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## Educational Services



EY-9222E-SA-0001

### **VAXcluster Maintenance Student Workbook Volume 1**

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HSC	RSTS	VMS
IAS	RSX	

# CONTENTS

## Volume 1

Introduction to VAXclusters .....	1-3
Introduction .....	1-5
Cluster Definitions .....	1-5
Hardware Components of a VAXcluster .....	1-7
Software Components of a VAXcluster .....	1-8
 The Computer Interconnect .....	 2-3
Packet Format Breakdown .....	2-6
Transmission on the CI Bus .....	2-8
Cluster Node-to-Node Links .....	2-9
Components of the CI Packet Body .....	2-10
Data Flow .....	2-12
The Star Coupler .....	2-16
Bend Radius of CI Cables .....	2-17
The Star Coupler Cabinet .....	2-18
The Star Coupler Box .....	2-19
Star Coupler Configuration .....	2-21
 The CI Interface .....	 3-3
The CI750 Port .....	3-7
CI750 Installation Highlights .....	3-8
Extracting the CIPA Logic Box .....	3-10
CIPA Box Module Access .....	3-11
The CI780 Port .....	3-17
CI780 Installation Highlights .....	3-18
The CI Port in the VAX-11/780 .....	3-19
The CI780 on the VAX 8600/8650 .....	3-23
Installing the CI780 on the VAX 8600/8650 .....	3-24
The CIBCI Interface .....	3-29
Location of the CIBCI Adapter (VAX 82xx, 83xx) .....	3-30
Location of the CIBCI Adapter (VAX 85xx, 87xx, 88xx) .....	3-32
 CI Port Diagnostics .....	 4-3
Diagnostic Summary .....	4-5
Repair Diagnostics (Level 3) .....	4-5
Functional Diagnostics (Level 3) .....	4-5
CI Exerciser (Level 2R) .....	4-5

Using the Autosizer on a CI Port .....	4-6
Booting Into the Diagnostic Supervisor on a VAX-11/750 .....	4-7
Repair-Level Diagnostics for the CI750 .....	4-8
Attaching Devices on a VAX-11/780 .....	4-19
Attaching Devices on a VAX 8600 .....	4-19
Booting in the Diagnostic Supervisor on a VAX-11/780 .....	4-20
Booting in the Diagnostic Supervisor on a VAX 8600 .....	4-21
Repair-Level Diagnostics for the CI780 .....	4-22
Loading the Diagnostic Supervisor on a VAX 8200/8300 .....	4-30
Loading the Diagnostic Supervisor on a VAX 85xx/8700/8800 ....	4-31
Repair-Level Diagnostics for the CIBCI .....	4-32
Functional Diagnostics .....	4-46
EVXCI: Cluster Exerciser .....	4-51
Sample Run of EVXCI .....	4-52
 CI Port Registers .....	 5-3
CI750 Address Assignment .....	5-4
CIBCI Address Assignment .....	5-6
CI780 Address Assignment .....	5-8
CI780 Address Assignment on the VAX 8600 .....	5-10
CI Port Hardware Registers .....	5-12
Configuration Register (CNFGR) for CI780 .....	5-13
Configuration Register (CNFGR) for CI750 .....	5-14
Configuration Register (CNFGR) for CIBCI .....	5-15
Port Maintenance Control and Status Register (CI750, CI780, CIBCI) .....	5-16
Maintenance Address Register (MADR) .....	5-17
Maintenance Data Register (MDATR) .....	5-17
Microcode Registers (in Local Store) .....	5-18
Device-Specific Registers .....	5-20
CI750 Diagnostic Registers .....	5-20
CIBCI-Specific Registers .....	5-20
 CI Functional Description .....	 6-3
CI Module Overview .....	6-5
Link Interface (ILI) L0100 .....	6-7
Packet Buffer Module (IPB) L0101 .....	6-8
Data Path Module (IDP) L0102 .....	6-9
SBI Interface Module (ISI) L0104 .....	6-10
CI750 Module Functions .....	6-13
CIBCI Module Functions .....	6-15
Link Board Operation .....	6-19

Arbitration for CI Bus .....	6-20
Sync/Trailer PROM Space .....	6-22
Link Interface Signals .....	6-23
Packet Buffer Board Operation .....	6-28
The Microword .....	6-33
Data Path Board Operation .....	6-36
The Virtual Circuit Descriptor Table .....	6-39

# **INTRODUCTION TO VAXclusters**

# **Introduction to VAXclusters**

## **Lesson Introduction**

The VAXcluster is a highly-integrated organization of VAX/VMS systems that communicate over a high-speed communications path.

It uses software which is already part of the VMS operating system. Therefore, no additional software products are required to install software on a VAXcluster.

The VAXcluster provides an environment in which all of the VAX systems function as a single system. They share the same system resources as well as having a single security and management domain.

This lesson will give an overview of the parts that make up the cluster as well as showing its relation to other types of multiple processor systems.

## **Lesson Objectives**

1. Identify the relationship between a VAXcluster and other coupled computer systems.
2. Describe the function of a VAXcluster and list the advantages.
3. Identify the major hardware components of the VAXcluster and describe the services they perform.
4. Identify the major software components of the VAXcluster and describe the function of each.

## **Lesson Outline**

- I. VAXcluster Introduction
- II. Hardware Components
- III. Software Components





## Introduction

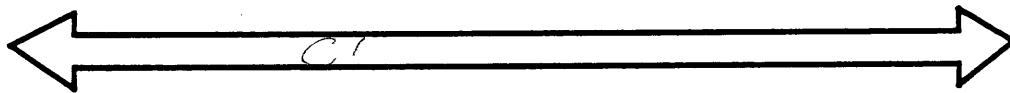
A VAXcluster is a collection of VAX systems connected by a Computer Interconnect (CI) Bus.

## Cluster Definitions

CI Bus	A Computer Interconnect Bus.
CI Cluster	A collection of VAX computers connected by the CI Bus.
VAXcluster	A type of CI Cluster where all the CPUs are running VMS.
CI Port	A type of interface on the CI Bus.
HSC	A mass storage controller for <u>RA</u> disks and <u>TA</u> tape drives.

Star Coupler A central connection for the CI Bus.

(V5) → MI LAVC defunct LOCAL AREA VAXCLUSTER ALSO CALLED (NL) NETWORK INTERCONNECT  
 Tightly Coupled Systems MIXED INTERCONNECT LAVC & CI Loosely Coupled Systems



CPUS  
MUST  
RUN  
SAME  
SOFTWARE

Multi-processor
Systems boot/fail <del>separately</del> <u>TOGETHER</u>
Single security/ management domain
Integrated file system
Limited growth potential
Single or adjacent cabinets

11/782

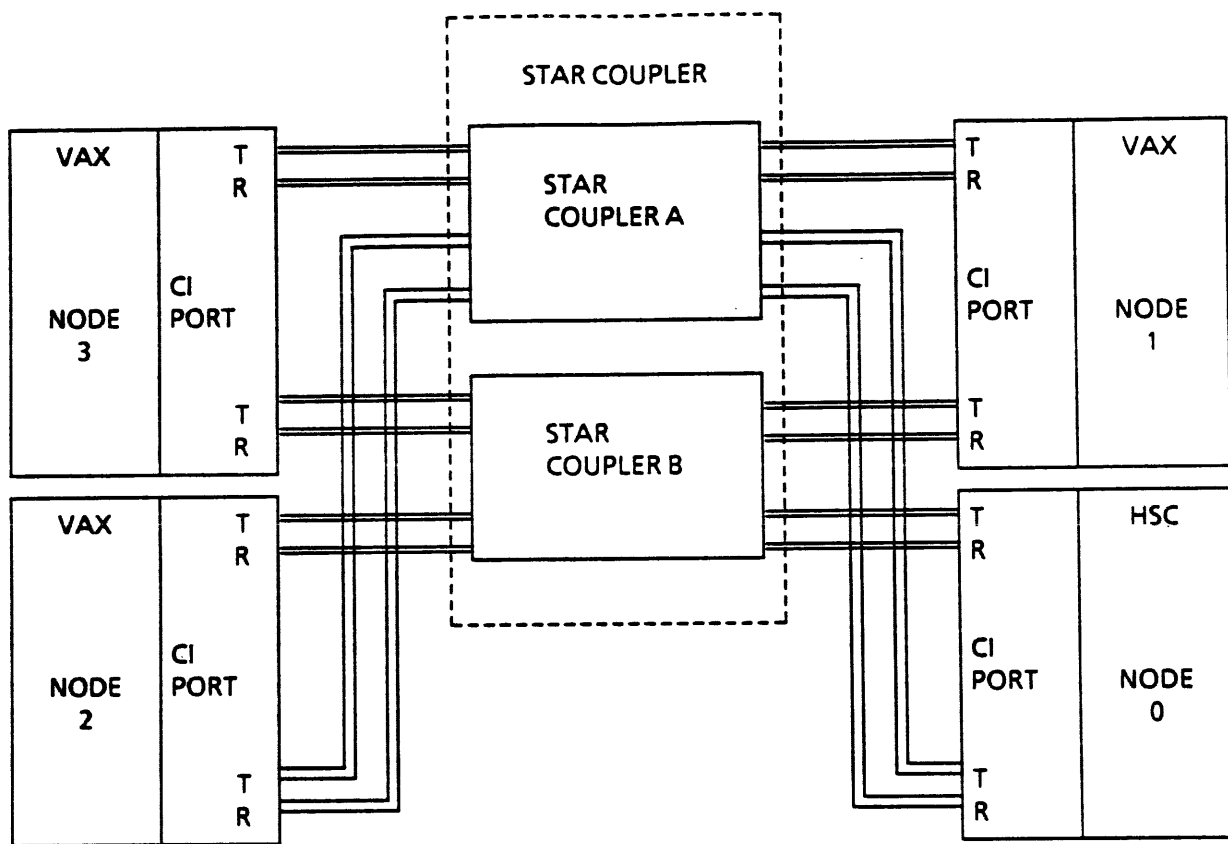
8800  
8350  
6000  
9000

VAXcluster
Systems boot/fail separately <u>MAYBE</u>
Single security/ management domain
Integrated file system
Powerful growth potential <u>BUT SOMEWHAT LIMITED</u>
Single computer room <u>CI CABLE LENGTH</u>

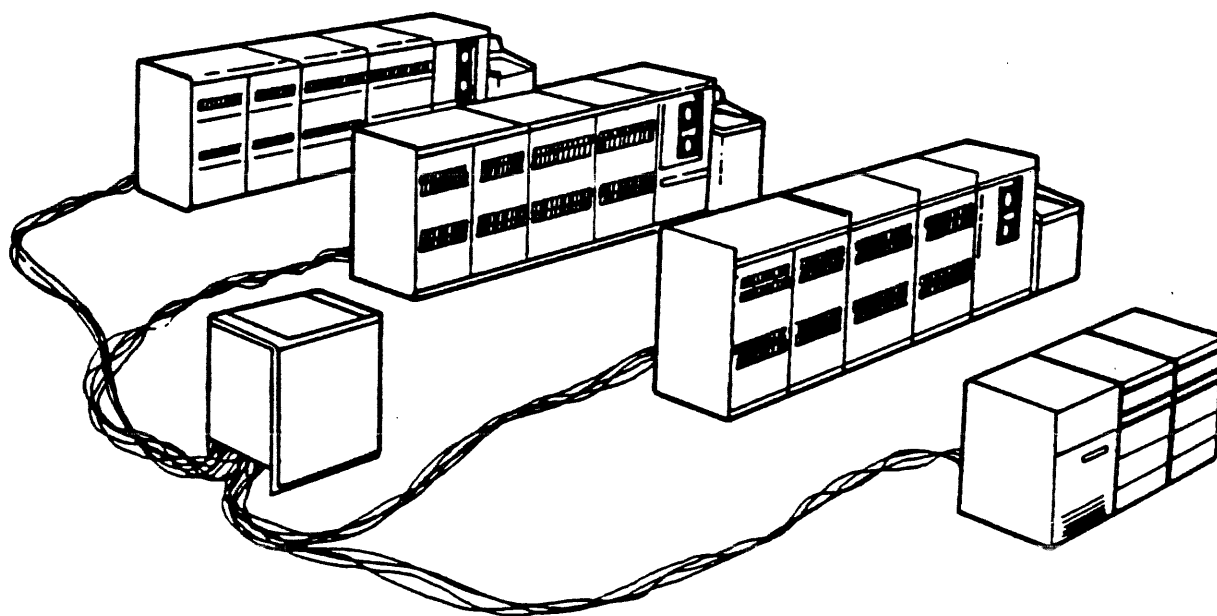
Network
Systems boot/fail separately
Separate security/ management domain
Separate file systems
Unlimited growth potential
Large geographical area

ZK-1344-83

## VAXclusters and Other Multiprocessors



CI Bus Detail Layout



Four Node VAXcluster Physical Layout

TK-10461

## Hardware Components of a VAXcluster

- VAX (8XXX-7xx)
  - VMS is running and is extended across the VAXcluster.
  - Active node: a member of the VAXcluster. *HSC=NON MEMBER - NO <sup>HAS</sup> VOTES*
  - All active nodes coordinate their actions with respect to mass storage utilization.
  - A VAXcluster should be treated as a single system.
- HSC (Hierarchical Storage Controller)
  - Controls RA-type or TA-type tapes. *DSA OPTICALS + SOLID STATE DRIVES.*
  - Optimizes access to storage devices. *SMART SEEKS (REARRANGED TO BE EFFICIENT)*
  - Passive node -- not a member of the VAXcluster.
  - Makes all storage devices look like a series of good logical blocks to VMS.
  - Contains resident diagnostic and utility programs.
- CI Bus
  - High-speed (70 megabit), multi-access bus.
  - Coaxial cables for transmit and receive.
  - Dual signal paths.
- Star Coupler (SC008) -- central connection point for CI nodes.
- CI Intelligent I/O Port
  - Connects VAX systems to the coaxial CI Bus.
  - Supports serialized packet communications on the CI Bus.  
*SERIAL TRANSMISSION  
OF PACKETS ON BUS*

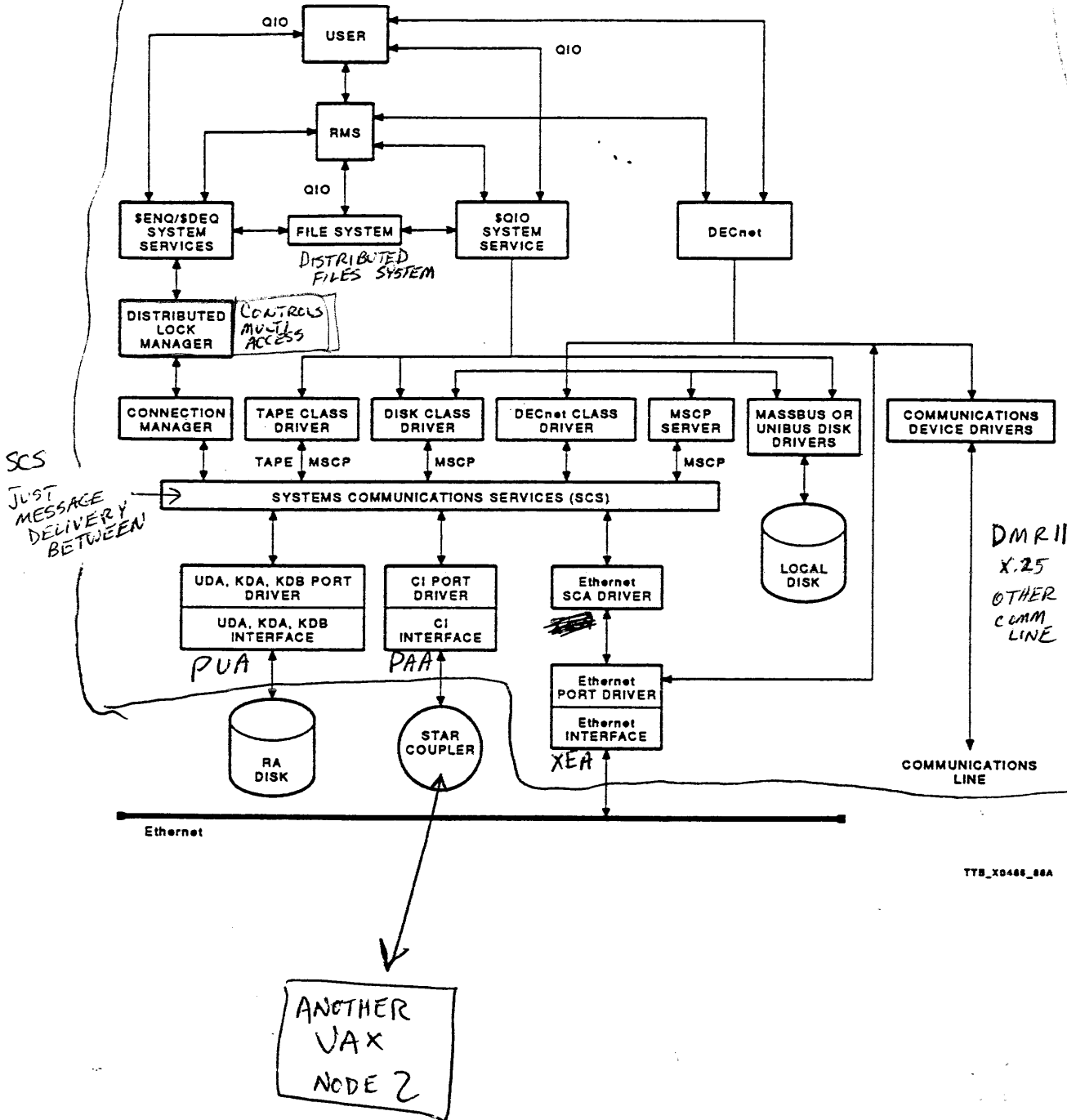
## Software Components of a VAXcluster

- Distributed File System
  - Used in conjunction with Record Management Services (RMS) to allow the same access to disks on a cluster-wide basis as is allowed on a single system.
  - The Distributed File System and RMS use the lock manager to coordinate cluster-wide file access.
- Distributed Lock Manager
  - Uses the Connection Manager and System Communication Services (SCS) to communicate information over the CI Bus.
  - Allows cluster-wide synchronization of access to shared resources.
  - Used by the file system, RMS, and the job controller.
- Distributed Job Controller
  - Uses the Distributed Lock Manager to signal other VAX nodes to examine the batch and print queues for jobs to be processed.
  - Permits users to submit batch/print jobs to queues that execute on any node in the cluster.
- Connection Manager
  - Runs on each processor in a cluster.
  - Conducts cluster state changes (joining/leaving cluster, quorum check).
  - Uses SCS to communicate across the CI.
- MSCP Server -- Allows MASSBUS and UNIBUS disks to be made available to other nodes in the cluster by software emulation of an HSC50/70.
- System Communication Services (SCS) -- Software layer that implements internode communications, according to Digital's System Communication Architecture. The SCS layer interfaces the System Application Software (SYSAPS) with the CI Bus.

Allows  
LOCAL  
DISKS  
TO BE  
AVAILABLE  
TO CLUSTER

# VAXcluster Software Overview

VAX 1  
NODE



TTB\_X0486\_88A

# **THE COMPUTER INTERCONNECT**

# **The Computer Interconnect**

## **Lesson Introduction**

The CI Bus is the communications path (or link) between the nodes in a cluster. The CI has its own protocol, which simply embeds any information to be passed between the nodes inside of a CI Informational Packet. This section is a discussion of communication over the CI Bus as well as a look at the physical connections themselves.

## **Lesson Objectives**

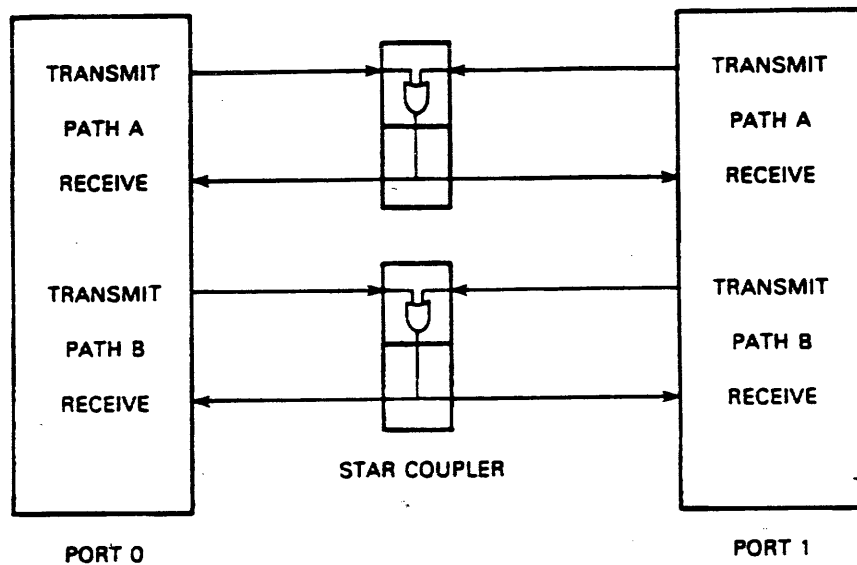
1. Describe the physical characteristics of the CI Bus.
2. Describe how communication is implemented over the CI Bus.
3. Define each of the elements that make up a CI Packet.
4. Describe CI Bus transmission, reception, and arbitration.

## **Lesson Outline**

- I. Physical Characteristics
- II. Packet Format
- III. CI Transmission
- IV. Virtual Circuit vs. Software Connection
- V. CI Packet Body
- VI. CI Data Flow

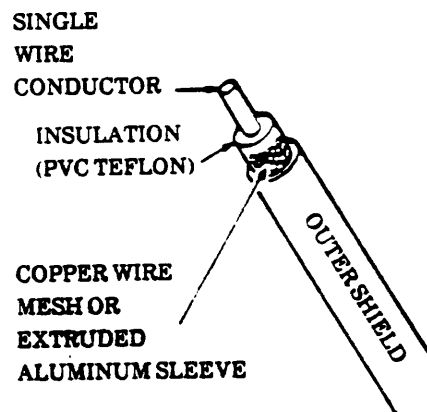






TK-10494

### CI Bus Providing Dual Paths to Each Port



Coaxial Cable

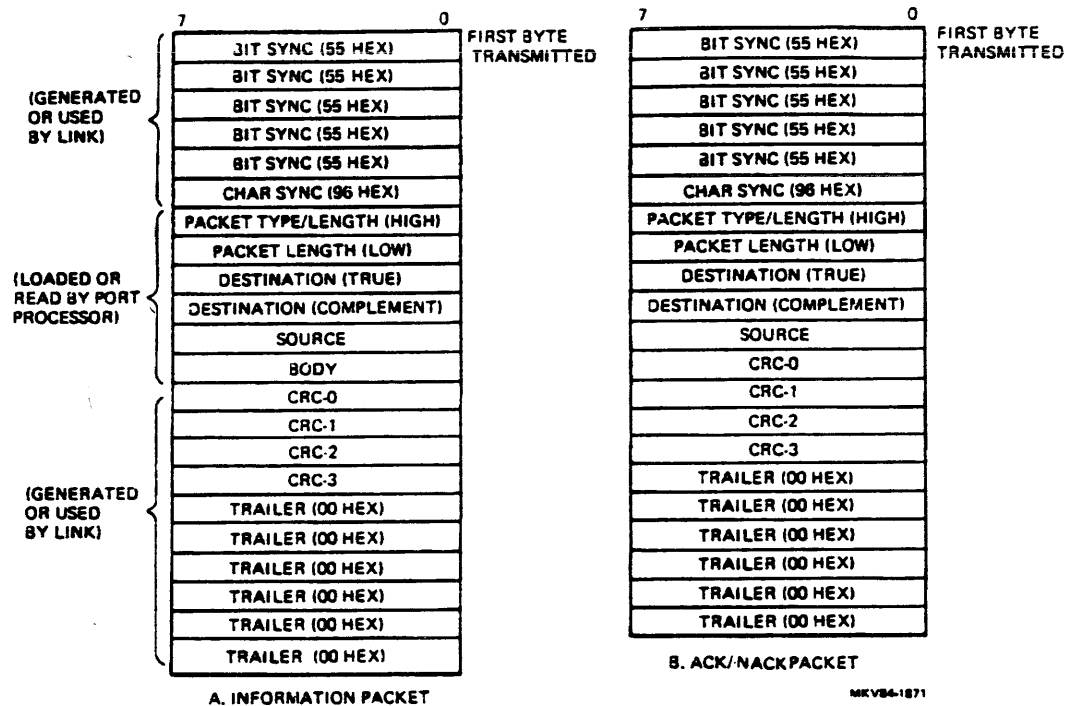
## Packet Format Breakdown

- Bit synchronization
  - Turns on the carrier detect circuitry.
  - Synchronizes the Manchester decoder.
  - Consists of alternating ones and zeroes.
- Character synchronization -- used by serial-to-parallel converter to frame the incoming bits into bytes.

