**Bridge**
Communications
Inc.

Series/1 Installation Guide

# BRIDGE COMMUNICATIONS, INC.

# SERIES/1 INSTALLATION GUIDE

Comments on this publication or its use are invited and should be directed to:

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This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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| Using the Connection Service | *Connection Service User's Guide* <br> *Connection Service Quick Reference Guide* | User or Network Manager |
| Operating and Maintaining a PC LAN | *EtherTerm User's Guide* | User or Network Manager |
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| Using and Configuring SNA Devices | *CS/1-SNA Support Guide* | User and Network Manager |
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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:

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where "aa-bbbb" identifies the publication, "cc" identifies the revision, and "dd" (if present) identifies a PCN.

Change bars are used in page margins to indicate changes made to the technical content of the publication since the previous PCN or revision.

| Part Number | Date | Description | Affected Pages |
|---|---|---|---|
| 09-0022-00 | 01/84 | Initial Release | Superseded |
| 09-0022-01 | 06/84 | Second Release | Superseded |
| 09-0022-02 | 09/84 | Third Release | Superseded |
| 09-0022-03 | 09/85 | Fourth Release | Superseded |
| 09-0022-04 | 05/86 | Fifth Release | Superseded |
| 09-0022-05 | 11/86 | Sixth Release<br>Reflects the following product releases:<br>IB/1, IB/2, MB/1, Broadband network interface,<br>Token Ring network interface, and SIO-3270<br>module | All |

# PREFACE

This guide provides the information necessary to install a Series/1 server within a Bridge Communications system environment.

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

This *Installation Guide* was prepared with the following assumptions of reader knowledge:

1.  The network planner should be familiar with basic concepts of Local Area Networks.

2.  The network planner should be familiar with the Bridge Communications product line information provided in the *Product Line Overview.*

3.  The network installer should be familiar with standard procedures for installation and for providing power and grounding according to specifications listed in this guide.

4.  The network installer should be familiar with the lines and equipment being interfaced to the Series/1 server.

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

Section 1.0    Introduction: Describes the purpose and scope of this guide and offers recommendations on how to use it.

Section 2.0    Functional Description: Describes the features, capabilities, and services provided by the Series/1 products; shows the Series/1 server's basic functional modules; describes the hardware and software modules; and discusses the theory of operation of these products.

Section 3.0    Preinstallation Planning: Provides external physical descriptions of the Series/1 servers and lists their environmental requirements.

Section 4.0    Standard Cable Requirements: Describes specifications for the cables that may be connected to the Series/1 servers and indicates requirements or restrictions.

Section 5.0    Unpacking and Installation: Outlines the procedures for unpacking, installing, and cabling a Series/1 server; describes all applicable hardware configuration jumpers; provides system checkout procedures; and recommends steps for preventive maintenance.

Section 6.0    System Modification: Describes the modifications that may be made to the Series/1 servers.

Appendix A    Power-on Diagnostics: Lists all the boards in the Series/1 unit and describes their self-test diagnostics, including the error messages they generate.

Appendix B    Bootstrap Procedure: Describes the three bootstrap options (automatic bootstrap, floppy bootstrap, and network bootstrap) and the procedure for implementing each.

Appendix C    Host Adapter Card Installation and CS/1-HSM Configuration: Describes the procedures for installing the Host Adapter Card in the host computer and for configuring the CS/1-HSM system software.

## CONTENTS

# TABLES

# FIGURES

# REFERENCES

The following publications describe the Ethernet, broadband, and Token Ring technologies:

[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)

The following publications describe the Xerox Network System protocols, the TCP protocols, and X.25 standards:

[7] *Internet Transport Protocols,* XSIS 028112 (Xerox Corporation, 1981)

[8] *Courier: The Remote Procedure Call Protocol,* XSIS 038112 (Xerox Corporation, 1981)

[9] *TCP/IP Internet Protocol Transition Workbook* (SRI International, 1982)

[10] *Ethernet Address Resolution Protocol,* RFC-826 (SRI International, 1982)

[11] *Internet Protocol,* RFC-791 (SRI International, 1982)

[12] *Internet Control Message Protocol,* RFC-792 (SRI International, 1982)

[13] *User Datagram Protocol,* RFC-768 (SRI International, 1982)

[14] *Transmission Control Protocol,* RFC-793 (SRI International, 1982)

[15] *Telnet Protocol,* RFC-764 (SRI International, 1982)

[16] *Name Server Protocol,* IEN-116 (SRI International, 1982)

[17] *Draft Revised CCITT Recommendation X.25,* COM VII No. 489 (CCITT Study Group VII, 1980)

Other related specifications include:

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

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

[20] *ATTACH*[TM] *User Guide,* 10211X07 (ABLE Computer, 1983)

[21] *VAX*[TM] *Software Installation Guide (Volume 2A), Command Language User's Guide* (Digital Equipment Corporation)

[22] *VAX Software Installation Guide (Volume 10), System Management and Operations Guide* (Digital Equipment Corporation)

[23] *Guide to VAX/VMS System Management and Daily Operations* (Digital Equipment Corporation)

[24] *Introducing the UNIX® System,* Henry McGilton and Rachel Morgan (McGraw-Hill Book Co., 1983)

[25] *UNIX Programmer's Manual* (Bell Telephone Laboratories, Inc., 1980)

[26] *UNIX System Manager's Manual* (Bell Telephone Laboratories, Inc., 1980)

[27] "Building 4.2BSD UNIX Systems with CONFIG", *UNIX System Manager's Manual* (Samuel J. Leffler, June 1983)

## 1.0 INTRODUCTION

This publication provides the information necessary to plan for and install the Bridge Communications, Inc., Series/1 products.

This section defines the purpose and scope of the publication and provides an overview of the Series/1 product line.

### 1.1 Purpose and Scope

This publication is designed for the system planner who needs a technical overview of the Series/1 servers 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* and the *Network Management Guide*. These guides contain the information necessary for software configuration and for the operation and management of a Series/1 server.

The information in this publication has been prepared to fulfill the needs of the customer who primarily uses the turnkey services provided by the Series/1 servers. Turnkey services are automatically included in each of the Series/1 products and require no programming or other enhancement.

Detailed information about non-turnkey features available on the Series/1 products is described in the *Software Technical Reference Manual.*

### 1.2 How to Use This Guide

Three discrete phases lead to the operation of a network system. This guide is divided into sections that provide the information necessary during each phase:

*   *System Planning.* Section 2.0 provides a description of the Series/1 products' capabilities and architectures.

*   *Preinstallation Planning.* Sections 3.0 and 4.0 provide the information required for the preinstallation planning process.

*   *Installation/Maintenance/Modification.* Sections 5.0 and 6.0 provide the information necessary for the installation, hardware configuration, maintenance, and modification of a Series/1 server.

*   *Diagnostics/Bootstrap Procedure.* Appendix A provides self-test diagnostics information for each system, including descriptions of all board-level tests. Appendix B provides the information necessary to boot the Series/1 server.

*   *HSM Host Adapter Card Installation.* Appendix C provides the information necessary for Host Adapter Card installation on a host computer, and for the software configuration of a VAX/VMS or UNIX operating system.

## 2.0 FUNCTIONAL DESCRIPTION

This section provides a functional description of the services offered by the Series/1 servers, lists the features and capabilities of each server, and describes both the overall system architecture and the individual hardware and software modules.

### 2.1 Service Overview

The two major services provided by the Series/1 servers are the Connection Service and the Interconnection Service. The following sections describe these services.

### 2.1.1 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 on the part of the customer and is standard on all Communications Servers and the Gateway Server/1. The Connection Service provides a friendly, highly reliable interface for the user, and a simple, fast interface for the host.

The Connection 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.

Figure 2-2 (A) shows the sequence of events initiated by a user request for a virtual circuit to a host computer. Figure 2-2 (B and C) shows how this service is extended via the GS/1 Connection Service.

The Connection Service provides protocol processing through the session level and takes care of all acknowledgments, duplicate filtering, sequencing, retransmission, and flow control.

The Connection Service 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. The GS/1 acts as a shared packet assembly/disassembly (X.25 PAD Server) when used in conjunction with the CS/1.

The Connection Service allows multiple simultaneous connections on each port, up to a maximum of eight connections on a single port.

Connection Service commands allow users 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

The Connection Service 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.

Connection Service commands are described in detail in the *Connection Service User's Guide.*
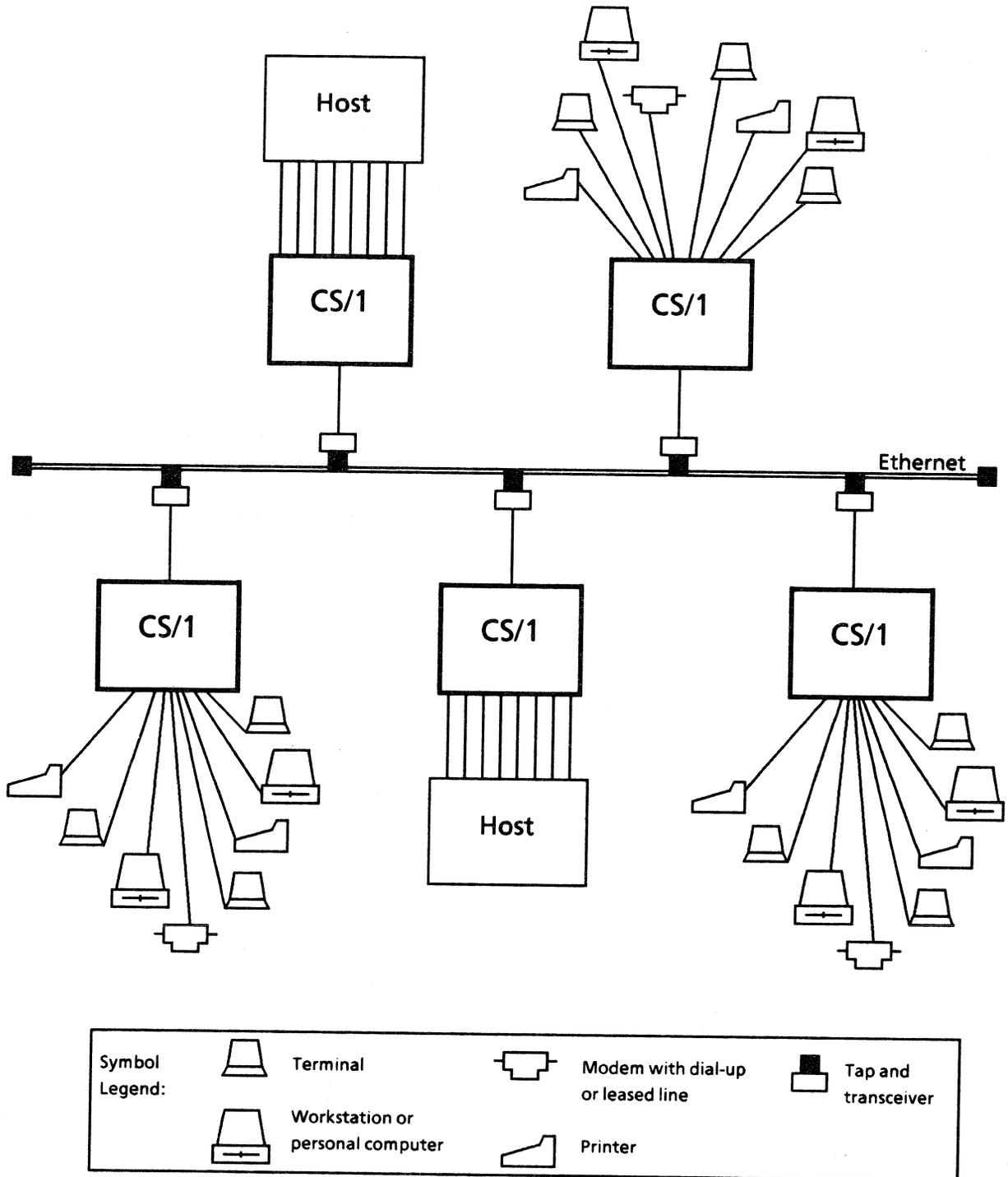
Figure 2-1  CS/1 Connection Service

Figure 2-2  Virtual Circuit Establishment
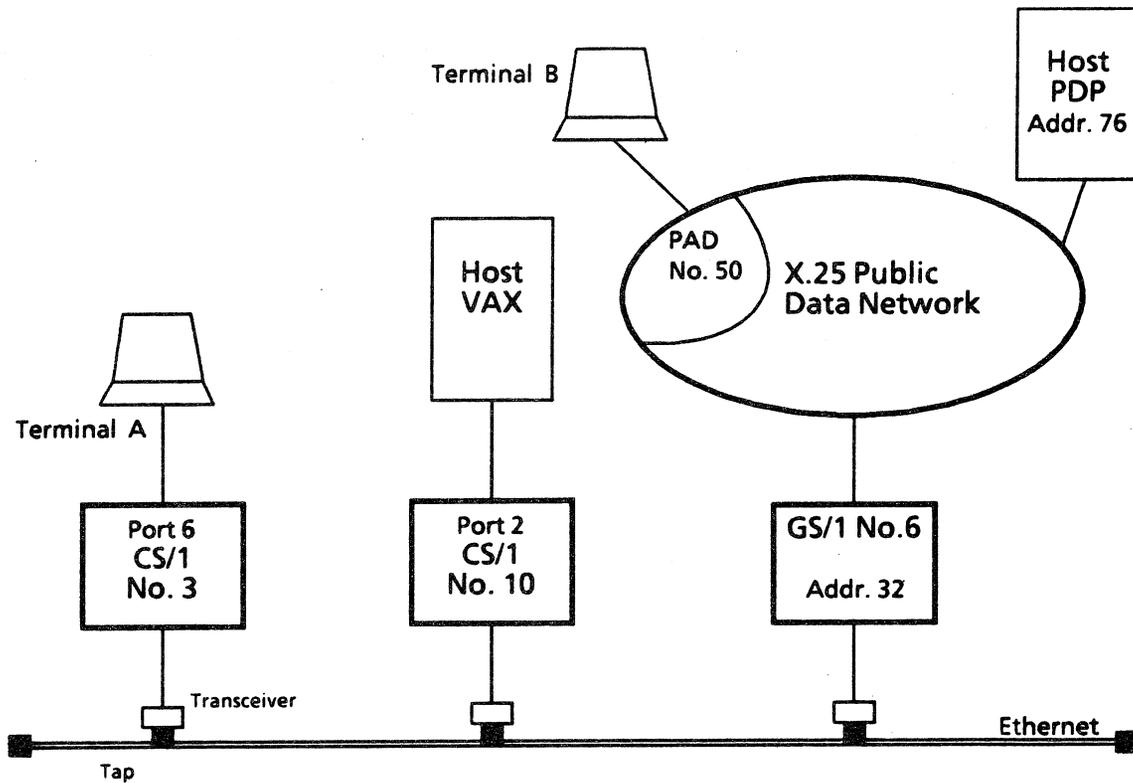
**A) Terminal A to host VAX** (CS/1 to CS/1)

1: User at terminal A enters "CONNECT VAX"
2: CS/1 No. 3 determines address of VAX
3: CS/1 No. 3 tells CS/1 No. 10 to open a connection on port 2
4: CS/1 No. 10 notifies host VAX of the connection request
5: CS/1 No. 10 tells CS/1 No. 3 that connection is open
6: CS/1 No. 3 outputs "Connected to VAX" to terminal A and all data is passed between terminal A and VAX

**B) Terminal A to host PDP** (CS/1 to GS/1)

1: User at terminal A enters "CONNECT PDP"
2: CS/1 No. 3 determines address of PDP
3: CS/1 No. 3 tells GS/1 No. 6 to open a connection to X.25 address 76
4: GS/1 No. 6 issues X.25 call to host PDP; host returns call accepted
5: GS/1 No.6 tells CS/1 No. 3 that connection is open
6: CS/1 No. 3 outputs "Connected to PDP" to terminal and all data is passed between terminal A and PDP

**C) Terminal B to host VAX** (GS/1 to CS/1)

1: Terminal B connects to GS/1 No. 6 (X.25 address 32) through PAD
2: User at terminal B types "CONNECT VAX"
3: GS/1 No. 6 determines address of VAX
4: GS/1 No. 6 tells CS/1 No. 10 to open a connection on port 2
5: CS/1 No. 10 notifies VAX of the connection request
6: CS/1 No. 10 tells GS/1 No. 6 that connection is open
7: GS/1 No. 6 outputs "Connected to VAX" to terminal B and all data is passed between terminal B and VAX

## 2.1.2 Interconnection Service

Local Area Network systems are used to interconnect devices within a geographically limited area. In the case of Ethernet networks, for example, the maximum length of a single segment is 500 meters. Extending the services provided by a Local Area Network over a wider geographic area requires internetwork gateways and bridges. The communications protocols accomplish internetwork routing functions in a manner transparent to the user.

Bridge Communications offers four Series/1 internetwork gateway products and two internetwork bridge products, which differ in the means by which they interconnect local area networks:

- Gateway Server/1 (GS/1)

  The GS/1 interconnects two or more XNS Ethernet networks via an X.25-based, packet-switched, long-haul network.

  The GS/1 uses the medium of an X.25 network to transmit packets between two networks that use the IDP protocol. The GS/1 Interconnection Service is typically used where resources or data are to be shared between devices located on two or more geographically distant XNS networks.

- Gateway Server/3 (GS/3)

  The GS/3 interconnects two XNS or TCP Ethernet networks via telephone lines or other communications links. The GS/3 Interconnection Service might be used by a corporation with offices in several buildings within the same city. The buildings are too far apart to connect via a single Ethernet coaxial cable (maximum length 2.5 km) but near enough that the use of a PDN as connecting medium is impractical. In this case, the Ethernet in each office location includes a GS/3 connected via short-distance communication links (such as leased lines) to one or more of the networks in the other locations.

- Gateway Server/4 (GS/4)

  The GS/4 links two XNS Ethernet networks via a transceiver device on each network. The GS/4 Interconnection Service is best suited for environments such as high-rise buildings and large manufacturing areas, where the number of users increases daily. GS/4s can tap into existing networks in the building, allowing one area to communicate with any other area. As many as 16 GS/4s can be used on one Ethernet network.

- Gateway Server/6 (GS/6)

  The GS/6 uses a broadband trunk to connect two or more XNS or TCP Ethernet networks at the network layer. The GS/6 Interconnection Service can be used in a single-cable broadband environment that conforms to IEEE 802 channel standards. By combining the advantages of baseband communication with the distance capability of broadband communication, the GS/6 can extend the range of Ethernet networks to 40 miles, depending on the topology of the broadband network. The GS/6 Broadband network is capable of a data rate of 1M bps.

- Internetwork Bridge/1 (IB/1)

  The IB/1 is a protocol-transparent internetwork bridge that connects a Broadband network to an Ethernet network. The IB/1 can be used in a broadband-to-Ethernet environment which conforms to Bridge's 5M bps CSMA/CD Broadband network specifications and IEEE 802.3 Ethernet network specifications.

- Multiport Bridge/1 (MB/1)

  The MB/1 consists of the IB/1 and an external eight-port Multiport Transceiver Unit (MTU). With the addition of an MTU, the IB/1 becomes a bridge with one broadband connection and eight Ethernet connections. Functionally, the MB/1 is identical to the IB/1.

- Internetwork Bridge/2 (IB/2)

  The IB/2 is a protocol-transparent bridge that links two Ethernet networks via a transceiver device on each network. The IB/2 can be used in an Ethernet-to-Ethernet environment that conforms to Ethernet IEEE 802.3 standards.

The Gateway Servers and Internetwork Bridges each perform internetwork routing functions. The following paragraphs describe internetwork routing on the GSs and IBs, respectively.

Gateway Servers implement internetwork routing on the network level based on information stored in a routing table of the remote networks to which they are attached.

For Gateway Servers with the XNS protocols, the routing table initially contains only the information entered by the network manager during system generation, described in the *Network Management Guide*. As long as the server is powered on, it broadcasts its routing table at regular intervals to the Gateway Servers on all of the attached networks. On the basis of transmissions it receives from other servers, each Gateway Server expands its routing table dynamically to include all networks that can be reached through multiple hops across the other Gateway Servers. Each remote network number appears only once in a server's routing table, accompanied by the address of the first server in the path and the number of hops necessary to reach the remote network. The Gateway Server that keeps the routing table chooses the shortest available path to each destination network. If a shorter path appears, the server revises its table. For further information on the XNS Connection routing, see reference [7].

Gateway Servers with the IP protocol use static routing tables, which are created and maintained by the network manager. As information becomes available (e.g., as networks are added or removed, or as shorter paths appear) the network manager updates the routing tables.

Internetwork Bridges implement internetwork routing on the data link level. The IBs maintain routing tables through continuous adaptive learning and aging features. The IB can learn up to 8,000 Ethernet addresses and can age (delete) them out of the routing table as they become obsolete. Routing tables are updated automatically as the IB learns the locations of local and remote stations or ages unused or currently non-existent stations, without the need for input from the network manager: table maintenance is an automatic function of the learning and aging features. The network manager can, however, add or delete up to 16 routes by issuing simple commands through the IB's auxiliary port.

Figures 2-3 through 2-8 show the Interconnection Service provided by the GS/1, GS/3, GS/4, GS/6, IB/1, and IB/2, respectively.
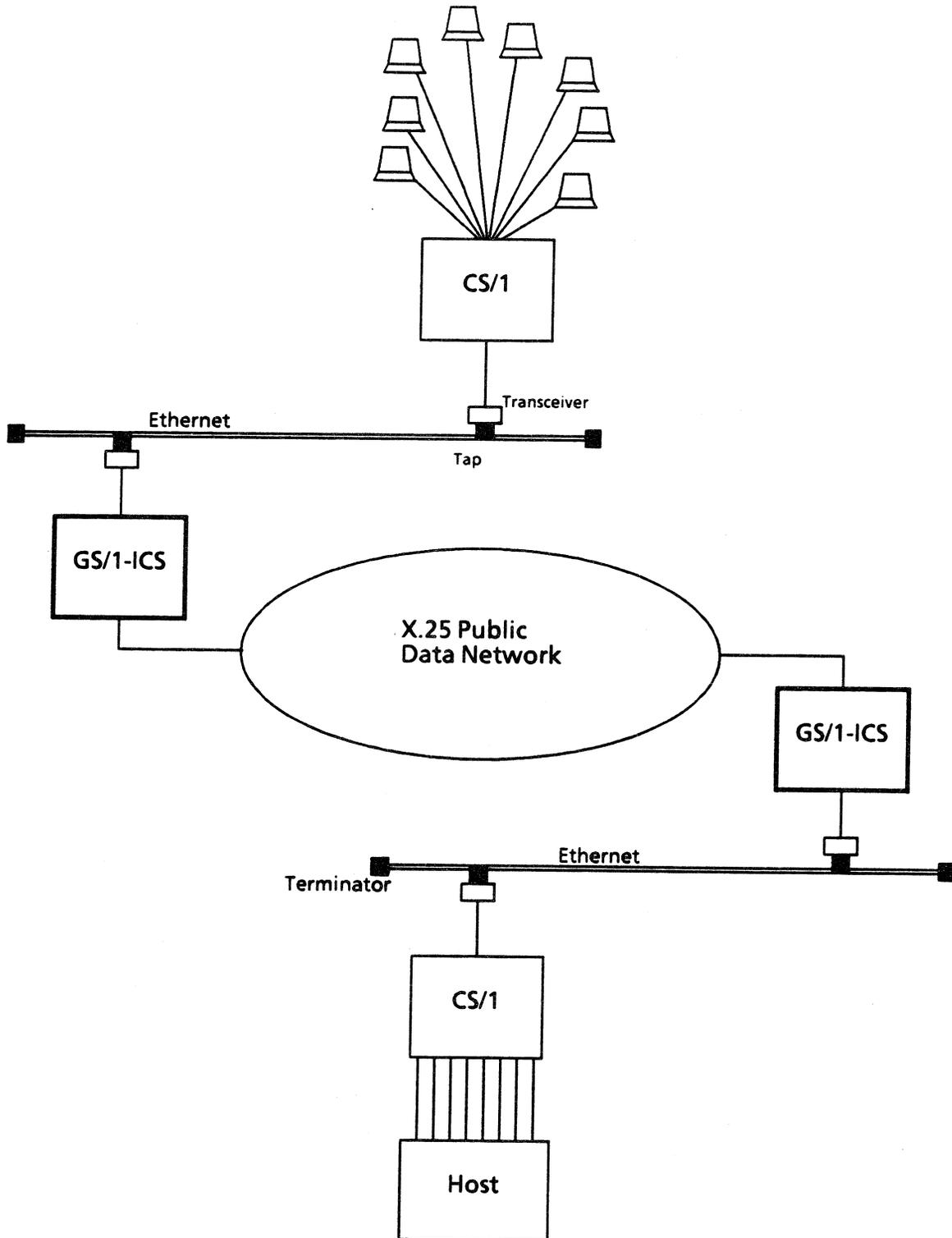
Figure 2-3  GS/1 Interconnection Service

Ethernet

CS/1

Host

GS/3

CS/1

Point-to-point
Communication Links

CS/1

GS/3

GS/3

Transceiver

Ethernet

Tap
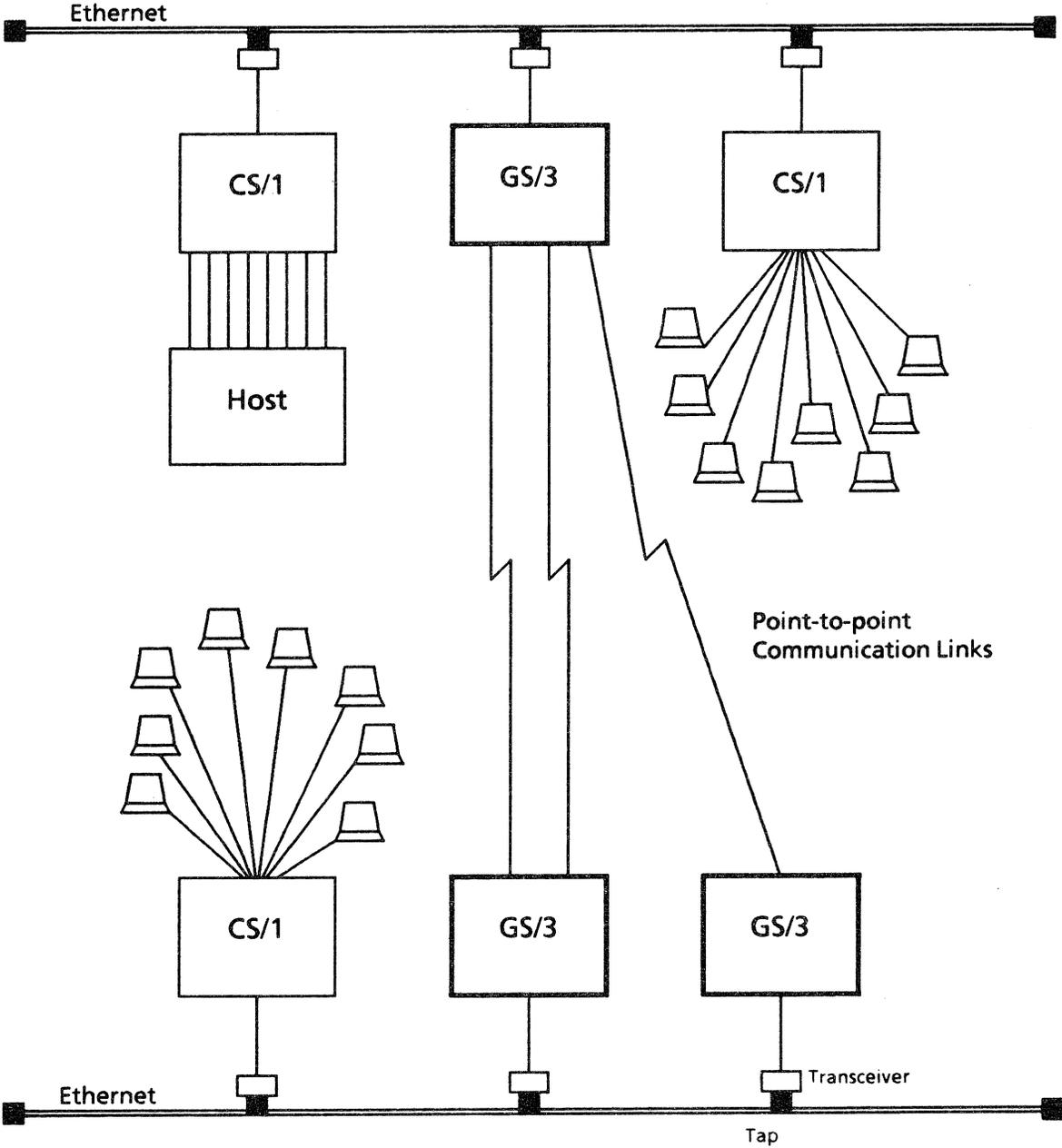
Figure 2-4  GS/3 Interconnection Service
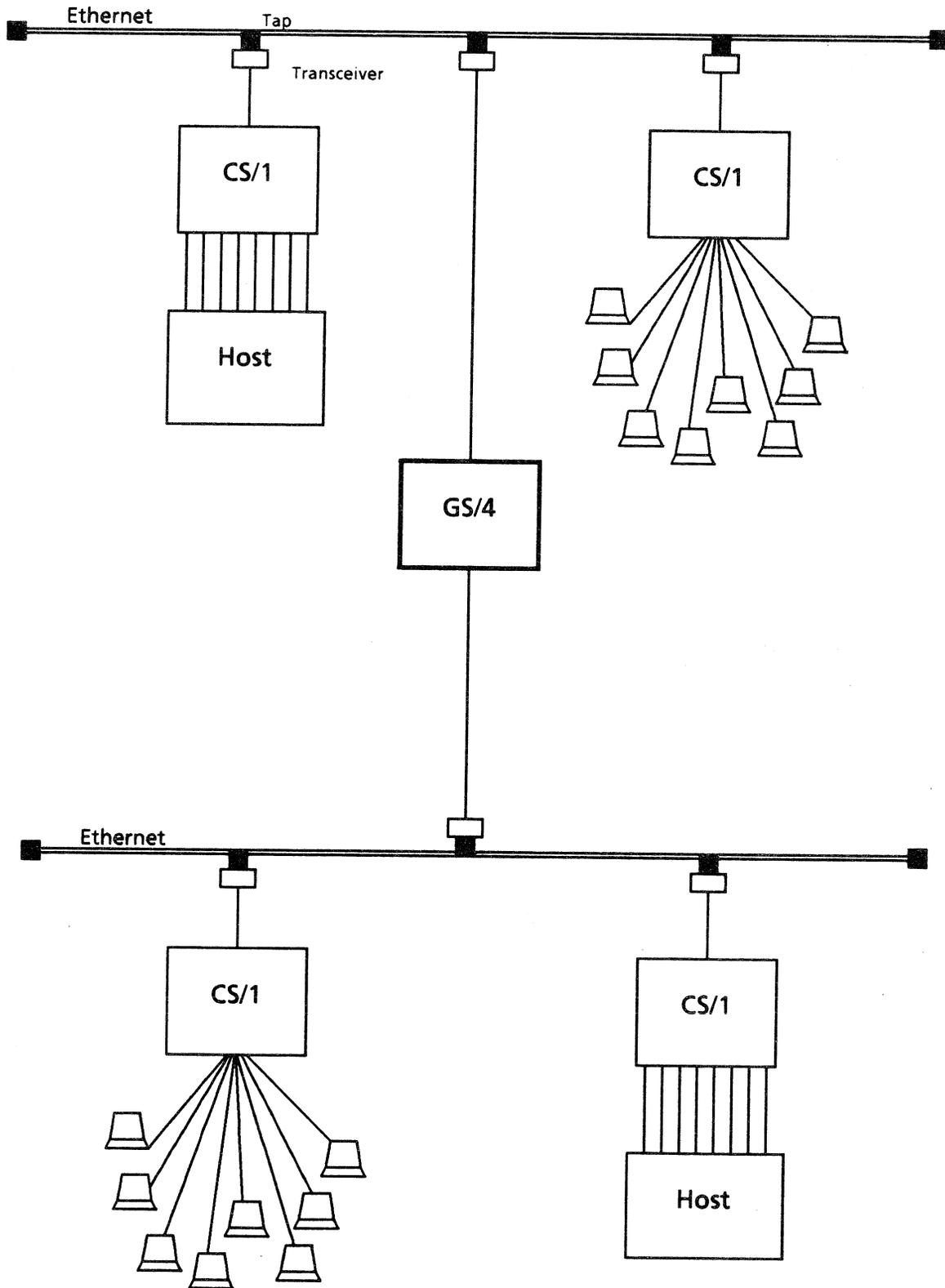
Figure 2-5  GS/4 Interconnection Service
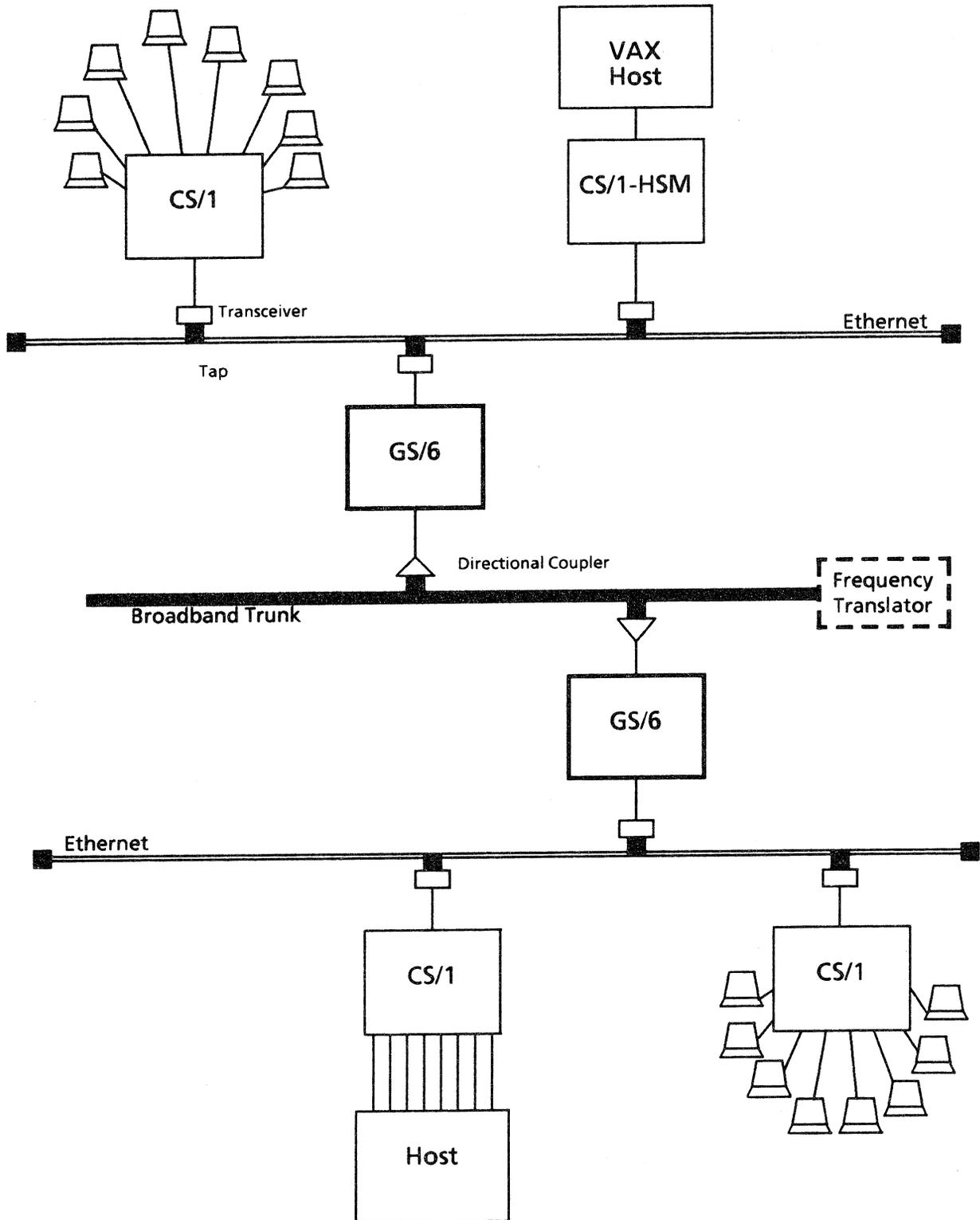
Figure 2-6  GS/6 Interconnection Service
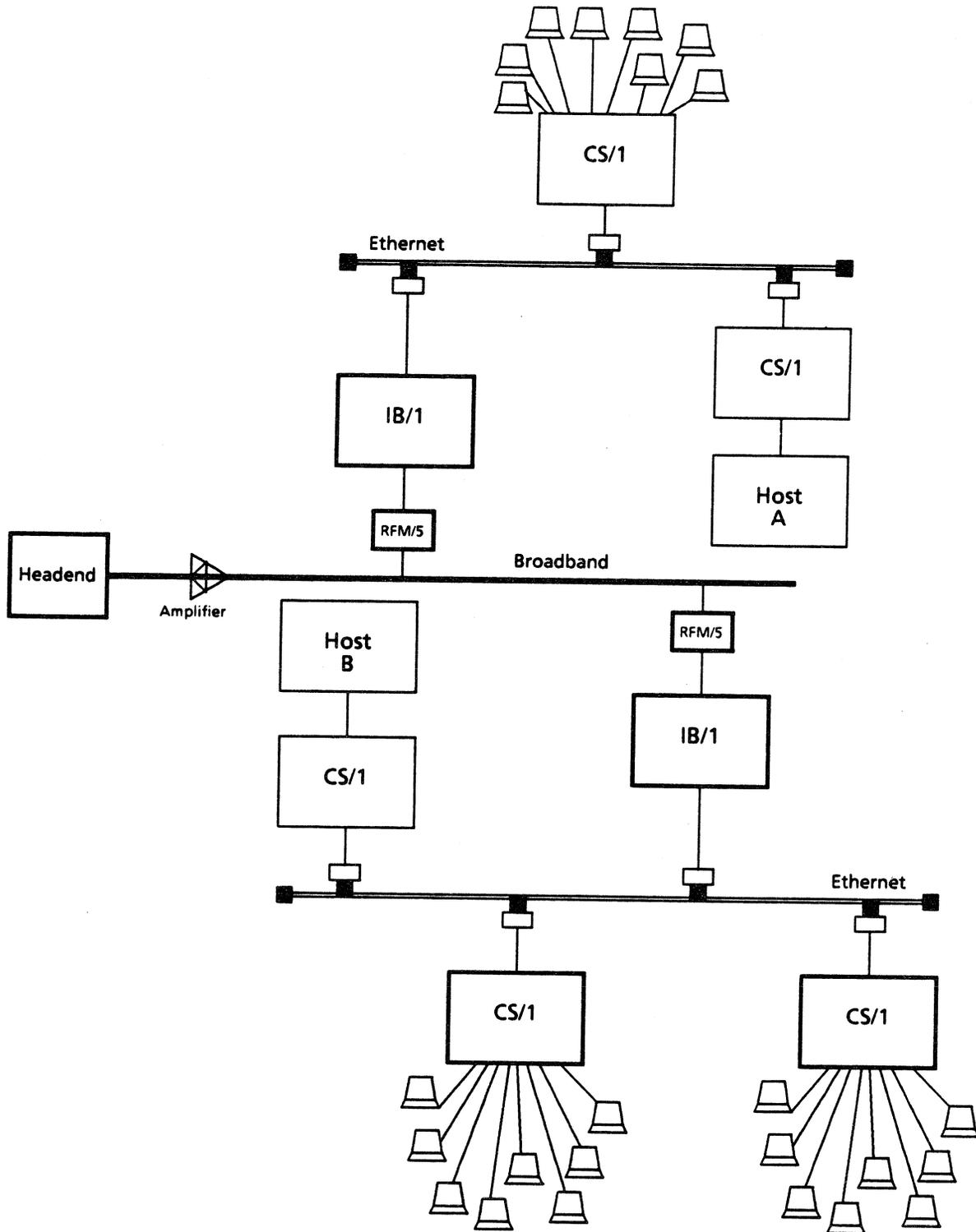
Figure 2-7  IB/1 Interconnection Service
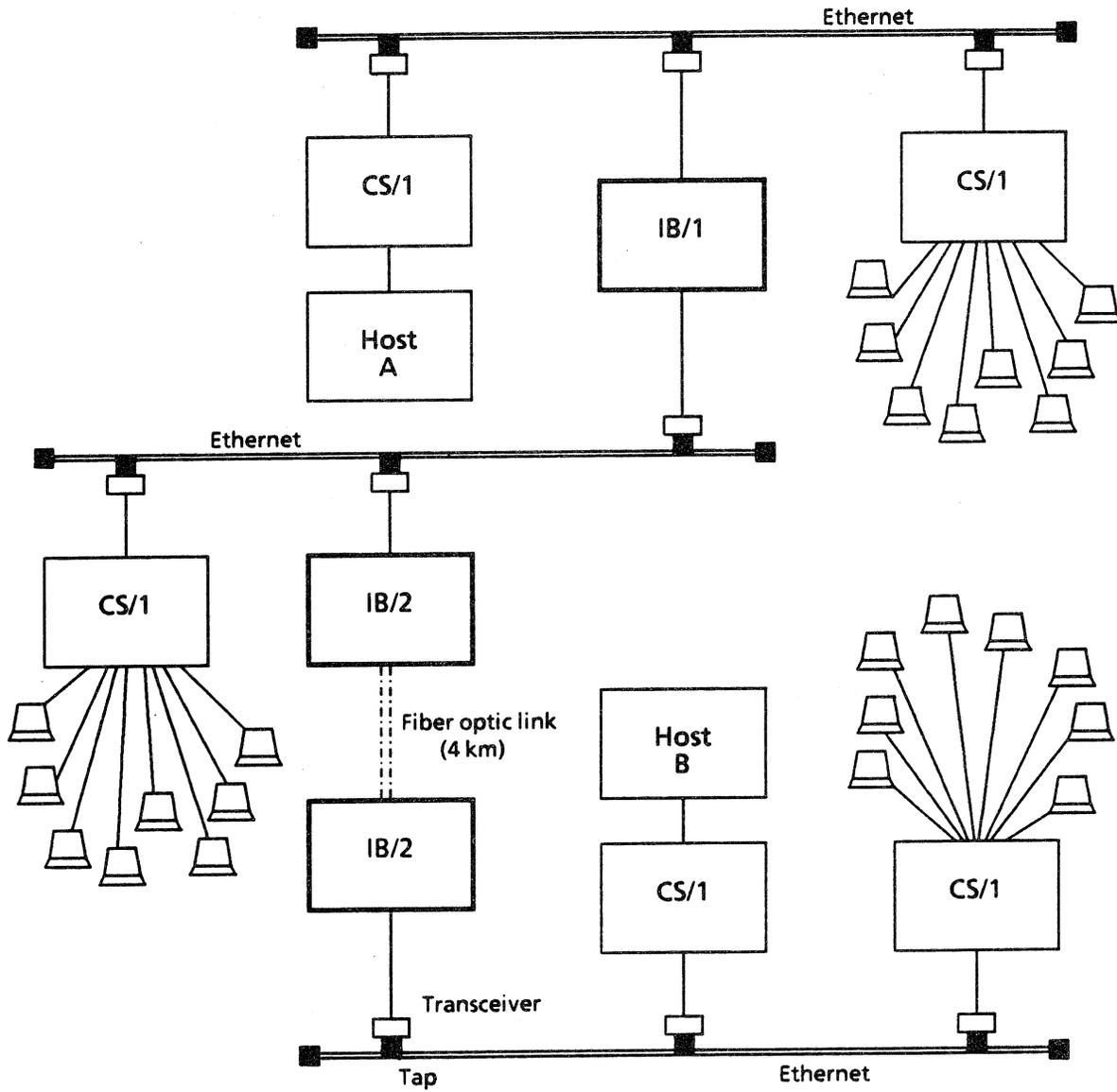
Figure 2-8  IB/2 Interconnection Service

## 2.2 Features and Capabilities

This section describes the features and capabilities of different Series/1 server models.

### 2.2.1 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 communications with 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 with either XNS or TCP protocols, automatically providing the Bridge Connection Service with either protocol set (Section 2.1.1 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 3270 serial I/O interface 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 interface 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. In extended VT100 mode, the server offers compatibility with the CS/1-SNA (described in Section 2.2.3).

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.

The CS/1 with bisynchronous interfaces, or a combination of asynchronous and bisynchronous interfaces, may be ordered with a special software package, called SPMUX, that emulates a Sperry MUX™ (multiplexer) and provides communications for Sperry UTS™ terminals. The SPMUX package is described in more detail in Section 2.2.4.

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 19.2K bps 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 64K bps 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.

## 2.2.2 CS/1-HSM Features and Capabilities

The CS/1-HSM provides up to 64 virtual ports to a DEC™ VAX host computer over one or two high-speed multiplexed lines. These virtual ports are available to devices attached to other servers on the same network or on an accessible network. The CS/1-HSM supports only the XNS protocols.

The CS/1-HSM package includes a Host Adapter Card (HAC), which is installed in the host computer in place of one or more of the DMF32™ cards that usually provide terminal access. Each HAC can provide up to 64 ports, replacing up to eight DMF32 cards. (The HAC is described and illustrated in Appendix C.)

### ** NOTE **

To support a CS/1-HSM, the host must be equipped with an asynchronous DMF32 driver.

Each CS/1-HSM can support one or two hosts, with a total combined maximum of 64 ports. The CS/1-HSM package also includes a HAC cable, which connects the CS/1-HSM to the host.

## 2.2.3 CS/1-SNA Features and Capabilities

The CS/1-SNA provides an interface between an SNA host and an Ethernet network. Two versions of software are available on the CS/1-SNA: one version supports the XNS protocols; the other, the TCP protocols.

The CS/1-SNA is compatible with Ethernet systems and with the IBM Systems Network Architecture (SNA) protocols. The CS/1-SNA Connection Service is available to asynchronous devices connected to an XNS Ethernet via a CS/1, CS/100, or other device. The Connection Service is also available to asynchronous devices with the TCP protocols and connected to the Ethernet via any UNIX-based system that has TCP capability, such as a Sun Microsystems workstation.

To the SNA host, the CS/1-SNA appears to be a 3274 model 51C cluster controller. Asynchronous terminals on the Ethernet emulate 3278 model 2 devices, and printers emulate 3287 SCS and 3287 DSC devices. In SNA terms, the CS/1-SNA looks like a Type 2 PU (physical unit) with Type 1, 2, or 3 LUs (logical units). Type 1 and 3 LUs are printers, and Type 2 LUs are terminals.

Each CS/1-SNA supports one synchronous port with a maximum of 24 LU-to-LU sessions. The CS/1-SNA can be connected directly to the IBM 37x5 front-end processor or to a Bell 208A or 208B modem.

It has also been tested successfully with the Amdahl 4705 front-end processor. The CS/1-SNA supports line speeds up to 64K bps; the SDLC link can be half duplex or full duplex.

The CS/1-SNA uses an RS-232-C, D-Series connector, which is compatible with the CCITT X.21bis and V.24 specifications. An SIO module providing V.35 connectors is available as an option.

The asynchronous terminals supported by the CS/1-SNA include:

- Beehive International BeeHive

- Digital Equipment Corporation (DEC) models VT100 (both the standard mode and the extended mode that performs 3270 special functions via the numeric keypad), VT220, VT240, and VT241

- Falco Data Products model 1078

- Honeywell models VIP 7200, 7201, 7305, 7801, and 7814

- IBM model 3101

- Lear Siegler models ADM1178 and ADM3A

- TeleVideo Systems model 925

- Xerox model 820

- Devices attached to an SIO-3270

An IBM PC with EtherTerm emulates a DEC VT100 and, therefore, is also supported by the CS/1-SNA. In this application, however, only the XNS software is supported.

