BRIDGE COMMUNICATIONS, INC.

CS/1 INSTALLATION GUIDE

09-0117-00

October 1987

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Bridge Communications, Inc.
Attn: Technical Publications
2081 Stierlin Road
Mountain View, CA 94043

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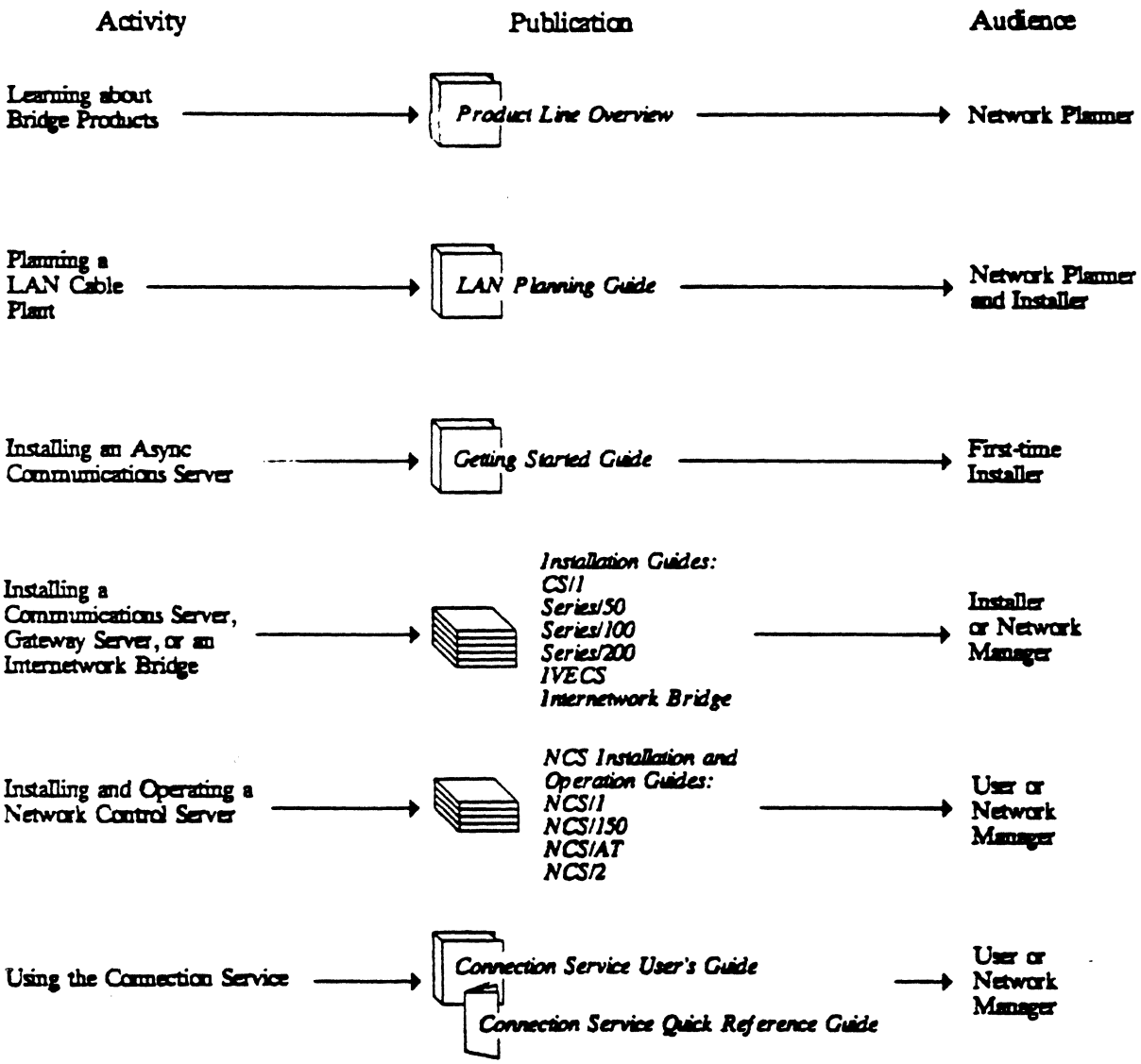

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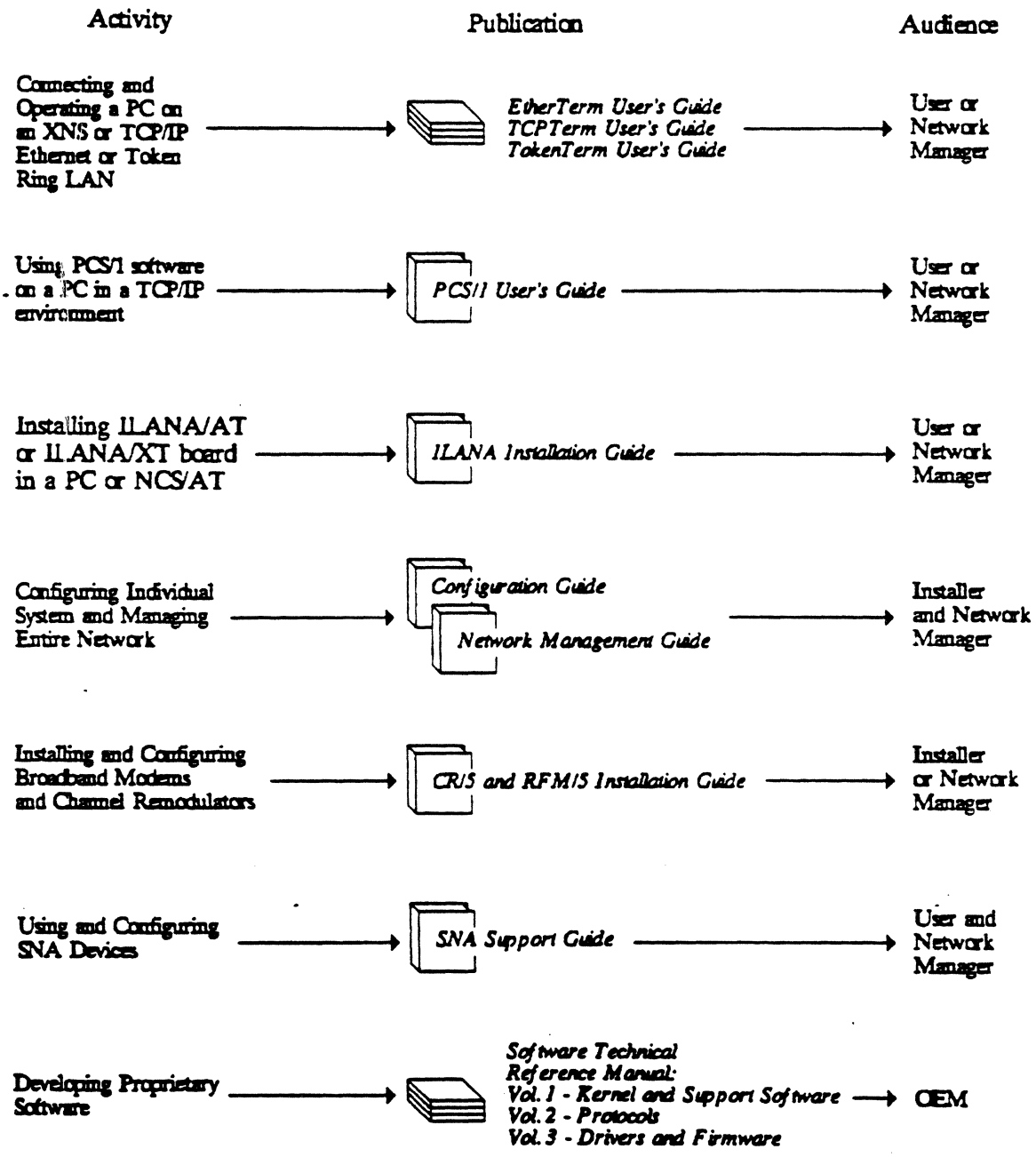

PUBLICATION CHANGE RECORD

This page records all revisions to this publication, as well as any Publication Change Notices (PCNs) posted against each revision. The first entry is always the publication's initial release. Revisions and PCNs subsequently posted are numbered sequentially and dated, and include a brief description of the changes made. A revision always incorporates both the previous revision and any PCNs posted against it. The part numbers assigned to revisions and PCNs use the following format:

aa-bbbb-cc-dd

where "aa-bbbb" identifies the publication, "cc" identifies the revision, and "dd" identifies the PCN.

Part Number	Date	Description	Affected Pages
09-0117-00	11/87	First Release	All

PREFACE

This guide provides the information necessary to install a Communications Server/1 (CS/1) within a Bridge system environment.

This guide is intended to be used in conjunction with the *Connection Service User's Guide*, *Configuration Guide*, and *Network Management Guide*, which describe the Connection Service commands and provide information necessary for software configuration and operation and management of Bridge Communications network system products.

This guide was prepared with the following assumptions of reader knowledge:

- The network planner should be familiar with basic concepts of Local Area Networks.
- The network planner should be familiar with the Bridge Communications product line information provided in the *Product Line Overview.*
- The network installer should be familiar with standard procedures for installation and for providing power and grounding according to specifications listed in this guide and the *LAN Planning Guide.*
- The network installer should be familiar with the lines and equipment being interfaced to the CS/1.

The information in this guide is grouped into seven major sections:

Section 1	Introduction: Describes the purpose and scope of this guide and offers recommendations on how to use it.
Section 2	Preinstallation Planning: Describes the features, capabilities, and services provided by the CS/1's basic functional modules; provides external physical descriptions of CS/1s and lists their environmental requirements.
Section 3	Unpacking and Installation: Outlines the procedures for unpacking, installing, and cabling a CS/1; describes all applicable hardware configuration jumpers and firmware configuration procedures; lists connector pin assignments; provides system checkout procedures; and recommends steps for preventive maintenance.
Section 4	System Modification: Describes modifications that may be made to CS/1s.
Appendix A	Power-on Diagnostics: Describes self-test diagnostics for all CS/1 boards, including error messages generated.
Appendix B	Bootstrap Procedure: Describes the three bootstrap options (automatic bootstrap, floppy bootstrap, and network bootstrap) and the procedure for implementing each.
Appendix C	System Architecture: Shows the CS/1's basic functional modules; describes the hardware and software modules; briefly discusses the theory of operation of these products.

CONTENTS

TABLES

FIGURES

REFERENCES

Ethernet, broadband, and Token Ring technology references:

[1] *The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specifications,* Version 1.0 (Digital Equipment Corporation, Intel Corporation, and Xerox Corporation, 1980)

[2] *The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specifications,* Version 2.0 (Digital Equipment Corporation, Intel Corporation, and Xerox Corporation, 1982)

[3] *IEEE Standard 802.3 CSMA/CD Access Method and Physical Layer Specifications,* Draft Document (The Institute of Electrical and Electronics Engineers, Inc., 1985)

[4] *Broadband Network Technology: An Overview for the Data and Telecommunications Industries,* Edward Cooper (Sytek Press, 1986)

[5] *ANSI/IEEE Standard 802.5 Token Ring Access Method and Physical Layer Specifications,* ISO Draft Proposal 8802/5 (The Institute of Electrical and Electronics Engineers, Inc., 1985)

[6] *TMS380 Adapter Chipset User's Guide* (Texas Instruments Incorporated, 1985)

Other related specifications:

[7] *Intel Multibus™ Specification,* 9800683-03 (Intel Corporation, 1981)

[8] *Intel iSBX™ Bus Specification,* 142686-002 (Intel Corporation, 1981)

[9] *UNIX System Manager's Manual* (Samuel J. Leffler, June 1983)

CUSTOMER EQUIPMENT SUPPORT

In the event that your installation requires servicing, Bridge has a nationwide service organization with trained specialists to support you. Consult the designated Bridge representative at your company for the address of the service office nearest you.

Prior to placing a service call, verify proper operation of the equipment. To do this, review the installation and troubleshooting sections of the appropriate installation guide. Additionally, network managers should follow the troubleshooting procedures listed in the *Network Management Guide*.

If it is necessary to contact Bridge, please have the following information available when you call:

- Bridge customer code number. Each customer site has a unique code, which is marked on all Bridge shipping and billing documents. For example:

Company Name	*Customer Code*
ABC Company-Tucson	10234-TU1
XYZ Company-Phoenix	78902-PH1

  The first five digits of the code identify the account information; the last three characters identify the location of the site.

- Customer contact and telephone number. This should be the person within your company who will be working on the problem.
- System or unit problem. Please be prepared to provide a complete and concise description of the problem.
- Model and serial number. Bridge requires the model name and serial number of any unit that requires service.
- Purchase order number (if not covered by warranty or contract). For equipment that is not covered by warranty or contract, you must provide a purchase order number for any service request submitted to Bridge.

After receiving this information, Bridge will dispatch your request to the appropriate office or authorized service representative. If it is necessary to ship back a system for service, Bridge will assign a Return Materials Authorization (RMA) number to be used for return of Bridge equipment. Be sure to mark this number on the outside of the container prior to shipping the system.

SECTION 1

INTRODUCTION

This publication provides the information necessary to plan for and install a Bridge Communications Server/1 (CS/1). This section defines the purpose and scope of the publication.

1.1 Purpose and Scope

This publication is designed for the system planner who needs a technical overview of CS/1s and for the system installer who needs specific installation instructions. It is intended to be used in conjunction with the *Connection Service User's Guide*, *Configuration Guide*, and *Network Management Guide*. These guides contain information necessary for software configuration and for operation and management of CS/1s.

Information in this publication has been prepared to fulfill the needs of the customer who primarily uses the turnkey services provided by CS/1s. Turnkey services are automatically included in each of the CS/1 products and require no programming or other enhancements.

Non-turnkey features available on the CS/1 products are described in the *Software Technical Reference Manual*.

1.2 How to Use This Guide

This guide is divided into several sections that provide the information necessary during each phase of CS/1 installation:

Preinstallation Planning	Section 2 describes the features and capabilities of the CS/1, describes the Connection Service associated with the CS/1, and provides a brief physical description and environmental requirements of the CS/1. Appendix C reviews the functional modules and the hardware and software architectures of the CS/1.
Unpacking and Installation	Section 3 includes unpacking and installation instructions, startup and checkout procedures, hardware and firmware configuration information, and suggestions for preventive maintenance.

System Modification	Section 4 provides information concerning adding I/O boards and changing PROMs.
Appendices	Appendix A presents status and error messages generated by the CS/1 power-on self-tests, including descriptions of all board-level tests. Appendix B details information necessary to boot the CS/1 from a floppy disk, the network, or from the CS/1's CPU monitor. Appendix C describes the basic hardware and software architecture of the CS/1.

1.3 Conventions

This manual uses the following conventions:

**** NOTE ****

This heading is used in this manual to identify notes. Notes call attention to important features or instructions.

**** CAUTION ****

This heading is used to identify caution statements. Caution statements contain directions that you must follow to avoid immediate system damage or loss of system data.

**** WARNING ****

This heading is used to identify warning statements. Warning statements contain directions that you must follow for your personal safety. Follow all instructions carefully.

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Text on the terminal screen
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This typeface is used in the manual to represent
text that appears on your terminal screen.
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The Return key

When a specific key is referred to in text, it is called out by its label, such as "the Return key" or "the Escape key". Key combinations are indicated by hyphens: "Control-R" means that you should press and hold the Control key while you press the key labeled "R".

SECTION 2

PREINSTALLATION PLANNING

This section describes the features and capabilities of CS/1s, defines Connection Services available to the user, and outlines the external physical specifications of CS/1s. It is essential that you review this information prior to installing a CS/1.

2.1 Features and Capabilities

The CS/1 supports a wide range of I/O and network interface features and capabilities. These are described in general terms in the subsequent discussions. Information provided here is split into two basic groups: descriptions pertinent to CS/1s in general and descriptions specific to CS/1-FTs. Where information applies equally to all CS/1 products, the generic term "server" is used. Where information applies to only one CS/1 product, the server model is included for clarity.

2.1.1 CS/1 Features and Capabilities

The CS/1 provides any combination of available serial I/O (SIO) interfaces, including asynchronous, byte-synchronous, bit-synchronous, and 3270. For instance, a CS/1 may contain one asynchronous SIO board and two synchronous SIO boards, and be able to provide network connections to asynchronous, byte-synchronous, and bit-synchronous devices. Or, for example, a CS/1 may contain one SIO-A board and two SIO-16 boards, for a total of 40 asynchronous ports, plus an SIO-3270 board for connection to up to eight 3270 display stations. Each individual SIO board in the CS/1 supports only one kind of interface.

The CS/1 provides full connectivity among a set of devices by implementing virtual connections among them over an Ethernet, broadband, or Token Ring network. The CS/1 is available in configurations running the International Standards Organization (ISO) Open Systems Interconnection (OSI), Transmission Control Protocol/Internet Protocol (TCP/IP), or Xerox Network Systems (XNS) protocols, automatically providing the Bridge Connection Service with any of these protocol sets (Section 2.2 describes the Connection Service features).

The CS/1 with asynchronous interfaces supports asynchronous terminals, modems, hosts, printers, word processors, personal computers, and other devices with an RS-232-C interface (standard with SIO-A or SIO-16) or an RS-422 interface (optional with SIO-A only).

The CS/1 with byte-synchronous interfaces supports most synchronous terminals, modems, and hosts.

The CS/1 with bit-synchronous interfaces supports most bit-synchronous and synchronous terminals, modems, and hosts.

The CS/1 with 3270 serial I/O (SIO-3270) interfaces supports IBM Category A display stations operating in Control Unit Terminal (CUT) mode with data entry or typewriter style keyboards. With the 3270 interface, the CS/1 also supports wide screen display, extended highlighting, color, and extended color screens. The SIO-3270 is an intelligent protocol converter that emulates an asynchronous terminal operating in either VT100 Emulation mode or Extended VT100 mode:

- In VT100 Emulation mode, the SIO-3270 causes the IBM display station to emulate a VT100 terminal to the host.
- In extended VT100 mode, the SIO-3270 causes the IBM display station to emulate a VT100 terminal to the host, providing a superset of the VT100 Emulation mode features.

The CS/1 may be ordered with any one of these four interface variations or with a combination of up to four variations installed in one unit.

CS/1s with asynchronous or synchronous I/O options offer a choice of two electrical protocols for serial communication: RS-232-C and RS-422. RS-232-C can be used for distances up to 200 feet at speeds up to 19.2 Kbps and is not recommended for noisy or industrial environments. RS-422 can be used for distances up to 4,000 feet at speeds up to 64 Kbps and provides excellent noise protection and minimal RFI generation. RS-422 tolerates ground shifts up to 7 volts. The CS/1 with the 3270 interface uses RG-62 coaxial cable that can be used for distances up to 4,000 feet. RG-62 coaxial cable is not recommended for noisy or industrial environments.

2.1.2 CS/1-FT Features and Capabilities

The CS/1-FT is a modular, fault-tolerant Communications Server that features a redundant data link. It can be configured with any of the same serial I/O interface options described in the preceding section. However, it incorporates a dual-board network controller configuration that supports Ethernet, Bridge Broadband, or a combination of Ethernet and Bridge Broadband network interfaces.

If the CS/1-FT detects a single media or data link fault, it automatically shifts all traffic to the remaining operational media. This switching process is transparent to the user and requires no direct network manager intervention.

The CS/1-FT supports up to 64 terminals, personal computers, printers, host ports, and modems running TCP/IP protocols. The XNS protocol support provided with the standard CS/1 is not available in the CS/1-FT configuration. Refer to Section 3.5, Section 3.6.1, and Appendix C for more information.

The CS/1-FT has the following special features:

- Supports any combination of baseband, broadband, or fiber-optic media. The CS/1-FT can be configured with two data links of the same type, or with dissimilar data links depending on customer requirements.
- During normal operation, without any media failure, the CS/1-FT balances traffic over both cable plants, significantly increasing network capacity.
- By using two data links, two network interfaces, and two cable plants, the CS/1-FT can ensure immediate recovery and full operation on a single interface whenever a cable media failure occurs—thereby minimizing performance degradation.

2.2 Connection Service

The Connection Service is available to a user (interacting with the server via a terminal device) or to a host computer. The Connection Service requires no programming and is standard on all Communications Servers. It provides a friendly, highly reliable interface for the user, and a simple, fast interface for the host.

This service allows the user to establish a virtual circuit (logical connection) between two terminal devices, between a terminal device and a host, or between two hosts. The name "terminal device" is used generically to indicate any terminal-like device. The user or device may actually be a computer emulating a terminal or a process feeding such a terminal emulator.

The user (or terminal emulator) specifies the name of the device to which the circuit is to be established. Once the circuit is established, all information is passed reliably between the two devices.

Figure 2-1 illustrates the CS/1 Connection Service on an Ethernet network. This example shows the network configured as a "terminal switch," which allows terminal devices to communicate with multiple hosts. This service also provides a mechanism for host-to-host data transfer.

The Connection Service provides protocol processing through the session level and takes care of all acknowledgments, duplicate filtering, sequencing, retransmission, and flow control. It allows a terminal or host connected to a network via a CS/1 to establish virtual connections with a host or terminal on an X.25 network, and vice versa. This service provides translation from XNS protocols to X.25 and X.29 protocols. In addition, it allows multiple simultaneous connections on each port, up to a maximum of eight connections on a single port.

Connection Service commands allow you to:

- Establish and terminate a virtual circuit to another device
- Examine and alter configuration parameters (e.g., device type, baud rate, parity, flow control)
- Send and receive in-band and out-of-band signals (e.g., interrupts)
- Switch among multiple sessions
- Assign and use logical names
- Examine error and traffic statistics

These commands are available to each port configured to support an asynchronous terminal. For byte-synchronous and bit-synchronous terminal ports, the functions provided by the Connection Service commands (e.g., forming connections) must be performed remotely by a "third-party" terminal connected to an asynchronous port.

Each command is described in detail in the *Connection Service User's Guide*.

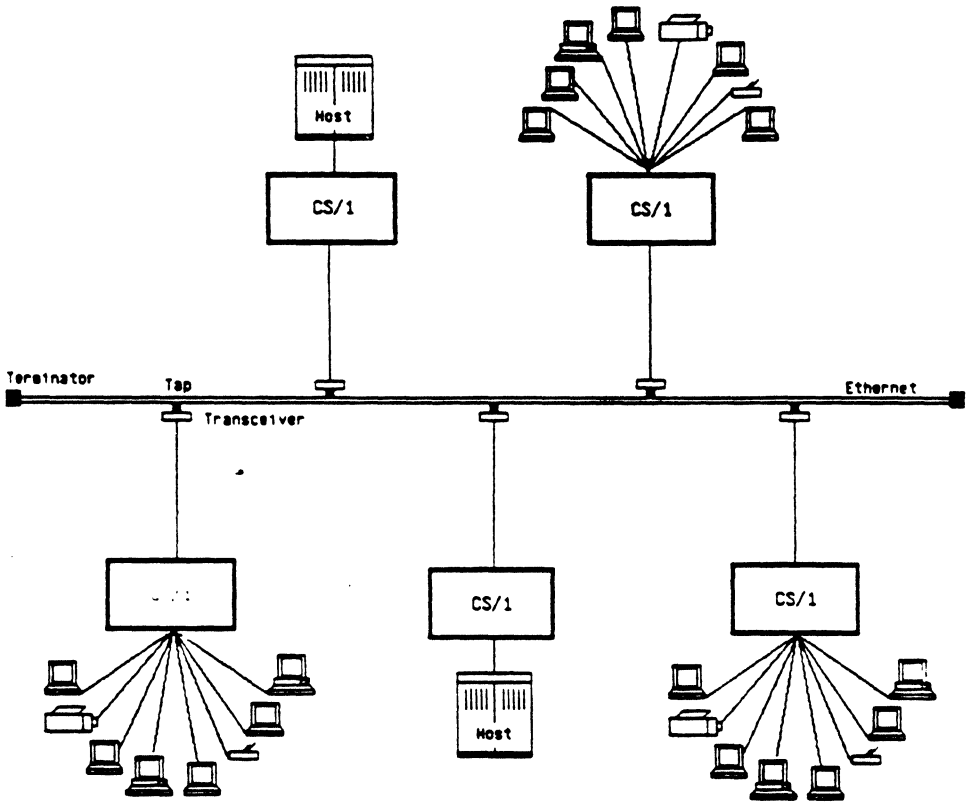


Figure 2-1 CS/1 Connection Service

2.3 Physical Description

This section illustrates a typical CS/1's enclosure and briefly describes external indicators, switches, and general connector locations. Refer to Section 3.6 for complete details concerning connectors and pin assignments.

Figure 2-2 shows a CS/1 enclosure. Figure 2-3 illustrates the front panel of a CS/1, indicating the positions of the diagnostic LEDs and floppy disk unit. Figure 2-4 shows the back panel of a CS/1 with SIO-A or SIO-ST modules and an Ethernet network interface, and indicates the positions of the switches and back panel attachment assemblies.

Sections 3.6.1 through 3.6.3 provide detailed descriptions and illustrations of each back panel attachment assembly (Figures 3-14 through 3-23).

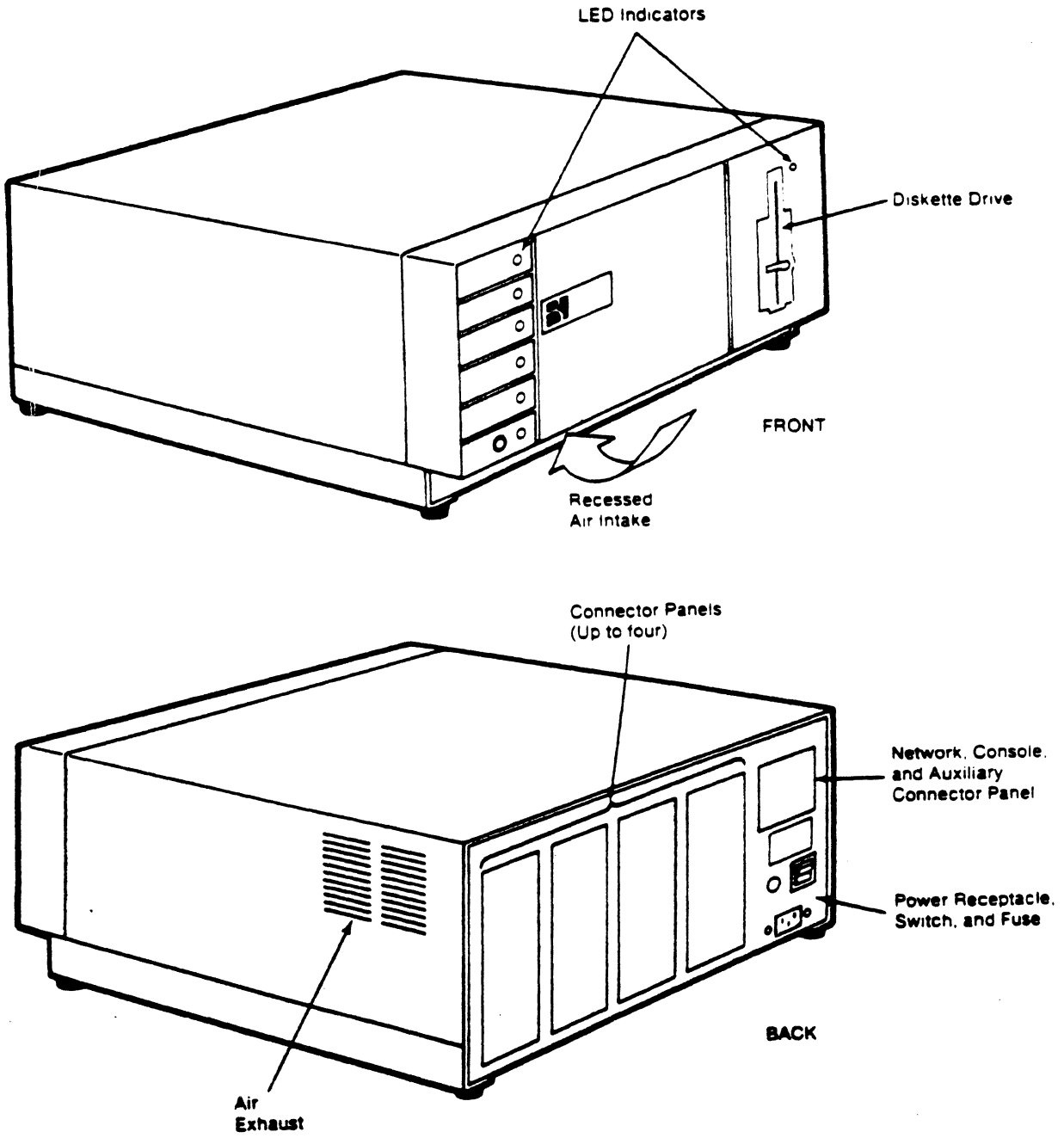


Figure 2-2 CS/1 Enclosure

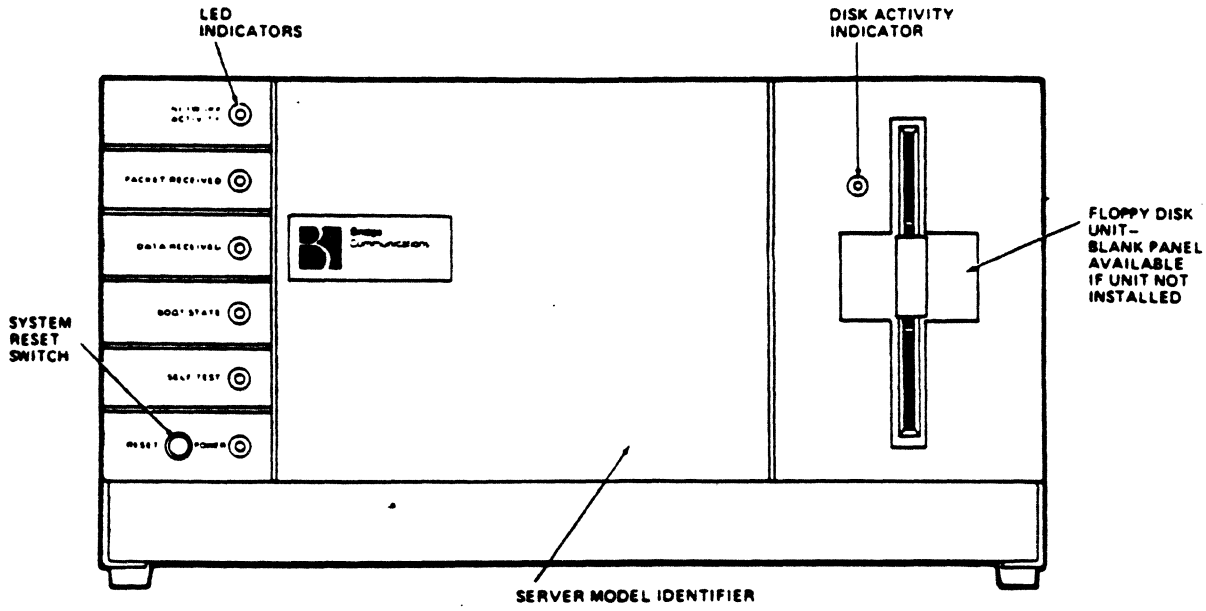


Figure 2-3 CS/1 Front Panel

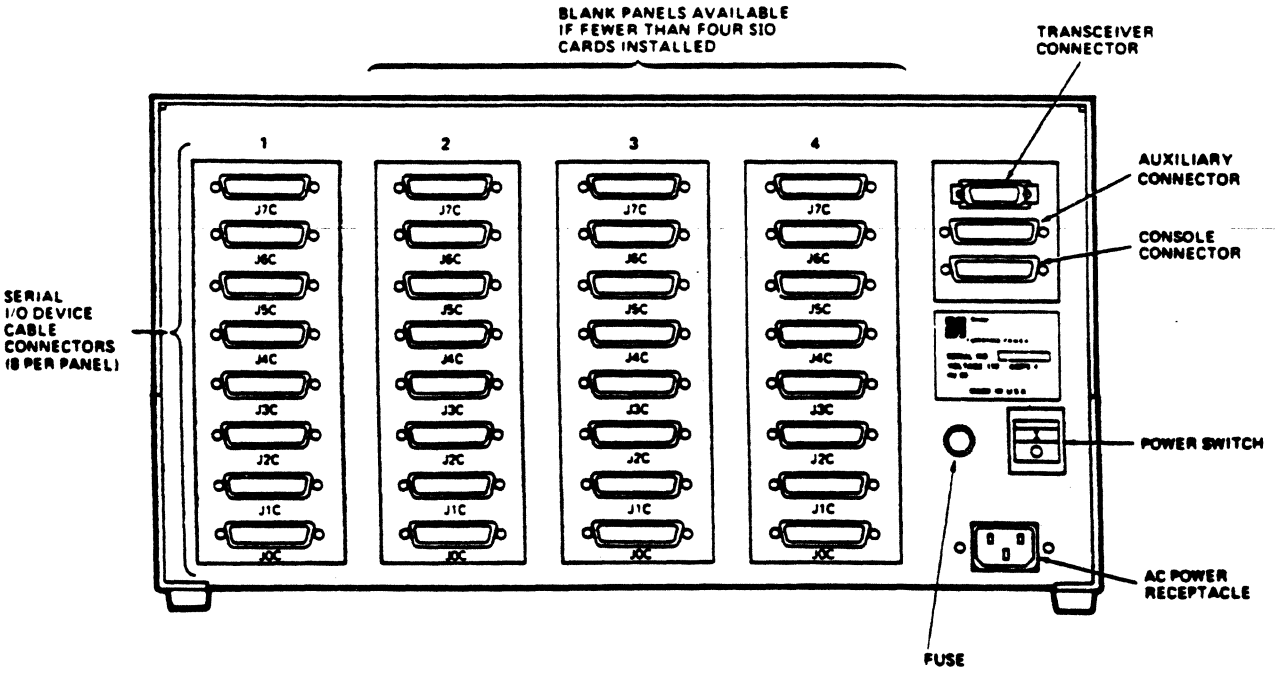


Figure 2-4 CS/1 Back Panel with SIO-A or SIO-ST Modules

2.3.1 CS/1 Front Panel LED Displays

The CS/1 front panel contains seven LED indicators that light to display diagnostic activity both at power-on and while the server software is running. Table 2-1 lists the LEDs and their functions.