- Packet type/length (high)

Bit	7	6	Packet type
	0	0	INFO
	0	1	not used
	1	0	NAK
	1	1	ACK

- Bits 5:4 are always zero.
  - Bits 3:0 are upper four bits of the 12-bit packet length (zero for ACK/NAK).
- Packet length (low) -- used only for information packets, contains the lower eight bits of the packet length field.
- Destination -- matches the address set in the link board switches on the destination node
- Destination (complement) -- matches the complement of the address set in the link board switches on the destination node.
- Source -- matches the address set in the link board switches on the source node.
- Body -- the message (used only for information packets).
- CRC -- a four-byte CRC code for message.
- Trailer -- six bytes of zeroes.



## Packet Formats

## Transmission on the CI Bus

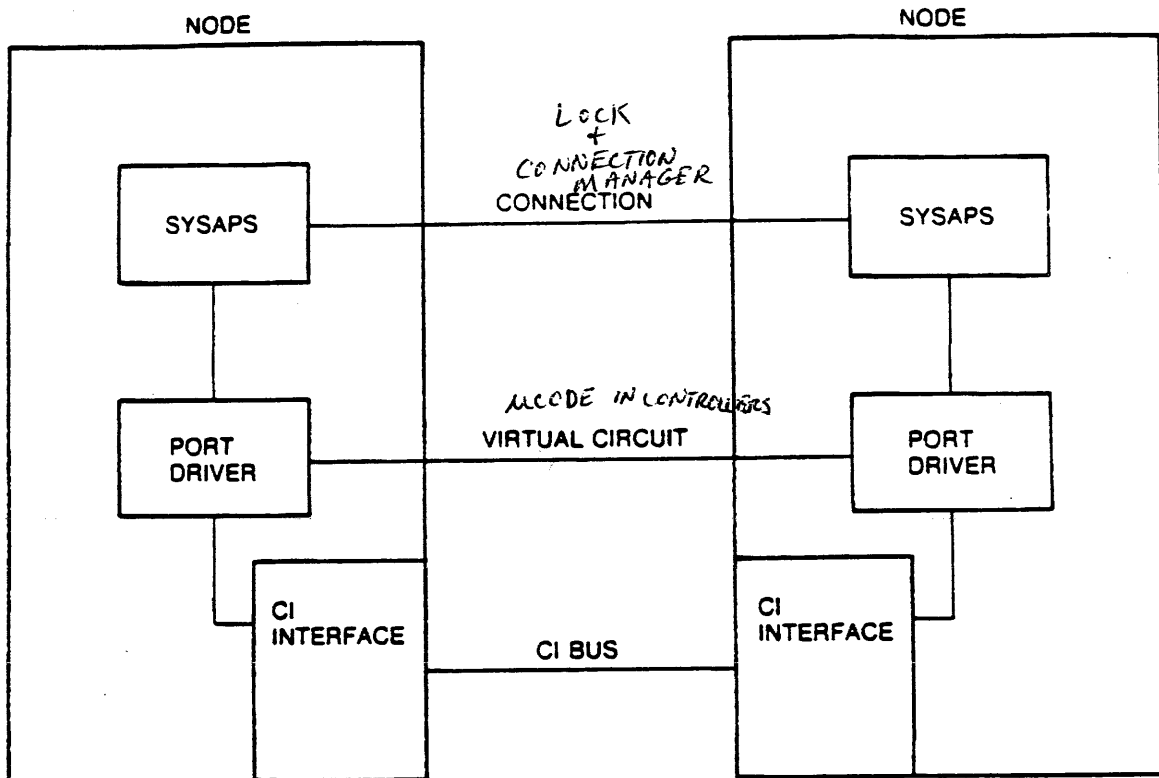
- Path selection for transmission
  - Normally, the path is selected at random by the microcode.
  - Periodically, a specific path is selected by the software (configuration poller) in order to determine cluster configuration.
- Responses (expected immediately on the same path)
  - ACK = successful reception.
  - NAK = unsuccessful reception because buffer is full.

$\overset{\text{NO PACKET}}{= \text{TIMEOUT}}$  No response (NO\_\_RSP) = unsuccessful reception because of collision, CRC error, and so forth.

- Retries (microcode-driven)
  - 64 NO\_\_RSPs are allowed per path.
  - 128 NAKs are allowed per path (a NAK resets the NO\_\_RSP counter).
  - No error is logged until the retry count is exhausted.
  - The port switches paths and starts over when the count is exceeded for the selected path.
  - The node closes the virtual circuit (port-to-port logical connection) when the count is exceeded for both paths.

## Cluster Node-to-Node Links

The diagram below illustrates the terms used to describe the various types of links that exist between nodes. Note that a "connection" and a "virtual circuit" are LOGICAL links while the CI Bus is the PHYSICAL link.



Node-to-Node Physical and Logical Link

### Connection

A System Communication Architecture (SCA) logical path by which two processes running in different nodes communicate. Connections are multiplexed within a single virtual circuit between nodes.

### Virtual Circuit

A logical connection path between two nodes in a cluster. The message traffic of communication processes is channeled (multiplexed) through this circuit.

## Components of the CI Packet Body

- The body of a CI Information Packet is usually of three types:

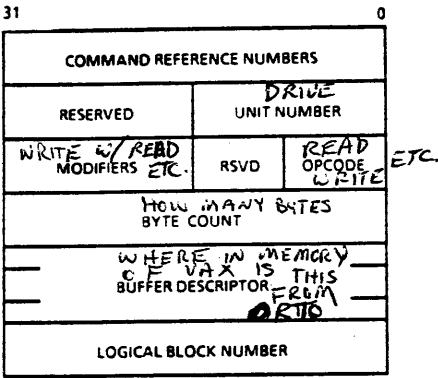
Sequential message	Typically an MSCP command; delivery of sequential message is guaranteed.
Datagram	An intersystem communication message the delivery of which is not guaranteed; for example, an error log message. <i>DECNET MESSAGES ALSO</i>
Block Transfer	Block data going to/from a storage device; <del>or</del> <del>between</del> data between systems.

- An MSCP command (sequential-type message) is not considered complete until an MSCP response from the receiving node is received.
- The accompanying diagrams illustrate the format of an MSCP message that might be sent across the CI Bus.

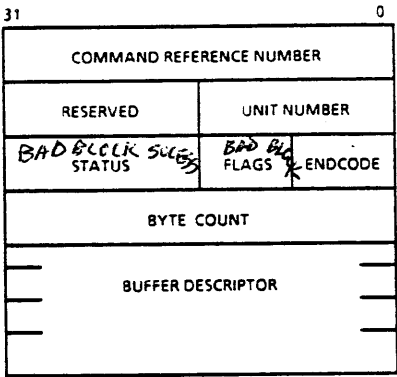
Command Packets

Response Packet

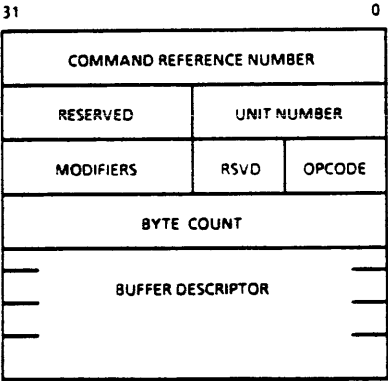
DISK DATA TRANSFER COMMAND PACKET



END MESSAGE PACKET



TAPE DATA TRANSFER COMMAND PACKET

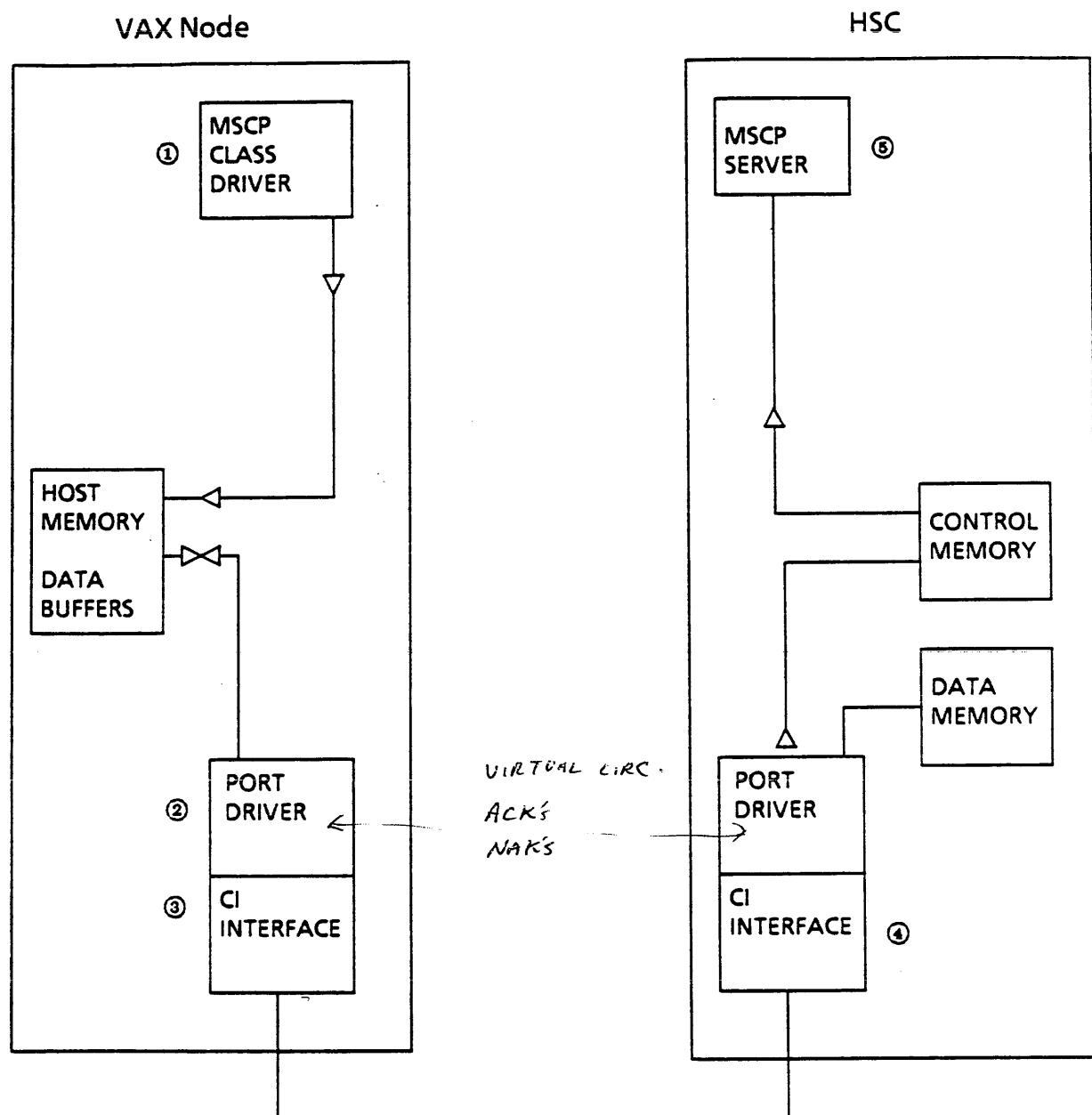


## Data Flow

The following is an abbreviated account of a data transfer between a node in a VAXcluster and an HSC disk server. The numbers correspond to the figures on pages 2-13 and 2-15. In this case, a "write" to the disk is done:

- ① The MSCP write command is issued by the host class driver.
- ② The CI Port driver adds an envelope<sup>—HEADER, TRAILER</sup> to the MSCP command packet (packet type, packet length, destination, source).
- ③ The link board of the CI Port arbitrates for the CI Bus (listens for a quiet slot). The link board then adds sync and trailer bytes and transmits packet.
- ④ The destination link board (in HSC) issues an ACK.
- ⑤ In HSC, the MSCP message is stripped of the envelope by the port driver and handed to the class server.





Typical Data Transfer (Diagram 1)

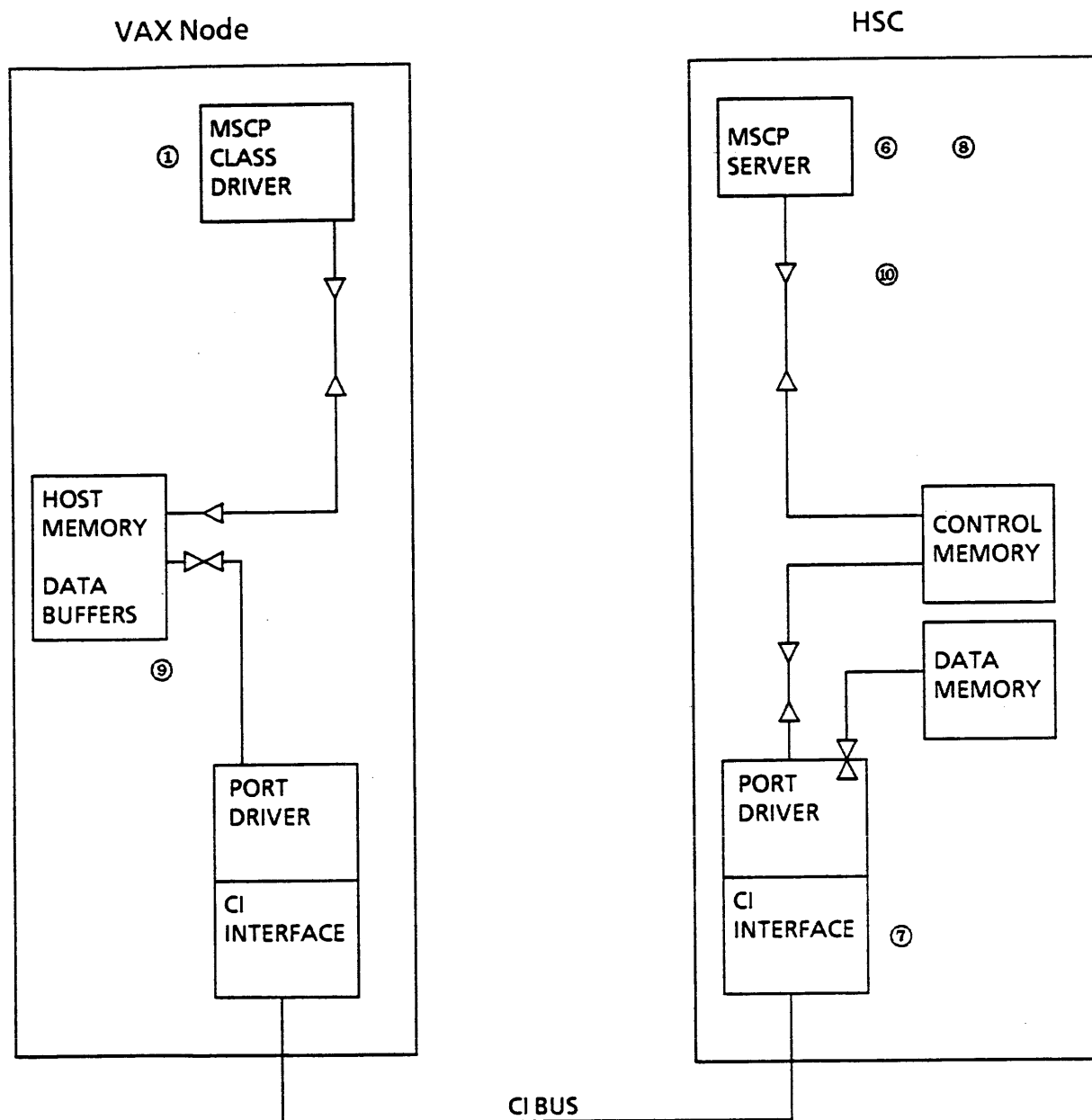
## **Data Flow (Cont.)**

- ⑥ The class server in HSC allocates data structures in data memory to handle the requested transfer and puts together an end message packet (but does not send it yet).
- ⑦ The CI Port of HSC issues series of send data requests, each request ending with an ACK received from host node.
- ⑧ HSC software issues an SDI seek command to appropriate drive.
- ⑨ The host responds to these requests by sending the data packet and data, and then waiting for an ACK from the HSC CI Port.

The sequence continues until the transfer is complete. The last packet from the host contains a bit indicating the end of the data.

- ⑩ The HSC port server now sends an end message (previously put together by port server) back to the host node, satisfying the requirement that every MSCP message be completed with a response message.

**NOTE:** A transmission on the CI Bus is never considered "complete" until an ACK packet has been received from the correct node.



Typical Data Transfer (Diagram 2)

## The Star Coupler

*CAN BE  
24 OR 32*

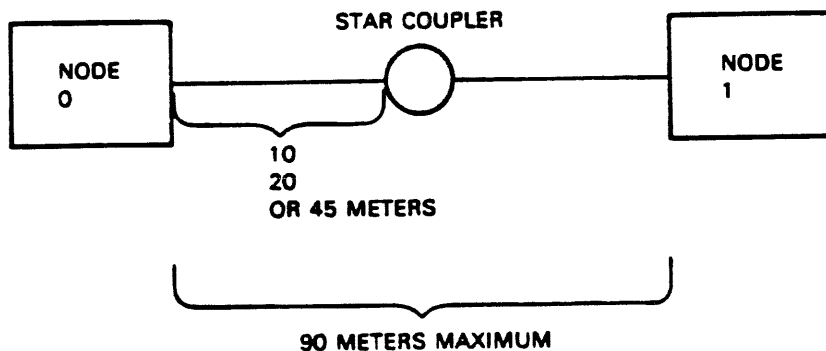
- Provides central connection point for up to sixteen nodes of a CI Cluster.
- Transformer coupled connections -- CI cables can be added or removed without affecting cluster communications.
- Completely passive device -- no active electrical components, no power requirements.
- Two types of Star Couplers

- ORDER BOTH FOR COMPLETE 16 PART DUAL*
- SC008-AC for dual path, 8-node cluster
  - SC008-AD for dual path, 16-node cluster *JUST PANEL*

### ● Cable types <sup>LENGTH</sup>

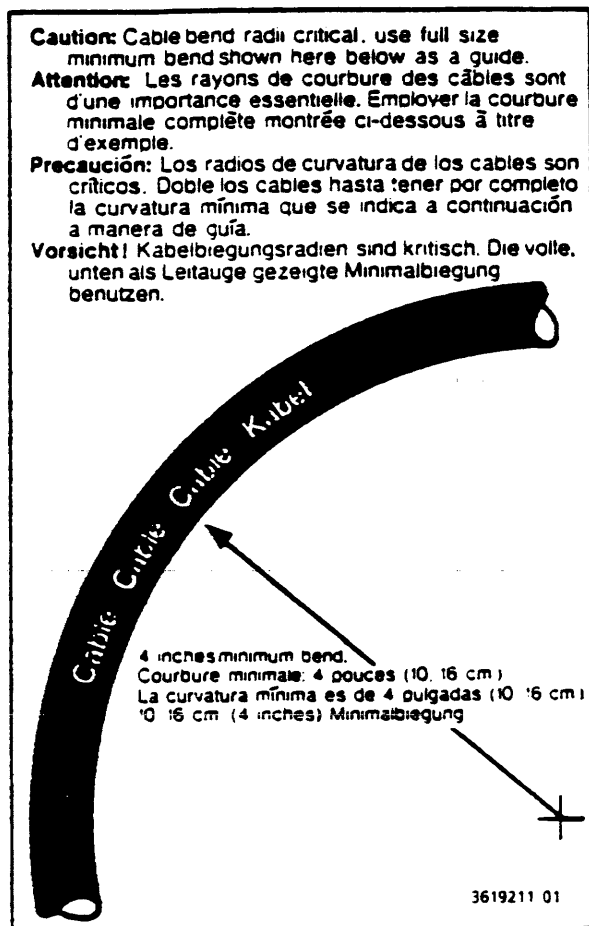
- BNCI-XX = One pair (single path, two cables)
- BNCL-XX = Two pairs (dual path, four cables)

- Maximum distance between nodes:



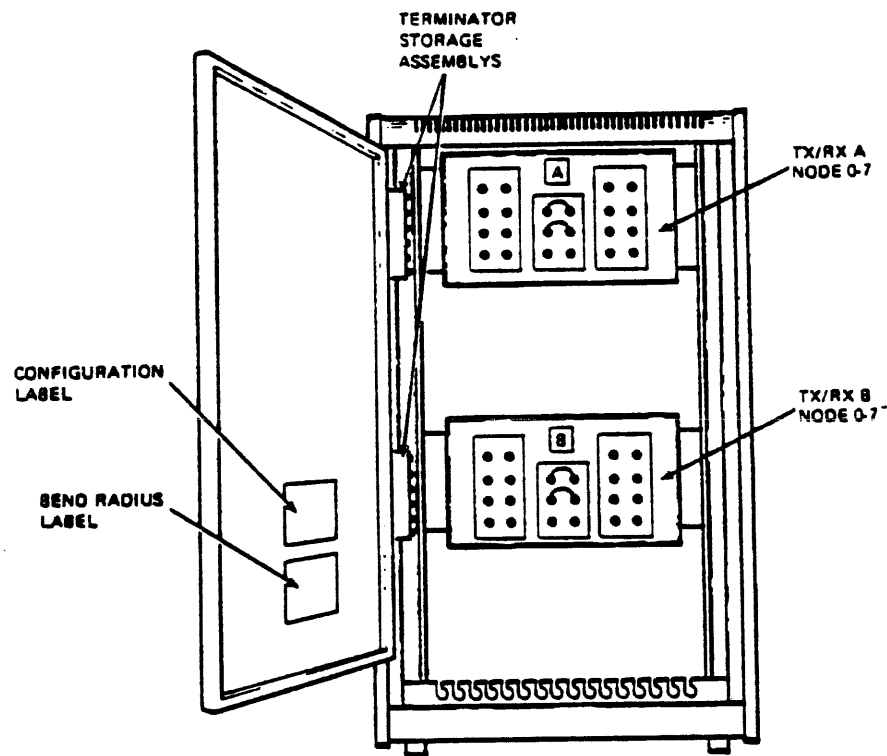
TK-10408

## Bend Radius of CI Cables



TK-9217

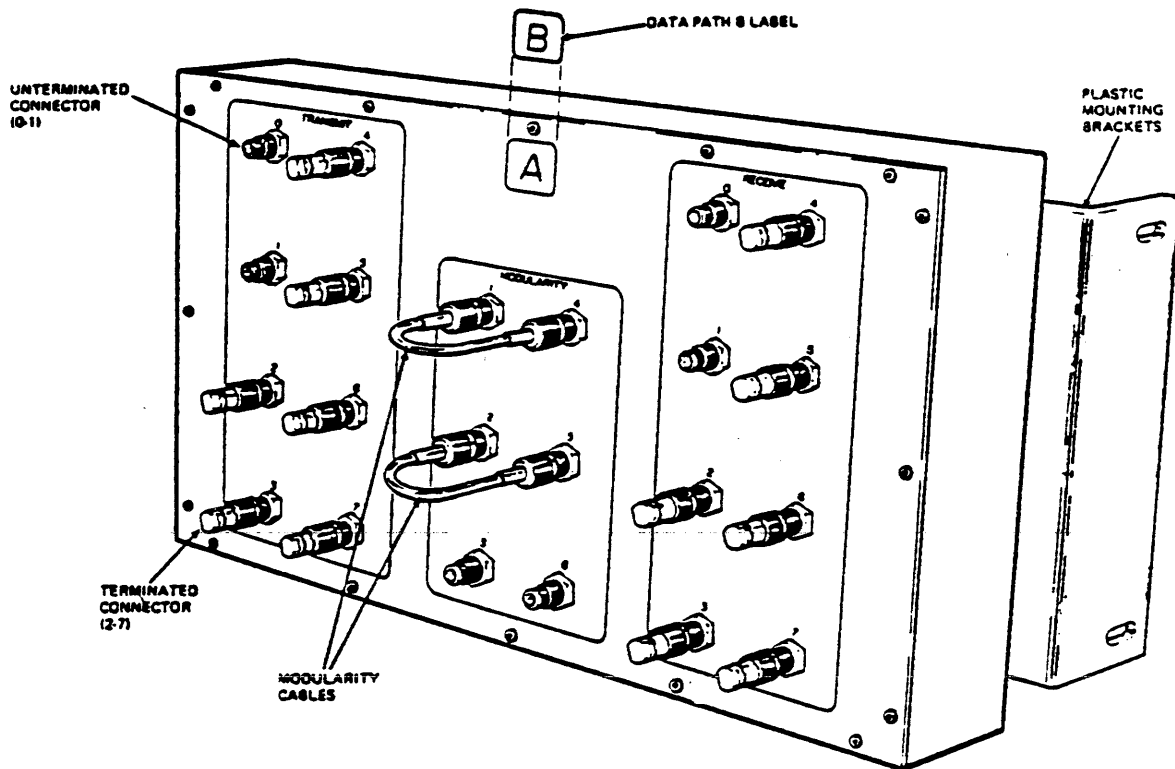
# The Star Coupler Cabinet



TK-0220

## The Star Coupler Box

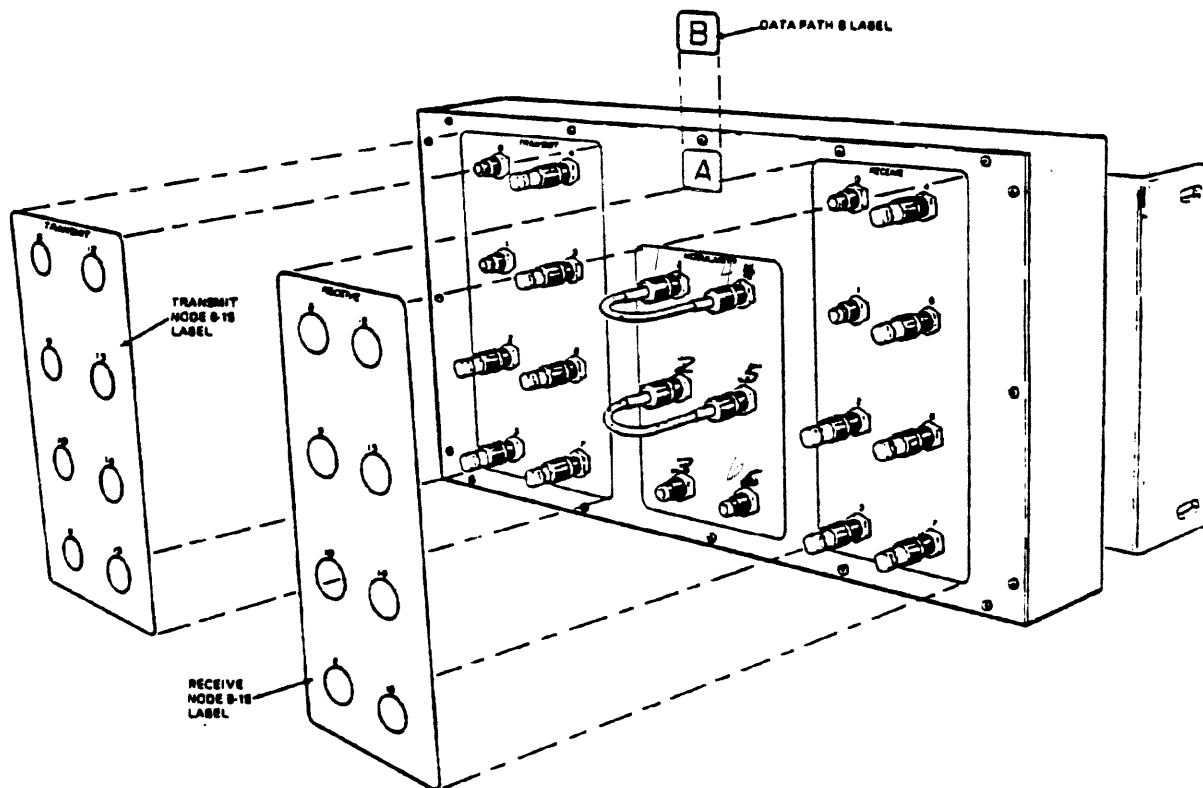
- Each box (panel) contains eight receive connections and eight transmit connections:



TK-9226

## The Star Coupler Box (Cont.)

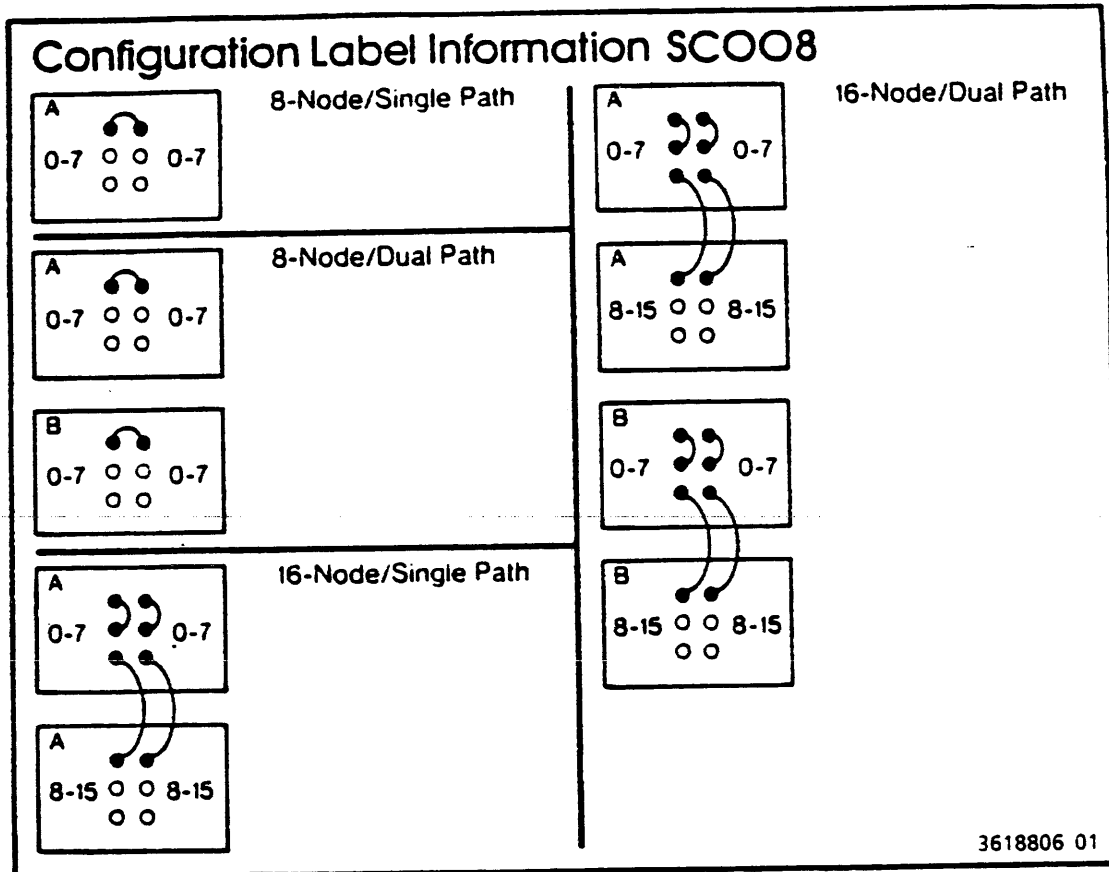
- When using a 16-node configuration, special labels are supplied for overlays:





## Star Coupler Configuration

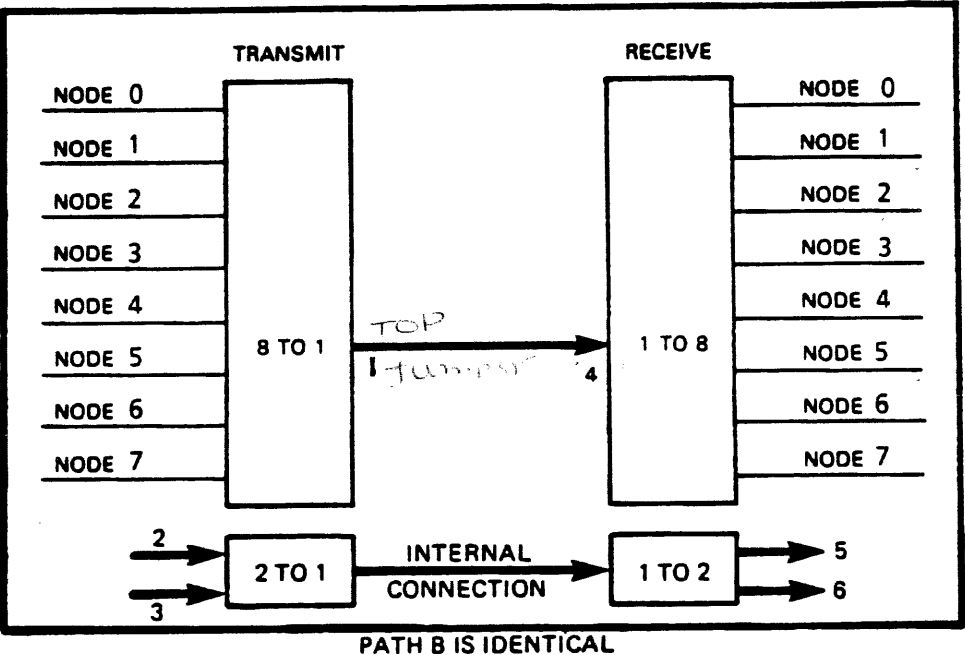
- Modularity cables determine how the Star Coupler is going to be used.
- Although available, single path configurations are not supported by Digital.



TK-0219

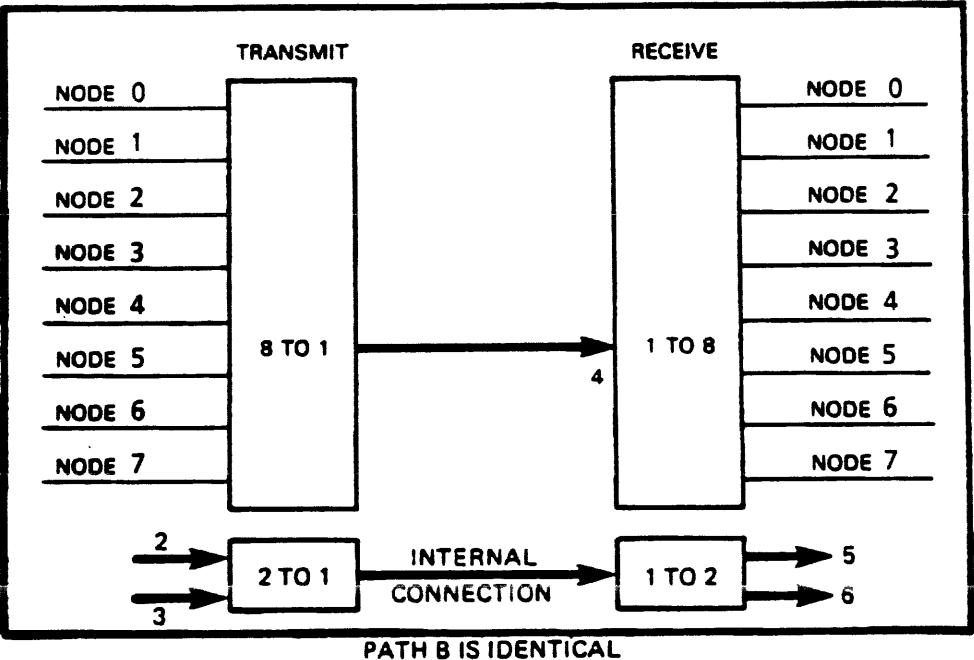
# Star Coupler Configuration (Cont.)

- An 8-node, dual path configuration electrically looks like this:



TK-10600

8-Node Configuration (Path A)

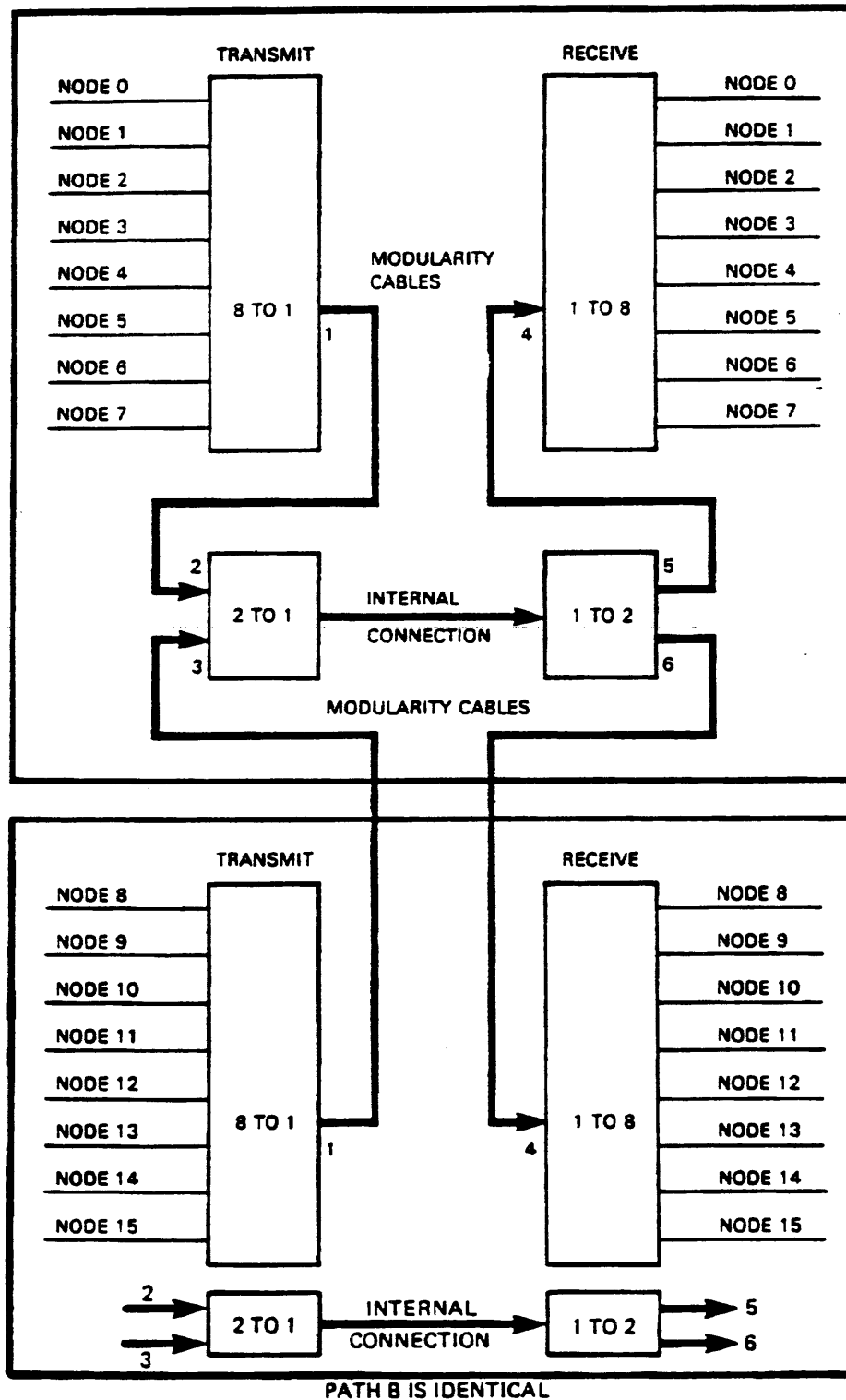


TK-10600

8-Node Configuration (Path A)

## Star Coupler Configuration (Cont.)

- A 16-node, dual path configuration electrically looks like this (only one path shown):



TK-10500

## CISCE (CI Star Coupler Extender)

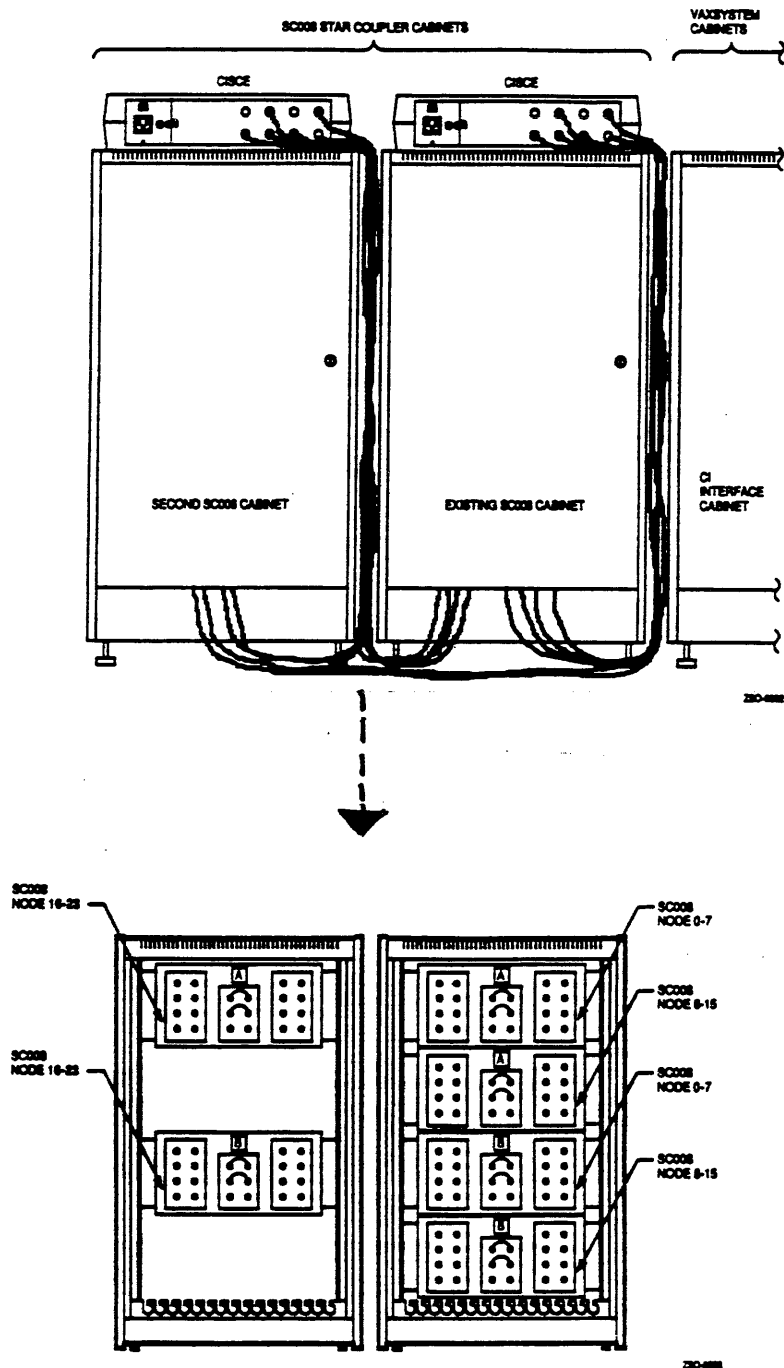
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- o Used to extend a CI cluster from 16 nodes to 24 nodes.
- o Maximum number of VAX processors allowed on CI cluster remains at 16: additional nodes beyond 16 must be HSC controllers.
- o VAXcluster prerequisites for CISCE use:
  - a. All nodes must use L0118 Link module.
  - b. All nodes must meet minimum hardware revision levels as specified in System Revision Control Document.
  - c. VAXcluster should be running VMS 4.7 or later.
  - d. HSC nodes should be running CRONIC 3.7 or later.
- o Requires the following additional hardware:
  - a. A second star couple cabinet containing two SC008 panels.
  - b. Two CISCE amplifier boxes (one for each path).
  - c. Four meter CISCE cable to connect amplifier box to Star coupler cabinet.
  - d. Separate power receptacle for amp boxes

## CISCE (CI Star Coupler Extender)

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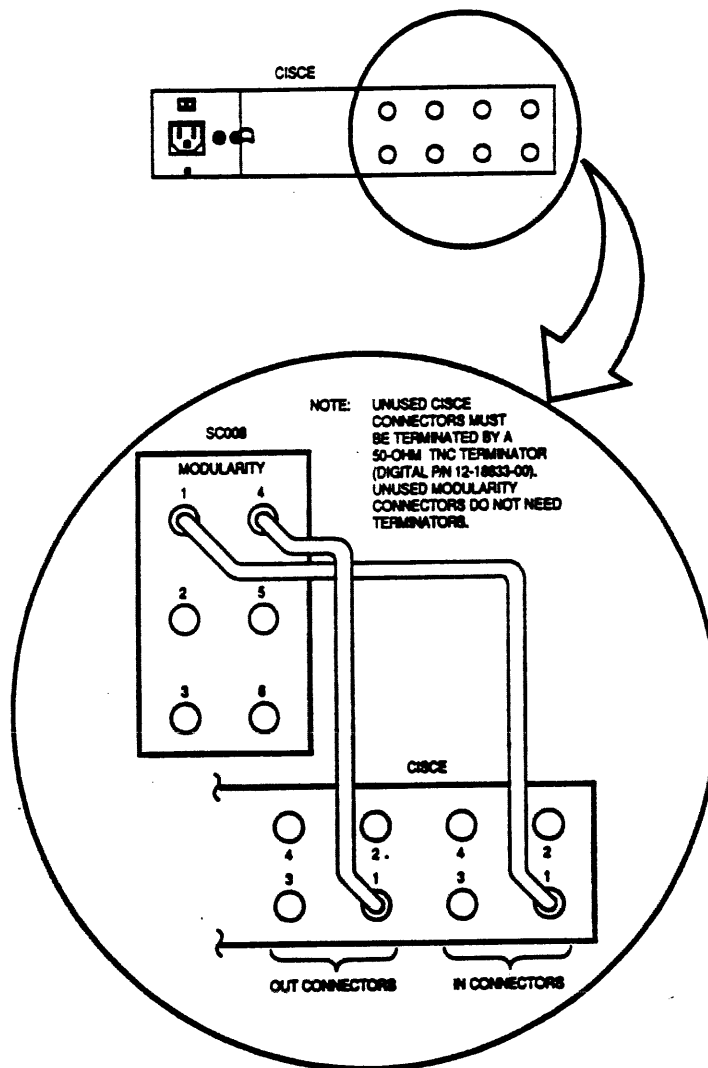
- o The following diagrams illustrate the external layout of the CISCE.



