



Metasys Ethernet Router
JC-MER-CXB

User Manual

#TD060100-0MA

Version 1.1



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1 Introduction

Description

The Metasys Ethernet Router (JC-MER-CXB) provides either router or gateway connectivity between ARCNET and Ethernet networks. Sometimes in router/gateway applications, a desktop PMI/OVS compatible computer is dedicated to the task of executing the application program from either a hard disk or floppy disk. On the PMI/OVS motherboard, two network interface modules are used to connect to the two networks of interest. With the JC-MER-CXB, this same functionality can be provided in a compact and reliable configuration.

On the front panel of the JC-MER-CXB is a BNC connector for the ARCNET and an RJ-45 connector for the Ethernet.

Resident in the JC-MER-CXB is an embedded computer with a solid-state flash disk capable of executing an application program. This user-supplied application program routes packets between ARCNET and Ethernet networks that utilize the same network layer or serve as a gateway between different protocols used by the ARCNET and Ethernet networks. For example, a popular transport layer for Ethernet is TCP/IP. To route between ARCNET and Ethernet at the network layer (IP), ARCNET would need to be operating a TCP/IP stack as well. For all other situations where different higher-level protocols are involved, a gateway program would be needed to effect connectivity between ARCNET and Ethernet. Either situation can be addressed by the JC-MER-CXB.

To provide ARCNET-to-Ethernet connectivity within a Metasys system, the JC-MER-CXB was created by installing the necessary application program onto the flash disk. This product replaces the JC-MH-16, JC-EP-RG and JC-EP-CS version or model of the Ethernet router. To configure the JC-MER-CXB, a laptop computer running a terminal emulation program, like HyperTerminal, is attached to one of the COM ports using a null-modem cable. Once configured, the program runs continually.

SPECIFICATIONS

<i>Electrical</i>	DC	AC
Input voltage:	10–36 volts	8–24 volts
Input power:	8 W	8 VA
Input frequency:	N/A	47–63 Hz

Environmental

Operating temperature:	0°C to +60°C
Storage temperature:	–40°C to +85°C
Humidity:	10% to 95%, non-condensing



Ethernet Data Rates

10/100 Mbps

ARCNET Data Rate

2.5 Mbps

Shipping Weight

1 lb. (.45 kg)

Compatibility

ANSI/ATA 878.1 and IEEE 802.3

Regulatory Compliance

CE Mark
CFR 47, Part 15 Class A
UL 508 Listed Device
cUL 22.222 #14
(intended for use with Class 2 circuits)

LED Indicators

Status — multicolor (see page 20 for details)

ARCNET	Ethernet
RX — green	LINK/ACT — green/yellow
ACT — yellow	DUP — green/yellow

Connector Information

Ethernet Socket Pin Assignments (RJ-45 Connector)

1	TD+
2	TD-
3	RD+
6	RD-
(all other pins are unused)	

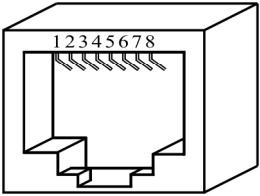


Figure 1 — RJ-45 Connector

ARCNET Socket Pin Assignments (RJ-45 connector)

4	Line – (Phase B)
5	Line + (Phase A)
(all other pins are unused)	

ARCNET Socket Pin Assignments (3-pin screw terminal connector)

	485	485X
SH	Shield	Shield
B	Line –	Line
A	Line +	Line

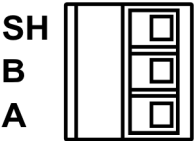


Figure 2 — 3-pin Connector

COM1 & COM2 Pin Assignments (DB9 connectors)

PIN	Signal	Function
2	RXD	Receive Data
3	TXD	Transmit Data
5	GND	Ground
(all other pins are unused)		

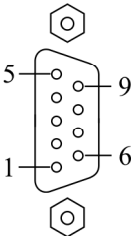


Figure 3 — DB9 Pins

COM1 & COM2 EIA-232 Communication Parameters (DB9 connectors)

Baud Rate	57,600 bps
Data Bits	8
Parity	No Parity
Stop Bit	1

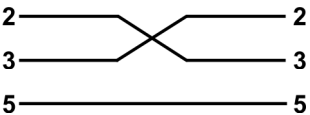


Figure 4 — Null-Modem Cable Wiring

Mechanical

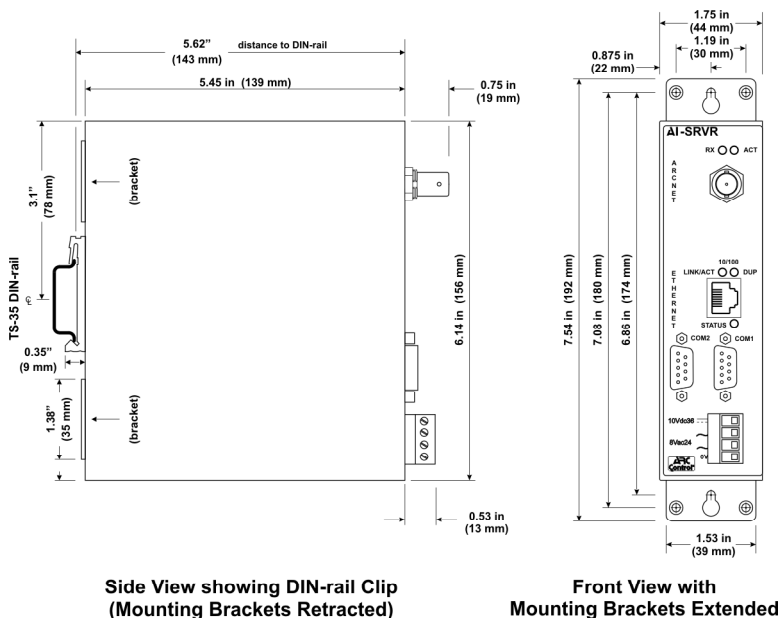


Figure 5 — JC-MER-CXB Dimensions

Metasys Ethernet Router Ordering Information

JC-MER-CXB Coaxial Cable Dipulse Transceiver

ELECTROMAGNETIC COMPATIBILITY

JC-MER-CXB units comply with Class A radiated and conducted emissions as defined by CFR 47, Part 15 and by EN55022. This equipment is intended for use in non-residential areas.

Warning

This is a Class A product as defined in EN55022. In a domestic environment this product may cause radio interference — in which case the user may be required to take adequate measures.

2 Operation

Description

The JC-MER-CXB integrates Metasys N1 LAN segments with an Ethernet network that uses the TCP/IP (Transmission Control Protocol/Internet Protocol) suite. The router provides the physical connection between a Metasys ARCNET segment and the Ethernet network. It takes advantage of a customer's existing Ethernet network, while maintaining the dedicated Facility Management System (FMS) communications necessary for complex, time-critical, local control strategies.

With the JC-MER-CXB, Metasys controllers communicate transparently over Ethernet, using standard components and maintaining complete compatibility with existing network equipment. From an operator's view, this coupling of the N1 LAN to Ethernet creates a single large network. No special commands are necessary to switch between networks; data automatically transmits between networks without operator knowledge or intervention.

The JC-MER-CXB communicates over an Ethernet network using the TCP/IP protocol. Two networked JC-MER-CXBs pass ARCNET data between themselves using the User Datagram Protocol (UDP) service provided by TCP/IP. On the Ethernet network, the router is seen as a workstation passing messages to another workstation. If a power failure occurs, the router automatically restarts communications once power is restored.