Table 2-1 CS/1 Front Panel LED Indicators

Name	*Function*
Network Activity	For servers on an Ethernet or broadband network, flashes when a packet is detected on the network. Packet address need not match the server's address. Used to verify proper physical attachment to the network cable and to indicate network load. For servers on a Token Ring network, the Network Activity LED remains lit as long as the server is inserted into the ring.
Packet Received	Flashes when the server detects a packet on the network whose address field matches the server's address. Used to verify that packets are being received by the server.
Data Received	Flashes when the server detects data being received from one of the I/O ports. Used to verify proper physical attachment of I/O devices.
Boot State	On during software bootstrap from onboard diskette or from an NCS.
Self Test	On for 10 seconds following reset or power-on. Remains lit longer only if self-test diagnostic fails; fault(s) may be further identified by removing top cover of unit and locating lit LED(s) on individual board(s). Flashes to indicate no boot source present. Refer to Appendix A for a description of diagnostic messages.
Power	On as long as power supply generates +5 VDC.
Disk Activity	On when diskette is being accessed. Diskette must not be removed from unit and Reset switch must not be pressed while this LED is lit.

2.3.2 Front Panel Reset Switch

The Reset switch is located at the lower left corner of the front panel (refer to Figure 2-3). Pressing the switch causes a system reset; the system software and hardware are initialized; and the system executes self-test diagnostics and software bootstrap. The switch is recessed into the front panel to reduce the likelihood of pressing it unintentionally.

2.3.3 AC Power Switch, Fuse, and Receptacle

The power switch, fuse, and power receptacle are located on the back panel on all CS/1s (refer to Figure 2-4). Both sides of the AC line are switched, and the switch is marked according to the international convention. When the "I" side is pressed, the switch is on; when the "O" side is pressed, the switch is off.

The 120 VAC version of the CS/1 is delivered with a 5-amp, 1¼" x ¼", fast-acting, normal blow, U.S. standard fuse. The 230 VAC version is delivered with a 3-amp, 20 mm x 5 mm, fast-acting, normal blow, I.E.C. standard fuse. Replace these fuses only with fuses of identical rating and size.

Each server has an international CEE-22 AC power receptacle approved for 6-amp operation. The connector has three prongs, with chassis ground on the middle prong. The server is normally supplied with an approximate 8-foot (2.4-meter) long, standard U.S. power cord set. Power cord connectors for use outside the U.S. are also available from Bridge.

2.4 Environmental Requirements

CS/1 dimensions are listed in Table 2-2. CS/1s are designed to fit into a 10-inch ANSI-standard rack.

Table 2-2 CS/1 Dimensions

Length	*Width*	*Height*
17.0 in 43.2 cm	21.3 in 54.1 cm	9.5 in 24.1 cm

Allow approximately 6 inches (15 cm) free space on all sides of the CS/1. This allows for ventilation at the front air intake and side air exhausts and for cable clearance at the rear of the CS/1. The clearance provided by standard rack construction normally allows adequate air flow and cable clearance for rack mount installations, provided that the rack contains an independent blower or fan.

CS/1s are designed to operate safely and reliably in an office environment. The fan that cools the CS/1 generates 28 decibels PSIL. The environmental conditions recommended for safe, reliable operation are listed in Table 2-3.

Table 2-3
CS/1 Environmental Requirements

	Minimum	*Maximum*
Storage Temperature	-40 ° F -20 ° C	140 ° F 75 ° C
Operating Temperature	41 ° F 5 ° C	104 ° F 40 ° C
Altitude	Sea Level	15,000 ft 4572 m
Humidity *	20%	80%

* Relative humidity with no condensation.

Electrical Requirements

The CS/1 power supply has overcurrent protection on all voltages and overvoltage protection on +5 VDC. The total power consumption is 300 watts.

The power supply unit can be ordered in a 120 VAC or a 230 VAC version, as listed in Table 2-4. Refer to the label on the back panel of the unit to verify that the voltage option is appropriate for the local power source. Conversion of the unit from one voltage range to the other can be performed only by trained personnel. The frequency range acceptable at either voltage is 47 Hz to 63 Hz.

**** CAUTION ****

Hardware changes, such as adding or removing Serial Input/Output (SIO) modules, made to a server with an Intelligent Broadband Controller/Multibus module (IBC/M) board may alter the original voltages at the RFM/5 end. Check the voltages at the RFM/5 end; they must measure within 5 percent of their original value. Refer to the *CR/5 and RFM/5 Installation Guide* for acceptable voltage ranges.

If the voltages measure outside of the 5 percent maximum range, contact Bridge or an authorized service representative.

The unit must be connected to the AC power source with a grounded line cord in order to meet safety requirements.

Table 2-4 Voltage Options

Voltage	*Range*	*Current*
120 VAC	98–132 VAC	3.5 amps maximum
230 VAC	195–264 VAC	2.2 amps maximum

2.5 Network Cable Plant Installation

Installation of the network cable plant is the responsibility of the customer and should be performed by a qualified contractor in accordance with local regulations. Bridge offers an optional installation service, which is described in the *LAN Planning Guide*.

SECTION 3

UNPACKING AND INSTALLATION

The following procedures are required to prepare the CS/1 for operation:

- Unpacking the server
- Configuring the server's boards (if necessary)
- Installing the server
- Connecting the server to the network and to devices or lines
- Starting up and checking out the server

This section describes the steps necessary to perform these procedures and lists recommendations for preventive maintenance.

Once you have installed and connected the hardware, some software configuration may also be necessary. The *Connection Service User's Guide* describes the Connection Service and port configuration procedures for asynchronous servers. The *Configuration Guide* describes system generation and port configuration procedures for all Bridge servers.

3.1 Handling Static Sensitive Devices

Electro-static discharge (ESD) can damage PROMs and other circuit board components. Failures resulting from ESD may void your warranty. To prevent this, follow these handling procedures:

- Do not remove the board from its static protective package prior to installation.
- Do not touch pins, leads, or solder connections.
- Handle boards and components by the edges only, avoiding the gold-plated area.
- Store or ship boards and components in static protective packages.

Technicians who install PROMs and circuit boards should observe proper grounding techniques when handling any static sensitive device. These techniques include using a foot strap and grounded mat or wearing a grounded static discharge wrist strap.

3.2 Unpacking

Each CS/1 unit is inspected before shipment and is packed in a carton with protective padding. Inspect the shipping carton and the unit itself upon receipt for damage sustained during shipment. To unpack the CS/1, follow these steps:

1. Inspect the carton for damage.
2. Carefully open the top of the carton.
3. Remove the upper layer of protective padding, and then remove the unit from the carton.

**** CAUTION ****

The cover of the unit is held in place by ball studs. To remove it, lift each side of the rear overhang with a brisk upward motion, thereby disengaging the ball stud on each side separately.

When lifting the entire unit, be sure to hold it by the bottom edge, not by the cover's rear overhang.

4. Remove the plastic bag from the unit.
5. Inspect the unit for shipping damage. If you find any damage, contact the transport representative to file a report. If the unit must be returned to the factory, ship it in its original carton. If the original carton was damaged in shipment, repack the unit in a carton that provides equivalent protection.
6. Verify that the carton contains all the items listed on the packing slip.
7. Verify that the serial number on the label on the back of the unit corresponds to the serial number listed on the packing slip.

**** NOTE ****

The Ethernet address of the unit also appears on this label. On some units, the label may be affixed to the bottom.

8. Verify that the power specifications listed on the serial number label are appropriate for the available power source.
9. Ensure that all the boards inside the unit are securely seated by following these steps:
   a. Remove the unit's top cover by lifting each side of the rear overhang with a brisk upward motion, thereby disengaging each ball stud separately.
   b. If a bar across the cardcage (referred to as the cardcage board lock) is present, remove it by unscrewing the screw on one side and lifting the bar up.
   c. Remove each board by pulling up firmly on the extractor levers; then reseat it with a firm downward push.
   d. Replace the cardcage board lock, if any.

After these steps have been accomplished, you can configure the CS/1. Hardware configuration is described in Section 3.3. Firmware configuration for units featuring MCPU20 boards is described in Section 3.9.

3.3 Hardware Configuration

This section describes the configuration of the boards in the CS/1 products. A CS/1 with an Ethernet interface contains one of the EC/2 modules described in Section 3.3.1. Table 3-1 contains a summary of the configuration options available on CS/1 hardware modules, listing the factory default for each option and indicating the section that describes the option in detail.

**** NOTE ****

Most configuration areas have a default that is set at the factory; if the default setting is appropriate, no reconfiguration is necessary.

All configuration areas on the Floppy Disk Controller (FDC) board and on the floppy disk drive itself are factory set and must not be changed.

If it is necessary to alter the configuration of any of the boards, remove the unit's top cover first (refer to Section 3.2, step 9).

**** CAUTION ****

Electro-static discharge (ESD) can damage PROMs and other circuit board components. Do not remove a circuit board or PROM from its static protective package prior to installation. When handling any circuit board or PROM, avoid touching pins, leads, solder connections, or gold-plated edges. Failures resulting from ESD may void your warranty. For handling instructions, refer to Section 3.1.

Table 3-1 CS/1 Hardware Configuration Option Summary

Board	*Option*	*Factory Default*	*Section*
MCPU	Bootstrap	Automatic bootstrap	3.3.5
MCPU	Console/download port baud rate	9600 baud (both ports)	3.3.5
MCPU	Automatic reboot (internal disk drive)	Enabled	3.3.5
MCPU	Automatic reboot (diskless)	Enabled	3.3.5
MCPU	Memory size	384 Kbytes	3.3.5
MCPU	Continuous self-test	Disabled	3.3.5
MCPU20*	Continuous self-test	Disabled*	3.3.6
SIO	Local loopback	Enabled	3.3.8
SIO	SIO board number	SIO 1**	3.3.8
SIO	Clock source	***	3.3.8
SIO-16	SIO board number	SIO 1**	3.3.9
SIO-3270	SIO board number	SIO 2**	3.3.10
SBA	EXT/TXC selection	TXC enabled	3.3.11

* For MCPU20, only the Continuous Self-Test option is settable with a jumper. See Section 3.9 for all other MCPU20 default configurations and firmware configuration instructions.

** Applies only to boards ordered separately.

*** Depends on board version. See Tables 3-10 through 3-15.

Table 3-2 lists the hardware modules available in each CS/1, and indicates the slot assignment for each module. Figure 3-1 illustrates the placement of major hardware components within the server's enclosure.

Table 3-2 Hardware Module Slot Assignment*

	Slot Assignment							
Server	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
CS/1 w/ Ethernet	Unused	EC/2	MPCU**	FDC***	SIO 4	SIO 3	SIO 2	SIO 1
CS/1 w/ Broadband	Unused	IBC/M	MPCU**	FDC	SIO 4	SIO 3	SIO 2	SIO 1
CS/1 w/ Token Ring	Unused	TRC/M	MPCU**	FDC	SIO 4	SIO 3	SIO 2	SIO 1
CS/1-FT	IBC/M1	IBC/M0	MPCU	FDC	SIO 4	SIO 3	SIO 2	SIO 1

* Where specific module versions are indicated, only those modules are available.

** Or MPCU20. If MPCU20 is installed, slot D is unused, whether or not an internal floppy disk is installed.

*** Unused on servers with no internal disk drive.

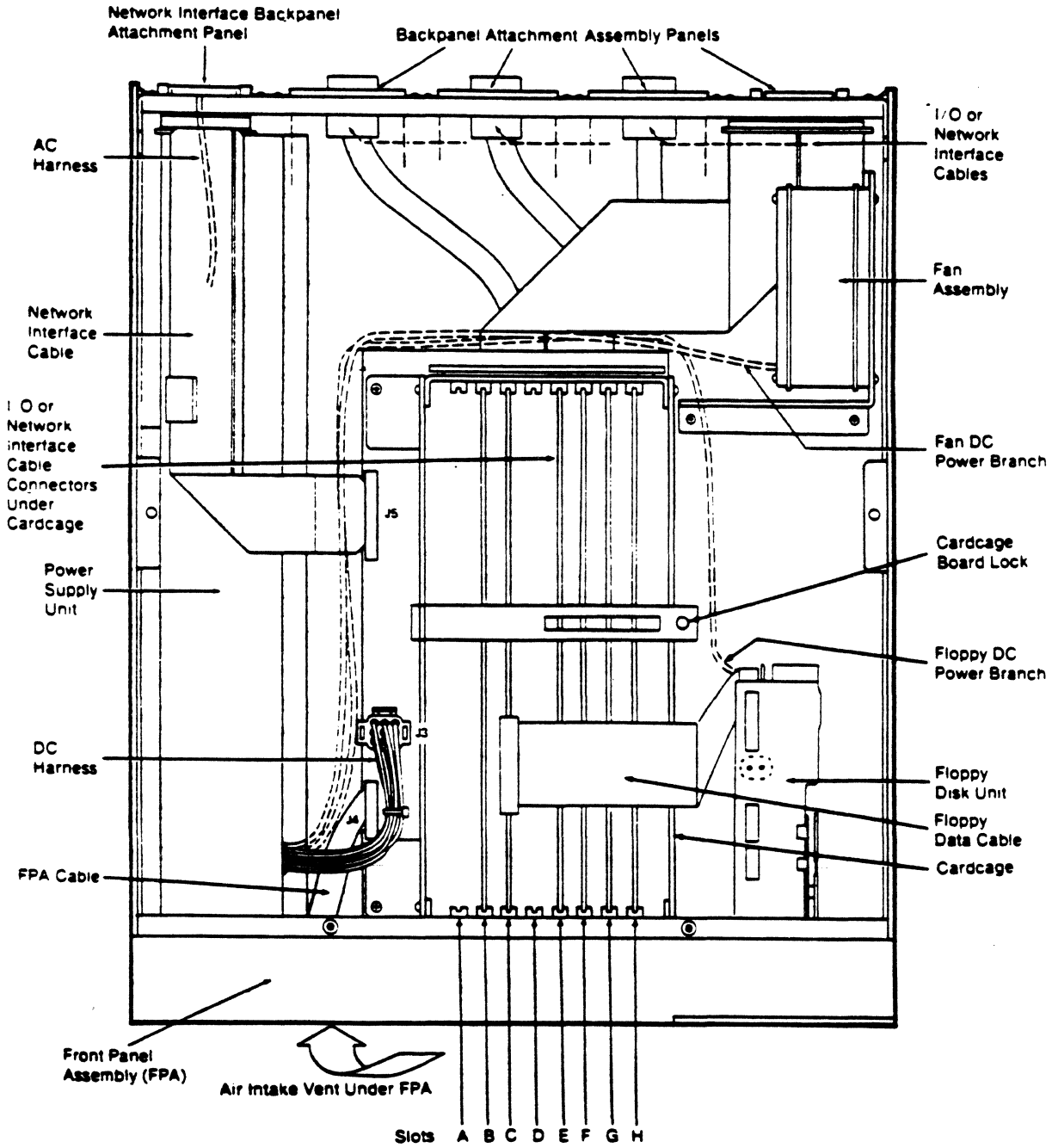


Figure 3-1 Placement of Major Hardware Components

3.3.1 Configuring the EC/2 Board

The EC/2 board is available in two versions: the 256-kilobyte EC/2 and the 512-kilobyte EC/2. The versions are identical, except that one has 256 kilobytes of memory and the other has 512 kilobytes of memory. The boards look identical, have the same LEDs, and are configured the same way. A CS/1 with an MCPU20 board has a 512-kilobyte EC/2.

The EC/2 board contains six LEDs: one Halt LED and five Self Test LEDs (labeled A through E). At power-on or reset, all the LEDs light to indicate that the board is running the self-test diagnostics. If all the tests complete successfully, the LEDs turn off. In addition, the Halt LED lights when the microprocessor is in a halt state. Appendix B describes the EC/2 board self-test diagnostics.

The EC/2 is located in slot B.

The EC/2 board is available in two types, identified by part number: 06-0021-xx and 06-0041-xx, where xx represents a number between 00 and 04. EC/2 number 06-0041-xx is a revised layout of EC/2 number 06-0021-xx. The functionality, LEDs, and power-on diagnostics of the two boards are the same.

On the EC/2 board numbered 06-0021-xx, the part number is printed on the left edge of the board's component side. On the EC/2 board numbered 06-0041-xx, the part number is printed on the right edge of the board's component side. Figures 3-2 and 3-3 illustrate the location of the part number on each type of EC/2 board, as well as the location and identification of onboard LEDs.

There are no user-alterable configuration areas on the EC/2.

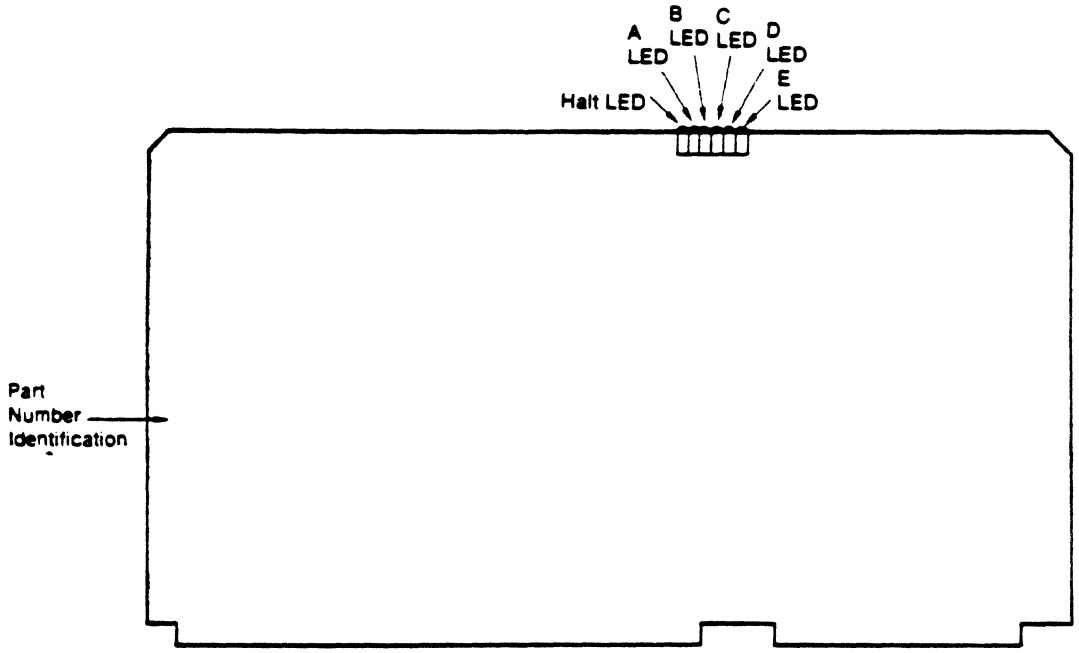


Figure 3-2 LEDs and Part Number ID Location for EC/2 Board No. 06-0021-xx

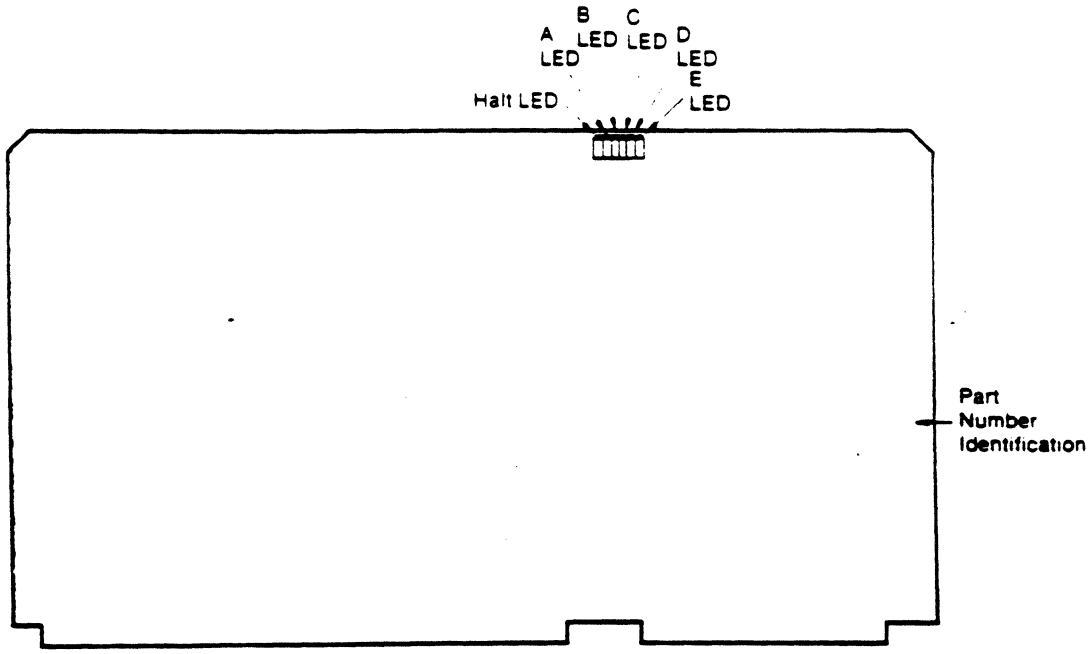


Figure 3-3 LEDs and Part Number ID Location for EC/2 Board No. 06-0041-xx

3.3.2 Configuring the IBC/M Board (CS/1)

In a CS/1, the Intelligent Broadband Controller/Multibus Module (IBC/M) board is located in slot B of the cardcage.

The IBC/M board contains seven diagnostic LEDs: one Halt LED, one Carrier Sense LED, and five Self Test LEDs. At power-on or reset, all the LEDs, except the Carrier Sense LED, light to indicate that the board is running the self-test diagnostics. If all the tests complete successfully, the LEDs turn off. In addition, the Halt LED lights when the microprocessor is in a halt state. Appendix A describes self-test diagnostics for the IBC/M board.

The IBC/M board has no configuration areas that you can set.

Figure 3-4 illustrates the positions of the diagnostic LEDs on the IBC/M board.

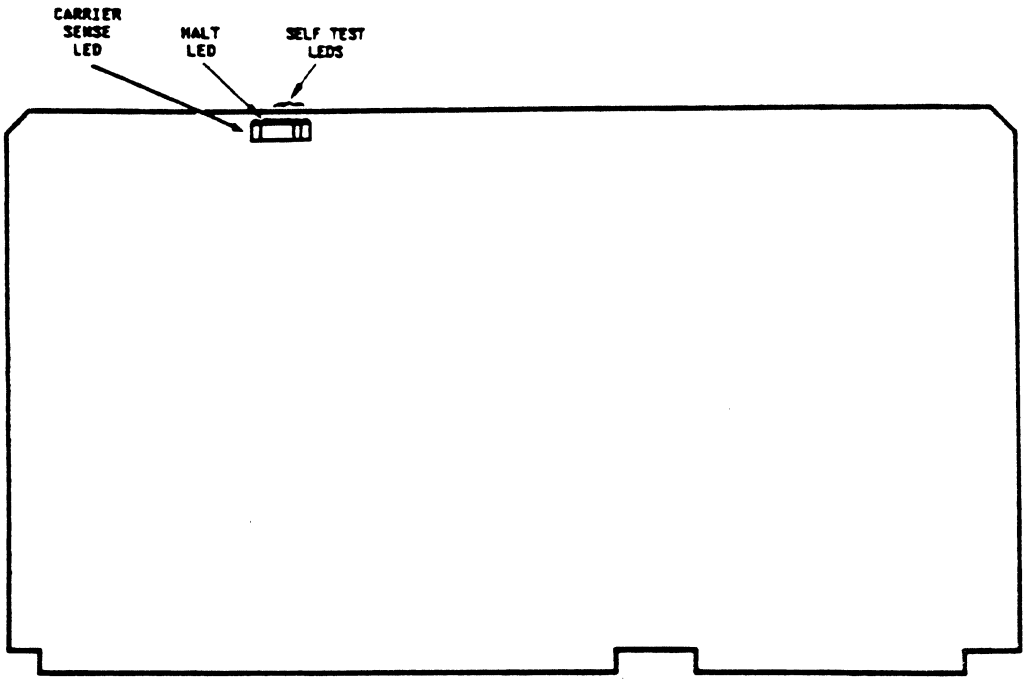


Figure 3-4 IBC/M Board

3.3.3 Configuring the IBC/M Board (CS/1-FT)

A CS/1-FT contains two IBC/M boards, designated IBC/M 0 and IBC/M 1. IBC/M 0 resides in slot B of the cardcage; IBC/M 1 is located in slot A. These boards are essentially identical, except that each features a different configuration area setting, consisting of DIP switch and shorting plug arrangements. These configuration areas also indicate Ethernet and broadband network types.

Four configuration areas are used to identify IBC/M 0 and IBC/M 1 for both Ethernet and Bridge Broadband configurations. Figure 3-5 illustrates the LEDs and configuration areas for CS/1-FT IBC/M boards. Tables 3-3 through 3-6 list settings for configuration areas illustrated in Figure 3-5. In addition to the DIP switch settings specified in Table 3-5, a shorting plug connects E100 to E101 for broadband IBC/M boards; no shorting plug is installed for Ethernet implementations. The configuration area DIP switches and shorting pin pairs described in Tables 3-3 through 3-6, are set OFF or left open, respectively, if not explicitly indicated as set ON (DIP switches) or with a shorting plug in place (across pins). Figure 3-6 illustrates in detail the shorting plugs described in Table 3-6. Do not alter other pin pairs on the IBC/M.

Each IBC/M board contains seven diagnostic LEDs: one Halt LED, one Carrier Sense LED, and five Self Test LEDs. At power-on or reset, all the LEDs light, except the Carrier Sense LED, to indicate that the board is running the self-test diagnostics. If all the tests complete successfully, the LEDs are turned off. In addition, the Halt LED lights when the microprocessor is in a halt state. Appendix A describes IBC/M board self-test diagnostics.

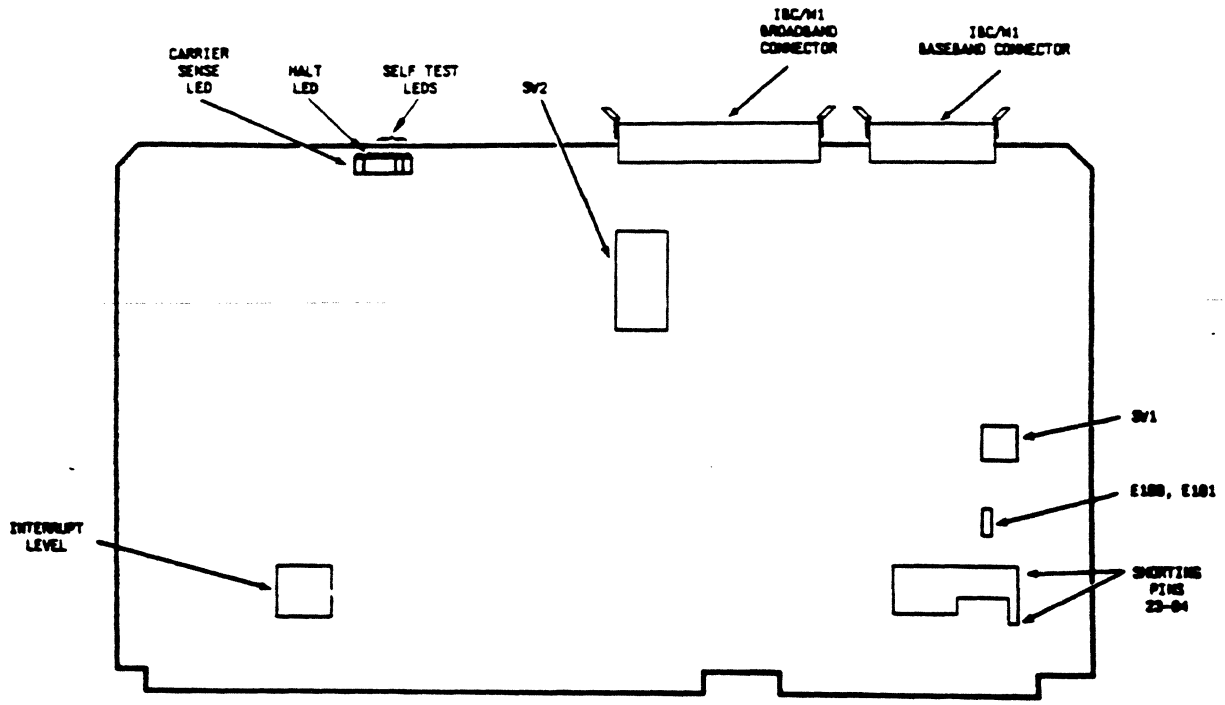


Figure 3-5 IBC/M Board (CS/1-FT)

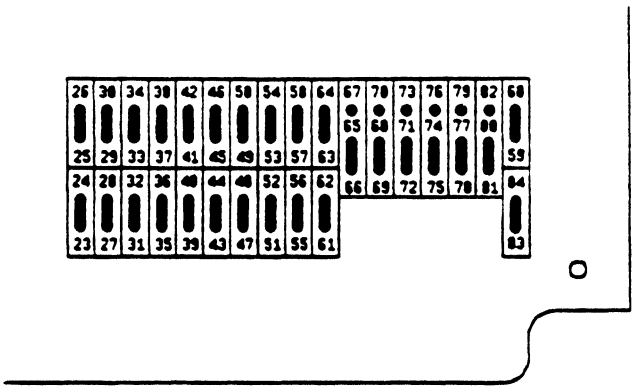
Table 3-3 Multibus Interrupt Level	
Board Type	*Interrupt Level (Shorting Plug Set)*
IBC/M 0	2
IBC/M 1	4

Table 3-4 Switch SW1 Settings	
Board Type	*SW1 Switches Set On*
IBC/M 0	1
IBC/M 1	1,2

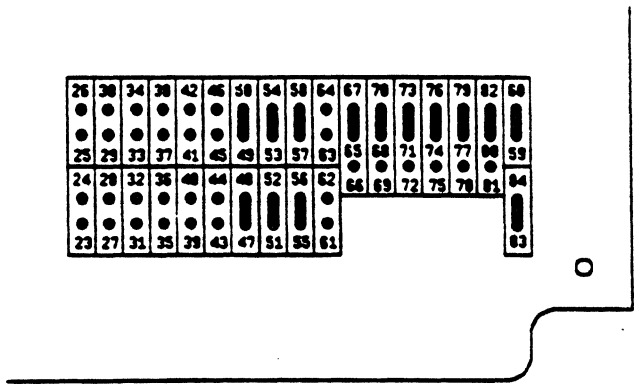
Table 3-5 Switch SW2 Settings	
Network Type	*SW2 Switches Set On*
Broadband*	1,7
Baseband	1
* E100 is connected to E101.	