## CISCE (cont)

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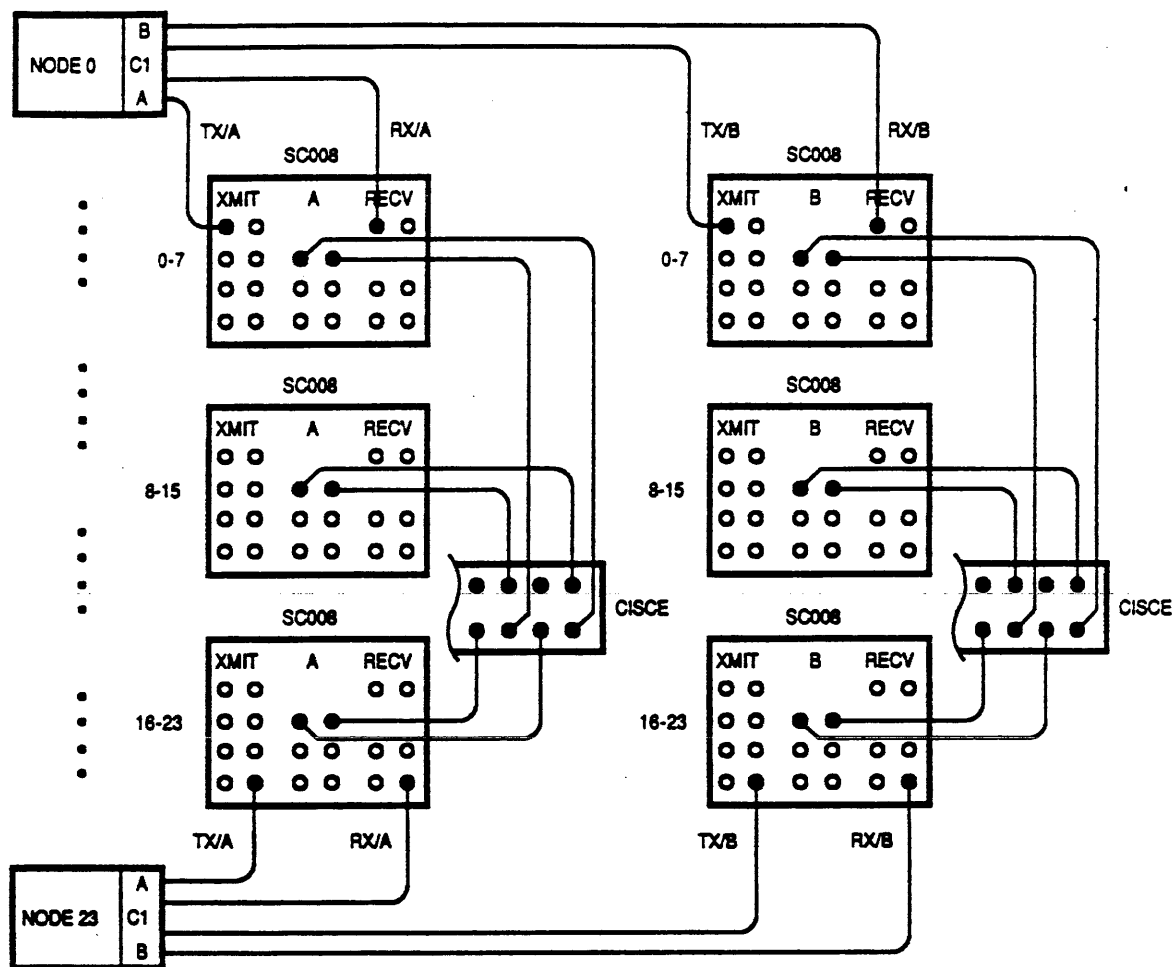
- o CISCE amplifier boxes are housed in a DECserver 200 common package.
- o Each box contains a power supply and a four amplifiers on one module.
- o Each amplifier shares four common signal sources (IN connectors).
- o Modularity output (connector 1) from SC008 panel is routed to one of the four IN CONNECTORS of the CISCE. Properly amplified output is sent through OUT CONNECTORS of the CISCE to modularity input (connector 4) of each available SC008 panel.



230-487

# CISCE (cont)

- o The following diagram illustrates a 24-node dual path configuration.



ZSC-0088

## **THE CI INTERFACE**



# **The CI Interface**

## **Lesson Introduction**

The CI Interface in each VAX is an intelligent interface between the System Bus of that VAX and the CI Bus. The microprocessor in the CI Interface runs its own microcode and can function fairly independently of the VAX processor. We will discuss the physical description and the installation for each of the different types of CI Interfaces.

## **Lesson Objectives**

1. Identify each of the different CI Interfaces.
2. Describe the difference between the CI750, CI780, CIBCA, and CIBCI.
3. Describe the physical characteristics of a CI Interface.
4. Install a CI Interface onto a CMI-, SBI-, or BI-based VAX.
5. Understand the distribution of power to the CI Interface.
6. Set the node address on a CI Port.

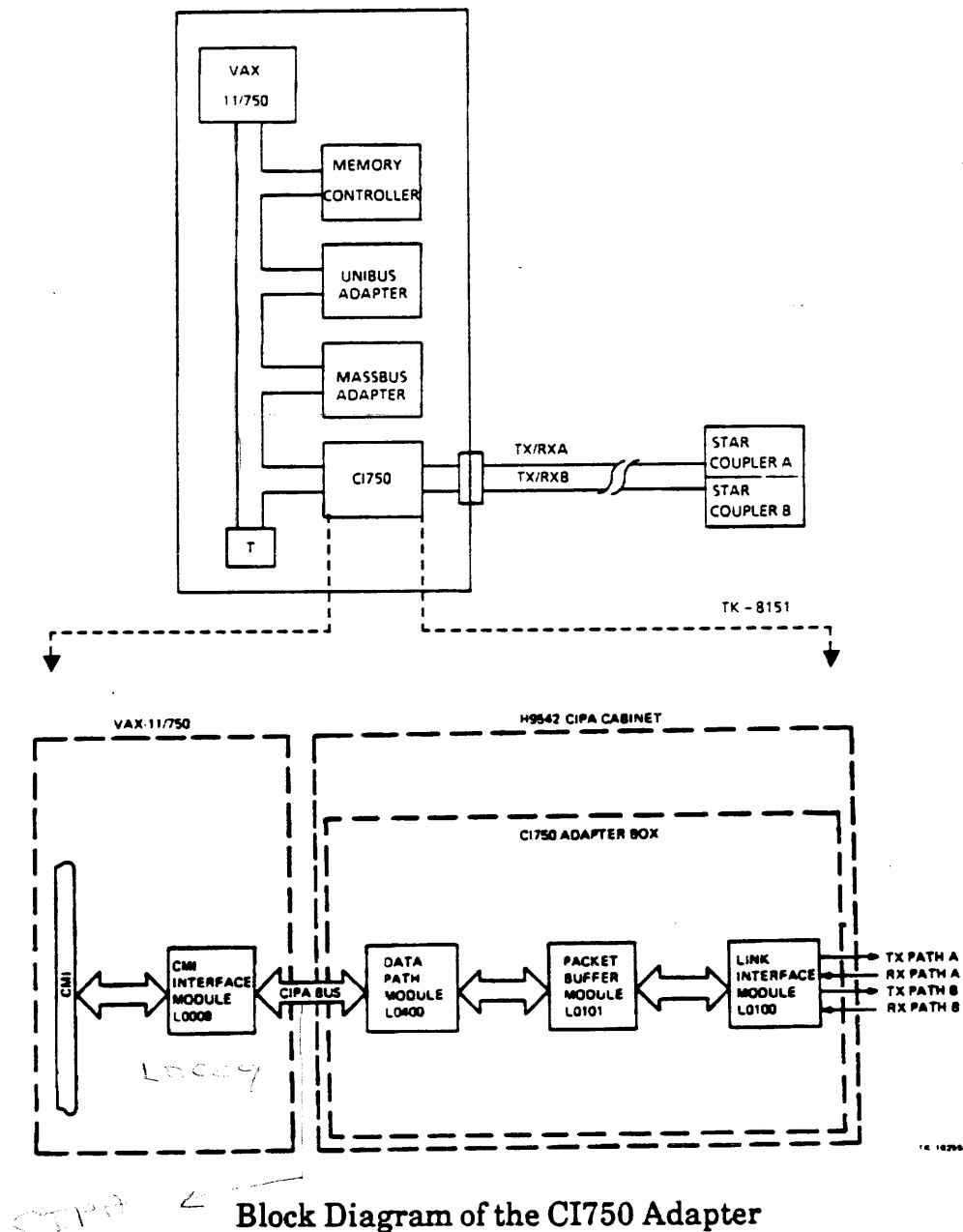
## **Lesson Outline**

- I. CI750
- II. CI780
- III. CI780 in a VAX 8600/8650
- IV. CIBCI

## **CI750 INTERFACE**

## The CI750 Port

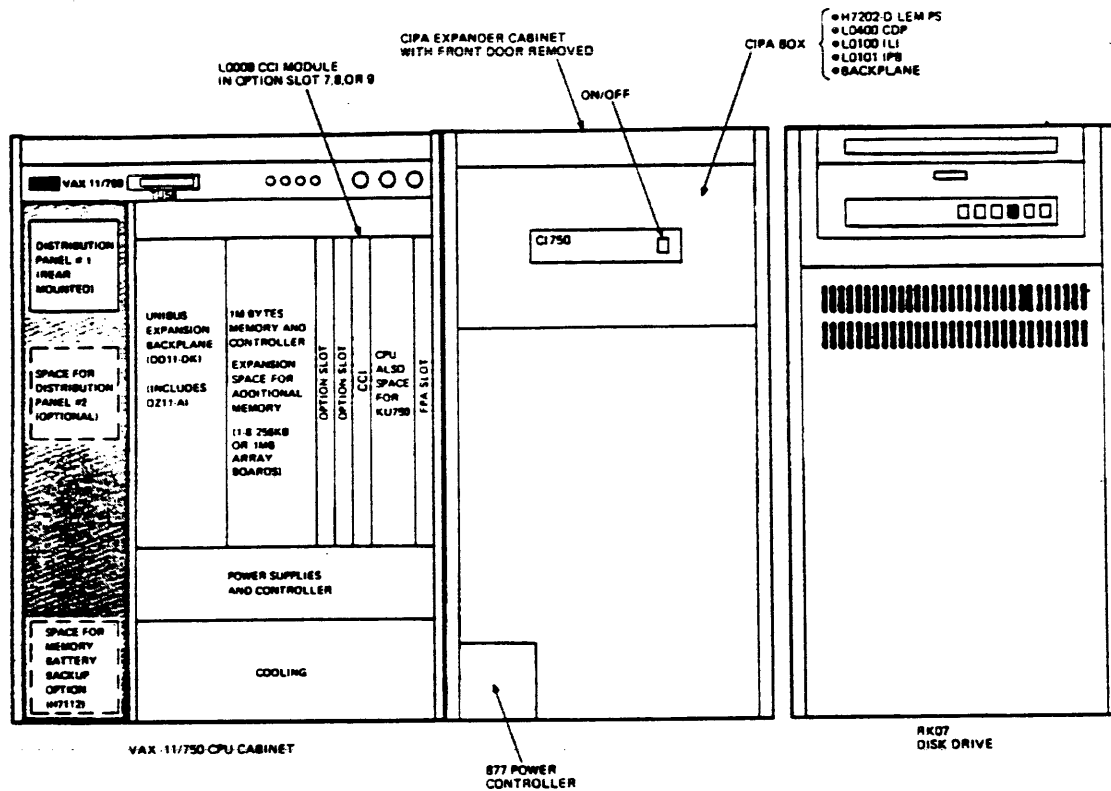
- Operates from the VAX 750 CMI bus.
- Functions as a buffered communications port adapter for the VAX 750 computer and other nodes within the CI Cluster.
- Reduces CPU overhead by performing data buffering, address translation, and serial encoding/decoding within the cluster environment.



Block Diagram of the CI750 Adapter

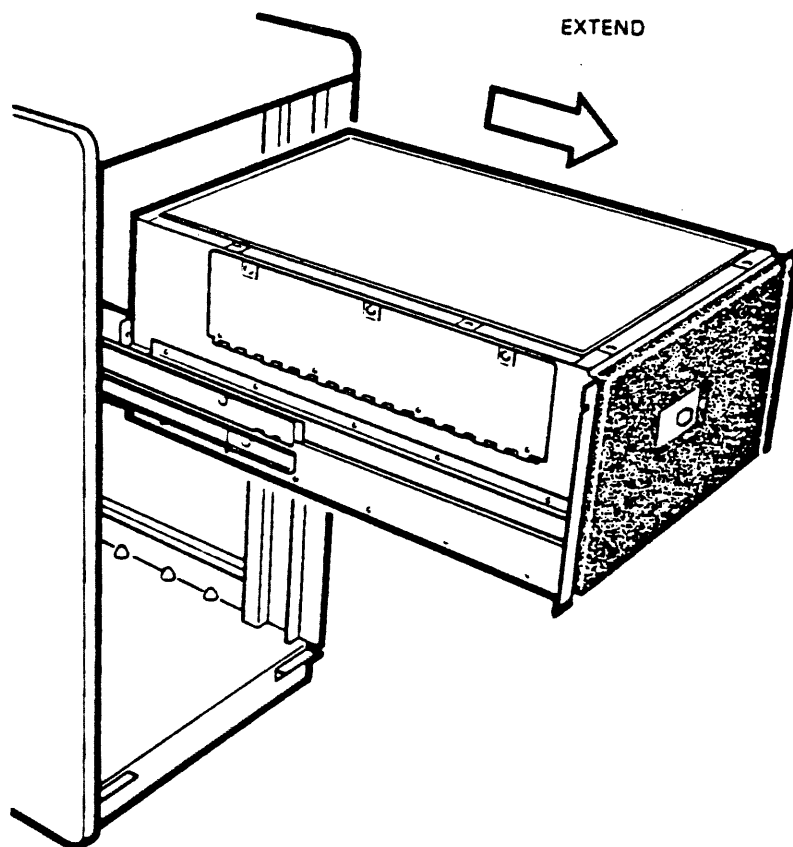
## **CI750 Installation Highlights**

- The CMI Interface module (L0009) is normally placed in option slot 7 of the CPU cabinet.
- The CI750 base address is normally F3E000, which is determined by jumpers on the backplane slot of the L0009 module. Note that to obtain this address, all jumpers are OUT.
- A priority plug on the L0009 module provides the CI750 with the proper Bus Grant selection, therefore no CMI backplane jumpers are needed.
- The CMI Arbitration jumpers should be set such that the CI750 is the LOWEST priority device of all the options present.
- Normally, the Slow CMI jumper will be OUT.
- CI Bus arbitration and quiet slot times are determined by jumpers on the CIPA box backplane.
- Boot timer default is determined by jumpers on the CIPA box backplane.
- Node address switches are on the link board in the CIPA box.



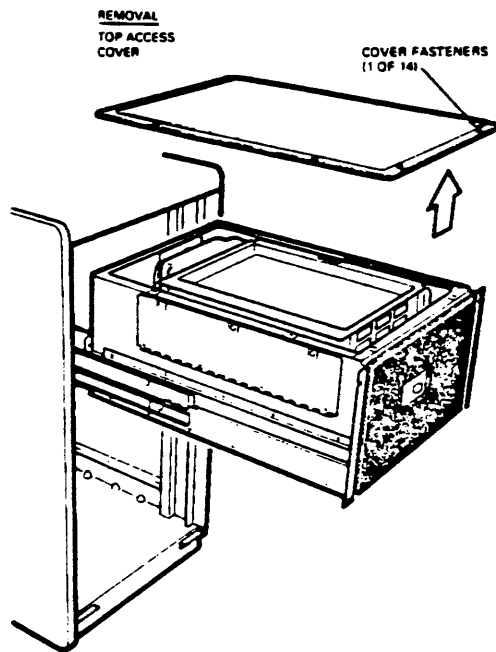
Front View of the CI750

## Extracting the CIPA Logic Box

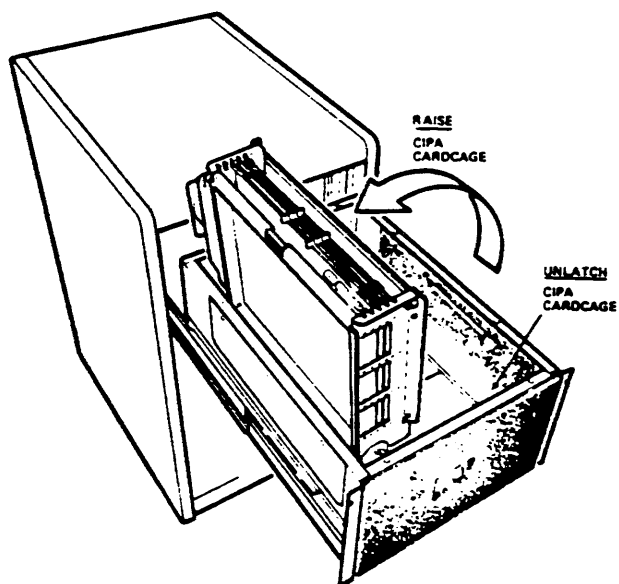


MKV86-1360

## CIPA Box Module Access



WMLV00-1 307



WMLV00-1 308

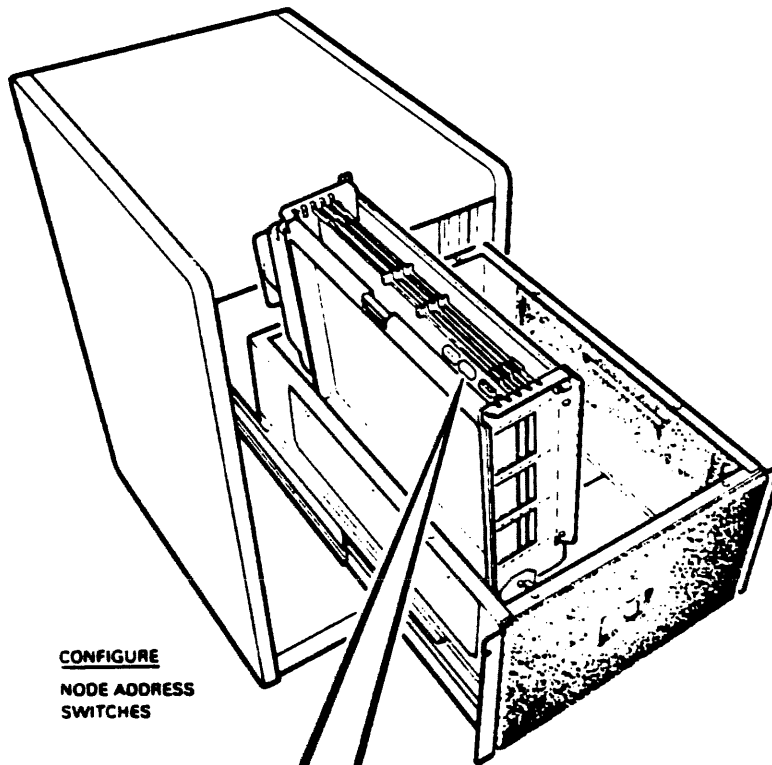
## CIPA Box Module Access (Cont.)

FOR  
CHIP  
CHASING  
ALLOWS  
BOARD  
TO BE  
PUT ON  
TOP OF STACK  
TO GET  
AT CHIPS

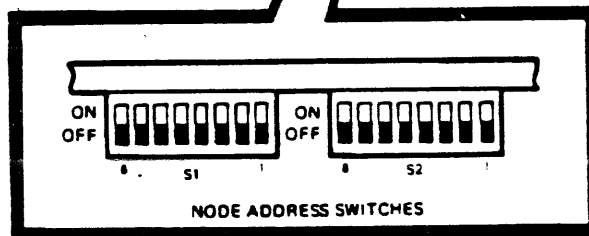
1	MAINT - CDP (L0400) ALTERNATE
2	MAINT - IPB (L0101) ALTERNATE
3	ILI (L0100)
4	NORMAL - IPB (L0101)
5	NORMAL - CDP (L0400)

