably use one of the Private IP address ranges. Address Allocation for Private Internets; The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of the IP address space for private internets:

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

Before connecting to an existing LAN and assigning IP addresses to equipment, you should check with your IT System Administrator.

With the PCs and ICMs configured (and downloaded), MP4000 can start communicating with the ICM via the ICM's Maint ENet port



The **Setup/Options Communications Dialog** allows you to select which PC communications port you want to use to communicate between a PC and an ICM. Select the Ethernet option and specify the address of the ICM that the PC is plugged directly into.

For instance, as with the previous examples,

The IP base is 192 . 168 . 0 . 100, with Subnet mask 255 . 255 . 255 . 0,
 192 . 168 . 0 . 100 (Rack 0)
 192 . 168 . 0 . 101 (Rack 1)
 192 . 168 . 0 . 148 (Console 0)
 192 . 168 . 0 . 202 (PC)

Using a Crossover Category 5 patch cable Between the ICM and the PC

If you plugged the Cable into the Rack 0 ICM Maint ENet you would select "To Rack 0 @ IP Address: 192.168.0.100".

If you plugged the Cable into the Rack 1 ICM Maint ENet you would select "To Rack 0 @ IP Address: 192.168.0.101".

If you plugged the Cable into the Console 0 ICM Maint ENet you would select "To Console 0 @ IP Address: 192.168.0.148".

Using a STRAIGHT Category 5 patch cable Between the ICMs and a Hub/Switch,

and another STRAIGHT Category 5 patch cable Between the PC and a Hub/Switch.

You could select any Rack's IP address that was plugged into the Hub/Switch without moving any cables.

Note: If a PC is plugged directly into any ICM Maint ENet it can still communicate with the other Racks through the ICM and over the MP ENet Control network.

Example: PC is plugged into the Rack 0 ICM Maint ENet Port, Rack 0 and 1 are connected to a Hub/Switch via their MP ENet (control network) Ports.

In the MP4000 Software Network Tree, you can select Rack 1's ICM (or other modules) and communicate with them via the MP ENet (control network) even though your PC is Plugged into Rack 0.

{This communication happens when there is time/bandwidth available, in-between the Real-Time (30 frames per second) MediaPro ICM control messages that synchronize and distribute the inputs, outputs (including animation data) and commands between Rack 0 (the master) and Racks 1-31 (the slaves).}



A note about **locally administered Media Access Control (MAC) "Ethernet" addresses**:

The ICM-4020E Ethernet board uses locally administered MAC addresses, deriving its MAC and IP addresses from the IP Base Address and The Rack #.

Since neither, duplicate IP or MAC address is allowed to exist on the same network, having them relate to each other is convenient.

Media Access Control (MAC) addresses are 48 bit Ethernet addresses represented as six hexadecimal numbers separated by colons (:) or dashes (-).

The Universally or Locally Administered (U/L) Address Bit (2nd bit of octet 0) indicates whether the address has been assigned by a local or universal administrator. Universally administered addresses have this bit set to 0. If this bit is set to 1, the entire address (i.e., 48 bits) has been locally administered.

A note about **Latency**:

For proper operation, the maximum latency between any two ICMS through the MP ENet (Real Time 30 frame per second control network ports) must not exceed 9ms one-way (18 ms round trip for ping or other round trip latency tests).

For more information, see the following references:

<http://anitech-systems.com/> Anitech System's Web Site
<http://anitech-systems.com/MP4000/manual/> Manuals
<http://anitech-systems.com/MP4000/manual/briefs/> Briefs

http://www.3com.com/other/pdfs/infra/corpinfo/en_US/501302.pdf Understanding IP Addressing: Everything you ever wanted to know

<http://anixter.com/>, <http://anixter.com/techlib/>, Many documents relative to Ethernet cables, by Anixter

Surviving the Manufacturing and Industrial Environment, by Anixter, Cisco and Rockwell/Allen-Bradley
http://www.ciscoworldmagazine.com/webpapers/2001/06_rockwell.shtml, <http://www.ab.com/networks/enetpaper.html>

http://www.rjlnxx.com/ENET_on_the_factory_floor.pdf, Industrial Ethernet Connectivity, by RJ-Lnxx