Table 3-6 Shorting Pins 23 through 84

Board Description	*Shorting Pins Connected*
Broadband IBC/M 0	Odd-numbered pins 23-63 connected to even-numbered pins 24-64
	66, 69, 72, 75, 78, 81, and 83 connected to 65, 68, 71, 74, 77, 80, and 84, respectively
Ethernet IBC/M 0	Odd-numbered pins 47-59 connected to even-numbered pins 48-60
	67, 70, 73, 76, 79, 82, and 84 connected to 65, 68, 71, 74, 77, 80, and 83, respectively
IBC/M 1	For both broadband and Ethernet versions: E53 is connected to E54



(Broadband IBC/M 0 board)



(Ethernet IBC/M 0 board)

Figure 3-6 IBC/M Shorting Pins 23 through 84 (detail)

3.3.4 Configuring the TRC/M Board

The Token Ring Controller/Multibus (TRC/M) board is located in slot B of the cardcage. The board's self-test diagnostics reside in firmware and run automatically when the server is powered on or reset. The TRC/M board has no LEDs or configuration areas. The cable connecting the server to the Multistation Access Unit (MAU) must be attached to the server in order for the server to operate. Appendix A describes TRC/M board self-test diagnostics.

3.3.5 Configuring the MCPU Board

The Main CPU (MCPU) board contains power-on, self-test diagnostics; a monitor; and console terminal and auxiliary port interfaces. The console and auxiliary ports connectors are located on the back panel. The connectors on the backpanel attachment assemblies are illustrated in Figure 2-4 in Section 2.3.1, and Figures 3-14 through 3-16 in Section 3.6.1, depending on the network interface present in the server. The ports support XON/XOFF flow control. Both ports are configured for eight databits and no parity, and cannot be reconfigured; the attached devices must be set appropriately.

The optional Floppy Disk Controller (FDC) board is piggybacked on the MCPU board via an iSBX interface and occupies slot D of the cardcage.

The MCPU board contains two diagnostic LEDs, labeled SELF TEST and HALT. The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are running. The LED turns off when the diagnostics complete successfully. The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. Appendix A describes MCPU board self-test diagnostics.

The MCPU board contains one configuration area designated E1, which is located on the upper edge of the board and is accessible without removing the board. Configuration area E1 implements seven sets of pins:

- Pins A, B, and C select the bootstrap mechanism. The shorting plug positions and the options they select are listed in Table 3-7 and described in detail in Appendix B. In the table, "Out" indicates that the pins are not connected; "In" indicates that the pins are connected by a shorting plug.
- Pins D and E select the baud rate of the console port.
- Pins I and J select the baud rate of the auxiliary port. The shorting plug positions and the options they select are listed in Table 3-8. The speed of the auxiliary port must always be set equal to or less than the speed of the console port.
- Pin F disables or enables the automatic reboot option. Auto reboot is disabled when the shorting plug is removed and enabled when the plug is in place (the factory default). When auto reboot is enabled, fatal error conditions and exception conditions cause the monitor to display an error message on the console and then reset and reboot the system. When auto reboot is disabled, the monitor displays error messages but retains control of the system; no reset or reboot occurs. This allows you the option of saving dumps on diskette or performing debugging procedures. The Pin F shorting plug must be in place for the CS/1 to respond to a remote reboot command, for example, from an NCS.

- Pin G specifies the speed of the processor installed on the MCPU board. This shorting plug is factory set and must not be altered. The plug should be in place on a 12.3 MHz system and absent on a 10 MHz system.
- Pin H specifies the amount of memory installed on the MCPU board. The shorting plug must be absent on all 384K systems running the MCPU firmware designated M1 MMON 01B or later. Early MCPU firmware ignores the setting of this shorting plug, so the plug is optional for 256K systems running MCPU firmware Release 0 or earlier.
- Pin K selects continuous test mode. Continuous test mode causes the system to perform self-test diagnostics continuously as long as the unit is powered on. Continuous test mode is enabled when the shorting plug is IN and disabled when the plug is OUT.

Figure 3-7 illustrates the positions of the LEDs and configuration area E1 on the MCPU board. Pin A of the configuration area is nearest the CS/1's front panel.

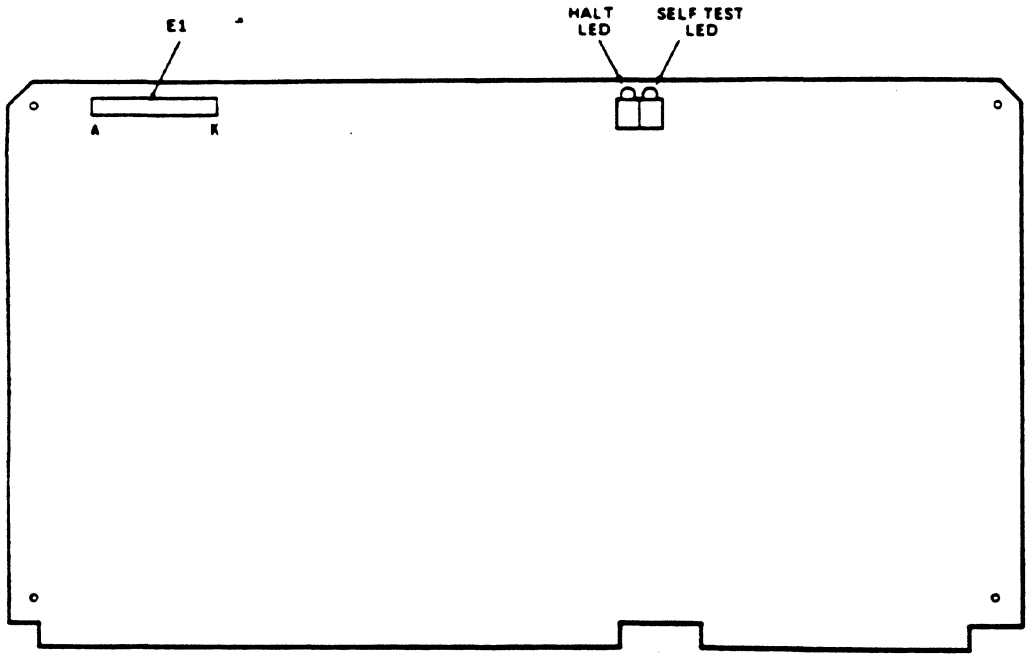


Figure 3-7 MCPU Board

Table 3-7 Bootstrap Option Shorting Plug Positions MCPU Configuration Area E1

Pin A	*Pin B*	*Pin C*	*Bootstrap Option*
Out	Out	Out	Automatic bootstrap*
Out	Out	In	Floppy bootstrap
Out	In	In	Network bootstrap

* Factory default.

Table 3-8 Console/Auxiliary Port Baud Rate Shorting Plug Positions; Configuration Area E1

	Console Port		*Auxiliary Port*	
Baud Rate	*Pin D*	*Pin E*	*Pin I*	*Pin J*
9600 *	Out	Out	Out	Out
1200	Out	In	Out	In
300	In	Out	In	Out
110	In	In	In	In

* Factory default.

3.3.6 Configuring the MCPU20 Board

The Main CPU20 (MCPU20) board contains power-on, self-test diagnostics; a monitor; and console terminal and auxiliary port interfaces. The console and auxiliary ports connectors are located on the back panel. The connectors on the backpanel attachment assemblies are illustrated in Figure 2-4 in Section 2.3.1, and Figures 3-14 through 3-16 in Section 3.6.1, depending on the network interface present in the server. Both ports support XON/XOFF flow control. Both ports are configured for eight databits and no parity, and cannot be reconfigured; the attached devices must be set appropriately.

The board is located in slot C of the cardcage. Configuring the MCPU20 board involves, if necessary, installing one shorting plug and altering configuration parameters via "Firmware Configuration" procedures described in Section 3.9. Firmware configuration changes are perfomed after CS/1 checkout.

The MCPU20 board contains two diagnostic LEDs, labeled SELF TEST and HALT. The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are running. The LED turns off when the diagnostics complete successfully. The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. Appendix A describes MCPU20 board self-test diagnostics.

The MCPU20 board contains one configuration area, designated E77, located near the center of the board; it is not accessible without removing the board.

Pin A of configuration area E77 selects continuous test mode. Continuous test mode causes the system to perform self-test diagnostics continuously as long as the unit is powered on. Continuous test mode is enabled when the shorting plug is in place and disabled when the plug is removed. Other pins in area E77 are not implemented.

Figure 3-8 illustrates LEDs and the configuration area of the MCPU20 board.

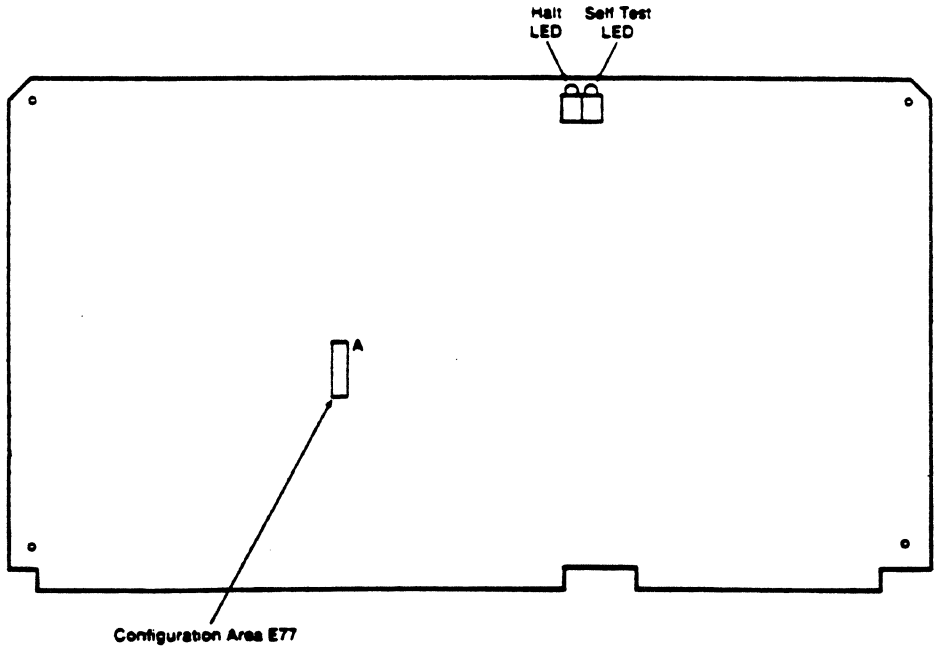


Figure 3-8 MCPU20 Board

3.3.7 Configuring the MBI Board

The Main Backplane Interconnect (MBI) board is designed to accommodate seven Multibus boards. The slot assignments are listed in Table 3-2 in Section 3.3. Slot A, the slot closest to the power connector (J3), is identified by the designations J1A and J2A on the component side of the MBI board. The J1 connectors are all bussed according to the Multibus specification outlined in reference [7]. The connections to connectors J2A, J2B, and J2C (slots A, B, and C) are soldered to the MBI board; to avoid component damage, no boards except those specified in Table 3-2 should be mounted in these slots. Connectors J2D through J2H are left open and are designed to accommodate either standard Multibus P2 connectors or 60-pin connectors with short wirewrap pins (allowing direct connection to flat cables). One such connector must be present for each hardware module installed in the unit. Table 3-9 lists the connector identifiers that are silkscreened on the MBI board, describes the connector functions, and notes the cable associated with each connector. On the MBI board, the cable connectors are polarized to prevent reversed insertion.

Figure 3-9 illustrates the MBI board and indicates the positions of all cable connectors.

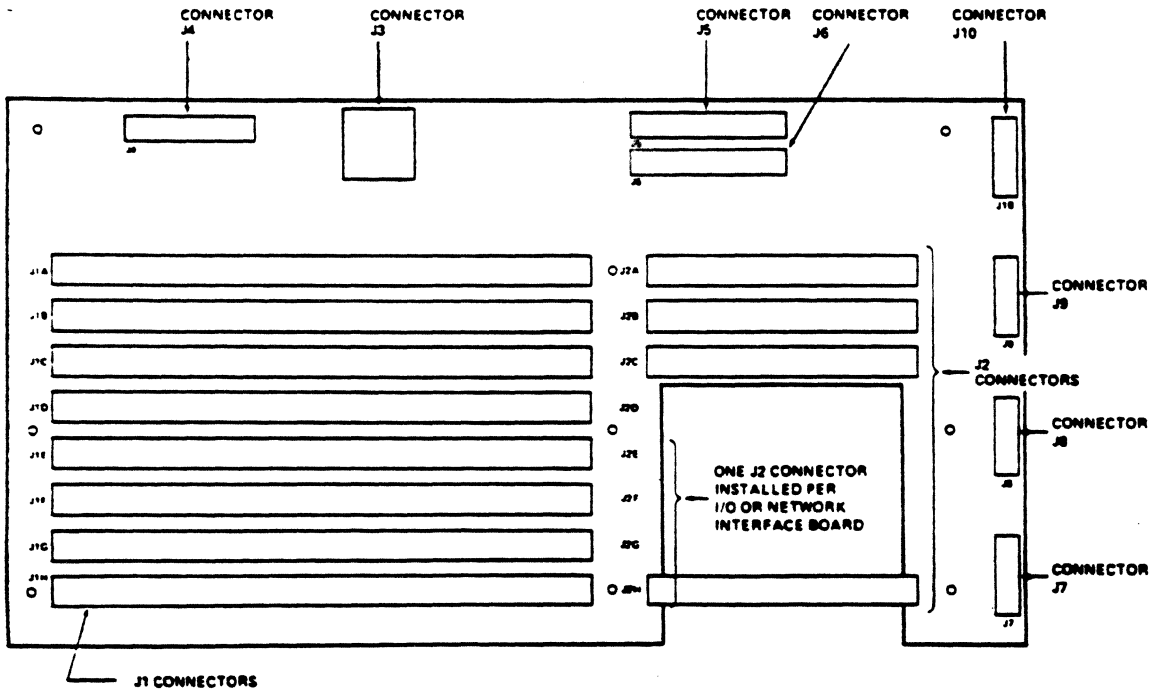


Figure 3-9 MBI Board

Table 3-9 MBI Connector Functions and Associated Cables

Connector	*Function*	*Associated Cable*
J1A-J1H	Connectors for slots A through H	None
J2A-J2C	Connectors for slots A through C	None
J2D-J2H	Left open for P2 or 60-pin connectors	None
J3	DC connector for power supply	Power supply harness
J4	Power connector for Front Panel Assembly (FPA) displays	FPA cable
J5	EBA or TBA connector	Transceiver or Token Ring cable
J6	BBA-37 connector	Broadband drop cable
J7-J10	Auxiliary power connectors	SBA/EBA cable

3.3.8 Configuring the SIO Board

This section describes configuring the SIO board. Sections 3.3.9 and 3.3.10 describe configuring the SIO-16 and SIO-3270 boards, respectively.

The SIO board is available in the following versions:

- SIO-A
- SIO-ST
- SIO-SM
- SIO-422
- SIO-H422
- SIO-HS422
- SIO-V.35

The CS/1 supports up to four SIO modules, which may be intermixed with each other, with the SIO-16, or with the SIO-3270. The CS/1 provides a maximum of 64 serial ports, depending on the SIO modules selected. Section 3.6.3 describes the features of each version of the SIO board.

The first SIO board is always mounted in slot H. Subsequent SIO boards, if any, are mounted in slots G, F, and E, in that order. Table 3-2 in the beginning of this section indicates slot assignments for the CS/1's hardware modules.

Each SIO board contains two LEDs, labeled SELFTEST and HALT. The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are running. The Self Test LED turns off when the diagnostics complete successfully. The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. Appendix A describes SIO board self-test diagnostics.

Most SIO board configuration options (e.g., baud rate and protocol selection) are software-selectable and are stored on the diskette. The following paragraphs describe the shorting plug settings controlling hardware elements that cannot be selected by the software.

- Area E23 enables or disables local loopback, which is implemented by factory default on all SIO ports, irrespective of version or configuration. For each port, Transmit Data is looped back to Receive Data. Other lines (when implemented) are not looped back. Local loopback causes a continuous BREAK to be transmitted on the Data Out line. If this is undesirable, local loopback can be disabled by removing the shorting plug.
- Areas E22A and E22B assign the SIO board number (SIO 1 through SIO 4). Board numbers must be assigned in sequence, in ascending numeric order. Table 3-10 lists the numbers assigned by each combination of shorting plug positions. Board number assignment is required only for boards ordered separately; boards shipped with a CS/1 have preassigned board numbers.

- Area E59 assigns the Multibus interrupt. Multibus interrupt level assignment is required only for boards ordered separately; boards shipped with a CS/1 have preassigned interrupt levels.

**** NOTE ****

Multibus interrupt level and SIO board number must be configured as indicated in Table 3-10 for the SIO board to operate properly. Table 3-10 lists the Multibus interrupt level assigned by each combination of shorting plugs in conjunction with those assigning SIO board number.

- Areas E49, E69, and E70 determine whether the clock sources are internal or external. Tables 3-11 through 3-15 list the shorting plug settings necessary for various clock sources. These settings apply only to the SIO-SM, SIO-ST, SIO-422, SIO-HS422, and SIO-V.35 boards. On the SIO-A and SIO-H422 boards, the shorting plug settings are factory set for internal receive and transmit clocks, and you should not be alter them. Areas E49 and E69 do not appear on the SIO-ST board.

  The recommended settings for the SIO-SM, SIO-ST, SIO-422, SIO-HS422, and SIO-V.35 boards vary according to the type of device being connected. In general, for use with modem equipment, set both transmit and receive clock sources to external. For use with terminal devices, set both clocks to internal.

  The corresponding configuration areas on the SBA assembly must select the same option (see Section 3.3.11).

**** NOTE ****

For SIO-422 applications requiring ST rather than TT signals, a special cable must be constructed with ST-A connected to pin 17 and ST-B connected to pin 35 (standard RS-449 cables have ST-A on pin 5 and ST-B on pin 23).

For SIO-V.35 applications requiring SCTE rather than SCT signals, a special cable must be constructed with SCTE-A jumpered to pin Y and SCTE-B jumpered to pin a (V.35 standards specify SCTE-A on pin U and SCTE-B on pin W).

Figure 3-10 illustrates the positions of the two diagnostic LEDs and all configuration areas on the SIO board.

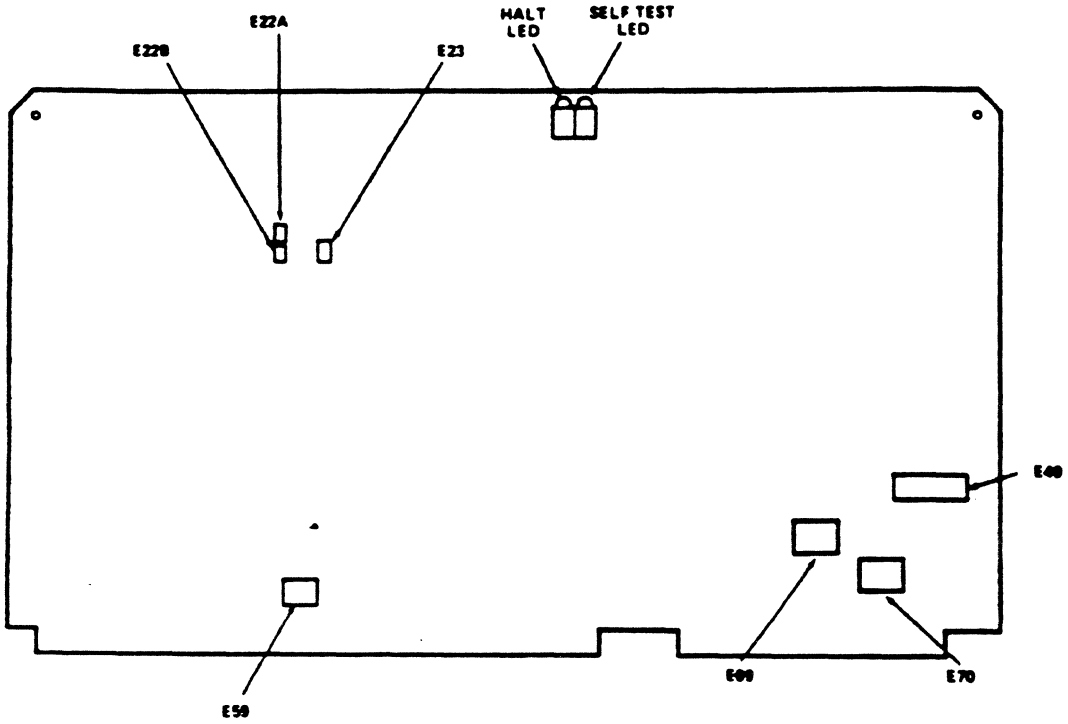


Figure 3-10 SIO Board

Table 3-10 SIO Board Number and Multibus Interrupt Level Assignment Shorting Plug Positions

E22A	*E22B*	*E59 Pins Connected*	*Board No.*	*Interrupt Level*	*Slot ID*
Out	Out	10-11	SIO 1*	4	H
In	Out	7-8	SIO 2	5	G
Out	In	4-5	SIO 3	6	F
In	In	1-2	SIO 4	7	E

* Factory default for boards shipped separately.

Table 3-11 SIO-SM Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*E49 Pins Connected*	*E69 Pins Connected*	*E70 Pins Connected*
0	TX External	TXC	1-2*	1-2**	2-3*
0	TX Internal	EXC	2-3	1-2**	1-2
0	RX External	RXC	4-5*	n/a	n/a
0	RX Internal	–	5-6	n/a	n/a
1	TX External	TXC	7-8*	4-5**	5-6*
1	TX Internal	EXC	8-9	4-5**	4-5
1	RX External	RXC	10-11*	n/a	n/a
1	RX Internal	–	11-12	n/a	n/a
2	TX External	TXC	13-14*	7-8**	8-9*
2	TX Internal	EXC	14-15	7-8**	7-8
2	RX External	RXC	16-17*	n/a	n/a
2	RX Internal	–	17-18	n/a	n/a
3	TX External	TXC	19-20*	10-11**	11-12*
3	TX Internal	EXC	20-21	10-11**	10-11
3	RX External	RXC	22-23*	n/a	n/a
3	RX Internal	–	23-24	n/a	n/a

* Factory default, user-alterable.
** Factory default, not user-alterable.

Table 3-12 SBA-SM Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*E<z> * Pins Connected*
0	TX External	TXC	1-2**
0	TX Internal	EXC	2-3
1	TX External	TXC	1-2**
1	TX Internal	EXC	2-3
2	TX External	TXC	1-2**
2	TX Internal	EXC	2-3
3	TX External	TXC	1-2**
3	TX Internal	EXC	2-3

* To obtain the complete SBA area designator, substitute the port number on the SBA for <x> (e.g., area E2 sets clocks for port 2).

** Factory default, user-alterable.

Table 3-13 SIO-ST Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*E70 Pins Connected*
0	TX Internal	TXC	1-2*
1	TX Internal	TXC	4-5*
2	TX Internal	TXC	7-8*
3	TX Internal	TXC	10-11*

* Factory default, not user-alterable.

Table 3-14 SIO-422 and SIO-HS422
Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*E49 Pins Connected*	*E69 Pins Connected*	*E70 Pins Connected*
0	TX External	ST	1-2	2-3	2-3
0	TX Internal	TT	2-3 *	1-2 *	1-2*
0	RX External	RT	4-5 *	n/a	n/a
0	RX Internal	--	5-6	n/a	n/a
1	TX External	ST	7-8	5-6	5-6
1	TX Internal	TT	8-9 *	4-5 *	4-5*
1	RX External	RT	10-11 *	n/a	n/a
1	RX Internal	--	11-12	n/a	n/a
2	TX External	ST	13-14	8-9	8-9
2	TX Internal	TT	14-15 *	7-8 *	7-8*
2	RX External	RT	16-17 *	n/a	n/a
2	RX Internal	--	17-18	n/a	n/a
3	TX External	ST	19-20	11-12	11-12
3	TX Internal	TT	20-21*	10-11*	10-11*
3	RX External	RT	22-23*	n/a	n/a
3	RX Internal	--	23-24	n/a	n/a

* Factory default, user-alterable.

Table 3-15 SIO-V.35 Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*E49 Pins Connected*	*E69 Pins Connected*	*E70 Pins Connected*
0	TX External	SCT	1-2*	2-3*	2-3*
0	TX Internal	SCTE	2-3	1-2	1-2
0	RX External	SCR	4-5*	n/a	n/a
0	RX Internal	–	5-6	n/a	n/a
1	TX External	SCT	7-8*	5-6*	5-6*
1	TX Internal	SCTE	8-9	4-5	4-5
1	RX External	SCR	10-11*	n/a	n/a
1	RX Internal	–	11-12	n/a	n/a
2	TX External	SCT	13-14*	8-9*	8-9*
2	TX Internal	SCTE	14-15	7-8	7-8
2	RX External	SCR	16-17*	n/a	n/a
2	RX Internal	–	17-18	n/a	n/a
3	TX External	SCT	19-20*	11-12*	11-12*
3	TX Internal	SCTE	20-21	10-11	10-11
3	RX External	SCR	22-23*	n/a	n/a
3	RX Internal	–	23-24	n/a	n/a

* Factory default, user-alterable

3.3.9 Configuring the SIO-16 Board

The CS/1 can support up to four SIO-16 modules with a maximum of 64 serial ports. SIO-16 board features are described in Section 3.6.3.

The SIO-16 board contains a Halt LED, labeled CR1. While the self-test diagnostics or the microprocessor are running, the Halt LED remains unlit. The LED lights to indicate that the microprocessor is in a halt state and ready to download code to the SIO-16 board's RAM area. The LED also lights when the server is initialized or reset. Appendix A describes SIO-16 self-test diagnostics.

Figure 3-11 illustrates the positions of the Halt LED and configuration areas on the SIO-16 board. The following paragraphs describe configuration areas on the SIO-16 module.

- Area E41 assigns the SIO-16 board number (SIO 1 through SIO 4). The location of this configuration area is shown in Figure 3-11. Table 3-16 lists the SIO board number and Multibus interrupt level assigned by each combination of shorting plug positions. Board number assignment is required only for boards ordered separately; factory-installed boards have preassigned board numbers.
- Area E58 assigns the SIO-16 Multibus interrupt (level 4 through 7). The location of this configuration area is shown in Figure 3-11. Table 3-16 lists the Multibus interrupt in conjunction with SIO board number assignment. Multibus interrupt level assignment is required only for boards ordered separately; factory-installed boards have preassigned interrupt levels.

**** NOTE ****

Multibus interrupt level and SIO board number must be configured as indicated in Table 3-16 for the SIO board to operate properly.

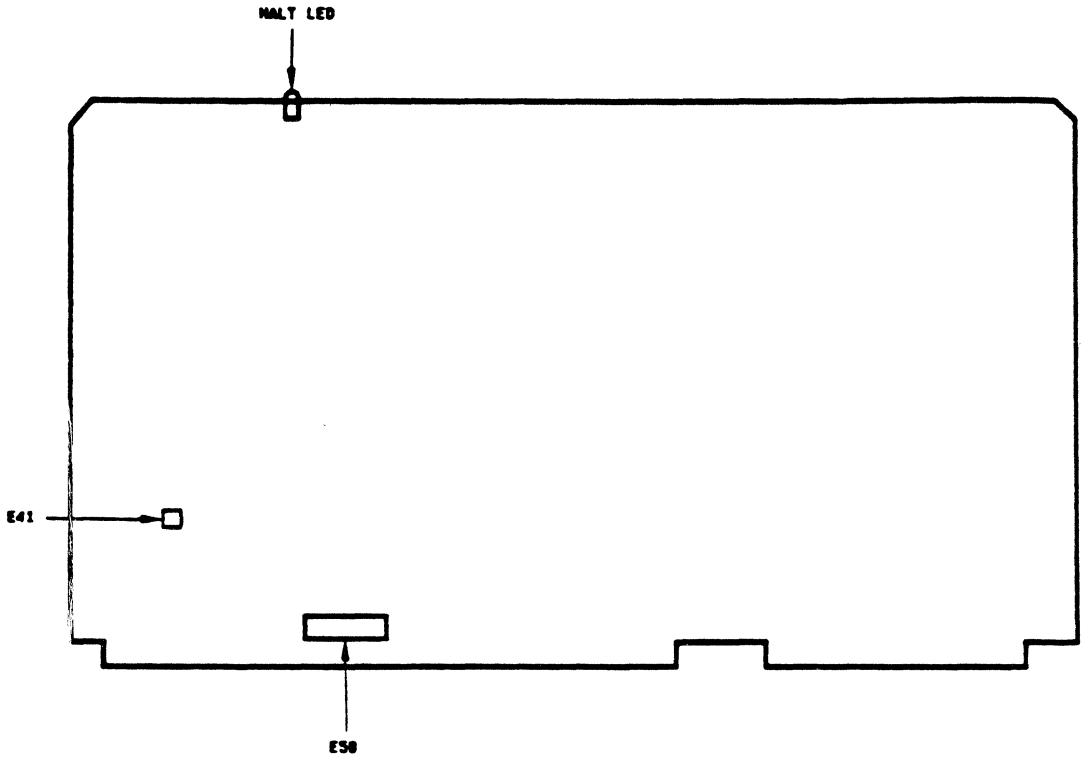


Figure 3-11 SIO-16 Board

Table 3-16 SIO-16 Board Number and Multibus Interrupt Level Assignment Shorting Plug Positions

Board Number	*Interrupt Level*	*Configuration Area*	*Pins Connected*
1	4	E41	None
1	4	E58	7 and 8
2	5	E41	2 and 4
2	5	E58	5 and 6
3	6	E41	1 and 3
3	6	E58	3 and 4
4	7	E41	1 and 3, 2 and 4
4	7	E58	1 and 2

3.3.10 Configuring the SIO-3270 Board

The CS/1 can support up to four SIO-3270 boards with a maximum of 8 coaxial cable ports per board. SIO-3270 features are described in Section 3.6.3.

The SIO-3270 module contains eight LEDs, labeled LED1 through LED8.

The LEDs on the SIO-3270 board light at power-on or reset, then go out, except LED8 which remains lit while the microprocessor is running. In addition, LED7 lights while the self-tests run on the board; LED5 or LED6 lights if a fault is encountered during the initial tests and remains lit while the monitor is entered. Appendix A describes the SIO-3270 self-test diagnostics.

Figure 3-12 illustrates the positions of the LEDs and configuration areas on the SIO-3270 board. Table 3-17 lists the default configuration of the board, indicating the presence or absence of shorting plugs ("In" and "Out", respectively) in the configuration areas. Configuration areas not described in Tables 3-17 and 3-18 should not be altered.

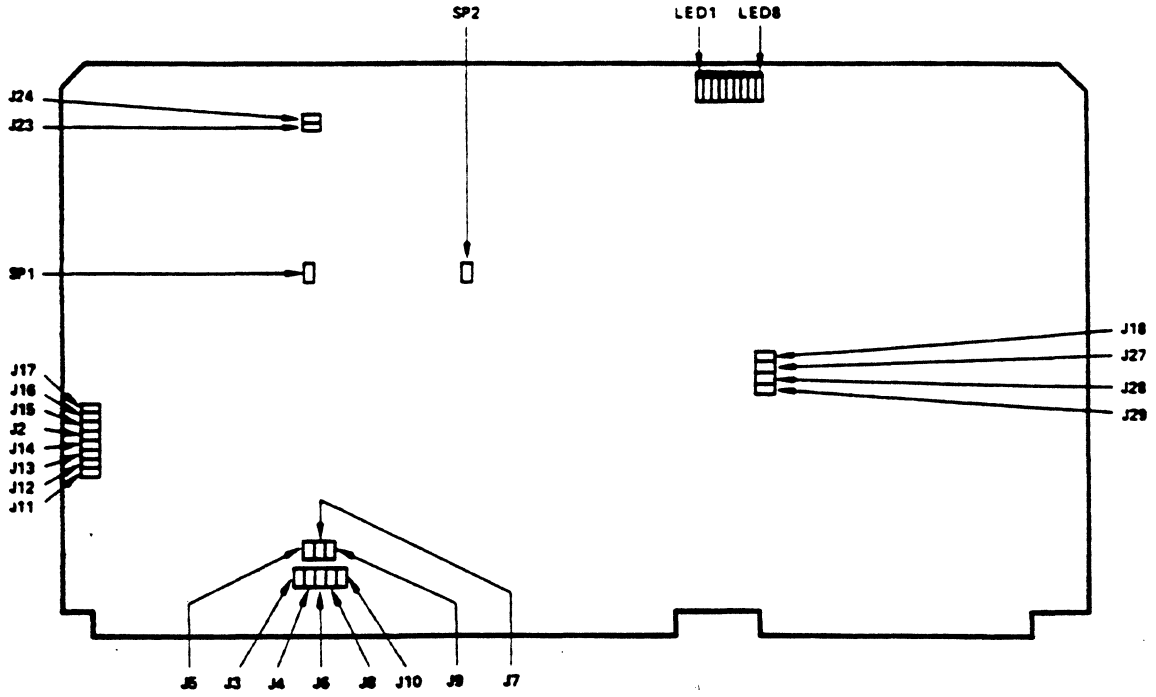


Figure 3-12 SIO-3270 Board

Table 3-17 SIO-3270 Default Configuration Shorting Plug Positions

Configuration Area	*Shorting Plug*
J2	Out
J3	Out
J4	Out
J5	In
J6	Out
J7	Out
J8	Out
J9	Out
J10	Out
J11	In
J12	In
J13	In
J14	In
J15	Out
J16	Out
J17	In
J18	Out
J23	In
J24	Out
J27	In
J28	Out
J29	Out
SP1	*
SP2	*

* Area SP1 contains 3 vertically aligned pins, the upper 2 are connected by a shorting plug; area SP2 contains 2 vertically aligned pins, which are connected by a shorting plug.