The asynchronous printers supported by the CS/1-SNA include:

- DEC model LA100

- Diablo model 630

- Epson model RX-80

- Texas Instruments model 810.


## 2.2.4 Sperry MUX Features and Capabilities

A CS/1 containing SIO-STS modules or a combination of SIO-A and SIO-STS modules can support Sperry MUX (SPMUX) software. (Refer to Section 5.2 for a discussion of SIO modules.) SPMUX provides communication between Sperry Universal Terminal System (UTS) or other UTS-compatible terminals and Sperry DCP™ host front-end processors. The SPMUX software is also capable of supporting asynchronous terminals.

The SPMUX Connection Service is available only to UTS terminals connected to an XNS Ethernet via SIO-STS modules in a CS/1 with the SPMUX software. The DCP host is connected to the network via a CS/1 containing SIO-SMS modules. Terminals attached to SIO-A modules in a CS/1 with SPMUX software use the standard Connection Service, and cannot make connections to the DCP host.

On the UTS terminal end, a CS/1 with the SPMUX software emulates Sperry multiplexer equipment. In the standard Sperry configuration, the multiplexer connects the terminal to the DCP either directly or via a modem and communication link. On the DCP host end,

each line from the CS/1 emulates a communication link from a multiplexer, carrying multiplexed messages to and from UTS terminals.

A CS/1 with the SPMUX software supports up to 8 UTS terminals per SIO-ST board, for a maximum of 32 terminals; at the host end, each CS/1 can support up to 10 DCP ports. Performance tests indicate that in an installation with a Mapper™ application, a ratio of 8 to 16 terminals per DCP port and a maximum of 10 DCP ports per CS/1 yields an average user response time of 3 to 8 seconds. Increasing the number of terminals per DCP port or increasing the number of DCP ports per CS/1 degrades user response time correspondingly.

The CS/1 with SPMUX software provides the capability of configuring ranges of terminal groups and mapping these groups to specific DCP port numbers. The CS/1 and the SPMUX software, with the DCP demultiplexer, ensure end-to-end data integrity.

UTS terminals are connected to the CS/1 with standard Sperry UTS device cables provided by the customer. The DCP is connected to the CS/1 with a special host adapter cable (CBL-SH-25) provided by Bridge Communications, Inc.

Refer to Section 3.1.8 for information on the SIO requirements of the CS/1 with the SPMUX software and to the *LAN Planning Guide* for the specifications of the host adapter cable.

## 2.2.5 GS/1 and CS/1-X.25 Features and Capabilities

The GS/1 (XNS Ethernet-to-X.25 Gateway) provides communication between devices connected to an Ethernet network and devices connected to an X.25 network (Connection Service), or between remote Ethernets connected by an X.25-based Public or Private Data Network (Interconnection Service). The CS/1-X.25 provides an interface to an X.25 host, allowing up to 48 virtual circuits on a single, high-speed line.

The GS/1 and CS/1-X.25 Connection Services are compatible with Ethernet systems that use the XNS Sequenced Packet Protocol (SPP) and with the standard X.25 protocol defined by the *CCITT Recommendation X.25* (reference [17]). The GS/1 has been tested and certified on a variety of X.25-based Public Data Networks (PDNs). Contact Bridge Communications, Inc., or an authorized representative for further information on specific PDNs.

The GS/1 Interconnection Service is available to devices connected to an Ethernet via a Communications Server or other XNS-compatible device. The GS/1 and CS/1-X.25 Connection Service is available to devices connected to an Ethernet via a Bridge Communications Server or other XNS-compatible device and to devices accessing the GS/1 via an X.25 PDN. When the GS/1 receives a packet destined for a remote Ethernet, it checks to see if an X.25 logical channel exists to the Gateway Server on the remote Ethernet. If a logical channel already exists, the GS/1 routes the traffic on that channel. If no logical channel exists, the GS/1 creates one.

Every 20 seconds, the GS/1 computes the traffic level on each logical channel to each destination. If one logical channel is overutilized, the server establishes an additional logical channel to the same destination. If several logical channels to one destination exist, and one or more of them is underutilized, the server terminates one logical channel. If a single, unused logical channel exists, the server targets it for possible termination. If the logical channel has still had no traffic within 300 seconds, the server terminates the channel. When establishing logical channels, the server balances the load as evenly as possible among the physical lines at

both ends of the connection. When routing packets to a destination served by multiple logical channels, the server allocates sequential packets to the different channels on a round-robin basis.

Each GS/1 or CS/1-X.25 SIO module supports two synchronous ports, with a maximum aggregate transfer rate of 190 to 200 bps. The maximum transfer rate on any one port varies from 56K bps to 64K bps, depending on the maximum speed supported by the PDN. (For example, Tymnet supports speeds up to 56K bps, while Transpac supports speeds up to 64K bps.) The typical port speed combinations are one 56K bps port and one 19.2K bps port, or two 19.2K bps ports. Both servers support up to four SIO boards.

The GS/1 and CS/1-X.25 offer a choice of three electrical protocols for serial communication: RS-232-C, RS-422, and V.35. RS-232-C can be used for distances up to 200 feet at speeds up to 19.2K bps 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 64K bps and provides excellent noise protection and minimal RFI generation. RS-422 tolerates ground shifts up to 7 volts. V.35 is designed specifically to interface with high-speed modems (e.g., Bell 303). Distances up to 200 feet at speeds up to 64K bps are permissible; noise protection is similar to that with RS-232-C. Refer to the *LAN Planning Guide* for further information.

The standard GS/1 and CS/1-X.25 use an RS-232-C, D-Series connector, which is fully compatible with the CCITT X.21bis specification. CCITT X.21 connectors with RS-422 electrical protocols, RS-449 connectors with RS-422 electrical protocols, or V.35 connectors are available as options.

## 2.2.6 GS/3 Features and Capabilities

The GS/3 (Point-to-Point Gateway) acts as a router on the Ethernet, providing communication between devices on the local Ethernet and devices on another Ethernet via a medium- to high-speed, synchronous communication link. The GS/3 is similar to the GS/1, except that packets transmitted by the GS/3 to a GS/3 on another Ethernet are encapsulated in a simple synchronous framing protocol rather than in the full X.25 protocol set. Thus, the interface need not conform to X.25 PDN specifications in terms of data transfer speed, frame size, or other protocol considerations.

Two versions of software are available on the GS/3: one version provides the XNS protocols; the other, the IP protocol.

The GS/3 supports one service, the Interconnection Service, which provides transparent automatic routing of packets between two or more Ethernets. The full range of services available in a single-Ethernet network is thus available to devices located on interconnected Ethernets. The user may notice performance variations, depending on the speed of the link between the GS/3s, but otherwise perceives no difference in the services. The particular type of communication link used between GS/3s depends on the distance between GS/3s, the customer's requirement for data transfer rates, and other factors. The *LAN Planning Guide* describes the capabilities, requirements, and restrictions of the various types of communication links supported by the GS/3.

When a GS/3 is configured with multiple lines to the same remote GS/3, the Interconnection Service can perform load-balancing on those lines. The GS/3 is also failure-adaptive, and can automatically switch transmission from one line to another if a line becomes unavailable or congested. The server monitors response time and reliability on each line, automatically switching packets to different lines to optimize performance. If a line remains idle for the entire duration of the interval used by the packet-checking algorithm, the server sends a probe packet to test the line. If no acknowledgment is received, the GS/3 removes the line from the routing table until subsequent probes show that it is operational.

With either the XNS or IP protocols, each GS/3 I/O module provides two synchronous, full-duplex ports, with a maximum aggregate transfer rate of 75.2K bps. The maximum transfer rate on any one port is 64K bps. Up to four SIO modules may be installed, for a maximum of eight ports per GS/3.

The GS/3 offers a choice of three electrical protocols for serial communication: RS-232-C, RS-422, and V.35. RS-232-C can be used for distances up to 200 feet at speeds up to 19.2K bps 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 64K bps and provides excellent noise protection and minimal RFI generation. RS-422 tolerates ground shifts up to 7 volts. V.35 is designed specifically to interface with high-speed modems (e.g., Bell 303). Distances up to 200 feet at speeds up to 64K bps are permissible; noise protection is similar to that with RS-232-C. Refer to the *LAN Planning Guide* for further information. The standard GS/3 uses RS-232-C, D-Series connectors. CCITT X.21 connectors with RS-422 electrical protocols, RS-449 connectors with RS-422 electrical protocols, or V.35 connectors are available as options.

### 2.2.7 GS/4 Features and Capabilities

The GS/4 (Ethernet-to-Ethernet Gateway) interconnects two XNS Ethernet networks via a transceiver device on each network. The server provides communication between devices on both Ethernets. The full range of services is available to devices located on both Ethernets; the user perceives no difference in the services.

The GS/4 treats the Ethernets it connects as two separate networks. It forwards packets meant for one network to that network only, thus reducing the traffic on each network.

### 2.2.8 GS/6 Features and Capabilities

The GS/6 (Ethernet-to-Broadband Gateway) provides communication between devices on the local Ethernet and devices on other Ethernets via a broadband trunk.

Two versions of software are available on the GS/6: one provides the XNS protocols, the other, the IP protocol.

The GS/6 supports only the Interconnection Service, which provides transparent automatic routing of packets between two or more Ethernets. The full range of Bridge networking services is available to devices located on both Ethernets; the user perceives no difference in the services.

Each GS/6 supports one HSM-MDM board with one frequency-shift-keying (FSK) modulated RF port. The port supports a maximum data transfer rate of 1M bps (using a single 6 MHz broadband channel).

## 2.2.9 IB/1 and IB/2 Features and Capabilities

The IB/1 (Ethernet-to-Broadband Internetwork Bridge) interconnects an Ethernet network via a transceiver device and a broadband network via a Radio Frequency Modem/5 (RFM/5). The IB/1 is protocol transparent, providing communication between devices on both networks.

The IB/2 (Ethernet-to-Ethernet Internetwork Bridge) interconnects two Ethernet networks via a transceiver device on each network, providing high-performance, protocol transparent routing, and treating both Ethernet networks as one logical network.

The IBs are data link level (ISO Layer 2) bridges that route packets based on Ethernet address only. The IBs continuously monitor traffic on both networks, filtering, forwarding, or discarding packets as necessary.

The IBs contain multiple high-speed 68000 processors, filtering local traffic at up to 7,000 packets per second, and forwarding internetwork traffic at up to 2,500 packets per second.

The IBs feature a programmable generalized filtering capability to isolate excess internetwork traffic and to protect network security. Custom filters can be set up to discard packets based on address. Filters can also be established to screen traffic based on arbitrary masks on any packet byte, word, or double word, thereby enhancing network security and performance.

## 2.3 System Architecture

Each Series/1 server 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 2-9.
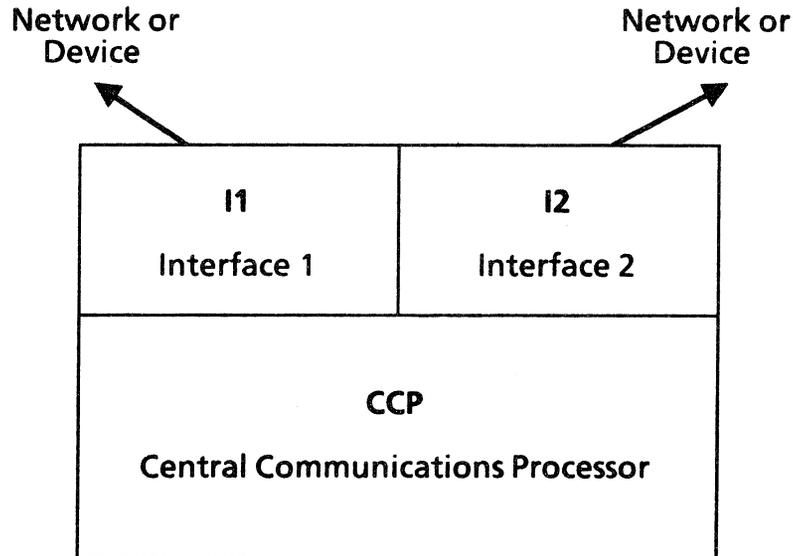


Figure 2-9 Basic Functional Modules

The CCP is made up of a Main CPU (MCPU) 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 for Series/1 servers is the Network Controller module.

The I2 module for Series/1 servers is either an I/O module or a second Network Controller module, depending on the server model. For instance, the I2 module for an IB/1 is a Broadband Network Controller module; for a CS/1-HSM, the I2 module is a high speed multiplexer module.

The system hardware is described in Section 2.4; the system software is described in Section 2.5.

## 2.4  Hardware Modules

The Series/1 server hardware modules and their correspondence with the functional modules are illustrated in Figures 2-10 through 2-13. 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 an RF modem) is not typically included as part of the Series/1 server products, but is available separately from Bridge Communications, Inc. The hardware modules are interconnected by an IEEE 796 Multibus-standard Main Backplane Interconnect (MBI) board (see reference [18]). The following sections describe the major modules, the MBI, and other miscellaneous hardware components of the Series/1 servers.



```
                  Tap                            Ethernet
          ───────────────────────────────────────────────
                   ▢ Transceiver

      *   ┌─────────────┐   ┌──────────────┐   ┌──────────────┐
          │ EC 2        │   │ Main CPU     │   │ Serial I/O   │
          │             │   │              │   │              │
          │ LANCE       │   │              │   │              │
          │ Ethernet    │   │              │   │              │
          │ Controller  │   │              │   │              │
          │             │   │              │   │              │
          │ 68000       │   │ 68000        │   │ 68000        │
          │             │   │              │   │              │
          │ 256KB RAM   │   │ 384KB RAM    │   │ 4KB RAM***   │
          │             │   │              │   │              │
          │             │   │ Disk         │   │              │
          │             │   │ Controller** │   │              │
          └─────────────┘   └──────────────┘   └──────────────┘
                                                          IEEE 796
          ═══════════════════════════════════════════════ Multibus

             \_____∨_____/     _____∨_____/    \_____∨_____/
                  I1                CCP                 I2
```

**Figure 2-10  CS/1 (with Asynchronous, Byte-synchronous, or Bit-synchronous interfaces), CS/1-SNA, CS/1-X.25, GS/1, and GS/3 Hardware Architecture**
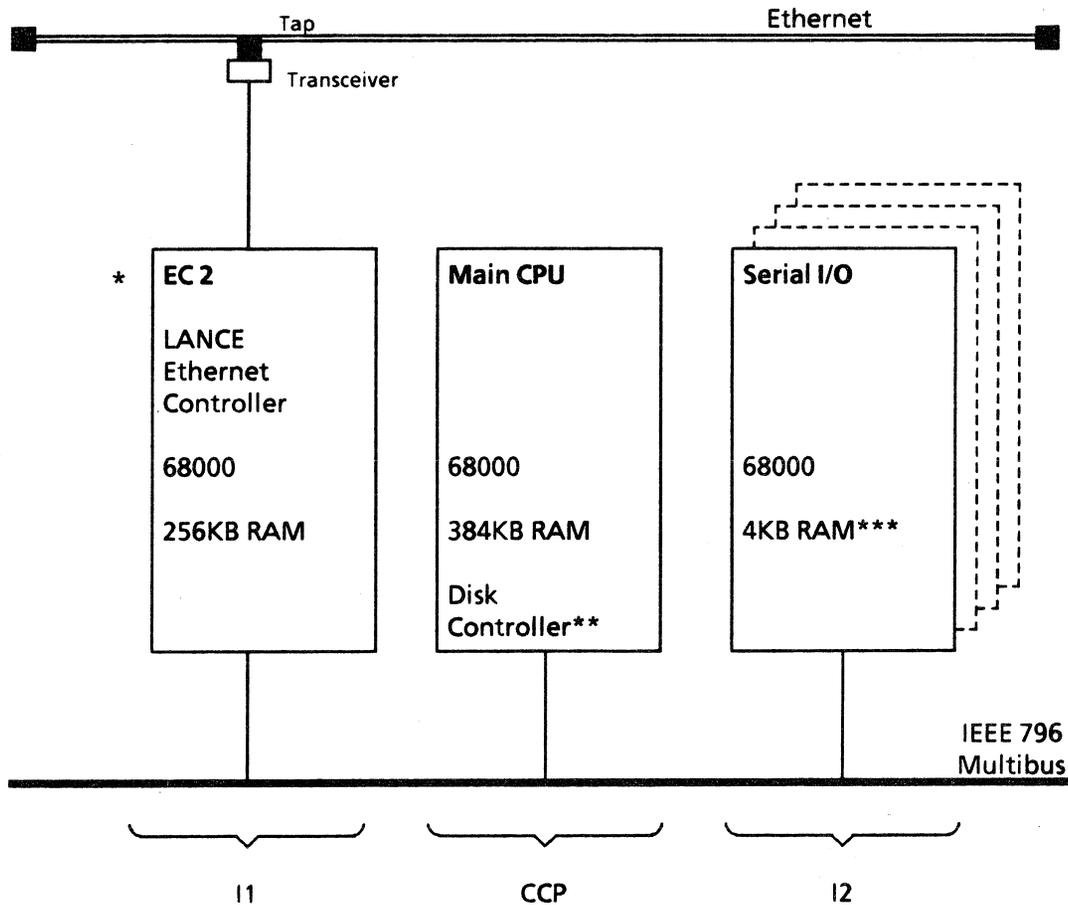
* Some systems may have a two-board I1 module (EC/1) with 128KB RAM. For CS/1 with asynchronous interfaces, this module may be an IBC/M or TRC/M, depending on the network medium.

** The disk controller is optional on the CS/1 with asynchronous, synchronous, or bit-synchronous I/o interfaces.

*** Systems with SIO-16 modules contain 32KB RAM.
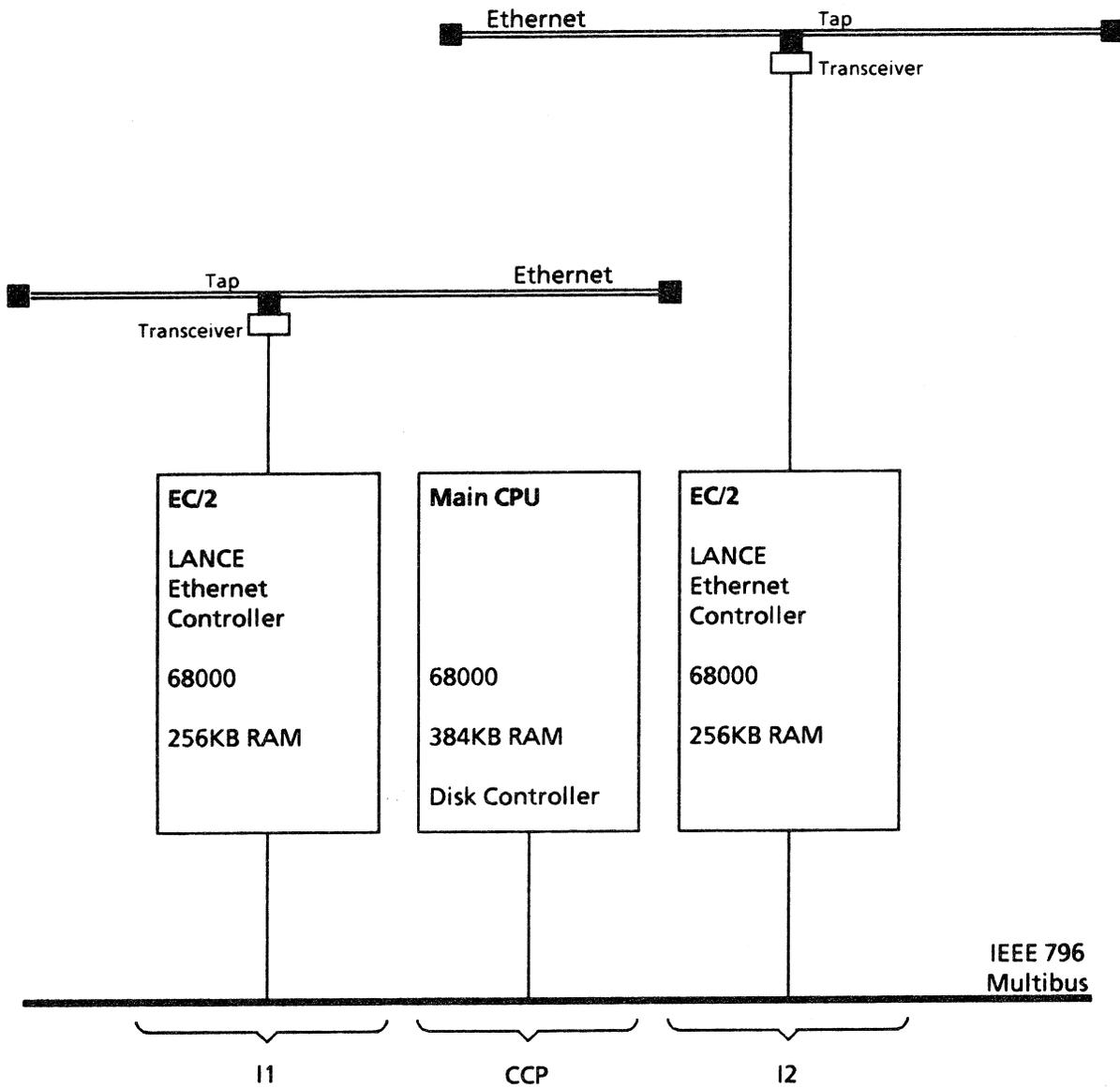
Figure 2-11 GS/4 and IB/2 Hardware Architecture

Tap                                    Ethernet

Transceiver

```
        * │ EC/2              │   │ Main CPU          │   │ HSM Module        │
          │                   │   │                   │   │                   │
          │ LANCE             │   │                   │   │ WD2511A           │
          │ Ethernet          │   │                   │   │ (HDLC)            │
          │ Controller        │   │                   │   │ Controller        │
          │                   │   │                   │   │                   │
          │ 68000             │   │ 68000             │   │                   │
          │                   │   │                   │   │                   │
          │ 256KB RAM         │   │ 384KB RAM         │   │                   │
          │                   │   │                   │   │                   │
          │                   │   │ Disk Controller   │   │                   │
          └───────────────────┘   └───────────────────┘   └───────────────────┘
```

IEEE 796
Multibus

I1                    CCP                    I2
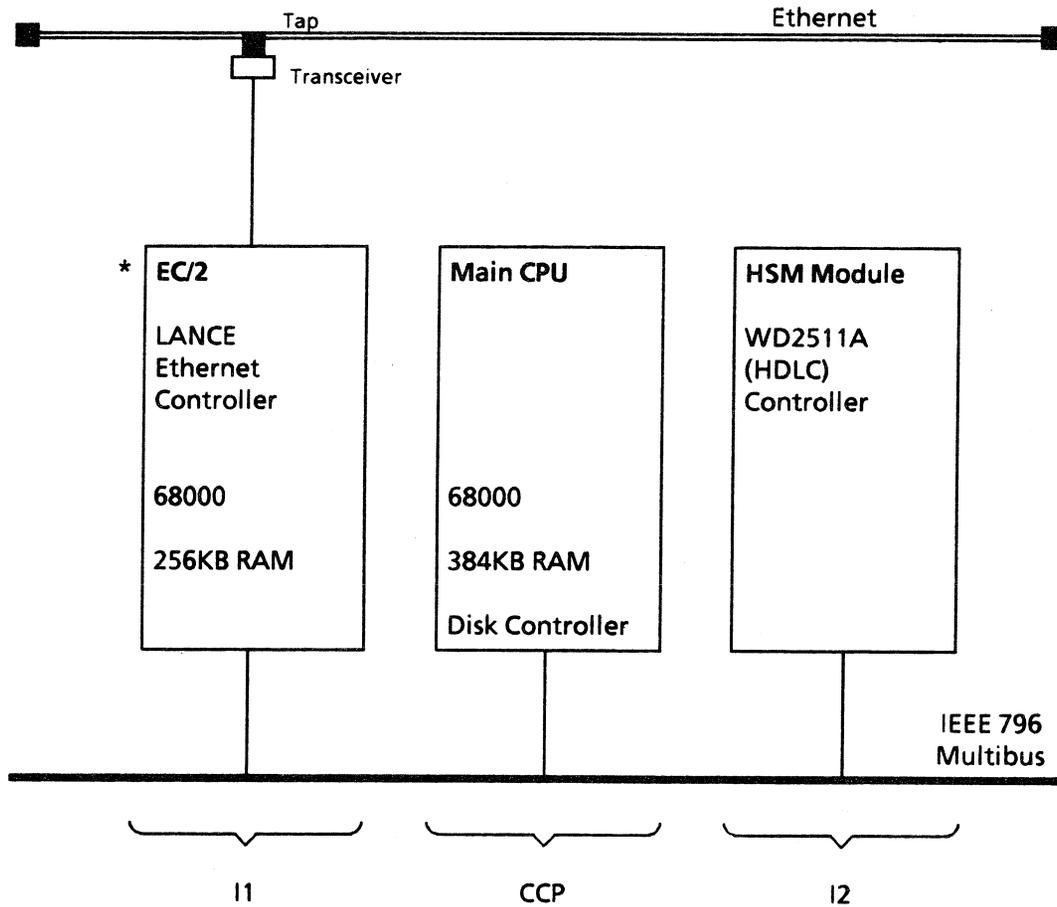
* Some systems may have a two-board I1 module (EC/1) with 128KB RAM.

Figure 2-12   CS/1-HSM and GS/6 Hardware Architecture
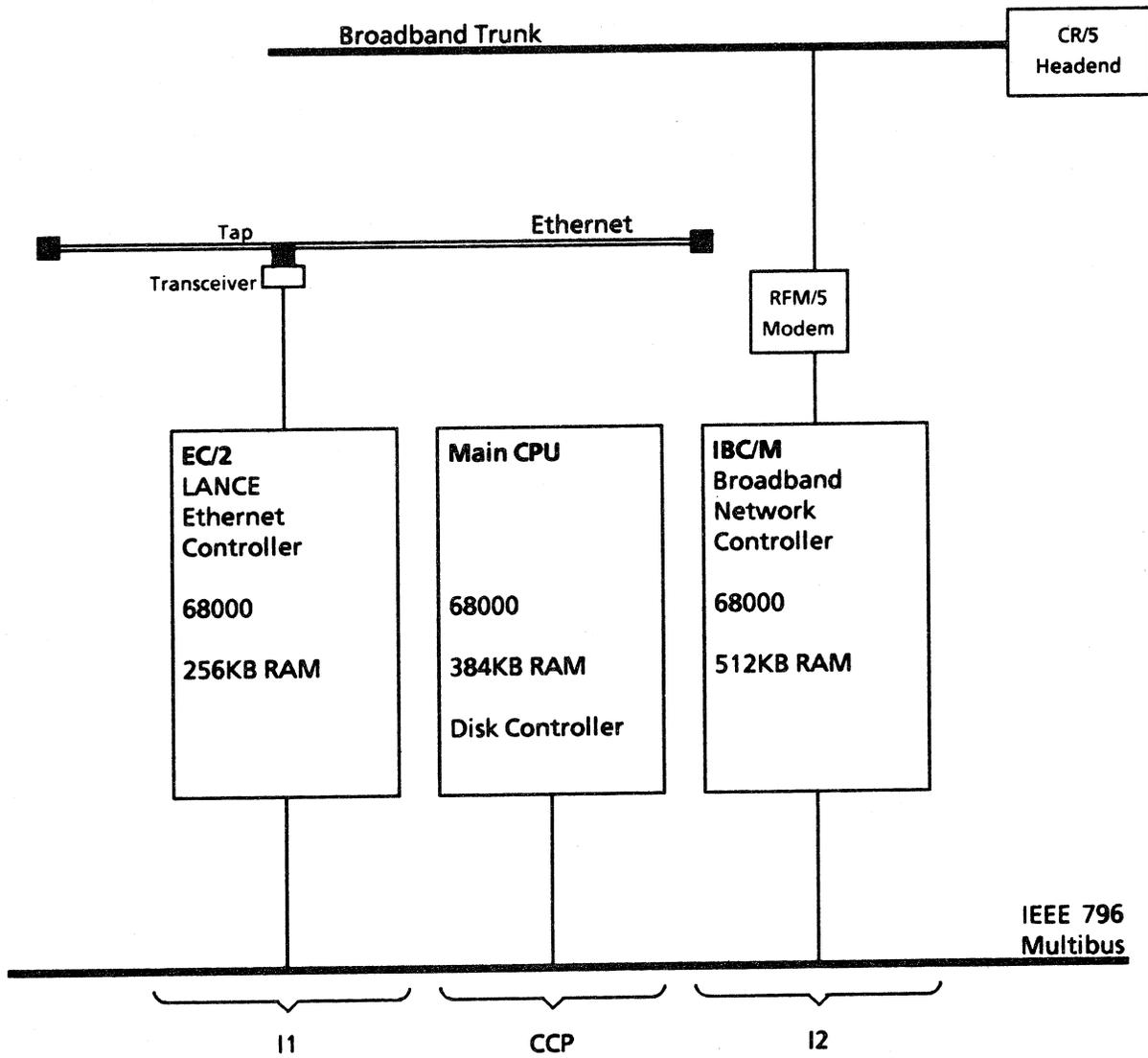
Figure 2-13  IB/1 Hardware Architecture

### 2.4.1 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/1 (EC/1) module or an Ethernet Controller/2 (EC/2) module for Ethernet networks; an Intelligent Broadband Controller Module (IBC/M) for broadband networks; or a Token Ring Controller Module (TRC/M) 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/1, 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.

The Ethernet controller module includes the Ethernet Backpanel Attachment (EBA) assembly. The module is available as the EC/1 or the EC/2. Current Series/1 products with the Ethernet network interface option contain the EC/2 module; older versions of some of the products may contain the EC/1 module. (Refer to the release memo shipped with the unit to determine whether it contains an EC/1 or an EC/2.) However, Bridge does not recommend upgrading products with the EC/1 module to the EC/2 module, since both offer equivalent functions in most applications. The network controller modules are described below.

**Ethernet Controller/1**

The EC/1 module consists of two Multibus boards: the Ethernet Transceiver Interface (ETI) board and the Ethernet Shared Buffer (ESB) board.

The primary function of the ETI board is to transmit and receive Ethernet packets to and from the transceiver. 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 board has discrete SSI and MSI integrated circuits. The ETI is connected to the ESB board through a private P2 Multibus connector, and derives only power and ground from the main P1 Multibus connector.

The ESB board is based on a 68000 microprocessor. It contains 128K bytes of triported RAM, 16K bytes of PROM, one general-purpose 16-bit timer, and a direct memory access (DMA) interface with data chaining. The ESB board is a Multibus slave and is capable of generating one Multibus interrupt. The ESB receives commands via Multibus address decoding and is capable of receiving a large number of back-to-back Ethernet packets. The ESB's processor performs all of the data link functions not handled by the hardware, as well as the buffer management functions necessary to accommodate data exchange between the DMA and the Multibus. The ESB is accessed from the Multibus through a byte-swapping scheme

that allows efficient exchange of data with modules that have byte-positioning conventions different from the Ethernet conventions.

The EC/1 module also includes the Ethernet Backpanel Attachment (EBA) assembly. The EBA board contains the connectors for the MCPU board's console and auxiliary port interfaces, as well as the transceiver interface connector.

### Ethernet Controller/2 (EC/2)

The EC/2 module implements the functions of the EC/1 on a single board. It is based on a 68000 microprocessor for managing the data link controller and associated data buffers. It supports 256K bytes of memory, 16K to 64K bytes of EPROM, and one general-purpose 16-bit timer.

The EC/2 module also includes the Ethernet Backpanel Attachment (EBA) assembly. The EBA assembly contains the connectors for the MCPU board's console and auxiliary port interfaces, as well as the transceiver interface connector.

For OEM use, the EC/2 board can support additional memory (up to 1M bytes) 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 512K bytes of memory, 16K to 64K bytes of EPROM, and one general-purpose 16-bit timer. The IBC/M includes a backpanel attachment assembly. For the CS/1, the assembly is a BBA-37; for the IB/1, the assembly is an SBA-B-37. The BBA-37 assembly contains the connectors for the MCPU board's console port interface, as well as the RFM/5 interface connector; the SBA-B-37 contains only the RFM/5 interface connector.

For OEM use, the IBC/M board can support additional memory and two serial I/O ports via an optional DUEX board and can connect 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 decapsulization, serialization and deserialization, CRC generation and checking, 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 512K bytes of memory, 48K bytes 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 inter-

faces, as well as a DB-9 connector to connect the standard IBM cable to the ring via a
multistation access unit interface connector.

## 2.4.2 Main CPU Module

The main CPU module consists of a Main CPU (MCPU) board and an optional Floppy Disk
Controller (FDC) board. The MCPU performs protocol processing and support functions; it
contains power-on self-test diagnostics and a monitor, as well as console terminal and auxili-
ary port interfaces.

The MCPU board is based on a 68000 microprocessor. It contains 384K bytes of RAM, 16K
bytes of PROM (expandable to 32K bytes), 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 [19]. 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.

In the CS/1-SNA, the MCPU module also includes the Shared Buffer Board (SBB), contain-
ing 256K bytes of Multibus RAM memory for 3270 screen buffer storage.

## 2.4.3 I/O Module

The primary function of the I/O module is to provide I/O device interfaces to the Bridge
Series/1 products. The I/O module differs depending on the server model. The module may
be a Serial I/O (SIO) module or a high-speed multiplexer (HSM) module. Refer to Sections
6.3 and 6.4 for procedures on adding and replacing SIO and HSM 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. Asynchro-
nous, synchronous, and bit-synchronous SIO modules can be intermixed within one CS/1
unit.

The CS/1-SNA supports a single SIO module with one synchronous port, which can be
configured for either full-duplex or half-duplex communication.

The GS/1, GS/3, and CS/1-X.25 provide up to two full-duplex, synchronous ports per SIO
board. They can support up to four SIO modules, providing a maximum of eight ports.

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 4K bytes of RAM, 16K bytes
of PROM (expandable to 32K bytes), two general-purpose 16-bit timers, eight serial I/O

ports, and an iSBX interface (see reference [19]). 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 Series/1 server. Refer to Sections 3.1.8 and 5.2.8 for detailed descriptions of 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 32K bytes 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. The SIO-16 board receives commands via Multibus address decoding. The SIO-16 board does not contain an iSBX connector.

The CS/1 can support up to four SIO-16 modules, providing a maximum of 64 ports. Refer to Sections 3.1.8 and 5.2.9 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 board. The SIO-3270 board is based on an Intel 80186 microprocessor and contains 128K bytes of dynamic RAM, 128K bytes of PROM (expandable to 192K bytes), 4K bytes 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. Refer to Sections 3.1.8 and 5.2.10 for detailed descriptions of the SIO-3270 module.

## HSM Module

The HSM module is available in two versions: one (referred to as the HSM) for the CS/1-HSM and one (referred to as the HSM-MDM) for the GS/6. Refer to Sections 3.1.9 and 5.2.12 for detailed descriptions of these versions.

Both versions are Multibus-compatible, synchronous serial communications boards, each with a single port. They are based on a Western Digital X.25 Packet Network Controller chip (WD2511A). The CS/1-HSM module consists of an HSM board, an SBA-HSM cable assembly, a Host Adapter Card (HAC) cable, and screws. The SBA assembly provides the connector for attaching the HAC cable. The GS/6 HSM board (HSM-MDM) is a modified HSM board with a higher data transfer rate (1M bps) and an interface to an on-board RF modem.

The CS/1-HSM can support up to two HSM modules, each of which supports one interface to the HAC cable that connects to the host computer. The GS/6 supports one HSM-MDM module.

## 2.4.4 Miscellaneous Hardware Components

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

The MBI board is designed to accommodate a maximum of eight Multibus-size boards. The MBI board 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.

The floppy disk drive has an unformatted capacity of 500K bytes and a formatted capacity of 320K bytes.

The CS/1-HSM also requires a Host Adapter Card (HAC), which is installed in the host computer and a HAC cable that connects the SBA assembly in the CS/1-HSM with the host. Appendix C describes in detail the HAC card installation and host configuration procedures.

## 2.5 Software Modules

This section briefly describes the Series/1 server software modules. Figures 2-14 through 2-26 illustrate the software modules and their relationship with the functional modules in various Series/1 products. For a complete discussion of the software modules refer to the *Software Technical Reference Manual.*

| CCP Module | | | | | | |
|---|---|---|---|---|---|---|
| Multitasking Kernel | | | | | | |
| DL<br><br>Ethernet<br>Data Link<br>Protocol | IDP<br>Inter-<br>network<br>Datagram<br>Protocol | SPP<br><br>Sequenced<br>Packet<br>Protocol | VTP<br><br>Virtual<br>Terminal<br>Protocol | VTM<br><br>Virtual<br>Terminal<br>Monitor | UI<br><br>User / Host<br>Interface | Device<br>Driver |
| Network Management Module | | | | | | |
| I1 Module | | | | | | I2 Module |
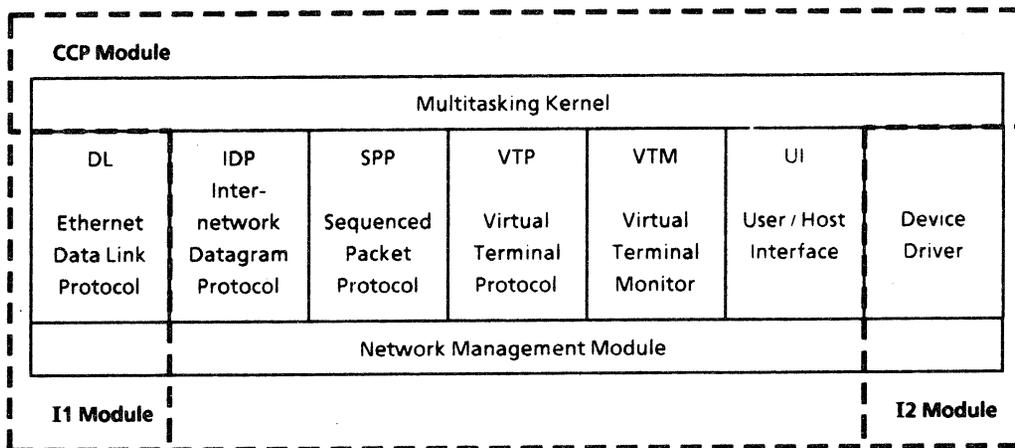
Figure 2-14  CS/1 (with XNS protocols and Asynchronous,
Byte-synchronous, or Bit-synchronous interfaces)
and CS/1-HSM Software Architecture

| CCP Module | | | | | | | |
|---|---|---|---|---|---|---|---|
| Multitasking Kernel | | | | | | | |
| DL<br><br>Ethernet<br>Data Link<br>Protocol | ARP<br><br>Address<br>Resolution<br>Protocol | IP<br><br>Internet<br>Protocol | TCP<br>Trans-<br>mission<br>Control<br>Protocol | TN<br><br>Telnet<br>Protocol | VTM<br><br>Virtual<br>Terminal<br>Monitor | UI<br><br>User /Host<br>Interface | Device<br>Driver |
| Network Management Module | | | | | | | |
| I1 Module | | | | | | | I2 Module |
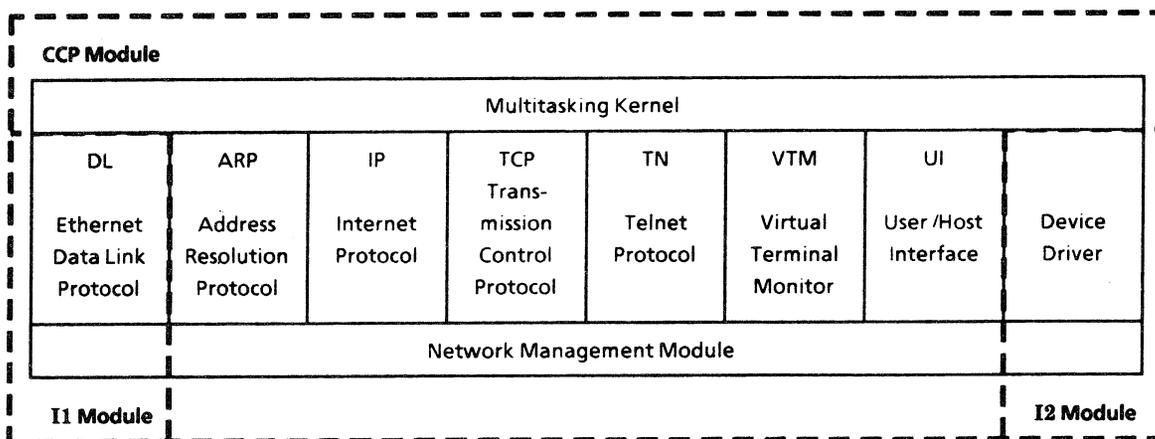
Figure 2-15  CS/1 Software Architecture
(with TCP protocols)
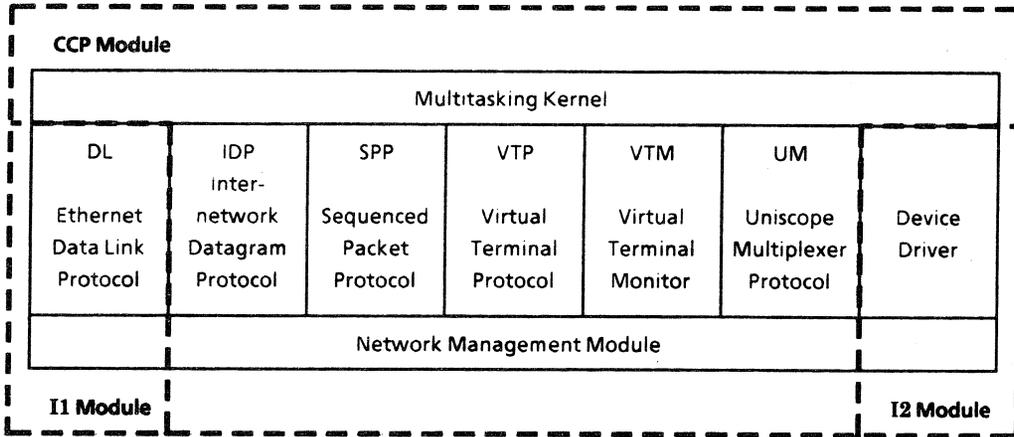
**Figure 2-16  Architecture of CS/1 with SPMUX Software**
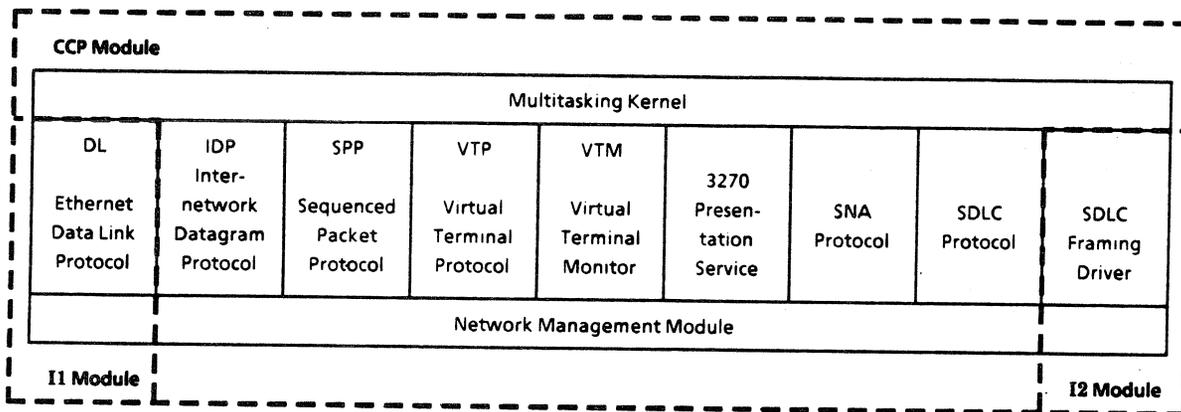


**Figure 2-17  CS/1-SNA Software Architecture**
**(with XNS protocols)**

**CCP Module**

| Multitasking Kernel | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DL<br><br>Ethernet<br>Data Link<br>Protocol | ARP<br><br>Address<br>Resolution<br>Protocol | IP<br><br>Internet<br>Protocol | TCP<br>Trans-<br>mission<br>Control<br>Protocol | TN<br><br>Telnet<br>Protocol | VTM<br><br>Virtual<br>Terminal<br>Monitor | 3270<br>Presen-<br>tation<br>Service | SNA<br>Protocol | SDLC<br>Protocol | SDLC<br>Framing<br>Driver |
| Network Management Module | | | | | | | | | |

I1 Module                                                                                       I2 Module
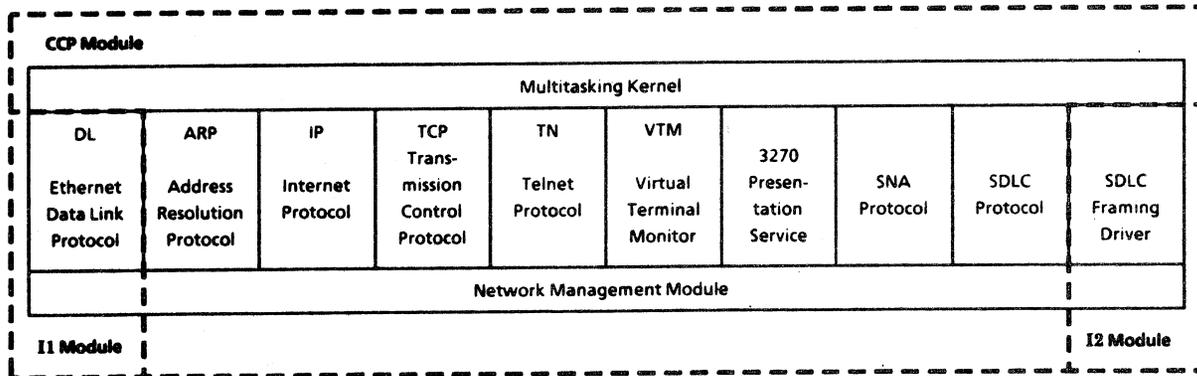
Figure 2-18  CS/1-SNA Software Architecture
(with TCP protocols)



**CCP Module**

| Multitasking Kernel | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DL<br><br>Ethernet<br>Data Link<br>Protocol | IDP<br>Inter-<br>network<br>Datagram<br>Protocol | SPP<br><br>Sequenced<br>Packet<br>Protocol | VTP<br><br>Virtual<br>Terminal<br>Protocol | VTM<br><br>Virtual<br>Terminal<br>Monitor | UI<br><br>User/Host<br>Interface | X.29<br>Protocol | X.25<br>Protocol<br>(Layers<br>2 and 3) | HDLC<br>Framing<br>Driver |
| Network Management Module | | | | | | | | | |