TK-10507

### CI750 CIPA Module Utilization



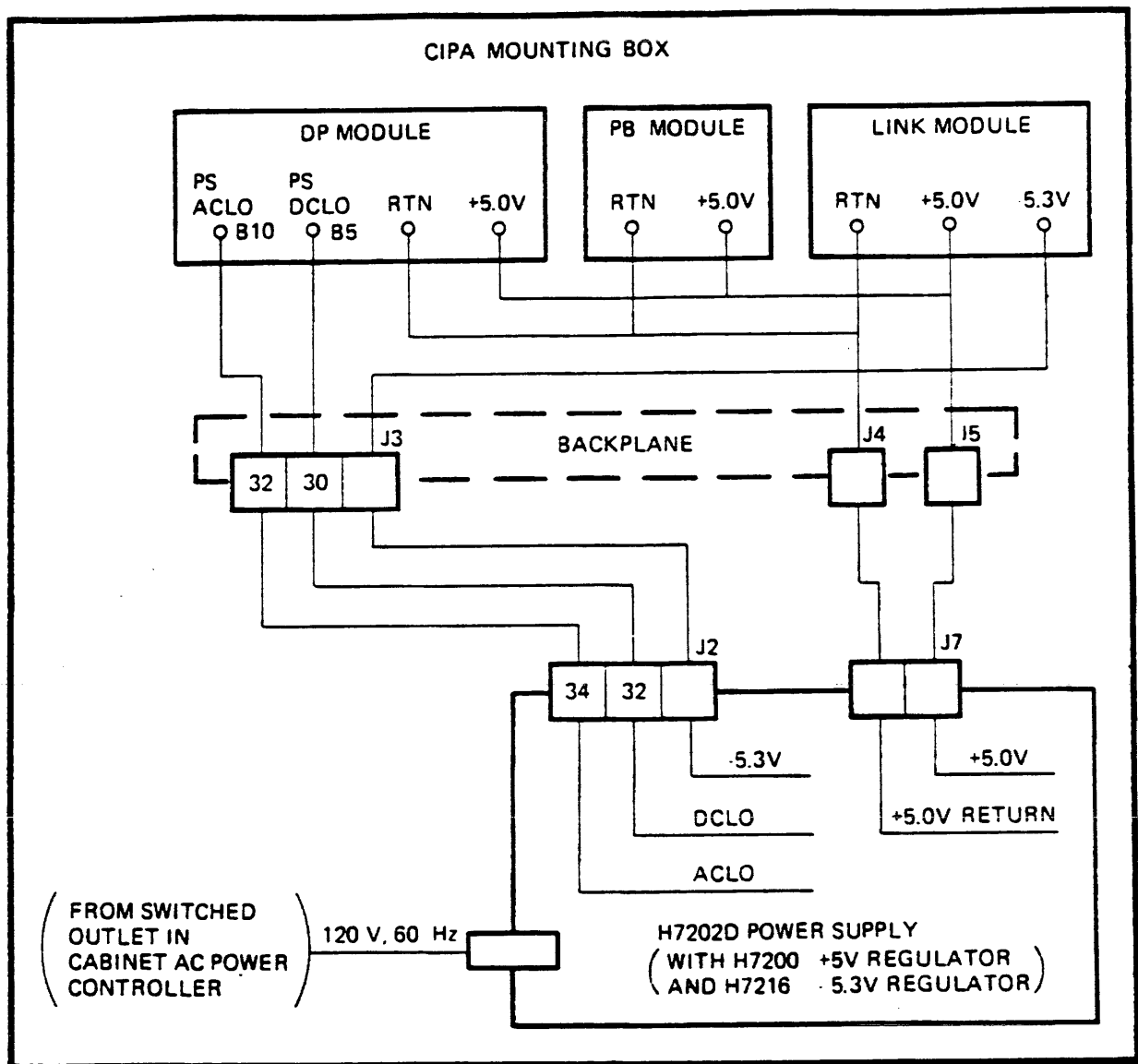
CONFIGURE  
NODE ADDRESS  
SWITCHES



MEV06-1383

### CIPA Mounting Box -- Module Access





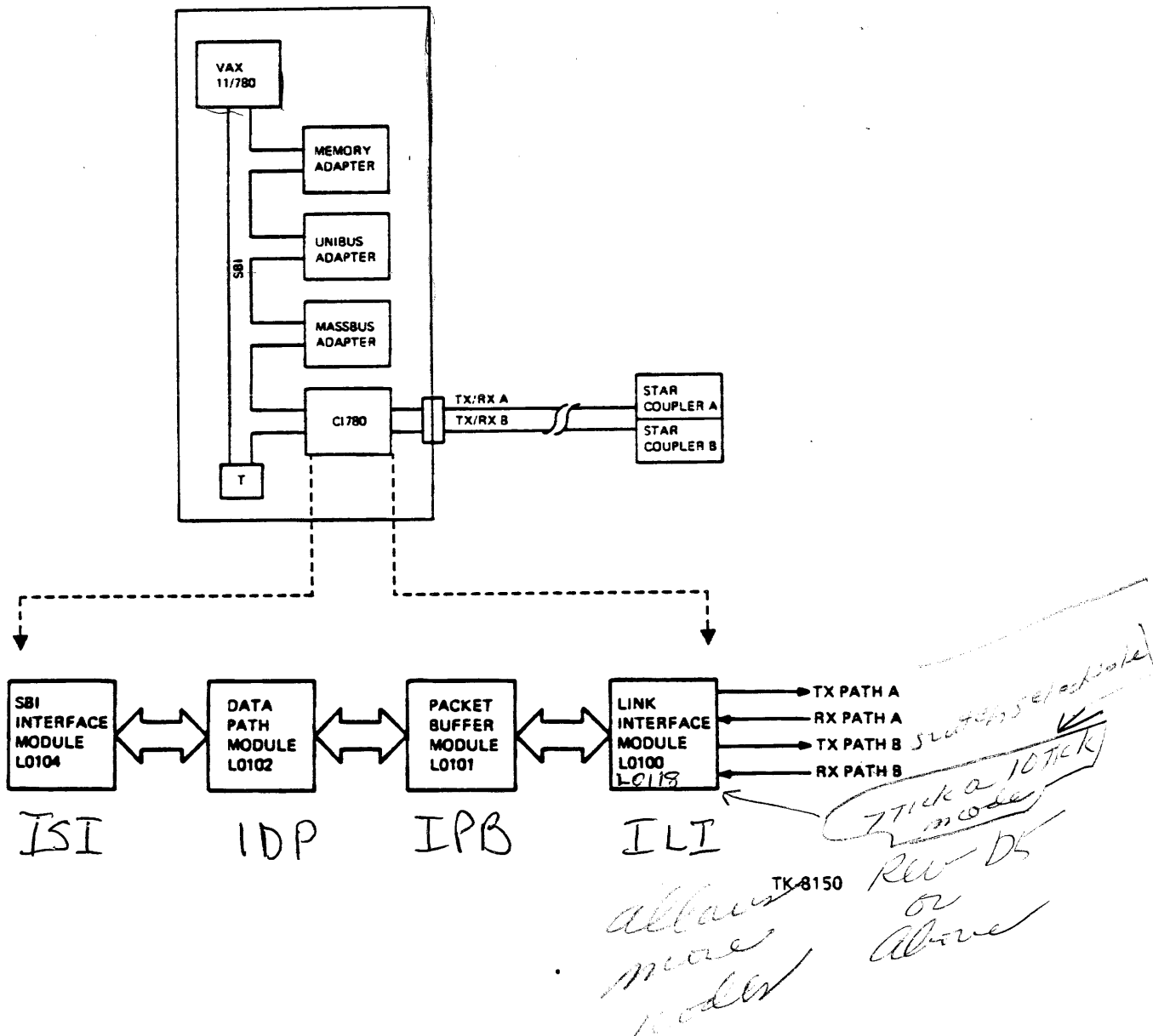
MKV85-0504

### CIPA Power Distribution

## **CI780 INTERFACE**

## The CI780 Port

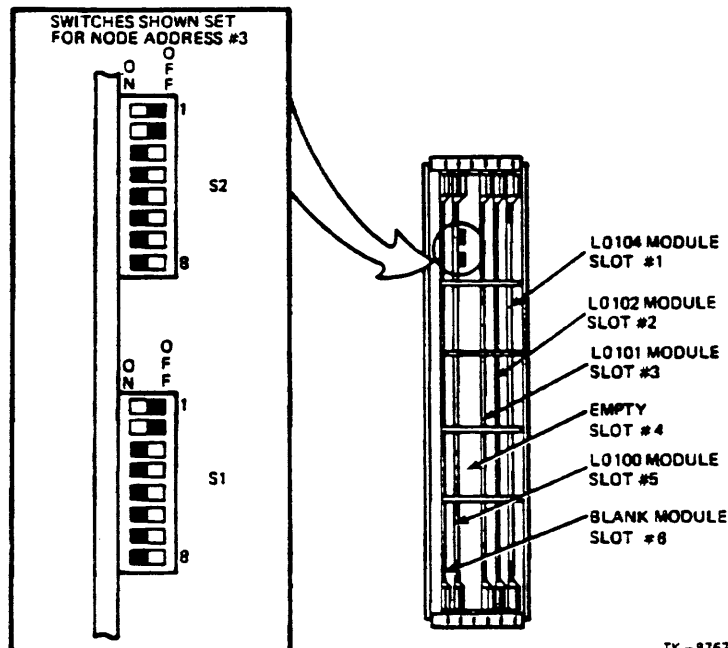
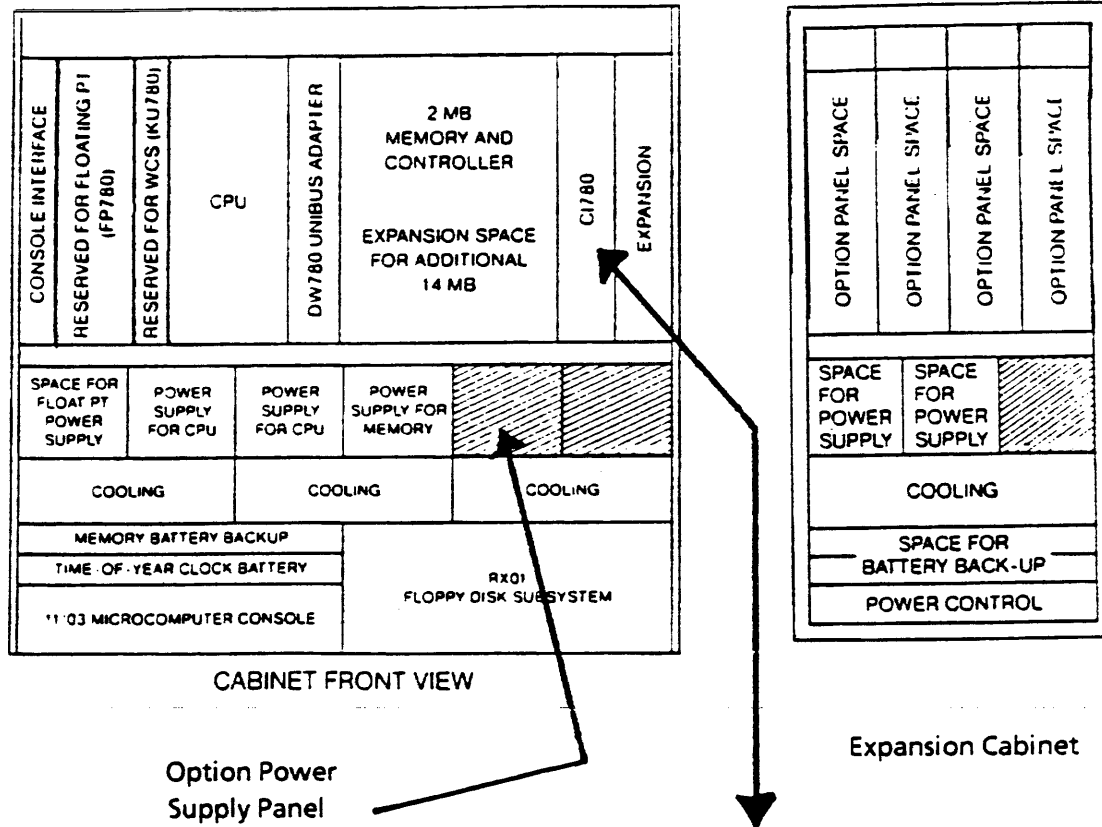
- Operates from the SBI bus on the VAX 780.
- The CI780 may be installed in any 4-inch option slot in either the standard CPU cabinet or an expansion cabinet of the host system.
- The CI780 option consists of four extended hex L-series modules and a pressed pin backplane.
- The diagrams below illustrate how the CI780 fits into the CPU configuration.



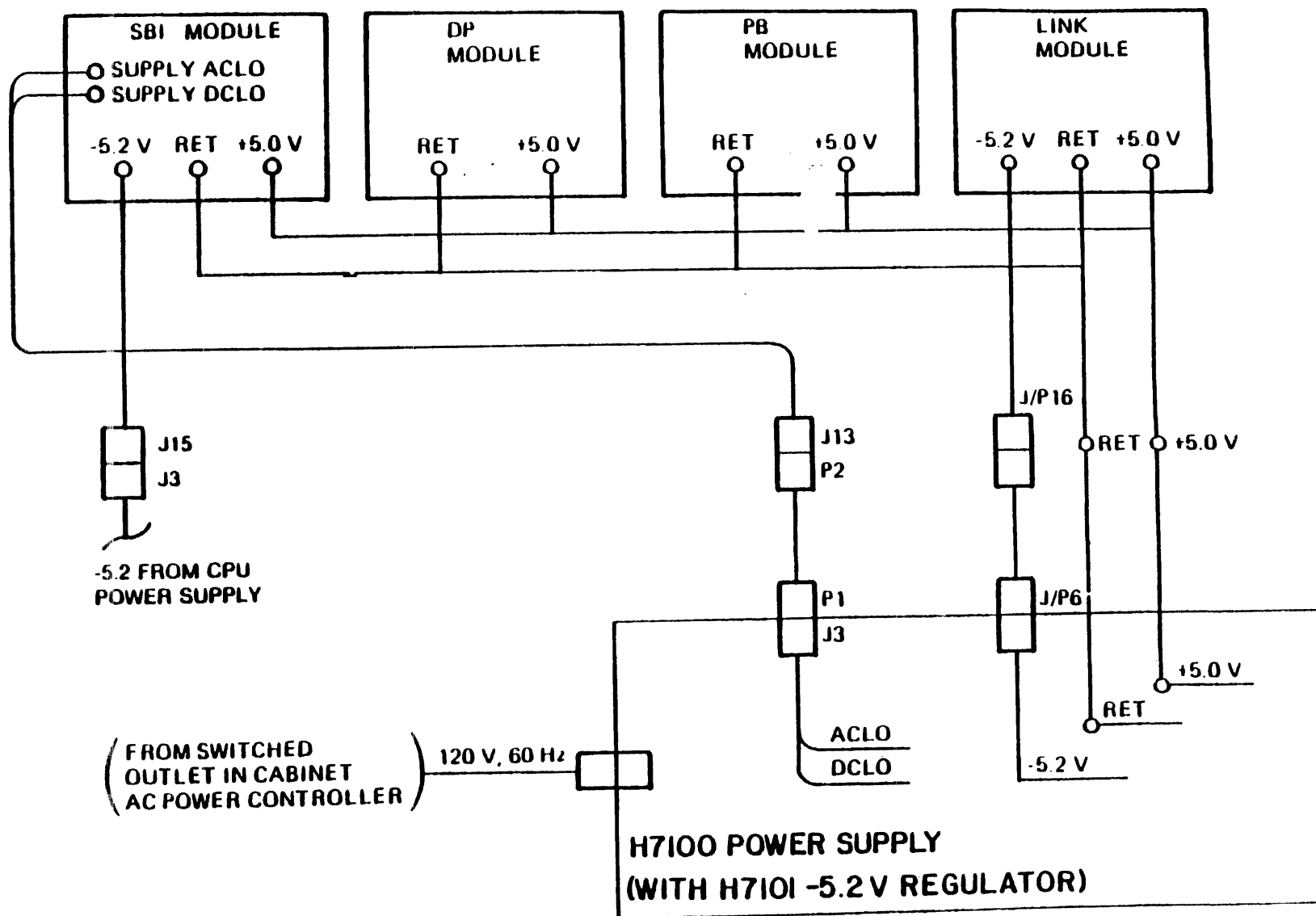
## **CI780 Installation Highlights**

- The CI Interface can be placed in an option slot in either the main CPU cabinet or the expansion cabinet.
- Pay attention to power supply for the interface: -5.2V is needed (comes with the H7100).
- The CI Interface is normally shipped with the TR arbitration level already set to 14 (physical address 2001C000) and the SBI BR priority level set to 4.
- Boot timer, quiet slot time, and arbitration times are determined by jumpers on the backplane of the CI780 assembly.

## The CI Port in the VAX 11-780



TK-8767



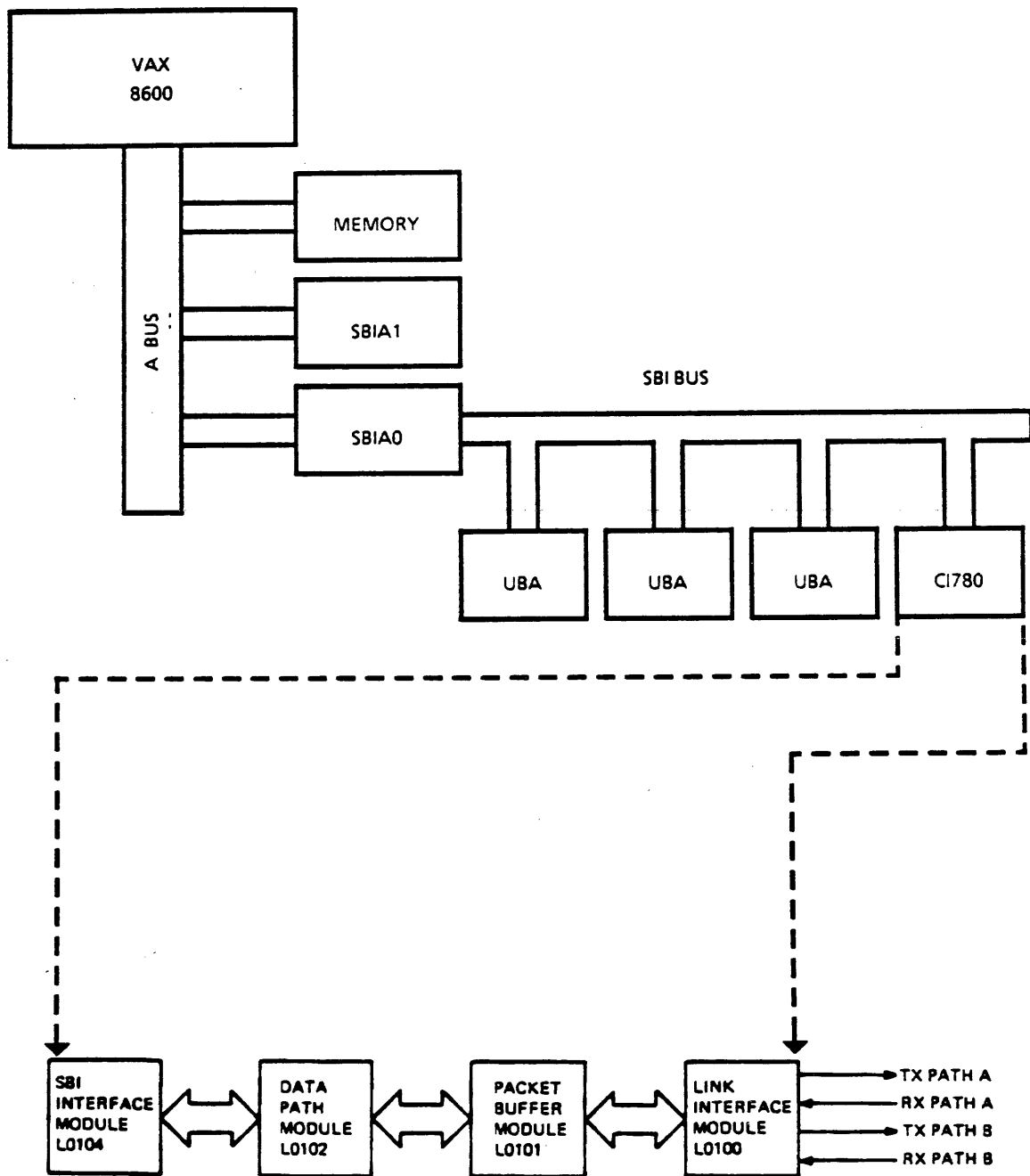
TK - 9099

CI780 Power Distribution

**VAX 8600/8650**

## The CI780 on the VAX 8600/8650

The CI Port hardware for the VAX 86xx CPU family resides on the SBI Bus. Therefore, the same four boards that compose the CI780 for the VAX 780 are used on the VAX 8600 and 8650.

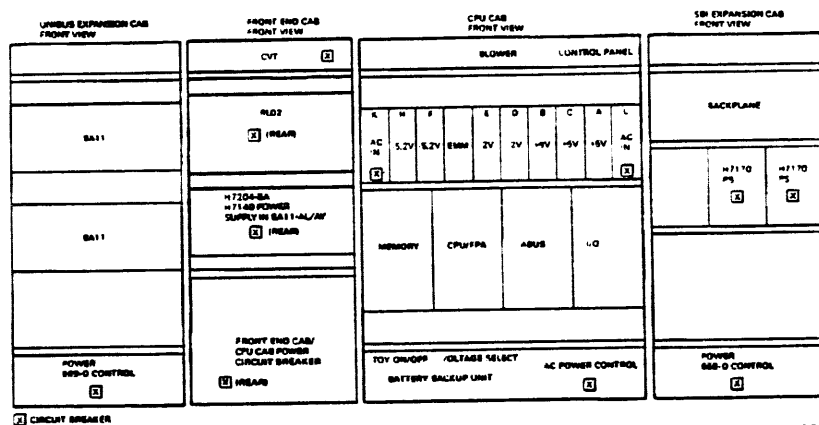


TK-8150



## Installing the CI780 on the VAX 8600/8650

- Installing the CI780 adapter on the VAX 86xx is easier than installing one on the VAX 780 because you do not have to worry about power supplies or backplane installation. In the 86xx, the necessary power supplies and backplane are already there.
- The CI780 boards go in slots 21 through 24 on the I/O cardcage as shown below.



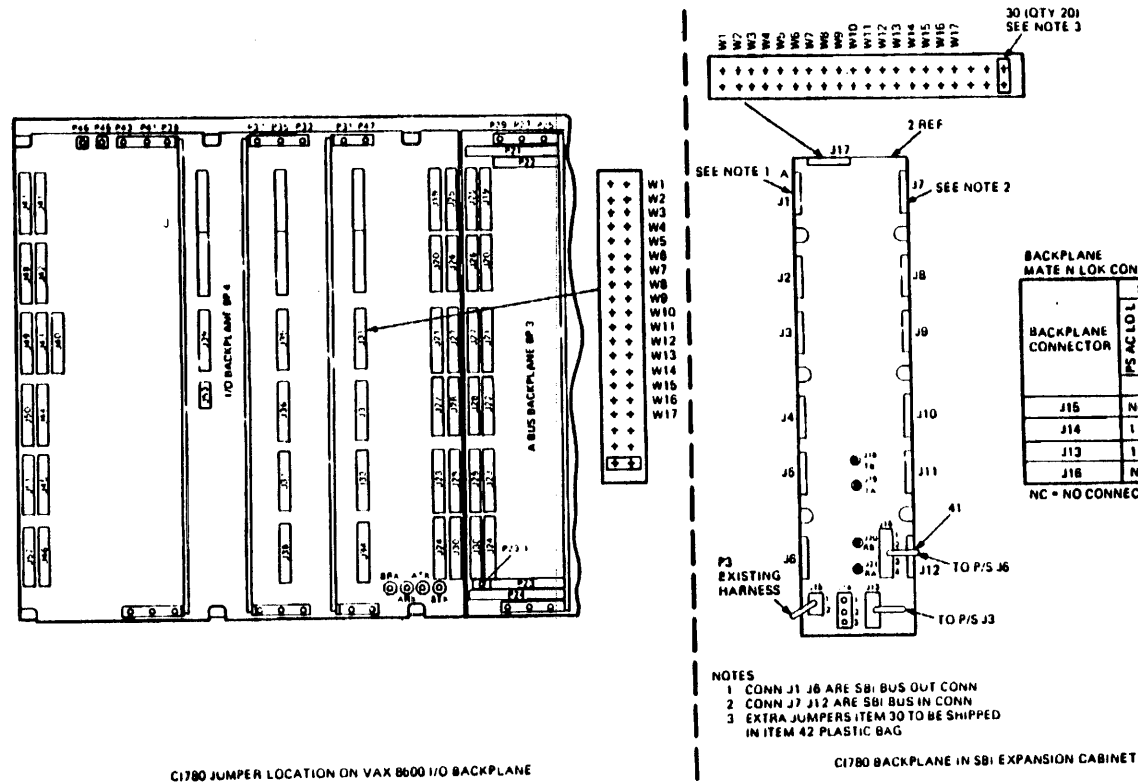
MR - 14665

OPTION	MODULE	BACKPLANE	SLOT
CI780-MA	L0100	I/O	24
CI780-MA	L0101	I/O	23
CI780-MA	L0102	I/O	22
CI780-MA	L0104	I/O	21
D886-AA	L0202	ABUS	04
D886-AA	L0203	ABUS	05
DW780-MA	M8273	I/O	14
DW780-MA	M8272	I/O	13
DW780-MA	M8271	I/O	12
DW780-MA	M8270	I/O	11
FP86-AA	L0213	CPU	07
FP86-AA	L0212	CPU	08
MS86-B	L0200	MEMORY	01-08
MS86-CA	L0225	MEMORY	-
MS86-B/CA	L9200	MEMORY	05,08
MS86-B/CA	L0222	MEMORY	09
TU81	M8739	I/O	02
UDA50	M7486	I/O	03
UDA50	M7485	I/O	04
DW780-MA	M8270	I/O	06
DW780-MA	M8271	I/O	07
DW780-MA	M8272	I/O	08
DW780-MA	M8273	I/O	09

\*INSTALLED IN SLOTS 01, 03, 05, AND 07.