The following paragraph describes the configuration areas on the SIO-3270 module that set the SIO board number and the Multibus interrupt level.

- Areas J2 and J14 assign the SIO-3270 board number (SIO 1 through SIO 4). The locations of these areas are indicated in Figure 3-12. Board number assignment is required only for boards ordered separately; factory-installed boards have preassigned board numbers and have been configured as required. Table 3-18 lists the board numbers assigned by each combination of shorting plug positions.
- Areas J3 through J6 are used to set the Multibus interrupt level. The locations of these areas are indicated in Figure 3-12.

** NOTE **

The Multibus interrupt level and SIO board number must be configured as indicated in Table 3-18 for the SIO-3270 board to function. Table 3-18 lists the appropriate shorting plug positions to set the SIO board number and the corresponding multibus interrupt level.

Table 3-18 SIO-3270 Board Number and Multibus Interrupt Level Assignment Shorting Plug Positions

Board Number	*Interrupt Level*	*Configuration Area*	*Shorting Plug*
1	5	J2	Out
		J3	Out
		J4	Out
		J5	In
		J6	Out
		J14	Out
2	6	J2	Out
		J3	Out
		J4	Out
		J5	Out
		J6	In
		J14	In
3	4	J2	In
		J3	Out
		J4	In
		J5	Out
		J6	Out
		J14	Out
4	3	J2	In
		J3	In
		J4	Out
		J5	Out
		J6	Out
		J14	In

3.3.11 Configuring Serial and Coaxial Backpanel Attachment Assemblies

This section describes the backpanel attachment assemblies that provide either serial or coaxial interface cable connectors. Table 3-19 lists the assemblies that provide connectors for device cables and the SIO module with which each assembly is associated.

Table 3-19 Serial and Coaxial Backpanel Attachment Assemblies

Assembly	*Associated SIO Board*
SBA-A	SIO-A
SBA-16	SIO-16
CBA	SIO-3270
SBA-SM	SIO-SM
SBA-ST	SIO-ST
SBA-422H	SIO-422
SBA-H422A	SIO-H422
SBA-HS422	SIO-HS422
SBA-V.35	SIO-V.35

Each SIO board is attached to its backpanel assembly in one of two ways: by a 60-pin flat cable from the SIO board's P2 connector to a 60-pin header on the backpanel assembly's PC board, or by a cabling harness from the bottom of the P2 connector directly to the individual connectors on the assembly. The type of configuration is chosen for convenience and has no effect on the performance of the system.

The SBA-A, SBA-16, CBA, SBA-ST, SBA-422H, SBA-H422A, SBA-HS422, and SBA-V.35 assemblies do not contain any configuration areas; the assemblies are factory configured and require no alteration. The connectors for these assemblies are described and illustrated in Section 3.6.3.

Each SBA-SM assembly contains four configuration areas labeled E0 through E3. These areas determine whether the associated port's EXC line or the TXC line is enabled as shown in Table 3-20. Placing a shorting plug on pins 1 and 2 of area E2, for example, selects line TXC for port 2. For accessibility, the areas are located on the back of the assembly.

** NOTE **

The configuration areas on the SBA-SM assembly for a particular port must always be set for the same option as that selected for the same port by areas E49, E69, and E70 on the SIO-SM board (refer to Table 3-11 in Section 3.3.8).

Figure 3-13 shows the positions on the SBA-SM assembly of configuration areas E0 through E3. Table 3-20 lists the settings of the shorting plugs.

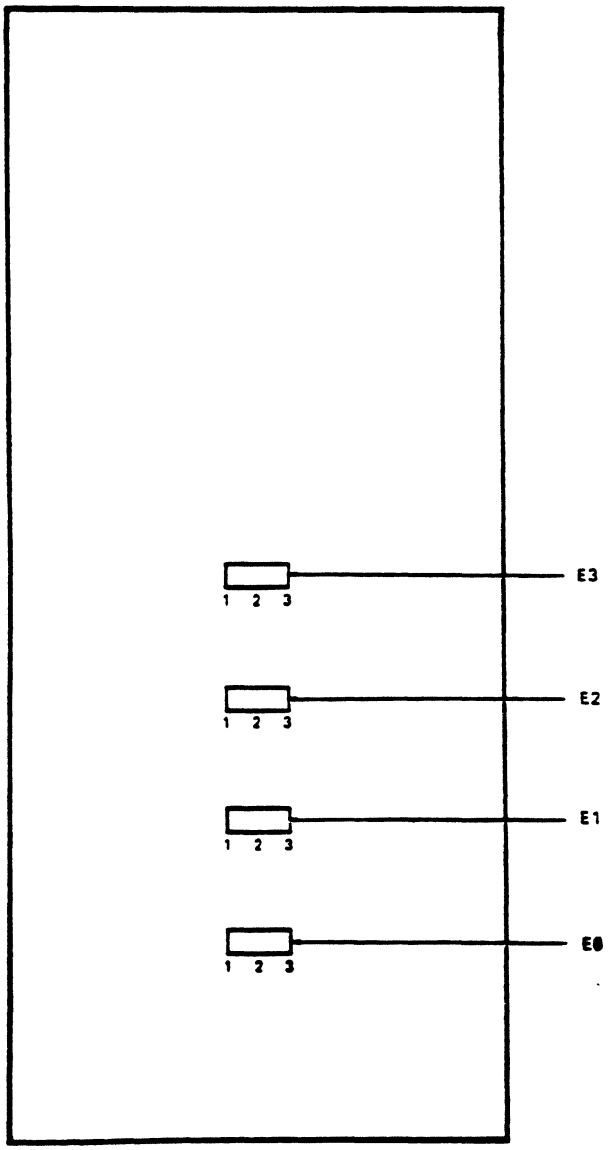


Figure 3-13 Configuration Areas on the SBA-SM Assembly

Table 3-20 SBA-SM Clock Source Shorting Plug Positions

Port No.	*Clock Source*	*Line Name*	*Pins Connected E0*	*E1*	*E2*	*E3*
0	TX External *	TXC	1-2			
0	TX Internal	EXC	2-3			
1	TX External *	TXC		1-2		
1	TX Internal	EXC		2-3		
2	TX External *	TXC			1-2	
2	TX Internal	EXC			2-3	
3	TX External *	TXC				1-2
3	TX Internal	EXC				2-3

* Factory default.

3.3.12 Network Interface Backpanel Attachment Assemblies

Table 3-21 lists the backpanel attachment assemblies that provide network interface cable connectors to the CS/1s, and the network interface with which each assembly is associated.

Table 3-21 Network Interface Backpanel Attachment Assemblies

Assembly	*Associated Interface*
EBA	EC/2
BBA-37	IBC/M
TBA	TRC/M
NBA	IBC/M

Each network interface board is connected to its backpanel assembly in one of three ways: by a 26-pin flat cable from the MBI, via a harness to the P2 connector on the network interface board, or through a harness from the IBC/M 1 card directly to an NBA assembly (CS/1-FT only). The type of configuration implemented has no effect on the performance of the system. Section 3.6.1 describes each of the Network Interface Backpanel Attachment assemblies.

3.4 Installing the CS/1

After you have checked all hardware configuration areas and set them, if necessary, the CS/1 is ready to be installed.

Section 2.4 lists environmental and electrical requirements. You may install the CS/1 on a tabletop or in a rack mount. For tabletop installation, place the unit on a firm, level surface.

For rack mount installation, you can order an optional rack mount kit (designated RM) from Bridge. The kit consists of a set of rack mount slides. To install the slides on the unit, follow these steps:

1. Remove the chassis side covers by removing the four screws that secure the plastic feet to the chassis bottom. With a rack-mounted unit, the plastic feet are not needed and you can discard them.

2. Unpack the slide set from its shipping carton. Verify that the carton contains the following items:

Description	*Quantity*
Slides (3 sections each)	2
Slide rear extension brackets	2
Package of slide hardware	1
Slide manufacturer's installation instructions	1

   Report any discrepancy to Bridge or an authorized service representative.

3. Remove the inner slide section from each slide by fully extending the slide and depressing the inter-section latch.

4. Using the ten 10-32 x .375" screws provided, secure the slide inner sections to the chassis sides. Place the end of the slide that has a latch-leaf spring so it points toward the rear of the chassis.

5. Reattach the chassis side covers, using the four screws removed in step 1.

Refer to the slide manufacturer's installation instructions for the remaining steps in the slide installation procedure and for the steps required to rack mount the unit once the slides are installed.

3.5 Installing the CS/1-FT

The CS/1-FT can be configured for installation in a redundant cable plant consisting of two Bridge Broadband networks, two Ethernet networks, or a Bridge Broadband and an Ethernet network. The network interface connectors are described in Section 3.6.1. This section briefly describes hardware installation for the CS/1-FT in each of these three applications. Section 3.4 provides general installation instructions.

Broadband/Broadband Installation

To install the CS/1-FT with an NBA-BB network panel (broadband/broadband combination), attach each broadband connector on the server to an RFM/5 modem and attach each modem to the broadband network(s) using appropriate cables. For modem and cable installation instructions, refer to the *CR/5 and RFM/5 Installation Guide* and the *LAN Planning Guide*.

Baseband/Broadband Installation

To install the CS/1-FT with an NBA-EB network panel (baseband/broadband combination), attach the server's Ethernet connector to an Ethernet transceiver using a transceiver cable and attach the broadband connector to an RFM/5 modem using a broadband modem cable. Attach the Ethernet transceiver and the RFM/5 modem to the network(s) using appropriate cables. Refer to the *LAN Planning Guide* for more information concerning Ethernet cabling, taps, and transceiver cables. Refer to the *CR/5 and RFM/5 Installation Guide* for RFM/5 and broadband cable installation instructions.

Baseband/Baseband Installation

To install a CS/1-FT with an NBA-EE network panel (baseband/baseband combination), attach each of the connectors to Ethernet transceivers using appropriate transceiver cables. Attach each transceiver to the network(s) using appropriate cables. Refer to the *LAN Planning Guide* for more information concerning Ethernet network cabling, taps, transceivers, and transceiver cables.

3.6 System Cabling

This section describes the network interface connectors, I/O device connectors, pin assignments, and external cabling requirements for the CS/1. You may supply the cable to connect a device or line to the CS/1 yourself, or order it from Bridge. The cables available from Bridge are described in the *LAN Planning Guide*

**** CAUTION ****

Before you attach any cable, be sure the CS/1 is powered off. Connecting or disconnecting the cable between the CS/1 and a device while the CS/1 is powered on can damage both units.

3.6.1 Network Interface Connectors

This section describes the Ethernet, Broadband, Token Ring, and CS/1-FT network interface connectors, and their respective pin assignments, available from Bridge.

Ethernet Connectors

The CS/1 with an Ethernet network interface has a female, 15-pin, D-Series, subminiature connector equipped with a slide lock located on an Ethernet Backpanel Attachment (EBA) assembly. The connector is the standard connector described in the Ethernet Version 1.0 or 2.0 specification (references [1] and [2]).

A CS/1 with an Ethernet Controller/2 (EC/2) board may be attached to Ethernet-compatible transceivers, and can operate with Digital Equipment Corporation DELNI™ equipment.

As an option, Bridge provides transceiver cables in lengths of 15 to 150 feet.

Connectors on the EBA assembly are shown in Figure 2-4, Section 2.3.1. Table 3-22 lists the transceiver connector pin assignments. Appendix C describes the modules and assemblies described above.

The CS/1 also supports fiber optic network cabling. Such a configuration requires linking the the CS/1 to the fiber optic media through an Ethernet-compatible optical transceiver. Refer to the *LAN Planning Guide* for information concerning fiber optic network cabling.

Table 3-22 EBA Assembly Transceiver Connector Pin Assignments

Pin No.	*Function*	*Circuit*	*Use*
1	Not connected	CI-S	Control In circuit Shield
2	Collision Presence +	CI-A	Control In circuit A
3	Transmit +	DO-A	Data Out circuit A
4	Receive Shield *	DI-S	Data In circuit Shield
5	Receive +	DI-A	Data In circuit A
6	Power Return	V_C	Voltage Common
7	Control Out + (Unsupported) *	CO-A	Control Out circuit A
8	Control Out Shield *	CO-S	Control Out circuit Shield
9	Collision Presence –	CI-B	Control In circuit B
10	Transmit –	DO-B	Data Out circuit B
11	Transmit Shield *	DO-S	Data Out circuit Shield
12	Receive –	DI-B	Data In circuit B
13	Power **	VP	Voltage Plus
14	Power Shield *	VS	Voltage Shield
15	Control Out - (Unsupported)	CO-B	Control Out circuit B
Shell	Chassis ground	PG	Protective Ground; Conductive Shell

* Attached to power return.
** Current should not exceed 500 mA.

Broadband Connectors

The CS/1 with a broadband network interface board has a vertical 37-pin, D-series, subminiature female broadband modem connector located on the Broadband Backpanel Attachment-37 (BBA-37) assembly. Refer to Appendix C for more information concerning this assembly.

As an option, Bridge provides broadband modem cables in 1.5-foot and 10-foot lengths.

Figure 3-14 illustrates the connectors on the BBA-37 assembly. Table 3-23 lists the broadband modem connector pin assignments. RFM/5 modem installation procedures are described in detail in the *CR/5 and RFM/5 Installation Guide*.

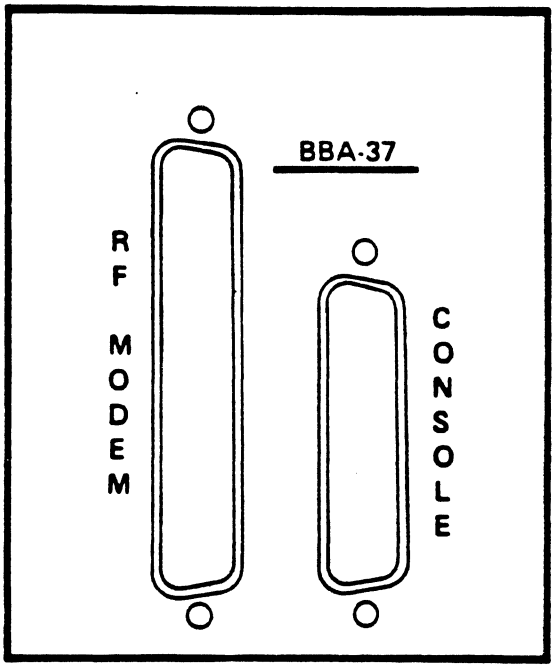


Figure 3-14 Connectors on the BBA-37 Assembly

Table 3-23 Broadband Modem Connector Pin Assignments

Pin No.	*Pin Name*	*Function*
1	TXD +	Transmit Data
2	TXC +	Transmit Clock
3	TXC –	Transmit Clock
4	STXD +	Serial Transmit Data Modem Control
5	STXD –	Serial Transmit Data Modem Control
6	CDT –	Collision Detect
7	CDT +	Collision Detect
8	CRS +	Carrier Sense
9	CRS –	Carrier Sense
10	RXD +	Receive Data
11	RXD –	Receive Data
12	RXC –	Receive Clock
13	RXC +	Receive Clock
14	SRXD –	Serial Receive Data Modem Control
15	SRXD +	Serial Receive Data Modem Control
16	Signal Ground	Ground
17-19	+12 VDC	
20	TXD –	Transmit Data
21	RTS –	Request to Send
22	RTS +	Request to Send
23-27	+5 VDC	
28-30	Signal Ground	Ground
31-33	–12 VDC	
34-35	Signal Ground	Ground
36-37	+12 VDC	

Token Ring Connectors

The CS/1 with a Token Ring interface has a DB-9 connector located on the TBA assembly. Refer to Appendix C for more information. Cables for these connectors are IBM® standard and must be supplied by the customer.

Figure 3-15 illustrates the connectors on the Token Ring Backpanel Attachment (TBA) assembly. Table 3-24 lists the DB-9 connector pin assignments.

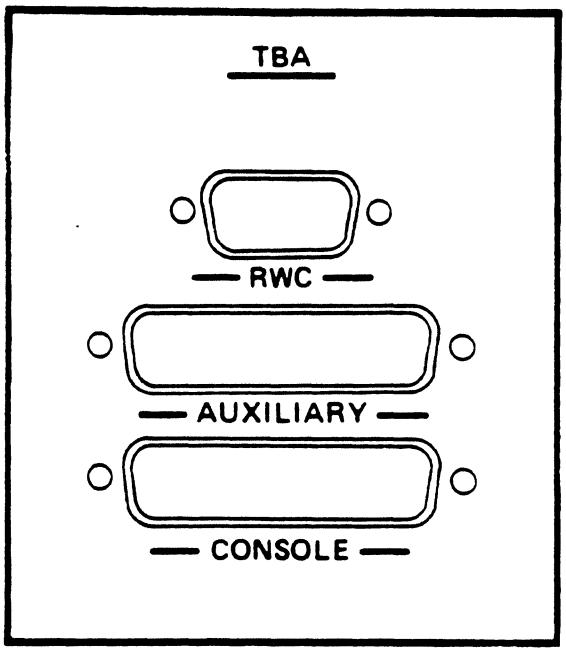


Figure 3-15 Connectors on the TBA Assembly

Table 3-24 DB-9 Connector Pin Assignments Screw-to-Jack Screw Mounting

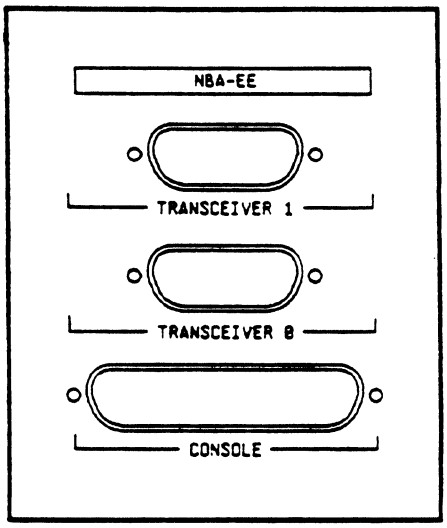
Wire Color	*DB-9 Pin No.*	*IBM Data Connector*
Red	1	Red
Black	5	Black
Green	6	Green
Orange	9	Orange

CS/1-FT Network Connectors

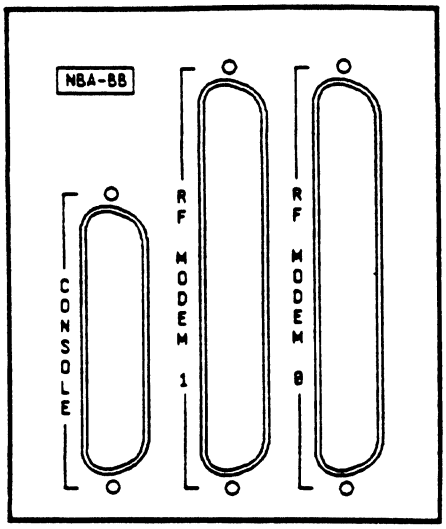
The CS/1-FT is available with three network configuration options: two Bridge Broadband modem connectors; two Ethernet connectors; or one Ethernet connector and one Bridge Broadband modem connector. The CS/1-FT does not support Token Ring networks. The pin assignments of CS/1-FT network connectors are as defined in Tables 3-22 and 3-23. Figure 3-16 illustrates the three CS/1-FT Network Backpanel Assembly (NBA) configurations available.

The CS/1-FT can interface simultaneously to two networks consisting of any media combination of 10 Mbps Ethernet coaxial cable, 5 Mbps broadband coaxial cable, or 10 Mbps fiber-optic cable. It can be installed in broadband (CATV) cable plants, and in either single cable (mid- or high-split) or dual cable environments.

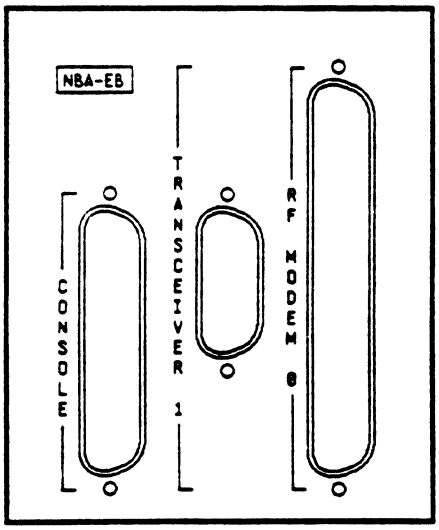
The Network Backpanel Attachment assembly is referred to as the NBA assembly for all three network interface connection options, with a suffix of -EE denoting two Ethernet interfaces, -EB denoting Ethernet and broadband interfaces, and -BB denoting two broadband interfaces. These interface panels replace the BBA and EBA panels featured in standard CS/1 configurations.



NBA-EE Backpanel Assembly



NBA-BB Backpanel Assembly



NBA-EB Backpanel Assembly

Figure 3-16 Connectors on the NBA Assemblies

3.6.2 Console and Auxiliary Port Connectors

In addition to the network connectors described in Section 3.6.1, each network interface back panel assembly contains either console and auxiliary port connectors, or a console port connector only, depending on the server model. This section describes the console and auxiliary port connectors and the functions they perform on each server model.

- Ethernet: On a CS/1 with an Ethernet interface, the EBA assembly contains two connectors for console and auxiliary cable attachment: both are horizontal 25-pin, subminiature, female D-connectors (RS-232-C DCE-type). The auxiliary port functions as a download port and is used only for software development.
- Broadband: On a CS/1 with the broadband network interface, the BBA assembly contains one connector for console cable attachment: a vertical 25-pin, subminiature female D-connector (RS-232-C DCE-type).
- Token Ring: On a CS/1 with the Token Ring network interface, the TBA assembly contains two connectors for console and auxiliary cable attachment. Both are horizontal female, D-Series, 25-pin, subminiature connectors (RS-232-C DCE-type). The auxiliary port functions as a download port and is used only for software development.
- CS/1-FT: On a CS/1-FT, the NBA assembly contains one connector for attachment to a console cable. Depending on the NBA assembly configuration, the 25-pin, subminature, female D-connector (RS-232-C, DCE-Type) is mounted either vertically (NBA-EB and NBA-BB) or horizontally (NBA-EE).

Figure 2-4, Section 2.3.1, illustrates the locations of the console and auxiliary connectors on a CS/1 back panel. Figures 3-14, 3-15, and 3-16 illustrate the connectors on the BBA-37, TBA, and NBA assemblies, respectively. Cables for the console and auxiliary port connectors are supplied by the customer.

Table 3-25 lists the connector pin assignments. The console and auxiliary port connectors support data lines and ground only. Both ports support XON/XOFF flow control characters.

On CS/1s, the baud rates for console and auxiliary ports are selectable via shorting plugs for MCPU board-based servers to 110, 300, 1200, or 9600 baud. Baud rates are selected through a menu-driven firmware configuration process for MCPU20 board-based servers; configuration options are 110, 300, 1200, 2400, 9600, 19200, or 38400. The default baud rate for either port is 9600 baud. Refer to Section 3.3.5 for MCPU shorting plug settings. Refer to Section 3.9 for corresponding MCPU20 board firmware configuration instructions.

The console port is preconfigured for eight databits and no parity. These values may not be adjusted.

Table 3-25 Console/Auxiliary Connector Pin Assignments

Pin No.	*RS-232-C* Name*	*Direction*	*Function*
1	AA	–	Shield
2	BA	In	Transmit Data
3	BB	Out	Receive Data
4-6	–	–	Unused
7	AB	–	Ground
8-25	–	–	Unused

* DCE type

3.6.3 I/O Device Connectors

This section describes the I/O device connectors available on each CS/1. I/O device connectors are arranged on modular backpanel attachment assemblies located on the back of the unit. The CS/1 can accommodate up to four backpanel assemblies. If the server is configured with fewer than four assemblies, blank panel covers are mounted in place of any uninstalled assemblies. Cables for I/O device connectors can be supplied by the customer. For most devices, Bridge provides device cables as an option. Cables for the SIO-3270 modules, however, must be supplied by the customer.

The ports on different Serial I/O (SIO) module versions support different levels of functionality.

The SIO module is available in the following versions for CS/1s:

- SIO-A for RS-232-C asynchronous devices
- SIO-16 for RS-232-C asynchronous devices
- SIO-3270 for IBM Type A coaxial display stations
- SIO-STS for RS-232-C synchronous terminals and hosts
- SIO-SMS for RS-232-C synchronous modems and hosts
- SIO-422S for RS-449 connectors with RS-422 electrical protocol
- SIO-H422A for RS-422 asynchronous terminals
- SIO-HS422A for X.21 connectors with RS-422 electrical protocol
- SIO-V.35S for V.35 electrical interfaces

None of these I/O modules are "standard" with CS/1s. Each must be ordered as an option to the baseline CS/1.

The first 64 I/O ports, beginning with 0, are mapped to physical I/O lines as indicated in Table 3-26. Port number mapping adjusts when a mix of SIO and SIO-16 boards is present. Port numbers are assigned contiguously to boards and ports, beginning with board 1, port 0.

SIO-STS, SIO-SMS, SIO-H422S, SIO-HS422S, and SIO-V.35S boards have a similar assignment strategy. Port numbers are assigned contiguously, beginning with board 1, port 0, with the limiting factor being the number of ports included on specific SIO boards.

Table 3-26 SIO Board Line Number/Port Mapping

	SIO-A or SIO-3270		*SIO-16*	
Port No.	*Board No.*	*Line Number*	*Board No.*	*Line Number*
0	1	0	1	0
1	1	1	1	1
2	1	2	1	2
3	1	3	1	3
4	1	4	1	4
5	1	5	1	5
6	1	6	1	6
7	1	7	1	7
8	2	0	1	8
9	2	1	1	9
10	2	2	1	10
11	2	3	1	11
12	2	4	1	12
13	2	5	1	13
14	2	6	1	14
15	2	7	1	15
16	3	0	2	0
17	3	1	2	1
18	3	2	2	2
19	3	3	2	3
20	3	4	2	4
21	3	5	2	5
22	3	6	2	6
23	3	7	2	7
24	4	0	2	8
25	4	1	2	9
26	4	2	2	10
27	4	3	2	11
28	4	4	2	12
29	4	5	2	13
30	4	6	2	14
31	4	7	2	15

** NOTE **

All device cables should use connectors with metallic backshells to eliminate RFI noise emissions associated with the cable.

SIO-A Connectors

The SIO-A module is tailored to support eight asynchronous ports with two pairs of handshake control lines and has the following features:

- All ports support RS-232-C electrical protocols with no modifications. The ports have 25-pin, female D-connectors (RS-232-C DCE-type). These connectors, designated J0C through J7C, are designed specifically to interface with DTE devices (e.g., terminals or computers) with standard RS-232-C cables.
- Each port has identical baud rates for reception and transmission.
- All ports support control signals RTS, CTS, DTR, and DCD. DSR is tied to DCD.

Table 3-27 lists the serial I/O device connector pin assignments for the SIO-A module; the connectors on the SBA-A assembly are illustrated in Figure 2-4, Section 2.3.1.

Table 3-27 SIO-A Connector Pin Assignments
DCE Connectors J0C through J7C

Pin No.	*RS-232-C Name*	*Bridge Name*	*Direction*	*Function*
1	AA	–	–	Chassis Ground*
2	BA	TXD/	In	Transmit Data
3	BB	RXD/	Out	Receive Data
4	CA	RTS	In	Request to Send
5	CB	CTS	Out	Clear to Send
6	CC	DSR	Out	Data Set Ready**
7	AB	GND	–	Signal Ground
8	CF	DCD	Out	Data Carrier Detect**
9-19	–	–	–	Unused
20	CD	DTR	In	Data Terminal Ready
21-25	–	–	–	Unused

* Cable shield should be connected to this pin.
** DSR and DCD are controlled by the same driver; in applications where DSR is needed, better electrical transmission is achieved if the signals are carried on only one wire, connected to both DSR and DCD at the device end.

SIO-16 Connectors

The SIO-16 module is tailored to support 16 asynchronous ports with two modem control lines per port. The SIO-16 board has the following features:

- All ports support RS-232-C electrical protocols with no modifications. The ports are accessed via two 50-pin, 25-pair male cable connectors. The two connectors, designated J0 and J1, are designed to interface with DTE devices (e.g., terminals or computers) via 50-wire telephone style cables and an intermediate-extender cable. The *LAN Planning Guide* describes and illustrates the connector combinations offered as options by Bridge.
- Each SIO-16 port has identical baud rates for reception and transmission.
- All ports support control signals DCD and DTR.

Figure 3-17 illustrates the connectors on the SBA-16 assembly.

Table 3-28 lists the pin assignments for connectors J0 and J1 on the SBA-16 assembly. The pin assignments for external end-point and intermediate level connectors used with the SIO-16 module are described in the *LAN Planning Guide*.

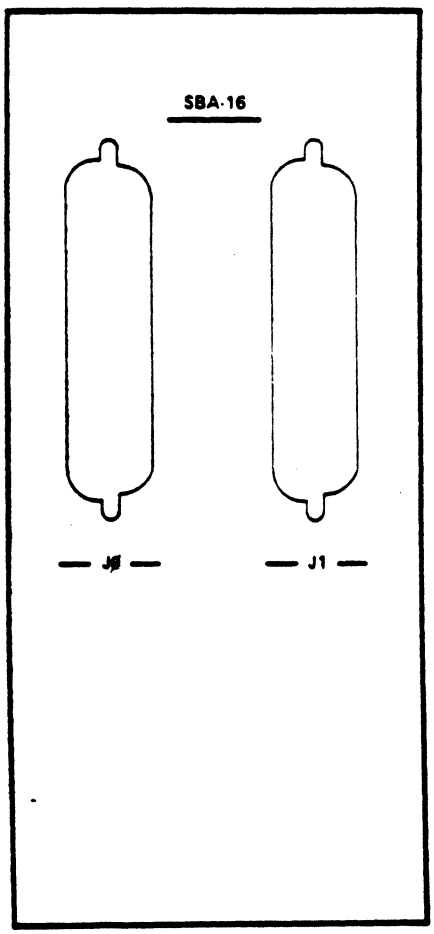


Figure 3-17 Connectors on the SBA-16 Assembly

Table 3-28 SIO-16 Connector Pin Assignments
SBA Connectors J0 and J1

Connector J0 Port No.	*Connector J1 Port No.*	*Pin No.*	*Signal Name*	*Direction*	*Function*
0	8	1	GND	–	Signal Ground
0	8	2	GND	–	Signal Ground
0	8	3	DTR	In	Data Terminal Ready
0	8	26	RXD	Out	Receive Data
0	8	27	TXD	In	Transmit Data
0	8	28	DCD	Out	Data Carrier Detect
1	9	4	GND	–	Signal Ground
1	9	5	GND	–	Signal Ground
1	9	6	DTR	In	Data Terminal Ready
1	9	29	RXD	Out	Receive Data
1	9	30	TXD	In	Transmit Data
1	9	31	DCD	Out	Data Carrier Detect
2	10	7	GND	–	Signal Ground
2	10	8	GND	–	Signal Ground
2	10	9	DTR	In	Data Terminal Ready
2	10	32	RXD	Out	Receive Data
2	10	33	TXD	In	Transmit Data
2	10	34	DCD	Out	Data Carrier Detect
3	11	10	GND	–	Signal Ground
3	11	11	GND	–	Signal Ground
3	11	12	DTR	In	Data Terminal Ready
3	11	35	RXD	Out	Receive Data
3	11	36	TXD	In	Transmit Data
3	11	37	DCD	Out	Data Carrier Detect
4	12	13	GND	–	Signal Ground
4	12	14	GND	–	Signal Ground
4	12	15	DTR	In	Data Terminal Ready
4	12	38	RXD	Out	Receive Data
4	12	39	TXD	In	Transmit Data
4	12	40	DCD	Out	Data Carrier Detect

(continued)

Table 3-28 SIO-16 Connector Pin Assignments SBA Connectors J0 and J1 (continued)

Connector J0 Port No.	*Connector J1 Port No.*	*Pin No.*	*Signal Name*	*Direction*	*Function*
5	13	16	GND	–	Signal Ground
5	13	17	GND	–	Signal Ground
5	13	18	DTR	In	Data Terminal Ready
5	13	41	RXD	Out	Receive Data
5	13	42	TXD	In	Transmit Data
5	13	43	DCD	Out	Data Carrier Detect
6	14	19	GND	–	Signal Ground
6	14	20	GND	–	Signal Ground
6	14	21	DTR	In	Data Terminal Ready
6	14	44	RXD	Out	Receive Data
6	14	45	TXD	In	Transmit Data
6	14	46	DCD	Out	Data Carrier Detect
7	15	22	GND	–	Signal Ground
7	15	23	GND	–	Signal Ground
7	15	24	DTR	In	Data Terminal Ready
7	15	47	RXD	Out	Receive Data
7	15	48	TXD	In	Transmit Data
7	15	49	DCD	Out	Data Carrier Detect

SIO-3270 Connectors

The SIO-3270 module is tailored to support eight IBM 3270 or 3270-compatible display stations and has the following features:

- All channels support standard IBM coaxial Category A electrical protocols with no modifications. The channels (or ports) are accessed via eight RG-62/AU BNC coaxial cable connectors. The connectors, designated CH0 through CH7, are designed to interface with DTE devices, specifically IBM 3270 models or compatibles.
- Each SIO-3270 channel has identical baud rates for reception and transmission.