I1 Module                                                                                       I2 Module
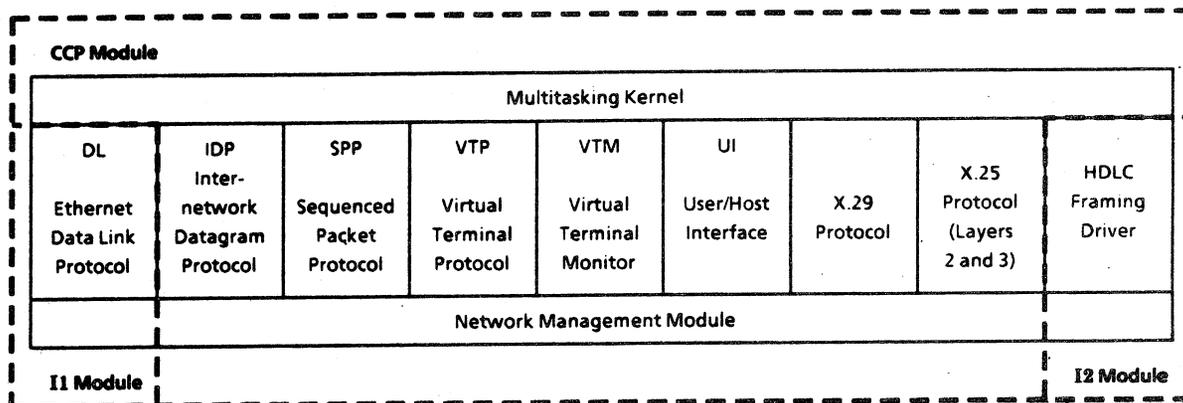
Figure 2-19  CS/1-X.25 and GS/1 Connection Service
Software Architecture

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ CCP Module                              │
│  ┌─────────────────────────────────────┐ │
│  │        Multitasking Kernel          │ │
│  ├──────┬──────┬──────┬──────┬─────────┤ │
│  │ DL   │ IDP  │      │      │         │ │
│  │      │Inter-│ X.25 │ X.25 │ HDLC    │ │
│  │Ethernet│network│Datagram│Protocol│Framing│ │
│  │Data Link│Datagram│Protocol│       │ Driver │ │
│  │Protocol│Protocol│      │      │         │ │
│  ├──────┴──────┴──────┴──────┴─────────┤ │
│  │     Network Management Module       │ │
│  └─────────────────────────────────────┘ │
│ I1 Module                    I2 Module  │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
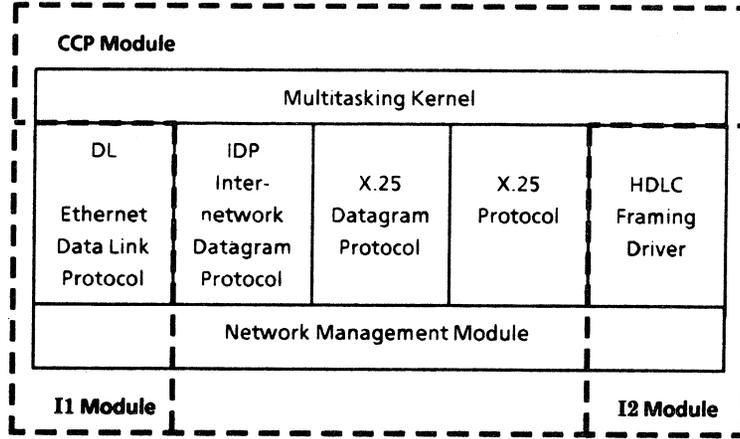
**Figure 2-20  GS/1 Interconnection Service
Software Architecture**

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ CCP Module                          │
│  ┌─────────────────────────────────┐ │
│  │      Multitasking Kernel        │ │
│  ├──────┬──────┬──────┬────────────┤ │
│  │      │ IDP  │ LM   │            │ │
│  │ DL   │Inter-│ Line │            │ │
│  │Ethernet│network│Manage-│ HDLC  │ │
│  │Data Link│Datagram│ment │Framing │ │
│  │Protocol│Protocol│Module│Driver  │ │
│  ├──────┴──────┴──────┴────────────┤ │
│  │   Network Management Module     │ │
│  └─────────────────────────────────┘ │
│ I1 Module                 I2 Module │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
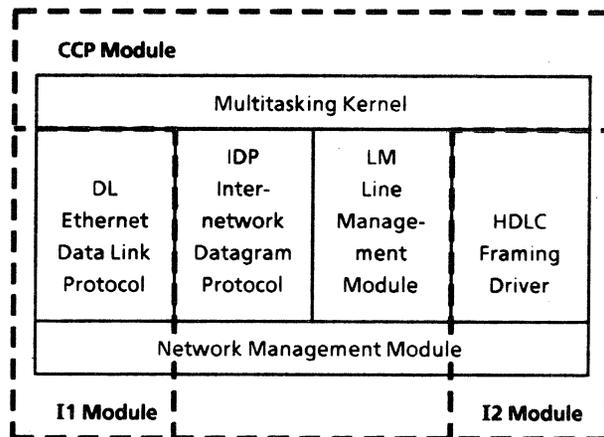
**Figure 2-21  GS/3 Software Architecture
(with XNS protocols)**

```
CCP Module
┌─────────────────────────────────────────────────────┐
│              Multitasking Kernel                      │
├────────┬──────────┬──────────┬──────────┬────────────┤
│  DL    │  ARP     │   IP     │  LM      │            │
│        │          │          │  Line    │  HDLC      │
│ Ethernet│ Address │ Internet │ Manage-  │  Framing   │
│ Data Link│Resolution│Protocol │ ment    │  Driver    │
│ Protocol│ Protocol │          │  Module  │            │
├────────┴──────────┴──────────┴──────────┤            │
│         Network Management Module         │            │
└──────────────────────────────────────────┴────────────┘
  I1 Module                                    I2 Module
```
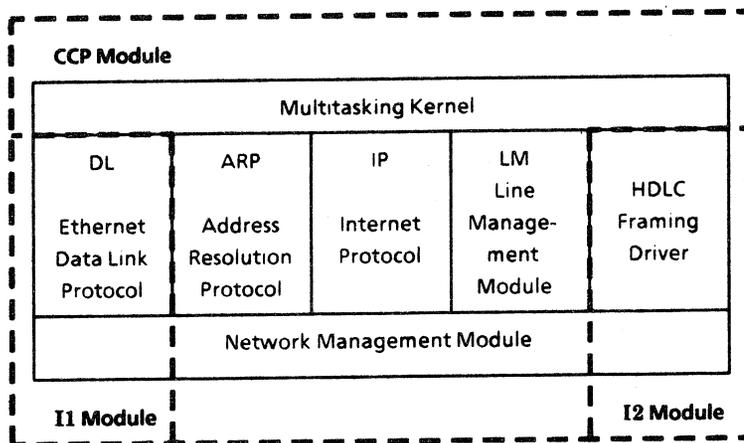
**Figure 2-22  GS/3 Software Architecture**
**(with the IP protocol)**

```
CCP Module
┌──────────────────────────────────────┐
│          Multitasking Kernel          │
├────────┬──────────┬──────────────────┤
│  DL    │  IDP     │     DL            │
│        │  Inter-  │                   │
│ Ethernet│ network │  Ethernet         │
│ Data Link│ Datagram│ Data Link        │
│ Protocol│ Protocol │ Protocol         │
├────────┴──────────┴──────────────────┤
│      Network Management Module         │
└────────────────────────────────────────┘
  I1 Module              I2 Module
```
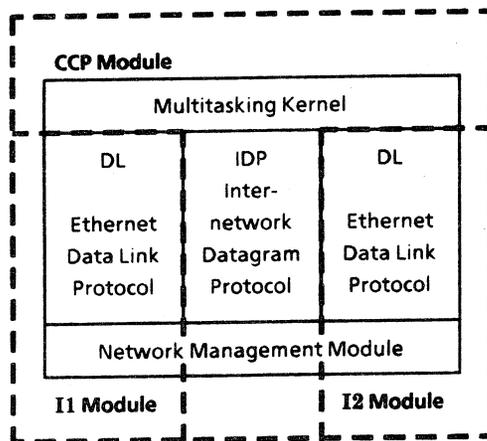
**Figure 2-23  GS/4 Software Architecture**
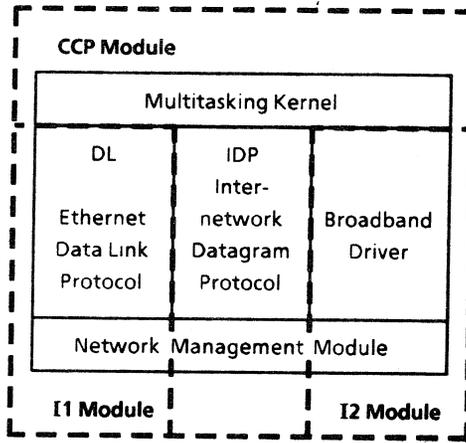
Figure 2-24  GS/6 Software Architecture
(with XNS protocols)
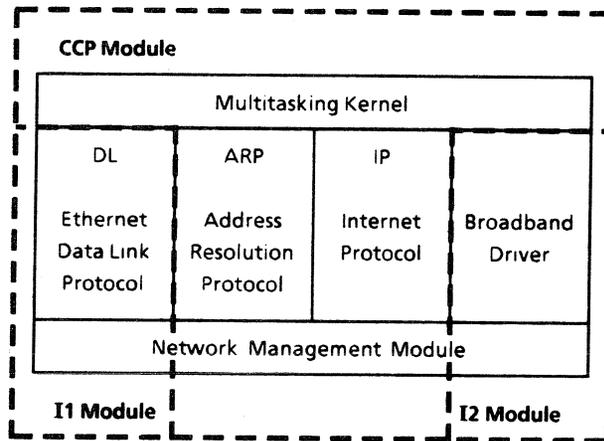
Figure 2-25  GS/6 Software Architecture
(with the IP protocol)

```
┌─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│  CCP Module                          │
│  ┌─────────────────────────────────┐ │
│  │        Multitasking Kernel       │ │
│  ├──────┬──────┬──────┬──────┬──────┤ │
│  │  DL  │  AF  │  PF  │  AF  │  DL  │ │
│  │      │      │      │      │Broadband│
│  │Ethernet│Address│Packet│Address│or Ethernet│
│  │Data Link│Filtering│Forwarding│Filtering│Data Link│
│  │Protocol│Module│Module│Module│Protocol│ │
│  ├──────┴──────┴──────┴──────┴──────┤ │
│  │   Network  Management  Module    │ │
│  └─────────────────────────────────┘ │
│  I1 Module                  I2 Module│
└─ ─ ─ ─ ─ ─ ─ ┘ └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┘
```
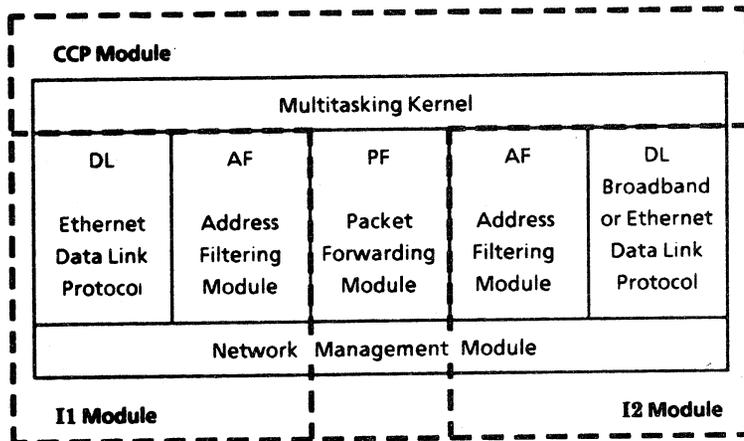
Figure 2-26  IB/1 and IB/2 Software Architecture

### 2.5.1 Common Software Modules

All Series/1 servers 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 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 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 board, or partially on the MCPU 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 board; on a server with an EC/2 network interface board, most of the code resides as software on the MCPU 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 Communications Servers also have an I/O Device Driver module, which varies by server model.

On the 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 the CS/1-HSM, the Device Driver module consists of a high-speed, multiplexing protocol driver known as the AP process.

On the 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 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.

On the CS/1-HSM, all of the Device Driver software resides on the MCPU board.

The CS/1-SNA, CS/1-X.25, and most Gateway Servers have a Framing Driver module.

The module in the CS/1-SNA is a bit-synchronous interrupt-based driver that passes data and flow control signals to and from the modems or lines attached to the SIO board. The majority of the software resides as firmware on the SIO board; the remaining software resides on the MCPU board.

The CS/1-X.25, GS/1, and GS/3 have a synchronous framing driver, which is an interrupt-based driver that transfers data and flow control signals to and from the modems or lines attached to the SIO board. The majority of the software resides as firmware on the SIO board; the remaining software resides on the MCPU board.

The GS/6's Broadband Driver module is a synchronous framing driver that transfers data to and from the broadband modem connected to the HSM-MDM board. The module resides as software on the MCPU board.

## 2.5.2 Common XNS Connection Service Modules

All servers that support 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 the XNS protocols, the CS/1-HSM, CS/1-X.25, and GS/1 each contain the User/Host Interface module.

The User/Host Interface (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.

### 2.5.3 CS/1 with TCP Connection Service Modules

The CS/1 with asynchronous I/O interfaces and the TCP protocols contains the modules described in Section 2.5.1, the VTM and UI modules described in Section 2.5.2, and the following TCP modules:

- Address Resolution Protocol module

- Internet Protocol module

- Transmission Control Protocol module

- Telnet 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 2.5.2).

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 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.

### 2.5.4 CS/1-SNA Modules

The CS/1-SNA with the XNS protocols contains the modules described in Sections 2.5.1 and 2.5.2, and the following SNA modules:

- 3270 Presentation Service module

- SNA Protocol module

- SDLC Protocol module

The 3270 Presentation Service (PS) module performs the device-dependent functions required for emulation of a 3270 terminal or printer. The PS module interprets data streams directed to the device, formats screen images for presentation at the device, and processes keystrokes.

The SNA Protocol consists of a Data Flow Control (DFC) module, a Transmission Control (TC) module, and a Path Control (PC) module. The DFC module controls the direction of data flow, chains message units, governs send and receive modes, and assists in error management. The TC module constructs the message unit headers for processing by Path Control, assigns message sequence numbers, and controls the rate of data flow. The PC module performs segmenting and blocking and establishes the transmission path for each message.

The SDLC Protocol module handles the Synchronous Data Link Control functions, providing reliable transmission of frames between the CS/1-SNA and the front-end processor.

The CS/1-SNA with the TCP protocols contains the modules described in Section 2.5.1, the VTM module described in Section 2.5.2, the TCP modules described in Section 2.5.3, and the SNA modules described above.

## 2.5.5 Sperry MUX Module

The SPMUX module contains the modules described in Sections 2.5.1 and 2.5.2, and a Uniscope Multiplexer (UM) module.

The UM module multiplexes messages from the attached terminals and transfers the messages to the VT module to be sent across the Ethernet to the remote host. In the reverse direction, UM demultiplexes messages sent by the remote host and transmits the messages to the appropriate serial port. UM also multiplexes and demultiplexes control information sent between terminal and host, and ensures end-to-end data integrity using an 8-bit LRC error-checking algorithm.

## 2.5.6 CS/1-X.25 and GS/1 Connection Service Modules

The CS/1-X.25 and the GS/1 Connection Service contain the modules described in Sections 2.5.1 and 2.5.2, and the following:

- X.29 Protocol module

- X.25 Protocol module

The X.29 Protocol module (abbreviated as X.29) provides the same services as the VTP and VTM modules, but using X.25 protocol functions. The services include establishment of virtual circuits, setting of terminal parameters, attention signaling, and synchronized disconnection.

The X.25 Protocol module (abbreviated as X.25) performs the encapsulation and decapsulation (on transmission and reception, respectively) necessary to send packet fragments on a virtual circuit across a PDN. The X.25 module resides on the MCPU board.

## 2.5.7 GS/1 Interconnection Service Modules

The GS/1 contains the modules described in Section 2.5.1; the Internetwork Datagram Protocol module described in Section 2.5.2; the X.25 Protocol module described in Section 2.5.6; and an X.25 DataGram Translator (XDG) module.

The XDG module translates the IDP datagram service into an X.25 connection service and, in the other direction, the X.25 connection service into an IDP datagram service. The XDG module is also responsible for load balancing. The module resides on the MCPU board.

## 2.5.8 GS/3 Modules

The GS/3 with the XNS protocols contains the modules described in Section 2.5.1, the Internetwork Datagram Protocol described in Section 2.5.2, and the Line Management module.

The Line Management module is responsible for load balancing and the packet-routing tasks necessary for automatic switchover of packet transmission from one line to another if one line becomes unavailable.

The GS/3 with the IP protocol contains the modules described in Section 2.5.1, the Address Resolution Protocol and Internet Protocol described in Section 2.5.3, and the Line Management module described above.

### 2.5.9  GS/4 Modules

The GS/4 contains the modules listed in Section 2.5.1 (including two Data Link modules) and no driver module. It also contains the Internetwork Datagram Protocol described in Section 2.5.2.

### 2.5.10  GS/6 Modules

The GS/6 with the XNS protocols contains the modules described in Section 2.5.1 and the Internetwork Datagram Protocol described in Section 2.5.2.

The GS/6 with the IP protocol contains the modules described in Section 2.5.1 and the Address Resolution and Internet protocols described in Section 2.5.3.

### 2.5.11  IB Modules

The IB/1 and IB/2 each contain the modules described in Section 2.5.1 (except the Device Driver module) and the following internetwork bridge modules:

- Address Filtering Module

- Packet Forwarding Module

Each internetwork bridge contains two Address Filtering (AF) modules. The AF modules are responsible for matching the Ethernet address on incoming packets to the appropriate destination address.

The Packet Forwarding (PF) module is responsible for forwarding packets to the appropriate destination network. This module initializes the Data Link interface and copies packet information from one memory space to another when forwarding packets between networks.

## 3.0 PREINSTALLATION PLANNING

This section describes the external physical specifications of the Series/1 servers.

Where information applies equally to all Series/1 products, the generic term "server" is used. Where information applies to only one Series/1 product, the server model is included for clarity.

## 3.1 Physical Description

This section lists the Series/1 server's external dimensions and weight; describes and illustrates the external indicators, switches, cables, and connectors; and lists the connector pin assignments where applicable.

## 3.1.1 Exterior Dimensions

The exterior dimensions and weight of the Series/1 unit are as follows:

| | |
|---|---|
| Height | 9.5 in / 24.1 cm |
| Width | 17.0 in / 43.2 cm |
| Depth | 21.3 in / 54.1 cm |
| Weight | 32.0 lb / 14.5 kg |

The Series/1 server is available for either tabletop or rack mount installation. Figure 3-1 shows the Series/1 server enclosure. Figure 3-2 illustrates the basic front panel of the CS/1 or Gateway Server, indicating the positions of the diagnostic LEDs and floppy disk unit. Figure 3-3 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. Figure 3-4 illustrates the front panel of the Internetwork Bridges, indicating the positions of the LEDs and floppy disk unit.

Servers equipped with other interface options may have different connector combinations. For example, three of the five back panels on a GS/4 or GS/6 are blank because only one cable connector is needed for each model.

Sections 3.1.6 through 3.1.10 provide detailed descriptions and illustrations of each discrete back panel attachment assembly (Figures 3-5 through 3-16).

LED INDICATORS

FLOPPY DISK UNIT

FRONT

RECESSED
AIR INTAKE

CONNECTOR PANELS
(UP TO FOUR)

NETWORK, CONSOLE,
AND AUXILIARY
CONNECTOR PANEL

POWER RECEPTABLE,
SWITCH, AND FUSE

BACK

AIR
EXHAUST
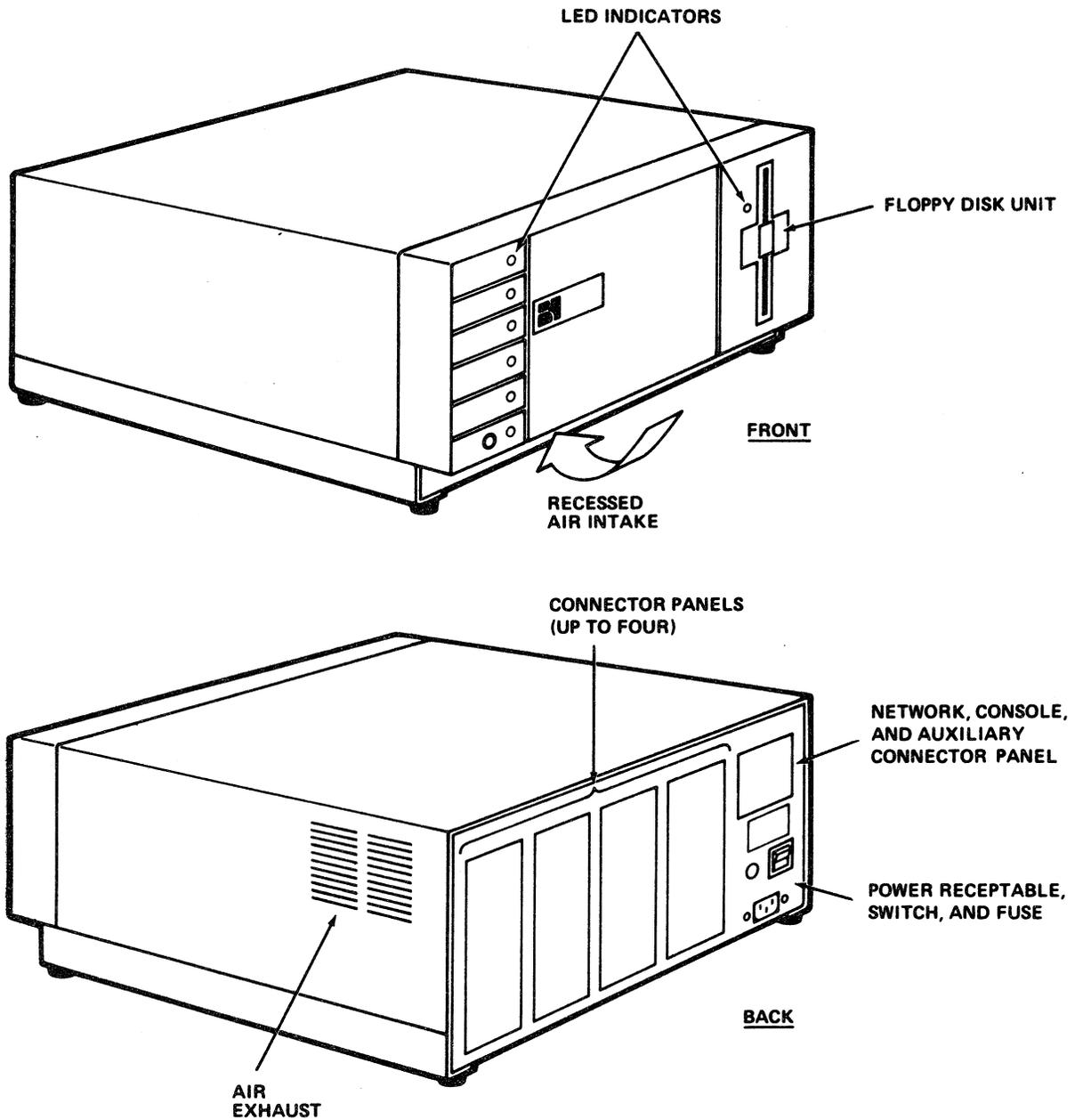
Figure 3-1  Series/1 Server Enclosure
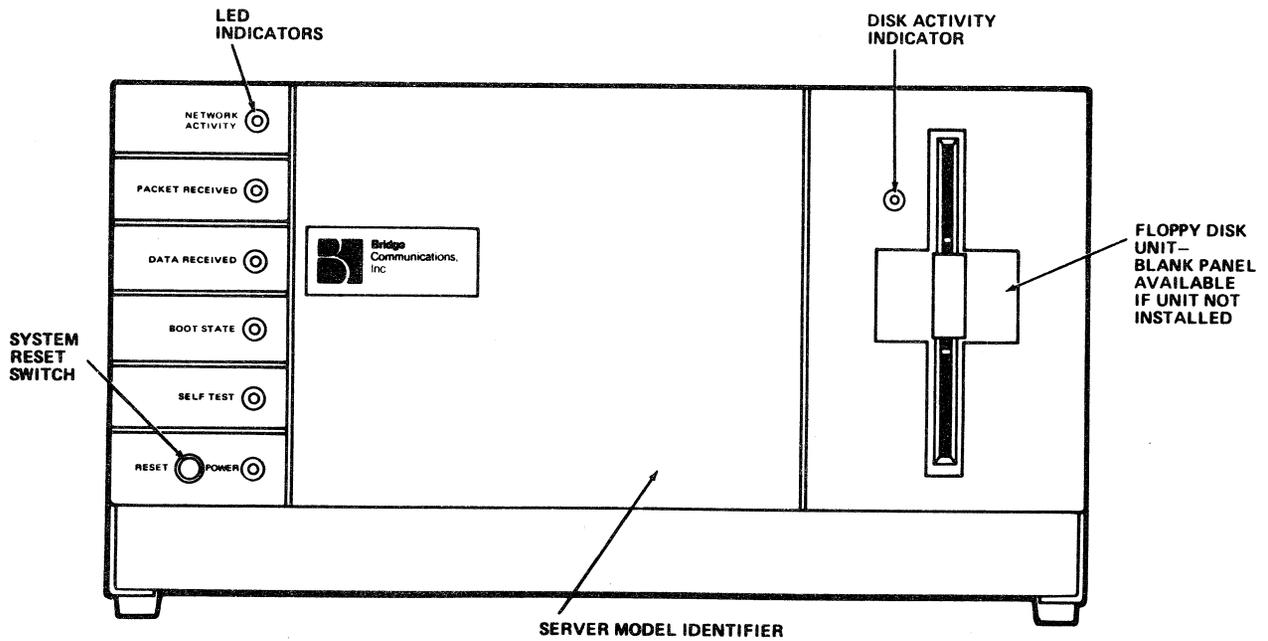
Figure 3-2  CS/1 and Gateway Server Front Panel
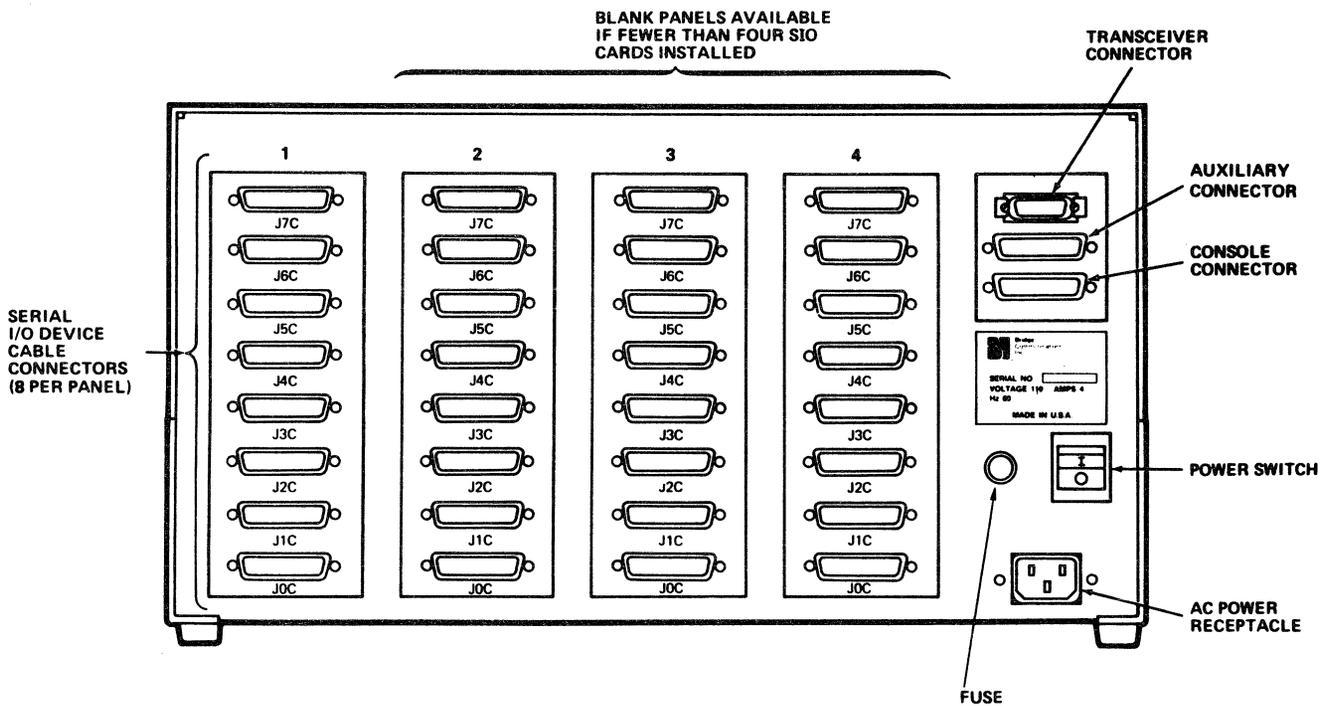
Figure 3-3  CS/1 Back Panel with SIO-A or SIO-ST

LED
INDICATORS

DISK ACTIVITY
INDICATOR

NETWORK
ACTIVITY

PACKET RECEIVED

Bridge
Communications
Inc

FLOPPY DISK
UNIT

PACKET
FORWARDED

SYSTEM
RESET
SWITCH

BOOT STATE

SELF TEST

RESET    POWER

INTERNETWORK BRIDGE
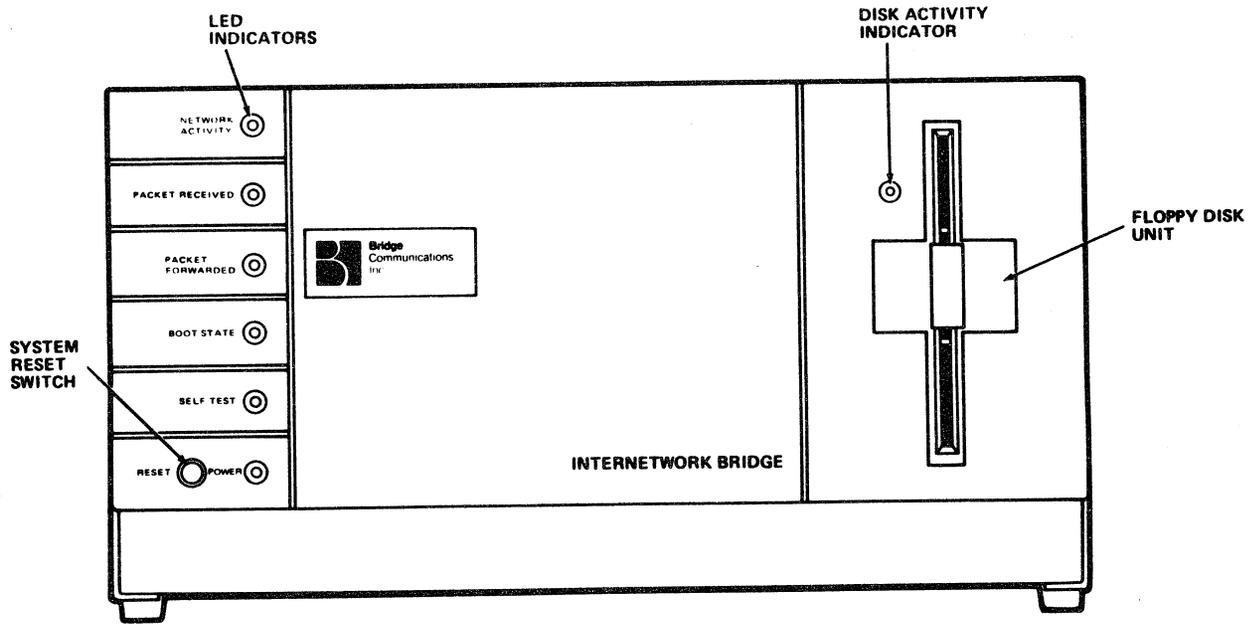
Figure 3-4 Internetwork Bridge Front Panel

### 3.1.2  CS/1 and Gateway Server Front Panel LED Displays

The CS/1 and Gateway Server's front panel contains seven LED indicators that light to display diagnostic activity both at power-on and while the server software is running. Table 3-1 lists the LEDs and their functions.

| Table 3-1  CS/1 and Gateway Server 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. |
| 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. |

### 3.1.3 Internetwork Bridge Front Panel LED Displays

The Internetwork Bridge front panel contains seven LED indicators that light to display diagnostic activity both at power-on and while the system software is running. Table 3-2 lists the LEDs on the IBs and their functions.

| Table 3-2 Internetwork Bridge Front Panel LED Indicators | |
|---|---|
| *Name* | *Function* |
| Network Activity | Flashes when the internetwork bridge detects a packet on the Ethernet network attached to the EBA assembly. Packet address need not match the server's address. Used to verify proper physical attachment to the network cable attached to the EBA, and to indicate network load. |
| Packet Received | Flashes when the destination address in a packet received from the Ethernet Controller indicates the packet should be forwarded. The packet may be discarded, however, based on filter criteria. |
| Packet Forwarded | Flashes when a data packet is forwarded from one network to another. |
| Boot State | On during software bootstrap from onboard diskette. |
| Self Test | On for 12 seconds following reset or power-on. Remains lit longer only if EC/2 fails self-test diagnostic; 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. |
| 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. |

### 3.1.4 Front Panel Reset Switch

The Reset switch is located at the lower left corner of the front panel (refer to Figure 3-1 or 3-4, Section 3.1.1, for CS/1 and Gateway Server, or IB, respectively). Pressing the switch initiates a system reset. The system software and hardware are reinitialized, 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.

### 3.1.5 AC Power Switch, Fuse, and Receptacle

The power switch, fuse, and power receptacle are located on the back panel on all Series/1 server models (refer to Figure 3-3). 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 Series/1 server is delivered with a 5-amp, 1¼" x ¼", fast-blow, U.S. standard fuse. The 230 VAC version is delivered with a 3-amp, 20 mm x 5 mm, fast-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 supplied with an 8-foot (2.4-meter) standard U.S. power cord set. Power cord connectors for use outside the U.S. or the U.K. are not supplied by Bridge Communications, Inc.

### 3.1.6 Network Interface Connectors

This section describes the Ethernet, Broadband, and Token Ring network interface connectors available from Bridge Communications.

**Ethernet Connectors**

The Series/1 server with an Ethernet network interface has a 15-pin, D-Series, subminiature female connector equipped with a slide lock (MIL-C-24308 or equivalent) located on the EBA. The connector is the standard connector described in the Ethernet Version 1.0 or 2.0 specification (references [1] and [2]) and in the IEEE 802.3 specification (reference [3]). Because it connects directly to two transceivers, the IB/2 is equipped with two transceiver connectors: one on the EBA panel and one on the SBA-E panel.

Series/1 servers with an EC/1 must use an Ethernet-compatible transceiver. Servers with an EC/2 board may be attached to Ethernet-compatible or IEEE 802.3-compatible transceivers, and can also operate with Digital Equipment Corporation DELNI equipment.

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

Connectors on the EBA assembly are shown in Figure 3-3, Section 3.1.1; the connector on the SBA-E assembly is shown in Figure 3-5. Tables 3-3 and 3-4 list the transceiver connector pin assignments.
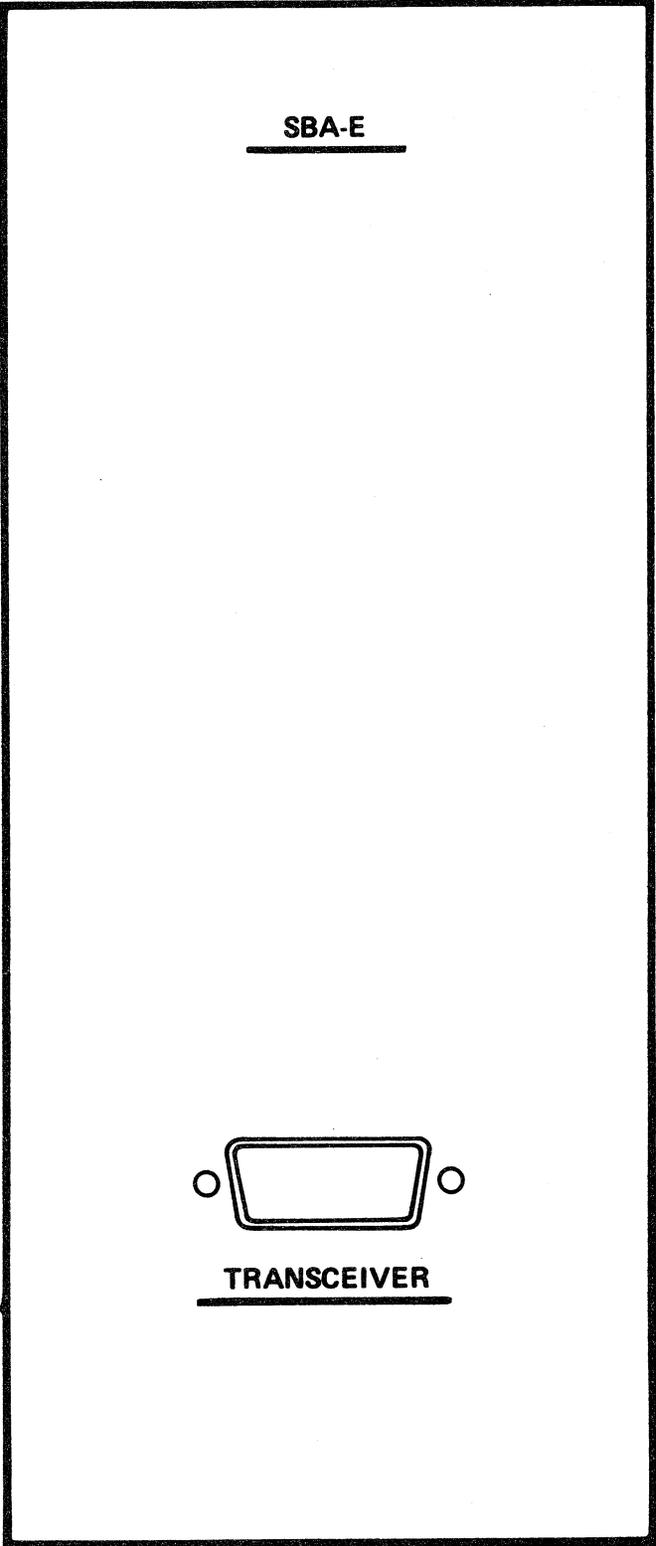
**SBA-E**

**TRANSCEIVER**

Figure 3-5  Connectors on the SBA-E Assembly

Bridge Communications, Inc.

**Table 3-3 Ethernet Transceiver Connector Pin Assignments**

| Pin No. | Function |
|---------|----------|
| 1 | Chassis ground |
| 2 | Collision Presence + |
| 3 | Transmit + |
| 4 | Unused |
| 5 | Receive + |
| 6 | Power Return |
| 7,8 | Unused |
| 9 | Collision Presence - |
| 10 | Transmit - |
| 11 | Unused |
| 12 | Receive - |
| 13 | Power * |
| 14,15 | Unused |
| Shell | Chassis ground |

\* Current should not exceed 500 mA.

**Table 3-4 IEEE 802.3 Transceiver Connector Pin Assignments**

| Pin No. | Function |
|---------|----------|
| 1 | Collision Shield |
| 2 | Collision Presence + |
| 3 | Transmit + |
| 4 | Receive Shield |
| 5 | Receive + |
| 6 | Power Return |
| 7 | Control Out + (Unsupported) |
| 8 | Control Out Shield |
| 9 | Collision Presence - |
| 10 | Transmit - |
| 11 | Transmit Shield |
| 12 | Receive - |
| 13 | Power * |
| 14 | Power Shield |
| 15 | Control Out - (Unsupported) |
| Shell | Chassis ground |

\* 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 RFM/5 connector located on the BBA-37 assembly.

The IB/1 is equipped with one RFM/5 connector on an SBA-B-37 assembly for its broadband network interface, and one transceiver connector on an EBA assembly (described in Section 3.1.6) for its Ethernet network interface.

As an option, Bridge Communications, Inc., provides RFM/5 modem cables in 18-inch and 10-foot lengths.

Figures 3-6 and 3-7 illustrate the connectors on the BBA-37 and the SBA-B-37 assemblies, respectively. Table 3-5 lists the RFM/5 connector pin assignments. RFM/5 installation procedures are described in detail in the *RFM/5 and CR/5 Installation Guide*.

**＊＊   NOTE   ＊＊**

The RF modem connector for the GS/6 is described in Section 3.1.10.
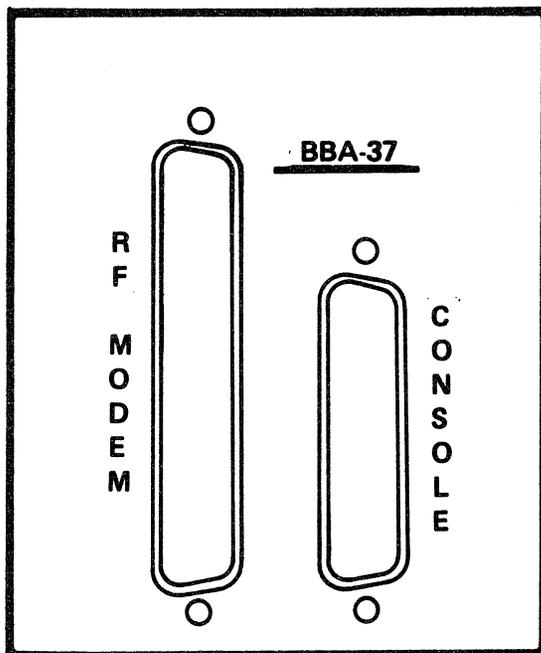


Figure 3-6  Connectors on the BBA-37 Assembly

**SBA-B-37**

**BROADBAND MODEM**
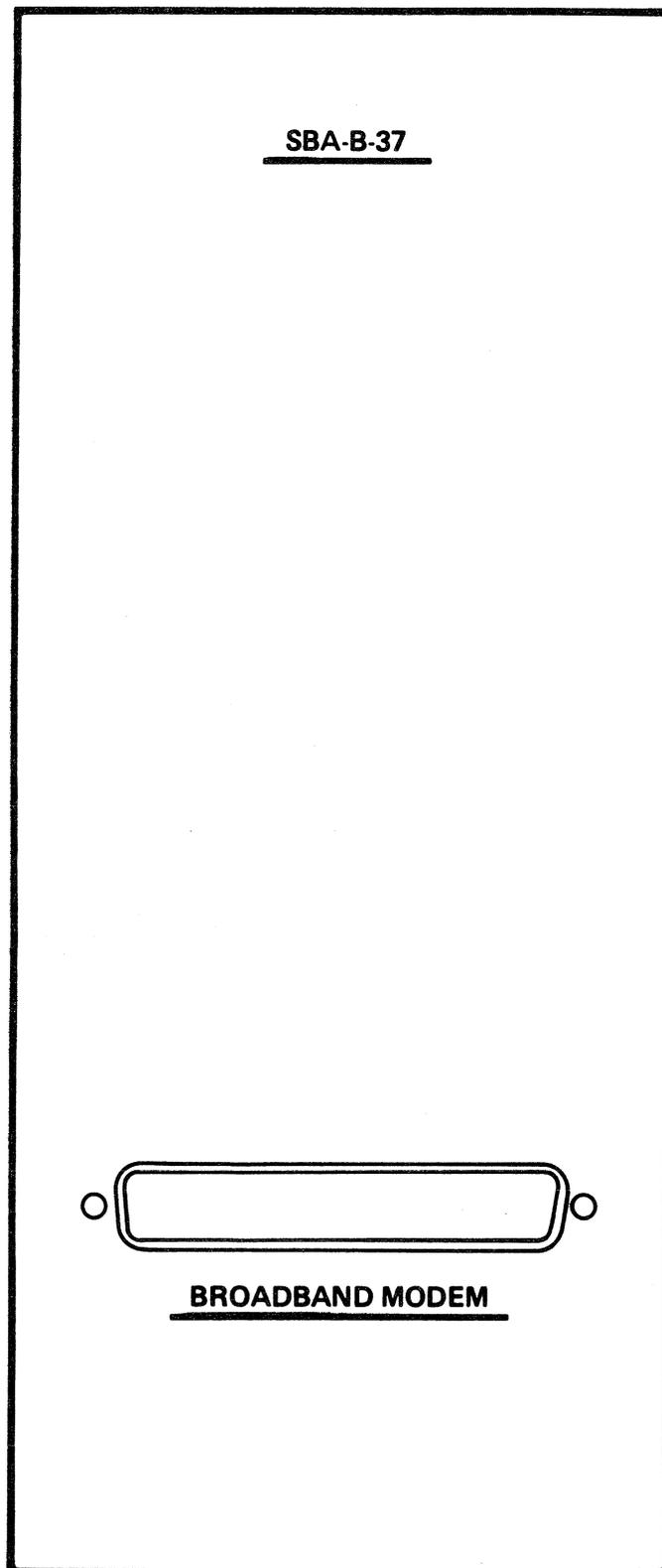
Figure 3-7  Connectors on the SBA-B-37 Assembly

### Table 3-5  RFM/5 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. Cables for these connectors are IBM™ standard and must be supplied by the customer.

Figure 3-8 illustrates the connectors on the TBA assembly. Table 3-6 lists the DB-9 connector pin assignments.
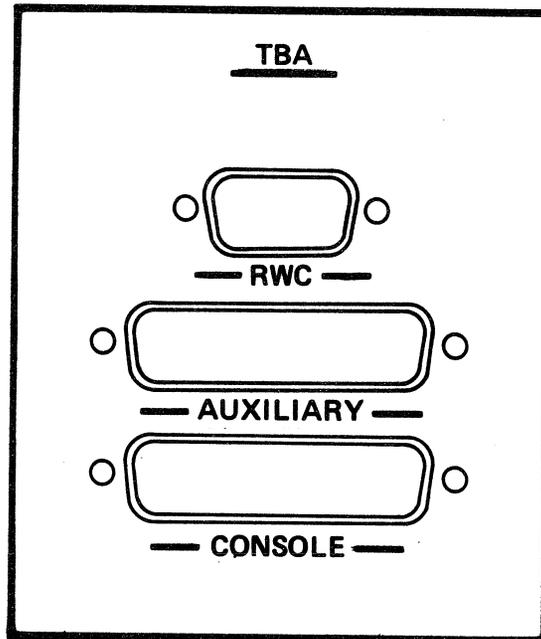
Figure 3-8  Connectors on the TBA Assembly

| Table 3-6  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 |

## 3.1.7 Console and Auxiliary Port Connectors

In addition to the network connectors described in Section 3.1.6, 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 or a Gateway Server with the Ethernet interface, the EBA assembly contains two connectors for console and auxiliary cable attachment: both are horizontal 25-pin, D-Series, subminiature female connectors (RS-232-C DCE-type). The auxiliary port functions as a download port.

  On an IB, the auxiliary port functions as a command port to which a terminal must be attached for entering IB commands.

- Broadband: On a CS/1 with the broadband network interface, the BBA assembly contains one connector for console cable attachment: a vertical 25-pin, D-Series, subminiature female 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 25-pin, D-Series, subminiature female connectors (RS-232-C DCE-type). The auxiliary port functions as a download port.

Figure 3-3, Section 3.1.1, illustrates the locations of the console and auxiliary connectors on a CS/1 back panel. Figures 3-6 and 3-8 illustrate the connectors on the BBA-37 and TBA assemblies, respectively. Cables for the console and auxiliary port connectors are supplied by the customer.

Table 3-7 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 Series/1 servers, the baud rates for both the console and auxiliary ports are selectable via shorting plugs to 110, 300, 1200, or 9600 baud. The default baud rate for both ports is 9600 baud. Refer to Section 5.2.6 for the shorting plug settings.

The console port is preconfigured for 8 databits and no parity. These values may not be adjusted.