The JC-MER-CXB is derived from an earlier version of this device that was an expansion module that occupied two slots of a Contemporary Controls MOD HUB ARCNET Modular Active Hub. The new device can be powered from an available low-voltage source or with an optional wall-mount transformer. The ARCNET and the Ethernet connections are made through ports on the front panel of the device. Unlike a PMI/OWS, the JC-MER-CXB has no monitor or keyboard. Instead, the monitor/keyboard functionality is done by an external laptop or desktop computer running a terminal emulation program (like HyperTerminal), while connected to COM ports on the JC-MER-CXB.

The JC-MER-CXB program is accessed via COM2. The embedded operating system is accessed via COM1. If a terminal emulation program is attached to COM2, real-time routing statistics can be observed. But once the router is started, no such cable connection is required for continued operation.

Theory of Operation

Setup and Addressing

The method of linking the two networks is to separate the N1 LAN into a number of ARCNET subnets. (In this document, the terms “subnet” and “ARCNET segment” are the same.) Each ARCNET subnet then connects to the customer’s Ethernet network via a single JC-MER-CXB.

The router uses the N1 network addressing scheme to route messages among the various ARCNET segments. Dividing Metasys into multiple subnets has no affect on existing Ethernet communications, and again, remains transparent to the operator.

To the operator, the router is simple to use and maintain. Once it is configured to the customer’s network, the router works on its own, uninterrupted. Branch office personnel configure the unit (via HyperTerminal) by accessing a single screen. Once set, the data is saved to a flash disk. Upon power up, the program and configuration data is executed without any intervention. There are no moving storage devices on the unit.

Protocols

The JC-MER-CXB uses the UDP/IP communications protocol to transmit messages across the Ethernet network. This is important because it allows the router to easily integrate into existing customer networks that comprise multiple Internet (TCP/IP protocol suite) networks.

Even though the JC-MER-CXB looks like a data router to the Metasys Network, most communications experts would call it a network gateway. To the Ethernet network, the router looks like a normal IBM® PMI/OWS workstation. Unlike typical network gateways and routers, the JC-MER-CXB *does not* process:

- routing protocols used by standard network routers, except for UDP/IP communications from other JC-MER-CXB units
- messages not generated by Metasys

The JC-MER-CXB responds to TCP/IP “ping” commands, allowing you to verify that the router is operational and properly connected to the Ethernet network. However, the ping could fail if a firewall blocks it from reaching the intended target.

Subnet Communication Upon Network Failure

If the Ethernet network goes down, or the router disconnects or fails, each Metasys subnet continues to function on a standalone basis. A JC-MER-CXB failure looks like a general failure of the Metasys N1 network. Devices on a subnet are still able to communicate with other devices on that subnet, but devices on a different subnet are offline.

Hardware Requirements

The following are other hardware requirements of the JC-MER-CXB:

- Metasys Network with NCM200 or NCM300 or NCM4500 at any revision; or, NCM101/NCM401at Revision K or later
- 10BASE-T/100BASE-TX Ethernet connection
- ARCNET connection (i.e., Metasys N1 LAN)
- 10–36 VDC or 8–24 VAC power at each JC-MER-CXB location

Design Considerations

NCM Compatibility

The JC-MER-CXB is compatible with all versions of the NCM200, NCM300 and NCM4500. If NCM101s/401s are used, they must be Revision K or later. EPROM chips in older NCM101s/401s can be upgraded for compatibility with the JC-MER-CXB. For information about upgrading, contact Field Support Services. (The NCM102 does not contain an N1 connection.)

Quantity of Routers Needed

The quantity of JC-MER-CXBs you need is identical to the number of ARCNET segments connected through the Ethernet system. For example, two units are required to connect two ARCNET segments over one Ethernet segment (see Figure 6). A router is placed at each location where the Ethernet segment meets the ARCNET segment. Up to 50 JC-MER-CXB units can be used on each Metasys Network (i.e., all ARCNET segments).

Physical Considerations

The router can be installed in a variety of ways, depending on the job site. When selecting a location, consider the following:

1. The location must have access to the customer's Ethernet network, the ARCNET segment being serviced, and power.
2. A JC-MER-CXB can be panel-mounted or DIN-rail mounted.
3. Need power: either 10–36 VDC or 8–24 VAC.

Design Summary

Use these steps as a guideline when designing a JC-MER-CXB Network, referring to Figure 6 for an example:

1. Lay out the network as you would a normal Metasys N1 Network. Determine the number and location of NCMs and Operator Workstations that will service the facility.
2. Determine which portions of the network will use ARCNET and which will use Ethernet. The network layout must consist of multiple ARCNET segments connected by the customer's Ethernet network.

The Ethernet network must be a single Local Area Network (LAN) that can interconnect all of the ARCNET segments.

Note: If the Ethernet network consists of multiple Ethernet segments, the segments must be connected using LAN Routers that support the TCP/IP protocol suite. Intermediate networks that use other communications technology (FDDI, Token Ring) are acceptable if the intermediate networks are high speed. Low speed networks (e.g., 9600-baud serial lines) will cause unacceptable delays to Metasys N1 communications.

The resulting network layout will be similar to the sample network shown in Figure 6. Each ARCNET segment will have one JC-MER-CXB attached to it. The ARCNET node address on each JC-MER-CXB has been preassigned 255.

3. Assign a subnet address to each ARCNET segment. We recommend using the subnet address “1” for the primary ARCNET segment, or the segment that has the most devices attached to it. Assign a unique node address to each NCM or Operator Workstation attached to the N1 network. Node addresses must be unique even if the NCMs are attached to different subnets. Record the subnet and node address information on the JC-MER-CXB Planning Form A. (See *Appendix A: Metasys Ethernet Router Planning Forms.*)

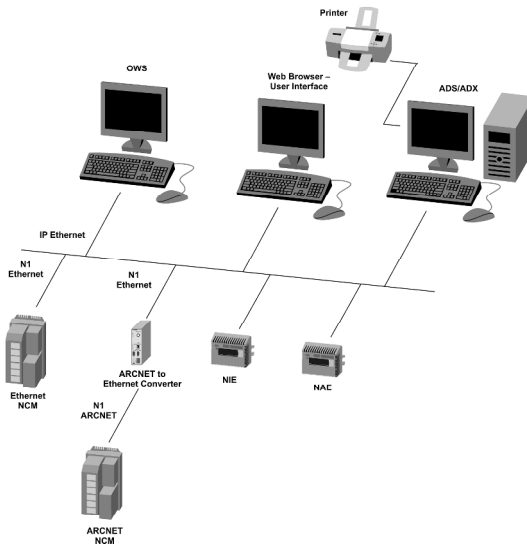


Figure 6 — Sample Layout of the JC-MER-CXB

-
4. Have the customer's network communications staff assign IP addresses and provide IP routing information for each JC-MER-CXB. Record this information on the JC-MER-CXB Planning Form B. (See *Appendix A: Metasys Ethernet Router Planning Forms*.) Append the ARCNET Subnet addresses from Form A to Form B.
 5. Using the JC-MER-CXB Planning Form B, configure each router by accessing its configuration screen. (See Chapter 3.)
 6. Use the assigned subnet and node addresses to address each of the Metasys NCMs and PMI/OWSs. When creating the DDL files for the system, use the subnet and node addresses in the NETWORK and GLOBAL DDL files.

Note: Since you are converting multiple standalone networks into one large network, verify that no duplicate system names exist. If duplicates exist, you must change them to unique system names in both DDL and GPL.

If you are converting an existing system to use JC-MER-CXB units, you'll need to update and recompile the DDL files when the routers are installed. Be sure to recompile all of the DDL files, including all of the NC files. *Failure to recompile all of the DDL files and download ALL devices could result in application failures for those NCMs located on new ARCNET segments.*

Note: Global and Model DDL file must be the same at all of the OWS (Operator Work Stations).