The backpanel attachment assembly for the SIO-3270 board is the Coaxial Backpanel Attachment (CBA) Assembly.

Figure 3-18 illustrates the connectors on the CBA assembly.

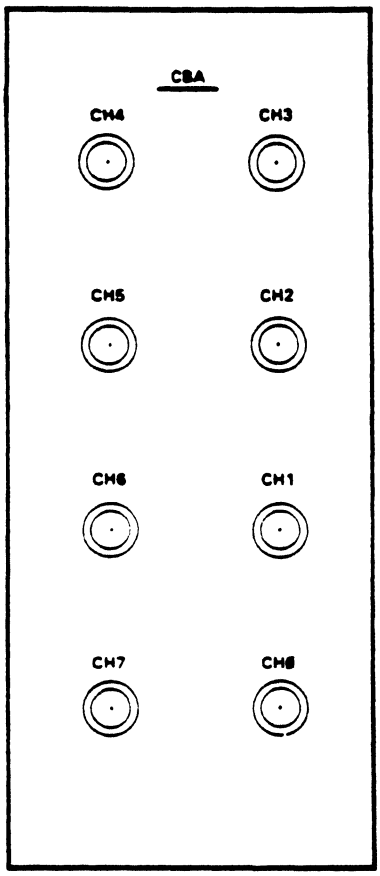


Figure 3-18 Connectors on the CBA Assembly

SIO-ST Connectors

The SIO-ST module is tailored to support eight synchronous DTE devices (usually terminals or hosts) with two pairs of handshake control lines. It has the following features:

- All ports support RS-232-C electrical protocols with no modifications. All ports have 25-pin, female D-connectors (RS-232-C DCE-type). These connectors, designated J0C through J7C, are designed to connect to DTE devices.
- Each port has identical baud rates for reception and transmission.
- All ports support control signals RTS, CTS, DTR, and DCD. The DTR line from the device is connected to the DSR line to the device on the SIO-STS, but is not actively driven by the server. If the device is a host that requires DSR to be actively toggled during dynamic circuit establishment, the server must be equipped with an SIO-SM module instead of an SIO-ST module.

- Each port supports only one clock line out. Connected devices must always be configured for external clock on receive and transmit, and the server port must be configured for internal clock on receive and transmit.

Figure 2-4, Section 2.3.1, illustrates the connectors on the SBA-ST assembly; Table 3-29 lists the serial I/O device connector pin assignments for the SIO-ST module.

Table 3-29 SIO-ST Connector Pin Assignments
DCE Connectors J0C through J7C

Pin No.	*RS-232-C Name*	*Bridge Name*	*Direction*	*Function*
1	AA	–	–	Chassis Ground*
2	BA	TXD/	In	Transmit Data
3	BB	RXD/	Out	Receive Data
4	CA	RTS	In	Request to Send
5	CB	CTS	Out	Clear to Send
6	CC	DSR	Out	Data Set Ready
7	AB	GND	–	Signal Ground
8	CF	DCD	Out	Data Carrier Detect
9-14	–	–	–	Unused
15	DB	TXC	Out	Transmit Clock**
16	–	–	–	Unused
17	DD	RXC	Out	Receive Clock**
18-19	–	–	–	Unused
20	CD	DTR	In	Data Terminal Ready
21-25	–	–	–	Unused

* Cable shield should be connected to this pin.
** DB and DD are controlled by the same driver; in applications where better electrical transmission is needed, only one wire should be implemented for both lines and the connection should be established at the remote end.

SIO-SM Connectors

The SIO-SM module is tailored to support four synchronous DCE devices (usually modems) or DTE devices requiring DSR (usually hosts), with a full complement of clock and control lines.

The SIO-SM module has the following features:

- All lines support RS-232-C electrical protocols with no modification. All ports have 25-pin, male D-connectors (RS-232-C DTE-type). These connectors, designated J0T through J3T, are designed specifically to interface with DCE devices (typically modems).

  An SIO-SMS port can also interface with DTE devices if the port's INTerfaceType parameter is set to DCE (refer to the *Configuration Guide* for a description of the INTerfaceType parameter). If a DTE device is attached to the SIO-SMS board, the special cable described in the *LAN Planning Guide* must be used. The clock source shorting plugs on the SIO-SMS board are set by default for communication with a modem, and usually must be reconfigured for communication with a DTE device (refer to Section 3.3.8).

  An SIO-SMS can also interface with DTE devices if the synchronous modem eliminator cable described in the *LAN Planning Guide* is used. The clock source shorting plugs on the board are set by default for communication with a modem, and usually must be reconfigured for communication with a DTE device (Figure 3-13 in Section 3.3.11 illustrates the SBA-SM assembly configuration).

- The baud rate is identical for reception and transmission on each port if internal clock signals are used. Baud rate for reception can be different from baud rate for transmission if external clock signals are selected.
- All ports support clock lines RXC, TXC, and EXC.
- All ports support control lines RTS, CTS, DTR, DCD, and DSR.

Figure 3-19 illustrates the connectors on the SBA-SM assembly; Table 3-30 lists the serial I/O device connector pin assignments for the SBA-SM module. The table applies only when the port's INTerfaceType parameter is set to DTE.

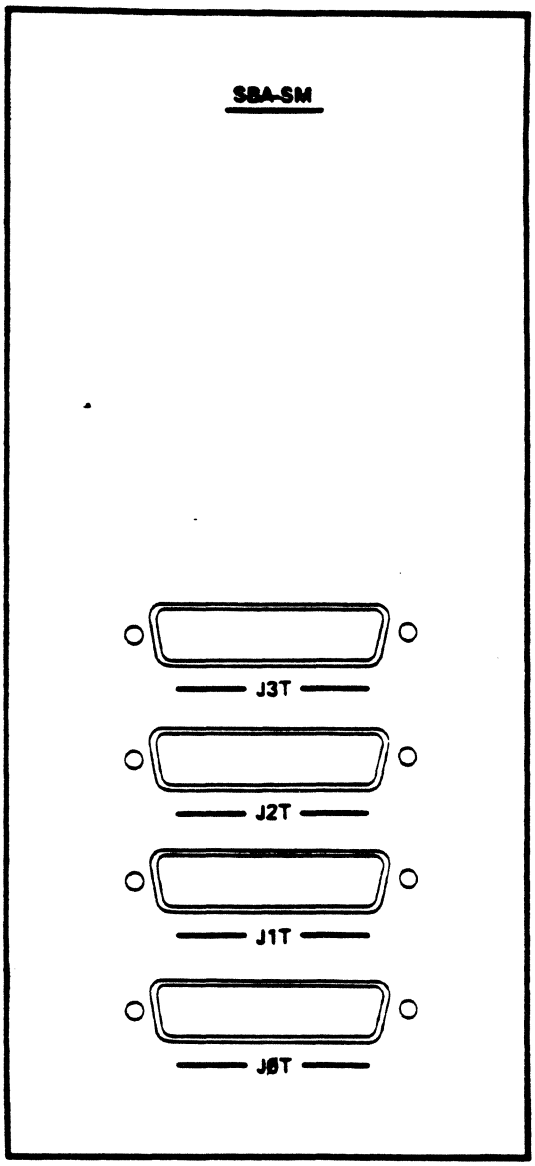


Figure 3-19 Connectors on the SBA-SM Assembly

Table 3-30 SIO-SM Connector Pin Assignments
DTE Connectors J0T through J3T

Pin No.	*RS-232-C Name*	*Bridge Name*	*Direction*	*Function*
1	AA	–	–	Chassis Ground*
2	BA	TXD/	Out	Transmit Data
3	BB	RXD/	In	Receive Data
4	CA	RTS	Out	Request to Send
5	CB	CTS	In	Clear to Send
6	CC	DSR	In	Data Set Ready
7	AB	GND	–	Signal Ground
8	CF	DCD	In	Data Carrier Detect
9-14	–	–	–	Unused
15	DB	TXC	In	Transmit Clock**
16	–	–	–	Unused
17	DD	RXC	In	Receive Clock
18	–	–	Out	Spare
19	–	–	–	Unused
20	CD	DTR	Out	Data Terminal Ready
21	CG	–	In	Spare
22	–	–	–	Unused
23	CH	–	Out	Spare
24	DA	EXC	Out	External Clock**
25	–	–	–	Unused

* Cable shield should be connected to this pin.
** Either Transmit Clock or External Clock can be selected, but not both (see Section 3.3.8).

SIO-422 Connectors

The SIO-422 module is tailored to support four ports with RS-422 electrical protocol and RS-449 connectors. The module is optimized for use with modems.

**** NOTE ****

Software limitations may make fewer ports available per module.

The SIO-422S (synchronous driver) is available as an option on the CS/1 with byte-synchronous or bit-synhronous interfaces.

All ports support RS-422 electrical protocols on data lines, clock lines, and one pair of handshake control lines. The connectors are 37-pin, male D-connectors (RS-449 DTE-type). Table 3-31 lists the serial device connector pin assignments for the SIO-422 module. Figure 3-20 illustrates the connectors on the SBA-422 assembly.

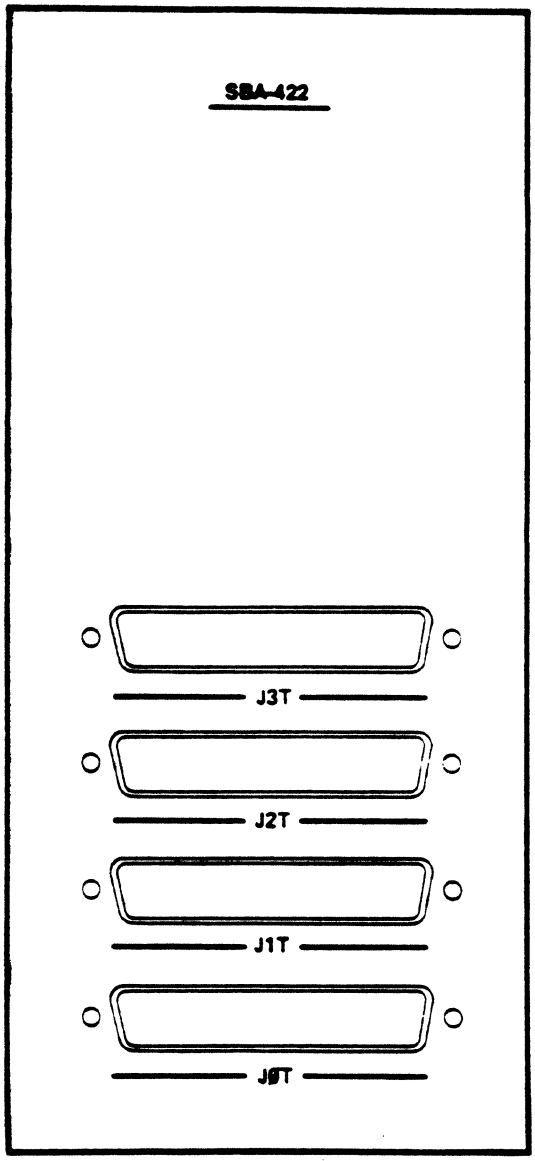


Figure 3-20 Connectors on the SBA-422 Assembly

Table 3-31 SIO-422 Connector Pin Assignments
DTE Connectors J0T through J3T

Pin No.	*RS-449 Name*	*Direction*	*Function*
1	Shield	–	Chassis Ground*
2,3	–	–	Unused
4	SD-A	Out	Send Data - A
5	–	–	Unused
6	RD-A	In	Receive Data - A
7	–	–	Unused
8	RT-A	In	Receive Timing - A
9-11	–	–	Unused
12	TR-A	Out	Terminal Ready - A
13	RR-A	In	Receiver Ready - A
14-16	–	–	Unused
17	TT-A	Out	Terminal Timing - A**
18	–	–	Unused
19	SG	–	Signal Ground
20,21	–	–	Unused
22	SD-B	Out	Send Data - B
23	–	–	Unused
24	RD-B	In	Receive Data - B
25	–	–	Unused
26	RT-B	In	Receive Timing - B
27-29	–	–	Unused
30	TR-B	Out	Terminal Ready - B
31	RR-B	In	Receiver Ready - B
32-34	–	–	Unused
35	TT-B	Out	Terminal Timing - B**
36-37	–	–	Unused

* Cable shield should be connected to this pin.
** For applications requiring ST rather than TT, shorting plugs must be in place in configuration areas E69 and E70 on the SIO-422, and a modified cable must be used (see Section 3.3.8).

SIO-H422 Connectors

The SIO-H422 module is tailored to support eight asynchronous DTE devices with RS-422 electrical protocol.

The SIO-H422A (asynchronous driver) module is available as an option on the CS/1 with asynchronous I/O interfaces.

**** NOTE ****

Asynchronous RS-232-C default port configurations are unavailable with the SIO-H422 interfaces.

All ports support data lines only, in accordance with CCITT Recommendation X.20. The connectors are 15-pin, male D-connectors (X.20 DTE-type). Figure 3-21 illustrates the connectors on the SBA-H422 assembly. Table 3-32 lists the serial device connector pin assignments for this module. Cables compatible with these connectors must be supplied by the customer.

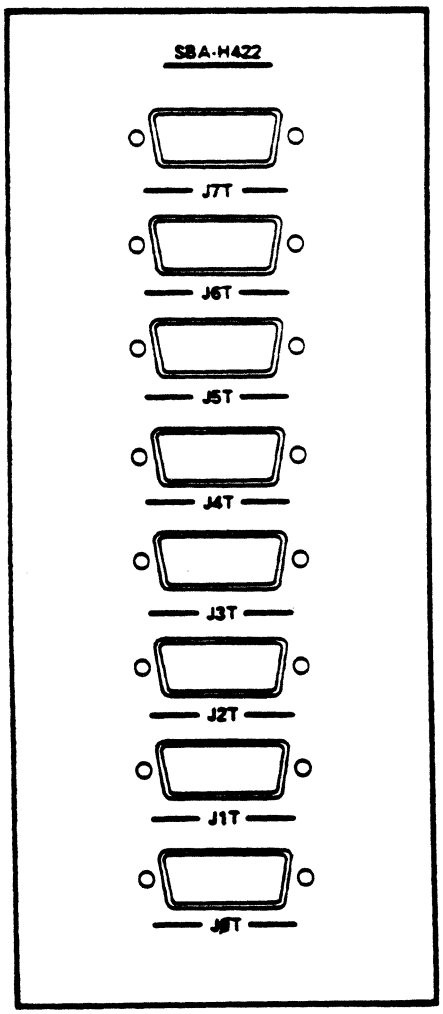


Figure 3-21 Connectors on the SBA-H422 Assembly

Table 3-32 SIO-H422 Connector Pin Assignments
DTE Connectors J0T through J7T

Pin No.	*X.20 Name*	*RS-449 Name*	*Direction*	*Function*
1	Shield	Shield	–	Chassis Ground*
2	T(A)	SD+	Out	Transmit Data +
3	–	–	–	Unused
4	R(A)	RD+	In	Receive Data +
5-7	–	–	–	Unused
8	G	SG	–	Signal Ground
9	T(B)	SD–	Out	Transmit Data –
10	–	–	–	Unused
11	R(B)	RD-	In	Receive Data –
12-15	–	–	–	Unused

* Cable shield should be connected to this pin.

SIO-HS422 Connectors

The SIO-HS422 module is tailored to support four synchronous DCE devices with RS-422 electrical protocol and CCITT X.21 connectors.

The SIO-HS422S (synchronous driver) module is available as an option on the CS/1 with byte-synchronous or bit-synchronous interfaces.

All of the lines indicated in the CCITT Recommendation X.21 specification are fully implemented, with the exception of the optional byte timing line (B). An additional clock line (ST) has been implemented. The connectors are 15-pin, male D-connectors (X.21 DTE-type). Cables compatible with these connectors must be supplied by the customer; the connectors are illustrated in Figure 3-22. Table 3-33 lists the serial device connector pin assignments for this module.

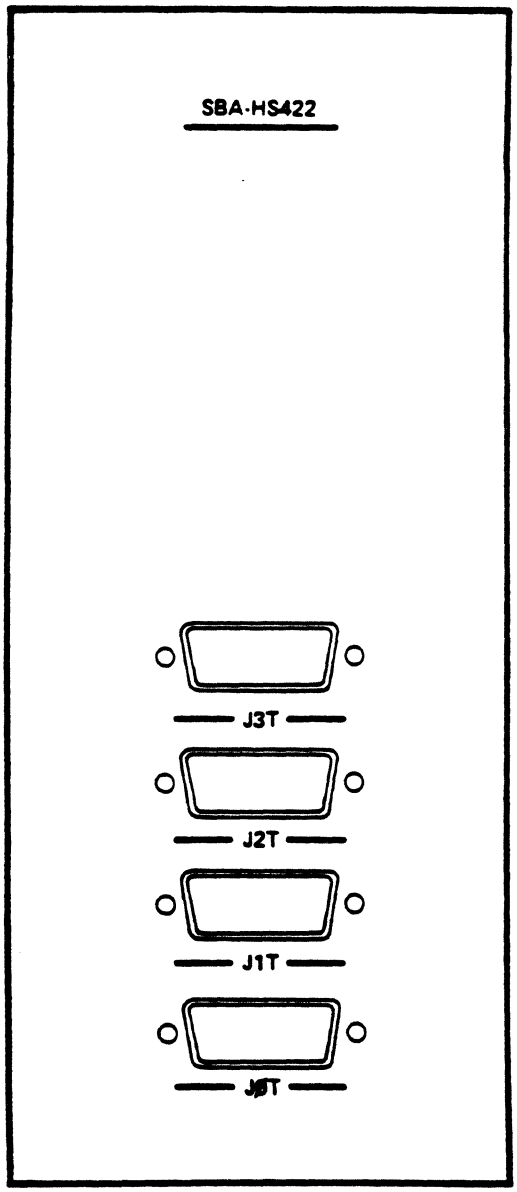


Figure 3-22 Connectors on the SBA-HS422 Assembly

Table 3-33 SIO-HS422 Connector Pin Assignments
DTE Connectors J0T through J3T

Pin No.	*X.21 Name*	*RS-449 Name*	*Direction*	*Function*
1	Shield	Shield	–	Chassis Ground*
2	T(A)	SD+	Out	Transmit Data +
3	C(A)	TR+	Out	Control +
4	R(A)	RD+	In	Receive Data +
5	I(A)	DM+	In	Indication +
6	S(A)	RT+	In	Signal Element Timing +
7	St(A)	TT+/ST+	Out/In	Terminal Timing +**
8	G	SG	–	Signal Ground
9	T(B)	SD–	Out	Transmit Data –
10	C(B)	TR–	Out	Control –
11	R(B)	RD–	In	Receive Data –
12	I(B)	DM–	In	Indication –
13	S(B)	RT–	In	Signal Element Timing –
14	St(B)	TT–/ST–	Out/In	Terminal Timing –**
15	G	SG	–	Signal Ground

* Cable shield should be connected to this pin.

** Line functions as Clock In (ST) or Clock Out (TT) depending on the settings of the clock source configuration areas on the SIO board (see Section 3.3.8).

SIO-V.35 Connectors

The SIO-V.35 module is tailored to support two ports with V.35 interfaces. The SIO-V.35S (synchronous driver) is available as an option for the CS/1 with byte-synchronous or bit-synchronous interfaces.

The SIO-V.35 module implements all data and control lines, as well as two pairs of handshake control lines, and has standard rectangular, 34-pin, M-CS V.35 connectors (female DTE-type). The connector pins are labeled with alphabetic characters in the ranges A through Z (uppercase) and a through n (lowercase).

Figure 3-23 illustrates the connectors on the SBA-V.35 assembly. Table 3-34 lists the serial device connector pin assignments for the SIO-V.35 module.

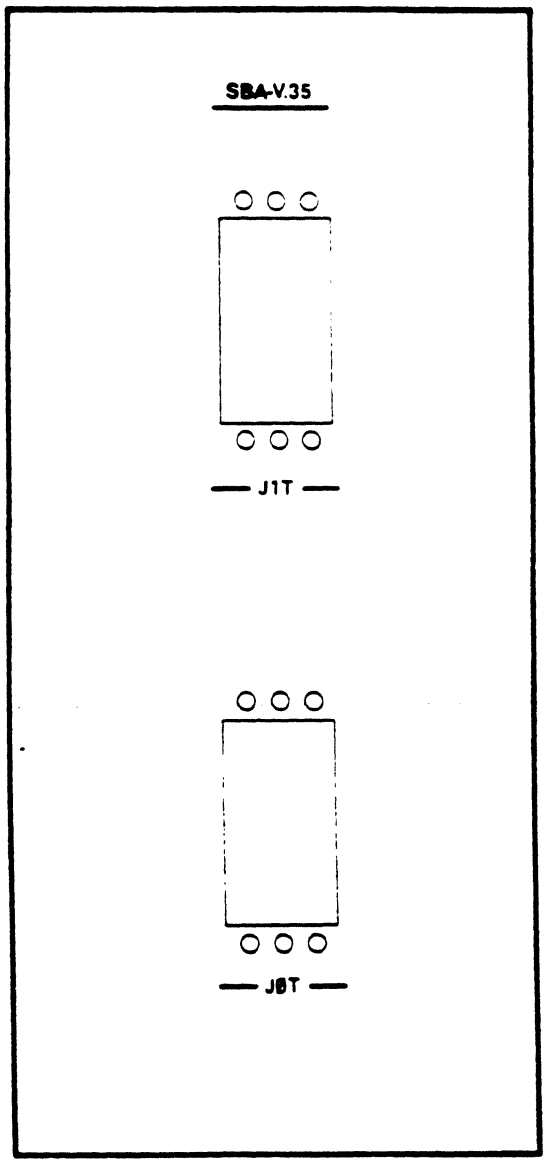


Figure 3-23 Connectors on the SBA-V.35 Assembly

Table 3-34 SIO-V.35 Connector Pin Assignments
DTE Connectors J0T and J1T

Pin No.	*V.35 Name*	*Direction*	*Function*
A	SHIELD	–	Chassis Ground*
B	S.GND	–	Signal Ground
C	RTS	Out	Ready To Send
D	CTS	In	Clear To Send
E	DSR	–	**
F	DCD	In	Data Carrier Detect
G	–	–	Unused
H	DTR**	In	Data Terminal Ready
I-N	–	–	Unused
P	SD-A	Out	Send Data - A
Q	–	–	Unused
R	RD-A	In	Receive Data - A
S	SD-B	Out	Send Data - B
T	RD-B	In	Receive Data - B
U	–	–	Unused
V	SCR-A	In	Receive Clock - A
W	–	–	Unused
X	SCR-B	In	Receive Clock - B
Y	SCT-A	In***	Transmit Clock - A
Z	–	–	Unused
a	SCT-B	In***	Transmit Clock - B
b-n	–	–	Unused

* Cable shield should be connected to this pin.

** Nonstandard use of DSR and DTR lines; in V.35 specification, DSR is implemented on pin E and DTR is not implemented.

*** For applications requiring SCTE rather than SCT, shorting plugs must be in place in configuration areas E69 and E70 on the SIO-V.35, and a modified cable must be used (refer to Section 3.3.8).

3.6.4 CS/1-to-Device Cabling

To attach a terminal device to port 0 of a CS/1, simply attach the device cable to the connector labeled J0C on the first SBA assembly; to attach a terminal device to port 1, attach the cable connector labeled J1C on the first SBA assembly. Figure 2-4 in Section 2.3.1 illustrates the position of each connector on the CS/1 back panel.

For the CS/1 with asynchronous (SIO-A), bit-synchronous, or byte-synchronous I/O modules, a terminal attached to a port configured as a host port will not interact appropriately with the server. The default configuration shipped with the CS/1 specifies ports 0 through 3 of each SIO-A module, for example, as host ports and ports 4 through 7 of each SIO-A module as terminal ports. The default parameters for all terminal ports assume 9600 baud and one stopbit.

The terminal ports are shipped with different databits and parity settings so that at least one port will be compatible with almost any terminal.

The ports numbered 0 through 7 on each SIO-A module are considered ports 0 through 31 by the software, i.e., SIO module 1 supports ports 0 through 7, SIO module 2 supports ports 8 through 15, and so on. Use the SETDefault or the ReaD commands from another port as necessary to alter inappropriate configurations. The *Connection Service User's Guide* describes the Connection Service commands in detail. Table 3-35 lists the default terminal port settings that apply to the CS/1 with four asynchronous (SIO-A) interfaces. Refer to the *Configuration Guide* for synchronous port configuration information.

Table 3-35 CS/1 with Four SIO-A Modules Default Terminal Port Settings

Port Numbers	*Databits*	*Parity*
4, 12, 20, 28	8	None
5, 13, 21, 29	7	Odd
6, 14, 22, 30	7	Even
7, 15, 23, 31	7	Mark

3.6.5 SIO-16 Module-to-Device Cabling

The SIO-16 module can be connected to a device using any of the cabling schemes listed in the *LAN Planning Guide*.

Each SIO-16 has an SBA-16 assembly on its back panel. Each assembly has two male telephony connectors for a total of eight connectors on a fully loaded CS/1. The connectors are labeled J0 and J1. Figure 3-17 in Section 3.6.3 illustrates the positions of the connectors on the SBA-16 assembly.

Each of the telephony connectors on the server's back panel provides eight ports, sixteen ports per SBA-16. Ports 0 through 7 are associated with connector J0 of the first SBA-16 assembly; ports 8 through 15 are associated with connector J1 of the first SBA-16 assembly; ports 16 through 23 are associated with connector J0 of the second SBA assembly, and so on.

The Hydra Adapter cable and the Harmonica breakout box are labeled sequentially from 1 through 8. Table 3-36 indicates the SIO-16 port numbers to which the labels correspond.

Table 3-36 SIO-16 Port Number Correspondence for 64-port CS/1

SIO-16 Board No.	*Connector*	*Port No.*	*Hydra/Harmonica Connector Number**
1	J0	0	1
1	J0	1	2
1	J0	2	3
1	J0	3	4
1	J0	4	5
1	J0	5	6
1	J0	6	7
1	J0	7	8
1	J1	8	1
1	J1	9	2
1	J1	10	3
1	J1	11	4
1	J1	12	5
1	J1	13	6
1	J1	14	7
1	J1	15	8
2	J0	16	1
2	J0	17	2
2	J0	18	3
2	J0	19	4
2	J0	20	5
2	J0	21	6
2	J0	22	7
2	J0	23	8
2	J1	24	1
2	J1	25	2
2	J1	26	3
2	J1	27	4
2	J1	28	5
2	J1	29	6
2	J1	30	7
2	J1	31	8

* Each Hydra/Harmonica number represents a unique cable or connector.

(continued)

Table 3-36 SIO-16 Port Number Correspondence for 64-port CS/1 (continued)

SIO-16 Board No.	*Connector*	*Port No.*	*Hydra/Harmonica Connector Number**
3	J0	32	1
3	J0	33	2
3	J0	34	3
3	J0	35	4
3	J0	36	5
3	J0	37	6
3	J0	38	7
3	J0	39	8
3	J1	40	1
3	J1	41	2
3	J1	42	3
3	J1	43	4
3	J1	44	5
3	J1	45	6
3	J1	46	7
3	J1	47	8
4	J0	48	1
4	J0	49	2
4	J0	50	3
4	J0	51	4
4	J0	52	5
4	J0	53	6
4	J0	54	7
4	J0	55	8
4	J1	56	1
4	J1	57	2
4	J1	58	3
4	J1	59	4
4	J1	60	5
4	J1	61	6
4	J1	62	7
4	J1	63	8

* Each Hydra/Harmonica number represents a unique cable or connector.

The cabling schemes used with the SIO-16 module are described below. To attach cables to the SIO-16 using any of the schemes described, a 25-pair female connector is required. Variations of the cables and connectors described in this section are compatible with the SIO-16. Cables and connectors described in this section may be purchased from Bridge. Contact Bridge for further information about SIO-16 cabling.

** NOTE **

Cables designed for use with other SIO boards cannot be intermixed with the cables designed for use with the SIO-16 board.

- **Hydra Adapter Cable to Terminal**

  To install the Hydra Adapter cable, follow these steps:

  1. Acquire a 25-pair Hydra Adapter cable and Modular DB-25 Adapters as needed. To order the appropriate type of Hydra Adapter cable, specify Bridge order number CBL-Hydra-6w.

     To order the DB-25 Adapters, specify Bridge order number CBL-Term/Comp-Male, or CBL-Term/Comp-Female, as needed.

  2. Attach the 25-pair end of the Hydra Adapter cable to the SBA-16 assembly on the back panel of the server.

     Ports 0 through 7 are associated with connector J0 of the first SBA-16 assembly; ports 8 through 15 are associated with connector J1 of the first SBA-16 assembly; ports 16 through 23 are associated with connector J0 of the second SBA-16 assembly, and so on.

  3. Each RJ-11 connector on the Hydra Adapter cable is labeled with a number in sequence from one to eight (Table 3-36 shows the correspondence to the server's port numbers).

     To attach a terminal device to port 0 of the CS/1 with SIO-16 modules:

     a. Connect the RJ-11 connector labeled 1 to a male Modular DB-25 Adapter.

     b. Attach the Modular DB-25 Adapter to the DB-25 connector on the terminal.

- **25-pair Extension Cable to Harmonica Breakout Box to Terminal**

  To install the 25-pair extension cable to Harmonica breakout box to terminal, follow these steps:

  1. Acquire a 25-pair extension cable (in the length required by the application), a Harmonica breakout box, 3-pair modular cable, and a Modular DB-25 Adapter.

     To order the appropriate 25-pair extension cable from Bridge, specify order numbers CBL-25pair-25, CBL-25pair-50, or CBL-25pair-100, as required by the installation.

     To order a Harmonica breakout box from Bridge, specify order number CBL-Harmonica-6W.

     To order 3-pair modular cable from Bridge, specify order number CBL-3pair-25.

     To order Modular DB-25 Adapters from Bridge, specify order number CBL-Term/Comp-Male or CBL-Term/Comp-Female, as required by the installation.

2. Attach one end of the 25-pair extension cable to the first (left-most) SBA-16 assembly on the server's back panel.
3. Attach the other end of the extension cable to the 25-pair connector on the Harmonica breakout box.
4. The RJ-11 receptacles on the Harmonica breakout box are labeled with a number between one and eight (Table 3-36 shows the correspondence to the server's SIO-16 ports).