**Table 3-7  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

### 3.1.8  I/O Connectors

This section describes the I/O connectors available to each Series/1 server. I/O device connectors are arranged on modular Backpanel Attachment assemblies located on the back of the unit. The Series/1 server 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 device connectors can be supplied by the customer. For most devices, Bridge Communications, Inc., 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:

- 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-ST for RS-232-C synchronous terminals and hosts

- SIO-SM for RS-232-C synchronous modems and hosts

- SIO-422 for RS-449 connectors with RS-422 electrical protocol

- SIO-H422 for RS-422 asynchronous terminals

- SIO-HS422 for X.21 connectors with RS-422 electrical protocol

- SIO-V.35 for V.35 electrical interfaces

Each version designator may have a one-character suffix indicating the type of driver supported by the module. For instance, the SIO-STS module supports a synchronous driver for the CS/1 with a synchronous interface. Table 3-8 indicates which I/O module is standard on each Series/1 server and which modules are available as options.

| Table 3-8  I/O Module Versions | | |
|---|---|---|
| *Server Model* | *Standard I/O Module* | *Optional I/O Modules* |
| CS/1* | None | SIO-A<br>SIO-16<br>SIO-3270<br>SIO-H422A<br>SIO-STS<br>SIO-SMS<br>SIO-422S<br>SIO-V.35S<br>SIO-HS422S |
| CS/1-SNA | SIO-SMS | SIO-422S<br>SIO-HS422S<br>SIO-V.35S |
| CS/1-X.25 | SIO-SMS<br>SIO-HS422S<br>SIO-V.35S | SIO-422S |
| CS/1-HSM | HSM | None |
| GS/1 | SIO-SMS | SIO-422S<br>SIO-HS422S<br>SIO-V.35S |
| GS/3 | SIO-SMS | SIO-422S<br>SIO-HS422H<br>SIO-V.35H |
| GS/6 | HSM-MDM | None |
| IB/1 | None** | None |
| IB/2 | None*** | None |

\*    For SPMUX connections, the CS/1 at the terminal end must be equipped with the SIO-STS module and the CS/1 at the host end must be equipped with the SIO-SMS module; no other versions may be used.

\*\*   The IB/1 connects to one Ethernet transceiver and one RFM/5 connector; it has no I/O interface.

\*\*\*  The IB/2 connects to two Ethernet transceivers; it has no I/O interface.

**SIO-A Connectors**

The SIO-A module is optional in the CS/1. The 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, D-Series female 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 3-9 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 3-3, Section 3.1.1.

| | | | | |
|---|---|---|---|---|
| **Table 3-9  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 optional in the CS/1. The 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. Figure 4-14 in Section 4.2 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 3-9 illustrates the connectors on the SBA-16 assembly.

Table 3-10 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 Section 4.2.
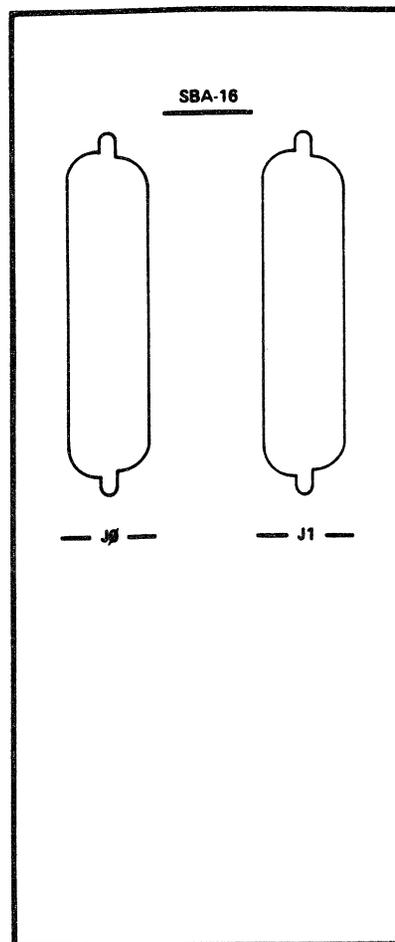
Figure 3-9  Connectors on the SBA-16 Assembly

**Table 3-10  SIO-16 Connector Pin Assignments**
**SBA Connectors J0 and J1**

*Connector J0*    *Connector J1*

| Port No. | 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 3-10  SIO-16 Connector Pin Assignments**
**SBA Connectors J0 and J1 (continued)**

| Connector J0 | Connector J1 | | | | |
| --- | --- | --- | --- | --- | --- |
| Port No. | 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 3-10 illustrates the connectors on the CBA assembly.
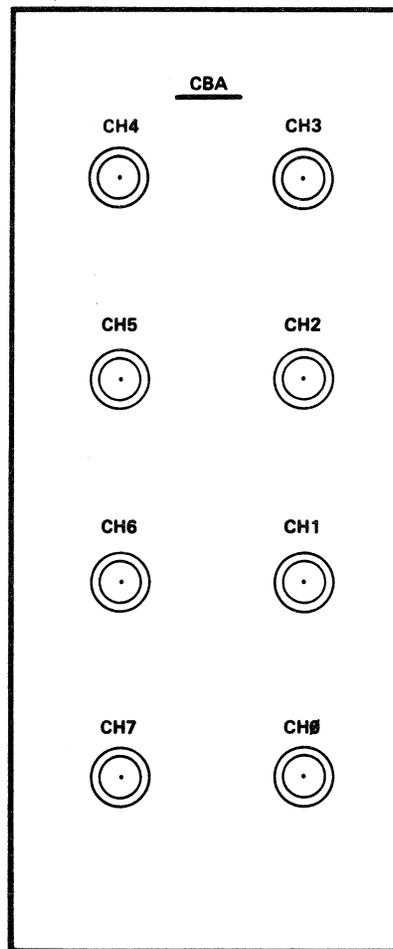
Figure 3-10  Connectors on the CBA Assembly

## 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. The SIO-STS version is standard in a CS/1 running SPMUX software and in a CS/1 with bit-synchronous interfaces. It has the following features:

- All ports support RS-232-C electrical protocols with no modifications. All ports have 25-pin, D-Series female 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 3-3, Section 3.1.1, illustrates the connectors on the SBA-ST assembly; Table 3-11 lists the serial I/O device connector pin assignments for the SIO-ST module.

### Table 3-11  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-SMS (synchronous driver) is standard in the CS/1-SNA, CS/1-X.25, and GS/1, and optional in the CS/1. The SIO-SMS is standard in the GS/3. The SIO-SM has the following features:

- All lines support RS-232-C electrical protocols with no modification. All ports have 25-pin, D-Series male 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 *Network Management Guide* for a description of the INTerfaceType parameter). If a DTE device is attached to the SIO-SMS board, the special cable shown in Figure 4-5 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 5.2.8).

  An SIO-SMS can also interface with DTE devices if the synchronous modem eliminator cable shown in Figure 4-7 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 5-15 in Section 5.2.13 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 3-11 illustrates the connectors on the SBA-SM assembly; Table 3-12 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.

**SBA-SM**

J3T

J2T

J1T

JØT
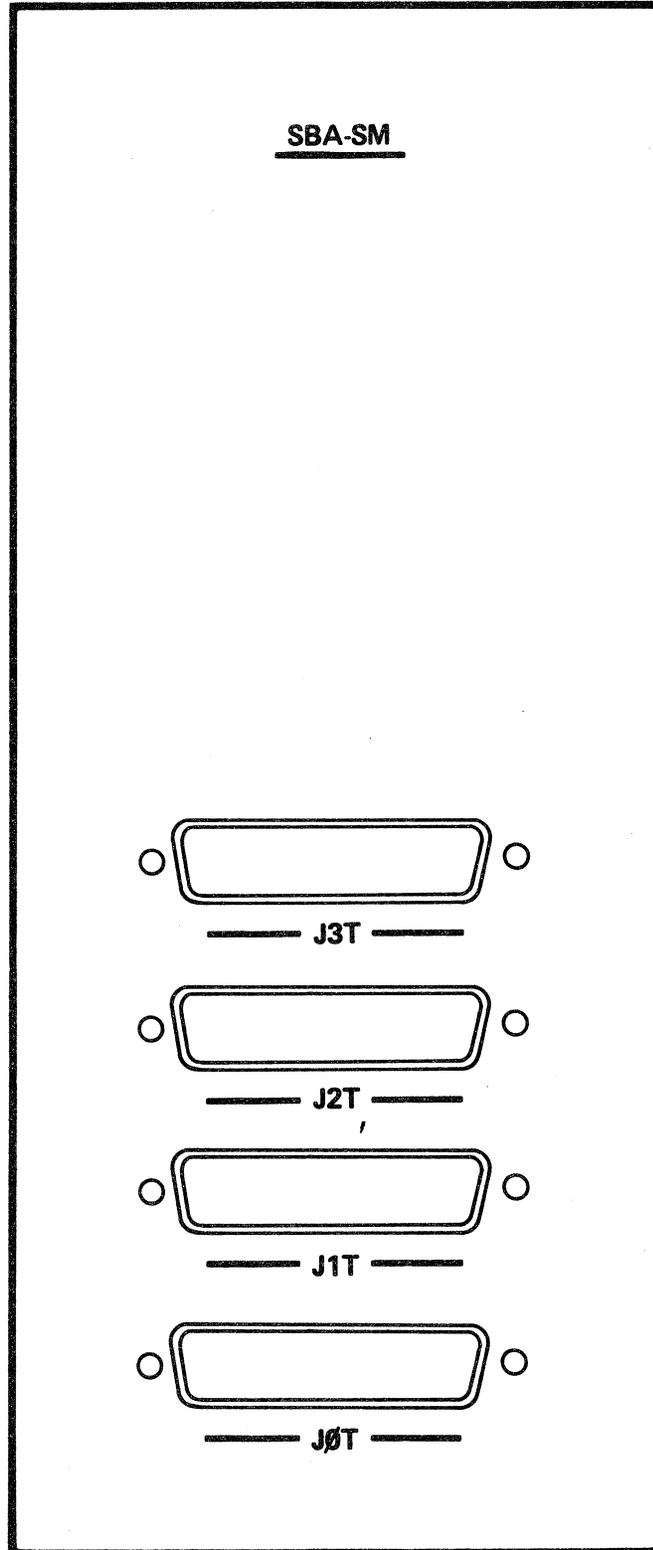
Figure 3-11  Connectors on the SBA-SM Assembly

**Table 3-12  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 5.2.8).

## 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 (SDLC driver) is available as an option on the CS/1 with synchronous or bit-synchronous interfaces, the CS/1-SNA, the CS/1-X.25, the GS/1, and the GS/3.

All ports support RS-422 electrical protocols on data lines, clock lines, and one pair of handshake control lines.  The connectors are 37-pin, D-Series male connectors (RS-449 DTE-type).  Table 3-13 lists the serial device connector pin assignments for the SIO-422 module.  Figure 3-12 illustrates the connectors on the SBA-422 assembly.

**SBA-422**

J3T

J2T

J1T

JØT
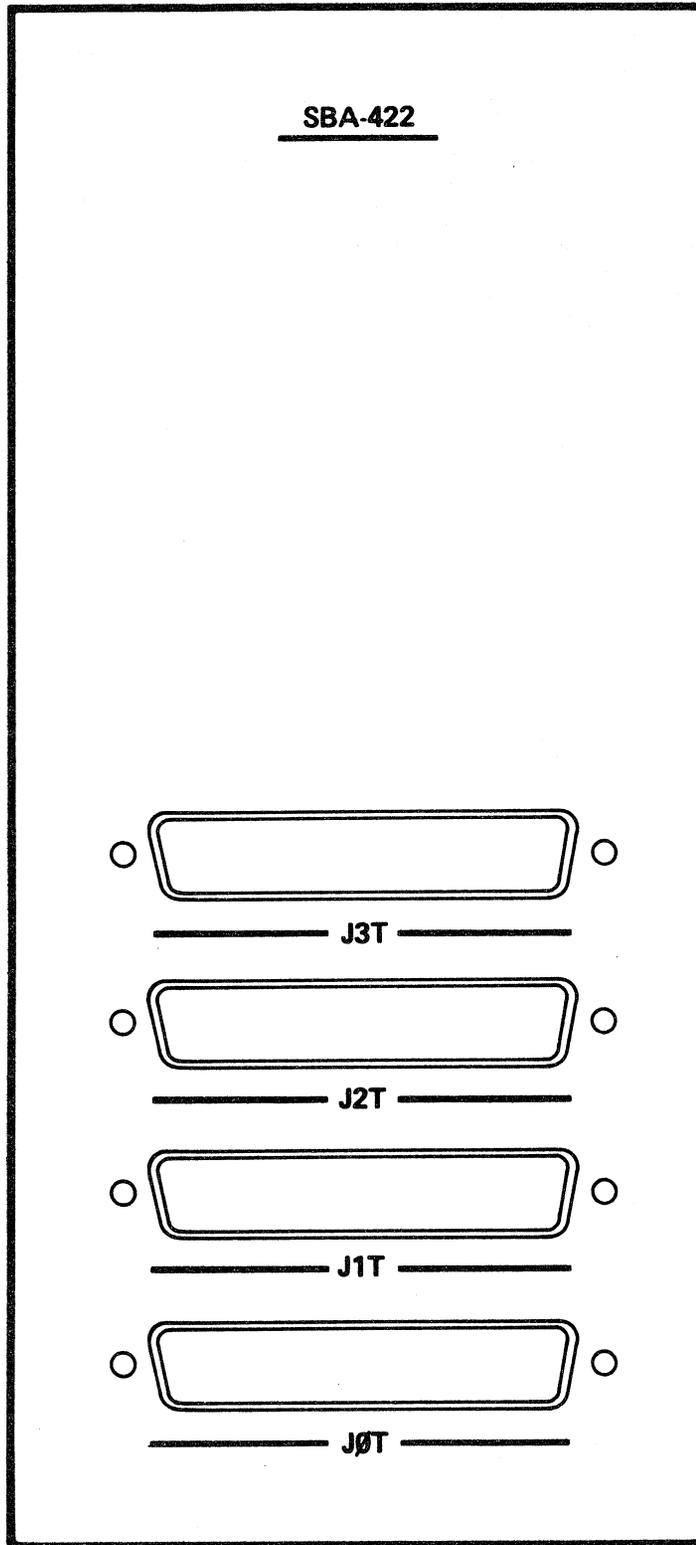
Figure 3-12  Connectors on the SBA-422 Assembly

Bridge Communications, Inc.

## Table 3-13 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 5.2.8).

**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, D-Series male connectors (X.20 DTE-type). Figure 3-13 illustrates the connectors ont he SBA-H422 assembly. Table 3-14 lists the serial device connector pin assignments for this module. Cables compatible with these connectors must be supplied by the customer.
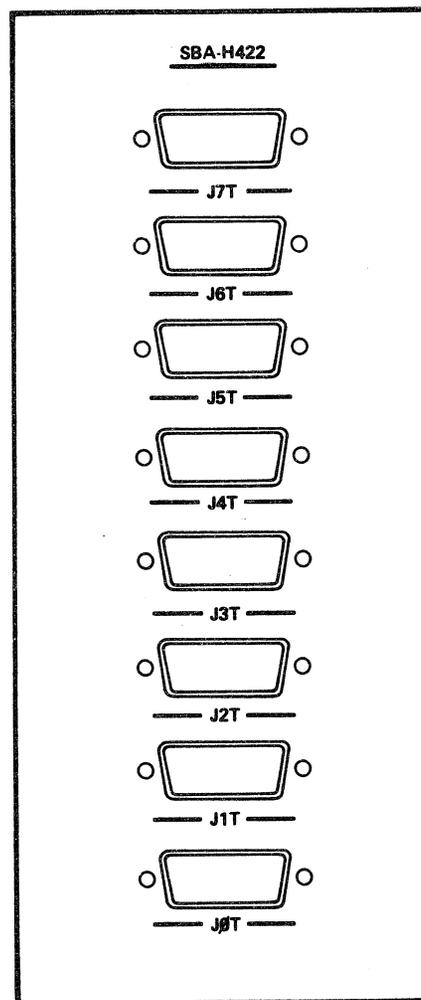
Figure 3-13  Connectors on the SBA-H422 Assembly

### Table 3-14  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 GS/3, CS/1 with character-synchronous or bit-synchronous interfaces, CS/1-SNA, CS/1-X.25, and GS/1.

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, D-Series male connectors (X.21 DTE-type). Cables compatible with these connectors must be supplied by the customer; the connectors are illustrated in Figure 3-14. Table 3-15 lists the serial device connector pin assignments for this module.
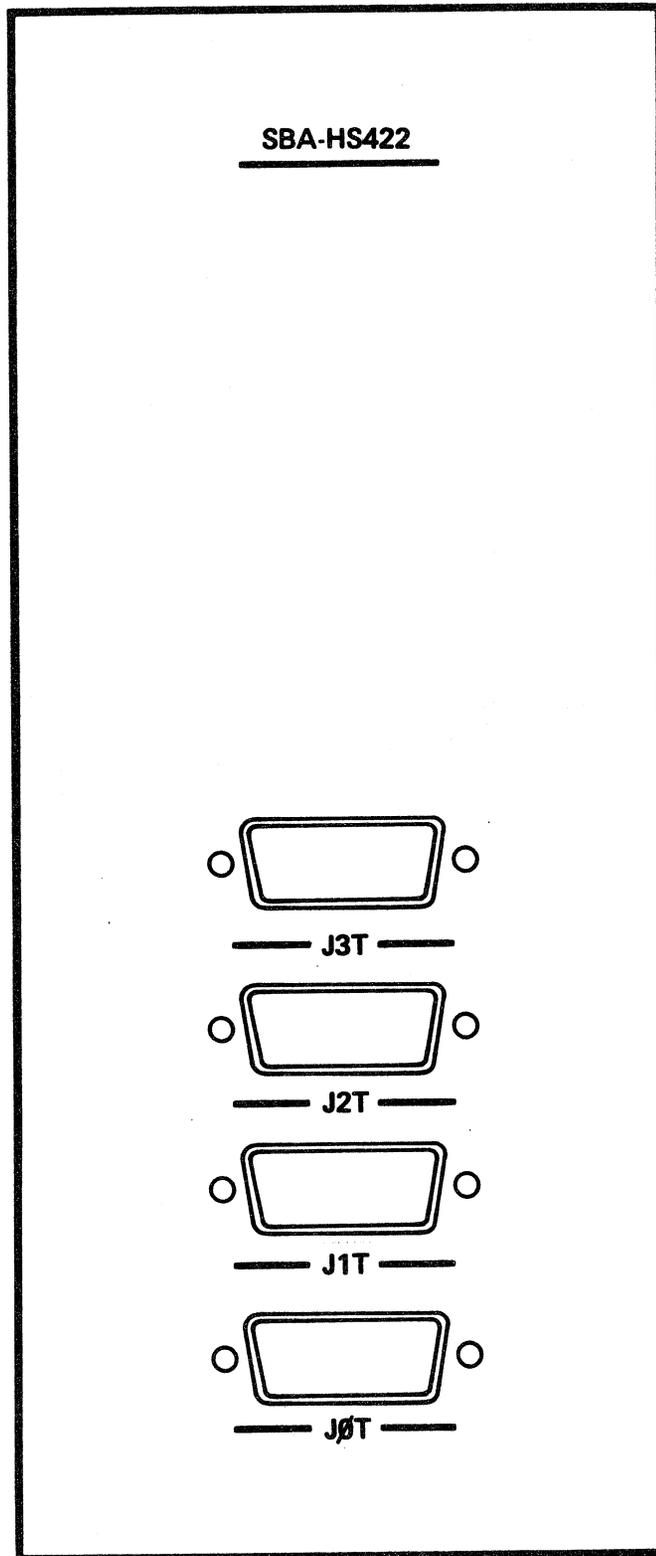
Figure 3-14  Connectors on the SBA-HS422 Assembly

| Table 3-15 SIO-HS422 Connector Pin Assignments<br>DTE Connectors J0T through J3T | | | | |
|---|---|---|---|---|
| *Pin<br>No.* | *X.21<br>Name* | *RS-449<br>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<br>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<br>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 5.2.8).

## 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 synchronous or bit-synchronous interfaces, and for the CS/1-SNA, CS/1-X.25, GS/1, and GS/3.

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-Series 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 3-15 illustrates the connectors on the SBA-V.35 assembly. Table 3-16 lists the serial device connector pin assignments for the SIO-V.35 module.
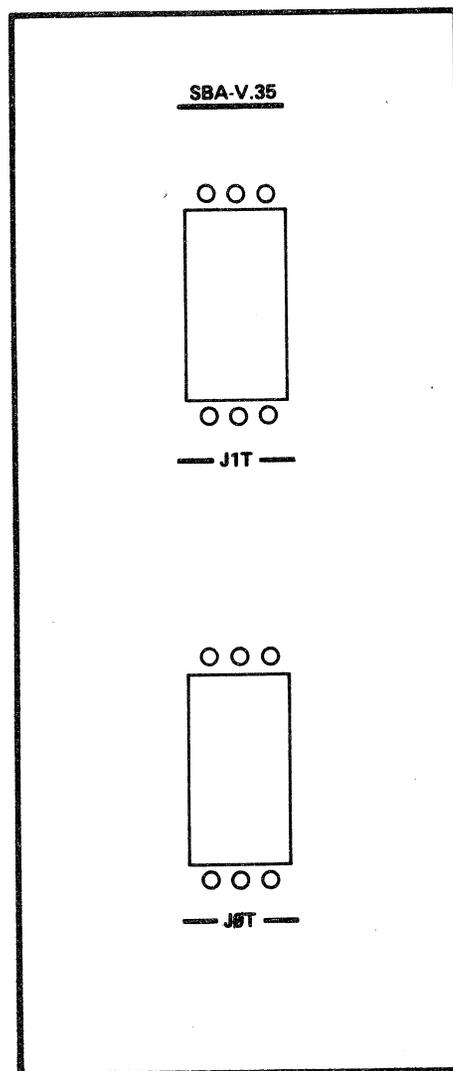


Figure 3-15  Connectors on the SBA-V.35 Assembly

**Table 3-16  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** | -- | Not Supported |
| 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 5.2.8).

### 3.1.9 HSM Connectors

The HSM board (in the CS/1-HSM) uses a special SBA assembly (SBA-HSM) with a single 9-pin, D-type subminiature female connector, illustrated in Figure 3-16. Table 3-17 lists the pin assignments for the HSM connector.

The HSM-MDM board (in the GS/6) connects to the RF modem inside the unit (refer to Section 3.1.10); an "F" type connector is present on the SBA assembly (SBA-BBM).
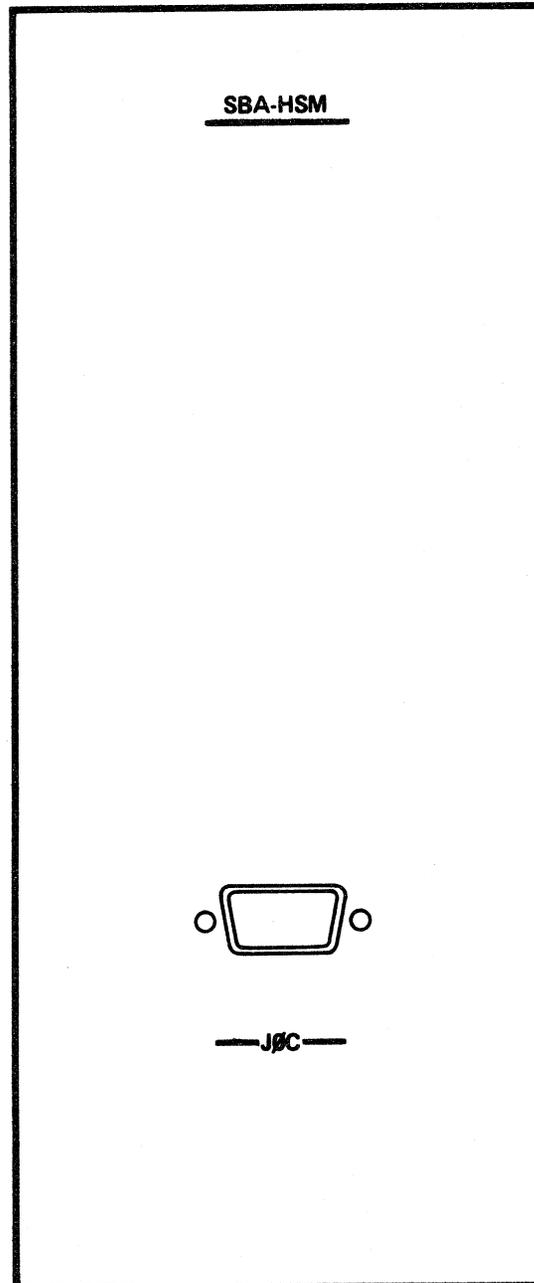
Figure 3-16  Connectors on the SBA-HSM Assembly

| **Table 3-17  HSM Connector Pin Assignments** |
| --- | --- | --- | --- |
| *Pin No.* | *Bridge Name* | *Direction* | *Function* |
| 1 | SHIELD | -- | Chassis Ground* |
| 2 | XMIT+ | In | Transmit Data + |
| 3 | -- | -- | Unused |
| 4 | REC+ | Out | Receive Data + |
| 5 | ELFS | -- | External Loopback Fixture Sense |
| 6 | XMIT- | In | Transmit Data - |
| 7 | -- | -- | Unused |
| 8 | REC- | Out | Receive Data - |
| 9 | SG | -- | Signal Ground |

\* Cable shield should be connected to this pin.

### 3.1.10  Other Connectors

This section describes the GS/4, GS/6, IB/1, and IB/2 connectors.

**GS/4 Connectors**

The GS/4 connects directly to two Ethernets via Ethernet transceivers. The server has two standard Series/1 transceiver cable connectors, described in Section 3.1.6. Refer to Tables 3-3 and 3-4 for the connector pin assignments. Figure 3-3 in Section 3.1.1 and Figure 3-5 in Section 3.1.6 illustrate the EBA and the SBA-E assemblies, respectively.

**GS/6 Connectors**

The GS/6 connects to two networks: one Ethernet network and one broadband network. On the Ethernet side, the GS/6 connects with a standard Series/1 transceiver cable connector, described in Section 3.1.6, and illustrated in Figure 3-3, Section 3.1.1. On the broadband side, the GS/6 connects to the broadband drop cable from the RF modem inside the unit. The GS/6 contains one type "F" connector located on its SBA-BBM assembly.

**IB/1 Connectors**

The IB/1 connects to two networks: one Ethernet network and one broadband network. On the Ethernet side, the IB/1 connects with a standard Series/1 transceiver cable connector, described in Section 3.1.6. On the Broadband side, the IB/1 connects to the broadband drop cable from the external RFM/5. The IB/1 contains one D-type subminiature female RF modem connector located on its SBA-B-37 assembly, described in Section 3.1.6. Refer to Tables 3-4 and 3-5, Section 3.1.6, for the connector pin assignments. Figure 3-3, Section 3.1.1, and Figure 3-7, Section 3.1.6, illustrate the connectors on the EBA and SBA-B-37 assemblies, respectively.

## IB/2 Connectors

The IB/2 connects directly to two Ethernets via Ethernet transceivers. The server has two standard Series/1 transceiver cable connectors, described in Section 3.1.6. Refer to Tables 3-3 and 3-4 for the connector pin assignments. Figures 3-3 and 3-5 in Section 3.1.6 illustrate the EBA and the SBA-E assemblies, respectively.

## 3.2 Environmental Planning

This section describes space, environmental, and power and grounding specifications for the Series/1 servers.

### 3.2.1 Space Requirements

The Series/1 server is available for either tabletop or rack mount installation. Dimensions of the unit are 9.5 inches x 17.0 inches x 21.3 inches (24.1 cm x 43.2 cm x 54.1 cm). The rack mount version is designed to fit in a 19-inch ANSI-standard rack.

The air intake on the front of the unit and the air exhaust on the sides of the unit must not be blocked, and approximately 6 inches (15 cm) free space must be allowed at the rear of the unit for cable clearance. 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.

### 3.2.2 Environmental Requirements

The Series/1 server is designed to operate safely and reliably in an office environment. The fan that cools the unit generates 28 decibels PSIL. The environmental conditions recommended for safe, reliable operation are listed in Table 3-18.

| Table 3-18 Environmental Requirements | | |
|---|---|---|
| | *Minimum* | *Maximum* |
| *Storage Temperature* | -13° F (-25° C) | 140° F (60° C) |
| *Operating Temperature* | 41° F (5° C) | 104° F (40° C) |
| *Altitude* | Sea level | 12,000 ft (3657 m) |
| *Humidity* * | 10% | 90% |
| * Relative humidity with no condensation. | | |

### 3.2.3 Power and Grounding Requirements

The Series/1 server 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 3-19. 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 440 Hz, allowing the unit to be powered from high-frequency emergency power sources.

**     CAUTION     **

Hardware changes made to a server with an IBC/M module may alter the original voltages at the RFM/5 end. The voltages must be checked at the RFM/5 end, and must measure within 5 percent of their original value.

If the voltages measure outside of the 5 percent maximum range, contact Bridge Communications, Inc., 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 3-19 Voltage Options | | |
|---|---|---|
| *Voltage* | *Range* | *Current* |
| 120 VAC | 90 - 140 VAC | 3.5 amps maximum |
| 230 VAC | 180 - 260 VAC | 1.8 amps maximum |

## 3.3 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 Communications, Inc., offers an optional installation service which is described in the *LAN Planning Guide*.

## 4.0 STANDARD CABLE REQUIREMENTS

This section contains specifications for the cables commonly used to connect devices to the Series/1 servers, and information about the control signals that may be affected by the cables. The cables described are the standard cables optionally supplied by Bridge Communications, Inc. For cable construction information, and for information about the cable, modem, and line interface requirements of the Series/1 servers, refer to the *LAN Planning Guide*.

Section 4.1 describes the standard cable specifications for use with the CS/1, GS/1, and GS/3 servers. Section 4.2 describes the cabling options recommended for use with the SIO-16 module.

### 4.1 Standard Cable Specifications

Figures 4-1 through 4-13 illustrate the cable specifications for use with standard devices and various models of Series/1 server. The connector type needed on the device end of the cables may vary depending on the kind of connector on the device. To attach a terminal to the server's console port, use the cable shown in Figure 4-1.
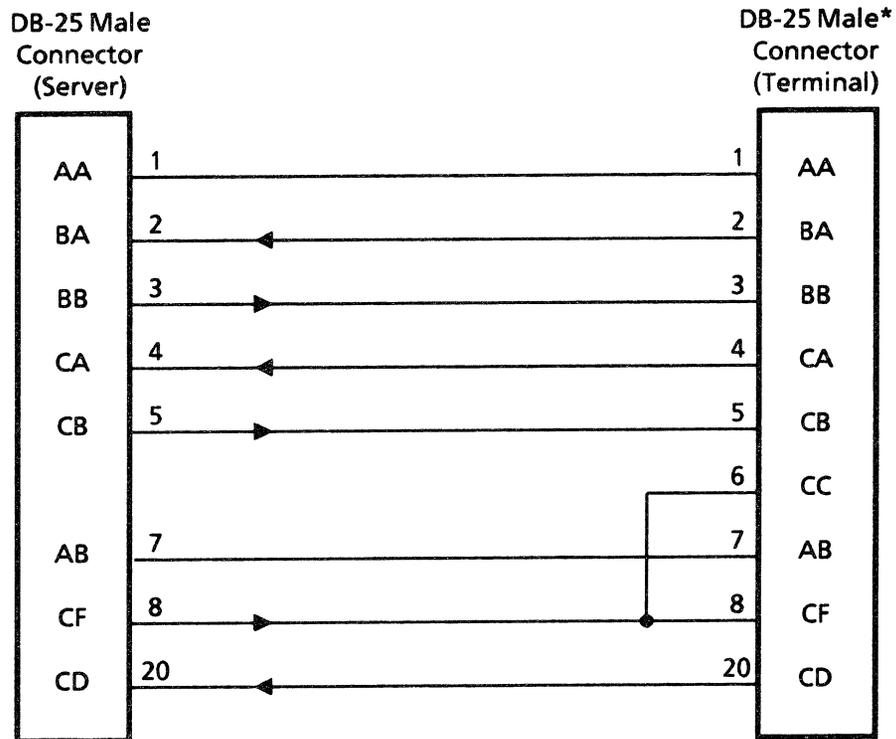
DB-25 Male
Connector
(Server)

DB-25 Male*
Connector
(Terminal)

| | | | | | |
|---|---|---|---|---|---|
| AA | 1 | ———————————————— | 1 | AA | |
| BA | 2 | ←—————————————— | 2 | BA | |
| BB | 3 | —————————————→ | 3 | BB | |
| CA | 4 | ←—————————————— | 4 | CA | |
| CB | 5 | —————————————→ | 5 | CB | |
| | | | 6 | CC | |
| AB | 7 | ———————————————— | 7 | AB | |
| CF | 8 | —————————————→ | 8 | CF | |
| CD | 20 | ←—————————————— | 20 | CD | |

* Deviation from EIA standards.  Connector type may vary; check requirements of device

Figure 4-1  Asynchronous Terminal Cable Specification
(CBL-AT-25, for use with SIO-A module)
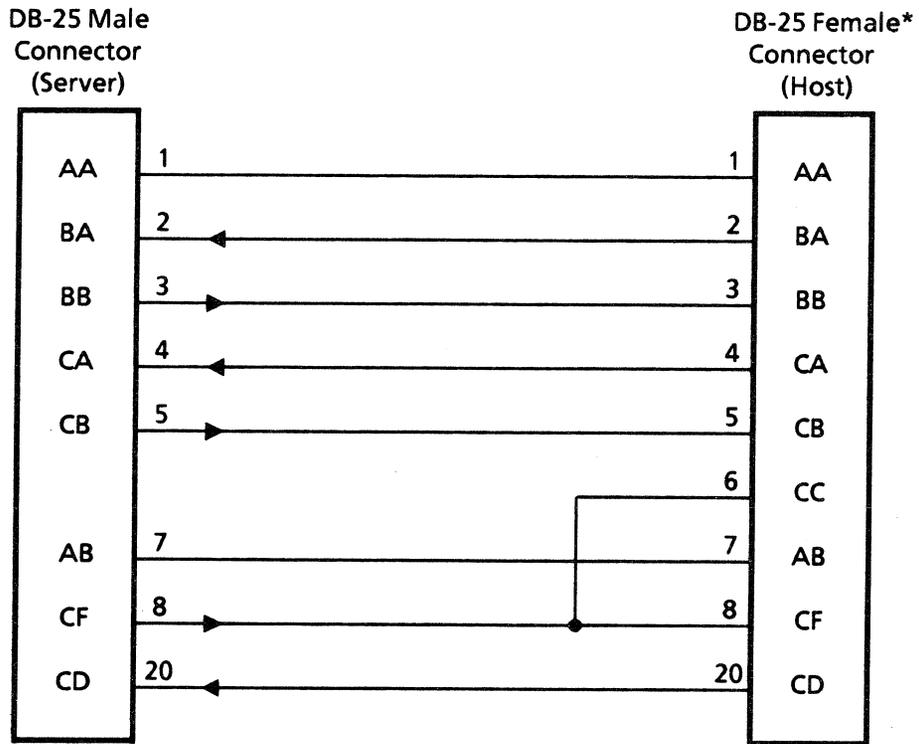
**DB-25 Male Connector (Server)**

| | | | | | |
|---|---|---|---|---|---|
| AA | 1 | → | 1 | AA | |
| BA | 2 | ← | 2 | BA | |
| BB | 3 | → | 3 | BB | |
| CA | 4 | ← | 4 | CA | |
| CB | 5 | → | 5 | CB | |
| | | | 6 | CC | |
| AB | 7 | | 7 | AB | |
| CF | 8 | → | 8 | CF | |
| CD | 20 | ← | 20 | CD | |

**DB-25 Female\* Connector (Host)**

* Deviation from EIA standards. Connector type may vary; check requirements of device.

Figure 4-2  Asynchronous Host Cable Specification
(CBL-AH-25, for use with SIO-A module)

DB-25 Male
Connector
(Server)

DB-25 Male*
Connector
(Modem or
DCE Host)

| Server | | Modem/DCE Host | |
|---|---|---|---|
| 1 | | 1 | AA** |
| 2 | | 2 | BA |
| 3 | | 3 | BB |
| 4 | | 4 | CA |
| 5 | | 5 | CB |
| 6 | not connected | 6 | CC |
| 7 | | 7 | AB |
| 8 | | 8 | CF |
| 20 | | 20 | CD |
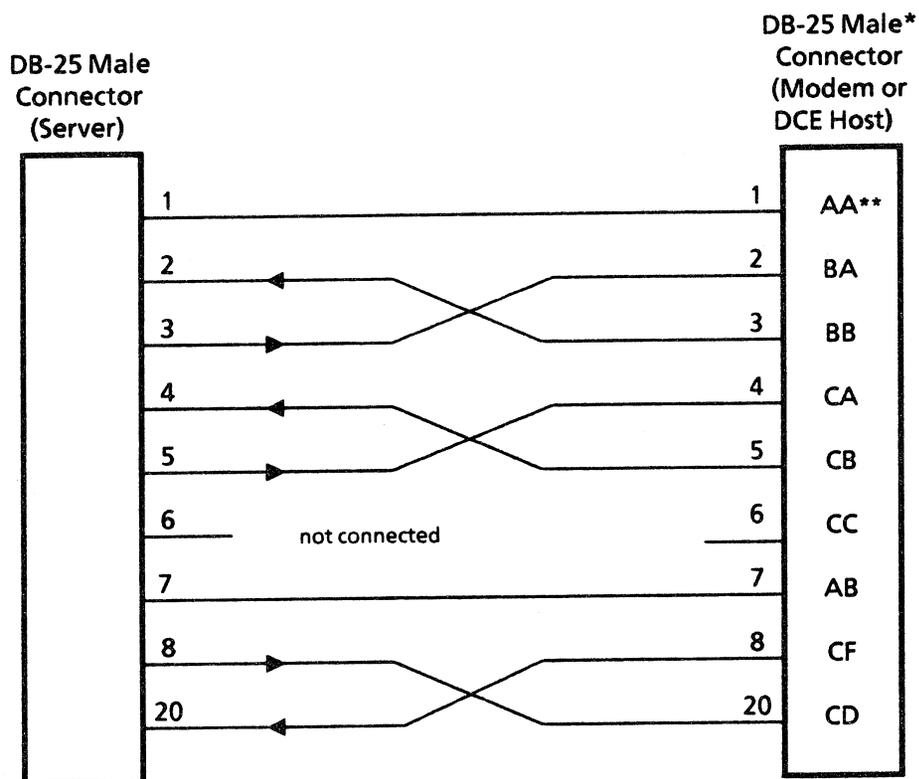
\* Connector type may vary; check requirements of the device.

\*\* Circuit names are based on the function at the device end of the circuit.

Figure 4-3  Asynchronous Modem Cable Specification
(CBL-AM-25, for use with SIO-A module)
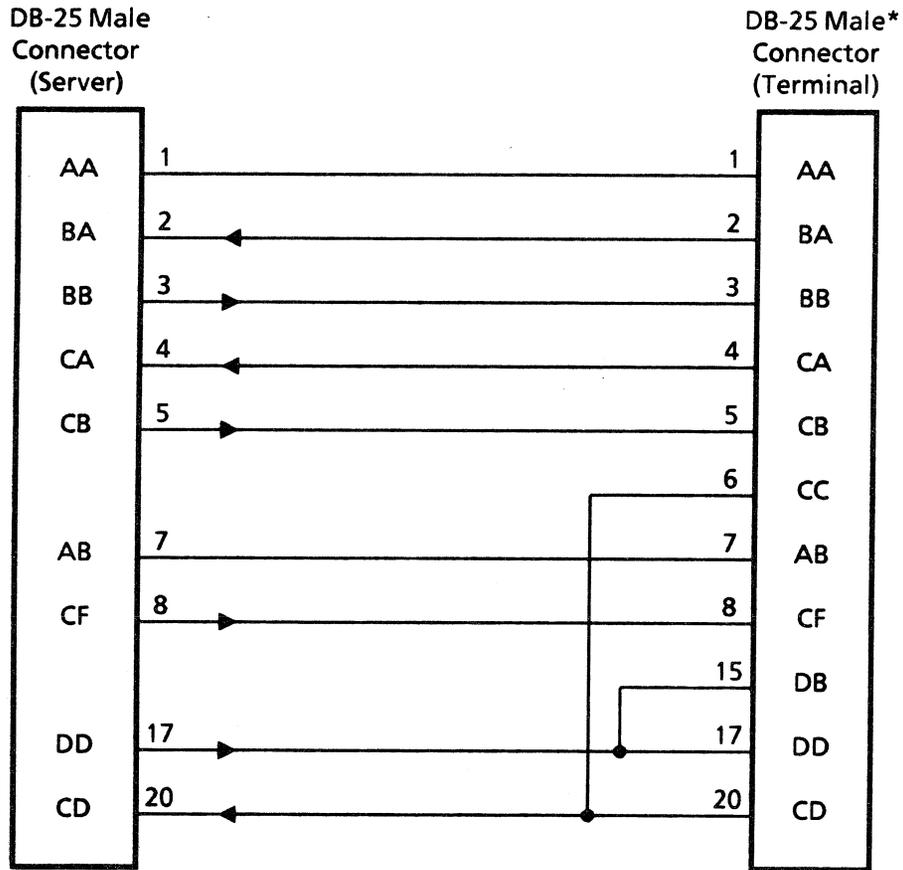
DB-25 Male                                          DB-25 Male*
Connector                                           Connector
(Server)                                            (Terminal)

| Server | Pin | | Pin | Terminal |
|--------|-----|--|-----|----------|
| AA | 1 | | 1 | AA |
| BA | 2 | | 2 | BA |
| BB | 3 | | 3 | BB |
| CA | 4 | | 4 | CA |
| CB | 5 | | 5 | CB |
|    |   | | 6 | CC |
| AB | 7 | | 7 | AB |
| CF | 8 | | 8 | CF |
|    |   | | 15 | DB |
| DD | 17 | | 17 | DD |
| CD | 20 | | 20 | CD |

* Deviation from EIA standards. Connector type may vary; check requirements of device.

Figure 4-4  Synchronous Terminal Cable Specification
(CBL-ST-25, for use with SIO-ST module)

DB-25 Female
Connector
(Server)

DB-25 Female
Connector
(Host)

| 1 | | 1 | AA* |
| 2 | | 2 | BA |
| 3 | | 3 | BB |
| 4 | | 4 | CA |
| 5 | | 5 | CB |
| | | 6 | CC |
| 7 | | 7 | AB |
| 8 | | 8 | CF |
| | | 15 | DB |
| | | 17 | DD |
| 18 | | | |
| 20 | | 20 | CD |
| 24 | | | |
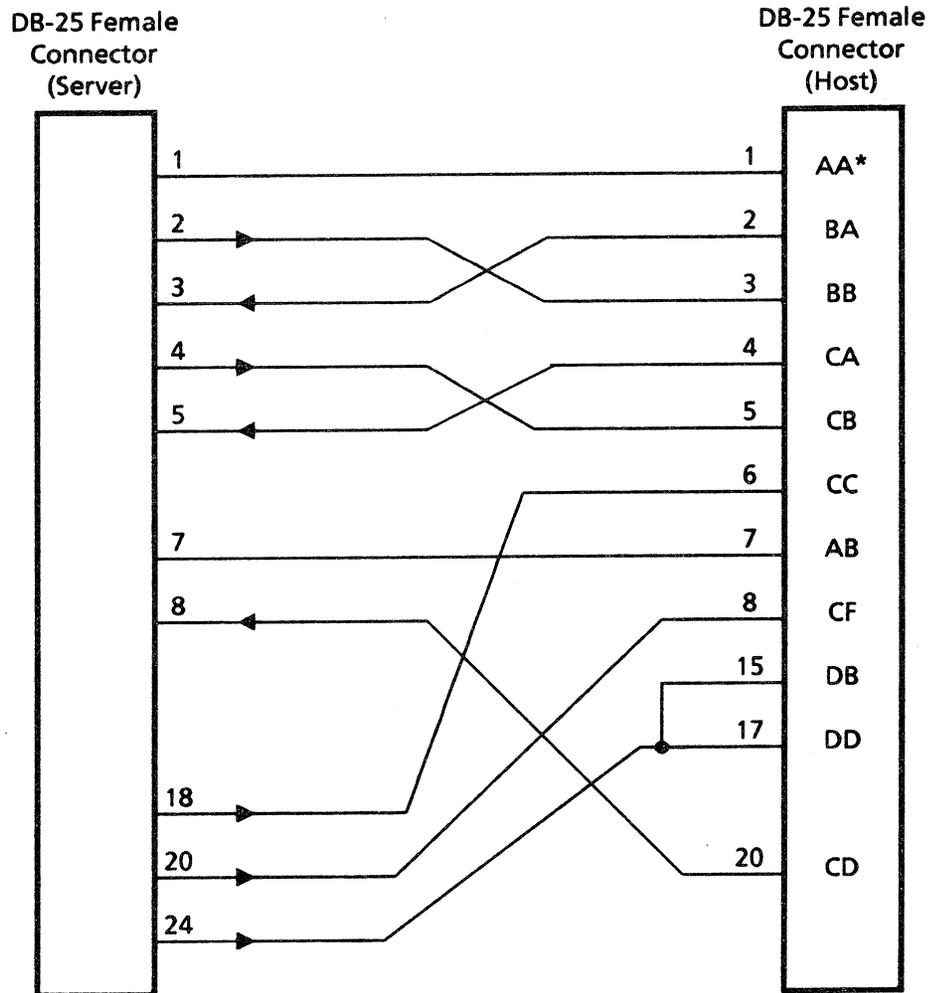
* Circuit names are based on the function at the device end of the circuit.

Figure 4-5  Synchronous Host Cable Specification
(CBL-SH-25, for use with SIO-SM module)

DB-25 Female
Connector
(Server)

DB-25 Male*
Connector
(Modem)

| Server | Pin | | Pin | Modem |
|---|---|---|---|---|
| AA | 1 | → | 1 | AA |
| BA | 2 | → | 2 | BA |
| BB | 3 | ← | 3 | BB |
| CA | 4 | → | 4 | CA |
| CB | 5 | ← | 5 | CB |
| CC | 6 | ← | 6 | CC |
| AB | 7 | | 7 | AB |
| CF | 8 | ← | 8 | CF |
| DB | 15 | ← | 15 | DB |
| DD | 17 | ← | 17 | DD |
| CD | 20 | → | 20 | CD |
| DA | 24 | → | 24 | DA |
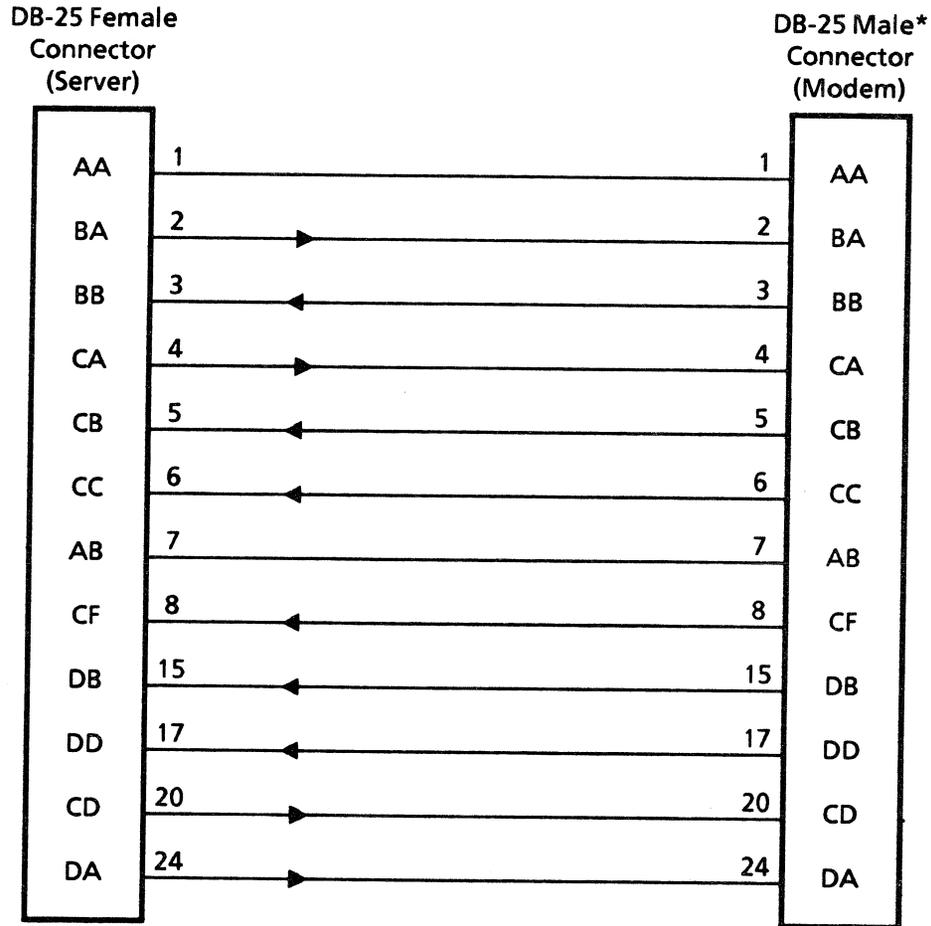
* Connector type may vary; check requirement of modem connector.