Design Restrictions

1. The system should not use any realtime control strategies that require data transfers across the Ethernet network. Because the Ethernet network may experience delays and down time caused by non-Metasys equipment, the network is subject to variations in performance.

Realtime control strategies can be used between NCMs located on a common ARCNET segment.

2. Use caution when defining critical alarm reports that must cross the Ethernet. Avoid alarms related to life safety because they may not arrive at the Operator Workstation or printer if the customer's Ethernet network is down.

-
3. Use of a customer's Wide Area Network (WAN) is not recommended. The delays associated with Wide Area Networks may be unacceptable for operation of the Metasys Network.
 4. If the system contains a JC/85 Gateway, the Gateway points should *not* be mapped to objects that reside in NCMs located on different subnets.

The JC/85 Gateway obtains the status for all objects that are defined in the Gateway at frequent intervals (every 1-5 seconds). This creates a large amount of message traffic on the N1 network. If this message traffic is routed across the Ethernet, it will (a) add excessive loading to the customer's Ethernet network, (b) slow down the operation of the JC/85 Gateway, and (c) result in sporadic offline reports for objects located in the remote NCMs.

5. For the same reasons, if the system contains a Network Port, the Network Port cannot map its analog data points to objects that reside in NCMs located on different subnets.
6. As with all Metasys networks, each NCM and PCI/OWS in the network must use a common time zone, even if the devices physically reside in different time zones.

Network Management Staff Involvement

When installing the JC-MER-CXB, work closely with the network management staff at the job site. They will know the intricacies of the Ethernet network to which you will be connecting. Get them involved as much as possible. They should be able to provide you with the following:

- Ethernet connections
- assignment of IP addresses
- debugging expertise during installation and commissioning of the JC-MER-CXB

Metasys May Be Affected

Realize that the Ethernet network will affect the Metasys N1 Network. It can do so in these ways:

- Ethernet traffic may slow down the performance of the Metasys N1 Network.

3 Installation and Commissioning

Hardware Installation

Mounting

The JC-MER-CXB is designed for mounting in an industrial enclosure or wiring closet using either set of provided mounting hardware listed below. The unit can also rest unsecured on a flat surface, if desired.

TS-35 DIN Rail Mounting	Panel Mounting
DIN rail clip	Panel mounting brackets
DIN rail clip support bracket	4-40 screws, flat-head (4)
4-40 screws, pan-head (2)	#8 screws, pan-head (2)

For quick snap-mounting to 35 mm DIN rail, a reinforced DIN rail clip is pre-attached to the back of the enclosure with two #4-40 pan-head screws. If the clip is removed, the unit can be panel-mounted by extending the top and bottom brackets which are shipped in retracted position. The extended brackets can then anchor the unit to a wall or other flat vertical surface with two #8 pan-head screws (also provided). The left illustration of *Figure 7* shows a rear view of the unit with the brackets in retracted position. The right illustration of *Figure 7* shows the brackets extended and secured to the unit enclosure with the same screws that were used in the retracted position.

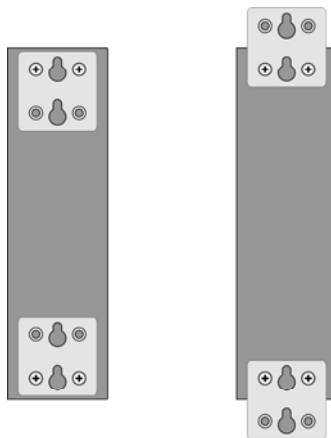


Figure 7 — Using the Panel-Mounting Brackets

Powering the JC-MER-CXB

To operate, the JC-MER-CXB requires low-voltage AC or DC power provided to its four-pin removable keyed connector. Consult the specifications for power requirements. There are several means for providing power.

DC Powered

Make connections as shown in the diagram. The unit uses a DC-DC converter that accepts a wide range of voltage (10–30 VDC) which it converts for internal use. The “0Vdc” connection is connected to chassis within the unit. Input connections are reverse-voltage protected.

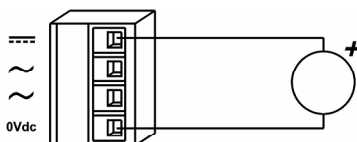


Figure 8 — DC Powered

Redundant DC Powered

Redundant diode-isolated DC power inputs are provided on the unit when a concern exists that the unit remain operational in the event of a primary power failure. Make connections as shown in the diagram. Each power supply must be capable of powering the unit. Do not assume that input currents from the two supplies will be balanced.

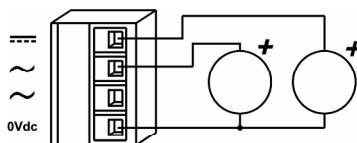


Figure 9 — Redundant DC Power

AC Powered

If only AC power is available, the JC-MER-CXB can be powered by the secondary of a low-voltage transformer whose primary is connected to the AC mains. The secondary must be 8–24 VAC and ungrounded. When using a grounded secondary transformer, refer to *Figure 11*. For convenience, two auxiliary power supplies are available from Contemporary Controls: the AI-XFMR is for 120 VAC primary power and the AI-XFMR-E uses 230 VAC.

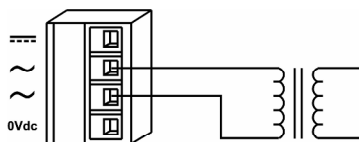


Figure 10 — AC Powered

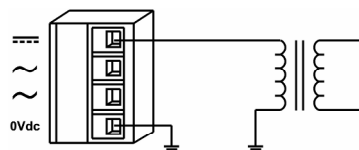


Figure 11 — AC Power with Grounded Secondary

AC Powered with Battery Backup

The JC-MER-CXB can also be powered from both an AC and DC source. Usually the DC source is from a battery connected as the DC powered option. Refer to *Figure 12* for details. In this application the unit does not charge the battery, so separate provisions are required for charging. If the AC source fails, the unit will operate from the battery.

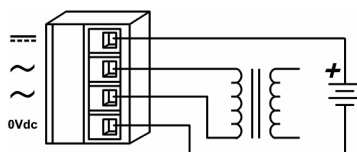


Figure 12 — AC Power with Battery Backup

Indicator Lights and Booting

STATUS: At power on, this LED briefly glows *red* as a test. Then while Linux boots (about 16 seconds), it *flashes green*. It then glows *solid* to indicate Linux is operational — although another 16 seconds must pass before ARCNET is functional. If this LED glows *red* during normal operation, a power supply problem is indicated; if the external power source is within specification, the JC-MER-CXB needs service.

ARCNET: If the unit is *connected* to a working ARCNET network, the “RX” LED glows green whenever the unit receives data — otherwise the “RX” LED will remain unlit. If the unit is *disconnected* from the network, the “RX” LED will glow by default. The “ACT” LED flashes yellow whenever the JC-MER-CXB is *engaged* in ARCNET activity.

Ethernet: After 2–3 seconds into the boot process (and thereafter), the “LINK/ACT” LED will glow if a *valid link* exists to an working Ethernet device. It indicates speed by *color*: *green* for 100 Mbps and *yellow* for 10 Mbps. It *flashes* to indicate activity. The “DUP” LED glows *green* to indicate full-duplex operation and *yellow* for half-duplex.

Bash Prompt and JC-MER-CXB Commands

The JC-MER-CXB uses the Linux operating system. When the Linux command line is displayed on screen, a special “bash” prompt appears. Because it is derived from the *Bourne* shell, the prompt is known by the pun: *Bourne Again Shell*, or ***bash***. It is the standard command-line interface on most Linux machines. All command-line entries for the JC-MER-CXB must ***use lower case letters!*** The bash prompt for the JC-MER-CXB is shown below.

```
[root@JC-MER ~]:
```

Figure 13 — Bash Prompt for the JC-MER-CXB

Configuring the JC-MER-CXB

The JC-MER-CXB consists of a computer running Linux. It has an Ethernet port, ARCNET port and a flash disk that emulates a disk drive. The router program is preloaded at the factory but must be configured. For this, Planning Forms are provided in Appendix A.