MR-0186-0113

## Internal Option Module Installation



MR - 16191

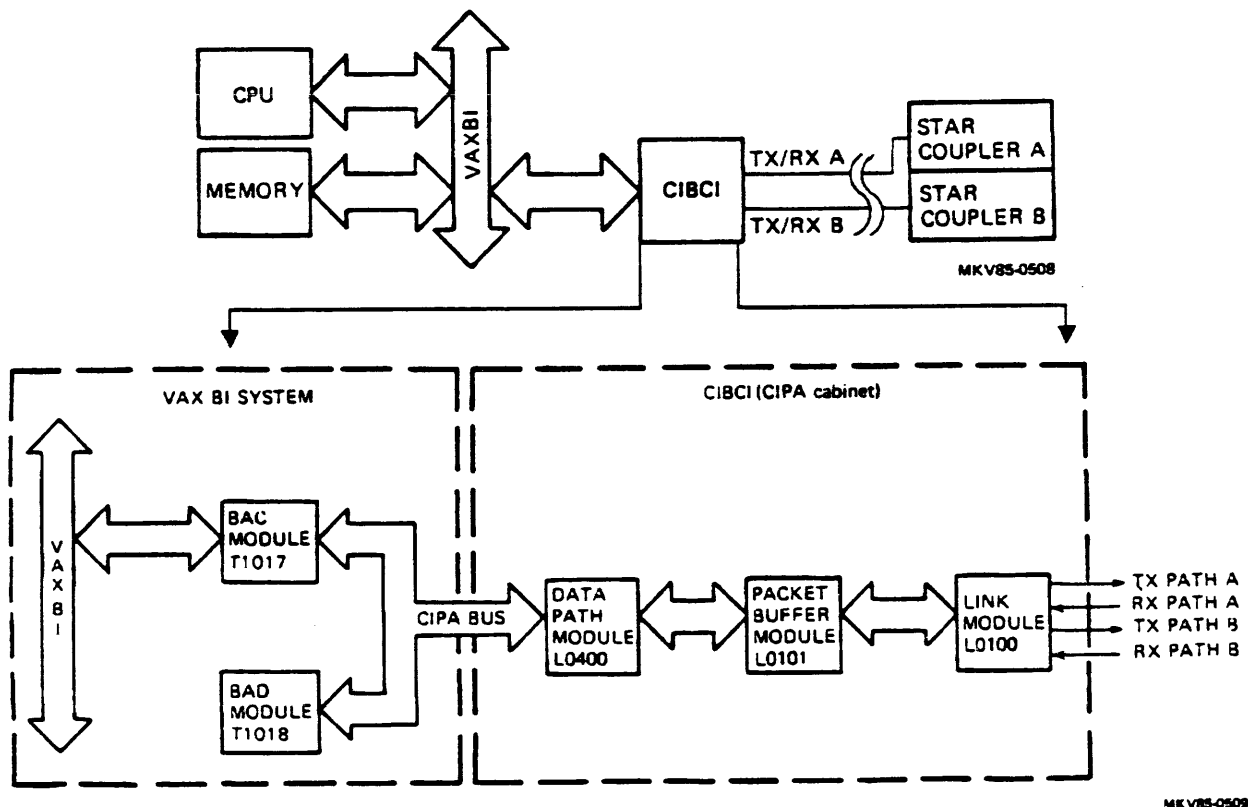
## CI780 Backplane Jumper Locations

# **CIBCI VAXBI INTERCONNECT**

OBSOLETE

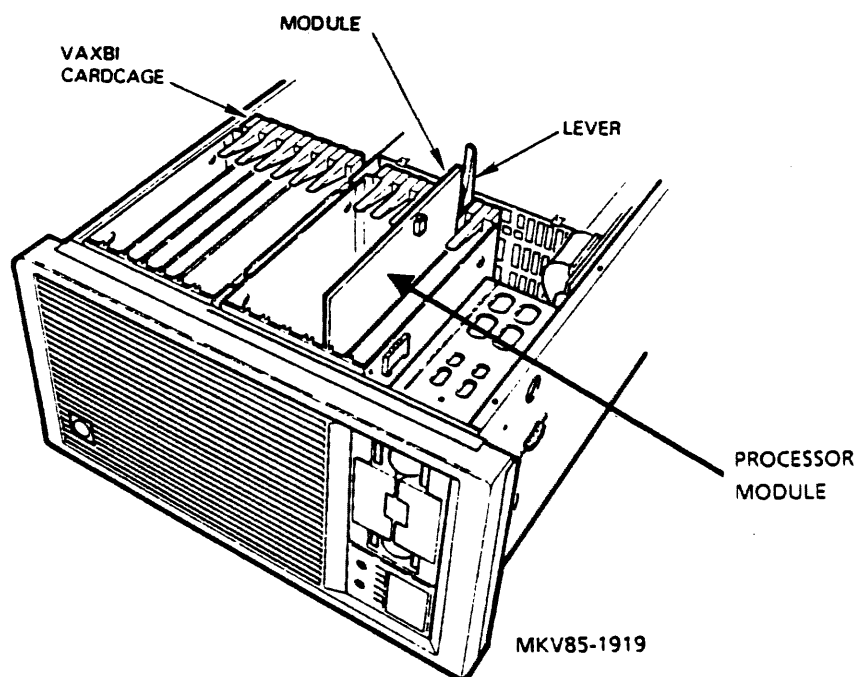
## The CIBCI Interface

- The CIBCI is the interface used to connect a VAXBI system (82xx, 83xx, 85xx, 87xx, 88xx) to the CI Cluster.
- The CIBCI adapter is partitioned into two separate hardware interfaces: one host processor interface and one computer interconnect port adapter interface. These interfaces consist of the following major components.
  - Two Eurocard T-series modules
    - a. Adapter control module (BAC) T1017
    - b. Adapter data module (BAD) T1018
  - Three extended hex L-series modules
    - a. Link interface module (ILI) L0100
    - b. Packet buffer module (IPB) L0101
    - c. Data path module (CDP) L0400

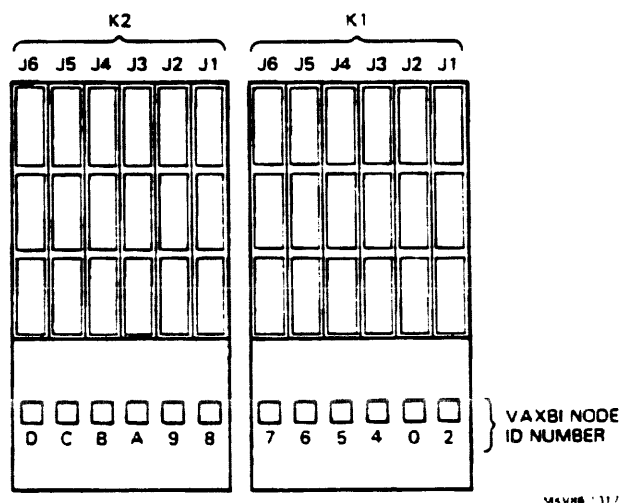


## Location of the CIBCI Adapter (VAX 82xx, 83xx)

- The following figures show the module layout for VAX 82xx and 83xx family computers. The CIBCI host processor interface goes in any two unoccupied option slots.
- Slot K1J1 always contains the primary CPU module. The CIBCI option is installed so that the BAC module is always to the left of the BAD module.



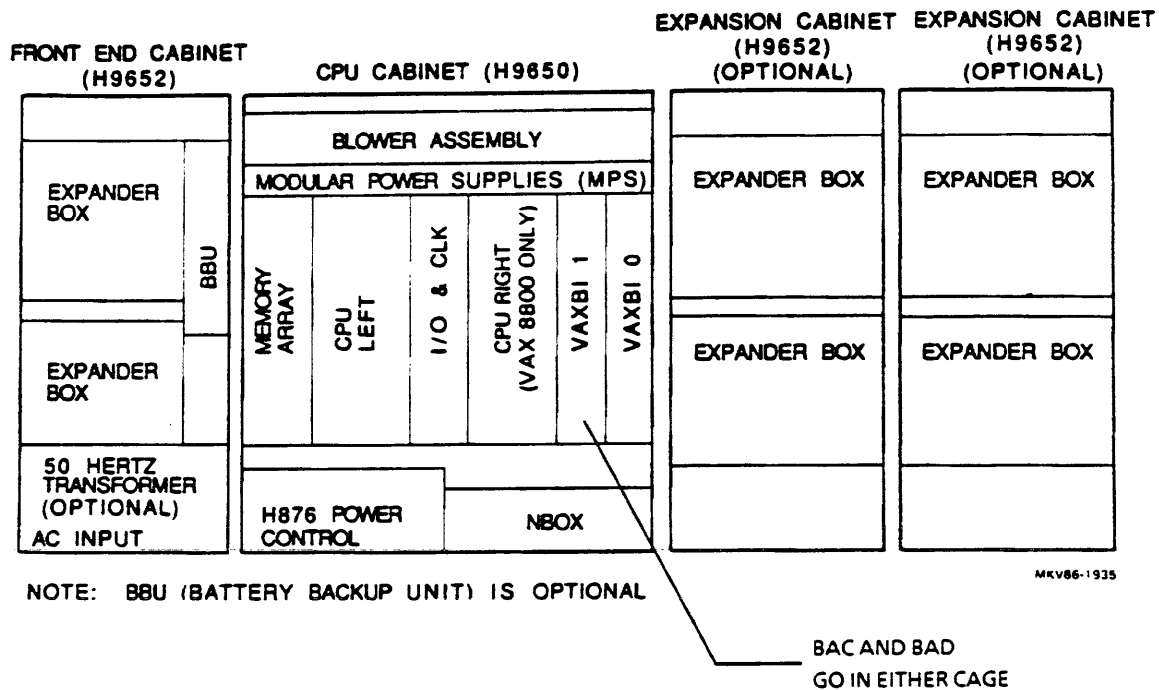
The 12-VAXBI Slot Cabinet



Top View of VAXBI Slot Cabinet

## Location of the CIBCI Adapter (VAX 85xx, 87xx, 88xx)

The CIBCI host processor interface (BAC and BAD modules) goes in either BI cage assembly, while the remaining boards of the port adapter interface go in the external CIPA cabinet.



VAX 8700/8800 System Cabinet Layout



3-32

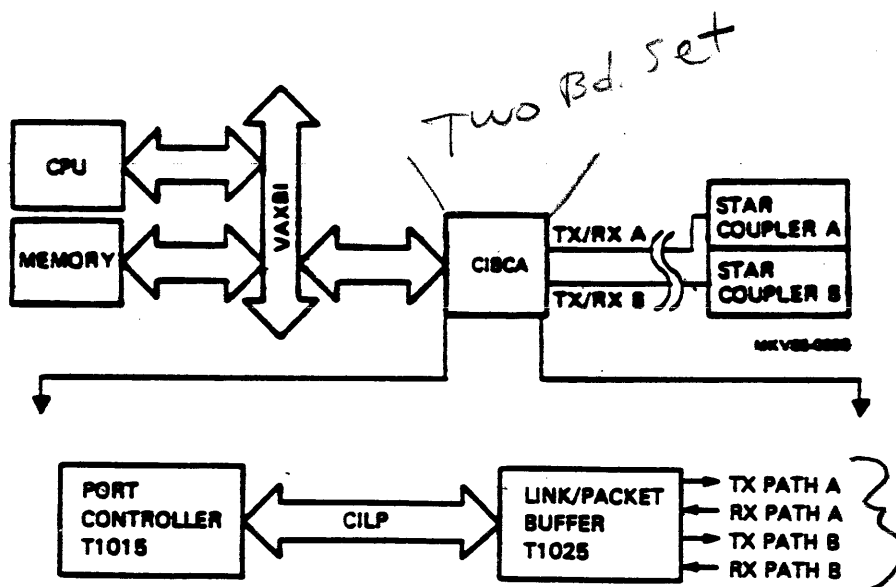
# **CIBCA VAXBI INTERCONNECT**



## The CIBCA-AA Interface

-----

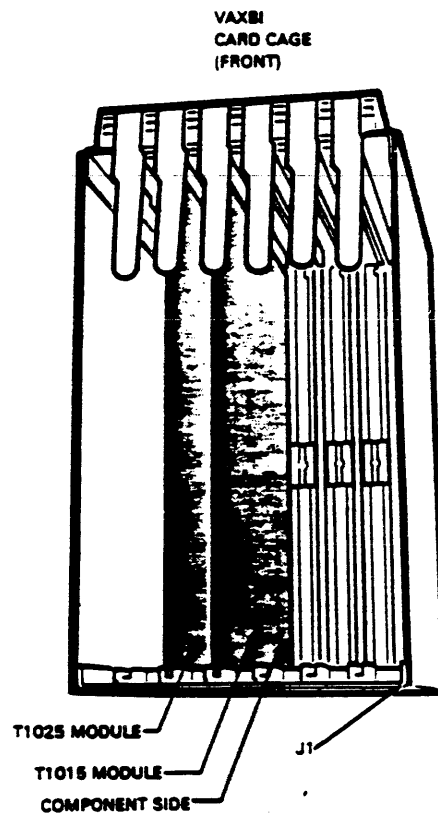
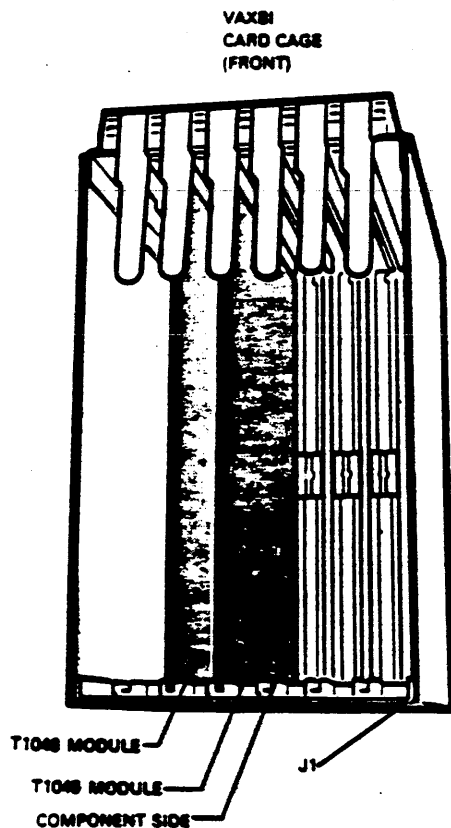
- o The CIBCA-AA is used to connect a VAXBI system (83xx, 85xx, 88xx, 62xx) to the CI cluster.
- o The CIBCA-AA adapter is composed of two separate hardware modules:
  - a. T1015 port controller
  - b. T1025 link/packet buffer
- o The CIBCA is functionally identical to the CIBCI: provides buffered parallel-to-serial communications between the BI bus and the CI bus.
- o The T1015 (port controller) manages the operation of the T1025 via the CI Link Protocol (CILP) bus.



## CIBCA Installation Highlights

---

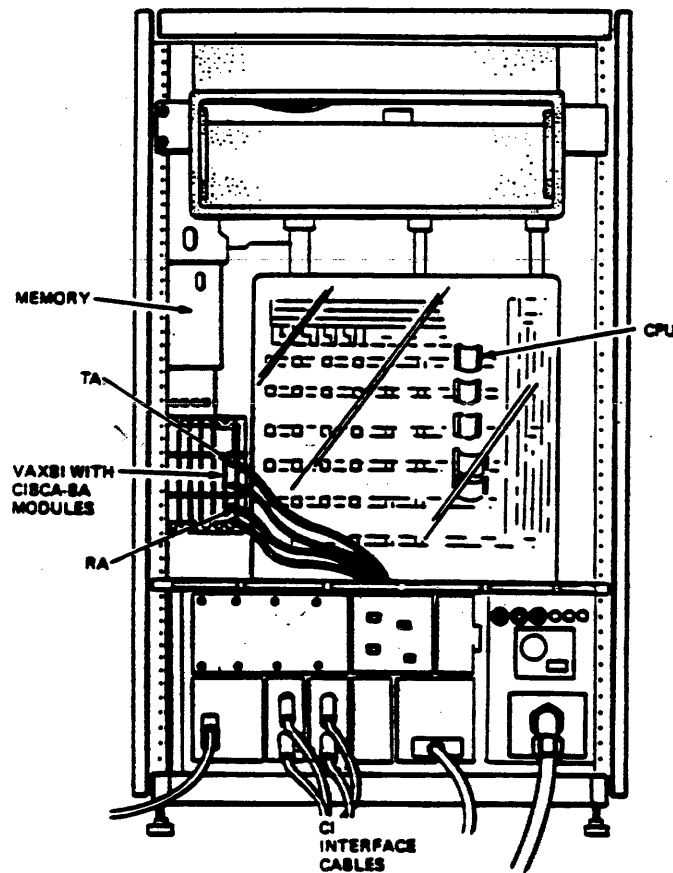
- o The CIBCA modules occupy any two adjacent slots in the BI card cage.
- o The "preferable" order is with the port controller module in the lower numbered slot. *To the right*
- o The CIBCA-AA uses microcode file CIBCA.BIN which is loaded from the console media on system boot.
- o The CIBCA-BA uses microcode file CIBCB.BIN which is resident on EEPROM so is not loaded at system boot. Use update utility EVGDA to manually load CIBCB.BIN from console into CIBCA interface.



## Location of CIBCA Adapter (VAX 8500)

-----

- o CI cables attach directly to the BI backplane.
- o BI node number determined by encapsulated plug.
- o CI node number determined by backplane jumpers (no switchpacks on CI adapter).
- o Backplane jumper assignment is the same for CIBCA-AA and CIBCA-BA.



CIBCA-BA Adapter in a VAX 8500 Series

## **CI PORT DIAGNOSTICS**

# CI Port Diagnostics

## Lesson Introduction

Three major diagnostic tools are available for testing the CI Interface.

The repair diagnostics test each section of the hardware one at a time. After checking the condition of the Data Path, ALU, and microsequencer, small microcode routines are loaded into the control store and executed to test the rest of the individual pieces of the CI hardware. These require exclusive use of the CI Port and will call out the failing FRU. STAND ALONE

} Lowest Level

The functional diagnostics test the CI Port using the actual functional microcode. These are used to check the CI's ability to execute each of the functions that the standard microcode supports. They also require exclusive use of the CI Port.

The CI Exerciser is simply a verification of the CI Port's ability to communicate with a remote node. This exerciser will use the hardware and software that the operating system uses. It functions in conjunction with the operating system and does not interfere with any phase of the VAXcluster.

## Lesson Objectives

1. State the purpose of each CI diagnostic and describe when each should be used.
2. Describe how to prepare for and run each CI diagnostic.
3. Verify the correct operation on the CI Port.
4. Verify the integrity of the CI Bus.
5. Identify the failing FRU in the CI Port.

## Lesson Outline

- I. Diagnostic Introduction
- II. CI750 Repair Diagnostics
- III. CI780 Repair Diagnostics
- IV. CIBCI Repair Diagnostics
- V. CI Functional Diagnostics
- VI. CI Exerciser



## CI DIAGNOSTIC SUMMARY

## REPAIR DIAGNOSTICS (Level 3)

CI750 (750) -----	CI780 (780,86xx) -----	CIBCI (82xx,83xx,85xx,88xx) -----
ECCGA	EVCGA	EVCKA
ECCGB	EVCGB	EVCKB
ECCGC	EVCGC	EVCKC
ECCGD	EVCGD	EVCKD
ECCGE		EVCKE
		EVCKF
		EVCKG
CIBCA-AA (83xx,88xx) -----		CIBCA-BA (83xx,88xx,62xx) -----
EVGCA		EVGEE (EVGER)
EVGCB (EVGCK)		EVGEF (EVGEL)
EVGCC (EVGCL)		EVGEG (EVGEM)
EVGCD (EVGCM)		EVGDA (CIBCB.BIN)
EVGCE (EVGCN)		

MCODE  
TAG ALONG  
FILES  
REQUIRED BY  
DIAGS

UPDATES EEPROM MCODE

- o CIBCA repair level diagnostics need repair level microcode to run properly (name of this microcode file is given in parenthesis).
- o Test the detailed hardware operation of the CI adapter.

FUNCTIONAL DIAGNOSTICS (Level 3) *stand alone*

- o EVGAA and EVGAB are used on all CI interfaces.
- o Test the functional operation of the CI adapter when connected to a star coupler.
- Use of Event Flag 1 is important when running functionals.



Clear = use microcode that is already loaded  
~~set~~ = load new microcode from load device

SET FLAG AFTER  
LOADING DIAG.

→ must have VMS

CI EXERCISER (Level 2R) EVXCI

MUST BE INSTALLED

ITS A SAVESET - NOT NORMALLY ON SYSTEM.

- o Used to test communication between nodes within a CI cluster.
- o Used to find a failing node or verify a repair.

## Diagnostic Summary

### Repair Diagnostics (Level 3)

<u>CI750</u>	<u>CI780 (780,86xx)</u>	<u>CIBCI (82xx,83xx, 85xx,87xx,88xx)</u>
ECCGA	EVCGA	EVCKA
ECCGB	EVCGB	EVCKB
ECCGC	EVCGC	EVCKC
ECCGD	EVCGD	EVCKD
ECCGE		EVCKE
		EVCKF
		EVCKG

### Functional Diagnostics (Level 3)

- EVGAA and EVGAB are used on all CI Interfaces.
- Test the functional operation of the hardware and the microcode of CI Port.
- The use of Event Flag 1 is important when running functional diagnostics.

Clear = use microcode that is already loaded

Set = load new microcode from load device

### CI Exerciser (Level 2R)

- Used to test communications between nodes.
- Used to find a failing node.
- Used to verify a repair.



## Using the Autosizer on a CI Port

- Attaching the necessary devices in order to run repair or functional diagnostics on the CI Port can be facilitated by using the EVSBA/autosizer.
- The user should verify that the node number found by the autosizer is the true node number. This is best done by running EVSBA in the Self-Test mode.

VAX PAX  
VERSION 32 AND UP OK

DS> RUN EVSBA/SEC:SELFTEST

.. Program: EVSBA - AUTOSIZER LEVEL 3, revision 5.2, 3 tests, at 17:24:42.05.

COMMAND? SIZE



!AUTOMATIC SIZING PROGRAM.

!THIS IS A TOOL AND NOT A DIAGNOSTIC PROGRAM.

DS>ATTACH KA86 HUB KAO YES YES 1FFF 0

DS>ATTACH SBIA HUB SIO

DS>ATTACH DW780 SIO DWO 3 4 ! UNIBUS I/O SPACE NUMBER 0

DS>ATTACH CI780 SIO PAA0 14  01 

COMMAND? CHANGE PAA0 NODE

ENTER VALUE: DECIMAL 0 THRU 255: 4

COMMAND? ATTACH

COMMAND? EXIT

VERIFY  
NODE  
#  
GIVEN BY AUTOSIZER  
IF WRONG -  
CHANGE

... End of run, 0 errors detected, pass count is 1, time is 17-jan-1987 17:26:25.14

- Note that the order of commands entered by the user to change the node number was:

SIZE

CHANGE

ATTACH

EXIT

SELECT PAA0

## Booting Into the Diagnostic Supervisor on a VAX-11/750

- To boot from a disk, insert the disk from which you are booting. From the console mode, type:

```
>>> INITIALIZE  
>>> B/10 ddcu
```

where:

dd = the two character device code of the boot device

c = the channel adapter to which the boot device is attached

u = the drive number of the boot device

For example:

```
>>> B/10 DMA0 -- boots from an RK07 on drive 0 of channel adapter A
```

```
>>> B/10 DBA0 -- boots from a MASSBUS disk on drive 0
```

- To boot from the console TU58, insert the appropriate tape cartridge. From the console mode, type:

```
>>> INITIALIZE  
>>> B DDA0
```

Once the Diagnostic Supervisor has been loaded and started it will identify itself and issue its user prompt:

```
DS>
```

## Repair-Level Diagnostics for the CI750

>>>8/10 DMA1

%%

DIAGNOSTIC SUPERVISOR. ZZ-EXSAA- 6.10-323 15-MAR 1983 10:04:46

DS> ATTACH CI750 CMI PAA0 15 4 2

DS> SELECT PAA0

DS> SHOW SELECT

\_PAA0 CI750 HUB 40F3E000 SLOT=15. BR=4. Node-2.