   To attach a terminal device to port 0 of the CS/1 with SIO-16 modules:

   a. Connect one end of the modular cable to the RJ-11 receptacle labeled 1 on the Harmonica breakout box.
   b. Connect the other end of the modular cable to a female Modular DB-25 Adapter.
   c. Attach the Modular DB-25 Adapter to the DB-25 connector on the terminal.

On the CS/1 with four SIO-16 modules, a terminal attached to a port configured as a host port will not be able to interact appropriately with the server. The default configuration shipped with the server specifies ports 0 through 3 and ports 8 through 11 of each SIO-16 module as host ports and ports 4 through 7 and ports 12 through 15 as terminal ports. The default parameters for all terminal ports on the SIO-16 module assume 9600 baud and 1 stop-bit.

On the CS/1 with four SIO-16 modules, the terminal ports are shipped with different parity and databit settings so that at least one port will be compatible with almost any terminal.

The ports on a CS/1 with four SIO-16 modules are considered ports 0 through 63 by the software, e.g., SIO-16 module 1 supports ports 0 through 15; SIO-16 module 2 supports ports 16 through 32; and so on.

Use the SETDefault or the ReaD commands as necessary from another port to alter inappropriate configurations. The *Connection Service User's Guide* describes the Connection Service commands in detail. Table 3-37 lists the default settings that apply to the CS/1 with four SIO-16 modules.

Table 3-37 CS/1 with Four SIO-16 Modules Default Terminal Port Settings

Port Numbers	*Databits*	*Parity*
4, 12, 20, 28, 36, 44, 52, 60	8	None
5, 13, 21, 29, 37, 45, 53, 61	7	Odd
6, 14, 22, 30, 38, 46, 54, 62	7	Even
7, 15, 23, 31, 39, 47, 55, 63	7	1

After the installation is defined for the site and the appropriate cabling equipment is obtained, Bridge recommends the following steps to simplify network management:

1. Label each 25-pair cable with a number in sequence from 1 to 8 (line 1 is attached to the first SBA-16 assembly, line 2 is attached to the second SBA-16 assembly, and so on).
2. On a map of the site, mark the locations of the 25-pair cable lines from end-point to end-point.
3. Mark the cable line leading from each server port to the attached terminal according to its line and port number (i.e., line 1, port 4 = L1 P4; line 2, port 17 = L2 P17, and so on).

Detailed information about network management is provided in the *Network Management Guide*.

3.6.6 SIO-3270 Module-to-Device Cabling

The SIO-3270 can be connected to a device using an RG-62 coaxial cable. To attach a terminal device to port CH0 of the server's CBA assembly, attach the device cable to the BNC connector labeled CH0 on the server's first CBA assembly.

The connectors on each CBA are labeled counterclockwise CH0 through CH7. Ports 0 through 7 are on the first CBA assembly; ports 8 through 15 are on the second CBA assembly, and so on.

** NOTE **

The SIO-3270 supports all IBM typewriter and data-entry style keyboards. The following warning appears on the status line if the physical keyboard is not one of those supported by the SIO-3270:

```
?KBD?
```

This warning is not displayed if you have used set-up mode to set the STATUS LINE option to HOST. The *Connection Service User's Guide* provides a complete description of Setup mode.

Figure 3-18 in Section 3.6.3 illustrates the BNC coaxial cable connectors on the CBA assembly.

3.6.7 Server-to-Network Cabling

You can either supply Ethernet transceiver cables and broadband drop cables or purchase them as an option from Bridge. For Token Ring networks, however, you must supply cabling.

Before installing the cable, be sure the server is powered off. Then connect the network cable to the appropriate connector on the network interface backpanel attachment assembly. Refer to Sections 2.3 and 3.6.1 for illustrations of the various backpanel assemblies, and to the *LAN Planning Guide* for cable specifications.

To facilitate the startup and checkout procedures for a CS/1 with the Ethernet network interface, do not attach the transceiver cable to the server until the server itself has been fully checked out.

To facilitate the startup and checkout procedures for a CS/1 with the broadband network interface, connect the unit to the RFM/5.

To facilitate the startup and checkout procedures for a CS/1 with the Token Ring interface, connect the server to the network cable. Refer to Sections 3.7 and 3.8 for startup and checkout procedures, respectively. Section 3.6.1 describes the specifications applicable to the network option at the site; the *LAN Planning Guide* lists and illustrates cable specifications.

** CAUTION **

Connecting or disconnecting the cable between the server and the network interface while the server is powered on can damage the transceiver, RFM/5, or Multistation Access Unit.

3.7 Server Startup

The following sections list the steps recommended for starting up a CS/1. The procedure for a server that has an internal disk drive differs from the procedure for one that does not. The procedure also varies depending on the network interface.

The procedure makes the following assumptions:

- The bootstrap option areas on the MCPU board (if applicable) have been configured properly. To check MCPU board settings, refer to Section 3.3.5. The options are described in Appendix B. With MCPU20-based CS/1s, this option is set via firmware configuration changes as described in Section 3.9.
- A server with the Ethernet interface and an internal disk drive need not be attached to the network initially.
- A server with the broadband interface must be connected to an RFM/5 in order to start up successfully, but the RFM/5 need not be attached to the network initially.
- A server with a Token Ring interface must be attached to a Token Ring Controller cable, but the cable need not be attached to the network initially.

The CS/1 startup procedure consists of four steps:

1. Self-test diagnostics
2. Boot procedure
3. System generation
4. Boot procedure

Steps 1 and 2, self-test diagnostics and booting, are common to all servers. If the self-tests do not pass successfully, refer to Appendix A for an explanation of the failure.

Steps 3 and 4, system generation and rebooting, are necessary only on some units. System generation may be performed on some models with internal disk drives, but may be unavailable on other units with internal disk drives. Table 3-38 lists system generation requirements. System generation may be performed on an NCS/AT, NCS/1, or NCS/2 for client servers with or without internal disk drives. The *Network Management Guide* and the NCS installation and operation guides provide detailed information about system generation.

Table 3-38
System Generation Requirements

Server	*Boot Source*	*System Generation*
CS/1	NCS/AT, NCS/1, NCS/2, NCS/150	Not required*
CS/1 with XNS protocols	Local floppy	Not required*
CS/1 (or CS/1-FT) with TCP/IP protocols	Local floppy	Required
CS/1 with byte-synchronous interfaces.	Local floppy	Required

* System generation may be required for nonstandard software or installation.

3.7.1 System with an Internal Disk Drive

Follow these steps to start up a CS/1 system that has an internal disk drive:

1. Power on the unit by pressing the "I" side of the power switch (located on the server's back panel). If the Power and Self Test LEDs on the front panel fail to light, power off the server by pressing the "O" side of the power switch. Verify that the power cord is properly connected to a working outlet; then power on the unit again.

2. While the Self Test LED is still lit, place the diskette in the drive with the label facing right (i.e., away from the LEDs).

   If the Self Test LED turns off or begins flashing before the diskette is in place, insert the diskette and press the Reset switch to restart the server.

3. During self-test diagnostics, the Self Test LED remains lit. If the Self Test LED remains lit longer than 15 seconds, one or more boards have failed the self-test diagnostics. Remove the server's top cover and check the status of the Self Test LEDs on the individual boards. A lit LED indicates a board failure (Section 3.3 includes an illustration of each board; and Appendix A describes self-test diagnostics).

   ** CAUTION **

   The unit is still powered on. Do not drop or place any object in the enclosure.

   If a console terminal is attached to the CS/1 console port, check the console for confirmation of the failure. Depending on where the failure occurred, the system may not be able to report the failure on the console (e.g., MCPU or MCPU20 failure). Report the board failure and console messages (if any) to Bridge, or an authorized service representative.

4. If the Self Test LED flashes on and off after the self-test diagnostics have completed (i.e., after the LED has been lit for 15 seconds and has then gone out), verify that the floppy diskette is properly inserted in the drive. Press the Reset switch to try again.

5. If the Self Test LED turns off within 15 to 30 seconds after power is applied, the server enters bootstrap phase and the Boot State LED lights. Appendix B describes the bootstrap procedure. When the bootstrap process is complete, the Boot State LED turns off; bootstrap takes approximately 20 seconds for CS/1s and slightly longer (some 15 to 20 seconds typically) for CS/1-FTs. If the LED remains lit longer than 60 seconds, contact a service representative.

6. After the bootstrap process is complete, the server reads software configuration information (e.g., parameter tables, routing tables, directory of logical names) from the diskette, which requires approximately 20 seconds. After the process is complete, the system is ready to be checked out.

3.7.2 System without an Internal Disk Drive

The procedure for starting up a diskless server is as follows:

1. The server being checked out must be attached to the network, and the network must include an operational NCS that has been configured to support that server. The NCS/AT, NCS/1, NCS/2, and NCS/150 are described in detail in their respective installation and operation guides.

   **** NOTE ****

   When performing startup of a CS/1-FT from an NCS, be sure that the NCS that is to perform the startup is attached to the CS/1-FT via network cable 0, or the cable connected to NBA connector 0 (see Figure 3-16).

   For a CS/1-FT with an NBA-EE assembly, this connector is labeled TRANSCEIVER 0; for a CS/1-FT with an NBA-BB assembly, the connector is labeled RF MODEM 0; for a CS/1-FT with an NBA-EB assembly, the connector is labeled RF MODEM 0.

2. On a server with the Ethernet network interface, with the system powered off, connect the transceiver cable between the server and a transceiver.

   **** CAUTION ****

   Connecting or disconnecting the cable between a server and an Ethernet transceiver while the system is powered on can damage the transceiver, RFM/5, or Multistation Access Unit.

3. Power on the system by pressing the "I" side of the power switch (located on the unit's back panel). If the Power and Self Test LEDs on the front panel fail to light, power off the server by pressing the "O" side of the power switch. Verify that the power cord is properly connected to a working outlet; then power on the system again.

4. If the Self Test LED remains lit longer than about 15 seconds, one or more boards have failed the self-test diagnostics. Remove the unit's top cover and check the status of the Self Test LEDs on the individual boards. A lit LED indicates a board failure. Refer to Section 3.3 for an illustration of each board, and to Appendix A for a description of the power-on diagnostics.

   **** CAUTION ****

   The unit is still powered on. Do not drop or place any object in the enclosure.

   If a console terminal is attached, check the console for confirmation of the failure. Depending on where the failure occurred, the system may not be able to report the failure on the console (e.g., MCPU or MCPU20 failure). Report the board failure and console messages (if any) to Bridge or an authorized service representative.

5. The Self Test LED remains lit, unflashing, for approximately 15 seconds while the diagnostics are running. If the Self Test LED flashes on and off after the Self Test diagnostics have completed, verify that the NCS is properly configured and attached to the network. Press the Reset switch to try again.

6. If the Self Test LED turns off within about 15 seconds after power is applied, the system enters bootstrap phase and the Boot State LED comes on. Refer to Appendix B for a description of the bootstrap procedure. When the bootstrap process is complete, the Boot State LED turns off. Bootstrap can take between 4 and 60 seconds, depending on the type of NCS from which the bootstrap process is being performed. If the LED remains lit longer than 60 seconds, contact a service representative.

7. After the bootstrap process is complete, the server reads default parameters from the NCS. Parameter values read at this time include port configurations, global parameters, and passwords. This process takes approximately 20 seconds. The CS/1 is ready to be checked out after bootstrap is completed. Refer to Section 3.8 for the system checkout procedure.

3.8 System Checkout

You can check out a CS/1 either locally or remotely, depending on its model:

- A CS/1 with an SIO-A, SIO-16, or SIO-3270 board and an asynchronous terminal attached is checked out locally. Local checkout procedures for a CS/1 are described in Section 3.8.1.
- All other CS/1s must be checked out by accessing them in remote mode from a terminal attached to an SIO-A, SIO-16, or an SIO-3270 port on a server somewhere on the network. Remote checkout procedures are described in Section 3.8.2. The CS/1 being checked out and the server to which the terminal is attached must be running the same set of high-level protocols. To check out a CS/1 running the OSI protocols, the network manager must connect to the remote server via port 136.

Before checking out a server, make sure:

- Sysgen has been run, if the server requires it. Refer to Table 3-38, in Section 3.7, for Sysgen requirements.
- Servers with an Ethernet interface or Bridge Broadband network interface internal disk drive have not been attached to the network. These servers are attached to the network during the checkout procedure.

3.8.1 Local Checkout

After you have started up the CS/1 successfully, follow these steps to check out the server. Terminate each command by pressing the Return key.

1. Attach a terminal to an SIO-A, SIO-16, or SIO-3270 port that is configured for the same parity and databits as the terminal. Sections 3.6.4, 3.6.5, and 3.6.6 list default terminal port settings and describe cabling instructions for the CS/1.
2. Power on the terminal and press the Return key. A few moments after the CS/1 starts up, a welcome message and prompt should appear on the terminal. They should look something like this:

   ```
   Welcome to your Communications Server
   >
   ```

   If they appear, skip to step 6.

   If no welcome message and prompt appear on the terminal, verify that the Data Received LED on the server's front panel flashes when a key on the terminal is pressed.
3. If the LED flashes but no prompt appears, verify that the port parameters are set appropriately for the terminal. A port configured for interaction with a host will not interact appropriately with a terminal. Refer to Section 3.6.4, 3.6.5, or 3.6.6 for default terminal port settings and for cabling information, depending on the I/O interface.
4. If the LED does not flash, verify that the I/O cable is properly attached to both the device and the CS/1. Once the cables are attached properly, repeat step 2.

5. If the server still does not respond, contact Bridge or an authorized service representative.

6. After the welcome message and prompt appear on the terminal, verify that the terminal can communicate successfully with the server by entering the command:

   ```
   show address
   ```

   Servers running the XNS or OSI protocols respond with the server's entire network address: network number, station address, and port number. Make a note of the port number, which will be used later in this procedure (step 12). Servers running the TCP/IP protocols display only the port number.

7. If either the command or the resulting display appears as a string of random characters or does not appear at all, the terminal is not transmitting with the same baud rate, parity, or databits as the server. Check the baud rate, parity, and databits of both the terminal and the CS/1 port. If these settings do not match, either adjust the terminal or attach it to a CS/1 port whose parameters do match the terminal's requirements (Table 3-35 lists the default port parameters for the CS/1 with four SIO-A modules; Table 3-36 lists the default port parameters for the CS/1 with four SIO-16 modules).

8. After the server and the terminal have successfully established two-way communication, the privilege level of the terminal must be set. For servers running the XNS or TCP/IP protocols, set the privilege level of the terminal to Global Network Manager by entering the command:

   ```
   set priv=gnm
   ```

   For servers running OSI protocols, set the privilege level of the terminal to Local Network Manager by entering the command:

   ```
   set priv=lnm
   ```

   In either case, a password is required; the default password supplied with the system software is the null string (""); simply press the Return key.

9. Attach a second terminal to another SIO-A, SIO-16, or SIO-3270 port on the server. If necessary, use the SETDefault command from the first terminal port to adjust the baud rate, parity, and databits parameters of the second terminal port. The SETDefault command is described in the *Connection Service User's Guide*.

10. Test the connection between the server and the second terminal by following the same steps as for the first terminal (steps 2 through 8).

11. Place the second terminal in Listening mode (so that it can be the destination of a connection) by entering the command:

    ```
    listen
    ```

12. Establish a connection from the first terminal to the second terminal. For a server with the XNS or OSI protocols, enter the following command using the port number obtained in step 6:

    ```
    connect !<destination port number>
    ```

    For a server running the TCP/IP protocols, enter the commands:

    ```
    setd (!<port #>) ip=<Internet address>

    connect <Internet address of port>
    ```

    **** NOTE ****

    The address assigned to a port using the SETDefault command must have the same network number portion as the server address assigned during system generation.

13. Once the connection is established, all characters typed on the first terminal appear on the second, and vice versa, but the data is not echoed on the terminal sending the data. Test the connection by typing a few characters on both terminals.

14. From the first terminal, terminate the connection by typing the Enter-Command-Mode character (typically "<CTRL-^>" or "<CTRL-~>") and the command:

    ```
    disconnect
    ```

    When all the servers in the network are checked out and are operating properly, connect the server to the network cable and check out the connections across the network.

    If the server has an Ethernet or Bridge Broadband interface, power off the server, attach the network cable to the server's network interface connector (refer to Section 3.3.12), and then power on the server (refer to Section 3.7 for the startup procedure).

15. Form a connection from a terminal on one server to a terminal on another. For servers running the XNS or OSI protocols, enter the command:

    ```
    connect %<address>!<destination port number>
    ```

    For a server running the TCP/IP protocols, enter the command:

    ```
    connect <Internet address of port>
    ```

16. Terminate the connection by entering the command:

    ```
    disconnect
    ```

3.8.2 Remote Checkout

This section describes the procedure for checking out a CS/1 by accessing it in remote mode. Throughout this procedure, the server being checked out is referred to as server A; the server used to perform the remote checkout is referred to as server B. This procedure makes the following assumptions about server A:

- Server A is a CS/1 and, if the device attached to server A is a host, the host has been properly configured.

The remote checkout procedure makes the following assumptions about server B:

- Server B is an asynchronous server running the same protocols as the server being checked out.
- Server B has a terminal attached.
- Server B has been checked out and is functioning properly.

Remote access cannot be made from a server running the XNS protocols to a server running the TCP/IP or OSI protocols, or vice versa.

1. Run the startup procedure (Section 3.7) on server A.
2. If server A has an Ethernet interface, power off the server, attach the transceiver connector the network cable, (refer to Figure 2-4 in Section 2.3.1 for an illustration of the connector), and power on and reboot server A (refer to Section 3.7 for the startup procedure).
3. From a terminal attached to server B, an asynchronous server whose protocols match those running on A, obtain Global Network Manager privilege for CS/1s running the XNS or TCP/IP protocols by entering:

   ```
   set priv=gnm
   ```

   Or, obtain Local Network Manager privilege for CS/1s running the OSI protocols by entering:

   ```
   set priv=lnm
   ```

   In either case, a password is required; the default password shipped with the system software is the null string (""); simply press the Return key.
4. Access server A in remote mode (XNS or TCP/IP protocols only). For a server running the XNS protocols, enter the command:

   ```
   remote %<address>
   ```

For a server running the TCP/IP protocols, enter the REMOTE command and the Internet address, as follows:

```
remote <Internet address>
```

For a server running the TCP/IP protocols version 11000 and later, the Internet address must have been established previously.

For a server running the OSI protocols, enter the command:

```
connect %<address>!136
```

The REMOTE command is not available for servers running the OSI protocols. Instead, a connection is made through the network management port, port 136. This port, and network management services associated with it, are described in the *Connection Service User's Guide.*

5. Verify that server A is functioning properly. At the "Remote:" prompt on the asynchronous terminal attached to server B, enter the command:

   ```
   show version
   ```

   Server A should respond by displaying the current version of software running in the unit and the current PROM firmware revisions. If server A responds with the message "Timeout failure," either server A is not running properly or a problem may exist with the transceiver connection to server A. Check the transceiver connection to server A.

6. Press the Break key to exit remote mode.

7. Form a connection from server B to a device or network attached to server A.

   If server A is a CS/1 running the XNS or OSI protocols, enter the following command at the asynchronous terminal attached to server B:

   ```
   connect %<address>!<destination port number>
   ```

   If server A is a CS/1 running the TCP/IP protocols, enter the following command at the asynchronous terminal attached to a port on server B:

   ```
   connect <Internet address>
   ```

   The Internet address must have been established previously.

8. A final step is required for detecting a single-cable fault on a CS/1-FT. To detect such a fault, first break the connection just established. Use the the following command, entered from the terminal attached to server B:

```
disconnect
```

Now enter the following command from the same terminal:

```
show arptable
```

This command generates a listing that provides information concerning the mapping between Internet addresses and Ethernet addresses of devices that communicate with these servers, lists available addresses, and shows the currently in-use addresses. For CS/1-FTs, there will be two cables indicated as available in the Show Arptable listing for each server's (in this case, servers A and B) Internet addresses listed in the arptable. If only one cable is shown as available, then a single cable fault has been detected. The *Connection Service User's Guide* provides more information concerning the Show Arptable command.

3.9 MCPU20 Firmware Configuration

This section describes setting the MCPU20 configuration parameters through the console port.

Certain parameters, such as auto reboot, console baud rate, and download baud rate, are stored by the MCPU20 in EEPROM (Electrically Erasable PROM). To alter these parameters, follow these steps:

1. Attach a terminal to the console port of the CS/1 system and power it on.

   The default baud rate for the console port of the CS/1 is 9600 baud; this option is alterable during the firmware configuration process. The character format is eight bits without parity and is not user-configurable.

2. Power on the CS/1, or if power has already been applied, press the Reset switch.

3. Press the Return key. A display similar to the following appears:

```
Series 1 Power-up
MCPU20 - Passed M3 MMON rev XXX
0 - IEC/M 512KB - Passed Station Address - 080002XXXXXX M1 IECM rev. XXX
1 - SIO - passed M0 ASYNC rev XXX
2 - Not Present
3 - Not Present
4 - Not Present

Bridge Communications MCPU20 Monitor
>
```

   The actual message will differ depending on the boards and versions of firmware present in the CS/1 system. The twelve-digit number, which is represented above as 080002XXXXXX, is an Ethernet address.

   Firmware configuration is part of a program built into the MCPU20's firmware, known as the monitor. The angle-bracket (>) prompt indicates that the monitor is ready to accept monitor commands.

4. At the angle-bracket prompt, enter the following command and press the Return key:

```
> fc
```

   The following menu appears:

```
Firmware Configuration Utility
Commands:

C - Change parameters
D - Display parameters
E - Exit to monitor

?
```

These commands have the following functions:

C Alters current parameters
D Displays the current parameter settings
E Returns to the monitor prompt (>)

5. To change any of the configuration parameters, select C. The following parameters are displayed with their current settings (factory default settings shown):

```
Current Parameters:

0. Console baud rate        9600
1. Download baud rate       9600
2. Auto reboot              Reboot only
3. Initial Boot Source      Auto
4. Number of reboots        00
5. Network boot string      _cs1
6. Drive type               96 TPI
Q. Previous menu

Select Parameter  ?
```

Sections 3.9.1 through 3.9.6 describe each of these parameters. To modify a parameter setting:

a. Press the number corresponding to the parameter you wish to modify. Do not press the Return key.

b. The choices available for the parameters are displayed. Make your selection.

c. The new value is entered next to the parameter name, and the list of parameters is redisplayed.

   To return to the Firmware Configuration Utility menu, press Q.

   If you press an incorrect key, the message "Illegal parameter" appears, and the choices are redisplayed.

d. Select E to return to the monitor prompt shown in step 3.

6. To exit monitor mode, press the reset switch or power off the IB.

The following subsections describe MCPU20 firmware configurable parameters.

3.9.1 Console/Download Port Baud Rate

These two parameters allow individual selection of different baud rates for the console port and the download port. Baud rates of 110, 300, 1200, 2400, 9600, 19200, and 38400 are supported.

3.9.2 Automatic Reboot

After a fatal error, the system reboots if the auto reboot parameter is set to "r" (reboot only); it boots to monitor if it is set to "m" (boot monitor); it uploads the current CS/1 system image to the NCS and then reboots if this parameters is set to "u" (upload).

3.9.3 Initial Boot Source

The four options for the initial boot source parameter are "m" (Monitor), "n" (Network), "f" (Floppy), and "a" (Automatic). When the boot source is set to Monitor, the CS/1 enters monitor mode after passing the self-test. When the boot source is set to Network, the CS/1 attempts to boot by sending the network string to the network. When the boot source is set to Floppy, the CS/1 attempts to boot from the floppy diskette.

If the initial boot source parameter is Automatic, the system tests for attachment of a terminal to the console port. If a terminal is attached, the CS/1 enters the monitor and waits for entry of the boot source. If no terminal is attached, the CS/1 attempts to boot from the floppy diskette. If this attempt fails, the CS/1 will try to boot from the network using the network boot string.

3.9.4 Number of Reboots

This parameter displays the accumulated number of system fatal exceptions and panics. To set this value to zero, set it to "R" (reset).

3.9.5 Network Boot String

The network boot string is sent over the network and should elicit a confirmation response from a network boot server. The default string is _cs1. Do not change this string. This parameter applies to CS/1s that are configured for network boot.

3.9.6 Drive Type

Both 96- and 48-TPI disk drives are supported, although Bridge currently supplies only the 96-TPI drives with MCPU20 board-based servers.

3.10 System Shutdown Procedure

To shut down a CS/1, follow these steps:

1. Notify all users that the server is being shut down. You may do so from an SIO-A, SIO-16, or SIO-3270 port on a CS/1 via the Broadcast command, described in the *Connection Service User's Guide*.
2. Disconnect all active sessions from the CS/1. Refer to the *Connection Service User's Guide* for detailed descriptions of the commands used to display a list of sessions and to disconnect sessions.
3. Remove the diskette from the disk drive before powering off the server.
4. Turn off the power to the server.

3.11 Preventive Maintenance

Bridge recommends the following general procedures for preventive maintenance:

1. Observe the environmental requirements listed in Section 2.4. Temperatures outside the recommended range degrade system reliability and cause diskette access errors.
2. Keep the unit's top cover closed (except when actually adding or replacing boards) to ensure proper cooling of the unit.
3. When adding or replacing boards, handle the boards carefully. Avoid touching the gold board edge area, since body oils can affect the conductivity of the surface.
4. Clean the air intake filter periodically by scrubbing it with a stiff brush to remove accumulated dust and lint. The filter is located inside the enclosure, between the front panel and the cardcage.
5. Before powering on, powering off, or resetting the unit, be sure the disk activity LED on the unit front panel is not lit. Remove the diskette from the disk drive before powering the unit on or off.
6. Handle the diskette carefully. Always hold the diskette by its protective cover or by the label area; never touch the exposed areas of the diskette itself.
7. In case of a system crash, an immediate memory dump may aid in diagnosing the problem. The network manager should keep two formatted diskettes available for this purpose. The procedure for obtaining a memory dump is described in the *Network Management Guide*.
8. To avoid excessive diskette wear, change the system diskette every three months. The *Network Management Guide* describes the procedure for copying diskettes.
9. When the system diskette is changed, clean the disk head by using a head cleaning diskette (e.g., Inmac 7157). A head cleaning diskette is available as an option from Bridge as part of the Installation Support Tool Kit (CS/1-INTK).

SECTION 4

SYSTEM MODIFICATION

This section describes modifications that can be made to CS/1s and outlines procedures for making these modifications..

4.1 Standard System Features

The CS/1 product line consists of modular system components. Standard equipment, services, and manuals provided with a CS/1 include:

- MCPU or MCPU20 board
- Floppy Disk Controller (FDC) board (MCPU board-based servers with an internal disk drive only)
- *CS/1 Installation Guide*
- *Connection Service User's Guide*
- *Network Management Guide*
- *Configuration Guide*

Depending on the server model, certain required system components are selectable, such as network controller modules, I/O interface modules, and system software with compatible firmware. Each network controller module and I/O interface module automatically includes the appropriate backpanel attachment assembly (e.g., the Token Ring Controller module includes the TBA assembly; the SIO-3270 module includes the CBA assembly, and so on). Table 4-1 lists the components selectable for each version of the CS/1.

Table 4-1 Selectable System Components

Server Model	*Network Interface Module*	*I/O Module*	*Software*
CS/1	Choice of EC/2, IBC/M, or TRC/M	Choice of SIO-A, SIO-16, SIO-3270, SIO-H422, SIO-HS422, or V.35*	Choice of XNS, TCP/IP, or OSI protocols; MCPU20 board-based units provide only TCP/IP protocol support.
CS/1-FT	IBC/M**	Same as above	

* Up to four modules may be intermixed within the server.

** CS/1-FTs employ two IBC/M boards. Refer to Sections 3.3.3 and 3.6.1, and Appendix C for more information.

4.2 Optional System Components

The following equipment and services are optional with the CS/1 products:

- 5¼-inch floppy diskette drive
- Network interface cables
- Device cables
- *Software Technical Reference Manual*

4.3 Adding I/O Modules

This section describes the steps required for adding and replacing I/O modules.

** NOTE **

When installing a module, connect the cable to the appropriate header on the MBI assembly.

Refer to Appendix C for descriptions of the I/O versions.

Each SIO module consists of one SIO board, one backpanel assembly, one SIO-to-backpanel cable, one 60-pin card edge connector, and two #4-40 x 0.50 in., cross-head, recessed screws with washers.

The SIO-16 module also includes a power cable for connecting the SBA-16 board with the MBI board.

The SIO board version and the backpanel assembly version must be compatible (e.g., an SIO-16 board must be used with an SBA-16 assembly). Steps for adding or replacing a backpanel assembly are included in the instructions.

SIO slot assignments are as follows:

Board # 1	Slot H
Board # 2	Slot G
Board # 3	Slot F
Board # 4	Slot E

SIO, SIO-16, or SIO-3270 board numbers must be assigned in sequence and in ascending numeric order. When adding a new SIO, SIO-16, or SIO-3270 board, always assign the next unused number.

** CAUTION **

Electro-static discharge (ESD) can damage PROMs and other circuit board components. Do not remove a circuit board or PROM from its static protective package prior to installation. When handling any circuit board or PROM, avoid touching pins, leads, solder connections, or gold-plated edges. Failures resulting from ESD may void your warranty. For handling instructions, refer to Section 3.1.

The steps required to add any SIO module are as follows:

1. Verify that the unit is powered off.
2. Remove the top cover. Disengage each ball stud separately by lifting each side of the back overhang with a brisk upward motion.
3. If the new assembly is an SBA-422H, SBA-422A, SBA-H422A, SBA-HS422, or SBA-V.35, go to step 5.

   If the assembly is an SBA-A, SBA-16, CBA, SBA-SM, or SBA-ST, place the 60-pin card edge connector in the appropriate slot of the cardcage and bolt it in place with the two screws and washers provided. Pin 1 of the connector must be adjacent to the 86-pin connector.
4. Remove all cables going to the cardcage and the MBI assembly.
5. Remove the three cross-head screws attaching the cardcage to the chassis and carefully lift out the cardcage.

   If the assembly is an SBA-A, SBA-16, SBA-SM, or SBA-ST, elevate the cardcage and insert the end of the backpanel cable into the 60-pin card edge connector installed in step 3. The colored stripe on the cable must point toward the outside of the cardcage. Be careful not to bend the pins when inserting the cable connector in the card edge connector.

   If the assembly is an SBA-422H, SBA-422A, SBA-H422A, SBA-HS422, or SBA-V.35, place the 60-pin card edge connector in the appropriate slot of the cardcage and bolt it with the two screws and washers provided. Pin 1 of the connector must be adjacent to the 86-pin connector. Be careful not to bend the pins when inserting the cable connector in the card edge connector.
6. If the assembly is a CBA, remove the three cross-head screws attaching the cardcage to the chassis and lift out the cardcage carefully. Insert the end of the flat cable connector into pins 2 through 19 of the Multibus P2 connector that was installed in step 3, above. The ribbon cable connector contains two notches, one at each end of the connector. To connect the ribbon cable to the appropriate pins, orient the first notch in the connector over pin 1 and the second notch over pin 20 so that only pins 2 through 19 are connected; pin 1 and pins 20 through 60 are not connected to the ribbon cable. When connected appropriately, the ribbon cable leads toward the power supply.
7. Verify that the filter foam is placed correctly before replacing the cardcage.
8. Replace the cardcage and reinstall the three cross-head screws, attaching the cardcage to the chassis.
9. Reconnect all cables to the cardcage.
10. Remove the six #4-40 x 0.25" screws holding the appropriate blank backpanel cover to the chassis back panel. The leftmost backpanel cover (as seen from the back of the unit) is assigned to board number 1. The backpanel cover to its right is assigned to board 2; the next, to board 3; and the rightmost, to board 4.
11. If the backpanel cable was not shipped from the factory already connected to the backpanel assembly, connect the free end of the backpanel cable to the bottom header (J10). The red mark on the cable must point toward the fan (i.e., toward the pin-60 side of the connector).

12. Attach the new backpanel assembly to the backpanel using the six screws and washers removed in step 10.
13. If the backpanel assembly is an SBA-16, connect the power cable to the SBA-16 and to the MCPU board.
14. Assign an SIO board number to the new board (refer to Sections 3.3.8, 3.3.9, and 3.3.10, respectively for SIO, SIO-16, and SIO-3270 board default port configuration information).
15. Install the new SIO board in the cardcage slot in which the new 60-pin connector was installed in step 3 or 5. Seat the new board with a firm downward push.
16. To replace the top cover, align the gridded area on the cover with the fan and push the cover down gently until it snaps into place.