You can *monitor* JC-MER-CXB statistics (if monitoring has been enabled) by connecting a null-modem cable from COM2 on the front of the unit to a COM port on a laptop or desktop computer running a terminal- emulation program like HyperTerminal. You *configure* the parameters by connecting to COM1. Remember: *monitor on COM2* and *configure on COM1*. See Appendix D for using HyperTerminal.

Once the terminal emulator is ready, connect it to COM2 (to monitor the boot process) then apply power to the JC-MER-CXB. After the Statistics Screen (see Figure 15 on page 31) appears and the "Idle" fields begin to count, move the cable to COM1, type *config* and press ENTER to access the configuration screen. The bottom of the screen displays information on using certain keys to perform editing tasks.

The left side of the screen displays the JC-MER-CXB IP address, Subnet Mask and Existing LAN Router IP address (network gateway, if one exists). On the right side are switches (e.g., "/S") and all ARCNET subnet addresses and associated JC-MER-CXB IP addresses. All of this information is stored to non-volatile memory and, except switch settings, must be identical on all JC-MER-CXBs.

```
Metasys Ethernet Router Configuration
Revision 1.01 : Linux

Extended
Timeout
0
Metasys Ethernet Router
IP Address
192.168.20.1
Subnet Mask
255.255.255.0
Existing LAN Router
IP Address
192.168.20.100

Switches, Subnets, Addresses
/S
/A
/M
#1 192.168.20.91
#2 192.168.20.23
#3 192.168.20.56
000

Edit Controls:
TAB/Arrow : Next Window
CTRL-D    : Cursor Right
CTRL-S    : Cursor Left
CTRL-E    : Line Up
CTRL-X    : Line Down
CTRL-Y    : Delete Line
CTRL-V    : Toggle Overtime

File Controls:
CTRL-K,S  : Save Changes and Exit
CTRL-K,Q  : Quit w/o Saving

OVERTYPE : OFF
```

Figure 14 — Configuration Screen

There is a provision for setting the Extended Timeout value of the ARCNET subnet. The default is 0 (meaning normal timeouts) and in the majority of applications, it should be left at 0. Extended timeouts are only required on large fiber optic installations where the ARCNET network diameter exceeds 5 km.

Using the JC-MER-CXB Planning Form B in Appendix A, add to your right-side screen data with the ARCNET Subnet Address (Column 1) and IP Address (Column 2) of each Metasys Ethernet device to be connected. Enter these two addresses on the same line above the "000" terminating flag at the end of the list. The # symbol means that the text following the # is a remark. The following is an example for three Metasys Ethernet devices:

```
1    192.168.20.91
2    192.168.20.23
3    192.168.20.56
```

Save the configuration screen data by simultaneously pressing the Ctrl and "K" keys, then release both keys and press the "S" key to save the data and automatically reboot the JC-MER-CXB with the new settings. The RX LED on the ARCNET port should glow and the ACT LED should flash as the ARCNET port searches for other ARCNET nodes.

Note: When entering IP addresses, care should be taken to avoid a trailing space which, although invisible onscreen, will nevertheless cause the address to be incorrect.

Verify no configuration errors exist by typing *cat router.err*.

Connecting Field Cables

The JC-MER-CXB connects to N1 ARCNET via coaxial as described in Appendix E. The unit connects to N1 Ethernet via an RJ-45 jack.

1. Connect the ARCNET cable from the Metasys N1 ARCNET subnet to the port on the JC-MER-CXB. If there is activity on the subnet, then the ACT LED on the unit should glow.
2. Connect the cable from the Ethernet network to the unit's Ethernet port. If the cabling is correct and there is a working Ethernet device on the other end of the cable, the green Link LED should glow. If so, proceed to the next step.

-
3. With HyperTerminal (or similar application) active and the JC-MER-CXB booted, attach the null-modem cable to COM2 then type "Q" to terminate the application and exit to Linux.
 4. At this point, the null-modem cable must be moved from COM2 back to COM1 to access Linux. Once the cable is attached to COM1, the bash prompt should be visible after the ENTER key is pressed. You can clear the screen by typing *clear* (lower case) and pressing ENTER.
 5. Verify that the router is communicating with Metasys by using *testnet* to read the configuration data and then ping each listed device. You will notice the ACT LED near the Ethernet port will flash, indicating a proper transmission. Run *testnet* by typing the following at the bash prompt:

```
testnet
```

This will report the communication status for each listed N1 device which could be an NCM, OWS, NIE or JC-MER-CXB.

Example:

```
Status of the Metasys Ethernet Devices:
Device 192.168.20.91 is responding
Device 192.168.23.23 is responding
Device 192.168.20.56 is responding
```

Copy the configuration file to every JC-MER-CXB in the network using the *download* utility or enter the data manually into each router (for information on using the *download* utility see page 43). The configuration file content must be identical for all routers on the job.

Once the download has been accomplished, execute the router program by typing *router* then press ENTER.

Note: The router used for the download will need to be rebooted by typing *reboot* or by recycling power the router.

To view router statistics, the null-modem cable must be reattached to the COM2 port. If the resulting display is garbled, refresh the screen by pressing the "R" key. When connected to COM2, the "R" key will "refresh" the screen and the "C" key will "clear" the statistics counters.

If the router configuration was not set up properly, the router will stop running and continuously display an error message with the instruction to press "Q" to quit. To determine the problem, refer to Chapter 4: *Troubleshooting*.

Reconfiguring the System

Over time, a Metasys Network that uses JC-MER-CXB devices may have to be reconfigured to account for additions and changes to the system. The reconfigurations that a system may undergo can be classified as:

- adding a new NCM or PMI/OWS
- moving an NCM or PMI/OWS
- adding a new Metasys ARCNET subnet
- changing the Ethernet network
- changing the layout of the N1 network

This section describes the steps necessary to perform each of these different types of reconfigurations.

Adding a New NCM or PMI/OWS to an Existing Subnet

Adding a new NCM or PMI/OWS to Metasys does not require any changes to the JC-MER-CXB hardware or software. An NCM101/401 that is added to a JC-MER-CXB system must be Revision K or later. All NCM200s and NCM300s are compatible with the JC-MER-CXB. To add a new NCM or PMI/OWS to an existing subnet:

1. Determine the correct subnet and node address for the new NCM PMI/OWS. The subnet address must match the subnet address for the ARCNET segment to which the NCM or PMI/OWS connects. The node address must be unique. You cannot duplicate any node address, even if the two devices reside on different subnets.
2. If the device is an NCM, determine the correct subnet and node address for its archive device.
3. Set the device subnet and node address as you normally do.
 - For a PCI/OWS, set the node address using the switches on the ARCNET card (note: PS/2 system cards do not have switches, so PS/2 users can ignore this) and specify the subnet and node addresses in the DDL network configuration file.
 - For an NCM, use WNCSETUP to set the subnet and node addresses. When using WNCSETUP, don't forget to specify the correct subnet and node address for the archive device.

-
4. Add the device to the system database, either by updating the DDL global file or by using a device definition window.
 5. Physically attach the new NCM or PCI/OWS to the ARCNET segment that you have selected.
 6. You do not need to make any changes to the JC-MER-CXB. The router automatically routes messages correctly using subnet address for the new device.