Figure 4-6  Synchronous Modem Cable Specification
(CBL-SM-25, for use with SIO-SM module)
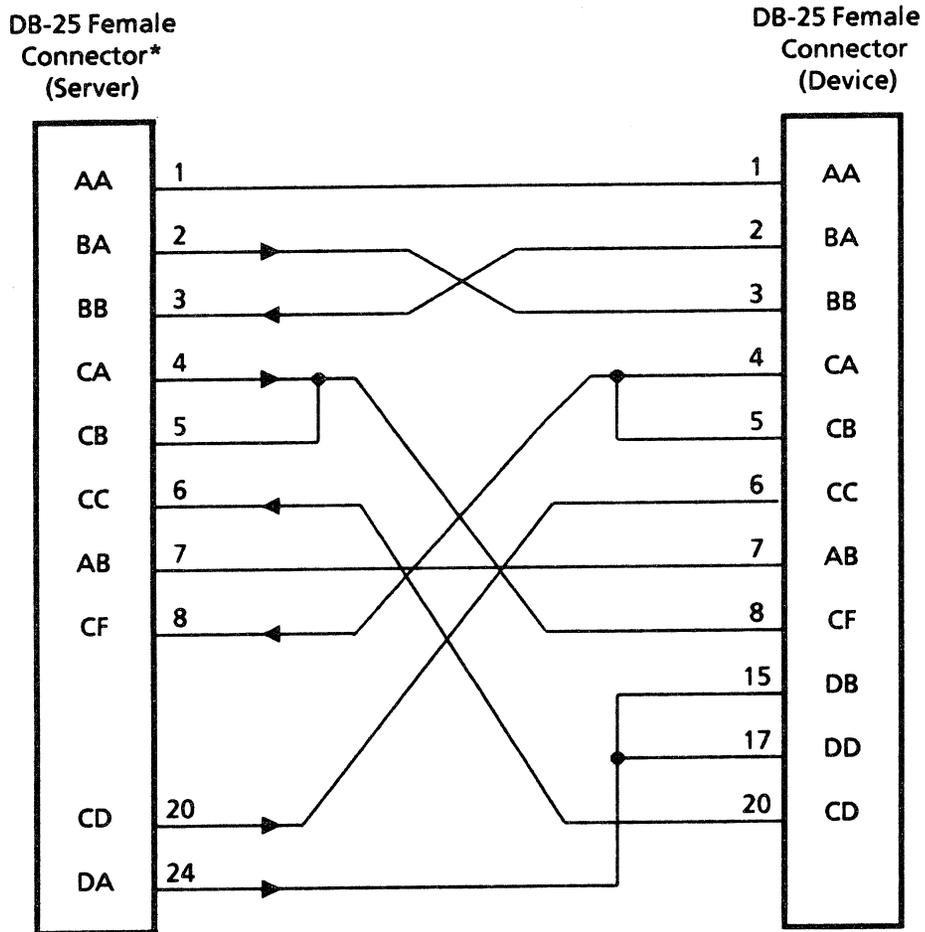
Figure 4-7  Synchronous Modem Eliminator Cable Specification
(CBL-SME-25, for use with SIO-SM module)
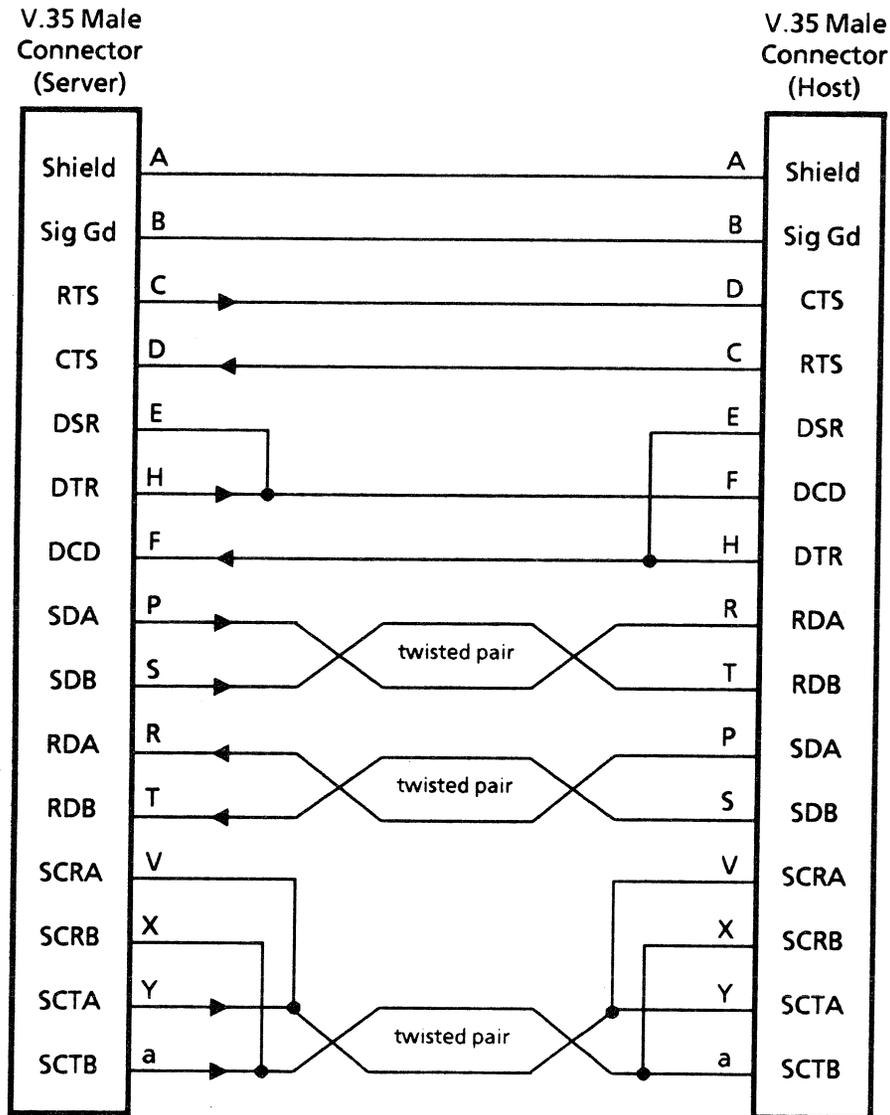
Figure 4-8  V.35 Host Cable Specification
(CBL-V35H-25, for use with SIO-V.35 module)

V.35 Male
Connector
(Server)

V.35 Male
Connector
(Modem)

| Server | Pin | | Pin | Modem |
|---|---|---|---|---|
| Shield | A | | A | Shield |
| Sig Gd | B | | B | Sig Gd |
| RTS | C | → | C | RTS |
| CTS | D | ← | D | CTS |
| DSR | E | ← | E | DSR |
| DCD | F | ← | F | DCD |
| DTR | H | → | H | DTR |
| SDA | P | twisted pair | P | SDA |
| SDB | S | twisted pair | S | SDB |
| RDA | R | twisted pair | R | RDA |
| RDB | T | twisted pair | T | RDB |
| SCRA | V | twisted pair | V | SCRA |
| SCRB | X | twisted pair | X | SCRB |
| SCTA | Y | twisted pair | Y | SCTA |
| SCTB | a | twisted pair | a | SCTB |
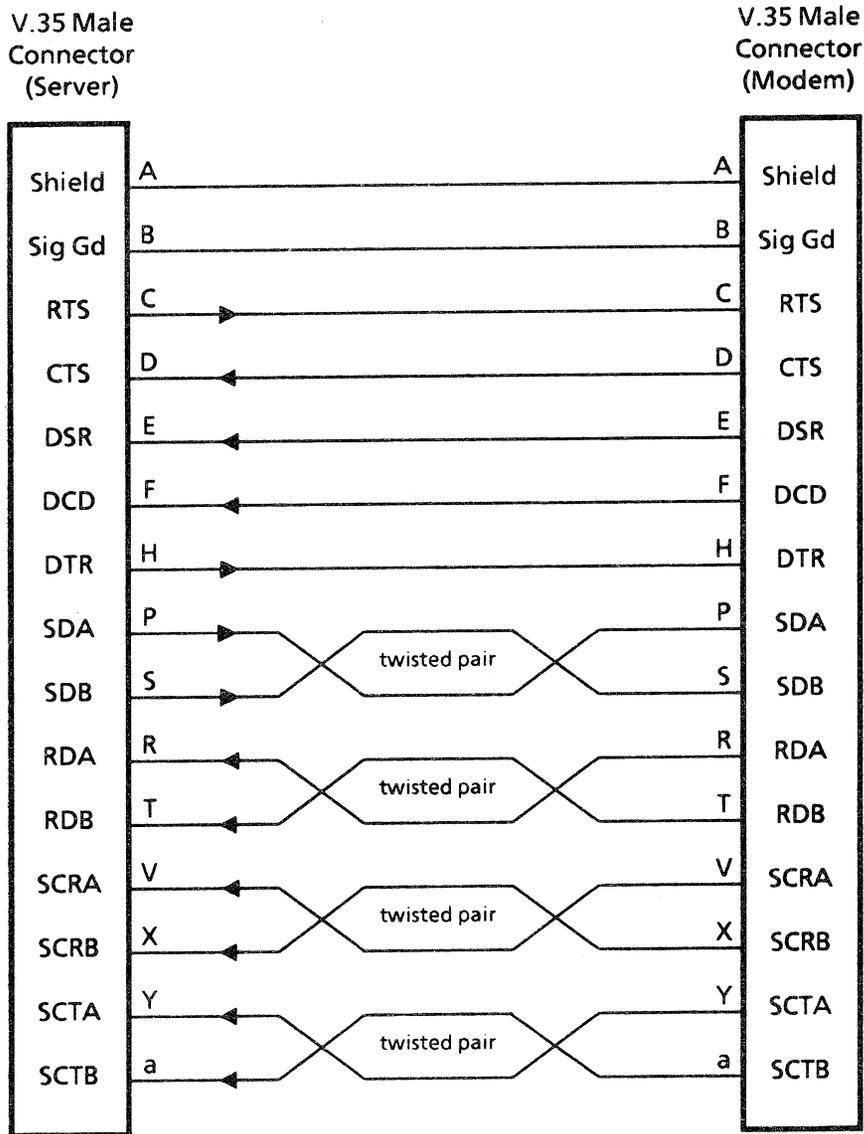
Figure 4-9  V.35 Modem Cable Specification
(CBL-V35M-25, for use with SIO-V.35 module)

Bridge Communications, Inc.
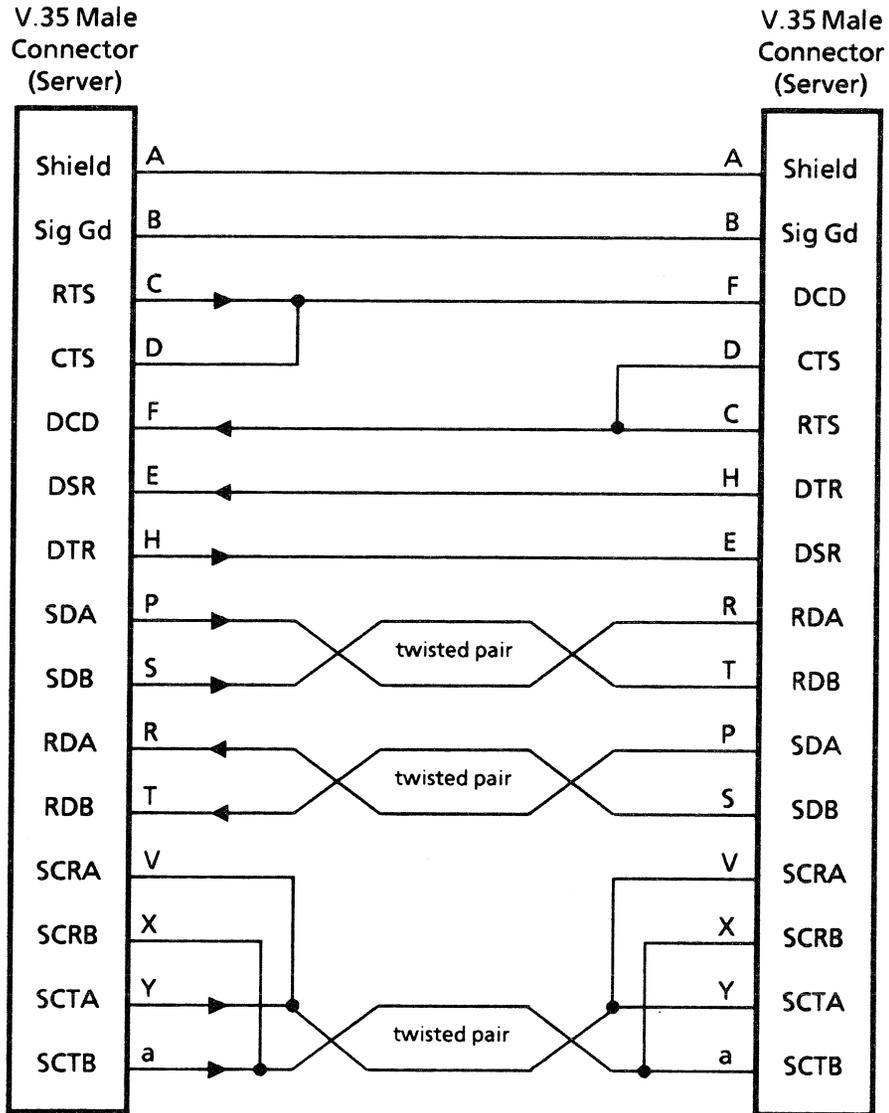
Figure 4-10  V.35 Modem Eliminator Cable Specification
(CBL-V35ME-25, for use with SIO-V.35 module)

**DC-37 Female**
**Connector**
**(Server)**

**DC-37 Male***
**Connector**
**(Modem)**

| Server | Pin | | Pin | Modem |
|--------|-----|--|-----|-------|
| Shield | 1 | | 1 | Shield |
| SD-A | 4 | twisted pair | 4 | SD-A |
| SD-B | 22 | | 22 | SD-B |
| RD-A | 6 | twisted pair | 6 | RD-A |
| RD-B | 24 | | 24 | RD-B |
| TT-A | 17 | twisted pair | 5 | ST-A |
| TT-B | 35 | | 23 | ST-B |
| RT-A | 8 | twisted pair | 8 | RT-A |
| RT-B | 26 | | 26 | RT-B |
| TR-A | 12 | twisted pair | 12 | TR-A |
| TR-B | 30 | | 30 | TR-B |
| RR-A | 13 | twisted pair | 13 | RR-A |
| RR-B | 31 | | 31 | RR-B |
| SG | 19 | | 19 | SG |
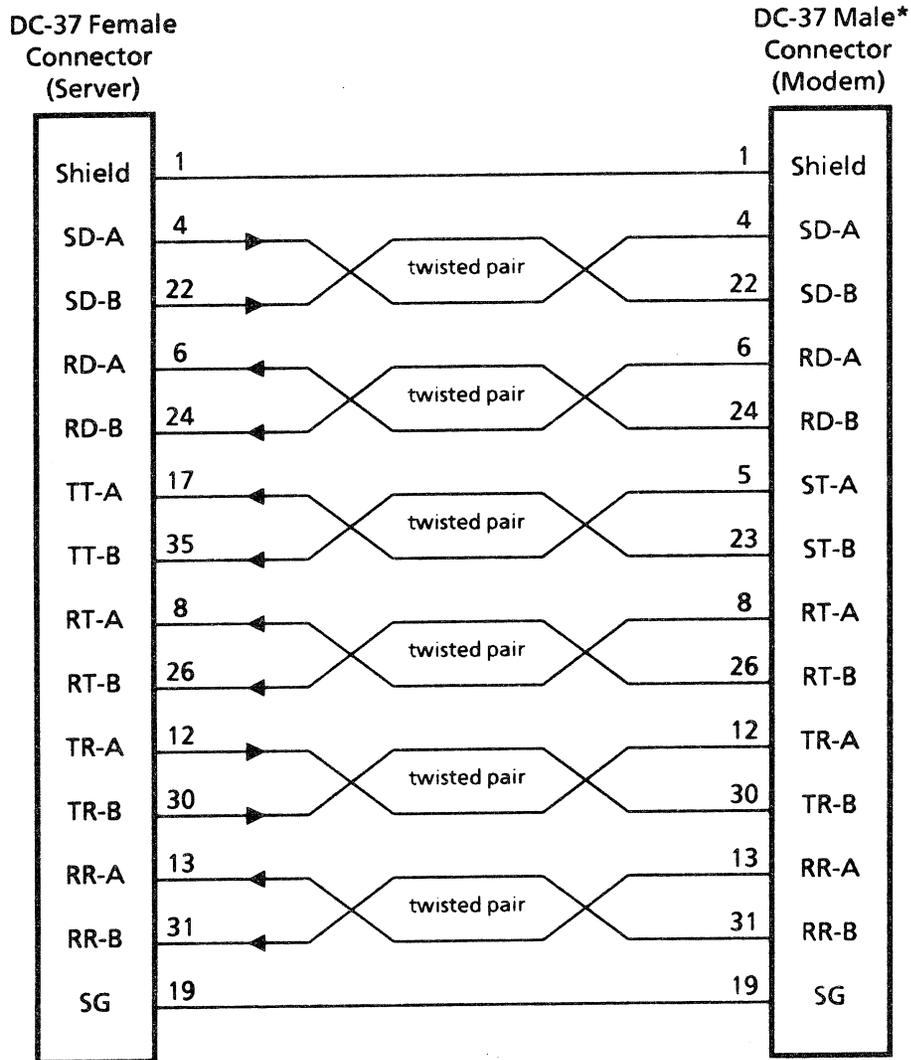
\* Connector type may vary; check requirements of modem connector.

Figure 4-11  RS-449 Modem Cable Specification
(CBL-449M-25, for use with SIO-422H module)
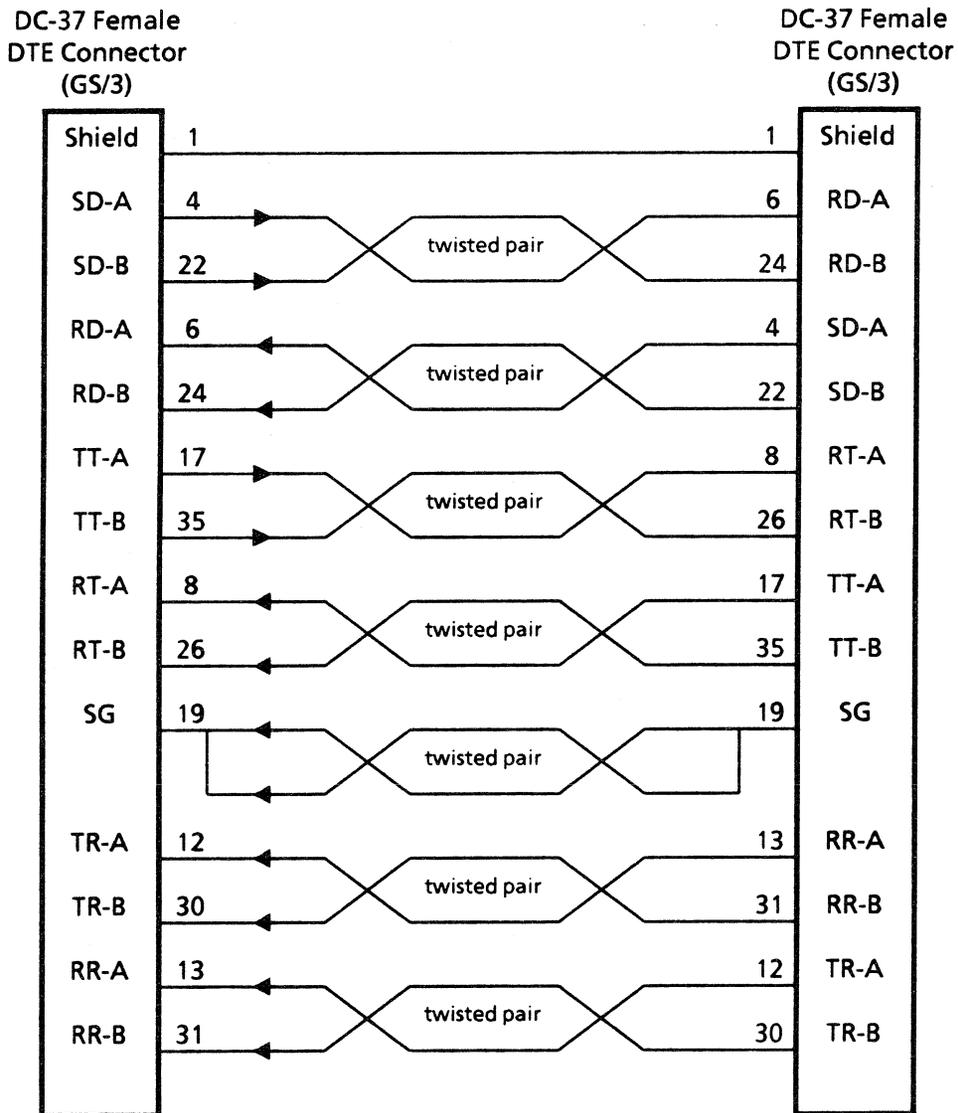
Figure 4-12 RS-449 Modem Eliminator Cable Specification
(CBL-449ME-25, for use with SIO-422H module)
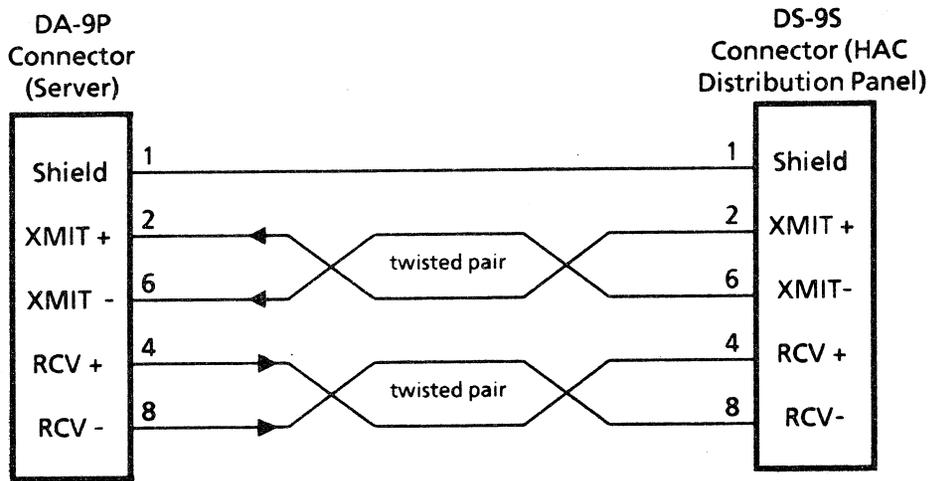
Figure 4-13  Host Adapter Card Cable Specification
(CBL-HSM-25, for use with HSM module)

## 4.2  Cabling Options for Use with the SIO-16 Module

The following cables and adapters are recommended for use with the SIO-16 module:

- **25-pair Extension Cable**
    - Double-ended female/female
    - Available in 25, 50, and 100-foot lengths

- **3-pair RJ-11 Modular Cable**
    - Double-ended male/male
    - Connects to any 6-wire RJ-11 receptacle
    - Available in 25-foot lengths

- **25-pair/RJ-11 Hydra Adapter Cable**
    - 25-pair female connector breaks out into eight 6-wire RJ-11 male connectors
    - Attaches to modems or DB-25 adapters
    - Available in lengths to order

- **Harmonica Breakout Box**
    - 25-pair male connector breaks out into eight female RJ-11 receptacles
    - Accepts one 25-pair connector and eight 6-wire RJ-11 plugs

- **Modular DB-25 Adapter**
    - Converts modular 6-wire RJ-11 male connector to DB-25 RS-232 connector (either male or female)
    - Connects to 6-wire RJ-11 modular cable or RJ-11 Hydra Adapter cable
    - Available in 3 pre-wired configurations (illustrated in figures 4-15 and 4-16)

Figure 4-14 illustrates the cabling options offered by Bridge.

## **  NOTE  **

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

Table 4-1 lists the RS-232 DB-25 connector pin assignments; Table 4-2 lists the RJ-11 connector pin assignments.  Figures 4-15 and 4-16 illustrate the pre-wired configurations of the Modular DB-25 Adapters.

CS/1-A
with SIO-16
Modules

25-pair
Extension Cable

25-pair
Extension Cable

RJ-11 Connector

Harmonica
Breakout Box

3-pair Modular
Cable

Hydra Adapter
Cable

RJ-11 Connector

Modular DB-25 Adapter

Terminal
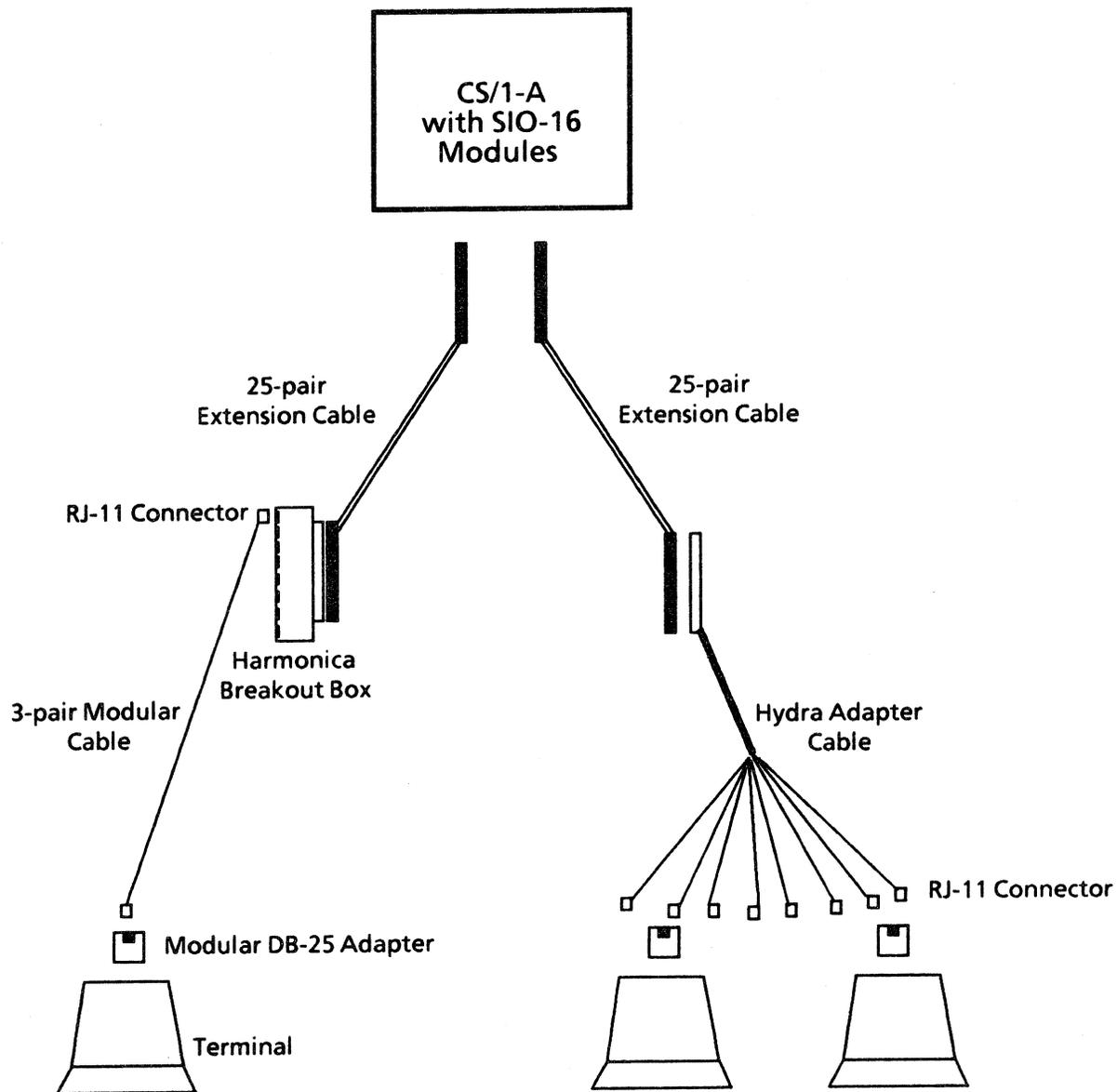
Figure 4-14  SIO-16 Cable and Adapter Options

## Table 4-1  SIO-16 Connector Pin Assignments
### DB-25 Connectors

| Pin No. | RS-232-C Name | Signal Name | Direction | Function |
|---|---|---|---|---|
| 2 | BA | TXD | In | Transmit Data |
| 3 | BB | RXD | Out | Receive Data |
| 7 | AB | GND | -- | Signal Ground |
| 8 | CF | DCD | Out | Data Carrier Detect |
| 20 | CD | DTR | In | Data Terminal Ready |

## Table 4-2  SIO-16 Connector Pin Assignments
### RJ-11 Connectors

| Pin No. | Signal Name | Direction | Function |
|---|---|---|---|
| 1 | DTR | In | Data Terminal Ready |
| 2 | TXD | In | Transmit Data |
| 3 | GND | -- | Signal Ground |
| 4 | RXD | Out | Receive Data |
| 5 | GND | -- | Signal Ground |
| 6 | DCD | Out | Data Carrier Detect |
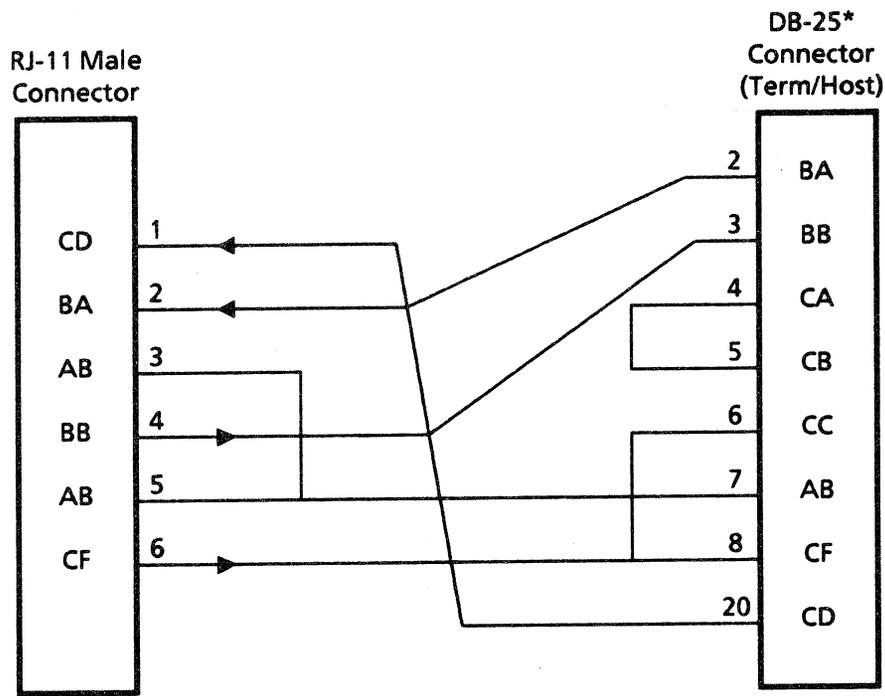
* Available either male or female.

Figure 4-15  Modular DB-25 Terminal/Host Adapter
(CBL-Term/Comp-Male or CBL-Term/Comp-Female)
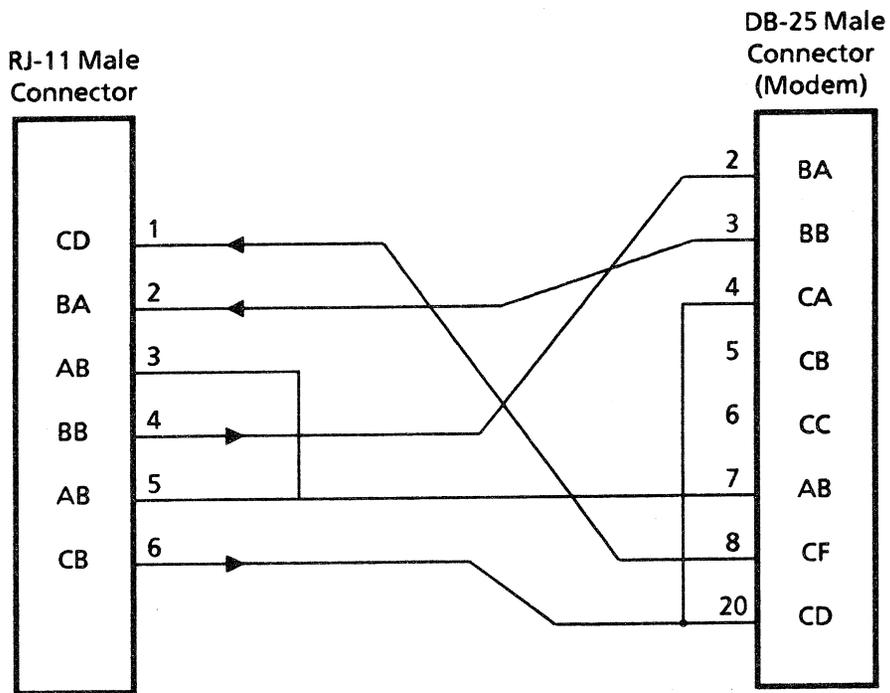


Figure 4-16  Modular DB-25 Modem Adapter
(CBL-Modem-Male)

## 5.0 UNPACKING AND INSTALLATION

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

- Unpacking the server

- Configuring the server's boards (if necessary)

- Installing the server

- Connecting the server to the network and to the 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 the hardware is installed and connected, some software configuration may also be necessary. The *Connection Service User's Guide* describes the Connection Service and configuration procedures for asynchronous servers and the GS/1. The *Network Management Guide* describes system generation and port configuration procedures for all Bridge Communications, Inc., servers.

## 5.1 Unpacking

Each Series/1 unit is inspected before shipment and is packed in a carton with protective padding. However, the shipping carton and the unit itself should be inspected after receipt for damage sustained during shipment. The following steps are recommended:

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.

4. Remove the plastic bag from the unit.

5. Inspect the unit for shipping damage. If damage is detected, contact the transport representative to file a report. If the unit must be returned to the factory, it should be shipped in its original carton. If the original carton was damaged in shipment, repack the unit in a carton that provides equivalent protection.

### ** CAUTION **

The cover of the unit is held in place by ball studs and can be removed simply by sliding it upward. When lifting the entire unit, be sure to hold it by the bottom edge, not by the cover's rear overhang.

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 network 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. First, remove the unit's top cover by lifting each side of the back overhang with a brisk upward motion, thereby disengaging each ball stud separately. Remove each board by pulling up firmly on the extractor levers; reseat with a firm downward push.

After these steps have been accomplished, the unit is ready to be configured. Hardware configuration is described in Section 5.2.

## 5.2  Hardware Configuration

This section describes the configuration of the boards in the Series/1 products.  Table 5-1 indicates the sections that apply to each Series/1 server model.

<table>
<tr><td colspan="4" align="center"><b>Table 5-1  Section Directory</b></td></tr>
<tr><td><i>Server<br>Model</i></td><td><i>Network<br>Interface</i></td><td><i>I/O<br>Interface</i></td><td><i>Relevant<br>Sections</i></td></tr>
<tr><td>CS/1</td><td>EC/1</td><td>SIO-A, SIO-ST,<br>SIO-SM, SIO-422,<br>SIO-H422, SIO-HS422,<br>SIO-V.35</td><td>5.2.1, 5.2.2, 5.2.6,<br>5.2.7, 5.2.8, 5.2.13,<br>5.2.14</td></tr>
<tr><td>CS/1</td><td>EC/2</td><td>SIO-A, SIO-ST,<br>SIO-SM, SIO-422,<br>SIO-HS422, SIO-HS422,<br>SIO-V.35</td><td>5.2.3, 5.2.6, 5.2.7,<br>5.2.8, 5.2.13, 5.2.14</td></tr>
<tr><td>CS/1</td><td>EC/2</td><td>SIO-16</td><td>5.2.3, 5.2.6, 5.2.7,<br>5.2.9, 5.2.13, 5.2.14</td></tr>
<tr><td>CS/1</td><td>EC/2</td><td>SIO-3270</td><td>5.2.3, 5.2.6, 5.2.7,<br>5.2.10, 5.2.13, 5.2.14</td></tr>
<tr><td>CS/1</td><td>IBC/M</td><td>SIO-A, SIO-H422</td><td>5.2.4, 5.2.6, 5.2.7,<br>5.2.8, 5.2.13,<br>5.2.14</td></tr>
<tr><td>CS/1</td><td>IBC/M</td><td>SIO-3270</td><td>5.2.4, 5.2.6, 5.2.7,<br>5.2.10, 5.2.13,<br>5.2.14</td></tr>
<tr><td>CS/1</td><td>TRC/M</td><td>SIO-A, SIO-ST,<br>SIO-SM, SIO-422,<br>SIO-H422, SIO-HS422,<br>SIO-V.35</td><td>5.2.5, 5.2.6, 5.2.7,<br>5.2.8, 5.2.13, 5.2.14</td></tr>
<tr><td>CS/1</td><td>TRC/M</td><td>SIO-16</td><td>5.2.5, 5.2.6, 5.2.7,<br>5.2.9, 5.2.13,<br>5.2.14</td></tr>
<tr><td>CS/1</td><td>TRC/M</td><td>SIO-3270</td><td>5.2.5, 5.2.6, 5.2.7,<br>5.2.10, 5.2.13,<br>5.2.14</td></tr>
<tr><td colspan="4" align="center">(continued)</td></tr>
</table>

## Table 5-1 Section Directory (continued)

| Server Model | Network Interface | I/O Interface | Relevant Sections |
|---|---|---|---|
| CS/1-HSM | EC/1 or EC/2* | HSM | 5.2.1 and 5.2.2 or 5.2.3, 5.2.6, 5.2.7, 5.2.12, 5.2.13, 5.2.14 |
| CS/1-SNA | EC/1 or EC/2* | SIO-SM, SIO-422 SIO-HS422, or SIO-V.35, | 5.2.1 and 5.2.2 or 5.2.3, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.2.11, 5.2.13, 5.2.14 |
| CS/1-X.25 and GS/1 | EC/1 or EC/2* | SIO-SM, SIO-422, SIO-HS422, or SIO-V.35 | 5.2.1 and 5.2.2 or 5.2.3, 5.2.6, 5.2.7, 5.2.8, 5.2.13, 5.2.14 |
| GS/3 | EC/2 | SIO-SM, SIO-422, SIO-HS422, or SIO-V.35 | 5.2.3, 5.2.6, 5.2.7, 5.2.8, 5.2.13, 5.2.14 |
| GS/4 | EC/2 | None | 5.2.3, 5.2.6, 5.2.7, 5.2.13, 5.2.14 |
| GS/6 | EC/2 | HSM-MDM | 5.2.3, 5.2.6, 5.2.7, 5.2.12, 5.2.13, 5.2.14 |
| IB/1 | EC/2 and IBC/M | None | 5.2.3, 5.2.4, 5.2.6, 5.2.7, 5.2.13 5.2.14 |
| IB/2 | EC/2 | None | 5.2.3, 5.2.6, 5.2.7, 5.2.13, 5.2.14 |

\*   Older Series/1 models may have the EC/1 module, described in Sections 5.2.1 and 5.2.2; all others with Ethernet interface contain one of the EC/2 modules described in Section 5.2.3.

Table 5-2 contains a summary of the configuration options available on Series/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 Flexible 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, the unit's top cover must be removed first (refer to Section 5.1, step 9).

**\*\* CAUTION \*\***

When handling any PC board or assembly, avoid touching the gold edge area. Careful handling prevents damage to the board or assembly.

### Table 5-2  Series/1 Hardware Configuration Option Summary

| Board | Option | Factory Default | Section |
|---|---|---|---|
| ETI | AC- or DC-coupled transceiver | AC-coupled | 5.2.2 |
| MCPU | Bootstrap option | Automatic bootstrap | 5.2.6 |
| MCPU | Console/download port baud rate | 9600 baud (both ports) | 5.2.6 |
| MCPU | Automatic reboot option (internal disk drive) | Enabled | 5.2.6 |
| MCPU | Automatic reboot option (diskless) | Enabled | 5.2.6 |
| MCPU | Memory size | 384K bytes | 5.2.6 |
| MCPU | Continuous self-test option | Disabled | 5.2.6 |
| SIO | Local loopback | Enabled | 5.2.8 |
| SIO | SIO board number | SIO 1* | 5.2.8 |
| SIO | Clock source | ** | 5.2.8 |
| SIO-16 | SIO board number | SIO 1* | 5.2.9 |
| SIO-3270 | SIO board number | SIO 2* | 5.2.10 |
| SIO | Clock source | ** | 5.2.8 |
| HSM | HSM board number | HSM 1* | 5.2.12 |
| SBA | EXT/TXC selection | TXC enabled | 5.2.13 |

    \*    Applies only to boards ordered separately.
   \*\*   Depends on board version.  See Tables 5-9 through 5-13.

Table 5-3 lists the hardware modules available in each Series/1 server, and indicates the slot assignment for each module. Figure 5-1 illustrates the placement of major hardware components within the server's enclosure.

### Table 5-3 Hardware Module Slot Assignment*

#### Slot Assignment

| Server | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| CS/1 w/ Ethernet, EC/1 module | ESB | ETI | MCPU | FDC** | SIO 4 | SIO 3 | SIO 2 | SIO 1 |
| CS/1 w/ Ethernet | Unused | EC/2 | MCPU | FDC | SIO 4 | SIO 3 | SIO 2 | SIO 1 |
| CS/1 w/ Broadband | Unused | IBC/M | MCPU | FDC | SIO 4 | SIO 3 | SIO 2 | SIO 1 |
| CS/1 w/ Token Ring | Unused | TRC/M | MCPU | FDC | SIO 4 | SIO 3 | SIO 2 | SIO 1 |
| CS/1-X.25 | Unused | EC/2 | MCPU | FDC | SIO 4 (SIO-SMS, SIO-HS422S, or SIO-V.35S) | SIO 3 (Same as E) | SIO 2 (Same as E) | SIO 1 (Same as E) |
| CS/1-SNA | Unused | EC/2 | MCPU | FDC | Unused | Unused | Unused | SIO 1 (SIO-SM) |
| CS/1-HSM | Unused | EC/2 | MCPU | FDC | Unused | Unused | HSM | HSM |
| GS/1 | Unused | EC/2 | MCPU | FDC | SIO 4 (SIO-SMS) | SIO 3 (Same as E) | SIO 2 (Same as E) | SIO 1 (Same as E) |
| GS/3*** | Unused | EC/2 | MCPU | FDC | SIO 4 (SIO-SMH) | SIO 3 (Same as E) | SIO 2 (Same as E) | SIO 1 (Same as E) |
| GS/4, IB/2 | Unused | EC/2 | MCPU | FDC | Unused | Unused | Unused | EC/2 |
| GS/6 | Unused | EC/2 | MCPU | FDC | Unused | Unused | Unused | HSM-MDM |
| IB/1 | Unused | EC/2 | MCPU | FDC | Unused | Unused | Unused | IBC/M |

\* Where specific module versions are indicated, only those modules are available.
** Unused on servers with no internal disk drive.
*** GS/3 with the IP protocol supports SIO board numbers 1 and 2 only.

NETWORK INTERFACE BACKPANEL
ATTACHMENT PANEL

BACKPANEL ATTACHMENT ASSEMBLY PANELS

AC
HARNESS

TO J2E          TO J2F          TO J2G

I/O OR
NETWORK
INTERFACE
CABLES

TO J2H

FAN
ASSEMBLY

NETWORK
INTERFACE
CABLE

I/O OR
NETWORK
INTERFACE
CABLE
CONNECTORS
UNDER
CARDCAGE

FAN DC
POWER BRANCH

J5

J2H
J2E  J2F  J2G

POWER
SUPPLY
UNIT

FLOPPY
DATA CABLE

FLOPPY DC
POWER BRANCH

J3

DC
HARNESS

FPA CABLE

J4

FLOPPY
DISK UNIT

CARDCAGE

FRONT PANEL
ASSEMBLY (FPA)

AIR INTAKE VENT UNDER FPA

SLOTS A THROUGH H

Figure 5-1  Placement of Major Hardware Components

## 5.2.1 ESB Board Configuration

The ESB board is located in slot B of the cardcage. The board contains a Self Test LED, labeled S.TEST, and a Halt LED, labeled HALT. The Self Test LED lights at power-on or reset to indicate that the self-test diagnostics are being performed. The Self Test LED turns off when the diagnostics complete successfully. The Halt LED lights at power-on or reset or when the microprocessor is in a halt state. (See Appendix A for a discussion of the power-on diagnostics of the ESB board.)

The ESB board contains no configuration areas.

Figure 5-2 illustrates the positions of the diagnostic LEDs on the ESB board.
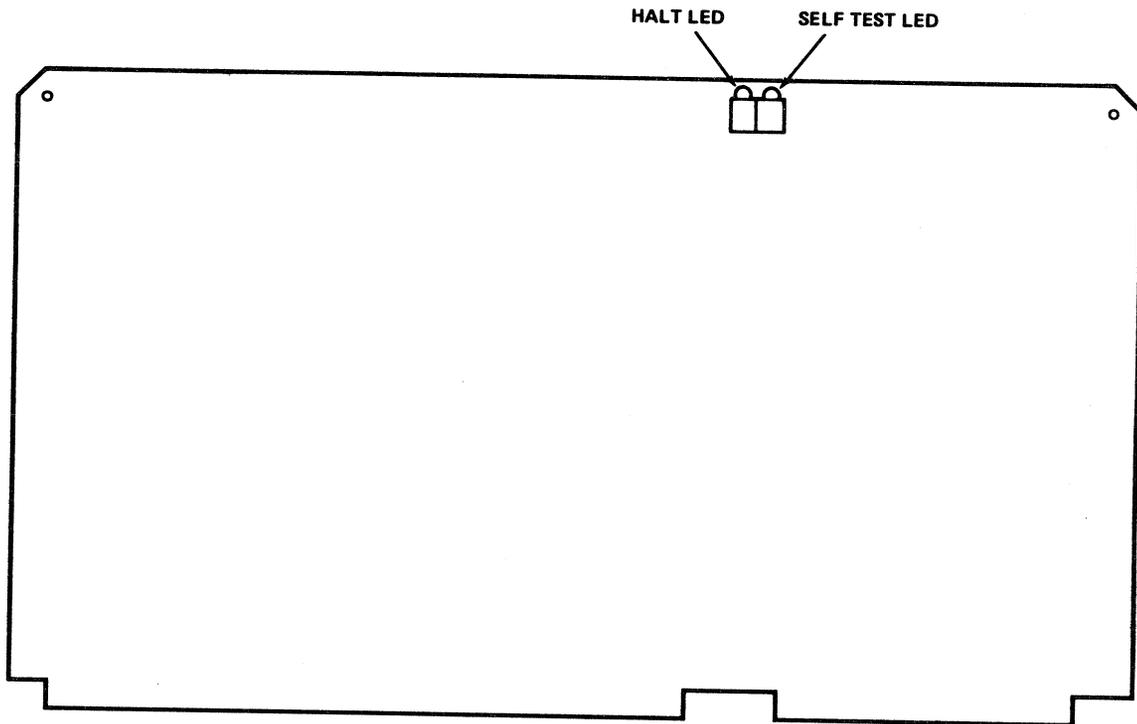


Figure 5-2  ESB Board

## 5.2.2 ETI Board Configuration

The ETI board is located in slot A of the cardcage.