4.4 Replacing an SIO Board

This section describes the procedure for replacing an installed SIO, SIO-16, or SIO-3270 board.

**** NOTE ****

If an SIO-16 module is replacing an SIO-A module, some software configuration may be necessary. See the descriptions of the ReaD and SetDefault commands in the *Connection Service User's Guide*.

1. Verify that the unit is powered off.
2. Remove the top cover by lifting each side of the back overhang.
3. Remove the board by pulling up firmly on the extractor levers. Place the board in the protective bag in which the replacement board was shipped.
4. Assign a board number to the replacement board (refer to Sections 3.3.8 through 3.3.10, depending on the board type).

**** CAUTION ****

Electro-static discharge (ESD) can damage PROMs and other circuit board components. Do not remove a circuit board or PROM from its static protective package prior to installation. When handling any circuit board or PROM, avoid touching pins, leads, solder connections, or gold-plated edges. Failures resulting from ESD may void your warranty. For handling instructions, refer to Section 3.1.

5. Install the replacement board in the slot from which the original board was removed in step 3.
6. Replace the top cover.

4.5 Replacing Firmware

To replace firmware, follow these steps:

1. Power off the server and unplug the power cord from the power source.
2. Remove the top cover by lifting each side of the back overhang.
3. Remove the board that contains the PROM to be replaced by pulling up firmly on the extractor levers. Table 4-2 lists each PROM type and the board on which each is installed.

Table 4-2 CS/1 PROM Types

PROM Identifier	*Associated Board*
M3 MMON	MCPU20
M1 MMON	MCPU
M0 ASYN	SIO-A, -16
M1 SYNC	Synchronous SIO
M2 CURZ	SIO-3270
M2 IBCM	IBC/M
M1 IECM	IEC/M

4. For all SIO versions identify the PROM to be replaced by comparing the alphanumeric identifier on the new PROM with that of the old PROM. Do not interchange a low-order PROM with a high-order PROM.
5. Take note of the orientation of the notch or prong 1 identifier in the old PROM. The new PROM must be oriented in the same direction. Do not use the printed label to determine the orientation of the PROM.

**** CAUTION ****

When the system is powered on, failure to orient the PROM correctly destroys the PROM.

6. Using a small screwdriver or PROM-pulling tool and making sure not to bend the prongs, carefully pry the old PROM out of its socket.
7. Remove the new PROM from the antistatic foam shipping pad.
8. If the rows of prongs have been misshapen, push the side of the PROM against a flat surface so that the prongs are at right angles to the PROM body and fit easily into the socket.

9. Being careful to line the prongs up with the socket, gently push the new PROM into its socket.

** CAUTION **

Be certain that no prongs are bent under the body of the PROM. Each prong must be properly inserted into the socket.

10. Place the old PROM in the antistatic foam pad.
11. The unit may now be powered on to run the self-test diagnostics, described in Appendix A. Retain the old PROM until the system has been powered up and tested with the new firmware.
12. If the new PROM fails the self-test diagnostics, verify that the PROM prongs are correctly inserted into the socket, and that no prong is bent under the PROM. Check the orientation of the PROM.
13. Follow the instructions in the release memo for return of the firmware.
14. Replace the top cover by aligning the gridded area on the cover with the fan and pushing the cover down gently until it snaps into place.

4.6 Adding Custom Interfaces

Custom interfaces that can be added to the CS/1 are:

- Additional Multibus board(s) in the cardcage
- Additional iSBX™ bus device(s) on the MCPU; iSBX is not supported by MCPU20

APPENDIX A

POWER-ON DIAGNOSTICS

The power-on, self-test diagnostics, which determine whether the boards in the system are functioning correctly, are performed automatically whenever the CS/1 is powered on or reset. The tests are grouped into primary and secondary tests.

The primary test runs on the Main CPU (MCPU or MCPU20) board. If the primary test fails, there is a fault on the Main CPU board, and further testing is aborted. The Self Test LEDs on the front panel and on the Main CPU board itself remain lit.

If the primary test is successful, the secondary tests are performed on the network controller and SIO boards.

On servers with an EC/2, a failure in the checksum PROM and RAM tests aborts further testing. On servers with an IBC/M, a failure in the checksum, 8253, or RAM tests aborts further testing. On servers with a TRC/M, a failure in the RAM tests aborts further testing.

If a console terminal is present during the power-on diagnostic tests for the EC/2, the IBC/M, or the TRC/M, error messages and test results are displayed on the terminal screen, if possible. When a secondary test fails, the monitor retains control of the system and waits for further commands. If this occurs, contact Bridge or an authorized service representative.

When all the tests are completed, the system is ready to be booted. Appendix B describes the bootstrap procedure.

The self-test diagnostics check most of the server hardware functionality. A more complete diagnostic package, called the Installation Support Tool Kit (CS/1-INTK), is available as an option from Bridge.

The following sections describe the diagnostics for the individual boards. Section A.3 lists the status and error messages associated with each board. Figure A-1 in Section A.3 illustrates a sample screen of messages following the power-on diagnostics for the CS/1 server.

A.1 Primary Tests

Primary tests are performed on the Main CPU boards (MCPU and MCPU20).

A.1.1 MCPU Board Diagnostics

The MCPU board contains two diagnostic LEDs, labeled SELF TEST and Halt. Figure 3-6 in Section 3.3.5 illustrates the positions of the LEDs on the board. The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are running. The LED turns off when the diagnostics complete successfully (10 to 12 seconds, depending on the amount of memory on and the speed of the board). If the LED fails to light at all, or if it remains lit longer than 12 seconds, the board should be replaced.

The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. If the failure that caused the Halt LED to light is in the software, pressing the Reset switch on the front panel may clear the problem. If the Halt LED remains lit after a system reset, or if it lights frequently during normal operation, a malfunction is indicated; contact Bridge or an authorized service representative.

Table A-1 lists the MCPU self-tests. If an error is encountered in tests 1 through f, further testing is aborted; an error message is sent to the console terminal, if possible. Section A.3 lists the status and error messages associated with the MCPU self-tests.

Table A-1 MCPU Self-Tests

Test Number	*Test Name*
1	Prom low byte checksum
2	Prom high byte checksum
3-7	9513 5-channel counter
8	Onboard data bus ripple
9	Onboard address bus ripple
a-c	Onboard RAM march
d-f	Onboard RAM refresh
10-11	9513 interrupts
12	Multibus timeout
13-14	Offboard data bus ripple
17-18	Offboard address bus ripple

A.1.2 MCPU20 Board Diagnostics

The MCPU20 contains two diagnostic LEDs for main processor halt and self tests. Figure 3-9 in Section 3.3.6 illustrates the positions of LEDs on the board.

The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are running. The LED turns off when the diagnostics complete successfully (15 to 30 seconds, depending on the amount of memory in the system). If the LED fails to light at all, or if it remains lit longer than 30 seconds, the board should be replaced.

The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. If the failure that caused the Halt LED to light is in the software, pressing the Reset switch on the front panel may clear the problem. If the Halt LED remains lit after a system reset, or if it lights frequently during normal operation, a malfunction is indicated; contact Bridge or an authorized service representative.

Table A-2 lists the MCPU20 self-tests. If an error is encountered in tests 1 through d, further testing is aborted; an error message is sent to the console terminal, if possible.

Table A-2 MCPU20 Self-Tests

Test Number	*Test Name*
1	UART data bus ripple test
2	Prom checksum
3	EEPROM initialization test
4	8253 3-channel counter test
5	RAM data bus ripple test
6	RAM RAS and CAS generation test
7	RAM address bus ripple test
8	RAM march test
9	RAM refresh test
a	8253 interrupt test
b	8272 initialization test
c	82530 UART tests: channels a and b
d	Multibus timeout test

A.2 Secondary Tests

Secondary tests run on the EC/2, IBC/M, TRC/M, and SIO boards.

A.2.1 EC/2 Board Diagnostics

The EC/2 board is available in two versions: the 256-kilobyte EC/2 and the 512-kilobyte EC/2. The versions are identical, except for the differing memory sizes.

The EC/2 board contains six LEDs: one Halt LED and five Self Test LEDs (labeled A through E). At power-on, all the LEDs are turned on. Then, as the EC/2 board runs its 18 self-tests, the LEDs corresponding to the number of the test being run light. The test number is encoded in binary on the board's self test LEDs. For example, if LED A lights, binary 10000 is indicated, corresponding to test number 16. If no errors are encountered, the LEDs are turned off.

The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. If the failure that caused the Halt LED to light is in the software, pressing the Reset switch on the front panel may clear the problem. If the Halt LED remains on after a system reset, or if it lights frequently during normal operation, a malfunction is indicated; contact Bridge or an authorized service representative.

During EC/2 testing, a failure on the checksum PROM and RAM test aborts further testing.

Figures 3-2 and 3-3 in Section 3.3.1 show the positions of the LEDs on the EC/2 board (part numbers 06-0021-xx and 06-0041-xx, respectively).

Table A-3 lists the EC/2 board self-tests. Section A.3 lists status and error messages associated with the EC/2 board self-tests.

Table A-3 EC/2 Board Self-Tests

Test Number	*Test Name*
1	PROM Low Byte Checksum
2	PROM High Byte Checksum
3-5	8253 Three-Channel Timer Test
6	Onboard Data Bus Ripple Test
7	Onboard Address Bus Ripple Test
8	Onboard RAM March Test
9	Onboard RAM Refresh Test
a	8253 Timer Generated Interrupt
b	Channel Attention Generated Interrupt Test
c	Test and Set Check of Lock
d	Lance Initialization Test
e	Lance Single Fragment Transmission Test
f	Lance Transmission and Reception of a Single Fragment Test
10	Lance Transmission and Reception with Odd Length Test
11	Lance Transmission and Reception without CRC Error Test
12	Lance Transmission and Reception with CRC Error Test

A.2.2 IBC/M Board Diagnostics

The IBC/M board contains seven LEDs: one Halt LED, one Carrier Sense LED, and five Self Test LEDs (the LED area is labeled simply "LEDs"; individual LEDs are unlabeled).

In order for self-tests to run successfully on the IBC/M board configured for connection to a Bridge Broadband network, the RFM/5 modem must be installed and connected to the server. The server, however, need not be attached to the network.

At power-on, all the Self Test LEDs light for approximately 3 seconds and then briefly go out. As each self-test runs, the LEDs relight correspondingly. If no errors are encountered in a test, the LED for that test turns off.

The Halt LED lights at power-on and reset or when the microprocessor is in a halt state. If the failure that caused the Halt LED to light is in the software, pressing the Reset switch on the front panel may clear the problem. If the Halt LED remains on after a system reset, or if it lights frequently during normal operation, a malfunction is indicated; contact Bridge or an authorized service representative.

The Carrier Sense LED indicates network activity. If this LED does not light during normal operation, contact Bridge or an authorized service representative.

Figures 3-4 and 3-5 in Sections 3.3.2 and 3.3.3 show the positions of diagnostic LEDs on the IBC/M board.

Table A-4 lists the IBC/M self-tests. Section A.3 lists status and error messages that may appear on the terminal screen.

Table A-4 IBC/M Board Self-Tests

Test Number	*Test Name*
1	Checksum 0-7
2	Checksum 8-F
3	8253 channel 0
4	8253 channel 1
5	8253 channel 2
6	RAM data bus ripple test
7	RAM address bus ripple test
8	RAM pattern test
9	RAM refresh test
a	TIC interrupt
b	Modem 8251 test
c	82586 Self-test
d	82586 internal loopback
f	82586 multiplexer test

A.2.3 TRC/M Board Diagnostics

This section describes the TRC/M board diagnostics. Although the TRC/M board contains no diagnostic LED indicators, the board runs self-test diagnostics that are similar to those run on the other network controller boards. Error messages are sent to the console terminal, if possible, when errors are encountered.

For self-tests to run on the TRC/M board, a network cable must be attached to the back of the server; the server, however, need not be attached to the network. Section A.3 lists the status and error messages that may appear on the terminal screen.

Table A-5 lists the TRC/M board self-tests.

Table A-5 TRC/M Board Self-Tests

Test Number	*Test Name*
0	Initial test
1	ROM CRC test
2	RAM error test
3	Instruction test
4	Context/interrupt test
5	Protocol handler hardware test
6	System interface register test

A.2.4 SIO Board Diagnostics

This section describes the SIO board diagnostics. Section A.2.5 discusses the SIO-16 board diagnostics; Section A.2.6 describes the SIO-3270 board diagnostics.

Each SIO board contains two diagnostic LEDs, labeled SELFTEST and HALT. Figure 3-10 in Section 3.3.8 illustrates the positions of the LEDs. The Self Test LED lights at power-on and reset to indicate that the self-test diagnostics are being performed. The LED turns off when the diagnostics complete successfully (approximately 10 seconds). If the LED fails to light at all during power-on, or if it remains lit longer than 10 seconds, the board should be replaced.

The Halt LED lights during reset and when the microprocessor is in a halt state. If the failure that caused the halt LED to light is in the software, pressing the Reset switch on the front panel may clear the problem. If the Halt LED remains on after a system reset, or if it lights frequently during normal operation, a malfunction is indicated; contact Bridge or an authorized service representative. Table A-6 lists the SIO board self-tests. Section A.3 lists the status and error messages associated with the SIO self-tests.

Table A-6 SIO Board Self-Tests

Test Number	*Test Name*
1	Prom low byte checksum
2	Prom high byte checksum
3	Onboard data bus ripple
4	Onboard address bus ripple
5	Onboard RAM march
6	Onboard RAM address pattern
7-b	9513 5-channel counter 1
c-10	9513 5-channel counter 2
11-12	9513 timer interrupts
13	Channel attention interrupt
14-15	Serial controller 1, polled
16-17	Serial controller 2, polled
18-19	Serial controller 3, polled
1a-1b	Serial controller 4, polled
1c-1d	Serial controller 1, stat int
1e-1f	Serial controller 2, stat int
20-21	Serial controller 3, stat int
22-23	Serial controller 4, stat int
24-25	Serial controller 1, rx tx int

(continued)

Table A-6 SIO Board Self-Tests (continued)	
Test Number	*Test Name*
26-27	Serial controller 2, rx tx int
28-29	Serial controller 3, rx tx int
2a-2b	Serial controller 4, rx tx int
2c	Multibus timeout test
2d-2e	Offboard data bus ripple
31-32	Offboard address bus ripple

A.2.5 SIO-16 Board Diagnostics

The SIO-16 board contains one LED, labeled CR1. This LED lights to indicate that the microprocessor is in a halt state and ready to download code to the SIO-16 board's RAM area. The LED also lights when the server is initialized or reset. The LED is unlit when the microprocessor is running. Figure 3-11 in Section 3.3.9 illustrates the position of this LED.

The SIO-16 board self-test diagnostics download and run automatically at power on, with no external LEDs or other indicators. If a console terminal is present during the power-on diagnostic tests, error messages and test results print on the terminal, if possible.

Table A-7 lists the SIO-16 self-tests. Section A.3 lists the status and error messages associated with each test.

Table A-7 SIO-16 Board Self-Tests

Test Number	*Test Name*
1	Onboard data bus ripple
2	Onboard address bus ripple
3	Onboard RAM march
4	8253 timer interrupts, counter 1
5	8253 timer interrupts, counter 0
6-7	Serial controller 1, polled
8-9	Serial controller 2, polled
a-b	Serial controller 3, polled
c-d	Serial controller 4, polled
e-f	Serial controller 5, polled
10-11	Serial controller 6, polled
12-13	Serial controller 7, polled
14-15	Serial controller 8, polled
16-17	Serial controller 1, rx, tx internal
18-19	Serial controller 2, rx, tx internal
1a-1b	Serial controller 3, rx, tx internal
1c-1d	Serial controller 4, rx, tx internal
1e-1f	Serial controller 5, rx, tx internal
20-21	Serial controller 6, rx, tx internal
22-23	Serial controller 7, rx, tx internal
24-25	Serial controller 8, rx, tx internal
26	Offboard data bus ripple
27	Offboard address bus ripple
28	Channel Attention interrupt

A.2.6 SIO-3270 Board Diagnostics

This section describes the SIO-3270 board diagnostics. For a discussion of the SIO and SIO-16 board diagnostics, see Sections A.2.4 and A.2.5, respectively. The SIO-3270 board's self-test diagnostics are performed automatically each time the server is powered on or reset.

The SIO-3270 module contains eight diagnostic LEDs, labeled LED1 through LED8. Figure 3-12 in Section 3.3.10 illustrates the positions of these LEDs.

All the LEDs light at power-on or reset, then go off, except LED8, which lights at power-on or reset and remains lit while the server is running. LED7 lights when the diagnostics begin, to indicate that the self-tests are running. As each self-test runs, the LEDs light correspondingly and go out when the self-test completes successfully. If an error occurs, the LED corresponding to the test remains lit until the fault is corrected; in addition, LED5 or LED6 lights until the monitor is entered. Table A-8 lists the SIO-3270 self-tests. Section A.3 lists the diagnostic messages associated with the SIO-3270 self-tests.

Table A-8 SIO-3270 Board Self-Tests

Test Number	*Test Name*
1	RAM
2	Jumpers
3	EPROM
4	Counters
5	Bus Timeout
6	Link
7	Multibus RAM

A.3 Diagnostic Messages

If a console terminal is attached to a CS/1, status and error messages generated by the power-on self-tests are sent to the terminal, if possible. The following briefly lists and describes these messages.

```
Bridge Communications MCPU Monitor
>
```

This message and prompt appear when the self-tests have completed and an MCPU board is installed. Control returns to the MCPU monitor.

```
Bridge Communications MCPU20 Monitor
>
```

This message and prompt appear when the self-tests have completed and an MCPU20 board is installed. Control returns to the MCPU20 monitor.

```
EC/2 - Failed Test # <x>
IEC/M - Failed Test # <x>
IBC/M - Failed Test # <x>
TRC/M - Failed Test # <x>
```

One of these messages is displayed if an error is encountered in test <x>. The network controller listed in the message is the one present in the system.

In servers with an EC/2 board, the test number is encoded in binary on the five Self Test LEDs. For example, if LED A lights, binary 10000 is indicated, corresponding to test 16. In servers with an IBC/M board, the test number is encoded in binary on the five Self Test LEDs. For example, if the first Self Test LED lights, binary number 10000 is indicated, corresponding to test 16.

```
Network Controller - not present
```

This message appears if the network controller does not respond to a Multibus memory access. Control returns to the MCPU or MCPU20 monitor.

```
EC/2 - Passed Station Address - <xxxxxxxxxxxx> M0 EDL2 rev. <xxy>
IEC/M - Passed Station Address - <xxxxxxxxxxxx> M0 EDL2 rev. <xxy>
IBC/M - Passed Station Address - <xxxxxxxxxxxx> M2 IBCM rev. <xxy>
TRC/M - Passed Station Address
```

One of these messages appears if no errors are encountered in the network controller tests. In these messages, <xxy> represents the board's revision level and <xxxxxxxxxxx> represents the server's physical address. The network controller listed is the one present in the system. Control returns to the MCPU or MCPU20 monitor.

```
EC/2 - timed out
```

```
IEC/M - timed out
```

```
IBC/M - timed out
```

```
TRC/M - timed out
```

One of these messages appears if the network controller is present but does not respond to a status request. The network controller listed is the one present in the system. Control returns to the MCPU or MCPU20 monitor.

```
Floppy Controller not present
```

This message appears if the system has no internal disk drive.

```
MCPU - Failed Test # <x>
```

For MCPU-based CS/1 units, this message is displayed if an error is encountered in test <x>, where <x> represents the test number.

```
MCPU - Passed M1 MMON rev. <xxy>
```

This message appears if no errors are encountered in the MCPU self-tests.

```
MCPU20 - Failed Test # <x>
```

For MCPU20-based CS/1 units, this message is displayed if an error is encountered in test <x>, where <x> represents the test number.

```
MCPU20 - Passed M3 MMON rev. <xxy>
```

This message appears if no errors are encountered in the MCPU20 self-tests.

```
Series/1 Power-up
```

This message appears when the MCPU or MCPU20 board enters the test sequence, and stays on the screen whether the tests terminate or fail.

`SIO <n> - Passed M<x> <aaaa> rev. <xxy>`

This message appears if no errors are encountered in the SIO self-tests. In this message, <n> represents the SIO board number, <x> represents PROM size, <aaaa> indicates the SIO board type, and <xxy> represents the board's revision level.

`SIO <n> - Failed Test # <x>`

This message appears if an error is encountered in test <x>.

`SIO <n> - not present`

This message appears if any of the possible SIO boards fails to respond to a Multibus request. Control returns to the MCPU or MCPU20 monitor. This message indicates an error only if an SIO board is actually in place in the slot indicated in the message.

`SIO <n> - timed out`

This message appears if SIO boards are present, but do not respond to a status request. Control returns to the MCPU or MCPU20 monitor.

Figure A-1 shows a sample screen of messages following the power-on diagnostics. The diagnostics were run on a server with an EC/2 board, an SIO board, an SIO-16 board, and no internal disk drive.

```
Series 1 Power-up
MCPU20 - Passed M3 MMON rev. 00B
0 - EC2 - Passed Station Address - 080002003113 M0 EDL2 rev. 00A
1 - SIO - Passed M0 ASYN rev.17B
2 - SIO - Present MR ASYN
3 - Not Present
4 - Not Present

Bridge Communications MCPU20 Monitor
>
```

Figure A-1 Sample Power-on Diagnostics Messages

APPENDIX B

BOOTSTRAP PROCEDURE

The CS/1 offers three bootstrap options: automatic bootstrap, floppy bootstrap, and network bootstrap. CS/1s running either the OSI, XNS, or TCP/IP protocols support both automatic and floppy bootstrap; however, network bootstrap support hinges on the type of NCS from which the server boots and the type of high-level protocol employed.

CS/1s running the XNS protocols support network bootstrap from an NCS/AT, NCS/1, or NCS/150, but do not support the option from an NCS/2. CS/1s running the TCP/IP protocols support network bootstrap from an NCS/150 and NCS/2, but do not support the option from an NCS/1 or NCS/AT.

The option is selected by the Bootstrap Option shorting plug positions on the MCPU board (refer to Section 3.3.5), or via the MCPU20 Firmware Configuration options menu as described in Section 3.9.

1. Automatic Bootstrap

   The server first checks for the presence of a terminal attached to the console port.

   - If no console terminal is attached, the server checks for the presence of a diskette in the disk drive. If a diskette is present, the server performs a floppy bootstrap (option 2). If no drive or diskette is present, the server performs a network bootstrap (option 3). If the network bootstrap request fails, the Self Test LED on the front panel begins flashing.
   - If a console terminal is attached, the server branches into the MCPU (or MCPU20) monitor and prints an angle-bracket prompt (>) on the console.

     To specify floppy bootstrap, enter the command:

     ```
     bt [<filename>]
     ```

     where "filename" is an optional file specification. The filename must be a single numeric character (i.e., 0 through 9). If a filename is specified, the server attempts to boot from the specified file. If no filename is entered, the server boots from the default bootfile (file 0). If no drive or diskette is present, or if the file is not found, an error message appears on the console and the monitor retains control of the server.

To specify network bootstrap, enter the command:

```
bt <filename>
```

where "filename" is a bootfile on the NCS's disk. If no filename is specified, the server attempts to boot from file 0 on an internal disk drive. If no drive or diskette is present or file 0 is not found, an error message appears on the console and the monitor retains control of the server. A valid NCS bootfile name can contain up to 14 characters, the first of which cannot be a number. If the specified NCS disk file is not found, or if no NCS in the network is operational, an error message appears on the console and the monitor retains control of the server.

2. Floppy Bootstrap

If the configurations specify floppy bootstrap, the server does not check for the presence or absence of the console terminal, but boots directly from the default bootfile on the local diskette. If a console terminal is attached and either no diskette is present or no bootfile is found, an error message appears on the terminal and the monitor retains control of the server. If no terminal is attached and either no diskette is present or no bootfile is found, the Self Test LED on the front panel begins blinking.

3. Network Bootstrap

When a server is powered on or reset with network bootstrap selected, it broadcasts a primary boot request over the network, asking for bootstrap from its primary NCS. Primary and secondary NCSs are discussed in detail in the NCS installation and operation guides. Refer to the appropriate guide for installation information. Each primary NCS on the network responds to this request by comparing the network address of the server issuing the request with the network addresses of its client servers.

If the server is listed as a client of the primary NCS, that NCS sends the server the Connection Service software and the configuration tables established for the server's ports.

If the client server receives no answer to its first request within 10 seconds, it repeats the primary boot request up to six times.

If the client server receives no answer to any of its primary boot requests, it broadcasts a secondary boot request to ask for bootstrap from its secondary NCS. If the client server's files have been backed up to the secondary NCS, the secondary NCS sends the server the Connection Service software and the configuration tables established for the server's ports.

If the server does not get a response to the boot requests and no console terminal is attached, the Self Test LED on the front panel begins flashing. If the server does not get a response to its boot requests and a console terminal is attached, an error message appears on the console and the monitor retains control of the server. If a console terminal is attached and the bootstrap software is received from the network, the server displays a series of periods on the terminal screen during bootstrap.

All of these options may also be affected by the setting of the Automatic Reboot option configuration areas on the MCPU board (see Section 3.3.5), or the MCPU20 firmware configuration setting for this option (see Section 3.9). If this setting enables the auto reboot feature, and any boot attempt fails, the server displays an error message on the console (if present) and then automatically restarts, performs the self-test diagnostics, and tries to perform the bootstrap operation again. This cycle continues indefinitely until the server boots successfully or is powered off.

If the bootstrap procedure is successful, the CS/1 is operational and ready to be used to configure user device ports or to establish network connections.

If the bootstrap procedure is performed without a console terminal, and a terminal is subsequently attached, the system immediately branches into the monitor. During normal operation, no console terminal should be attached; this port is used only for system generation and for custom software development.

APPENDIX C

SYSTEM ARCHITECTURE

C.1 Overview

Each CS/1 consists of three basic functional modules: the Central Communications Processor (CCP) module and two external interface modules (I1 and I2). These basic modules are illustrated in Figure C-1.

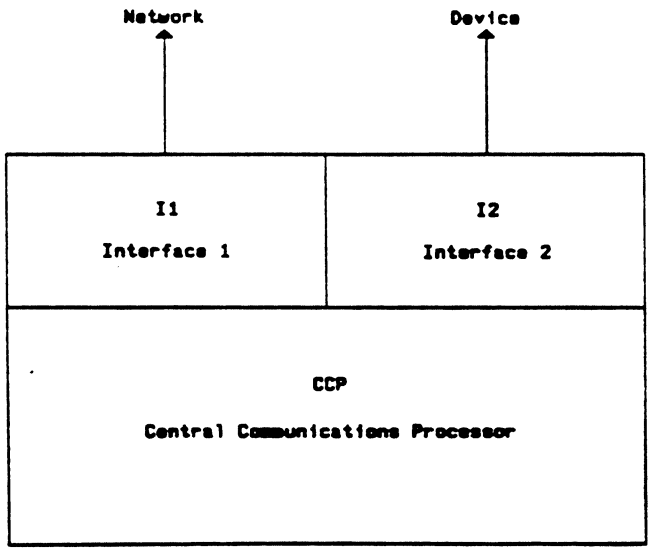


Figure C-1 Basic Functional Modules

The CCP is made up of either a Main CPU (MCPU) or Main CPU20 (MCPU20) board, a multitasking kernel (the operating system), the communications protocol software, and support software. The CCP provides the internal interface between the two external interface modules.

The I1 module is the Network Controller module. The I2 module is an I/O module.

The system hardware is described in Section C.2; the system software is described in Section C.3.

C.2 Hardware Modules

The CS/1 hardware modules and their correspondence with the functional modules are illustrated in Figures C-2, C-3, and C-4. Figure C-2 depicts the CS/1 hardware architecture for servers featuring the MCPU board, and asynchronous, byte-syncyhronous, or bit-synchronous interfaces. Figure C-3 illustrates the CS/1 hardware architecure for servers featuring the MCPU20 board, and same interfaces. Figure C-4 depicts a broadband version of the CS/1 with the MCPU20 board. The braces delineate the functional modules; the hardware modules are boxed.

The hardware used to attach the server to the network (e.g., a transceiver or a broadband modem) is not typically included as part of the CS/1 products, but is available separately from Bridge. The hardware modules are interconnected by an IEEE 796 Multibus-standard Main Backplane Interconnect (MBI) board. The following sections describe the major modules, MBI and other miscellaneous hardware components of the CS/1. CS/1-FT implementation features some differences with respect to network interfacing. These differences are outlined separately in Section C.2.5.

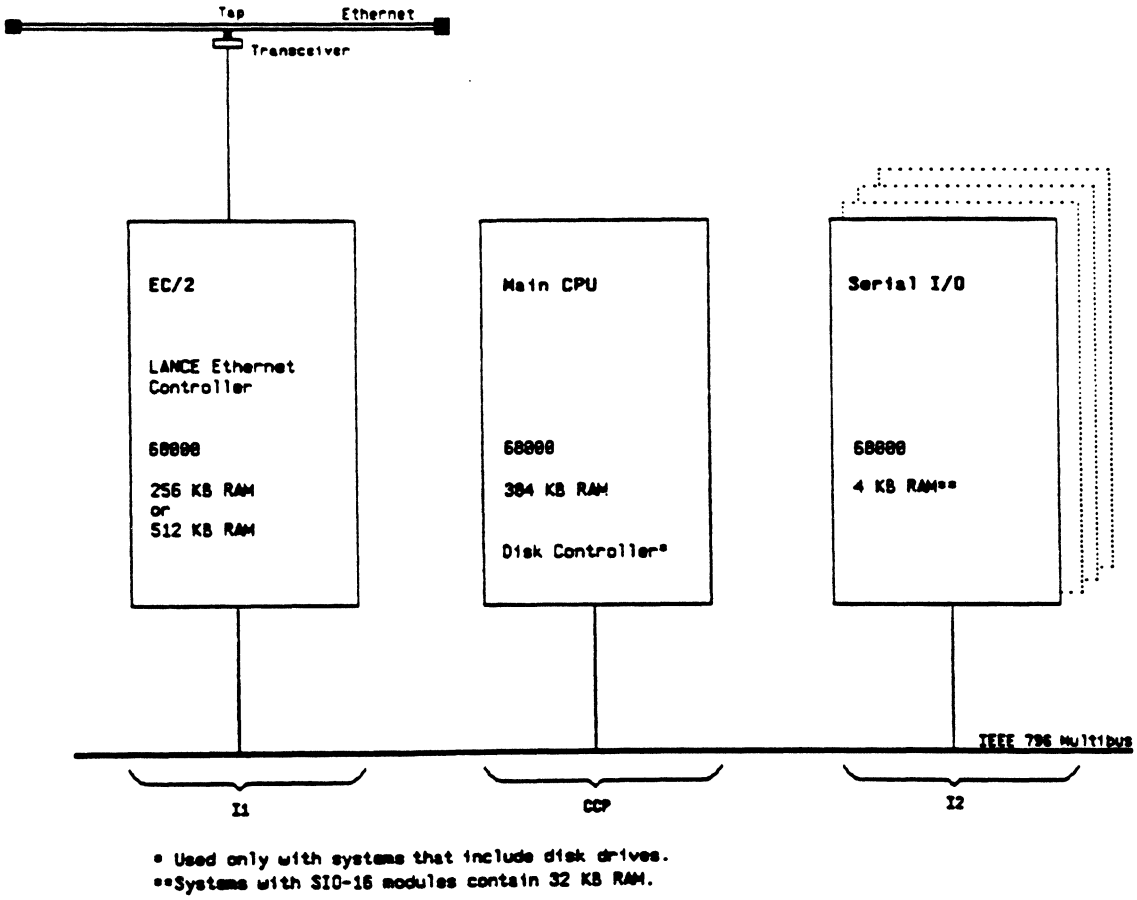
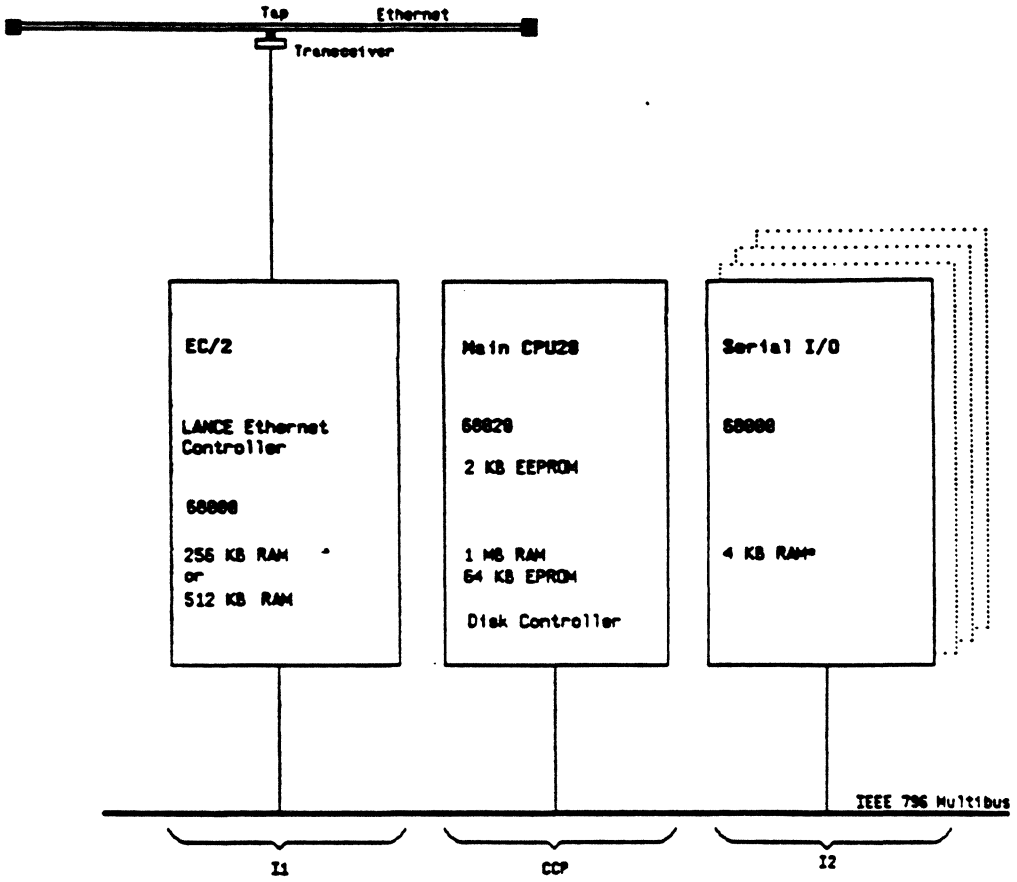


Figure C-2 CS/1 (with MCPU Board and Asynchronous, Byte-synchronous, or Bit-synchronous Interfaces) Hardware Architecture



* Systems with SIO-16 modules contain 32 KB RAM.