Moving an Existing NCM or PCI/OWS or NIE to a Different ARCNET Subnet

You may want to change the ARCNET segment to which an NCM or PCI/OWS is attached. This may be required because an NCM or PCI/OWS is moved to a new location or because the ARCNET cable layout has been changed. Moving an NCM or PCI/OWS to a different subnet does not require any changes to the JC-MER-CXB software. To move a device to a different subnet, follow these steps:

1. Determine the new subnet and node address for the NCM or the PCI/OWS. You will probably use the same node address for the device, but if you decide to change the node address, it must be unique. You cannot duplicate any node addresses, even if the two devices reside on different subnets. The device's subnet address will have to change to match the subnet address for the ARCNET segment to which the device will be moved.
2. If the device is an NCM, you may want to change its archive device. If you decide to change the archive device for the NCM, determine the subnet and node address for the new archive device.
3. Change the subnet and node address for the device as you normally do.
 - For a PCI/OWS, set the node address using the switches on the ARCNET card (note: PS/2 system cards do not have switches, so PS/2 users can ignore this) and specify the subnet and node addresses in the DDL network configuration file.
 - For an NCM, use NCSETUP to set the subnet and node addresses. Once the subnet address for an NCM is changed, you will not be able to communicate with the NCM over the N1 network until it is physically attached to its new subnet. When using NCSETUP, don't forget to specify the correct subnet and node address for the archive device.

-
4. Change the subnet and node addresses for the device in the Metasys database by updating the DDL Global file, compiling it and downloading it to all devices.
 5. Physically attach the device to its new ARCNET segment.
 6. You do not need to make any changes to the JC-MER-CXB. The router automatically routes messages correctly based on the new subnet address for the device.

Adding a New Metasys ARCNET Subnet

When a new device cannot be attached to one of the existing ARCNET segments, a new subnet and a new JC-MER-CXB must be added. To add a new subnet, do the following:

1. Determine a location for the new JC-MER-CXB. It must have access to electrical power, a connection to the customer's Ethernet network, and a connection to the new ARCNET segment.
2. Select a new subnet address for the new ARCNET segment. The subnet address must be unique (not previously used for a different ARCNET segment).
3. Obtain Internet address information for the new JC-MER-CXB from the customer's communications/computer support staff. The information should include an IP address for the JC-MER-CXB, the subnet mask that is used, and an IP address for the customer's existing LAN Router (if the customer's Ethernet network uses LAN Routers).
4. Obtain another JC-MER-CXB unit.
5. Install the new JC-MER-CXB and attach it to the Ethernet network and to the ARCNET network. Verify that the JC-MER-CXB is communicating by "pinging" it from another Ethernet-equipped device. This can be done from another JC-MER-CXB that has a terminal emulator attached or from any Ethernet device that has TCP/IP communications software. For example, to ping a new router with IP address 192.168.22.236, enter:

```
ping 192.168.22.236
```

The response to the PING command should indicate that the new router is communicating.

-
6. Modify the information in each JC-MER-CXB using the configuration program. Add a new line to the screen that lists the subnet address and the IP address for the new router. For example, if you are adding subnet number 12 with IP address 192.168.22.236, add the following line:

12 192.168.22.236

Add the new line *before* the line containing the three zeros (000). After you have edited the screen, save its information using the save command (Ctrl-K, S). Then use the *download* program to copy the new address information to all of the JC-MER-CXB devices used in the system.

To download the new information, reboot the JC-MER-CXB that contains the new configuration and after the router has started running, enter *download* at the prompt. Follow the instructions provided and note any messages displayed. After the new configuration has been successfully downloaded to all other routers, reboot the originating router by typing in *reboot*.

Note: The IP address of the router with the new configuration must appear in the configuration screen of every other JC-MER-CXB in the network. A receiving router will not accept information from a device that is not listed in its existing configuration screen.

7. Add the new NCM or PCI/OWS to the new ARCNET segment by following the procedures for adding an NCM or PCI/OWS to an existing ARCNET segment, as described previously.

Changing the Ethernet Network

Occasionally, the customer's communications/computer staff may decide to rearrange their Ethernet network. Normally this will not impact the operation of the JC-MER-CXB, except that it may result in a temporary loss of communications with one or more of the routers. Should this happen, each NCMs and PCI/OWS on those subnets will go offline. If the customer decides to change the configuration of their Ethernet network, you may have to change the IP address information stored in each router. To do this, you will have to change the configuration for each router.

If the IP address for the JC-MER-CXB was modified, you must update the configuration screen. Change the IP address as needed. Then use the *download* program to update all other routers.

Changing the Layout of the Metasys Network

In some situations you may want to reorganize the Metasys Network. This may involve joining two existing ARCNET subnets into a single subnet, splitting an existing subnet into two subnets, or adding new subnets. If you are performing a major reconfiguration of the network, follow these steps:

1. Determine the new network layout for Metasys. The new network layout should show a number of ARCNET subnets that are connected using JC-MER-CXB units and the customer's Ethernet network. Assign a unique subnet number to each ARCNET segment.
2. Using the new network layout, determine where the JC-MER-CXB devices will be located. For each router, determine if it is an existing router or a new router. If you will be installing new routers, you will have to obtain them.
3. Fill out a set of JC-MER-CXB planning forms for the new network layout. You should have filled out a set of forms when the routers were first installed. The *JC-MER-CXB Planning Form B* will be used to configure each of the JC-MER-CXB units. If you will be installing new routers, follow the procedures beginning on page 13.

-
4. Use the *JC-MER-CXB Planning Form B* to generate a new *router* file. The file should be a list of subnet address and IP address pairs of the form:

nnn xxx.xxx.xxx.xxx

where “*nnn*” is the subnet address and “*xxx.xxx.xxx.xxx*” is the IP address for the JC-MER-CXB attached to that subnet. The last line of the *router* file should be a line containing “000.” Once you have built a new *router* file that lists all of the subnets, a copy must be placed in each JC-MER-CXB attached to the system.

5. Configure the new hardware and install it as described in a previous section, *Adding a New Metasys ARCNET Subnet*.
6. Use the *JC-MER-CXB Planning Form B* to update the TCP/IP configuration on each of the existing JC-MER-CXB units. The procedure for updating the TCP/IP information is described in a previous section, *Changing the Ethernet Network*.
7. To update the DDL files for Metasys, use the *JC-MER-CXB Planning Form A*. The only changes you should have to make are to the Network Definition and the Global Definition DDL files to change the subnet addresses for each NCM and each PCI/OWS. If you add new NCMs to the system, you will most likely update the DDL files to add the data base information for the new NCMs when you update the subnet and node addresses for the Metasys devices.

4 Troubleshooting

Because the JC-MER-CXB hardware consists of an embedded computer, knowledge of Linux will help in troubleshooting the system.

Booting Up the Router

When first activated, the JC-MER-CXB computer runs through a self test. If an error is detected, the router will stop operating then repeatedly display an error message advising the operator to press “Q” to end the router program and exit to Linux.

Note: Move the null-modem cable from COM2 to COM1 so that so that Linux commands can be entered. At the bash prompt type *router* or *reboot*.

Debugging Ethernet Failures

Software tools are provided with the product for checking Ethernet network errors. These include the programs *ping*, *ipstat*, *testnet* and a router statistics mode. The nature of the *ping* and *ipstat* programs should be familiar to someone with previous experience with TCP/IP software.

Prior to using the router statistics mode tools, you may need to modify the router configuration file (*router*). Add the following three switches (upper case letters only) if they are not already present:

/A

/S

/M

When the router is running, it displays statistical information as shown in the example of Figure 15 — providing the null-modem cable is attached to COM2. This display shows ARCNET and Ethernet message counters.

The statistics screen normally shows the ARCNET and network message Idle counters rapidly incrementing. The counters for Invalid, Retry, and Failure messages should be zero. The ARCNET and network Normal counters and the ARCNET and Ethernet Broadcast counters increment as messages are received.