The board contains a Self Test LED, labeled S.TEST, which 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. (See Appendix A for a discussion of the power-on diagnostics for the ETI board.)

The ETI board contains one configuration area, labeled E102E, which is located in the lower right corner of the board, below reference designator R26. A shorting plug must be in place if the unit is attached to an AC-coupled transceiver (e.g., TCL Inc. 2010E or Bridge transceiver) and must be removed if the unit is attached to a DC-coupled transceiver.

Figure 5-3 illustrates the ETI board and indicates the positions of the diagnostic LED and area E102E.
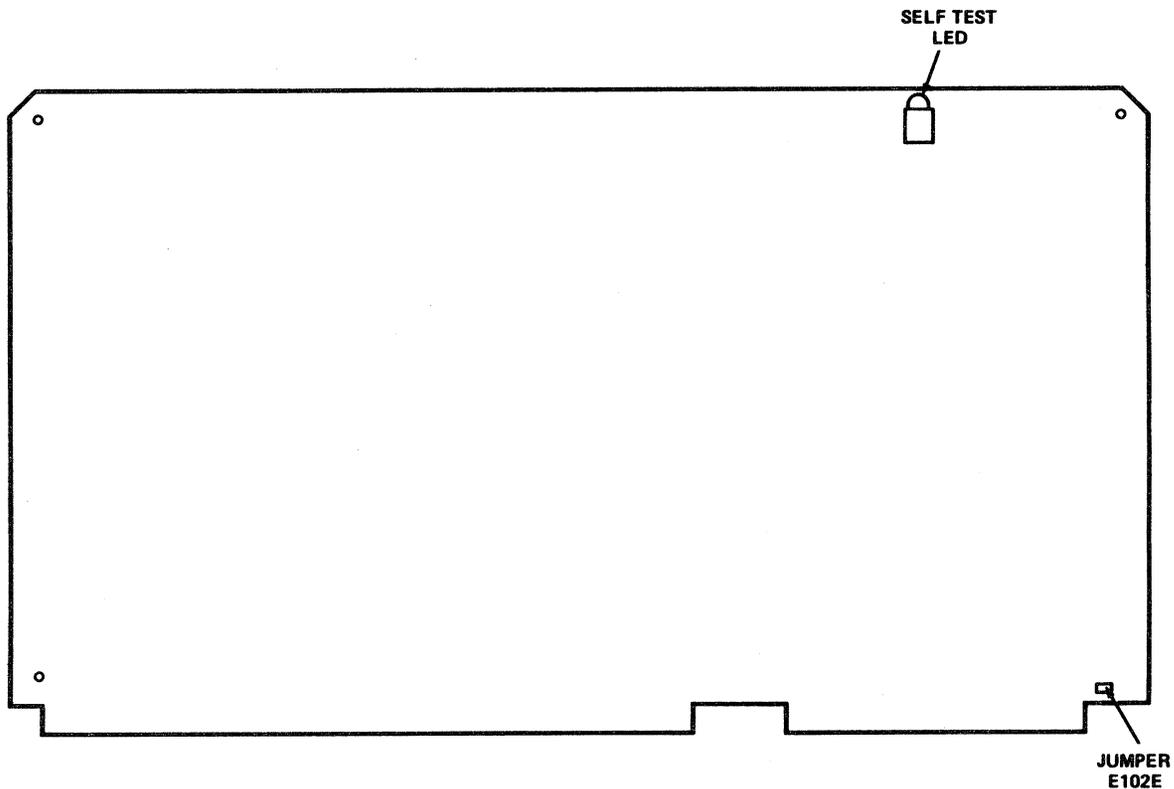


Figure 5-3 ETI Board

## 5.2.3 EC/2 Board Configuration

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. The following paragraphs describe the two EC/2 board types.

### EC/2 06-0021-xx

On the EC/2 board numbered 06-0021-xx, the part number is printed on the left edge of the board's component side.

The 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. Refer to Appendix A for a discussion of the power-on diagnostics for the EC/2 board.

The EC/2 board numbered 06-0021-xx contains four configuration areas that are factory configured and require no alteration by the customer:

- Area E82 contains a shorting plug connecting the pins.

- Area E89 assigns the Multibus interrupt level (levels 0 through 7). The Multibus interrupt level and Multibus base address must agree in order for the server to function.

**\*\*  NOTE  \*\***

The Multibus interrupt level and Multibus base address must agree in order for the server to function.

- Area E101 assigns the Multibus base address.

- Area E103 is configured according to the model of Manchester encoder/decoder present on the board. If it is model 7992A, pins 2 and 3 are connected; if it is model 7992B, pins 1 and 2 are connected. The encoder/decoder chip is located between the two configuration areas and has the model number clearly printed on it. No reconfiguration is required to operate Ethernet Version 1.0 or 2.0 transceivers, IEEE 802.3 transceivers, fiber optic transceivers, or DELNI equipment.

**\*\*  NOTE  \*\***

Pin 1 in Configuration area E103 faces the gold edge connector.

Table 5-4 lists the shorting plug positions for configuration areas E89 and E101; Figure 5-4 illustrates the positions of the diagnostic LEDs and the configuration areas on the EC/2 board numbered 06-0021-xx.
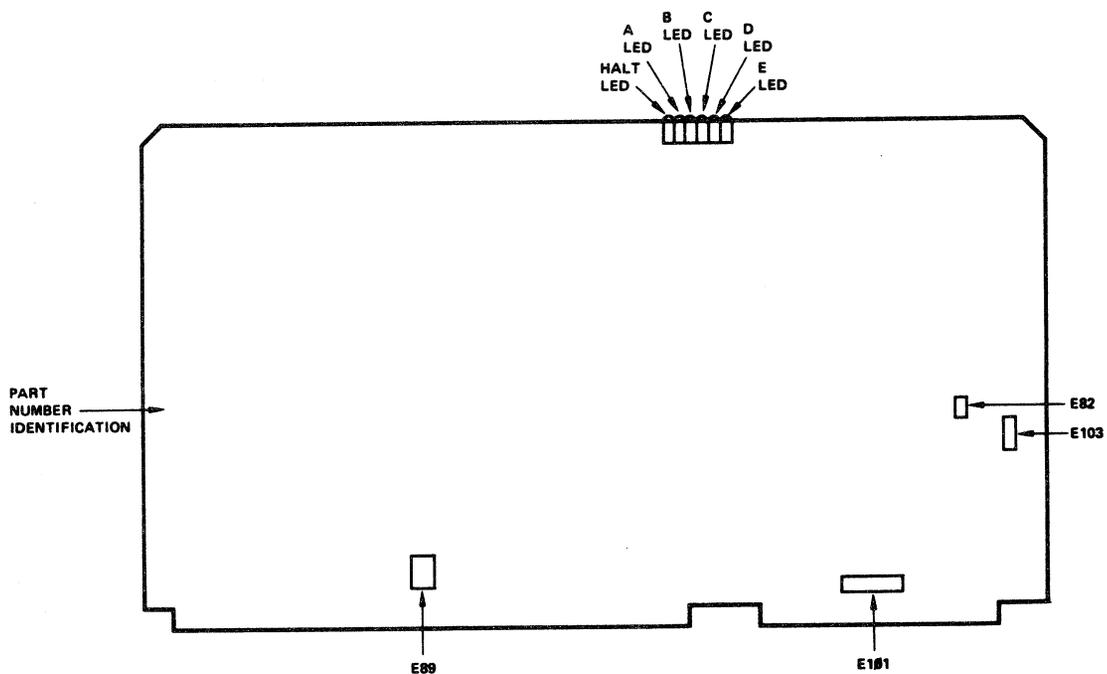
Figure 5-4  EC/2 Board Configuration, No. 06-0021-xx

## EC/2 06-0041-xx

On the EC/2 board numbered 06-0041-xx, the part number is printed on the right edge of the board's component side.

The 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. Refer to Appendix A for a discussion of the power-on diagnostics for the EC/2 board.

The EC/2 board numbered 06-0041-xx contains two configuration areas that are factory configured and require no alteration by the customer:

- Area E89 assigns the Multibus interrupt level (levels 0 through 7) in conjunction with the Multibus base address.

- Area E101 assigns the Multibus base address.

**  NOTE  **

The Multibus base address and Multibus interrupt level must agree in order for the server to function.

Table 5-4 lists the shorting plug positions for configurations areas E89 and E101; Figure 5-5 shows the LEDs and configuration areas on the EC/2 board numbered 06-0041-xx.
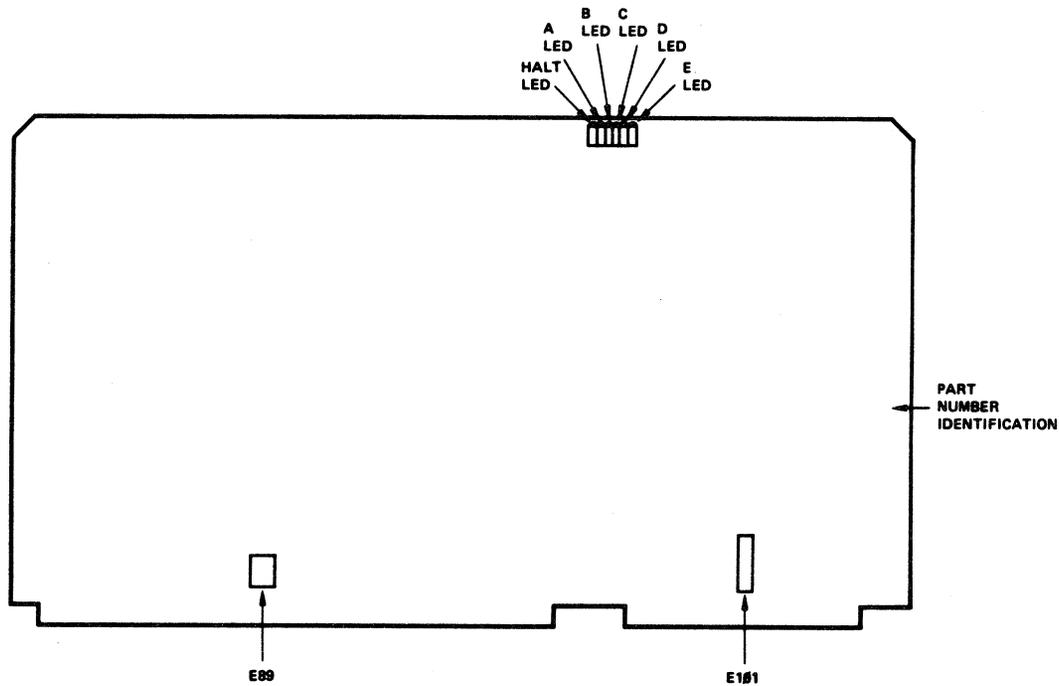
Figure 5-5  EC/2 Board Configuration, No. 06-0041-xx

### Table 5-4  EC/2 Multibus Interrupt Level and Base Address Assignment Shorting Plug Positions, Configuration Areas E89 and E101

|              | E89 Pins Connected | E101 Pins Connected |
|--------------|--------------------|---------------------|
| First EC/2   | None               | None                |
| Second EC/2* | 11-12              | 7-8                 |

* Applies to GS/4 and IB/2 only.

### 5.2.4  IBC/M Board Configuration

In a CS/1, the IBC/M board is located in slot B of the cardcage. In an IB/1, the IBC/M board is located in slot H.

The IBC/M board contains six diagnostic LEDs: one Halt LED and five Self Test LEDs.

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 are turned off. In addition, the Halt LED lights when the microprocessor is in a halt state. Refer to Appendix A for a complete discussion of the power-on diagnostics for the IBC/M board.

The IBC/M board has no configuration areas.

Figure 5-6 illustrates the positions of the diagnostic LEDs on the IBC/M board.

HALT LED    SELF-TEST LEDS
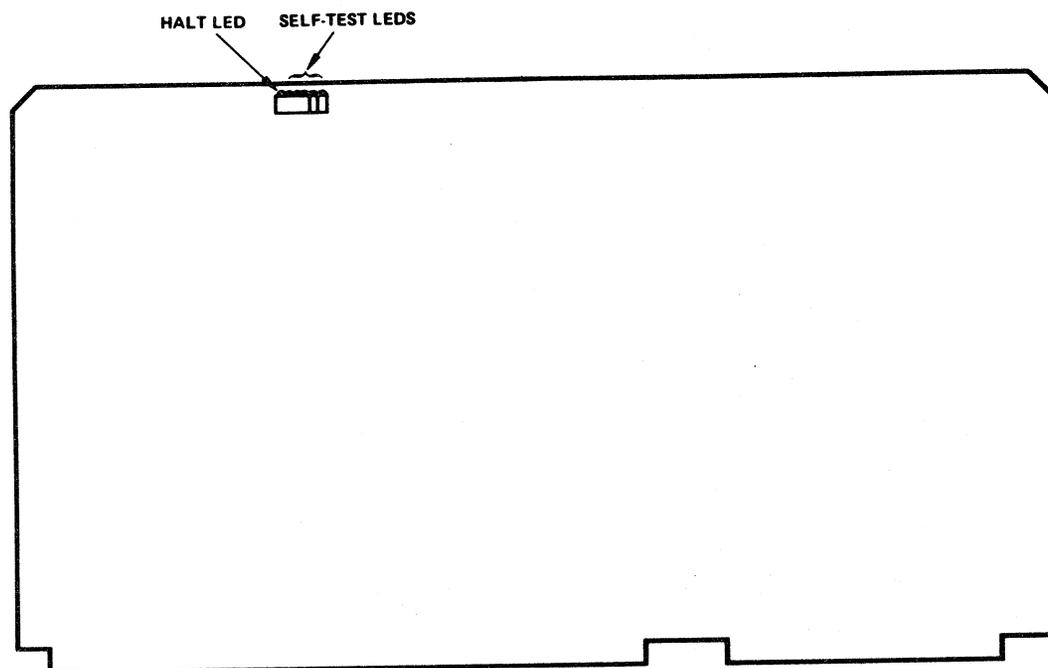
Figure 5-6  IBC/M Board

### 5.2.5  TRC/M Board Configuration

The 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. Refer to Appendix A for a discussion of the power-on diagnostics for the TRC/M board.

### 5.2.6  MCPU Board Configuration

The MCPU board contains power-on, self-test diagnostics, a monitor, and console terminal and auxiliary port interfaces. The console and auxiliary ports are accessed via connectors on the back panel. The connectors on the backpanel attachment assemblies are illustrated in Figure 3-3 in Section 3.1.1, and Figures 3-6 and 3-8 in Section 3.1.6, depending on the network interface present in the server. Both ports support XON/XOFF flow control. Both ports are configured for 8 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. The optional 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. Refer to Appendix A for a discussion of the self-test diagnostics for the MCPU board.

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. Six sets of pins in E1 are implemented:

- **Pins A, B, and C** select the bootstrap mechanism. The shorting plug positions and the options they select are listed in Table 5-5 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 5-6. 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 (allowing the user the option of saving dumps on diskette or performing debugging procedures).

- **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, and must be in place on 256K systems running 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 designated Release 9 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 place and disabled when the plug is removed.

Figure 5-7 illustrates the positions of the LEDs and configuration area E1 on the MCPU board. Pin A of the configuration area is toward the server front panel.
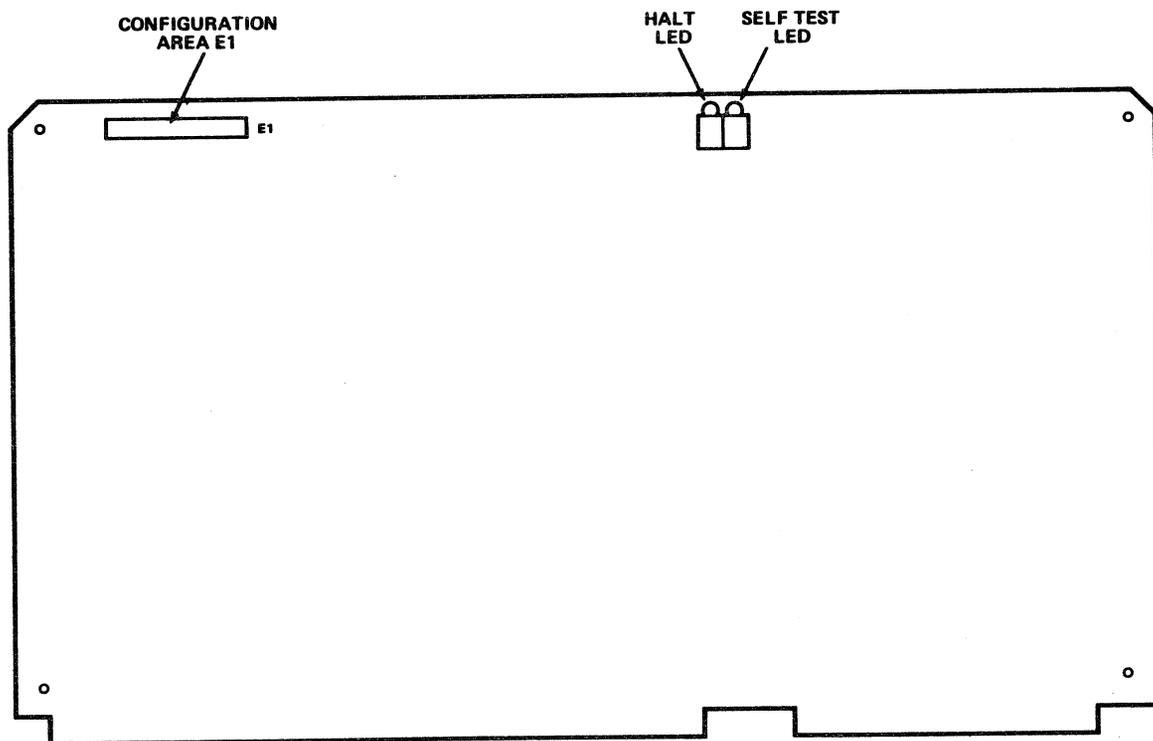


Figure 5-7 MCPU Board

| Table 5-5 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 5-6 Console/Auxiliary Port Baud Rate Shorting Plug Positions MCPU Configuration Area E1 | | | | |
|-------|-------|-------|-------|-------------|
| *Console Port* | | *Auxiliary Port* | | |
| *Pin D* | *Pin E* | *Pin I* | *Pin J* | *Baud Rate* |
| Out | Out | Out | Out | 9600 baud* |
| Out | In | Out | In | 1200 baud |
| In | Out | In | Out | 300 baud |
| In | In | In | In | 110 baud |
| | | * Factory default. | | |

## 5.2.7 MBI Board Configuration

The Main Backplane Interconnect (MBI) board is designed to accommodate seven Multibus boards. The slot assignments are listed in Table 5-3 in Section 5.2. 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 [18]. 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 5-3 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 5-7 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.

System chassis ground and signal ground are connected through a resistor/capacitor network (R5 and C5) located on the MBI board. Connecting the grounds in this manner is essential for reliable system operation.

Figure 5-8 illustrates the MBI board and indicates the positions of all cable connectors and components R5 and C5.
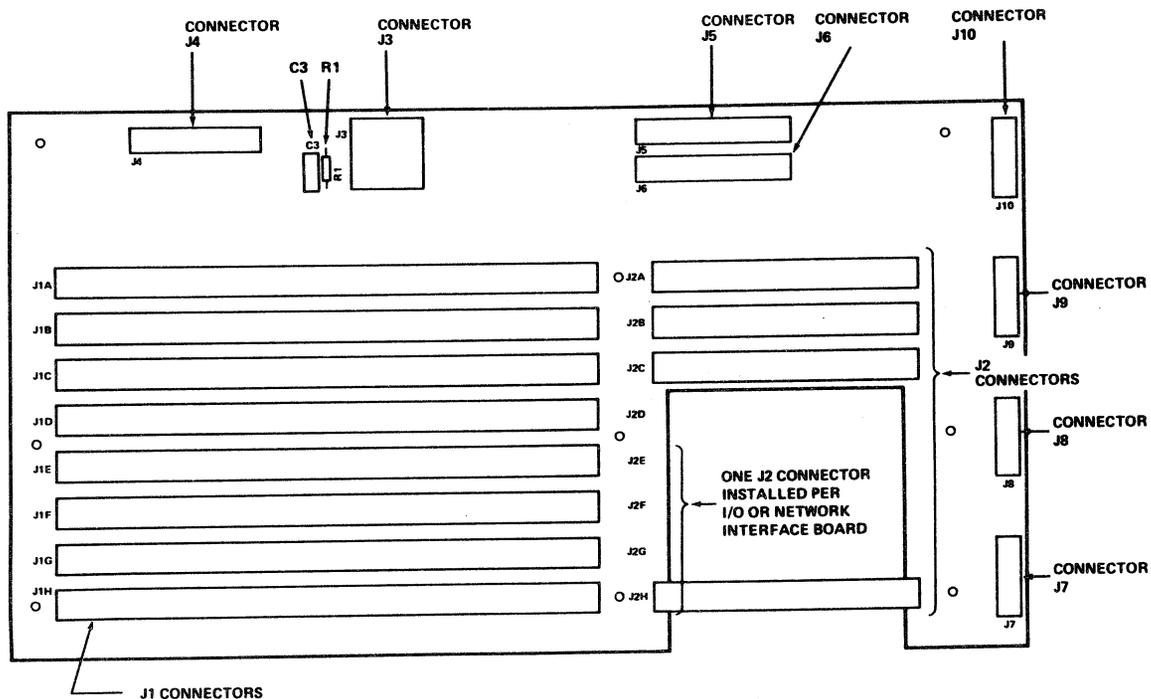


Figure 5-8  MBI Board

**Table 5-7  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 |

## 5.2.8 SIO Board Configuration

This section describes the configuration of the SIO board. Sections 5.2.9 and 5.2.10 describe the configurations of 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. The GS/1, CS/1-X.25, and GS/3 also support up to four SIO modules, with a maximum of eight serial ports. The CS/1-SNA supports one SIO module with a single serial port. The CS/1-HSM, IB/1, and IB/2 do not support SIO modules. Section 3.1.8 describes the features of each version of the SIO board.

The first SIO board is always mounted in slot H. If subsequent SIO boards are added, they must be mounted in slots G, F, and E, in that order. Table 5-3 in the beginning of this section indicates slot assignments for the Series/1 server's hardware modules.

The 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. Refer to Appendix A for a discussion of the self-test diagnostics for the SIO board.

Figure 5-9 illustrates the positions of the two diagnostic LEDs and all configuration areas on the SIO board. 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** are used to assign the SIO board number (SIO 1 through SIO 4). Board numbers must be assigned in sequence, in ascending numeric order. Table 5-8 lists the numbers assigned by each combination of shorting plug positions. The locations of these areas are indicated in Figure 5-9. Board number assignment is required only for boards ordered separately; boards shipped with a Series/1 server have preassigned board numbers.

- **Area E59** is used to assign the Multibus interrupt.

The locations of these areas are indicated in Figure 5-9. Multibus interrupt level assignment is required only for boards ordered separately; boards shipped with a Series/1 server have preassigned interrupt levels.

**\*\*  NOTE  \*\***

Multibus interrupt level and SIO board number must agree in order for the SIO board to function. Table 5-8 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 5-9 through 5-13 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 and should not be altered by the user. 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, both transmit and receive clock sources should be set to external. For direct connection (GS/3 and CS/1-X.25), the transmit clock should be set to internal and receive clock to external. For use with terminal devices, both clocks should be set to internal.

The corresponding configuration areas on the SBA assembly must select the same option (see Section 5.2.13).

**\*\*  NOTE  \*\***

For SIO-422 applications requiring ST rather than TT, a special cable must be constructed with ST-A jumpered to pin 17 and ST-B jumpered 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, 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).

Series/1 Installation Guide

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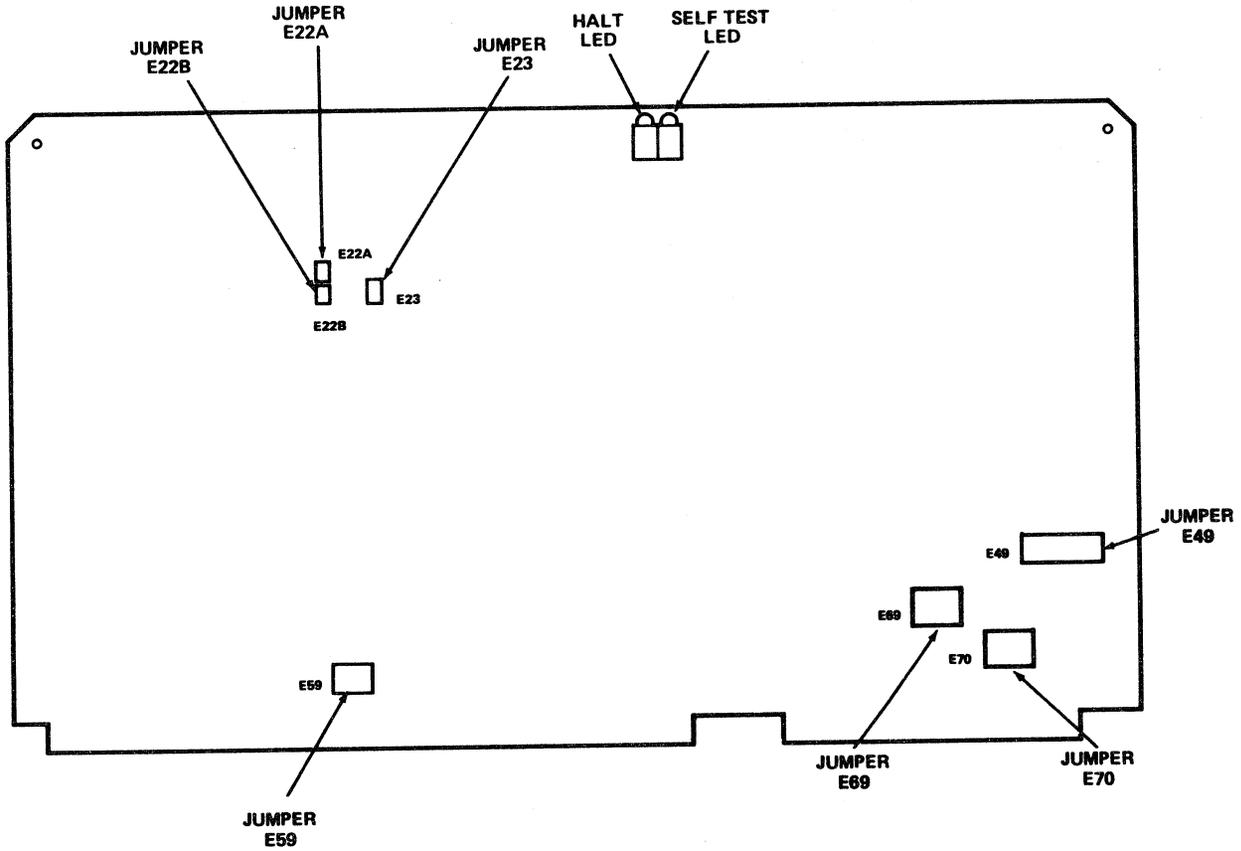


Figure 5-9  SIO Board

| Table 5-8 SIO Board Number and Multibus Interrupt Level Assignment Shorting Plug Positions | | | | |
|---|---|---|---|---|
| E22A | E22B | E59 Pins Connected | Board No. | Interrupt Level |
| Out | Out | 10-11 | SIO 1* | 4 |
| In | Out | 7-8 | SIO 2 | 5 |
| Out | In | 4-5 | SIO 3 | 6 |
| In | In | 1-2 | SIO 4 | 7 |

\* Factory default for boards shipped separately.

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Bridge Communications, Inc.

| Table 5-9 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 5-10 SBA-SM Clock Source Shorting Plug Positions | | | |
|---|---|---|---|
| Port No. | Clock Source | Line Name | E<x>* 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 5-11 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 5-12 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 5-13  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

## 5.2.9 SIO-16 Board Configuration

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 3.1.8.

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. Refer to Appendix A for a description of the SIO-16 self-test diagnostics.

Figure 5-10 illustrates the position of the Halt LED and configuration areas on the SIO-16 board. The following paragraph describes configuration areas on the SIO-16 module.

- **Area E41** is used to assign the SIO-16 board number (SIO 1 through SIO 4). The location of this configuration area is shown in Figure 5-10. Table 5-14 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** is used to assign the SIO-16 Multibus interrupt (level 4 through 7). The location of this configuration  area is shown in Figure 5-10. Table 5-14 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 agree in order for the SIO-16 board to function.
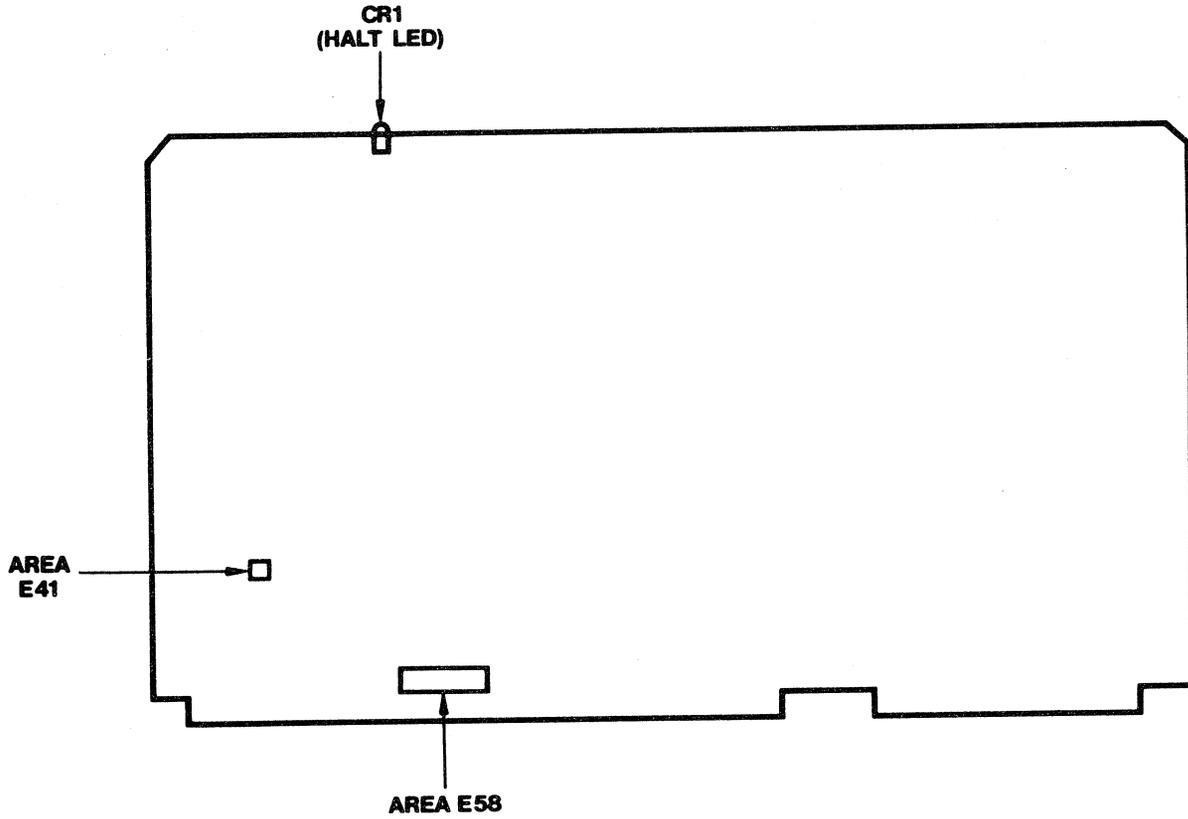
Figure 5-10  SIO-16 Board

### Table 5-14  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 |

### 5.2.10 SIO-3270 Board Configuration

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 3.1.8

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 5-11 illustrates the positions of the LEDs and configuration areas on the SIO-3270 board. Table 5-15 lists the default configuration of the board, indicating the presence or absence of shorting plugs ("In" and "Out", respectively) in the configuration areas.
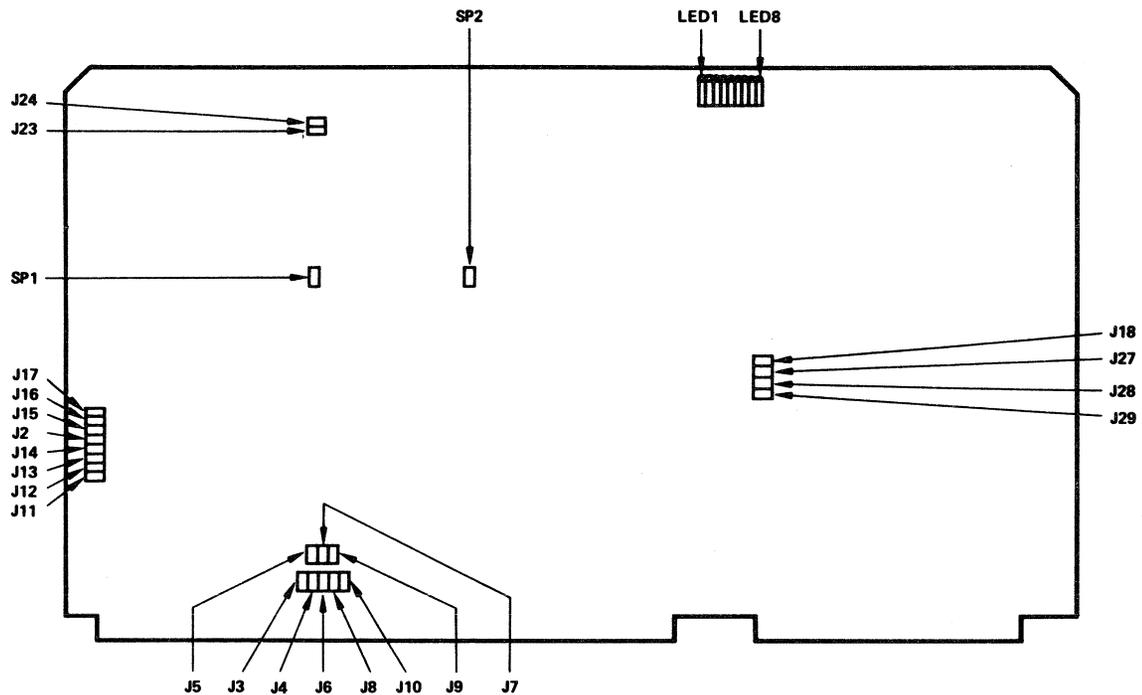
Figure 5-11  SIO-3270 Board

### Table 5-15 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 5-11. Board number assignment is required only for boards ordered separately; factory-installed boards have preassigned board numbers and have been configured as required. Table 5-16 lists the board numbers assigned by each combination of shorting plug positions.

- **Areas J3 through J6** are used to set the Multibus interrupt level (levels 4 through 7). The locations of these areas are indicated in Figure 5-11.

**  NOTE  **

Multibus interrupt level and SIO board number must agree in order for the
SIO-3270 to function. Table 5-16 lists the appropriate shorting plug positions to
set the SIO board number and the corresponding multibus interrupt level.

| Table 5-16 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 |

### 5.2.11 SBB Board Configuration

The CS/1-SNA supports one SBB board, which provides 256K of extra RAM. The board can be placed in any slot between the MCPU (slot C) and the SIO module.

The board contains one LED, a parity error indicator. It does not light unless a parity error is detected.

The SBB board contains four switches, labeled SW1 through SW4, which are factory set and should not be changed. SW1 is the I/O address switch; SW2 is the start address switch; SW3 is the stop address switch; and SW4 is the 1M block select switch. Refer to Table 5-17 for default switch settings.

In addition, the SBB board contains 39 configuration areas. They are factory set and should not be changed. Their numbers and shorting plug positions are listed in Table 5-18.

Figure 5-12 illustrates the LED and configuration areas on the SBB board.
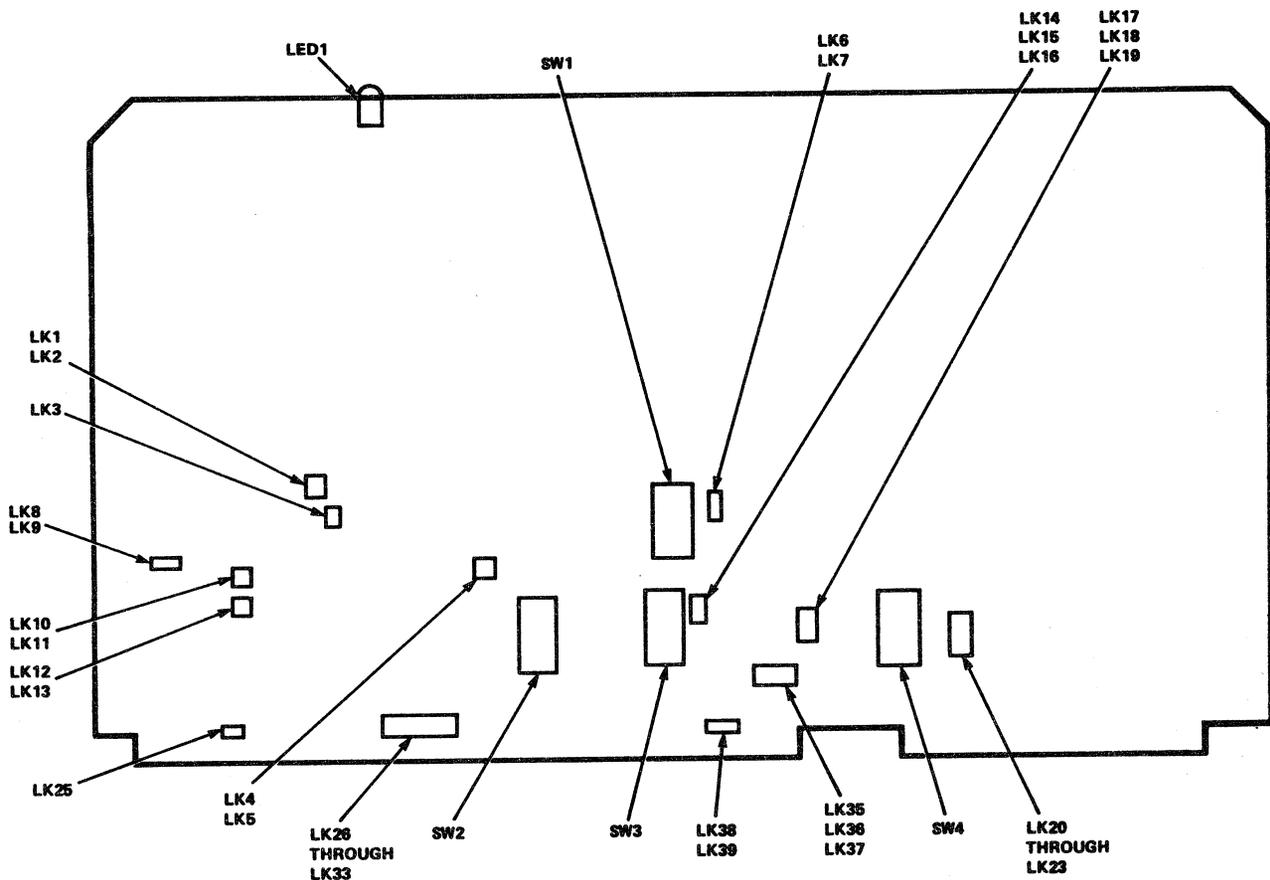


Figure 5-12  SBB Board

| Table 5-17  SBB Board Default Switch Settings for 256KB and 512KB Versions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pole | SW1 | | SW2 | | SW3 | | SW4 | |
| | 256KB | 512KB | 256KB | 512KB | 256KB | 512KB | 256KB | 512KB |
| 1 | On | On | On | Off | On | Off | Off | Off |
| 2 | Off | Off | On | On | Off | Off | Off | Off |
| 3 | Off | Off | Off | On | Off | On | Off | Off |
| 4 | Off | Off | On | On | Off | Off | Off | Off |
| 5 | Off | Off | On | On | Off | Off | Off | Off |
| 6 | Off | Off | On | On | Off | Off | Off | Off |
| 7 | Off | Off | On | On | Off | Off | Off | Off |
| 8 | Off | Off | On | On | Off | Off | Off | Off |

| Table 5-18  SBB Board Configuration Areas | | | | | |
|---|---|---|---|---|---|
| Area | Setting | Area | Setting | Area | Setting |
| LK1 | Out | LK14 | Out | LK27 | Out |
| LK2 | Out | LK15 | In | LK28 | Out |
| LK3 | In | LK16 | Out | LK29 | Out |
| LK4 | In | LK17 | In | LK30 | Out |
| LK5 | Out | LK18 | Out | LK31 | Out |
| LK6 | In | LK19 | Out | LK32 | Out |
| LK7 | Out | LK20 | Out | LK33 | Out |
| LK8 | Out | LK21 | Out | LK34 | Out |
| LK9 | In | LK22 | Out | LK35 | In |
| LK10 | Out | LK23 | Out | LK36 | Out |
| LK11 | In | LK24 | Out | LK37 | Out |
| LK12 | Out | LK25 | Out | LK38 | In |
| LK13 | In | LK26 | Out | LK39 | Out |

## 5.2.12 HSM Board Configuration

The HSM board is available in two versions: the version in the CS/1-HSM, referred to as the HSM board, and the version in the GS/6, referred to as the HSM-MDM board.

Both versions of the HSM board contain three diagnostic LEDs: RCV DATA, BUS ERROR, and SELF TEST. At power-on, the receive data and bus error indicators light. As soon as the system software is booted, these LEDs turn off, and the Self Test LED lights to indicate that the internal Self Test is in progress. If the board passes this test, the Self Test LED turns off.

While the communications software is running, the receive data LED indicates the state of the Receive Data line. When the light is dim or flashing, data is being transferred between the HSM and the attached line. When no data is being transferred, the light is either on at full intensity or off.

The CS/1-HSM supports up to two HSM boards. The first HSM board in each unit must be mounted in slot H, the second (if present) in slot G.

The HSM board contains two configuration areas, E34 and E38, which are used to assign the board and slot number (e.g., board 1, in slot H). Board numbers must be assigned in sequence, in ascending numeric order. Figure 5-13 illustrates the positions of the diagnostic LEDs and the configuration areas on the HSM board.

Table 5-19 lists the shorting plug positions appropriate for the possible slots. Board number reassignment is required only for boards ordered separately; board numbers are preassigned on boards shipped with a CS/1-HSM. Slots F and E are not normally available for an HSM board; the entries are included in Table 5-19 only for custom installations in which slots H and G contain SIO boards.

Each HSM board must be used with an SBA-HSM installed in the appropriate slot. The SBA-HSM is not configurable.

Appendix C describes and illustrates the HSM Host Adapter Card (HAC) installation and configuration procedures, and the CS/1-HSM configuration.
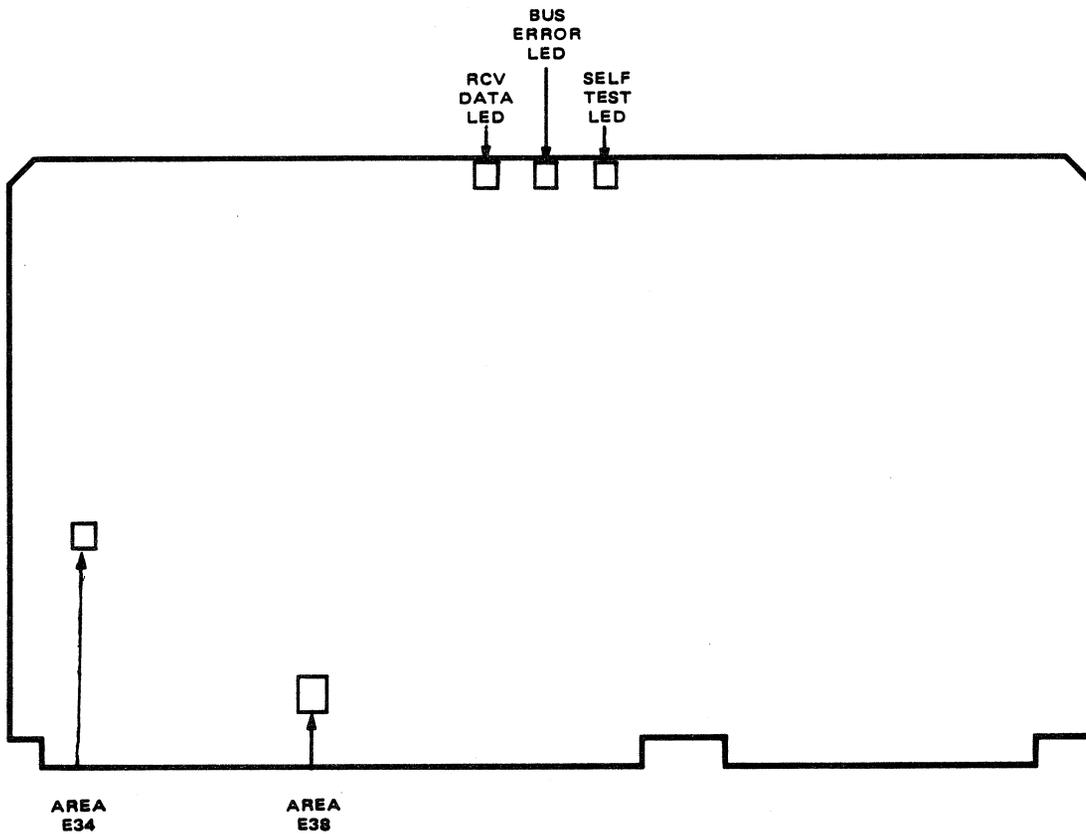
Figure 5-13  HSM Board

| Table 5-19  HSM Board Number Assignment Shorting Plug Positions | | | | |
|---|---|---|---|---|
| Board No. | Slot | Area E34 Pins 1-2 | Area E34 Pins 3-4 | Area E38 Pins * |
| 1** | H | Out | Out | 10-11 |
| 2 | G | In | Out | 7-8 |
| 3*** | F | Out | In | 4-5 |
| 4*** | E | In | In | 1-2 |

      *   Numbers refer to the pins in area E38
           that must be connected by a shorting plug.
      **   Factory default for boards shipped separately.
      ***  For custom installations only.

The GS/6 supports one modified HSM board (HSM-MDM), which must be mounted in slot H. The HSM-MDM board connects to the RF modem on the rear panel of the unit (SBA-BBM). The five configuration areas (E13, E29, E31, E34, E38) on the HSM-MDM are factory set and should not be changed:

- E13 (pins 1 and 2, 5 and 6, 8 and 9 connected)

- E29 (pins 5 and 6 connected)

- E31 (pins 2 and 3 connected)

- E34 (open, no pins connected)

- E38 (pins 10 and 11 connected)

Figure 5-14 illustrates the positions of the diagnostic LEDs and the configuration areas on the HSM-MDM board.