Figure C-3 Ethernet-based CS/1 (with MCPU20 Board and Asynchronous, Byte-synchronous, and Bit-synchronous Interfaces) Hardware Architecture

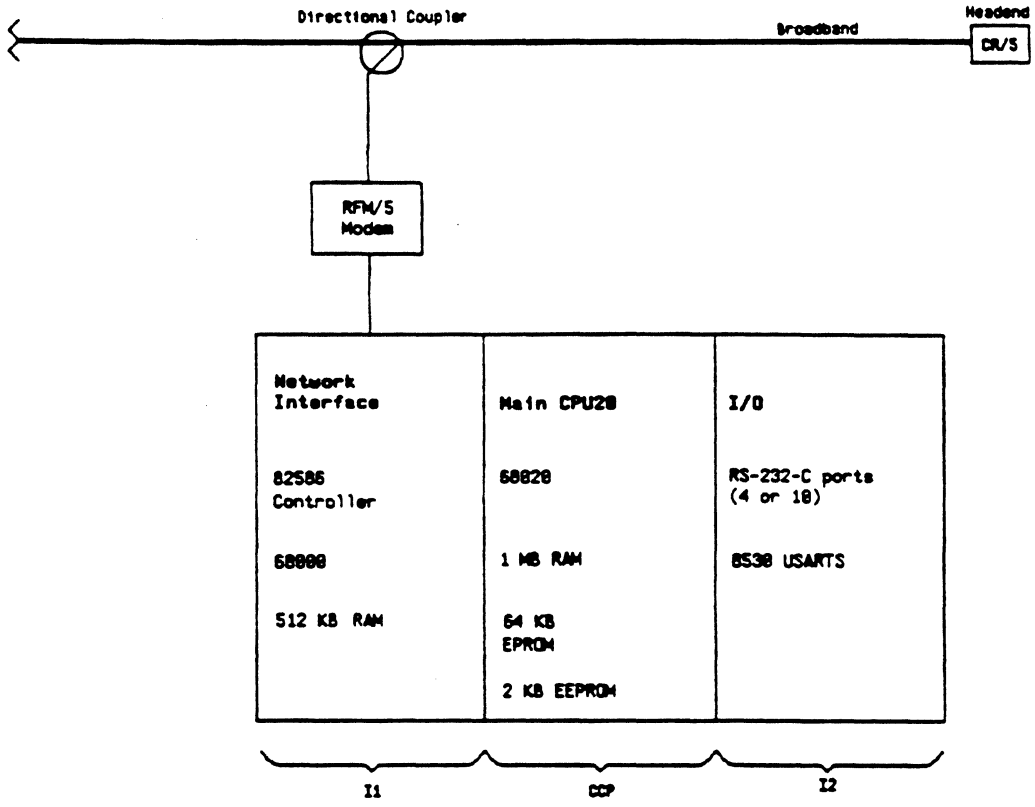


Figure C-4 CS/1 Hardware Architecture
(with the MCPU20 Board and a Bridge Broadband Interface)

C.2.1 Network Controller Module

Bridge Communications offers three network options:

- Ethernet
- Token Ring
- Broadband

Each network option requires a different network controller module: an Ethernet Controller/2 (EC/2) module for Ethernet networks; an Intelligent Broadband Controller/Multibus (IBC/M) module for broadband networks; or a Token Ring Controller/Multibus (TRC/M) module for Token Ring networks. Each network controller module includes a backpanel attachment assembly to facilitate connection to the appropriate network medium.

The network controller is a high-performance module that implements the network data link functions and buffers incoming packets from the network.

The EC/2 and IBC/M modules each contain on-board self-test diagnostics, a monitor, and an optional console terminal interface.

The TRC/M module contains no on-board self-test diagnostics; the module includes an optional console terminal interface, but no monitor.

The network controller modules are described below.

Ethernet Controller/2 (EC/2)

The Ethernet Controller/2 is a high-performance module that implements the network data link functions and buffers incoming packets from the network. It contains on-board self-test diagnostics, a monitor, and an optional console terminal interface.

The EC/2 module has two main functions: to transmit and receive Ethernet packets to and from the transceiver and to manage its buffers. The transmit functions include serialization, packet preamble generation, CRC generation, collision detection, and Manchester encoding. The receive functions include deserialization, packet preamble stripping, address recognition, CRC checking, Manchester decoding, and packet-too-long detection. The EC/2 board is a Multibus slave and is capable of generating one Multibus interrupt. It receives commands via Multibus address decoding and is capable of receiving a large number of back-to-back Ethernet packets. Its processor performs all of the data link functions not handled by the hardware, and the buffer management functions necessary to accommodate data exchange between the DMA and the Multibus.

For CS/1s, the EC/2 board is available in two versions: the 256-kilobyte EC/2 and the 512-kilobyte EC/2. The versions are identical, except that one has 256 kilobytes of memory and the other has 512 kilobytes.

The EC/2 is based on a 68000 microprocessor for managing the data link controller and associated data buffers. It supports 16 to 64 kilobytes of EPROM and one general-purpose 16-bit timer.

The EC/2 board can support additional memory (up to 1 megabyte) and two serial I/O ports via an optional DUEX board, and can connect directly to the Ethernet transceiver. The EC/2 board's Ethernet interface section has a LANCE Ethernet controller, which performs basic data link functions: data framing and decapsulation, serialization and deserialization, CRC generation and checking, and collision backoff and retransmission. The LANCE

controller also provides programmable features such as Time Domain Reflectometry, chaining DMA, promiscuous mode, and loopback mode.

Intelligent Broadband Controller/Multibus (IBC/M)

The IBC/M module transmits and receives packets to and from the broadband network. It is based on a 68000 microprocessor for managing the data link controller and associated data buffers. It supports 512 kilobytes of memory, 16 to 64 kilobytes of EPROM, and one general-purpose 16-bit timer. The IBC/M can include either a backpanel attachment assembly for connection to a broadband network, or a fault-tolerant backpanel assembly attaching either two broadband network connectors, one Ethernet connector and one broadband connector, or two Ethernet connectors. The broadband assembly is designated BBA-37; while the combination assemblies are designated NBA-BB (broadband/broadband); NBA-EE (Ethernet/Ethernet); or NBA-EB (Ethernet/broadband). The BBA-37 assembly contains the connectors for the MCPU (or MCPU20) board's console port interface, as well as the RFM/5 interface connector. The NBA assemblies each contain a single console port interface, in addition to the network connectors.

The IBC/M board connects directly to the RFM/5 connector. The IBC/M board's broadband interface section has an Intel 82586 controller, which performs basic data link functions: data framing, encapsulation and decapsulation, serialization and deserialization, CRC generation and checking, and collision backoff and retransmission. The 82586 controller also provides programmable features such as DMA chaining, promiscuous mode, and local loopback.

Token Ring Controller/Multibus (TRC/M)

The TRC/M module performs the network interface functions on Token Ring networks. The TRC/M module supports 512 kilobytes of memory and 48 kilobytes of EPROM. The TRC/M module uses the TMS380 chip set, which provides programmable features such as DMA chaining, internal and external local loopback, and ring monitor management functions.

The TRC/M module includes the Token Ring Backpanel Attachment (TBA) assembly. The TBA board contains the connectors for the MCPU board's console and auxiliary port interfaces, as well as a DB-9 connector to connect the standard IBM cable to the ring via a Multistation Access Unit interface connector.

C.2.2 Main CPU/CPU20 Module

The main CPU module consists of an MCPU or MCPU20 board and an optional Floppy Disk Controller (FDC) board (MCPU implementation only; MCPU20 board incorporates the floppy controller onboard). The MCPU or MCPU20 performs protocol processing and support functions, contains power-on self-test diagnostics and a monitor, and provides console terminal and auxiliary port interfaces.

The MCPU board is based on a 68000 microprocessor. It contains 384 kilobytes of RAM, 16 kilobytes of EPROM (expandable to 32 kilobytes), two general-purpose 16-bit timers, two serial I/O ports used for console and download, and an iSBX interface. The iSBX interface is described in reference [8]. The MCPU is a Multibus master and is capable of receiving and generating interrupts. The FDC board, if present, is piggybacked on the MCPU board via the iSBX interface.

The MCPU20 board is based on a 68020 microprocessor. It contains 1 megabyte of RAM, 64 kilobytes of EPROM (expandable to 1 megabyte), 2 kilobytes of EEPROM (expandable to 32 kilobytes), a general-purpose 16-bit timer, and two serial I/O ports used for console and download. There is no iSBX interface. The MCPU20 is a Multibus master and is capable of receiving Multibus interrupts. There is no FDC board when an MCPU20 is used; the floppy controller is integrated onto the MCPU20.

C.2.3 I/O Module

The primary function of the I/O module is to provide I/O device interfaces to the Bridge CS/1 products. This module is referred to as the Serial I/O (SIO) module. Refer to Sections 4.3 and 4.4 for procedures on adding and replacing SIO boards and modules.

SIO Module

The SIO module is available in three distinct types:

- SIO
- SIO-16
- SIO-3270

The following paragraphs describe the SIO module.

The CS/1 supports up to four SIO modules providing a maximum of 64 ports. Asynchronous, synchronous, and bit-synchronous SIO modules can be intermixed within one CS/1 unit.

Each SIO module consists of an SIO board, a Serial Backpanel Attachment (SBA) assembly and cable, a connector, and screws; the module contains self-test diagnostics but no monitor.

The SIO board is based on a 68000 microprocessor and contains 4 kilobytes of RAM, 16 kilobytes of PROM (expandable to 32 kilobytes), two general-purpose 16-bit timers, eight serial

I/O ports, and an iSBX interface (see reference [8]). The SIO board is a Multibus master and is capable of generating one Multibus interrupt. The SIO board receives commands via Multibus address decoding. The iSBX interface can be used to add interfaces to the CS/1. Sections 3.3.8 and 3.6.3 describe the SIO module.

SIO-16 Module

The SIO-16 module consists of an SIO-16 board, a Serial Backpanel Attachment (SBA-16) assembly and cable, a connector, screws, and a power cable for connecting the SBA-16 board to the MCPU board. The SIO-16 board is based on a 68000 microprocessor and contains 32 kilobytes of static RAM with no PROM. This board is tailored to support 16 asynchronous serial ports. The SIO-16 board acts as both a Multibus master and a Multibus slave device, and can generate one Multibus interrupt. This board receives commands via Multibus address decoding; it does not include an iSBX connector.

The CS/1 can support up to four SIO-16 modules, providing a maximum of 64 ports. Refer to Sections 3.3.9 and 3.6.3 for detailed descriptions of the SIO-16 module.

SIO-3270 Module

The SIO-3270 module consists of an SIO-3270 board, a Coaxial Backpanel Attachment (CBA) assembly and cable, a connector, screws, and a power cable for connecting the SIO-3270 board to the MCPU (or MCPU20) board. The SIO-3270 board is based on an Intel 80186 microprocessor and contains 128 kilobytes of dynamic RAM, 128 kilobytes of PROM (expandable to 192 kilobytes), and 4 kilobytes of EEPROM. This board is tailored to support eight Category A channels (referred to as ports throughout this guide).

The CS/1 can support up to four SIO-3270 modules, providing a maximum of 32 ports. Sections 3.3.10 and 3.6.3 describe the SIO-3270 module.

C.2.4 Miscellaneous Hardware Components

In addition to the board sets described in the previous sections, the CS/1 contains a Main Backplane Interconnect (MBI) board and an optional floppy disk drive.

The MBI board is designed to accommodate a maximum of seven Multibus-size boards. It contains system reset circuitry, which is activated when the Reset switch is pressed or when the circuitry senses a voltage change. Low voltages automatically reset the system, for example, under brown-out conditions or after a power failure.

There are two floppy disk drives that can be implemented with the CS/1. When a CS/1 features the MCPU board, a 48-tpi floppy drive is included with the server. It has a formatted capacity of 320 kilobytes. When a CS/1 features the MCPU20 board, a 96-tpi floppy drive is included instead. This disk drive has a formatted capacity of 720 kilobytes.

C.2.5 CS/1-FT Hardware Modules

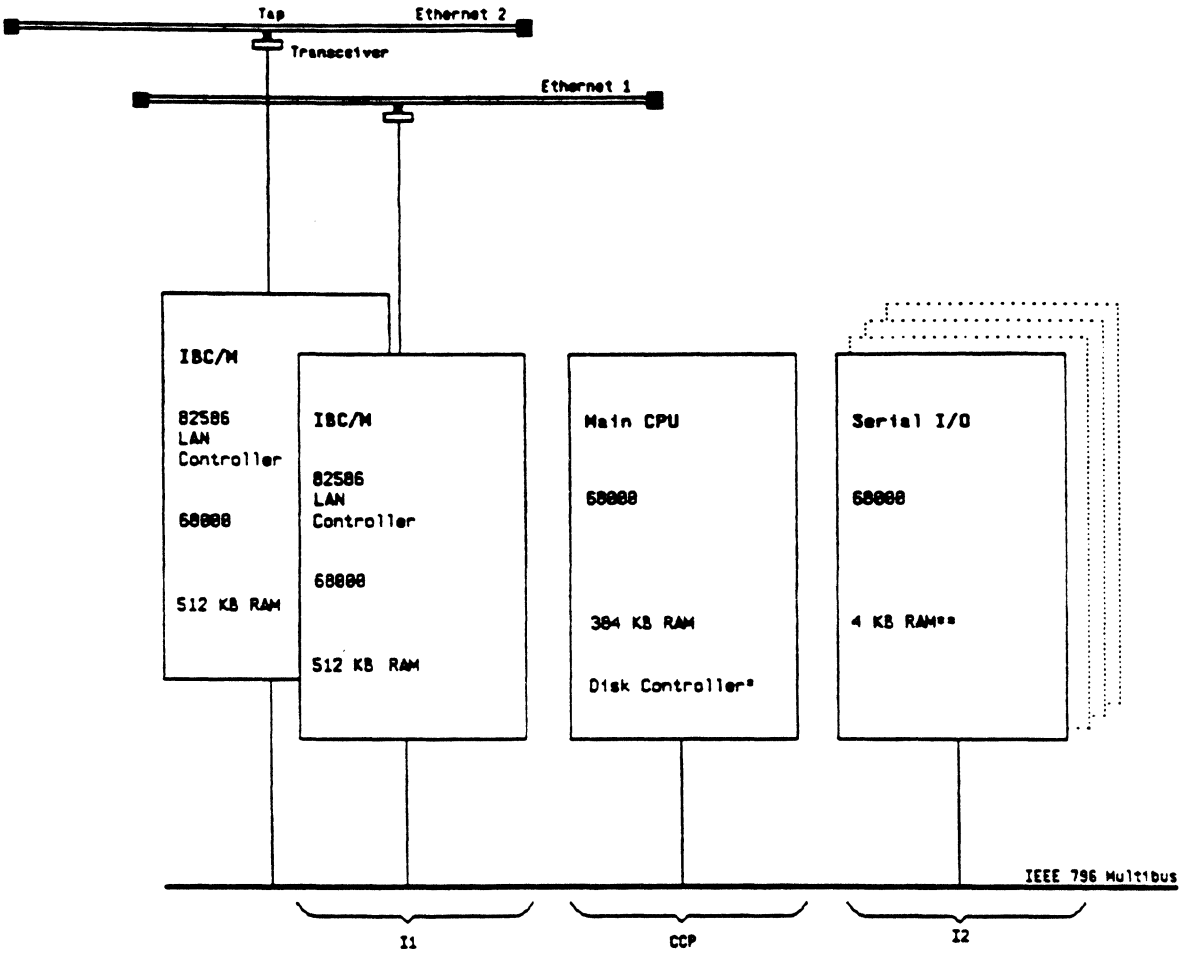
The hardware architecture for the CS/1-FT differs somewhat from the architecture described for other CS/1s. In particular, a redundant data link design requires two network interfaces. Figure C-5 illustrates the CS/1-FT hardware architecture in general, and shows a typical network interface arrangement.

The CS/1-FT employs one 12 MHz MCPU with 384 kilobytes of memory. In addition it features two IBC/M boards. This is a key difference between the CS/1-FT and other CS/1 configurations. These boards are part of the I1 section. An individual IBC/M board is used for either a broadband or an Ethernet interface (for Ethernet interfaces the IBC/M then replaces the EC/2 modules normally used). In addition, Ethernet versions of the CS/1-FT feature an 82586 LAN Controller working in conjunction with an 82501 Manchester encoder/decoder in place of the LANCE Ethernet Controller. Broadband CS/1-FT network interfaces also implement an 82586, but employ an 8251A UART to coordinate communication with the Bridge RFM/5 modem.

A CS/1-FT can be configured with two Bridge Broadband interfaces, two Ethernet interfaces, or one of each interface type. The CS/1-FT does not support Token Ring networks and is not available with the MCPU20 board.

As with the standard CS/1 implementation, the IBC/M boards are assembled directly to the RFM/5 connector. The IBC/M board's Intel 82586 controller performs basic data link functions: data framing, encapsulation and decapsulation, serialization and deserialization, CRC generation and checking, and collision backoff and retransmission. The 82586 controller also provides programmable features such as, DMA chaining, promiscuous mode, and local loopback.

All SIO modules supported by standard CS/1 configurations, as described in this manual, are supported by the CS/1-FT.



* The disk controller is optional on the CS/1 with asynchronous, synchronous, or bit-synchronous I/O interfaces.
** Systems with SIO-16 modules contain 32 KB RAM.

Figure C-5 CS/1-FT Hardware Architecture

C.3 Software Modules

This section briefly describes the CS/1 software modules. Figures C-6 and C-7 illustrate the software modules and their relationship with the functional modules in various CS/1 products. For a complete discussion of the software modules refer to the *Software Technical Reference Manual.*

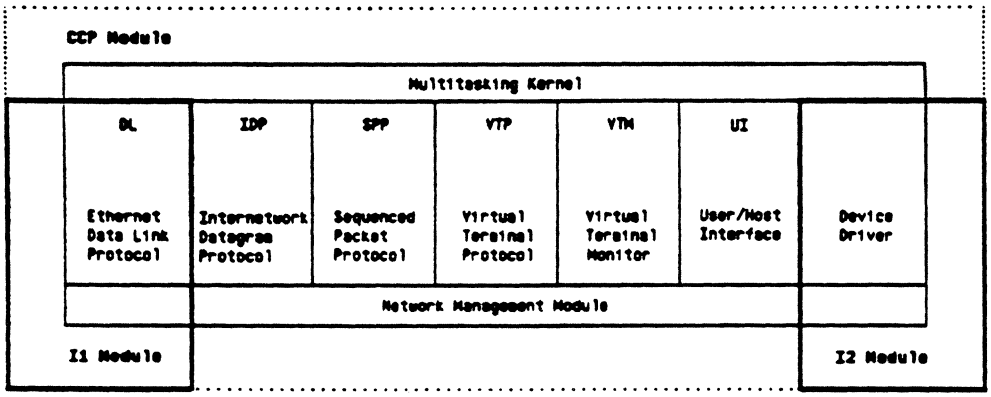


Figure C-6 CS/1 Software Architecture
(with XNS Protocols and Asynchronous,
Byte-synchronous, or Bit-synchronous Interfaces)

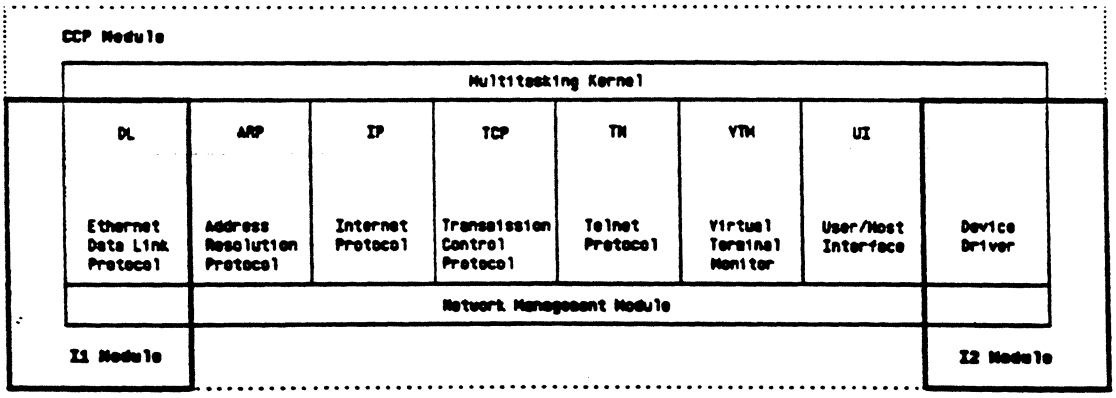


Figure C-7 CS/1 Software Architecture
(with TCP/IP Protocols)

C.3.1 Common Software Modules

Unless otherwise stated, information provided in this section applies to all CS/1s, including the CS/1-FT.

CS/1s have three software modules in common:

- Multitasking Kernel module
- Network Management module
- Data Link module

The Kernel module provides a multiprocess environment for all protocol modules. It includes a message-based interprocess communication facility, a shared buffer manager, a storage allocator, an interrupt processing dispatcher, and time-of-day and alarm facilities. The Kernel module determines which network interface is present, and starts up the appropriate data link module. The Kernel resides on the MCPU or MCPU20 board.

The Network Management module provides a variety of functions, including performance monitoring, error logging, network control, and configuration management. This module also resides on the MCPU or MCPU20 board.

The Data Link (DL) module performs the functions of the Network Data Link Protocol. These functions include transmitting and receiving frames; keeping statistics on network traffic, frame characteristics, and errors; and supporting diagnostic aids, including self-test diagnostics and higher-level testing. Depending on the type of network interface present, code resides either entirely on the MCPU or MCPU20 board, or partially on the MCPU or MCPU20 board and partially on the network interface board. For example, on a server with a TRC/M network interface module, all of the code resides on the MCPU or MCPU20 board; on a server with an EC/2 network interface board, most of the code resides as software on the MCPU or MCPU20 board, and some of the code resides as firmware on the EC/2 board itself.

In addition to these major modules, all servers include the following miscellaneous software and firmware:

- Floppy disk driver
- PROM monitor/debugger
- Boot loader
- Self-test diagnostics

All CS/1s also have an I/O Device Driver module, which varies by server model.

On a CS/1 with an asynchronous, byte-synchronous, or bit-synchronous I/O module, the module consists of an interrupt-based SIO driver that transfers data, attention, and flow control signals to and from devices attached to the SIO board using an asynchronous, byte-synchronous, or bit-synchronous line protocol.

On a CS/1 containing an SIO-A module, or a byte-synchronous or bit-synchronous I/O interface, the Device Driver software resides as firmware on the SIO board; the remaining software resides on the MCPU or MCPU20 board. On a CS/1 containing an SIO-16 module, the Device Driver software is soft-loaded when the server is booted, and then resides in RAM on the SIO-16 board.

C.3.2 Common XNS Connection Service Modules

All servers that support the XNS protocols contain the following:

- Internetwork Datagram Protocol module
- Sequenced Packet Protocol module
- Virtual Terminal Protocol and Virtual Terminal Monitor modules
- User/Host Interface module

The Internetwork Datagram Protocol (IDP) is the XNS Level 1 protocol. The IDP functions include addressing, routing, and delivering internetwork datagram packets. IDP provides a best-effort internetwork delivery service. Reliable delivery, sequencing, and flow-controlled transmission are the responsibility of the higher-level protocols located in both the originating and destination stations.

The Sequenced Packet Protocol (SPP) module provides reliable, sequenced, flow-controlled transmission of user packets across the internet system.

The Virtual Terminal Protocol (VTP) and Virtual Terminal Monitor (VTM) modules together constitute the Virtual Terminal module, which provides a virtual circuit service. The service includes name lookup, establishment of virtual circuits, negotiation of terminal parameters, reliable exchange of data, attention signaling, and synchronized disconnection. VTP implements a Virtual Terminal Protocol using XNS Courier protocol functions.

In addition, the CS/1 with asynchronous, byte-synchronous, or bit-synchronous I/O interfaces and running the XNS protocols contains the User/Host Interface (UI) module. The UI module allows the terminal user and the host to control the interface to the server by specifying parameters that describe transmission and device characteristics.

C.3.3 CS/1 with TCP/IP Connection Service Modules

The CS/1 with asynchronous I/O interfaces and the TCP/IP protocols contains the modules described in Section C.3.1, the VTM and UI modules described in Section C.3.2, and the following TCP/IP modules:

- Address Resolution Protocol module
- Internet Protocol module
- Transmission Control Protocol module
- Telnet Protocol module

The Address Resolution Protocol (ARP) module maps internetwork addresses into Ethernet addresses.

The Internet Protocol (IP) module provides the connectionless network layer protocol. IP performs an equivalent function to the IDP module present in the servers with XNS protocols (described in Section C.3.2).

The Transmission Control Protocol (TCP) module is the connection-oriented transport protocol. The TCP module provides services equivalent to the SPP module present in servers that support the XNS Connection Service.

The Telnet Protocol module is the application protocol for interfacing to terminal devices. It provides services equivalent to the Virtual Terminal Protocol module present in the servers with XNS protocols.

C.3.4 CS/1 with OSI Connection Service Modules

The CS/1 with asynchronous I/O interfaces and running the OSI protocols contains the Multitasking Kernel and Data Link modules described in Section C.3.1. In addition, this version of the CS/1 also includes the floppy disk driver, PROM monitor/debugger, boot loader, self-diagnositics, and I/O device driver module described in Section C.3.1. Figure C-8 illustrates the software modules associated with the OSI protocols, and their relationship to the CS/1 functional modules.

The following modules are unique to the OSI protocols, although analogous modules generally exist in the XNS and TCP/IP environments:

- End Systems-to-Intermediate Systems (ES-IS) module
- Connectionless Network Service (CLNS) module
- Transport Service module (TP4)
- Session Service module (SES)
- Presentation Service module (PRE)
- Association Control Service module (ACSE)
- Virtual Terminal Service module (VTP)
- Terminal/Host Agent module (TA)
- OSI User Interface module (UI)

The ES-IS exchange protocol determines the Subnetwork Point of Attachment (SNPA) for an OSI Network Service Access Point (NSAP) Address.

The Connectionless Network Service (CLNS) module implements the International Standard (IS) described in IS 8473, and provides a "best effort" internetwork delivery service, which includes addressing, routing, and relaying. This service is equivalent to the Internet Protocol feature of TCP/IP implementations, and the Internetwork Datagram Protocol module feature of XNS.

The Transport Service module implements Class 4 service of the International Standard as described in IS 8072/8073. It provides reliable, sequenced, flow-controlled transmission of user packets. It is equivalent to the Transmission Control Protocol service of the TCP/IP protocols and the Sequenced Packet Protocol service of XNS.

The Session Service module implements the Kernel, typed data, and full-duplex functional units of the International Standard as described in IS 8326/8327. Session provides session establishment, data transfer, and graceful release. There is no explicit counterpart in the TCP/IP or XNS protocol suites.

The Presentation Service module implements the Kernel functional unit of the Draft International Standard (DIS) as described in DIS 8822/8823. This service provides for the transmission of user data in such a way as to preserve the semantics of the data, independent of the syntactical representation of that data in the communicating devices. No counterpart exists in the TCP/IP and XNS protocol suites.

The Association Control Service module implements the Draft International Standard as described in DIS 8649/8650, Part II, covering Association Control. This service is used by all Application entities during the establishment and release of associations. No counterpart exists in the TCP/IP and XNS protocol suites.

The Virtual Terminal Service module implements DIS 9040/9041 for the Basic Class, subset B, A-mode, with the Telnet profile. The equivalent service in the TCP/IP protocol suite is Telnet, and in the XNS protocols the equivalent protocol is the Bridge Virtual Terminal Protocol.

The Terminal/Host Agent is a user of the Virtual Terminal Service. It handles multiple session support for the terminals and can be configured for a wide range of terminals, hosts, and applications. This replaces the Virtual Terminal module employed by the XNS and TCP/IP protocols.

The OSI User Interface is a user of the Virtual Terminal Service. It provides a command language for both the user and the local manager, and allows access to various services in the system (e.g., connection, configuration, names, accounts, and macros). It replaces the User Interface featured with the XNS and TCP/IP protocols.

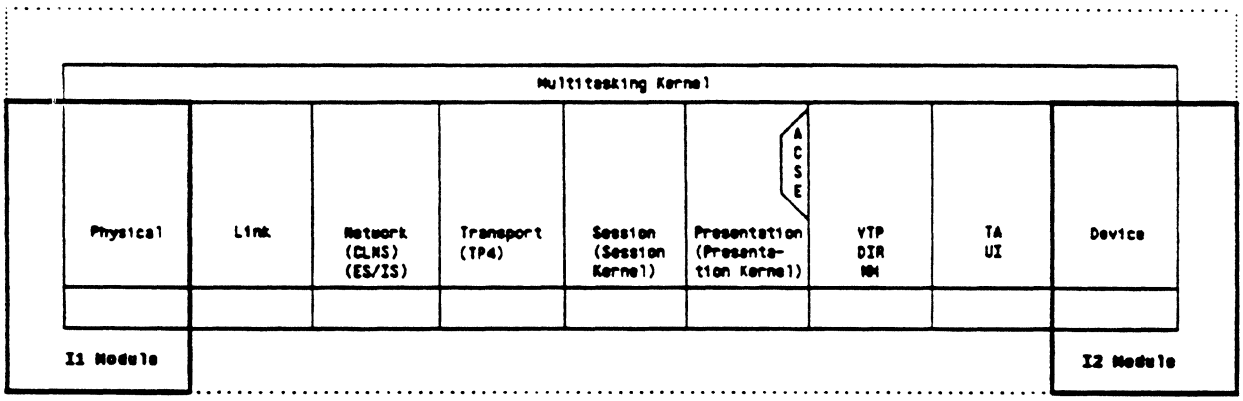


Figure C-8 CS/1 Software Architecture
(with OSI Protocols)

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