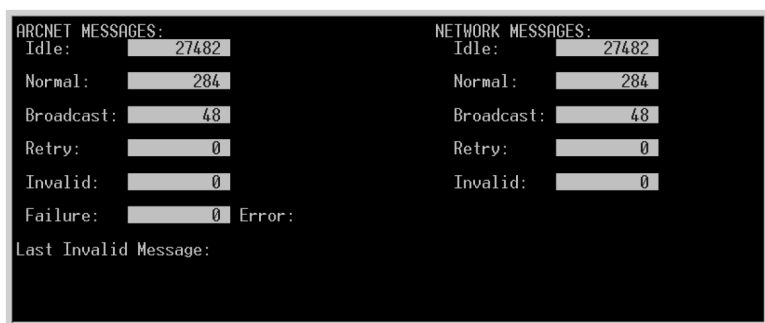


Figure 15– Statistics Screen available at COM2

- If an Invalid message counter is non-zero, it indicates that an Invalid Metasys message was detected. The last Metasys message that was invalid is displayed.
- To clear or reset the statistics screen counters, press "C".
- To refresh the statistics screen, press "R".
- A non-zero Failure counter indicates an Ethernet problem, and results in the display of an error number. Common Ethernet error numbers are listed on the following page.

Error Number	Meaning
98	Address already in use
102	Network dropped connection
74	Not a data message
112	Host is down
104	Connection reset by peer
101	Ethernet Network Unreachable (typically a customer LAN Router failure)
113	Host unreachable (a remote Metasys Ethernet device such as an NCM, OWS or JC-MER-CXB is off-line)
110	Connection timed out
111	Connection refused

Table 1 — Common Ethernet Errors

If a defined router is offline when another router boots up, error 113 displays on the statistics screen. This error just means that a router at one of the defined IP addresses did not respond as expected. The router software flags this router as offline and will not send any messages to it until it comes back online.

The other three Ethernet debugging tools are executed from the bash prompt once the router program has been stopped. After stopping the router by hitting the “Q” on the keyboard, switch the null-modem cable to COM1 to exercise Linux control.

Note: Once “Q” is hit, the router software stops transmitting Metasys messages, and its subnet loses communications with the rest of the Metasys Network. To restart the router program from the bash prompt, type *router*.

Ping Command

The *ping* command verifies that messages can be sent and received over the Ethernet network by transmitting continuous pings. The basic command format is:

```
ping xxx.xxx.xxx.xxx
```

where “xxx.xxx.xxx.xxx” is the IP address of a device on the Ethernet network. Other JC-MER-CXB units and TCP/IP-compatible device systems send back a response. The pinging will continue until you press Ctrl-C.

Failures are caused by cable problems, device driver configuration problems, or devices being offline. The display indicates if the ping was successful and the approximate response time. A normal response time for Ethernet is 25 to 50 milliseconds.

If there are any Ethernet communications errors, they are noted. If the Ethernet network is running properly, no errors are reported.

Ipstat Command

The program *ipstat* reports various useful statistics. To launch *ipstat*, type the following at the bash prompt:

ipstat

The resultant display reports the routing table, packet count, detected errors and memory usage. If the Ethernet is operating properly, the *ipstat* statistics should not report any errors.

Testnet Command

The *testnet* command reads the configuration data and attempts to ping each device that is listed. The command format is:

testnet

Testnet lists the communication status for each device. If *testnet* can talk to some devices but not others, the configuration data may contain inaccurate information, such as a wrong address. To correct bad addresses, access the configuration screen by running the *config* command.

General Problem Prevention

1. Configure the Metasys Ethernet Router's IP address, existing LAN Router IP address, and subnet mask using information from the customer's network manager.
2. The Metasys ARCNET subnet addresses need to match the router configuration screen data. Each ARCNET segment needs a unique subnet address. The Metasys DDL files must use the correct subnet addresses.
3. All of the Metasys devices on one ARCNET segment need to have the same subnet address. Although ARCNET hubs and links result in multiple ARCNET segments, for the purposes of the JC-MER-CXB, it is all considered one subnet.
4. Time-critical control strategies should not cross Ethernet segments.

Debugging ARCNET Failures

Use standard Metasys debugging tools to diagnose and correct suspected ARCNET failures. The JC-MER-CXB displays message statistics. The router should increment the ARCNET message counter (broadcast) when it is connected to any ARCNET NCM or workstation. This counter will increment even if multiple subnets are not defined. If this counter does not increment, there may be a problem with the router itself.

Debugging Router Failures

Several of the difficulties discussed in this section may be caused by a global DDL file that is inaccurate or has not been downloaded. Therefore, before going on, verify that the current global file is up-to-date and fully downloaded.

JC-MER-CXB Does Not Run When Booted

The configuration screen should be examined for errors.

Status Screen Indicates Failure Number 113

One or more JC-MER-CXB units were offline when this router started. Normal communication resumes when the other routers come online.

Status Screen Indicates Failure Number 101

This is caused by the customer's existing LAN Router being offline. Verify that the existing LAN Router IP address is correct. Check with the customer's LAN manager to determine the condition of the existing LAN Router.

Status Screen Indicates Invalid Messages

1. An operator tried to access an NCM defined in the DDL, but the NCM is on a subnet that does not appear in the configuration screen. Update the screen to include the undefined subnet.
2. The Metasys Network generated a message that contained an invalid address. Write down the message information that appears on the screen and call Field Support Services.

Metasys Devices Do Not Respond

If any other node on the same ARCNET segment responds normally, the router is not at fault. The problem could be caused by a Metasys device failure or an ARCNET cable problem. Check the device for any malfunctions, and use troubleshooting information from the *N1 Local Area Network Technical Bulletin* (in LIT-636017).

All the Devices on One ARCNET Segment Do Not Respond

1. If other ARCNET segments are working, the problem is isolated to the failing segment. Use *ping* to find out if the suspect router responds to Ethernet messages. (Firewalls may cause issues with the ping command.)
2. If the router responds, look at the ARCNET cable and Metasys equipment.
3. If the router does not respond, look at the router and the Ethernet network. (See *JC-MER-CXB Does Not Respond to Ping Requests*, further on.)

Multiple ARCNET Segments Do Not Respond

This could be caused by a router configuration problem or an Ethernet problem. Use *testnet* to determine which routers respond. Verify that the configuration screen entries are correct. Check the Metasys DDL files for correct subnet/node addresses. Check the configuration at each failing router. Check the Ethernet LAN for failures.

JC-MER-CXB Does Not Respond to Ping Requests

This could be caused by problems with the router or problems on the Ethernet LAN. Check the router configuration screen to see that all addressing is correct for this router. Use *ipstat* to look for errors in connecting to the Ethernet. If the router is running and appears to be configured properly, the problem is probably due to an Ethernet failure. Check with the network administrator to verify that the network has not been changed and is functional.

N1 Communications Are Occasionally Unreliable

1. Ethernet communications may be unreliable. Use *ipstat* or *ping* to check for Ethernet errors. If transmit or receive errors are indicated, check with the network administrator for the Ethernet network to determine if they have been experiencing Ethernet downtime or excessively heavy network traffic.
2. ARCNET communications may be unreliable. Check the ARCNET cables for any subnets that are experiencing problems.
3. Metasys N1 communications may be timing out. If you have eliminated the other possible causes of this problem, contact Field Support Services for assistance.

Data Cannot Be Viewed on OWS Across Network

The Metasys Operator Workstation (OWS) can be improperly configured so that it transmits broadcast ARCNET messages, but not point-to-point ARCNET messages. The symptoms are as follows:

- No nodes come online at the OWS.
- The OWS cannot open any focus windows that require data from a remote node.
- The OWS is online to the rest of the system, but cannot access any data over the network.
- The JC-MER-CXB statistic screen shows broadcast traffic from the OWS but not any normal message traffic.
- Other nodes may transmit Retry messages to the OWS.