DS> LOAD ECCGA

DS> SET TRACE

DS> START

.. Program CI750 - ECCGA Repair Level, revision 1.0, 13 tests.  
at 10:10:11.57.

Testing: \_PAA0

Test 1: CNFGR REG - LONGWORD WRITE ACCESS

Test 2: CNFGR REG - LONGWORD READ ACCESS TEST

Test 3: CNFGR REG - LONGWORD READ/WRITE TEST

Test 4: CIPA TIME OUT TEST

Test 5: RCV FILE - ADDRESS TEST

Test 6: RCV FILE - DATA PATH TEST

Test 7: XMIT FILE - ADDRESS TEST

Test 8: XMIT FILE - DATA PATH TEST

Test 9: XMIT FILE - READ/WRITE COUNTER TEST

Test 10: CMMD ADDR REG - READ/WRITE AND DATA PATH TEST

Test 11: CMMD ADDR LO REG - READ INCREMENT TEST

Test 12: CIPA BUS - DATA PATH TEST

Test 13: RCV/XMIT FILE COUNTER SEQUENCE TEST

.. End of run, 0 errors detected, pass count is 1,  
time is 15-MAR-1983 10:10:25.39

DS>

### ECCGA Printout

## Repair-Level Diagnostics for the CI750 (Cont.)

- ECCGA

- First of five repair-level diagnostics for the CI750.
- Thirteen tests:

Tests 1-11 will run without the CIPA present.

Tests 12 and 13 require the CIPA.

- Sections

REGISTER      CNFGR, PMCSR, MADR, MDATR Registers

- Operation

- Event Flag 5 is used to change the WCS tests for 3K.
- QUICK is not implemented in this diagnostic.
- Execution time for ECCGA is 3 seconds
- No Summary report is issued by this program.

## Repair-Level Diagnostics for the CI750 (Cont.)

```
DS> LOAD ECCGB
DS> SET TRACE
DS> START
```

```
.. Program: CI750 - ECCGB Repair Level, revision 1.1, 27 tests,
   at 10:12:17.64.
```

```
Testing: _PAA0
```

```
Test 1: BUSIB/IBIN DATA PATHS TEST
Test 2: PMCSR ACCESS TEST
Test 3: PMCSR - BIT READ/WRITE TEST
Test 4: MAINTENANCE INITIALIZE TEST
Test 5: MADR/BUS MD DATA PATHS TEST
Test 6: LOCAL STORE DUAL ADDRESS TEST
Test 7: LOCAL STORE READ/WRITE RAM TEST
Test 8: LOCAL STORE DYNAMIC MEMORY TEST
Test 9: INTERLOCKED READ/WRITE TEST
Test 10: VCDT- READ/WRITE RAM TEST
Test 11: VCDT DUAL ADDRESS TEST
Test 12: VCDT DYNAMIC MEMORY TEST
Test 13: CONTROL STORE - DUAL ADDRESS TEST
Test 14: CONTROL STORE - READ/WRITE RAM TEST
Test 15: CONTROL STORE RAM DYNAMIC MEMORY TEST
Test 16: CONTROL STORE ROM INSERTION TEST
Test 17: REGISTER DUAL ADDRESS TEST
Test 18: BUSIB SOURCE=LIT DEST=LS[LIT]
Test 19: BUSIB SOURCE EQUALS ALU
Test 20: BUSIB DESTINATION IS VCDT[LIT]
Test 21: BUSIB SOURCE EQUALS LS[LIT]
Test 22: BUSIB SOURCE EQUALS VCDT[LIT]
Test 23: BUSIB DESTINATION EQUALS LS[INDEX]
Test 24: INDEX REGISTER SA0/SA1 CHECK
Test 25: BUSIB SOURCE LS[INDEX]
Test 26: BUSIB DESTINATION EQUALS LS[XLATE]
Test 27: BUSIB SOURCE EQUALS LS[XLATE]
.. End of run, 0 errors detected, pass count is 1.
   time is 15-MAR-1983 10:16:20.77
DS>
```

### ECCGB Printout

## Repair-Level Diagnostics for the CI750 (Cont.)

- ECCGB

- Second of five repair-level diagnostics for the CI750.
- Twenty-seven tests.

- Sections

REGISTER	CNFR, PMCSR, MADR, and MDATR Registers
LS_VCDT	Local Store/VCDT Tests
CONTROL_STORE	Control Store Tests
IB_SRC_DST	Bus IB Source and Destination Tests

- Operation

- Event Flag 5 is used to change the WCS tests for 3K.
- QUICK is not implemented in this diagnostic.
- Execution time for ECCGB is 4 minutes.
- No Summary report is issued by this program.

## Repair-Level Diagnostics for the CI750 (Cont.)

```
DS> LOAD ECCGC
DS> SET TRACE
DS> START
```

```
.. Program: CI750 - ECCGC Repair Level, revision 1.0, 37 tests,
   at 10:18:23.92.
Testing: _PAA0
```

```
Test 1: 2911 SEQUENCER JUMP TEST
Test 2: CONTROL STORE PARITY ERROR TEST
Test 3: "2901" RAM DUAL ADDRESS TEST
Test 4: "2901" RAM/Q STUCK BIT TEST.
Test 5: "2901" RAM/Q REGISTER SHIFT.
Test 6: "2901" ALU FUNCTION TEST.
Test 7: "2901" CONDITION CODE Z BRANCH TEST.
Test 8: "2901" CONDITION CODE N BRANCH TEST.
Test 9: "2901" CONDITION CODE V BRANCH TEST.
Test 10: "2901" CONDITION CODE C BRANCH TEST.
Test 11: 2911 SEQUENCER UPC+1 TEST
Test 12: 2911 SEQUENCER JSR TEST
Test 13: POP!! MICROSTACK
Test 14: BUS IB<00> BRANCH TEST
Test 15: BUS IB<08> BRANCH TEST
Test 16: BUS IB<12> BRANCH TEST
Test 17: BUS IB<15> BRANCH TEST
Test 18: BUS IB<20> BRANCH TEST
Test 19: BUS IB<21> BRANCH TEST
Test 20: BUS IB<24> BRANCH TEST
Test 21: BUS IB<31> BRANCH TEST
Test 22: BUS IB<10><09> BRANCH TEST
Test 23: BUS IB<14><13> BRANCH TEST
Test 24: BUS IB<26><33> BRANCH TEST
Test 25: BUS IB<26><25> BRANCH TEST
Test 26: BUS IB<19><18><17><16> BRANCH TEST
Test 27: MAINTENANCE TIMER DISABLE BRANCH
Test 28: TICK BRANCH TEST
Test 29: REGISTER WRITTEN BRANCH T1
Test 30: REGISTER WRITTEN BRANCH T2
Test 31: POWER FAIL TEST WITH POWER FAIL DISABLE SET
Test 35: XBOR - PORT INITIATED WRITE TEST
Test 36: CMMD ADDR REG - PORT INITIATED WRITE TEST
Test 37: BYTE MASK - PORT INITIATED WRITE TEST
.. End of run, 0 errors detected, pass count is 1.
   time is 15-MAR-1983 10:20:51.02
DS>
```

ECCGC Printout

## Repair-Level Diagnostics for the CI750 (Cont.)

- ECCGC

- Third of five repair-level diagnostics for the CI750.
- Thirty-seven tests:

Tests 1-31 and 35-37 run in the default section.

Tests 32-34 are Manual Intervention Tests.

- Sections

SEQUENCER	2911 Sequencer Tests
ALU	2901 ALU Tests
BRANCH	Microcode Branch Tests
MANUAL	Manual Intervention Test

- Event Flags

- Flag 5 is used to change the WCS tests for 3K.
- Flag 6 is used for microlooping. *← FOR MANUFACTURING USE!*

- Operation

- QUICK is not implemented in this diagnostic.
- Execution time for ECCGC is 2 minutes and 28 seconds (excluding the Manual Intervention Test).
- No Summary report is issued by this program.



## Repair-Level Diagnostics for the CI750 (Cont.)

```
DS> LOAD ECCGD
DS> SET TRACE
DS> START
```

```
.. Program CI750 - ECCGD Repair Level, revision 1.2, 31 tests,
   at 10:30.27.32.
```

```
Testing: _PAA0
```

```
Test 1: EXTERNAL BUS LONGWORD WRITE TO MEMORY TEST
Test 2: LOCAL STORE PARITY ERROR TEST
Test 3: DYNAMIC LOCAL STORE MOVING INVERSIONS
Test 4: DYNAMIC VCDT MOVING INVERSIONS
Test 5: EXTERNAL BUS LONGWORD READ TO MEMORY TEST
Test 6: EXTERNAL BUS INTERLOCK READ TO MEMORY TEST
Test 7: EXTERNAL BUS INTERLOCK WRITE TO MEMORY TEST
Test 8: EXTERNAL BUS LONGWORD WRITE TO NXM TEST
Test 9: CORRECTABLE READ DATA TEST
Test 10: UNCORRECTABLE READ DATA TEST
Test 11: EXTERNAL BUS EXTENDED WRITES TEST
Test 12: EXTERNAL BUS EXTENDED READS TEST
Test 13: EXTERNAL BUS MASK REGISTER TEST
Test 14: INTERRUPT TEST
Test 15: MTE DURING INTERRUPT TEST
Test 16: CIPA BUS PARITY ERROR (CBPE) TEST
Test 17: SUSPEND AND EXECUTE TEST
Test 18: PACKET BUFFER OUT/IN REG LOOPBACK TEST
Test 19: PACKET BUFFER SELECT TEST
Test 20: OUTPUT PARITY ERROR TEST GENERATED BY PBIR
Test 21: TRANSMIT BUFFER "A" PATH/ADDR CHECK
Test 22: TRANSMIT BUFFER "B" PATH/ADDR CHECK
Test 23: RECEIVE BUFFER "A" PATH/ADDR CHECK
Test 24: RECEIVE BUFFER "B" PATH/ADDR CHECK
Test 25: TRANSMIT BUFFER "A" SA1/SA0
Test 26: TRANSMIT BUFFER "B" SA1/SA0
Test 27: RECEIVE BUFFER "A" SA1/SA0
Test 28: RECEIVE BUFFER "B" SA1/SA0
Test 29: FORCE RECEIVE BUFFER PARITY ERROR
Test 30: RECEIVE BUFFER "A" OVERFLOW TEST
Test 31: RECEIVE BUFFER "B" OVERFLOW TEST
```

```
.. End of run, 0 errors detected, pass count is 1.
   time is 15-MAR-1983 10:33:17.24
```

```
DS>
```

ECCGD Printout

## Repair-Level Diagnostics for the CI750 (Cont.)

- ECCGD

- Fourth of five repair-level diagnostics for the CI750.
- Thirty-one tests.

- Sections

EXTBUF  
PBUFFER

External Bus Tests (CMI)  
Packet Buffer Tests

- Event Flags -- Flag 6 is used for microlooping. ← USED BY MANUFACTURING
- Operation
  - QUICK is not implemented in this diagnostic.
  - Execution time for ECCGD is 2 minutes and 24 seconds.
  - No Summary report is issued by this program.

## Repair-Level Diagnostics for the CI750 (Cont.)

```
DS> LOAD ECCGE
DS> SET TRACE
DS> START
```

```
.. Program CI750 - ECCGE Repair Level, revision 1.2, 15 tests,
   at 10:35:51.34.
```

```
Testing: _PAA0
```

```
Test 1: INTERNAL MAINTENANCE LOOP TEST
Test 2: INTERNAL MT LOOPBACK WHILE LOADING XMIT BUFFER TEST
Test 3: INTERNAL MT LOOP TEST WITH ONE RCV BUF AVAILABLE
Test 4: INTERNAL MT LOOP TEST WITH NO RCV BUF'S AVAILABLE
Test 5: INTERNAL MAINT LP WITH SWAP NODE ADDRESS
Test 8: TRANSMIT BUFFER PARITY ERROR TEST
Test 9: ALTERNATING PACKET BUFFER UNLOAD TEST
Test 10: ARBITRATION TEST N+1+1
Test 11: EXTERNAL MAINT. LOOP PATH "A"
Test 12: EXTERNAL MAINT. LOOP PATH "B"
Test 13: EXT. MAINT. LOOP "RECEIVERS DISABLED"
Test 14: EXT. MAINT. LOOP "ABORTING TRANSMISSION"
Test 15. "ACKNOWLEDGE TIMEOUT" TEST
```

```
.. End of run, 0 errors detected, pass count is 1.
   time is 15-MAR-1983 10:37:15.73
```

```
DS>
```

### ECCGE Printout

## Repair-Level Diagnostics for the CI750 (Cont.)

- ECCGE

- Fifth of five repair-level diagnostics for the CI750.

- Fifteen tests: *120 STARS (120 STARS)*

Tests 1-5 and 8-15 run in the default section.

Tests 6-7 run only in the manual intervention section.

*PROMPT TO  
CHANGE ADDR  
SWITCHES*

- Sections

INT\_MLOOP  
EXT\_MLOOP  
MANUAL

Internal Maintenance Loop Tests  
External Maintenance Loop Tests  
Manual Intervention Tests

- Event Flags

- Flag 6 is used for microlooping.
- Flag 7 should be set if the extended-header jumper is installed. This affects Test 15 (Acknowledge Timeout Test).
- Flag 8 should be set if the extended-acknowledge-timeout jumper is installed. This affects Test 15 (Acknowledge Timeout Test).



- Flag 10, when set, allows as many as 64 no-response retries when running Tests 11 and 12 (External Maintenance Loop Path Tests).

*SET IF  
RUNNING ON BUSY  
CLUSTER SO TRAFFIC  
DOESN'T MAKE DIAG  
TIMEOUT*

- Operation

- QUICK feature is not implemented in this diagnostic.
- Execution time for ECCGE is 40 seconds (excluding Manual Intervention Tests).
- No Summary report is issued by this program.

## Attaching Devices on a VAX-11/780

DS> ATTACH CI780 HUB PAA0 14 4 1

node address switch setting

BR number

TR number

Device name

## Attaching Devices on a VAX 8600

DS> ATTACH SBIA HUB SIO  
DS> ATTACH CI780 SIO PAA0 14 4 1

## Booting in the Diagnostic Supervisor on a VAX-11/780

- When booting from a disk, insert the standard console floppy diskette and the disk from which you are booting, and type:

```
>>> BOOT Sgn
```

where:

S = Diagnostic boot

g = Generic drive type (B for an RP drive, R for an RM drive, M for an RK drive)

n = Drive number

For example:

```
>> BOOT SB0 - boots from drive unit 0 of an RP06
```

- When booting from the console floppy, insert the load path floppy diskette, and from console mode type:

```
>>> HALT  
>>> INITIALIZE  
>>> UNJAM  
>>> LOAD/START:FE00 ESSAA.EXE  
>>> START 10000
```

GOOD!  
USE THIS  
IF DIAG  
FLOPPY ISN'T  
BOOTABLE!

Once the VDS has been loaded and started it will identify itself and issue its user prompt:

```
DS>
```

## Booting in the Diagnostic Supervisor on a VAX 8600

- When booting from a non-console disk, insert the standard console RL02 disk and the disk from which you are booting and type:

```
>>> BOOT/R5:10 <device>
```

where:

device = a one to three character mnemonic (such as DU0 or CS1) that is appended to BOO.COM to form a file name that will be used to boot the operating system; if no device is specified, DEFBOO.COM will be used

For example:

```
>>> BOOT/R5:10 DU0 -- loads R5 with 10 and invokes DU0BOO.COM
```

```
>>> BOOT/R5:10/NOSTART -- loads R5, runs DEFBOO.COM, waits for further input
```

- When booting from a console disk, enter the following command:

```
>>> @EDSAA
```

Once the VDS has been loaded and started, it will identify itself and issue its user prompt:

DS>

~~DS>>>~~ SET QUIET OFF } (PRINTS BOOT)  
~~DS>>>~~ B } FILE DURING  
BOOT

777 ~~DS>>>~~ D R5 XXXX XX10

# Repair-Level Diagnostics for the CI780

```
DS> ATTACH SBIA HUB SIO
DS> ATTACH CI780 SIO PAA0 14 4 7
DS> SEL PAA0
DS> LOAD EVCGA
DS> SET TRACE
DS> START
```

```
.. Program: CI780 - EVCGA Repair Level, revision 1.0, 31 tests,
   at 08:51:07.21
```

Testing: PAA0

```
Test 1: CONFGR REG - LONG WORD WRITE ACCESS TEST
Test 2: CONFGR - BYTE/WORD WRITE ACCESS TEST
Test 3: CONFGR - READ ACCESS TEST
Test 4: CONFGR - READ/WRITE TEST
Test 5: BUSIB/IBIN DATA PATHS TEST
Test 6: PMCSR ACCESS TEST
Test 7: PMCSR - BIT READ/WRITE TEST
Test 8: MAINTENANCE INITIALIZE TEST
Test 9: MADR/BUS MD DATA PATHS TEST
Test 10: LOCAL STORE DUAL ADDRESS TEST
Test 11: LOCAL STORE READ/WRITE RAM TEST
Test 12: LOCAL STORE DYNAMIC MEMORY TEST
Test 13: INTERLOCKED READ/WRITE TEST
Test 14: VCDT - READ/WRITE RAM TEST
Test 15: VCDT DUAL ADDRESS TEST
Test 16: VCDT DYNAMIC MEMORY TEST
Test 17: CONTROL STORE - DUAL ADDRESS TEST
Test 18: CONTROL STORE - READ/WRITE RAM TEST
Test 19: CONTROL STORE RAM DYNAMIC MEMORY TEST
Test 20: CONTROL STORE ROM INSERTION TEST
Test 21: REGISTER DUAL ADDRESS TEST
Test 22: BUSIB SOURCE=LIT DEST=LS[LIT]
Test 23: BUSIB SOURCE EQUALS ALU
Test 24: BUSIB DESTINATION IS VCDT[LIT]
Test 25: BUSIB SOURCE EQUALS LS[LIT]
Test 26: BUSIB SOURCE EQUALS VCDT[LIT]
Test 27: BUSIB DESTINATION EQUALS LS[INDEX]
Test 28: INDEX REGISTER SA0/SA1 CHECK
Test 29: BUSIB SOURCE LS[INDEX]
Test 30: BUSIB DESTINATION EQUALS LS[XLATE]
Test 31: BUSIB SOURCE EQUALS LS[XLATE]
.. End of run, 0 errors detected, pass count is 1,
   time is 28-Aug-1988 08:52:29.40
DS>
```

EVCGA Printout



## Repair-Level Diagnostics for the CI780 (Cont.)

- EVC GA

- First of four repair-level diagnostics for the CI780.
- Thirty-one tests.

- Sections

REGISTER  
LS\_VCDT  
CONTROL\_STORE  
IB\_SRC\_DST

CNFGR, PMCSR, MADR, MDATR Registers  
Local Store/VCDT Tests  
Control Store Tests  
Bus IB Source and Destination Tests

- Operation

- Event Flag 5 is used to change the WCS tests for 3K.
- QUICK is not implemented in this diagnostic.
- Execution time for EVC GA is 1 minute, 30 seconds.
- No Summary report is issued by this program.

*writable control store*

*ONLY 2K  
PRESENT*

*will ERR  
IF SET*

## Repair-Level Diagnostics for the CI780 (Cont.)

DS> LOAD EVCGB  
DS> START

.. Program: CI780 - EVCGB Repair Level, revision 1.), 32 tests,  
at 08:53:00.67.

Testing: \_PAA0

Test 1: 2911 SEQUENCER JUMP TEST  
Test 2: CONTROL STORE PARITY ERROR TEST  
Test 3: "2901" RAM DUAL ADDRESS TEST  
Test 4: "2901" RAM/Q STUCK BIT TEST.  
Test 5: "2901" RAM/Q REGISTER SHIFT.  
Test 6: "2901" ALU FUNCTION TEST.  
Test 7: "2901" CONDITION CODE Z BRANCH TEST.  
Test 8: "2901" CONDITION CODE N BRANCH TEST.  
Test 9: "2901" CONDITION CODE V BRANCH TEST.  
Test 10: "2901" CONDITION CODE C BRANCH TEST.  
Test 11: 2911 SEQUENCER UPC+1 TEST  
Test 12: 2911 SEQUENCER JSR TEST  
Test 13: POP!! MICROSTACK  
Test 14: BUS IB<00> BRANCH TEST  
Test 15: BUS IB<08> BRANCH TEST  
Test 16: BUS IB<12> BRANCH TEST  
Test 17: BUS IB<15> BRANCH TEST  
Test 18: BUS IB<20> BRANCH TEST  
Test 19: BUS IB<21> BRANCH TEST  
Test 20: BUS IB<24> BRANCH TEST  
Test 21: BUS IB<31> BRANCH TEST  
Test 22: BUS IB<10><09> BRANCH TEST  
Test 23: BUS IB<14><13> BRANCH TEST  
Test 24: BUS IB<26><22> BRANCH TEST  
Test 25: BUS IB<26><25> BRANCH TEST  
Test 26: BUS IB<19><18><17><16> BRANCH TEST  
Test 27: MAINTENANCE TIMER DISABLE BRANCH TEST  
Test 28: TICK BRANCH TEST  
Test 29: REGISTER WRITTEN BRANCH T1  
Test 30: REGISTER WRITTEN BRANCH T2  
Test 31: POWER FAIL TEST WITH POWER FAIL DISABLE SET  
.. End of run, 0 errors detected, pass count is 1,  
time is 28-Aug-1988 08:53:32.22  
DS>

EVCGB Printout

## Repair-Level Diagnostics for the CI780 (Cont.)

- EVCGB

- Second of four repair-level diagnostics for the CI780.
- Thirty-two tests:

Tests 1-31 run in the default section.

Test 32 runs only in the manual section.

- Sections

SEQUENCER	2911 Sequencer Tests
ALU	2901 ALU Tests
BRANCH	Microcode Branch Tests
MANUAL	Manual Intervention Test

- Event Flags

- ~~Flag 5~~ is used to change the WCS tests for 3K.
- Flag 6 is used for microlooping.

- Operation

- QUICK is not implemented in this diagnostic.
- Execution time for EVCGB is 52 seconds (excluding the Manual Intervention Test).
- No Summary report is issued by this program.