The HSM-MDM board must be used with an SBA-BBM.
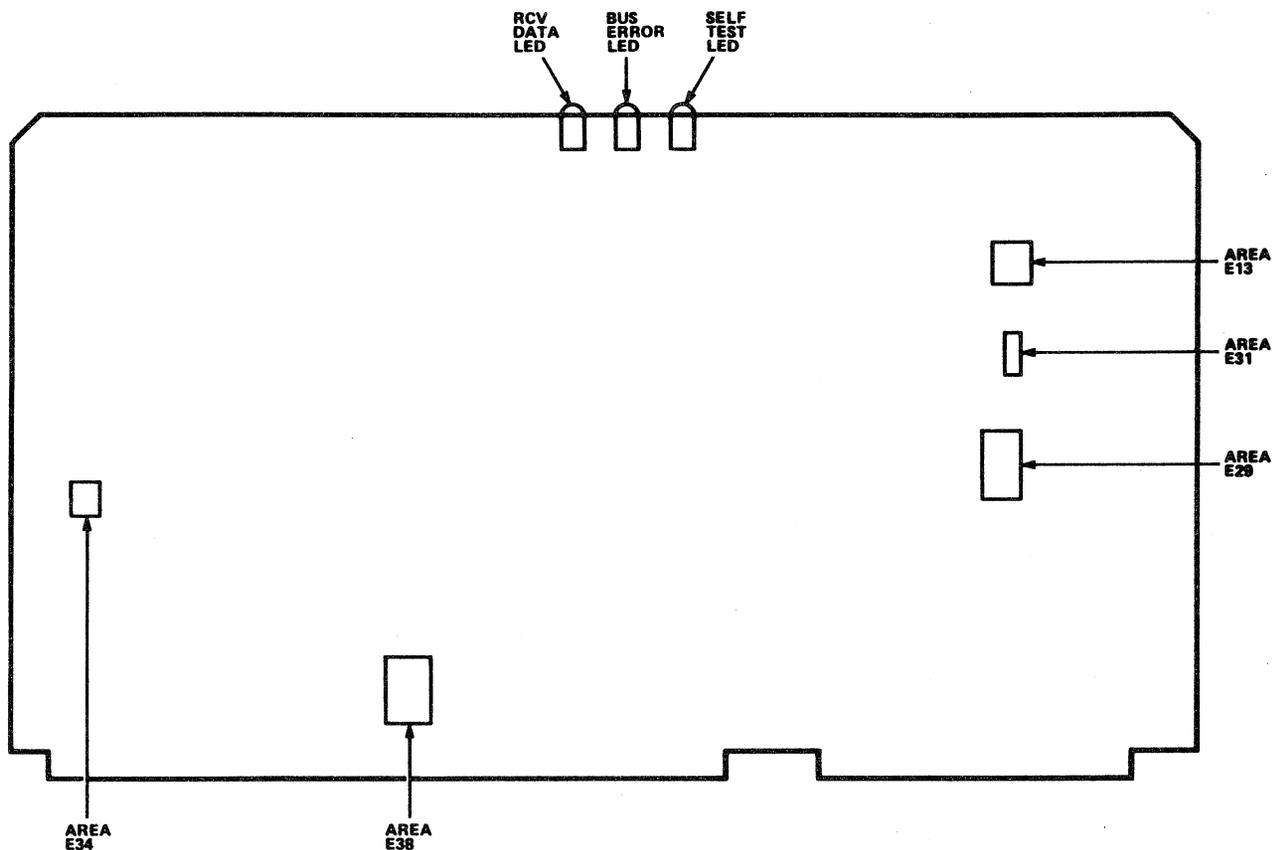


Figure 5-14  HSM-MDM Board

### 5.2.13 Serial and Coaxial Backpanel Attachment Assembly Configuration

This section describes the backpanel attachment assemblies that provide either serial or coaxial interface cable connectors. Table 5-20 lists the assemblies that provide connectors for device cables and the SIO module with which each assembly is associated.

| Table 5-20 Serial and Coaxial Backpanel Attachment Assemblies | |
| --- | --- |
| Assembly | Associated Module |
| 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 |
| SBA-HSM | HSM |
| SBA-BBM | HSM-MDM |

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 HSM board and its backpanel attachment assembly are connected by a cable harness from the P2 connector on the board to the individual connectors on the backpanel attachment assembly.

The SBA-A, SBA-16, CBA, SBA-ST, SBA-422H, SBA-H422A, SBA-HS422, SBA-V.35, and SBA-HSM 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 3.1.8.

Each SBA-SM assembly contains four configuration areas labeled E0 through E3. These areas determine whether the EXC line or the TXC line is enabled for the port whose number corresponds to the configuration area number, according to the specifications in Table 5-21. Placing a shorting plug on pins 1 and 2 of area E2, for example, selects line TXC for port 2; placing a plug on pins 2 and 3 selects line EXC for port 2. For accessibility, the areas are located on the back of the assembly rather than on the component side.

** 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 5-9 in Section 5.2.8).

Figure 5-15 shows the positions on the SBA-SM assembly of configuration areas E0 through
E3. Table 5-21 lists the settings of the shorting plugs.

The SBA-BBM has no areas that require configuration. However, the assembly includes the
RF modem, which must be adjusted for each broadband installation (see Section 5.2.15).
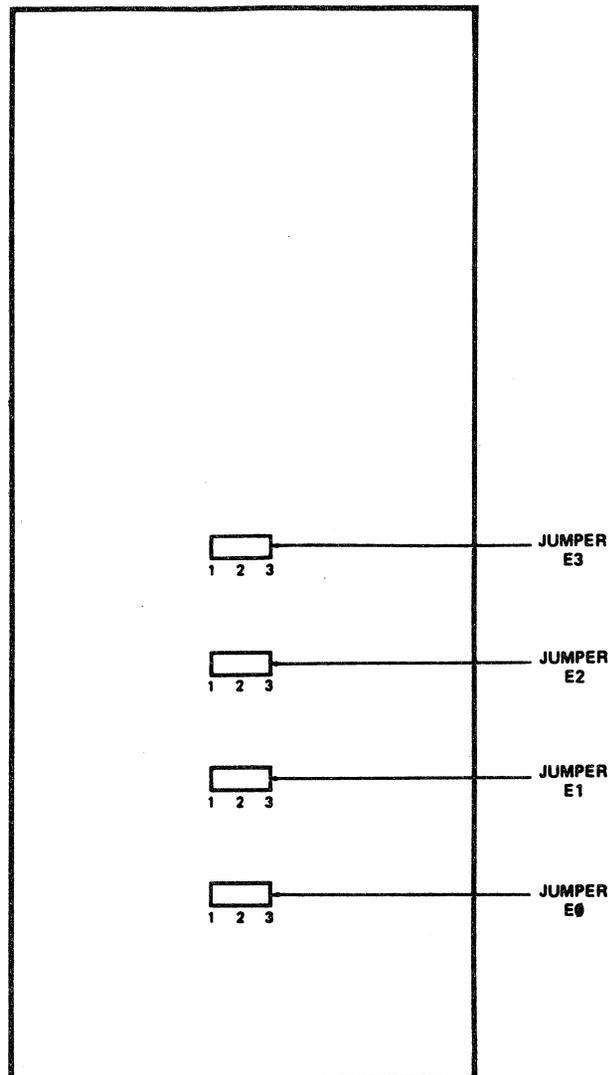


Figure 5-15  Configuration Areas on the SBA-SM Assembly

**Table 5-21  SBA-SM Clock Source
Shorting Plug Positions,
Configuration Areas E0 through E3**

| Port No. | Line Selected | Jumpered Pins |
|----------|---------------|---------------|
| 0 | TXC | E0 1-2* |
| 0 | EXC | E0 2-3 |
| 1 | TXC | E1 1-2* |
| 1 | EXC | E1 2-3 |
| 2 | TXC | E2 1-2* |
| 2 | EXC | E2 2-3 |
| 3 | TXC | E3 1-2* |
| 3 | EXC | E3 2-3 |

\* Factory default

### 5.2.14  Network Interface Backpanel Attachment Assemblies

Table 5-22 lists the backpanel attachment assemblies that provide network interface cable connectors to the Series/1 servers, and the network interface with which each assembly is associated.

**Table 5-22  Network Interface
Backpanel Attachment Assemblies**

| Assembly | Associated Interface |
|----------|----------------------|
| EBA | EC/1 or EC/2 |
| SBA-E* | EC/1 or EC/2 |
| BBA-37 | IBC/M |
| SBA-B-37* | IBC/M |
| TBA | TRC/M |

\*   SBA-E is used only with GS/4 and IB/2;
   SBA-B is used only with IB/1.

Each network interface board is connected to its backpanel assembly in one of two ways:  by a 26-pin flat cable from the MBI, or via a harness to the P2 connector on the network interface board. The type of configuration is chosen for convenience and has no effect on the performance of the system.

## 5.2.15  GS/6 RF Modem Configuration

An RF modem for the GS/6 is located on the SBA-BBM, which is attached to back panels 3 and 4 on the server; back panels 1 and 2 are blank.

The modem contains three LEDs (Figure 5-16), labeled PWR, RS, and RR. PWR is the Power LED; it lights at power-on and remains lit until the unit is powered off. The RS (Request to Send) LED flashes on and off as the HSM-MDM board sends a request to send data to the modem. The RR (carrier detect) LED flashes on and off as it detects the presence of the carrier. Because the GS/6 sends short packets at high speed, it may be difficult to detect the flashing of the LEDs.

The two screws on the modem are used to adjust the squelch level and the transmit level of the modem. These adjustments should be done only by a factory-authorized technician.
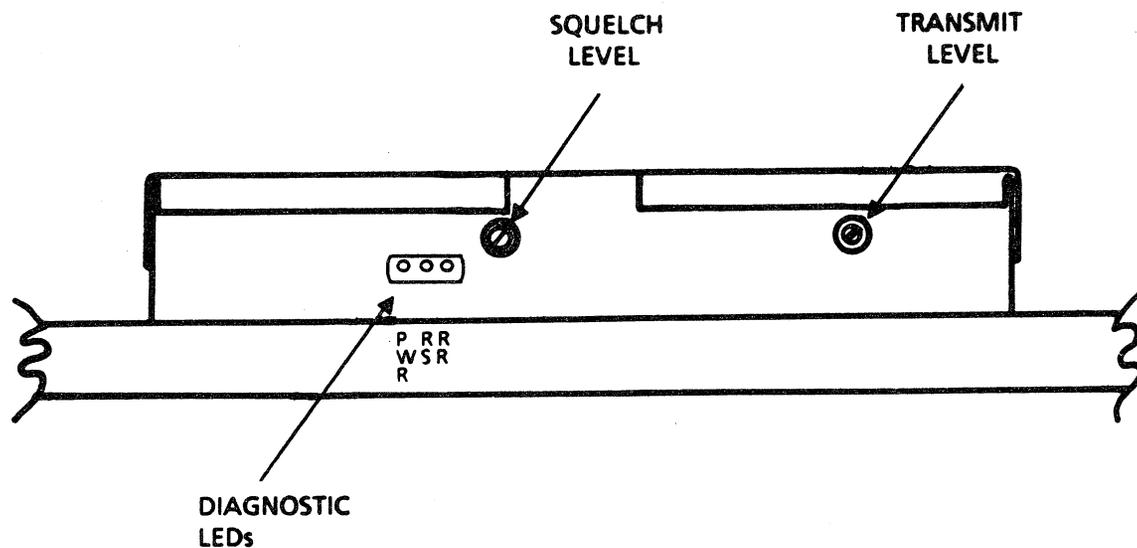


Figure 5-16  RF Modem for the GS/6

## 5.3 Tabletop Installation

After all hardware configuration areas have been checked, the unit is ready to be installed. Refer to Section 3.2 for space and environment requirements. Place the unit on a firm, level surface and connect the unit's external cables.

## 5.4 Optional Rack Mount Installation

For rack mount installation, an optional rack mount kit (designated RM) can be ordered from Bridge Communications, Inc. The kit consists of a set of rack mount slides. The following steps are required to install the slides on the unit:

1. Remove the chassis side covers by removing the four screws securing the plastic feet to the chassis bottom. The plastic feet may be discarded, since they are not needed on a rack-mounted unit.

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 Communications, Inc., 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. The end of the slide that has a latch-leaf spring must be placed 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.

## 5.5 System Cabling

This section describes the Series/1 servers' external cabling. The cable connecting a device or line to the Series/1 server is usually supplied by the customer, although Bridge supplies device cables as an option. Cable options supplied by Bridge are described in Section 4.1; cable connectors are described in Section 3.1.

### 5.5.1 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 3-3 in Section 3.1.1 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 5-23 lists the default terminal port settings that apply to the CS/1 with four asynchronous (SIO-A) interfaces. Refer to the *Network Management Guide* for synchronous port configuration information.

| Table 5-23 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 |

### 5.5.2 SIO-16 Module-to-Device Cabling

The SIO-16 module can be connected to a device using any of the cabling schemes listed in Section 4.2. These schemes are described in detail below, and illustrated in Figure 4-14, Section 4.2.

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 3-9 in Section 3.1.8 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 5-24 indicates the SIO-16 port numbers to which the labels correspond.

| Table 5-24  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 connector number represents a separate cable or connector.

(continued)

**Table 5-24  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 connector number
represents a separate 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 Communications, Inc. 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 5-24 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 5-24 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 stopbit.

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 5-25 lists the default settings that apply to the CS/1 with four SIO-16 modules.

| Table 5-25  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*.

### 5.5.3 SIO-3270 Module-to-Device Cabling

The SIO-3270 installed in a CS/1 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 set-up mode has been used to set the STATUS LINE option to HOST. The *Connection Service User's Guide* provides a complete description of Setup mode.

Figure 3-10 in Section 3.1.8 illustrates the BNC coaxial cable connectors on the CBA assembly.

## 5.5.4 Device Cabling for Other Servers

The CS/1-SNA supports one synchronous host port, port 0. The sysgen program sets the data flow for this port; it cannot be reconfigured as a terminal port. Sysgen is described in the *Network Management Guide*.

The CS/1-HSM provides 64 virtual ports to a DEC VAX host computer. These ports are configured as host ports only. For the CS/1-X.25, the GS/1, and the GS/3, if two physical lines connected to the same SIO board are of different speeds, the higher-speed line must be connected to port 0 and the lower-speed line must be connected to port 1.

The CS/1-X.25 and the GS/1 each provide 48 virtual ports that are configured as terminal ports. These virtual ports are not mapped directly to the number of SIO boards, to the number of physical lines connected to the SIO boards, or to the number of physical lines connected to the X.25 network to which the server is attached. Instead, the ports incoming from the X.25 network are dynamically allocated on a round-robin basis over all of the physical lines connected to the server. The virtual ports are configured with 7 databits and no parity. They are considered ports 0 through 47.

The GS/4, GS/6, IB/1, and IB/2 support no SIO boards. The GS/4 connects to two Ethernets through transceiver cables. The GS/6 connects to the broadband network via a broadband drop cable connected to the internal RF modem. The IB/1 connects to the broadband network via a broadband drop cable connected to the external RFM/5. The IB/2 connects to two Ethernets through transceiver cables.

## 5.5.5 Server-to-Network Cabling

Ethernet transceiver cables and broadband drop cables can be supplied either by the customer or purchased as an option from Bridge Communications, Inc. For Token Ring networks, however, cabling must be supplied by the customer.

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 3.1.6 and 3.1.8 for illustrations of the various backpanel assemblies, and to Section 4.1 for cable specifications.

In order to facilitate the startup and checkout procedures for Communications Servers with the Ethernet network interface, do not attach the transceiver cable to the server until the server itself has been fully checked out.

In order to facilitate the startup and checkout procedures for Communications Servers with the broadband network interface, the server must be connected to the RFM/5.

In order to facilitate the startup and checkout procedures for Communications Servers with the Token Ring interface, the server must be connected to the network cable. Refer to Sections 5.6, 5.7, and 5.8 for startup and checkout procedures, respectively. Section 3.1.6 describes the specifications applicable to the network option at the site; Section 4.1 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.

## 5.6 Server Startup

The following sections list the steps recommended for starting up a Series/1 server. 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 have been configured properly. To check the settings, refer to Section 5.2.6. The options are described in Appendix B.

- A server with the Ethernet interface and an internal disk drive must 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 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 need not be attached to the network initially.

The Series/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 5-26 lists system generation requirements. System generation may be performed on the NCS/1 for client servers with or without internal disk drives. The *Network Management Guide* and the *NCS/1 Installation and Operation Guide* provide detailed information about system generation.

**Table 5-26**
**System Generation Requirements**

| Server | Boot Source | System Generation |
|---|---|---|
| CS/1 | NCS/1 | Not required* |
| CS/1 | NCS/150 | Not required* |
| CS/1 with XNS protocols | Local floppy | Not required* |
| CS/1 with TCP protocols | Local floppy | Required |
| IB/1, IB/2 | Local floppy | Not available |
| CS/1 with byte-synchronous interfaces and SPMUX software, CS/1-HSM, CS/1-SNA, CS/1-X.25, GS/1, GS/3, GS/4, or GS/6 | Local Floppy | Required |

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

### 5.6.1 System with an Internal Disk Drive

Follow these steps to start up a Series/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. Place the diskette in the drive with the label facing right (i.e., away from the LEDs) while the Self Test LED is still lit.

   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 10 or 12 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. (Refer to Section 5.2 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 failure). Report the board failure and console messages (if any) to Bridge Communications, Inc., 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 5 to 9 seconds and 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 10 or 12 seconds after power is applied, the server enters bootstrap phase and the Boot State LED lights. Refer to Appendix B for a description of the bootstrap procedure. When the bootstrap process is complete, the Boot State LED turns off; bootstrap takes approximately 20 seconds. If the LED remains lit longer than 60 seconds, contact a service representative.

6. For Communications Servers and Gateway Servers, 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. For Internetwork Bridges, after the bootstrap process is complete, the IB reads default system parameters from the diskette and initializes the data link controllers. This process takes about 30 seconds, after which the system is ready to be checked out.

## 5.6.2 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/150 and NCS/1 are described in detail in their respective *Installation and Operation Guides*.

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.

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 10 or 12 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 5.2 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 failure). Report the board failure and console messages (if any) to Bridge Communications, Inc., or an authorized service representative.

5. The Self Test LED remains on, unflashing, for approximately 5 to 10 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 10 or 12 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 takes approximately 60 seconds. 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 diskette. On servers running the XNS protocols, for instance, the server reads the clearinghouse directory from the diskette. Or, for example, on servers with the TCP protocols, the server reads the Name Server directory from the diskette. (The *Connection Service User's Guide* describes the parameter tables and clearinghouse directory in detail.) This takes approximately 20 seconds, after which the system is ready to be checked out. Refer to Section 5.7 for the system checkout procedure.

## 5.7 System Checkout

A Series/1 server can be checked either locally or remotely, depending on its model:

- A CS/1 with an SIO-A, SIO-3270, or SIO-16 board and an asynchronous terminal attached is checked out locally. Local checkout procedures for a CS/1 are described in Section 5.7.1.

- An IB with an asynchronous terminal attached to the auxiliary port is checked out locally. Checkout procedures for the IBs are described in Section 5.7.2.

- All other Series/1 servers 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 5.7.3. The CS/1 or Gateway Server being checked out and the server to which the terminal is attached must be running the same set of high-level protocols.

Before checking out a server, make sure:

- Sysgen has been run, if the server requires it. Refer to Table 5-26, in Section 5.6, for Sysgen requirements.

- Servers with the Ethernet interface and an internal disk drive and an Ethernet interface have not been attached to the network. These servers are attached to the network during the checkout procedure.

## 5.7.1 Local Checkout

After a CS/1 has been started up successfully, follow these steps to check out the server:

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 5.5.1, 5.5.2, and 5.5.3 list default terminal port settings and describe cabling instructions for the CS/1.

2. Power on the terminal and press the return key. The server's welcome message and prompt should appear on the terminal. If they appear, skip to step 7.

3. 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.

4. 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 5.6.1 or 5.6.2 for default terminal port settings and for cabling information, depending on the I/O interface.

5. If the LED does not flash, verify that the I/O cable is properly attached to both the device and the Series/1 server. Once the cables are attached properly, repeat step 2.

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

7. 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 with XNS 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 13). Servers with the TCP protocols display only the port number.

8. 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 Series/1 server port. If these settings do not match, either adjust the terminal or attach it to a Series/1 server port whose parameters do match the terminal's requirements (Table 5-23 lists the default port parameters for the CS/1 with four SIO-A modules; Table 5-25 lists the default port parameters for the CS/1 with four SIO-16 modules).

9. After the server and the terminal have successfully established two-way communication, set the privilege level of the terminal to Global Network Manager by entering the command:

    set priv=gnm

A password is required; the default password supplied with the system software is the null string (""); simply press the return key.

10. 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*.

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

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

    listen

13. Establish a connection from the second terminal to the first terminal. For servers with the XNS protocols, enter the following command using the port number obtained in step 7:

    connect !<destination port number>

For servers with the TCP protocols version 10110 or earlier, enter the command:

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

** NOTE **

The Internet address must have been defined during system generation.

For servers with the TCP protocols version 11000 or later, 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.

14. 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.

15. 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.

16. If the server has an Ethernet interface, power off the server.

17. If the server has an Ethernet interface, attach the network cable to the server's network interface connector (refer to Section 3.1.6).

18. If the server has an Ethernet interface, power on the servers (refer to Section 5.6 for the startup procedure).

19. Form a connection from a terminal on one server to a terminal on another. For servers with the XNS protocols, enter the command:

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

For servers with the TCP protocols, enter the command:

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

20. Terminate the connection by entering the command:

```
disconnect
```

### 5.7.2 Internetwork Bridge Checkout

This section describes the procedure for checking out an Internetwork Bridge. The procedure makes the following assumptions:

- An asynchronous terminal is attached to the IB's auxiliary port.

- The attached terminal and the IB's auxiliary port are configured as follows:

| | |
|---|---|
| Baud Rate | 9600 |
| DataBits | 8 |
| StopBits | 1 |
| Parity | None |
| Duplex | Full |
| Flow Control | XON/XOFF |

To check out an IB, follow these steps:

1. If the server is an IB/1, attach the RFM/5 cable.

2. Start up the IB (refer to Section 5.6 for startup procedures). If the server is an IB/1, wait 60 seconds to ensure that the server starts up. If the RFM/5 cable is not attached properly, the server does not start up. After the server starts up, continue with Step 3.

3. Power off the server.

4. Attach the transceiver cable to the appropriate network connectors on the server (refer to Figure 3-3 in Section 3.1.1 for an illustration of the connector, and to the *LAN Planning Guide* for detailed information on network cabling).

5. Power on the server.

6. If the IB starts up properly, the following message appears on the terminal screen:

       <date/time>  Bridge initialized and running

   If the message appears, continue with step 7.

   If the message does not appear, verify that the asynchronous terminal attached to the server's auxiliary port is configured properly. Reconfigure the terminal as necessary, and continue with step 5.

   If the terminal is configured properly and the message still does not appear, contact Bridge Communications, Inc., or an authorized service representative.

7. At the IB prompt, obtain Local Network Manager privilege level by entering:

       set priv=lnm

   A password is required; the default password shipped with the system software is the null string (""); simply press the return key.

8.  At the system prompt, check the status of the server by entering the command:

    ```
    show systemstatus
    ```

    This command generates a display similar to the following:

    ```
    Aging = ON(ON)   Forward = ON(ON)   LEarn = ON(ON)

    Overall System Status:  Normal(Mon Aug  4 18:29)

    Board Status:
        Board       Type         State
        -----       ----         -----
          0       Ethernet     Normal(Mon Aug  4 18:29)
          1       Ethernet     Normal(Mon Aug  4 18:29)
    ```

    The first line of the display shows the current value of the Aging, Forward, and LEarn parameters, with the default value of each parameter in parentheses. The second line indicates that the Internetwork Bridge is in normal operation and shows the time it was last booted. The board status indicates, for each network interface board, the type of network to which it is attached, its state, and the time it was last powered on or reset. If this display does not appear, contact Bridge Communications, Inc., or an authorized service representative.

9.  Ensure that IB is properly attached to each network by entering the following commands at the IB prompt:

    ```
    show netstatistics 0
    show netstatistics 1
    ```

    The resulting display should show some level of network activity, for instance, packets and bytes received, if there are other stations on the networks. Compared to the level of network activity, network errors should be low. If the network error rate is relatively high for the Ethernet network on an IB/1 or IB/2, check the following:

    • The network is properly terminated
    • The transceiver is properly attached
    • The IB is properly attached to the transceiver

    For an IB/1, if the error rate is high on the Broadband network, verify the integrity of the RFM/5, splitter, CR/5, and cable attachments.

10. When the integrity of the physical connections is verified, check out the networks by moving packets between them, e.g., by using the file transfer service or by making connections across the networks.

## 5.7.3 Remote Checkout

This section describes the procedure for checking out a Communications Server or a Gateway Server by accessing it in remote mode. Throughout this procedure, the server being checked out is referred to as server A; the source server is referred to as server B. This procedure makes the following assumptions about server A:

- If server A is a Communications Server and the attached device is a host, the host has been properly configured.

- If Server A is a Gateway Server

  - The gateway (if any) on the remote network has been checked out and is functioning properly.
  - A destination whose network number and network or Internet address is known has been checked out locally on the remote network and is functioning properly.

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

- Server B is an asynchronous server with the same protocols as the server being checked out.

- Server B has a terminal attached.

- Any local connections between devices on the network that are needed to check remote devices (e.g., a terminal connected to an SIO-A, SIO-16, or SIO-3270 port on a CS/1) have been checked and are functioning properly (refer to Sections 5.5 and 5.7.1).

- Server B on the remote network has been checked out and is functioning properly.

  Remote access cannot be made from a server with XNS protocols to a server with TCP protocols, or vice versa.

  1.  Run the startup procedure (Section 5.6) on server A.
  2.  If server A has an Ethernet interface, power off the server.
  3.  If server A has an Ethernet interface, attach the transceiver connector to the network cable (refer to Figure 3-3 in Section 3.1.1 for an illustration of the connector).
  4.  If server A has an Ethernet interface, power on and reboot server A (refer to Section 5.7 for the startup procedure).
  5.  From a terminal attached to server B, an asynchronous server whose protocols match those run on A, obtain Global Network Manager privilege by entering:

      ```
      set priv=gnm
      ```

      A password is required; the default password shipped with the system software is the null string (""); simply press the return key.
  6.  Access server A in remote mode. For servers with the XNS protocols, enter the command:

      ```
      remote %<address>
      ```

For servers with the TCP protocols, enter the REMote command and the Internet address, as follows:

```
remote <Internet address>
```

For servers with TCP protocols version 11000 and later, the Internet address must have been established previously.

7. 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 does not respond or responds with the message "Timeout failure" a problem may exist with the transceiver connection to server A. Check the transceiver connection to server A.

8. Press the break key to exit remote mode.
9. Form a connection from server B to a device or network attached to server A.

If server A is a Communications Server with XNS protocols, enter the following command at the asynchronous terminal attached to server B:

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

If server A is a Communications Server with TCP 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.

If server A is a Gateway Server with XNS protocols, make a connection to a device on the remote network by entering the following command at the asynchronous terminal attached to a port on server B:

```
connect &<rem net#>%<rem Ethernet addr>!<dest port #>
```

If server A is a Gateway Server with the IP protocol, make a connection to a device on the remote network by entering the following command at the asynchronous terminal attached to a port on server B:

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

## 5.8 System Shutdown Procedure

To shut down a Series/1 server, follow these steps:

1. Notify all users that the server is being shut down. This may be done from an SIO-A, SIO-16, or SIO-3270 port on a Communications Server via the Broadcast command, described in the *Connection Service User's Guide*.

2. On a Communications Server, disconnect all active sessions. See the *Connection Service User's Guide* for detailed descriptions of the commands needed 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.

## 5.9 Preventive Maintenance

Bridge Communications, Inc., recommends the following general procedures for preventive maintenance:

1. Observe the environmental requirements listed in Section 3.2. 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 Communications, Inc., as part of the Installation Support Tool Kit (CS/1-INTK).

## 6.0 SYSTEM MODIFICATION

This section describes the modifications that can be made to the Series/1 server and outlines the procedures for making these modifications.

### 6.1 Standard System Features

The Series/1 product line consists of modular system components. The equipment and services that are standard features of the Series/1 products include:

* MCPU board

* Floppy Disk Controller (FDC) board (servers with internal disk drive)

* *Series/1 Installation Guide*

In addition to these items, CS/1s and GS/1s include:

* *Connection Service User's Guide*

* *Network Management 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 6-1 lists the required components that are selectable for each server model.

| Table 6-1 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, or SIO-HS422 | Choice of SW/1-A/BSC/SDLC (XNS protocols) or SW/1-TCP (TCP protocols) |

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

(continued)

| Server Model | Network Interface Module | I/O Module | Software |
|---|---|---|---|
| CS/1-HSM | EC/2 | HSM | SW/1-HSM (XNS protocols) |
| CS/1-SNA** | EC/2 | Choice of SIO-SM, SIO-HS422, or SIO-V.35 | SW/1-SNA (XNS protocols) or SW/1-SNA/TCP (TCP protocols) |
| CS/1-X.25 | EC/2 | Choice of SIO-422, SIO-HS422, or SIO-V.35 | SW/1-X.25 (XNS protocols) |
| GS/1 | EC/2 | Choice of SIO-SM, SIO-422, SIO-HS422, or SIO-V.32 | SW/2-CX/ICS (XNS protocols) |
| GS/3 | EC/2 | Choice of SIO-SM, SIO-422, SIO-HS422, or SIO-V.35 | Choice of SW/3 (XNS protocols) or SW/3-IP (IP protocol) |
| GS/4 | Two EC/2s | None | Choice of SW/4 (XNS protocols) or SW/4-IP (IP protocol) |
| GS/6 | EC/2 | HSM-MDM | SW-6 (XNS protocols) or SW/6-IP (IP protocol) |
| IB/1 | EC/2 and IBC/M | None | SW/1-IB |
| IB/2 | Two EC/2s | None | SW/1-IB |

**Table 6-1 Selectable System Components (continued)**

** Requires an SBB board.

## 6.2 Optional System Components

The following equipment and services are optional features of the Series/1 products:

- 5¼-inch floppy diskette drive

- Network interface cables

- Device cables

- *Software Technical Reference Manual*

- Frequency translator (GS/6 only)

## 6.3 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 Section 2.4.3 for descriptions of the I/O versions.

### 6.3.1 Adding an SIO, SIO-16, or SIO-3270 Module

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.

In addition to these items, the SIO-16 module 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 back-panel 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  \*\***

When handling any PC board or assembly, avoid touching the gold edge area. Careful handling prevents damage to the board or assembly.

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 5.2.8, 5.2.9, and 5.2.10, 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.

## 6.3.2 Adding an HSM Module

This section describes the procedure for adding a second HSM module to a CS/1-HSM.

The HSM module consists of one HSM board, one SBA-HSM cable assembly, and two #4-40 x 0.50 in., cross-head, recessed screws with washers.

A CS/1-HSM can support up to two HSM boards. Their slot assignments are as follows:

         Board #1      Slot H
         Board #2      Slot G

Board numbers must be assigned in sequence and in ascending numeric order.

## ** CAUTION **

When handling any PC board or assembly, avoid touching the gold edge area. Careful handling prevents damage to the board or assembly.

The steps required to install a new HSM board 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. Remove all cables to the cardcage and the MBI assembly.

4. Remove the three cross-head screws attaching the cardcage to the chassis and carefully lift out the cardcage. With the cardcage elevated, place the 60-pin card edge connector of the SBA-HSM assembly 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. Be careful not to bend the pins when inserting the cable connector in the card edge connector.

5. Verify that the filter foam is placed correctly before replacing the cardcage.

6. Replace the cardcage and reinstall the three cross-head screws, attaching the cardcage to the chassis.

7. Reconnect all cables to the cardcage.

8. 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 back panel cover to its right is assigned to board 2. The other two back panels remain blank.

9. Attach the new SBA-HSM assembly to the backpanel using the six screws and washers removed in step 8.

10. Assign a board number to the new board (refer to Section 5.2.12).

11. Install the new board in the cardcage slot in which the new 60-pin connector of the SBA-HSM was installed in step 4. Seat the new board with a firm downward push.

12. 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.

## 6.4 Replacing an I/O Board

This section describes the procedure for replacing an installed SIO, SIO-16, SIO-3270, HSM, or HSM-MDM board. The backpanel assembly for the GS/6 (SBA-BBM), which includes the RF modem, should be replaced only by a factory-authorized technician.

**\*\* 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 5.2.8 through 5.2.12, depending on the board type). This step does not apply to the HSM-MDM board; skip to step 5.

5.  Install the replacement board in the slot from which the original board was removed in step 3.

6.  Replace the top cover.

## 6.5  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 6-2 lists each PROM type and the board on which each is installed.

| Table 6-2  Series/1 PROM Types | |
| --- | --- |
| *PROM Identifier* | *Associated Board* |
| MMON | MCPU |
| ASYN | SIO-A |
| SYNC | Synchronous SIO |
| COAX | SIO-3270 |
| EDL1 | EC/1 |
| EDL2 | EC/2 |
| IECM | IEC/M |
| IBCM | IBC/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.

## 6.6  Adding Custom Interfaces

The custom interfaces that can be added to the Series/1 server are:

- Additional Multibus board(s) in the cardcage

- Additional iSBX bus device(s) on the MCPU or SIO boards (unavailable on the SIO-16 and SIO-3270 modules)

# APPENDIX A

# POWER-ON DIAGNOSTICS

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

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

If the primary test is successful, the secondary tests are performed on the network controller. On servers with an EC/1 module, the ESB board is tested first. Any failure in the ESB board's RAM area causes further testing to abort, since the RAM is used to store status information; if any failure other than RAM failure is detected, testing continues. Both types of failure cause the Self Test LEDs on the ESB board and on the front panel to remain lit.

When all tests on the ESB board are completed, the ETI board is tested. If any failure is detected, the Self Test LEDs on the ETI board and on the front panel remain lit. Testing continues on all SIO boards present in the system; as with the other boards, failure causes the Self Test LEDs on the SIO board and on the front panel to remain lit.

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 Communications, Inc., 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 Communications, Inc.

The following sections describe the diagnostics for the individual boards. Section A.9 lists the status and error messages associated with each board. Figure A-1 in Section A.9 illustrates a sample screen of messages following the power-on diagnostics for the Series/1 server. The diagnostics displayed in the figure were run on a server with an EC/2, an SIO board, an SIO-16 board, and no internal disk drive.

## A.1 MCPU Board Diagnostics

The MCPU contains two diagnostic LEDs, labeled SELF TEST and Halt. Figure 5-7 in Section 5.2.6 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 Communications, Inc., 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. Refer to Section A.9 for a list of 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.2 EC/1 Module Diagnostics

The EC/1 module is made up of the ESB and ETI boards. Both boards are tested but all testing information is stored on the ESB. The ESB runs its own tests first. The failure of an ESB RAM test halts further testing. Once the ESB tests complete successfully, the ESB starts the ETI tests.

Table A-2 lists the EC/1 module self-tests. The ESB runs all of the tests; the ETI runs tests 13 through 1c only. Refer to Section A.9 for a list of the status and error messages associated with the each self-test.

| Table A-2  EC/1 Module 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 | Onboard RAM march |
| b | Onboard RAM refresh |
| c | Level 0 input check |
| d | Level 1 interrupt check |
| e-11 | 9513 interrupts |
| 12 | Channel attention interrupt |
| 13 | Loopback short packet good CRC |
| 14 | Loopback short packet bad CRC |
| 15 | Address recognition good CRC |
| 16 | Address recognition bad CRC |
| 17 | Address mismatch |
| 18 | Broadcast recognition |
| 19 | Transmit timeout |
| 1a | Transmit 6 fragments good CRC |
| 1b | Transmit reload pointer interrupt |
| 1c | Transmit odd length packet |

## A.2.1 ESB Board

The ESB board contains a Self Test LED, labeled S.TEST, which 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 (this takes approximately three seconds). If the LED fails to light at all during power-on, or if it remains lit for longer than three seconds, the board should be replaced.

The ESB board contains another LED, labeled HALT, which 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 Communications, Inc., or an authorized service representative.

Refer to Figure 5-2 in Section 5.2.1 for the positions of the diagnostic LEDs on the ESB board.

## A.2.2 ETI Board

The ETI board contains a Self Test LED, labeled S.TEST, which 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 (this takes approximately three seconds). If the LED fails to light at all during power-on, or if it remains lit longer than three seconds, the board may be faulty.

A faulty transceiver connection can cause the ETI board to fail the self-test diagnostics. To determine the cause of the failure, power off the server, disconnect the transceiver cable, then power on the server. If the ETI board still fails, the board itself is at fault.

Refer to Figure 5-3 in Section 5.2.2 for the position of the LED on the ETI board.

## A.3  EC/2 Board Diagnostics

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.  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 Communications, Inc., or an authorized service representative.

Refer to Figure 5-4 or 5-5 in Section 5.2 for 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.  Refer to Section A.9 for a list of 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.4  IBC/M Board Diagnostics

The IBC/M board contains six LEDs: one Halt 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, 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 Communications, Inc., or an authorized service representative.

Refer to Figure 5-6 in Section 5.2.4 for the positions of the diagnostic LEDs on the IBC/M board.

Table A-4 lists the IBC/M self-tests. Refer to Section A.9 for a list of 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.5  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. Refer to Section A.9 for a list of 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.6 SIO Board Diagnostics

This section describes the SIO board diagnostics. Section A.7 discusses the SIO-16 board diagnostics; Section A.8 describes the SIO-3270 board diagnostics.

Each SIO board contains two diagnostic LEDs, labeled SELFTEST and HALT. Figure 5-9 in Section 5.2.8 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 Communications, Inc., or an authorized service representative. Table A-6 lists the SIO board self-tests. Refer to Section A.9 for a list of 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.7 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 5-10 in Section 5.2.9 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. Refer to Section A.9 for a list of 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.8  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.6 and A.7, 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 5-11 in Section 5.2.10 illustrates the positions of these LEDs.

All the LEDs light at power-on or reset, then go out, 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. Refer to Section A.9 for a list of 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.9 Diagnostic Messages

If a console terminal is attached to a Series/1 server, status and error messages generated by the power-on self-tests are sent to the terminal, if possible.

```
Bridge Communications MCPU Monitor
>
```

> The message and prompt appear when the self-tests have completed. Control returns to the MCPU monitor.

```
EC/1 - Failed Test # <x>

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 monitor.

```
EC/1 - Passed Station Address - <xxxxxxxxxxx> MO EDL1 rev. <xxy>

EC/2 - Passed Station Address - <xxxxxxxxxxx> MO EDL2 rev. <xxy>

IEC/M - Passed Station Address - <xxxxxxxxxxx> MO EDL2 rev. <xxy>

IBC/M - Passed Station Address - <xxxxxxxxxxx> MZ 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 monitor.

EC/1 - timed out

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. Con-     |
> trol returns to the MCPU monitor.

Floppy Controller not present

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

MCPU - Failed Test # <x>

> 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.

Series/1 Power-up

> This message appears when the MCPU 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 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 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
MCPU - Passed M1 MMON rev. 01D
EC2 - Passed Station Address - 080002003113 M0 EDL2 rev. 00A
SIO # 1 - Passed M0 ASYN rev.17B
SIO # 2 - Present MR ASYN
SIO # 3 - Not Present
SIO # 4 - Not Present

Floppy Controller not present

Bridge Communications MCPU Monitor
>
```

Figure A-1  Sample Power-on Diagnostics Messages

# APPENDIX B

# BOOTSTRAP PROCEDURE

The Series/1 servers with XNS protocols offer three bootstrap options: automatic bootstrap, floppy bootstrap, and network bootstrap. Series/1 servers with TCP protocols support network bootstrap from an NCS/150, but do not support the option from an NCS/1.

The option is selected by the Bootstrap Option shorting plug positions on the MCPU board (refer to Section 5.2.6). The procedure is affected by the presence or absence of a console terminal and by the version of the MCPU firmware. Firmware designated Release 9 or earlier does not support network bootstrap.

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 and if the MCPU firmware is designated M1 MMON 01B or later, 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 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

Network bootstrap is supported by MCPU firmware M1 MMON 01B or later.

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/150* and *NCS/1 Installation and Operation Guides*. Refer to the appropriate guide for the installation. 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 ten 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 5.2.6). 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 Series/1 server 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

# HSM HOST ADAPTER CARD INSTALLATION AND CONFIGURATION

The CS/1-HSM includes a Host Adapter Card (HAC), which is installed in the host computer. This appendix outlines the procedure for installing and configuring the HAC.

The CS/1-HSM supports up to two HACs; for each HAC, one HSM board is required. (Refer to Sections 6.3 and 6.4 for the procedure for adding or replacing an HSM board in a CS/1-HSM.)

## C.1 Installation Overview

Figure C-1 shows how the HAC is installed in the host cabinet and attached to the CS/1-HSM.
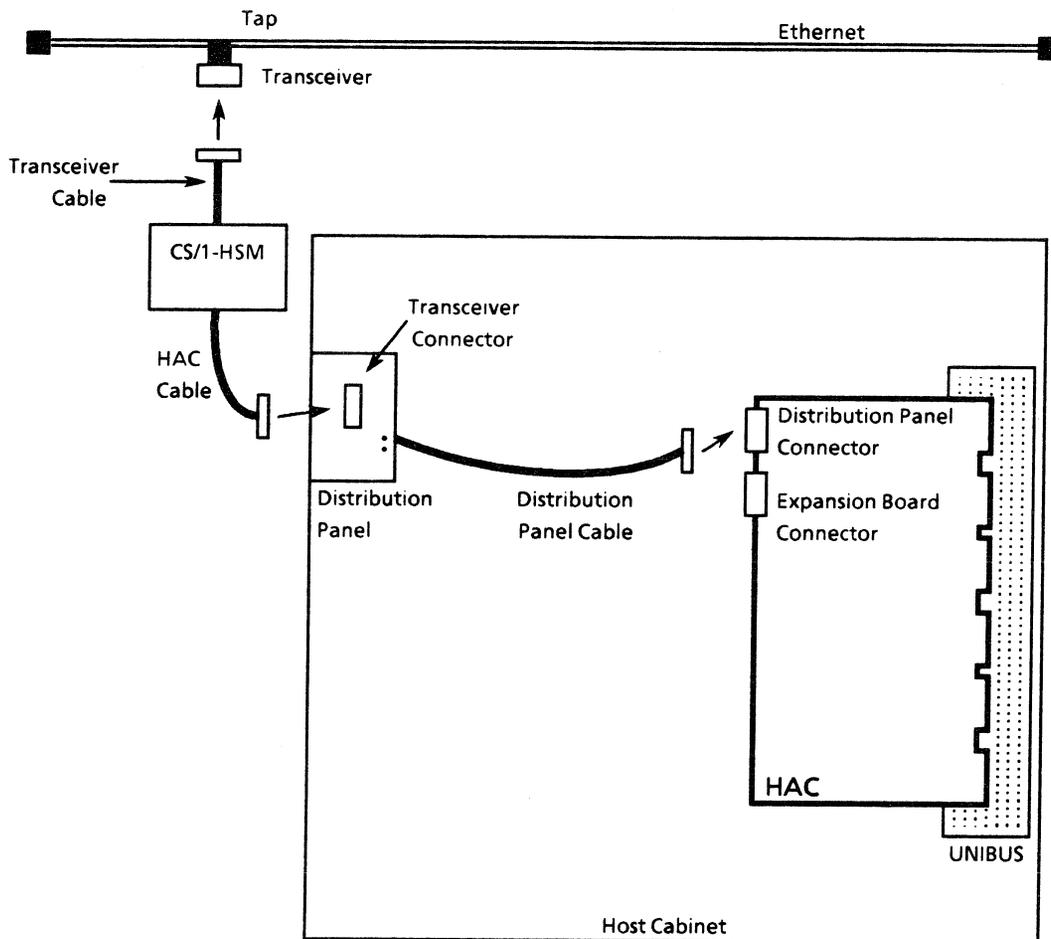


Figure C-1  HAC Installation

The HAC is installed in the UNIBUS and the distribution panel is mounted on the host chassis in a convenient location.

The distribution panel cable, which comes attached to the panel, is plugged into the HAC. The HAC cable (shown in Figure 4-13 in Section 4.1) is plugged into the distribution panel at one end and to connector J1 on the CS/1-HSM at the other end. The CS/1-HSM is connected to the Ethernet network via a transceiver device on the coaxial cable and a transceiver connector on the CS/1-HSM.

A transceiver is installed on a tap, which contacts the the transmission medium of the coaxial cable, leading from the network connector on the CS/1-HSM to the Ethernet network.

## C.2 Information Required for Configuration and Installation

Before configuring or installing the HAC, determine and note the number of DMF32 boards to be emulated by the HAC.

The CS/1-HSM can support up to two HACs. For each HAC installed on the VAX, one HSM board is required in the CS/1-HSM. (Refer to Sections 6.3 and 6.4 for the procedure for adding or replacing an HSM board in a CS/1-HSM.) Each HAC may be configured to emulate from 1 to 8 DMF32 boards, with 8 virtual ports per DMF32 emulated. For example, a HAC configured to emulate 6 DMF32s has 48 virtual ports. Table C-1 lists the maximum recommended number of DMF32 boards to be emulated on each type of VAX.

| Table C-1  Maximum Recommended Number of DMF32s Emulated | |
| --- | --- |
| *VAX Type* | *DMF32s to be Emulated* |
| 11/780 & 11/785 | 10* |
| 11/750 | 8 |
| 11/730 | 2 |
| * | Requires two HACs and two HSM modules. Each HAC emulates up to eight DMF32s; e.g., six on one HAC and four on the other. |

The host operating system must be equipped with an asynchronous DMF32 software driver, which is enabled automatically when the VMS or UNIX operating system is configured for DMF32 operation.

## C.3  Configuring the VAX Under VMS

The procedure in this section applies only to VAXs running VMS. To configure a VAX with UNIX system software, proceed to Section C.4.

### **  CAUTION  **

Back up the VAX completely before beginning the configuration procedure.

The number of DMF32 boards to be emulated by the HAC, determined in Section C.1, is required in this section.

The VMS SYSGEN commands SHOW/CONFIGURATION and CONFIGURE are used to determine the base CSR address at which the HAC should be installed. These commands are described in the *VAX Software Installation Guide (Volume 10), System Management and Operations Guide* (reference [22]).

Under VMS, all addresses used to support the HAC must be contiguous. The HAC requires hexadecimal 40 contiguous addresses for each sixteen ports to be supported.

To determine the base CSR address at which the HAC should be installed, follow these steps:

1.  If the HAC is replacing existing DMF32 boards, note the base CSR address of the first DMF board being replaced and use that address for the HAC. Skip the remainder of this section and go on to Section C.6 for hardware configuration information.

2.  Log in under the system manager's account.

3.  The SHOW/CONFIGURATION command displays the current system configuration. Figure C-2 shows an interaction involving the SHOW/CONFIGURATION command; the VMS system prompt is a dollar sign ($); the SYSGEN prompt is SYSGEN>; the user entries are shown in bold type.