These problems are caused by an IRQ conflict at the OWS. The normal IRQ setting for the ARCNET card is 7. Some system BIOSes will conflict with this setting. To resolve the conflict, change the ARCNET IRQ to a different IRQ setting that is not currently in use.

5 Service

Warranty

Contemporary Controls (CCSI) warrants its product to the original purchaser for two years from the product's shipping date. If a CCSI product fails to operate in compliance with its specification during this period, CCSI will, at its option, repair or replace the product at no charge. The customer is, however, responsible for shipping the product; CCSI assumes no responsibility for the product until it is received. This warranty does not cover repair of products that have been damaged by abuse, accident, disaster, misuse, or incorrect installation.

CCSI's limited warranty covers products only as delivered. User modification may void the warranty if the product is damaged during installation of the modifications, in which case this warranty does not cover repair or replacement.

This warranty in no way warrants suitability of the product for any specific application.

IN NO EVENT WILL CCSI BE LIABLE FOR ANY DAMAGES INCLUDING LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT EVEN IF CCSI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY PARTY OTHER THAN THE PURCHASER.

THE ABOVE WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR USE, TITLE AND NONINFRINGEMENT.

Repair or replacement as provided above shall be the purchaser's sole and exclusive remedy and CCSI's exclusive liability for any breach of warranty.

Technical Support

Contemporary Controls (U.S.A.) will provide technical support on its products by calling +1-630-963-7070 each weekday (except holidays) between 8:00 a.m. and 5:00 p.m. Central time.

Contemporary Controls Ltd (U.K.) will provide technical support on its products by calling +44 (0)24 7641 3786 each weekday (except holidays) between 8:00 a.m. and 5:00 p.m. United Kingdom time. If you have a problem outside these hours, leave a voice-mail message in the CCSI after hours mailbox after calling our main phone number. You can also fax your request by calling +1-630-963-0109 (U.S.) or +44 (0)24 7641 3923 (U.K.), or contact us via e-mail at info@ccontrols.com or info@ccontrols.co.uk. You can visit our web site at www.ccontrols.com. When contacting us, please leave a detailed description of the problem. We will contact you by phone the next business day or in the manner your instructions indicate. We will attempt to resolve the problem over the phone. If unresolvable, the customer will be given an RMA number in order that the product may be returned to CCSI for repair.

Warranty Repair

Products under warranty that were not subjected to misuse or abuse will be repaired at no charge to the customer. The customer, however, pays for shipping the product back to CCSI while CCSI pays for the return shipment to the customer. CCSI normally ships ground. International shipments may take longer. If the product has been found to be misused or abused, CCSI will provide the customer with a quote for repair. No work will be done without customer approval.

Non-Warranty Repair

CCSI provides a repair service for all its products. Repair charges are based upon a fixed fee basis depending upon the complexity of the product. Therefore, Customer Service can provide a quotation on the repair cost at the time a Returned Material Authorization (RMA) is requested. Customers pay the cost of shipping the defective product to CCSI and will be invoiced for the return shipment to their facility. No repair will be performed without customer approval. If a product is determined to be unrepairable, the customer will be asked if the product can be replaced with a refurbished product (assuming one is available). Under no circumstances will CCSI replace a defective product without customer approval. Allow ten working days for repairs.

Returning Products for Repair

To schedule service for a product, please call CCSI Customer Service support directly at +1-630-963-7070 (U.S.) or +44 (0)24 7641 3786 (U.K.). *Have the product model and serial number available, along with a description of the problem.* A Customer Service representative will record the appropriate information and issue, via fax, an RMA number — a code number by which we track the product while it is being processed. Once you have received the RMA number, follow the instructions of the Customer Service support representative and return the product to us, freight prepaid, with the RMA number clearly marked on the exterior of the package. If possible, reuse the original shipping containers and packaging. In any event, be sure you follow good ESD-control practices when handling the product, and ensure that antistatic bags and packing materials with adequate padding and shock-absorbing properties are used. CCSI is not responsible for any damage incurred from improper packaging. Shipments should be insured for your protection.

Ship the product, freight prepaid, to the location from which it was purchased:

Contemporary Control Systems, Inc.
2431 Curtiss Street
Downers Grove, IL 60515
U.S.A.

Contemporary Controls Ltd
Sovereign Court Two
University of Warwick Science Park
Sir William Lyons Rd.
Coventry CV4 7EZ
U.K.

Appendices

Appendix A: Metasys Ethernet Router Planning Forms

Metasys Ethernet Router Planning Form A

ARCNET Node Address	ARCNET Subnet Address	NCM/ OWS	Description (Optional)

Appendix B: Common Commands and Software Switches

JC-MER-CXB Main Program (router)

The JC-MER-CXB is set up to automatically load and run all of the TCP/IP and router software when the computer is booted. The unit's software first loads some Metasys kernel software. The router program, *router*, is then run.

If a terminal emulator is attached to COM2, a startup screen displays when the JC-MER-CXB is booted. Once the router software is running, an operator can type "Q" on the keyboard to terminate the *router* program. To restart the router software, either type *router* at the bash prompt or recycle power.

Ethernet Communications Tests (testnet)

The *testnet* program looks at the list of Metasys Ethernet devices defined in the configuration screen and attempts to communicate with each of them by issuing TCP/IP *ping* commands. The program produces a summary of the communications with each Metasys Ethernet device as shown below.



```
[root@JC-MER ~]: testnet

JOHNSON CONTROLS
METASYS ROUTER NETWORK TESTER
Revision: 4.0 24 OCT 2006

Copyright (c) 1998-2006 Contemporary Controls, Inc.
Portions Copyright (c) 1992-2006 Johnson Controls, Inc.
All Rights Reserved.

Status of the Metasys Devices:
Device 192.168.20.1 is responding ***
Device 192.168.20.91 is responding ***
Device 192.168.20.23 is not responding
[root@JC-MER ~]:
```

Figure 16 — Example of Testnet Results Screen

If a device is not responding to *testnet*, either the Ethernet or the device has failed. Test the Ethernet link, then check connections to the device. Finally, verify each item in the configuration screen.

Note: A firewall can prevent an OWS from responding to the *ping* command.

Determining the MAC Address of the JC-MER-CXB (getmac)

Sometimes your IT staff may need to know the MAC address of the JC-MER-CXB. This is reported on screen by entering the command *getmac* at the bash prompt.

Configuration Download (download)

This program downloads the router configuration from one router to all of the other JC-MER-CXB units. When the *download* program is run, it will prompt for additional information. It will also indicate which routers were downloaded successfully. If a download fails, rerun the *download* program.

The *download* program must be run from a router whose IP address is listed on the configuration screen of each destination router. A router will not accept communication from any device whose address is not in the router's configuration screen.

Software Switches

/A or /B The "/A" switch and the "/B" switch control the way that ARCNET broadcast messages are handled by the JC-MER-CXB. If neither of these switches are defined, the JC-MER-CXB sends one IP message to each IP address listed in the configuration screen, for every ARCNET broadcast message received. This mode will generate a lot of Ethernet traffic and can cause Metasys nodes to have off-line problems if any IP address defined in this screen is not present on the network. Including one of these two switches causes the JC-MER-CXB to send one broadcast message to all nodes within the broadcast domain of the unit. Additional messages are sent to each of the remaining devices that do not receive the broadcast message. The two switches control how the broadcast message is sent on the Ethernet network. The "/A" switch sends broadcast messages to the all-ones IP address (255.255.255.255). The "/B" switch sends broadcast messages to the network directed address. The "/B" switch should be used on networks that do not pass all ones broadcast messages to all parts of a single IP network. Ask your network administrator which type of broadcast message the network supports — all ones ("/A" switch) or *network directed* ("/B" switch). The "/A" switch is set as the default condition. Do not set both switches active at the same time on a single router.