Connectivity: The Last Frontier, Best Industrial Installation Practices, by Industrial Ethernet Book, RJ-Lnxx and Woodhead Industries
<http://ethernet.industrial-networking.com/articles/i06connectivity.asp>

<http://ieee.org/>, <http://standards.ieee.org/reading/ieee/std/lanman/>
Carrier sense multiple access with collision detection (**CSMA/CD**) access method and physical layer specifications
<http://standards.ieee.org/reading/ieee/std/lanman/802.3-2000.pdf>

<http://www.iana.org/>, <http://www.iana.org/assignments/ipv4-address-space> Internet Protocol (IPv4) **Public/Global Address Space**

<http://www.ietf.org/>, Automatic Private IP Addressing (**APIPA**) [169.254.x.x]
<http://search.ietf.org/internet-drafts/draft-ietf-zeroconf-ipv4-linklocal-04.txt>

<http://www.rfc-editor.org/>, The RFC Editor is the publisher of the RFCs and is responsible for the final editorial review of the documents.
The Requests for Comments (**RFCs**) form a series of notes that discuss many aspects of computer communication.

<http://www.rfc-editor.org/rfc/bcp/bcp5.txt> <http://www.rfc-editor.org/rfc/rfc1918.txt> Address Allocation for **Private Internets**

<http://www.rfc-editor.org/rfc/rfc950.txt> Internet Standard **Subnetting** Procedure

<http://www.rfc-editor.org/rfc/rfc1519.txt> Classless Inter-Domain Routing (**CIDR**)

<http://www.rfc-editor.org/rfc/std/std3.txt> Communication, Application and Support Requirements for **Internet Hosts**

<http://www.rfc-editor.org/rfc/std/std6.txt> User Datagram Protocol (**UDP**)

<http://www.rfc-editor.org/rfc/std/std5.txt> Internet Protocol (**IP**)

<http://www.rfc-editor.org/rfc/std/std37.txt> <http://www.rfc-editor.org/rfc/std/std38.txt> **ARP**: Convert IP Addresses to Ethernet MAC Address

<http://www.rfc-editor.org/rfc/std/std2.txt> <http://www.rfc-editor.org/rfc/rfc1700.txt> **Assigned Numbers**: Addresses, Ports, Protocols

<http://www.rfc-editor.org/rfc/std/std1.txt> Internet Official Protocol Standards

[ISBN 3-540-96651-X](#) **Introduction to TCP/IP** by John Davidson

[ISBN 1-565-92660-9](#) **Ethernet the Definitive Guide** Designing and Managing Local Area Networks by Charles E. Spurgeon

[ISBN 0-471-12706-X](#) **Ethernet Networks** Design, Implementation, Operation, Management 2nd ed. by Gilbert Held

[ISBN 0-201-63495-3](#) **TCP/IP Illustrated TCP for Transactions** Vol. 3 by W. Richard Stevens

[ISBN 0-201-63448-1](#) Interconnections: **Bridges, Routers, Switches, and Internetworking** Protocols by Radia Perlman

[ISBN 0-201-63354-X](#) **TCP/IP Illustrated the Implementation** Vol. 2, by W. Richard Stevens

[ISBN 0-201-63346-9](#) **TCP/IP Illustrated the Protocols** Vol. 1 by W. Richard Stevens

[ISBN 0-132-16987-8](#) **Internetworking with TCP/IP** Principles, Protocols, and Architecture Vol. 1 2nd ed. by Douglas E. Comer

[ISBN 0-131-62959-X](#) **Computer Networks** 2nd ed. by Andrew S. Tanenbaum

[ISBN 0-070-46320-4](#) **Ethernet Management** Guide – Keeping the Link by Martin Nemzow,

Check with your IT Network System Administrators

Specifications subject to change at any time.

The data in this document incorporates proprietary rights
of **Anitech Systems Inc., 25021 Anza Drive, Valencia, CA 91355 USA**

Phone +1(661) 257-2184 **Fax** +1(661) 257-2025

Email Mail@Anitech-Systems.com

Web <http://www.Anitech-Systems.com>

FTP <ftp://ftp.Anitech-Systems.com>

Any party accepting this document does so in confidence
and agrees that it shall not be duplicated in whole or in part,
nor disclosed to others, without the consent of ANITECH SYSTEMS.