```
$ RUN  SYS$SYSTEM:SYSGEN
SYSGEN>   SHOW/CONFIGURATION

Name: UMA Units:1 Nexus: 3 (UBA) CSR: 776700  Vector 1: 254 Vector 2: 000
Name: TTA Units:8 Nexus: 8 (UBA) CSR: 760100  Vector 1: 300 Vector 2: 304
Name: TTB Units:8 Nexus: 8 (UBA) CSR: 760110  Vector 1: 310 Vector 2: 314
Name: TTC Units:8 Nexus: 8 (UBA) CSR: 760120  Vector 1: 320 Vector 2: 324
Name: TTC Units:8 Nexus: 8 (UBA) CSR: 760130  Vector 1: 330 Vector 2: 334
```

Figure C-2  SHOW/CONFIGURATION Command Interaction

To display the current system configuration, follow these steps:

a.  Invoke SYSGEN by entering the following command at the VMS system prompt
    ($):


        RUN SYS$SYSTEM:SYSGEN


    VMS responds by displaying the SYSGEN prompt, as shown in Figure C-2.

b.  Record the current configuration of the UNIBUS by entering the
    SHOW/CONFIGURATION command at the SYSGEN prompt and creating a
    hardcopy of the output.

4.  Find the physical name in Table C-2 that corresponds to the first two letters of each
    device listed in the SHOW/CONFIGURATION output. If a device does not appear in
    Table C-2, its physical name is not needed. Table C-2 lists DEC floating vector devices
    recognized by AUTOCONFIGURE.

### Table C-2  Floating Vector Devices and Corresponding Names

| VMS Device | Physical Name | VMS Device | Physical Name | VMS Device | Physical Name |
|---|---|---|---|---|---|
| DD | TU58 | OK | DWR70 | XA | DR11W |
| DL | RL11 | OK | W11C | XB | DR11B |
| DY | RX211 | OM | DC11 | XD | DMP11* |
| IS | ISB11 | ON | DPV11 | XD | DMV11* |
| IX | IEQ11 | OQ | KMV11 | XE | UNA |
| LA | LPA11 | OR | DQ11 | XG | CPI32 |
| LS | LPS11 | PP | PP611 | XK | KMC11 |
| MS | TS11 | PR | PR611 | XM | DMC11 |
| OA | DR11C | PT | TU81 | XP | PCL11 |
| OB | DN11 | PU | UDA | XS | KMS11 |
| OC | DT11 | RSV | RSV | XU | DU11 |
| OD | DX11 | TT | DZ11 | XV | DV11 |
| OE | GT40 | TX | DHV11 | XW | DUP11 |
| OF | KW11W | TX | DMZ32/ | YH | DH11 |
| OG | LK11 |  | CPI32 | YJ | DJ11 |
| OH | LPP11 | TX | DMF32 | YM | DM11B |
| OI | VMV21 | UK | KCT32 | YL | DL11C |
| OJ | VMV31 | VB | VS100 |  |  |

* For a DEC-supported XD device with 4 registers, use DMP11;
  for an unsupported XD device with 8 registers, use DMV11.

5.  Note the number of each type of device listed in the SHOW/CONFIGURATION output. SHOW/CONFIGURATION displays one line per device. For example, Figure C-3 shows four TT devices (physical name DZ11) currently installed.

6.  The CONFIGURE command determines the base CSR address required for any proposed UNIBUS configuration. Using this command does not affect the current configuration. Figure C-3 shows a typical interaction involving the CONFIGURE command; the user's entries are shown in bold type.

```
SYSGEN>   CONFIG
DEVICE>   DZ11,4
DEVICE>   DMF32,8
DEVICE>   <Control-Z>

DEVICE: DZ11    Name: TTA    CSR: 760100   Vector: 300   Support: yes
DEVICE: DZ11    Name: TTB    CSR: 760110   Vector: 310   Support: yes
DEVICE: DZ11    Name: TTC    CSR: 760120   Vector: 320   Support: yes
DEVICE  DZ11    Name: TTD    CSR: 760130   Vector: 330   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760400   Vector: 340   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760440   Vector: 400   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760500   Vector: 440   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760540   Vector: 500   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760600   Vector: 540   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760640   Vector: 600   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760700   Vector: 640   Support: yes
DEVICE: DMF32   Name: COMB   CSR: 760740   Vector: 700   Support: yes

SYSGEN>   EXIT
```

Figure C-3  CONFIGURE Command Interaction

To display the proposed system configuration using the CONFIGURE command, follow these steps:

a.  Invoke the CONFIGURE command. The system responds by prompting for a device, as shown in Figure C-3.

b.  For each device compiled in step 4, enter the physical name followed by a comma and the number of those devices.

c.  When each device compiled in step 4 has been entered, enter "DMF32" followed by a comma and the number of DMF32 boards the HAC will emulate.

d.  Enter <CTRL-Z>. The resulting display shows the proposed new configuration with the HAC installed.

7.  Compare the CSR addresses displayed by CONFIGURE with the original configuration shown by the SHOW/CONFIGURATION command in step 3b. If the addresses of any previously installed boards have changed, then those boards must be readdressed by a DEC system engineer. Readdressing is usually required only if a KMS11 is installed on the UNIBUS.

8.  Select and note the base CSR address for the HAC from the CONFIGURE display. If no DMF32s were previously installed, the appropriate address is that of the first DMF32 listed. If DMF32s were previously installed, the correct address is the address of the first new DMF32. For example, the correct base CSR address in Figure C-3 is 760400.

The address is required for hardware configuration, described in Section C.6.

9.  Create a hardcopy of the current output of the SHOW/CONFIGURATION command and keep it in a safe place in case it is requested by Bridge support personnel.

10. If the HAC revision level is 0 or 1, set the TTY_DEFPORT parameter to 1 and save the change, as shown in Figure C-3:

```
SET TTY_DEFPORT 1
WRITE CURRENT
```

11. Exit SYSGEN by entering the following at the Sysgen prompt, as shown in Figure C-3:

```
EXIT
```

12. Ensure that all HAC ports have been configured for modem control. The ports may be configured appropriately by editing the SYS$MANAGER:SYSTARTUP.COM command file to include the following command for each HAC port:

```
SET TERMINAL/PERM/HOSTSYNC/MODEM/HANGUP/DMA <portID>:
```

For example, the following line configures port 1 for modem control:

```
set terminal/perm/hostsync/modem/hangup/dma txa1:
```

One line must be included for each HAC port. Figure C-4 shows a typical SYSTARTUP.COM file with the HAC ports appropriately configured. See the discussion of setting device characteristics in reference [23]. Further information on the SET TERMINAL command is available in reference [21].

The ports may also be configured appropriately by using sysgen to set the TTY_DEFCHAR parameter, as described in reference [22].

```
$ !
$ !     sys$manager:SYSTARTUP.COM
$ !     system specific startup command file
$ !
$ set noon
$ purge sys$manager:operator.log/keep=2
$ !     setup TXA0 as a printer port
$! set term/page=69/nowrap txa0:
$! set device txa0: /spooled
$! start/queue/burst txa0:
$! if $status then goto endtxa0
$! initialize/queue/burst txa0:
$! start/queue txa0:
$! endtxa0:
$! assign/system txa0: sys$print
$ !     setup the other ports
$ set term/perm/hostsync/modem/hangup/dma txa1:
$ set term/perm/hostsync/modem/hangup/dma txa2:
$ set term/perm/hostsync/modem/hangup/dma txa3:
$ set term/perm/hostsync/modem/hangup/dma txa4:
$ set term/perm/hostsync/modem/hangup/dma txa5:
$ set term/perm/hostsync/modem/hangup/dma txa6:
$ set term/perm/hostsync/modem/hangup/dma txa7:
$ set term/perm/hostsync/modem/hangup/dma txb0:
$ set term/perm/hostsync/modem/hangup/dma txb1:
$ set term/perm/hostsync/modem/hangup/dma txb2:
$ set term/perm/hostsync/modem/hangup/dma txb3:
$ set term/perm/hostsync/modem/hangup/dma txb4:
$ set term/perm/hostsync/modem/hangup/dma txb5:
$ set term/perm/hostsync/modem/hangup/dma txb6:
$ set term/perm/hostsync/modem/hangup/dma txb7:
$!
$ define/system sys$announce "VAX3 / VMS 4.1 at your service!"
$ define/system sys$welcome "@sys$manager:welcome.txt"
$ startup$interactive__logins == 16
$ reply /all/bell "System boot completed : VAX3 / VMS 4.1 is now up!"
$ exit
```

Figure C-4  Typical SYSTARTUP.COM Command File
Modified for CS/1-HSM Ports

## C.4 Configuring the VAX Under a UNIX Operating System

The procedure in this section applies only to VAXs with UNIX operating systems. The procedure for configuring a VAX running VMS is described in Section C.3.

### ** CAUTION **

Back up the VAX completely before beginning the configuration procedure. UNIX operating system configuration should be attempted only by someone who has a thorough knowledge of UNIX systems.

The procedures in this section include determining the HAC base CSR address, modifying the system configuration file, and building the new kernel. Additional UNIX system configuration is required after the board is installed, as described in Section C.8.

The number of DMF32 boards to be emulated by the HAC, determined in Section C.1, is required in this section.

If the HAC is replacing existing DMF32 boards, note the base CSR address of the first DMF board being replaced and use that address for the HAC. Skip the remainder of this section and go on to Section C.6.

### C.4.1 Determining the HAC Base CSR Address

The procedure in this section requires reference to UNIX operating system configuration files. Figure C-5 shows a typical configuration file that includes DMF32 device specifications and describes the information in the file.

# Configuration file for VAXNAME VAX                    } Comment Line

```
machine         vax
cpu             "VAX750"
ident           VAXNAME                                      Global Configuration Parameters
timezone        8 dst
maxusers        32
options         MRSP
```

config vmunix root on hp swap on hp0 and hp1           } System Image Parameters

    Name of Kernel

```
controller      mba0      at    nexus ?
controller      mba1      at    nexus ?
controller      uba0      at    nexus ?
disk            hp0       at    mba? drive 0
disk            hp1       at    mba? drive 1
master          ht0       at    mba?   drive ?
tape            tu0       at    ht0 slave 0
controller      tm0       at    uba0 csr 0172520              vector tmintr
tape            te0       at    tm0 drive 0
tape            te1       at    tm0 drive 1
controller      zs0       at    uba? csr 072440               vector tsintr
device          ts0       at    zs0 drive 0
device          dz0       at    uba0 csr 0160100 flags 0x00   vector dzrint dzxint
device          dz1       at    uba0 csr 0160120 flags 0x00   vector dzrint dzxint
device          dh0       at    uba0 csr 0160020              vector dhrint dhxint
device          dm0       at    uba0 csr 0170500              vector dmintr
device          dmf0      at    uba? csr 0160340
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          dmf1      at    uba? csr 0160400
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          dmf2      at    uba? csr 0160440
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          dmf3      at    uba? csr 0160500
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          dmf4      at    uba? csr 0160540
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          dmf5      at    uba? csr 0160600
     vector dmfsrint      dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device          lp0       at    uba? csr 0177514                  vector lpintr
```

Device Specifications

DMF Device Specifications

Device Name    Logical Unit Number    CSR Address    Interrupt Vectors

Figure C-5  Typical UNIX System Configuration File

Bridge Communications, Inc.

To determine the base CSR address at which the HAC should be installed, follow these steps:

1.  Log in to the VAX under the root account.

2.  Display the current system configuration file to list devices installed on the UNIBUS. These files usually reside in the system directory /sys/conf.

    a.  If the current system configuration file does include DMF32 device specifications (like the configuration file in Figure C-5), then the UNIBUS already contains one or more DMF32-type devices. Determine the highest used address in the file. The HAC's base CSR address should be 40 octal higher than the highest used address.

    b.  If the current system configuration file does not include any DMF32 device specifications, then the UNIBUS does not include any DMF32-type devices. Continue with step 3.

3.  Several generic system configuration files are supplied with a UNIX operating system. Display the system configuration file named GENERIC. Its pathname is usually /sys/conf/GENERIC.

    If the system configuration file GENERIC is not available on your system, look for DMF32 device specifications in other generic system configuration files. If none includes DMF32 device specifications, the procedure in Section C.5 must be used to determine the HAC base CSR address.

4.  Note the CSR address of the first DMF device listed in the GENERIC system configuration file. It is usually 0160340. This number represents the octal value of the lower 16 bits of the UNIBUS address.

    For example, the CSR of the first DMF device listed in the configuration file in Figure C-5 is 0160340.

5.  Display the current system configuration file, and check that the CSR address obtained from the GENERIC configuration file is available. If it is available, use the address as the base CSR address of the HAC.

    If the address obtained from the GENERIC configuration file is already in use, the procedure in Section C.5 must be used to determine the HAC base CSR address and to modify the system configuration file.

The information in the GENERIC system configuration file will be used to modify the system configuration file, as described in Section C.4.2.

## C.4.2  Modifying the System Configuration File

If the base CSR address of your HAC was determined by following the procedure in Section C.5, then the system configuration file must be modified as described in that section; the procedure in this section does not apply.

The procedures in this section and in Section C.4.3 are performed in the directory /sys and its subdirectories, as shown in Figure C-6. In the figure, "vax1" is the name of the configuration file to be modified for the CS/1-HSM. The procedure requires the presence of a /sys subdirectory with the same name as the configuration file.
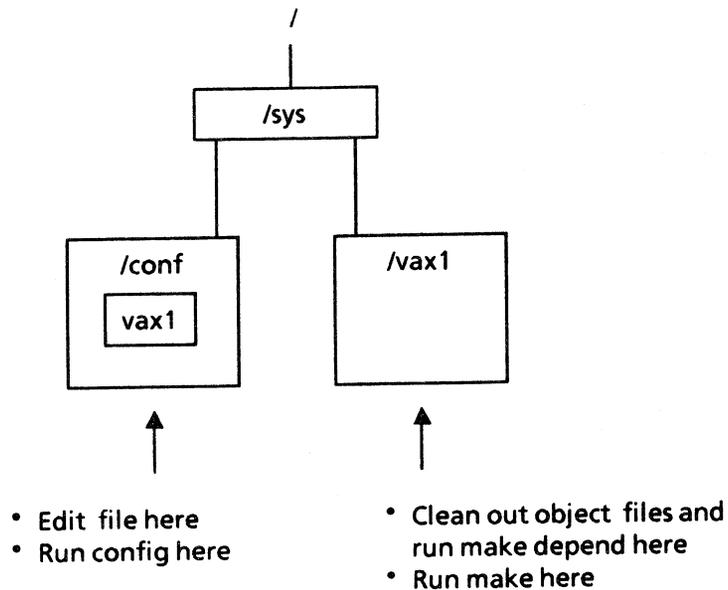


Figure C-6  Configuration Directory Structure

The system configuration file must be edited to include HAC addressing and interrupt information. The file is edited as though DMF32 boards were being added to the system. Figure C-7 shows a sample configuration file.

To modify the system configuration file, follow these steps:

1.  Determine the name of the configuration file to be modified. Check for the presence of a /sys subdirectory with the same name as the configuration file to be modified; if it does not exist, create it.

2.  Invoke an editor to edit the system configuration file for the VAX in which the HAC will be installed. Configuration files usually reside in /sys/conf.

3.  Copy the DMF device specifications from the system configuration file /sys/conf/GENERIC into the system configuration file for the VAX in which the HAC will be installed.

4.  If the HAC is to emulate eight DMF32s, two DMF device specifications may have to be added, with each logical unit number increased by one and each CSR increased by octal 40, as shown below:

```
device    d6atat uba? csr 0160640
vector dmfsrint dmfsxint dmfdaint dmfbint dmfrint dmfxint dmflint
device    dmf7at uba? csr 0160700
vector dmfsrint dmfsxint dmfdaint dmfbint dmfrint dmfxint dmflint
```

5.  Figure C-7 shows a typical configuration file set up for a HAC emulating four DMF32 boards, with a base CSR address of 0160340.

    Device specifications in the system configuration file enable support of the listed devices, but do not mandate their actual presence. Therefore, excess dmf specifications, such as "device dmf4..." and "device dmf5..." in Figure C-7, need not be deleted.

6.  Exit the editor.

7.  Print the current system configuration file and keep the output in a safe place in case it is requested by Bridge support personnel.

```
# Configuration file for VAXNAMEVAX

machine        vax
cpu            "VAX750"
ident          VAXNAME
timezone       8 dst
maxusers       32
options        MRSP

config vmunix  root on hp  swap on hp0 and hp1

controller     mba0    at  nexus ?
controller     mba1    at  nexus ?
controller     uba0    at  nexus ?
disk           hp0     at  mba? drive 0
disk           hp1     at  mba? drive 1
master         ht0     at  mba? drive ?
tape           tu0     at  ht0 slave 0
controller     tm0     at  uba0 csr 0172520              vector tmintr
tape           te0     at  tm0 drive 0
tape           te1     at  tm0 drive 1
controller     zs0     at  uba? csr 072440               vector tsintr
device         ts0     at  zs0 drive 0
device         dz0     at  uba0 csr 0160100 flags 0x00   vector dzrint dzxint
device         dz1     at  uba0 csr 0160120 flags 0x00   vector dzrint dzxint
device         dh0     at  uba0 csr 0160020              vector dhrint dhxint
device         dm0     at  uba0 csr 0170500              vector dmintr
device         dmf0    at  uba? csr 0160340
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf1    at  uba? csr 0160400
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf2    at  uba? csr 0160440
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf3    at  uba? csr 0160500
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf4    at  uba? csr 0160540
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf5    at  uba? csr 0160600
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
```

Figure C-7  UNIX System Configuration File
Modified for the CS/1-HSM

## C.4.3 Building the New Kernel

The procedure in this section should be followed whether the preceding instructions in Section C.4.2 or those in Section C.5 were used.

The config, make depend, and make commands are used to create the new kernel. These commands and the procedure for building a new kernel are described in references [26] and [27].

### ** CAUTION **

Do not delete the existing kernel until the system has been booted and operated successfully with the new kernel.

To create the new kernel, follow these steps:

1.  From the directory that contains the modified configuration file created in the previous section, run config as shown below, where filename is the name of the modified configuration file:

    ```
    /etc/config <filename>
    ```

    When config is finished, it displays the message "Don't forget to run make depend." If config reports any errors, correct them before proceeding.

2.  When config has completed successfully, change directories to the /sys subdirectory that has the same name as the modified configuration file, as shown in Figure C-7. For example, enter the following command to change from /sys/conf to the directory vax1:

    ```
    cd ../vax1
    ```

3.  Clean out the current directory by using make clean or by using the rm command to remove all object files:

    ```
    make clean
    ```

4.  Run make depend:

    ```
    make depend
    ```

5.  When make depend has completed successfully, build the new kernel using the make command. The kernel is usually named "vmunix"; most systems require modification if another name is used. The kernel name is pointed out in Figure C-7. For example, to build a new kernel called "vmunix", enter the following:

    ```
    make vmunix
    ```

    Be aware that building a new kernel is a lengthy process. Depending on the system configuration and load, it may take several hours.

6.  When the new kernel has been built, change directories to the root directory and copy the old kernel to a backup file. For example, the following commands create a backup copy in the root directory:

```
cd /
cp vmunix vmunix.backup
```

Do not delete the backup copy until the system has been booted and operated success-fully with the new kernel.

7.  Copy the new kernel to the root directory. For example, the following command copies the new kernel "vmunix" in the directory /sys/vax1 to the current directory:

```
cp /sys/vax1/vmunix .
```

Additional UNIX operating system configuration is required after the board is installed. HAC installation is described in Section C.6; final UNIX system configuration is described in Section C.8.

## C.5  Non-Standard UNIX Operating System Configuration

This section describes non-standard UNIX operating system configuration only. If the configuration for the site is a standard UNIX operating system, complete the procedures described in Section C.4, then skip this section and go on to Section C.6.

This section describes the procedures for configuring a UNIX operating system when the base CSR address found in the generic system configuration file is not available or is already in use.

The procedures in this section replace part of the procedure in Section C.4.1 and the entire procedure in Section C.4.2, as referenced in those sections. After following the procedures in this section to determine a non-standard base CSR address for the HAC and to modify the system configuration file, return to Section C.4.3 to build the new kernel.

### C.5.1  Determining a Non-Standard HAC Base CSR Address

The procedure in this section requires reference to the UNIX system configuration file. This file usually resides in the system directory /sys/conf. Figure C-8 shows a sample configuration file prior to modification for a HAC and describes the information in the file.

# Configuration file for VAXNAME VAX                              } **Comment Line**

```
machine      vax
cpu          "VAX750"
ident        VAXNAME
timezone     8 dst
maxusers     32
options      MRSP
```
                                                        } **Global Configuration Parameters**

config  vmunix  root on hp swap on hp0 and hp1              } **System Image Parameters**

**Name of Kernel**

```
controller   mba0   at  nexus ?
controller   mba1   at  nexus ?
controller   uba0   at  nexus ?
disk         hp0    at  mba? drive 0
disk         hp1    at  mba? drive 1
master       ht0    at  mba? drive ?
tape         tu0    at  ht0 slave 0
controller   tm0    at  uba0 csr 0172520              vector tmintr
tape         te0    at  tm0 drive 0
tape         te1    at  tm0 drive 1
controller   zs0    at  uba? csr 072440               vector tsintr
device       ts0    at  zs0 drive 0
device       dz0    at  uba0 csr 0160100 flags 0x00   vector dzrint dzxint
device       dz1    at  uba0 csr 0160120 flags 0x00   vector dzrint dzxint
device       dh0    at  uba0 csr 0160020              vector dhrint dhxint
device       dm0    at  uba0 csr 0170500              vector dmintr
```
                                                        } **Device Specifications**

**Device Name**  **Logical Unit Number**  **CSR Address**  **Interrupt Vectors**

Figure C-8  UNIX System Configuration File
Prior to Modification for the CS/1-HSM

To determine the base CSR address at which the HAC should be installed, follow these steps:

1.  Log in to the VAX under the root account.

2.  Display the current system configuration file to list devices installed on the UNIBUS. The device names for most devices are listed in Section 4 of the *UNIX Programmer's Manual* (reference [25]).

3.  Table C-3 lists device ranks for floating address assignment, with physical device names and common UNIX abbreviations for those devices. The device rank of a DMF32 is 27, so that is the rank of the HAC. Using the table and referring to the system configuration file, determine the type of device present on the UNIBUS with a rank closest to, but not greater than, the HAC.

    This device will be referred to in subsequent steps as the "closest device".

    For example, the system configuration file shown in Figure C-8 lists a DZ11-type device, indicated by the device name "dz". The "dz1" is the device present on the UNIBUS with rank closest to that of the HAC.

    If a device with a rank less than 27 is not present, refer to the note at the end of this procedure.

### Table C-3 Device Ranks

| Rank | Physical Name | UNIX Device | Rank | Physical Name | UNIX Device |
|------|---------------|-------------|------|---------------|-------------|
| 1 | DJ11 | YJ | 15 | LPA11 | LA |
| 2 | DH11 | YH | 16 | KW11C | OL |
| 3 | DQ11 | OR | 17 | RSV | RSV |
| 4 | DU11 | XU | 18 | RX211 | DY |
| 5 | DUP11 | XW | 19 | DR11W | XA |
| 6 | LK11 | OG | 20 | DR11B | XB |
| 7 | DMC11 | XM | 21 | DMP11 | XD |
| 8 | DZ11, | TT | 22 | DPV11 | ON |
|   | VX/DZ |  | 23 |  | ISB11 |
| 9 | KMC11 | XK | 24 | DMV11 | XD |
| 10 | LPP11 | OH | 25 | UNA | XE |
| 11 | VMV21 | OI | 26 | UDA | PU |
| 12 | VMV31 | OJ | 27 | DMF32, | TX |
| 13 | DWR70 | OK |   | VMZ/32N |  |
| 14 | RL11 | DL | 28 | KMS11 | XS |

4.  Refer to the current system configuration file to determine the base CSR address of the closest device.

    For example, the address of the closest device (dz1) in the sample configuration file shown in Figure C-8 is 0160120.

5.   To calculate the first unused address following the closest device, add 100 octal (or the usual amount allowed at your installation) to the base CSR address of the closest device. For example, the first unused address following the dz1 in the sample configuration file is 0160220.

6.   Add octal 10 to the calculated address.

     For example, octal 10 plus 0160220 equals 0160230.

7.   For each device rank in Table C-3 following the closest device (up to and including the DMF32), add octal 10 to the calculated address.

     For example, there are 19 device ranks (23 octal) following the rank of the DZ11, including the DMF32. The calculated address equals (23 octal x 10 octal) + 0160230 = 0160460.

8.   Round up the calculated address to an octal 40 boundary (e.g., 0160320 rounds up to 0160340, 0160360 rounds up to 0160400, and 0160500 remains at 0160500).

     For example, the calculated address of 0160460 rounds up to 0160500.

9.   If the calculated address is available, note the address for configuration and installation at that address, as described in Section C.4.2. If the calculated address is not available, contact Bridge Communications, Inc., or an authorized representative.

10.  Continue with Section C.4.2 to modify the system configuration file.

**    NOTE    **

Some systems may require a non-standard device address for the HAC. Any address listed in Table C-3, Section C.4.1, that does not interfere with existing UNIBUS addresses may be used. Addresses beginning at octal 0162000 are recommended. For systems that require non-standard device addresses, the HAC vector address must also be selected. Any address in the range octal 300 through 777 that does not interfere with existing addresses may be used. Addresses beginning at octal 500 are recommended. The HAC requires octal 10 bytes of vector space to contain two interrupt vector pairs. The HAC should be configured for installation at the selected device address as described in the following section. Record the interrupt vector address in a permanent location for later use.

## C.5.2  Modifying the Configuration File for a Non-Standard Base CSR

If the base CSR address of the HAC was determined by following the preceding section of this appendix, then the system configuration file must be modified as described below. After following the procedure here, return to Section C.4.3 to build the new kernel.

The procedures in this section (and in Section C.4.3) are performed in the directory /sys and its subdirectories, as shown in Figure C-9. In the figure, "vax1" is the name of the configuration file to be modified for the HAC. The procedure requires the presence of a /sys subdirectory with the same name as the configuration file.
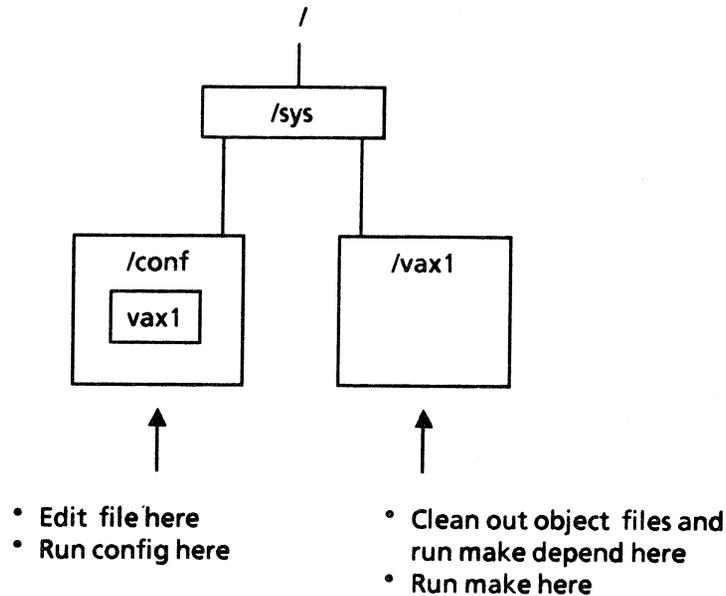
Figure C-9  Configuration Directory Structure

The system configuration file must be edited to include HAC addressing and interrupt information. The file is edited as though DMF32 boards were being added to the system.

To modify the system configuration file, follow these steps:

1. Determine the name of the configuration file to be modified and check for the presence of a /sys subdirectory with the same name.

2. Invoke an editor to edit the system configuration file for the VAX in which the HAC will be installed. Configuration files usually reside in the directory /sys/conf.

3. Each DMF32 board that is to be emulated requires a line like the following in the device specifications area of the file:

```
device          dmf0    at uba? csr 0160500
vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
```

For the first DMF32 board that the HAC is to emulate, add a line like that shown above. appending the appropriate logical unit number to the name and specifying the appropriate HAC base CSR address. If no other DMF32 devices are installed on the UNIBUS, use logical unit 0. If other DMF32 devices exist on the UNIBUS, use the first unused logical unit number.

4. For each subsequent DMF32 board emulated by the HAC, add a similar line, incrementing the logical unit number by one and the CSR address by 40 octal for each subsequent board:

```
device          dmf1    at uba? csr 0160540
vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
```

For example, if the first CSR address is 0160500, the second address would be 0160540, the third address would be 0160600, and so on. Figure C-10 shows a typical configuration file set up for a HAC emulating six DMF32 boards, with a base CSR address of 0160500.

5. Exit the editor.

6. Print the current system configuration file and keep the output in a safe place in case it is requested by Bridge support personnel.

7. Return to Section C.4.3 to build the new kernel.

```
# Configuration file for VAXNAME VAX

machine        vax
cpu            "VAX750"
ident          VAXNAME
timezone       8 dst
maxusers       32
options        MRSP

config  vmunix  root on hp  swap on hp0 and hp1

controller     mba0    at  nexus ?
controller     mba1    at  nexus ?
controller     uba0    at  nexus ?
disk           hp0     at  mba? drive 0
disk           hp1     at  mba? drive 1
master         ht0     at  mba? drive ?
tape           tu0     at  ht0 slave 0
controller     tm0     at  uba0 csr 0172520          vector tmintr
tape           te0     at  tm0 drive 0
tape           te1     at  tm0 drive 1
controller     zs0     at  uba? csr 072440            vector tsintr
device         ts0     at  zs0 drive 0
device         dz0     at  uba0 csr 0160100 flags 0x00   vector dzrint dzxint
device         dz1     at  uba0 csr 0160120 flags 0x00   vector dzrint dzxint
device         dh0     at  uba0 csr 0160020              vector dhrint dhxint
device         dm0     at  uba0 csr 0170500              vector dmintr
device         dmf0    at  uba? csr 0160500
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf1    at  uba? csr 0160540
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf2    at  uba? csr 0160600
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf3    at  uba? csr 0160640
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf4    at  uba? csr 0160700
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
device         dmf5    at  uba? csr 0160740
        vector dmfsrint dmfsxint dmfdaint dmfdbint dmfrint dmfxint dmflint
```

Figure C-10  UNIX System Configuration File
Modified for the CS/1-HSM

## C.6  Installing the HAC

Before installing the HAC, back up the VAX in the usual manner.

**  CAUTION  **

When handling the HAC, avoid touching the gold edge area at the bottom of the board. Careful handling prevents damage to the board or assembly.

A DEC service representative must configure the UNIBUS slot in which the HAC will be installed for DMA. This is done by removing the slot's Non-Processor Grant (NPG) jumper, as described in step 7. The NPG jumper is wire-wrapped on the UNIBUS backplane.

To install the HAC on a VAX, follow these steps:

1. Check the settings of the microswitches in locations S1 and S2 on the HAC (shown in Figure C-11). In location S1, all settings except 4 should be open (i.e., off); 4 should be closed (i.e., on). In location S2, all settings except 8 should be open; 8 should be closed.



S1    S2
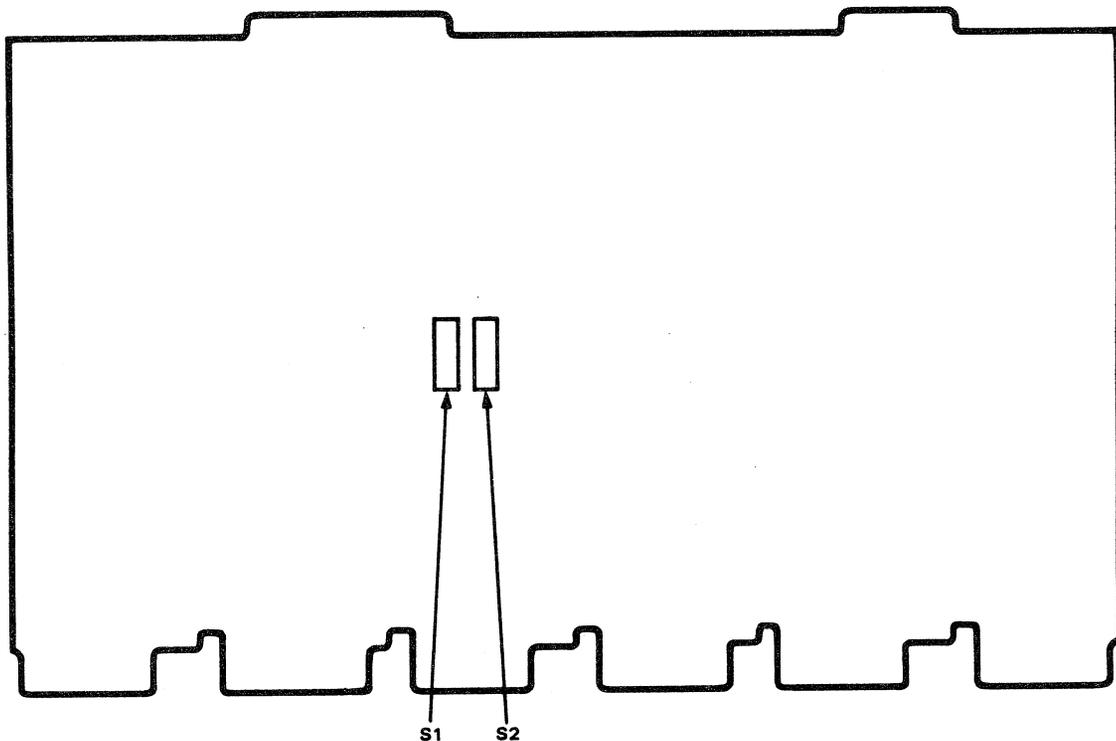
Figure C-11  HAC Configuration

2.  Notify all users that the VAX will be shut down and allow them to log out.

3.  Power off the UNIBUS in which the HAC will be installed. Write-protect the disk drives.

## ** WARNING **

Ensure that the appropriate UNIBUS has been powered off before installing the HAC or distribution panel.

4.  Find a vacant small peripheral controller (SPC) slot on the UNIBUS for the HAC. Slots 2 or 3 in a DD12-C four-slot UNIBUS or slots 2 through 8 in a DD11-D nine-slot UNIBUS are usually used.

5.  Remove the Flip Chip from the selected slot in the UNIBUS. Figure C-12 is a diagram of a Flip Chip (approximate size).
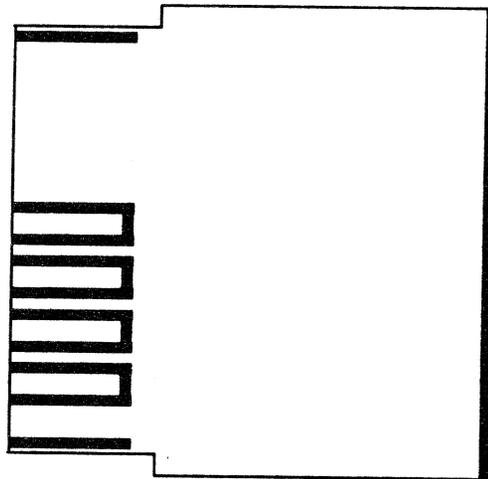


Figure C-12  Flip Chip

6.  Install the HAC in the UNIBUS by sliding the board into the selected slot and using the ejectors to lock it into place.

7.  The HAC's UNIBUS slot must be configured for DMA by removing the NPG jumper. This procedure should be performed by a DEC service representative, following these steps:

    a.  Open the host cabinet to access the UNIBUS backplane.

    b.  Figure C-13 is a diagram of the UNIBUS backplane, showing the location of the NPG jumper for the first UNIBUS slot. The pins are arranged in sections designated A through F. To identify section A, look at the front of the UNIBUS and find the UNIBUS terminator card, which is installed in sections A and B on the UNIBUS.

    c.  Return to the UNIBUS backplane and identify sections A, B, and C.

d.  As shown in the enlargement in Figure C-13, each slot is four pins wide on the backplane, counted by tracing a zig-zag pattern left-to-right from pin A1, to pin B1, to pin A2, to pin B2. The NPG jumper for each slot connects pins A1 and B1 in section C.

To determine the pins that correspond to the slot in which the HAC is installed, find section C and count over four pins for each slot up to, but not including, the HAC's slot. For example, if the HAC is in the third UNIBUS slot, count over 8 pins. The ninth pin is pin A1, the pin connected to pin B1 by the NPG jumper.

e.  Verify the location of the NPG jumper:
- Find section C on the backplane
- Count over four pins for each UNIBUS slot before the HAC's slot
- Locate the wire connecting pin A1 to pin B1 in the appropriate slot

f.  Remove the NPG jumper by cutting the wire that connects pin A1 to pin B1. If the wire is not present, that slot has already been configured appropriately.

8.  Attach the HAC distribution panel to the host chassis in a convenient location.

9.  Route the HAC distribution panel cable to the UNIBUS chassis. Leave adequate slack in the cable for normal movement of components within the chassis and for installation of other components. Do not pinch the cable or route it tightly around sharp corners.

10. Insert the HAC distribution cable into connector J1 on the HAC board. The cable connector must be inserted in a horizontal position.

**  NOTE  **

The cable connector is not keyed and may be inserted horizontally in either direction.

11. Connect the HAC cable between the HAC's distribution panel and the CS/1-HSM.
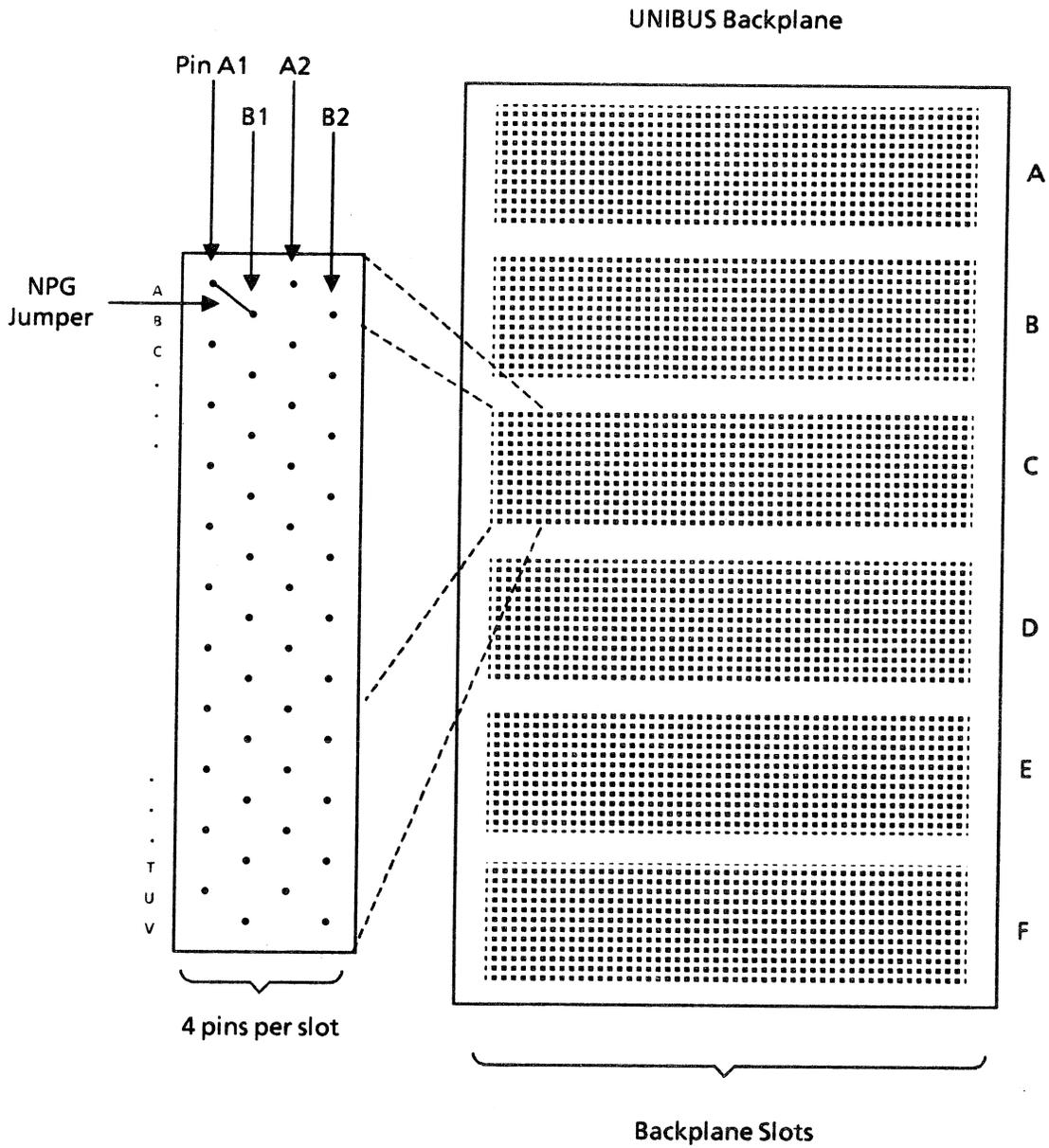
Figure C-13 NPG Jumper

## C.7 Running the Sysgen and Host Installation Programs

After the CS/1-HSM has been configured, follow these steps to complete the HAC installation on the VAX:

1. Turn on the power to the VAX, but do not boot the system software (i.e., leave the VAX in the monitor).

2. Run the system generation program on the CS/1-HSM. Refer to the *Network Management Guide* for the system generation procedures. When Sysgen is finished, leave the CS/1-HSM in the MCPU monitor.

3. Run the CS/1-HSM host installation program by following these steps:

   a. If any software other than the system generation program has been running on the CS/1-HSM, reset the server and enter the monitor. Refer to the *Network Management Guide* for the procedure for entering the monitor.

   b. In response to the monitor prompt, run the host installation program by entering this command:

      > bt 1

   c. The program prompts for the number of the HSM boards attached to the HAC being configured. If a single CS/1-HSM is connected to two different hosts, the host installation program must be run once for each host. Enter the board number (either 1 or 2 for non-custom installations), followed by a return. The program accepts only values inside the possible range.

   d. At this point, the program initiates communication with the HAC connected to the specified HSM board. If no response is received from the HAC within 15 seconds, the program displays an error message and returns to the initial prompt screen.

      If communication is established with the HAC, the program displays the current UNIBUS base address of the HAC, in hexadecimal, and prompts for a new value.

   e. Convert the selected octal base CSR address to a hexadecimal address using the following list.

   | Octal | Hexadecimal | Octal | Hexadecimal |
   |-------|-------------|-------|-------------|
   | 760340 | 3E0E0 | 760600 | 3E180 |
   | 760400 | 3E100 | 760640 | 3E1A0 |
   | 760440 | 3E120 | 760700 | 3E1C0 |
   | 760500 | 3E140 | 760740 | 3E1E0 |
   | 760540 | 3E160 | 761000 | 3E200 |

   Enter the base CSR address in hexadecimal, except the leading "3", and press the return key. The program accepts only characters that are valid hexadecimal digits.

   f. The program updates the UNIBUS address, then displays a message that the host configuration is complete. If the CS/1-HSM contains more than one HSM board, return to step C, above, and repeat the procedure for the second board.

The device names listed in ttys are linked to the system's table of device drivers by the /dev directory. The HAC entries in /dev include major and minor device numbers. The major number represents a class of devices that can all be handled by a given driver. The minor number is used by the driver to differentiate between devices.

The following line is an example of an entry in /dev for a HAC port:

```
crw--w--w-  1 root        22,     0 Nov  4 10:26 ttyh0
```

The major device number is 22, and the minor device number is 0. The device name for the port is ttyh0.

More information on devices and special files is available in reference [24].

**Modifying /dev**

Each HAC port must be identified in the /dev directory. To add the HAC port names to /dev, follow these steps:

1. Display the contents of /etc/ttys. Verify that the ttys file does not already contain device names in the following range, where the final digit is hexadecimal:

   ```
   ttyh0-ttyhf      ttyl0-ttylf
   ttyi0-ttyif      ttym0-ttymf
   ttyj0-ttyjf      ttyn0-ttynf
   ttyk0-ttykf      ttyo0-ttyof
   ```

   If a DH device is present on the system or if any device names in the above range are present, consult your UNIX representative to modify /dev and ttys.

2. Change directories to /dev and print the contents of the /dev directory before making any changes, for example:

   ```
   cd /dev
   ls -l | lpr
   ```

   This hardcopy will be used when modifying /etc/ttys.

3. For every two DMF32s emulated by the HAC, run one MAKEDEV command, specifying dmf0 in the first command, dmf1 in the second, dmf2 in the third, and so on. For example. two commands are required for a HAC emulating four DMF32s:

   ```
   MAKEDEV dmf0
   MAKEDEV dmf1
   ```

   The first MAKEDEV command generates device names ttyh0 through ttyhf, and the second command generates ttyi0 through ttyif. Each MAKEDEV command generates 16 entries in /dev.

4. Print the contents of the /dev directory and keep the output in a safe place in case it is requested by Bridge support personnel.

**Modifying the ttys File**

The device name of each HAC port must be identified in /etc/ttys. To modify the ttys file, follow these steps:

1. Log in to the VAX under the root account.

2. Compare the hardcopies of the contents of the /dev directory generated above to determine the new device names that identify HAC ports. These names must be added to the ttys file.

3. Invoke an editor to edit /etc/ttys for the VAX in which the HAC is installed.

4. Device names are listed in the ttys file with one name per line. Each device name is preceded by two digits. The first digit must be set to 1 to enable login on that port or to 0 to disable login on that port. The second digit, which represents port characteristics defined in the /etc/gettytab file, is usually set to 2 for all HAC ports.

   Add the HAC port names identified in /dev, preceding each name with 12 to enable login or 02 to disable login on that port.

5. Save the changes and exit the editor.

6. Print the current ttys file and keep the output in a safe place in case it is requested by Bridge support personnel.

7. To initialize the port information, enter the following command exactly as shown below, with one space following "kill" and one space following "-HUP":

   ```
   kill -HUP 1
   ```

   This command sends a signal to inform the system initialization process that /etc/ttys has been changed.

If the file /etc/ttytype is present, remember to define the default terminal type of the terminal used to access the HAC ports in remote mode.

g.   The program displays the current number of DMF32 cards being emulated and prompts for a new value. Enter the appropriate number of DMF32 cards being emulated and press the return key.

h.   When each HAC has been configured, respond to the server prompt with a return in order to exit from the host installation program and return to the monitor.

4.   If the board revision level is 0 or 1, turn off the power to the host computer and wait five seconds. Power-on and boot the host as usual.

5.   After the host is booted, boot the CS/1-HSM communications software by disconnecting the console terminal and pressing the Reset switch.

## C.8  Final UNIX System Configuration

The procedures in this section are required only for UNIX operating systems.

After the HAC has been installed, the CS/1-HSM ports must be identified in the /dev directory and listed in /etc/ttys. Each CS/1-HSM port is considered an individual device by the UNIX operating system, and is treated like a file. The device name for each CS/1-HSM port appears in /etc/ttys.

Figure C-14 lists, in two columns, the contents of a ttys file for a HAC supporting 32 ports. The first line is for the VAX console port. The next 8 lines are for a dz-type controller. The final 32 lines, 12ttyh0 through 02ttyif, are for the HAC.

```
                          14console
                          02tty00
            12ttyhc       02tty01
            12ttyhd       02tty02
            12ttyhe       12tty03
            12ttyhf       12tty04
            02ttyi0       12tty05
            02ttyi1       12tty06
            02ttyi2       12tty07
            02ttyi3       12ttyh0
            02ttyi4       12ttyh1
            02ttyi5       12ttyh2
            02ttyi6       12ttyh3
            02ttyi7       12ttyh4
            02ttyi8       12ttyh5
            02ttyi9       12ttyh6
            02ttyia       12ttyh7
            02ttyib       12ttyh8
            02ttyic       12ttyh9
            02ttyid       12ttyha
            02ttyie       12ttyhb
            02ttyif
```

Figure C-14  Ttys File Modified for the CS/1-HSM

# INDEX