-
- /D This switch is used for diagnostic purposes. Using this option displays the contents of all the messages received by the JC-MER-CXB.
- Note: The "/D" switch cannot be used in combination with the "/S" switch.
- /M Monitor statistics. This outputs statistics to the statistics screen, but only if the "/S" switch has been set to display a template by which the statistics may be meaningfully viewed.
- /S Statistics screen. This displays the router statistics screen via the COM2 port. If the "/M" switch is set to monitor statistics, the statistics are reported onscreen. If the "/M" switch is not set, the statistics screen is still displayed, but no statistics are reported. **Once per day the statistics counters are zeroed.** When statistics are updated to the monitor, router operation does slow down. For optimum performance, turn the statistics display off. If "/S" is not on, the Johnson Controls copyright page is continuously displayed at COM2, but router operation can still be confirmed by the activity of the LEDs. For more Statistics Screen information, see Appendix C.
- /T Test option. Causes the router program to evaluate the contents of the configuration data and report errors. The router *halts* after this process ends — therefore, do not use "/T" in an operating router. Type *router* to restart.
- /U This switch is used to allow Multi-Metasys N1 networks to exist on the same Ethernet network. When configuring the JC-MER-CXB to run in a Multi-network configuration, the configuration screen must contain the “/U *nnnnn*” switch. Replace the *nnnnn* characters with the UDP port address that was used to configure other Metasys Ethernet devices that will exist within the target Metasys network. DO NOT use this switch unless you are configuring a Multiple Metasys N1 Network configuration. See Appendix F for more UDP information.

The configuration screen must be the same (except for switch settings) for all JC-MER-CXB units in the system. If the configuration screen is updated, it must be copied into each router. This can be done using the *download* command.

Other Linux Commands

The following Linux commands are used less-frequently by operators of the JC-MER-CXB. However, they are listed here for those who may find them useful in certain circumstances.

cat [filename] This command will print the contents of a file to the screen.

cd This command will change the current directory.

clear This command will clear the display screen.

ifconfig This command will display network and hardware addresses.

ls This command will list the current directory contents.

ls -l This command will list the current directory contents *in detail*.

reboot This command will stop the system, power off and reboot.

FTP Files from JC-MER-CXB

Using a PC on the same subnet as the JC-MER-CXB, you can use a web browser to FTP files from the router. In the browser address field, enter:

ftp://xxx.xxx.xxx.xxx

where *xxx.xxx.xxx.xxx* is the IP address of the JC-MER-CXB. When this browser command is executed, you will be prompted for a user ID and for a password. For both response, type the word "root". If done properly, the root directory of the JC-MER-CXB will be displayed. At this point, use normal Windows actions to locate and copy the desired files from the router to your PC. Often, the file of most interest is *router.err* which is in the root directory.

You should never FTP files *into* the JC-MER-CXB unless directed to do so by Contemporary Controls. If you accidentally disturb the files in the JC-MER-CXB, just reboot the unit to restore normal operation.

Appendix C: Statistics Screen Information

A sample statistics output (viewed on COM2) is shown below:

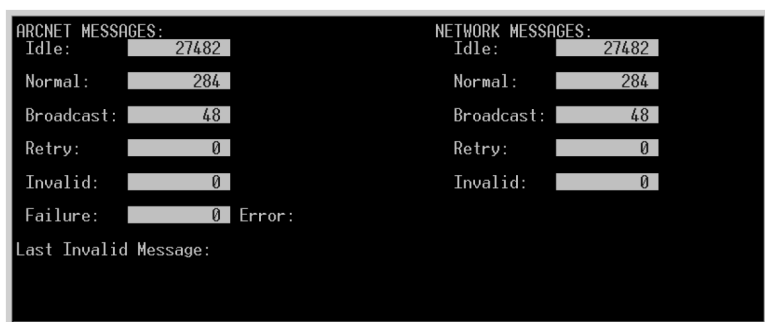


Figure 17 — Example of Statistics Screen

The left column shows the number of **ARCNET** messages received by the router. The right column shows the number of **Ethernet** messages received by the router. The Idle counters are incremented when the router has no messages to process and is idle. Whenever statistics are displayed, the Idle counter increments continuously.

Note: Use the Idle counter only as an indication that the router is running. It does not provide an accurate estimate of percent idle time for the router.

The **Normal** message counters indicate the number of Normal (non-broadcast) messages received by the router. The **Broadcast** message counters report the number of Broadcast messages received by the router and destined for all nodes in Metasys. The **Retry** message counter tracks the number of RTOS (Real Time Operating System) messages retransmitted; low numbers reflect stable N1 communications.

Invalid counters report the number of Invalid messages received. Invalid messages contains invalid addresses. These counters should always be zero during normal operation — otherwise, the latest Invalid message is displayed on the screen below the statistics.

The ARCNET **Failure** counter indicates the number of times an ARCNET message could not be delivered to its destination due to Ethernet errors. While this counter should normally be zero, it will increment if one of the other JC-MER-CXB units is offline.

Appendix D: Setting Up HyperTerminal

HyperTerminal is a terminal-emulation program included with Windows®. To communicate with the JC-MER-CXB you will need to configure HyperTerminal. First run HyperTerminal and then:

- Choose the File menu item.
- Choose the Properties menu item.
- In the “Connect using” box select the COM port you are using to communicate with the JC-MER-CXB.
- Press the Configure button.
- Select the Port settings tab.
- Set the Bits per second to 57600.
- Set the Data bits to 8.
- Set the Parity to None.
- Set the Stop bits to 1.
- Set the Flow control to None.*
- Press the OK button.
- Select the Settings tab.
- Choose the “Terminal Keys” option.
- In the Emulation box select ANSI.
- Press the OK button.

* "Hardware" flow control could cause unreliable communication.

If you connect to a running JC-MER-CXB you may need to refresh the screen. While the router program is executing, press “R” to redraw the screen.

Appendix E: Field Connections

The JC-MER-CXB transceiver presents a high-impedance connection in both the powered and unpowered states. Although nominally a bus device, it can be used in either bus or star ARCNET topologies that use RG-62/u coaxial cable.

Regardless of the topology implemented, the coaxial port will require a BNC Tee connector with at least one leg of the connector fastened to coaxial cable. If the unit passes traffic from one portion of an ARCNET bus to another, the remaining leg of the Tee connector will tie to another coaxial cable. But if the unit occupies the *end* of a bus segment, the remaining leg of the Tee connector must be fitted with a BNC-style terminator having 93 (nominal) ohms of resistance.

The maximum ARCNET segment length is 1000 feet and the maximum number of nodes per segment is eight. To extend a bus segment beyond 1000 feet, an active hub is required. The coaxial cable should attach directly to the hub port *without* using a BNC Tee connector since the port internally terminates the end of a bus segment.

Appendix F: UDP Port Address Assignments

Metasys Ethernet networks use a default value of 11001 for the UDP port address (UDPPA) and NCMs automatically configure themselves to use this value. Since each N1 network must have a unique UDPPA, other values must be used when multiple N1 networks are involved.

□

Any UDPPA from 2050 to 65535 (except 11002) can be used, but it is best to start numbering networks in a Multinetwork configuration with 11003 and continue sequentially.

□

Ask the Network Administrator or the customer's Ethernet network support provider if they know of any reason why any UDPPA you have chosen should not be used on their network.

For more information, refer to the following document: □ □

LIT-6360175 N1 Ethernet/IP Network Technical Bulletin.

Appendix G: Linux Trademark Information

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