## Repair-Level Diagnostics for the CI780 (Cont.)

DS> LOAD EVCGC  
DS> START

.. Program: CI780 - EVCGC Repair Level, V1.0, revision 1.0, 32 tests.  
at 08:56:23.66  
Testing: \_PAA0

Test 1: EXTERNAL BUS LONGWORD WRITE TO MEMORY TEST  
Test 2: LOCAL STORE PARITY ERROR TEST  
Test 3: DYNAMIC LOCAL STORE MOVING INVERSIONS  
Test 4: DYNAMIC VCDT MOVING INVERSIONS  
Test 5: EXTERNAL BUS LONGWORD READ TO MEMORY TEST  
Test 6: EXTERNAL BUS INTERLOCK READ TO MEMORY TEST  
Test 7: EXTERNAL BUS INTERLOCK WRITE TO MEMORY TEST  
Test 8: EXTERNAL BUS LONGWORD WRITE TO NXM TEST  
Test 9: COMMAND ADDRESS REGISTER TEST  
Test 10: EXTERNAL BUS EXTENDED WRITES TEST  
Test 11: EXTERNAL BUS EXTENDED READ TEST  
Test 12: EXTERNAL BUS MASK REGISTER TEST  
Test 13: INTERRUPT TEST  
Test 14: MTE DURING INTERRUPT TEST  
Test 15: COMMAND TRANSMIT ERROR (CXTER) TEST  
Test 16: SUSPEND AND EXECUTE TEST  
Test 17: PACKET BUFFER OUT/IN REG LOOPBACK TEST  
Test 18: OUTPUT PARITY ERROR TEST GENERATED BY LS  
Test 19: INPUT PARITY ERROR (IPE) TEST  
Test 20: PACKET BUFFER SELECT TEST  
Test 21: OUTPUT PARITY ERROR TEST GENERATED BY PBIR  
Test 22: TRANSMIT BUFF "A" PATH/ADDR CHECK  
Test 23: TRANSMIT BUFF "B" PATH/ADDR CHECK  
Test 24: RECEIVE BUFF "A" PATH/ADDR CHECK  
Test 25: RECEIVE BUFF "B" PATH/ADDR CHECK  
Test 26: TRANSMIT BUFFER A SA1/SA0  
Test 27: TRANSMIT BUFFER "B" SA1/SA0  
Test 28: RECEIVE BUFFER A SA1/SA0  
Test 29: RECEIVE BUFFER B SA1/SA0  
Test 30: FORCE RECEIVE BUFFER PARITY ERROR  
Test 31: RECEIVE BUFFER A OVERFLOW TEST  
Test 32: RECEIVE BUFFER B OVERFLOW TEST

.. End of run, 0 errors detected, pass count is 1.  
time is 28-Aug-1986 08:57:11.94  
DS>

EXT BUS  
= SBT  
NOT CI!

EVCGC Printout

## Repair-Level Diagnostics for the CI780 (Cont.)

- EVC GC

- Third of four repair-level diagnostics for the CI780.

- ~~Thirty tests.~~ 32 TESTS

- Sections

EXTBUS

PBUFFER

(SBI) (BUS)

External Bus Tests (SBI)

Packet Buffer Tests

- Event Flag 6 is used for microlooping. MANUF. ONLY

- Operation

- QUICK is not implemented in this diagnostic.

- Execution time for EVC GC is 1 minute, 19 seconds.

- No Summary report is issued by this program.

## Repair-Level Diagnostics for the CI780 (Cont.)

DS> LOAD EVCGD

DS> START

.. Program: CI780 - EVCGD Repair Level, revision 1.2, 15 tests,  
at 08:57:54.35.

Testing: \_PAA0

\*\*\*\*\*INFORMATIONAL MESSAGE\*\*\*\*\*

TEST 10 AND 15 WILL ERROR IF CPU CLOCK SPEEDS ARE SET TO FAST OR  
SLOW SPEEDS. CLOCK SPEEDS MUST BE SET TO NORMAL.

\*\*\*\*\*

Test 1: INTERNAL MAINTENANCE LOOP TEST  
Test 2: INTERNAL MT LOOPBACK WHILE LOADING XMIT BUFFER TEST  
Test 3: INTERNAL MT LOOP TEST WITH ON RCV BUF AVAILABLE  
Test 4: INTERNAL MT LOOP TEST WITH NO RCV BUF'S AVAILABLE  
Test 5: INTERNAL MAINT LP WITH SWAP NODE ADDRESS  
Test 8: INTERNAL MAINT LP WITH SWAP NODE ADDRESS  
Test 9: ALTERNATING PACKET BUFFER UNLOAD TEST  
Test 10: ARBITRATION TEST N+I+1  
Test 11: EXTERNAL MAINT. LOOP PATH "A"  
Test 12: EXTERNAL MAINT. LOOP PATH "B"  
Test 13: EXT. MAINT. LOOP "RECEIVERS DISABLED"  
Test 14: EXT. MAINT. LOOP "ABORTING TRANSMISSION"  
Test 15: "ACKNOWLEDGE TIMEOUT" TEST

.. End of run, 0 errors detected, pass count is 1,  
time is 28-Aug-1986 08:58:04.94

DS>

### EVCGD Printout

## Repair-Level Diagnostics for the CI780 (Cont.)

- EVC GD

- Fourth of four repair-level diagnostics for the CI780.
- Fifteen tests:

Tests 1-5, 8, 9, and 11-14 run in the default section.

Tests 6, 7, ~~10, 11, 12, 13, 14~~ run only in the manual section.

- Sections

INT_MLOOP	Internal Maintenance Loop Tests
EXT_MLOOP	External Maintenance Loop Tests
MANUAL	Manual Intervention Tests

→ TEST LINK BRD. SWITCHES <sup>set</sup> Flag 10

- Event Flags

- Flag 6 is used for microlooping.
- Flag 7 should be set if the extended header jumper is installed. This affects Test 15 (Acknowledge Timeout Test).
- Flag 8 should be set if the extended acknowledge timeout jumper is installed. This affects Test 15 (Acknowledge Timeout Test).
- Flag 10, when set, will allow as many as 64 no-response retries when running Tests 11 and 12 (External Maintenance Loop Path Tests). SET IF ON BUSY CI

- Operation

- QUICK feature is not implemented in this diagnostic.
- Execution time for EVC GD is 13 seconds (excluding Manual Intervention Tests).
- No SUMMARY report is issued by this program.

## Loading the Diagnostic Supervisor on a VAX 8200/8300

- Insert the RX50 diskette containing file EBSAA.EXE into the console RX50 disk drive unit 0.
- Load the diagnostic supervisor program into physical memory by entering the following CCL command at the console terminal:

```
>>> B/R5:10 CSA1:
```

or

```
>>> B/R5:10 DU40
```

← Drive unit number

↑ BI node number

- Identify the CIBCI adapter and its node configuration parameters to the diagnostic supervisor program as follows:

```
DS> ATTACH CIBCI HUB PAA0 6 4 0
```

- Select the CIBCI adapter:

```
DS> SELECT PAA0
```

- Show the unit selected as follows:

```
DS> SHOW SELECT
```



## Loading the Diagnostic Supervisor on a VAX 85xx/8700/8800

- Insert the RX50 diskette containing file EZSAA.EXE into the PC380 console system RX50 disk drive unit 0.
- Load the diagnostic supervisor program resident on the PC380 console system disk into physical memory by entering the following CCL command. Use the PC380 console system keyboard as follows:

```
>>> @DIAB00
%%
DIAGNOSTIC SUPERVISORP .1e1a;DS>
```

- Attach the CPU to its memory and the NBI adapters as follows:

```
DS> ATTACH KAAAA HUB KAO YES — CPU 1
DS> ATTACH KAAAA HUB KA1 NO — CPU 2
DS> ATTACH MSAAA HUB MS0 — MEM
DS> ATTACH NBIA HUB NBIA0 0 — ADAPT
DS> ATTACH NBIB NBIA0 NBIB0 0 0 — BUS
DS> ATTACH NBIB NBIA0 NBIB1 1 0 — ADAPT
DS> ATTACH NBIA HUB NBIA1 1 — BUS
DS> ATTACH NBIB NBIA1 NBIB0 0 0 —
DS> ATTACH NBIB NBIA1 NBIB1 1 0 —
```

*Handwritten notes:*  
= PRIMARY CPU (pointing to CPU 1)  
CPU 1  
CPU 2  
MEM  
ADAPT  
BUS  
ADAPT  
BUS

- Identify the CIBCI adapter and its node configuration parameters to the diagnostic supervisor:

```
DS> ATTACH CIBCI NBIB0 PAA0 6 4 0
```

- Select the CIBCI adapter as the unit under test:

```
DS> SELECT PAA0
```

- Show the unit selected:

```
DS> SHOW SELECT
```

# Repair-Level Diagnostics for the CIBCI

DS> LOAD EVCKA

DS> SET FLAGS TRACE, HALT

DS> SET EVENT FLAGS 4

DS> START/PASS:5

.. Program: CIBCI - EVCKA Repair level, revision 1.0, 28 tests,  
at 00:24:40.75.  
Testing: \_PAA0

SET EVENT FLAG 4 FOR REV LEVEL OF BIIC IN TEST 3

Test 1: ERROR INTERRUPT CONTROL TEST

Test 2: DEVICE TYPE REGISTER TEST

Test 3: BC AND CIBCI SELF TEST

REVISION LEVEL OF BIIC CHIP ON CIBCI IS: 0

Test 4: CNFGR - L WRITE ACCESS TEST

Test 5: CNFGR - L READ ACCESS TEST

Test 6: R/W TEST OF DIAG BIT IN CNFGR

Test 7: CNFGR - L READ ACCESS TEST - AFTER DISABLING UCSREEN IN BCICR

Test 8: CNFGR - L READ ACCESS TEST - AFTER DISABLING STS IN BCICR

Test 9: PORT DATA REGISTER - R/W TEST - SOURCE IS B1

Test 10: R/W TEST OF BUFFERED COMMAND ADDRESS REGISTER (BCAR)

Test 11: R/W TEST OF BCMR

Test 12: R/W TEST OF DMA REGISTER

Test 13: RECEIVED COMMAND DATA PATH TEST

Test 14: R/W TEST OF CNFGR, BCAR AND BCMR TAKEN ALTOGETHER

Test 15: SIZE OF TRANSFER TEST

Test 16: DMA FILE - R/W COUNTER TEST

Test 17: DMA FILE - COUNTER SEQUENCE TEST

Test 18: R/W TEST OF BCAR AND BCMR USING THE MASTER SEQUENCER

Test 19: BICA ADDRESS REGISTER TEST

Test 20: STOP TEST

Test 21: PORT DATA REGISTER - CIPA DATA PATH TEST

Test 22: WITH DIAG BIT CLEAR, R/W TEST OF BCAR

Test 23: WITH DIAG BIT CLEAR, R/W TEST OF DMA REGISTER

Test 24: CIPAPD REGISTER READ TEST (CIPA BUX READ TEST)

Test 25: L READ ACCESS TEST OF LS AFTER DISABLING UCSREEN IN BCI CONTROL REG

Test 26: NUACK TEST FOR NODE ADDRESS 200

Test 27: L READ ACCESS TEST OF LS AFTER DISABLING STS IN THE BICSR

Test 28: USER INTERRUPT CONTROL TEST

.. End of run, 0 errors detected, pass count is 1.  
time is 15-JUL-1985 00:24:52.74

DS>

Trace Printout for Repair Diagnostic EVCKA

## Repair-Level Diagnostics for the CIBCI (Cont.)

- **EVCKA**

- First of six repair-level diagnostics for the CIBCI.
- Twenty-eight tests.

- **Sections**

BAC	BICA Control module
BAD	BICA Data module
CIPA	CIPA box

- **Event Flags**

- Flag 4 is used to output revision level of BIIC chip in Test 3.
- Flag 5 determines whether the message pertaining to the use of Event Flag 4 will get printed at the start of the diagnostic.

- **Operation**

- QUICK feature not implemented in this diagnostic.
- Execution time is approximately 12 seconds.
- The summary report provides an error count by test number, no report is generated if there are no errors.

## Repair-Level Diagnostics for the CIBCI (Cont.)

DS> LOAD EVCKB

DS> SET FLAGS TRACE, HALT

DS> START/PASS:5

.. Program: CIBCI - EVCKB Repair level, revision 1.0, 27 tests,  
at 00:25:58.39.  
Testing: \_PAA0

Test 1: BUSIB/IB IN DATA PATHS TEST  
Test 2: PMCSR ACCESS TEST  
Test 3: PMCSR - BIT READ/WRITE TEST  
Test 4: INITIALIZE TEST  
Test 5: MAOR/BUS MD DATA PATHS TEST  
Test 6: LOCAL STORE DUAL ADDRESS TEST  
Test 7: LOCAL STORE READ/WRITE RAM TEST  
Test 8: LOCAL STORE DYNAMIC MEMORY TEST  
Test 9: INTERLOCKED READ/WRITE TEST  
Test 10: VCDT - READ/WRITE RAM TEST  
Test 11: VCDT DUAL ADDRESS TEST  
Test 12: VCDT DYNAMIC MEMORY TEST  
Test 13: CONTROL STORE - DUAL ADDRESS TEST  
Test 14: CONTROL STORE - READ/WRITE RAM TEST  
Test 15: CONTROL STORE RAM DYNAMIC MEMORY TEST  
Test 16: CONTROL STORE ROM INSERTION TEST  
Test 17: REGISTER DUAL ADDRESS TEST  
Test 18: BUSIB SOURCE=LIT DEST=LS[LIT]  
Test 19: BUSIB SOURCE EQUALS ALU  
Test 20: BUSIB DESTINATION IS VCDT[LIT]  
Test 21: BUSIB SOURCE EQUALS LS[LIT]  
Test 22: BUSIB SOURCE EQUALS VCDT[LIT]  
Test 23: BUSIB DESTINATION EQUALS LS[INDEX]  
Test 24: INDEX REGISTER SA0/SA1 CHECK  
Test 25: BUSIB SOURCE LS[INDEX]  
Test 26: BUSIB DESTINATION EQUALS LS[XLATE]  
Test 27: BUSIB SOURCE EQUALS LS[XLATE]  
.. End of run, 0 errors detected, pass count is 1.  
time is 15-JUL-1985 00:29:37.92  
DS>

### Trace Printout for Repair Diagnostic EVCKB

## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKB

- Second of six repair-level diagnostics for the CIBCI.
- Twenty-seven tests.

- Sections

REGISTER

LS\_VCDT

CONTROL\_STORE

IB\_SRC\_DST

CNFR, PMCSR, MADR, MDATR Registers

Local Store/VCDT Tests

Control Store Tests

Bus IB Source and Dest Tests

- Event Flag 5 is used to change the WCS test for 3K.
- Operation
  - QUICK feature not implemented.
  - No Summary report is issued.

## Repair-Level Diagnostics for the CIBCI (Cont.)

```
DDS> LOAD EVCKC
DS> SET FLAGS TRACE. HALT
DS> START/PASS:5
```

```
.. Program: CIBCI - EVCKC Repair level, revision 1.0, 33 tests.
   at 00:30:00.98
   Testing: _PAA0
```

```
Test 1: 2911 SEQUENCER JUMP TEST
Test 2: CONTROL STORE PARITY ERROR TEST
Test 3: "2901" RAM DUAL ADDRESS TEST
Test 4: "2901" RAM/Q STUCK BIT TEST
Test 5: "2901" RAM/Q REGISTER SHIFT
Test 6: "2901" ALU FUNCTION TEST.
Test 7: "2901" CONDITION CODE Z BRANCH TEST.
Test 8: "2901" CONDITION CODE N BRANCH TEST.
Test 9: "2901" CONDITION CODE V BRANCH TEST.
Test 10: "2901" CONDITION CODE C BRANCH TEST.
Test 11: 2911 SEQUENCER UPC+1 TEST
Test 12: 2911 SEQUENCER JSR TEST
Test 13: POP!! MICROSTCK
Test 14: BUS IB<00> BRANCH TEST
Test 15: BUS IB<08> BRANCH TEST
Test 16: BUS IB<12> BRANCH TEST
Test 17: BUS IB<15> BRANCH TEST
Test 18: BUS IB<20> BRANCH TEST
Test 19: BUS IB<21> BRANCH TEST
Test 20: BUS IB<24> BRANCH TEST
Test 21: BUS IB<31> BRANCH TEST
Test 22: BUS IB<10> <09> BRANCH TEST
Test 23: BUS IB<14> <13> BRANCH TEST
Test 24: BUS IB<28> <22> BRANCH TEST
Test 25: BUS IB<28> <25> BRANCH TEST
Test 26: BUS IB<19> <18> <17> <16> BRANCH TEST
Test 27: MAINTENANCE TIMER DISABLE BRANCH TEST
Test 28: TICK BRANCH TEST
Test 29: REGISTER WRITTEN BRANCH T1
Test 30: REGISTER WRITTEN BRANCH T2
Test 31: XBOR - PORT INITIATED WRITE TEST
Test 32: BICA CMMO ADDR REG - PORT INITIATED WRITE TEST
Test 33: BYTE MASK - PORT INITIATED WRITE TEST
```

```
.. End of run, 0 errors detected, pass count is 1.
   time is 15-JUL-1985 00:32:56:24
```

```
DS>
```

Trace Printout for Repair Diagnostic EVCKC

## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKC:
  - Third of six repair-level diagnostics for the CIBCI.
  - Thirty-three tests.
- Sections

SEQUENCER	2911 Sequencer Tests
ALU	2901 ALU Tests
BRANCH	Microcode Branch Tests
- Event Flags
  - Event Flag 5 used to change the WCS test for 3K.
  - Event Flag 6 used for microlooping.
- Operation
  - QUICK feature not implemented.
  - No Summary report is issued.
  - Execution time is 3 minutes, 52 seconds.

## Repair-Level Diagnostics for the CIBCI (Cont.)

DS> LOAD EVCKD

DS> SET FLAGS TRACE, HALT

DS> START/PASS:5

..Program: CIBCI - EVCKD Repair level, revision 1.0, 21 tests,  
at 00:33:15.20.  
Testing: \_PAA0

Test 1: EXTERNAL BUS LONGWORD WRITE TO MEMORY TEST  
Test 2: LOCAL STORE PARITY ERROR TEST  
Test 3: DYNAMIC LOCAL STORE MOVING INVERSIONS  
Test 4: DYNAMIC VCDT MOVING INVERSIONS  
Test 5: EXTERNAL BUS LONGWORD READ TO MEMORY TEST  
Test 6: EXTERNAL BUS INTERLOCK READ TO MEMORY TEST  
Test 7: EXTERNAL BUS INTERLOCK WRITE TO MEMORY TEST  
Test 8: EXTERNAL BUS LONGWORD WRITE TO NXM TEST  
Test 9: CORRECTABLE READ DATA TEST FOR VAX-11/750  
TEST IGNORED FOR THIS PROCESSOR

Test 10: READ DATA SUBSTITUTE TEST FOR VAX-11/750  
TEST IGNORED FOR THIS PROCESSOR

Test 11: READ DATA SUBSTITUTE TEST FOR VAX 8700  
TEST IGNORED FOR THIS PROCESSOR

Test 12: CORRECTABLE READ DATA TEST FOR VAX 8200  
Test 11: READ DATA SUBSTITUTE TEST FOR VAX 8200  
Test 14: EXTERNAL BUS EXTENDED WRITES TEST  
Test 15: EXTERNAL BUS EXTENDED READS TEST  
Test 16: EXTERNAL BUS MASK REGISTER TEST  
Test 17: INTERRUPT TEST  
Test 18: MTE DURING INTERRUPT TEST  
Test 19: CIPA BUS PARITY ERROR (CBPE) TEST  
Test 20: SUSPEND AND EXECUTE TEST  
Test 21: PACKET BUFFER OUT/IN REG LOOPBACK TEST

..End of run, 0 errors detected, pass count is 1,  
time is 15-JUL-1985 00:34:43.82

DS>

## Trace Printout for Repair Diagnostic EVCKD



## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKD

- Fourth of seven repair-level diagnostics for the CIBCI.
- Twenty-one tests:

Tests 1-8 and 14-21 run in the default mode.

Tests 9 and 10 pertain to tests used in early development work and can be ignored.

Test 11 pertains to the RDS test for VAX 8800.

Test 12 and 13 pertain to CRD and RDS tests for the VAX 8200/8300.

- Sections

EXTBUS	External Bus Tests (BI)
PBUFFER	Packet Buffer Tests
CBA	CRD and RDS Test pertaining to the CBA
	Test bed
NAUTILUS	RDS Test pertaining to VAX 8800
SCORPIO	CRD and RDS Tests pertaining to
	VAX 8200/8300

- Event Flags

- Event Flag 1 controls the output of the message indicating that a test will not be performed because of CPU incompatibility (tests 9, 10, 11, 12).
- Event Flag 6 is used for microlooping. MAN

- Operation

- QUICK feature not implemented.
- No Summary report is issued.
- Execution time is 2 minutes, 7 seconds.

## Repair-Level Diagnostics for the CIBCI (Cont.)

```
DS> LOAD EVCKE
DS> SET FLAGS TRACE, HALT
DS> START/PASS:5
```

```
..Program: CIBCI - EVCKE Repair level, revision 1.0, 13 tests,
  at 00:34:59.99.
  Testing: _PAA0
```

```
Test 1:  PACKET BUFFER SELECT TEST
Test 2:  OUTPUT PARITY ERROR TEST GENERATED BY PBIR
Test 3:  TRANSMIT BUFFER "A" PATH/ADDR CHECK
Test 4:  TRANSMIT BUFFER "B" PATH/ADDR CHECK
Test 5:  RECEIVE BUFFER "A" PATH/ADDR CHECK
Test 6:  RECEIVE BUFFER "B" PATH/ADDR CHECK
Test 7:  TRANSMIT BUFFER "A" SA1/SA0
Test 8:  TRANSMIT BUFFER "B" SA1/SA0
Test 9:  RECEIVE BUFFER "A" SA1/SA0
Test 10: RECEIVE BUFFER "B" SA1/SDA0
Test 11: FORCE RECEIVE BUFFER PARITY ERROR
Test 12: RECEIVE BUFFER "A" OVERFLOW TEST
Test 13: RECEIVE BUFFER "B" OVERFLOW TEST
```

```
..End of run, 0 errors detected, pass count is 1.
  time is 15-JUL-1985 00:36:29.08
```

```
DS>
```

### Trace Printout for Repair Diagnostic EVCKE

## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKE

- Fifth of seven repair-level diagnostics for the CIBCI.

- Nineteen tests:

Tests 14, 15, 16, 17, 18 and 19 are run in manual mode.

Test 14 is a true node address test.

Test 15 is a complement node address test.

Test 16 is a boot time test.

Test 17 is a CIPA power fail test.

Test 18 and 19 are CPU power fail test.

- Sections

PBUFFER

Packet Buffer Test

MANUAL

Manual Intervention Tests

- Event Flag 6 is used for microlooping.

- Operation

- QUICK feature not implemented.
- No Summary report is issued.
- Execution time is 2 minutes, 40 seconds.

## Repair-Level Diagnostics for the CIBCI (Cont.)

```
DS> LOAD EVCKF
DS> SET FLAGS TRACE, HALT
DS> START/PASS:5
```

```
..Program: CIBCI - EVCKF Repair level, revision 1.0, 14 tests.
  at 00:39:31.19.
  Testing: _PAA0
```

```
Test 1:  INTERNAL MAINTENANCE LOOP TEST
Test 2:  INTERNAL MT LOOPBACK WHILE LOADING XMIT BUFFER TEST
Test 3:  INTERNAL MT LOOP TEST WITH ONE RCV BUF AVAILABLE
Test 4:  INTERNAL MT LOOP TEST WITH NO REV BUF'S AVAILABLE
Test 5:  INTERNAL MAINT LP WITH SWAP NODE ADDRESS
Test 6:  TRANSMIT BUFFER PARITY ERROR TEST
Test 7:  ALTERNATING PACKET BUFFER UNLOAD TEST
Test 8:  ARBITRATION TEST N+I+1
```

Trace Printout for Repair Diagnostic EVCKF

## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKF
    - Sixth of seven repair-level diagnostics for the CIBCI.
    - Eight tests.
  - Section
- |           |                                 |
|-----------|---------------------------------|
| INT_MLOOP | Internal Maintenance Loop Tests |
|-----------|---------------------------------|
- Event Flags
    - Flag 6 is used for microlooping.
    - Flag 11 is used for quiet slot value test of link module.
  - Operation
    - QUICK feature not implemented.
    - No Summary report is issued.
    - Execution time is 35 seconds.

## Repair-Level Diagnostics for the CIBCI (Cont.)

```
DS> LOAD EVCKG
DS> SET FLAGS TRACE, HALT
DS> START/PASS:5
```

```
..Program: CIBCI - EVCKG Repair level, revision 1.0, 6 tests
  at 00:39:31.19
  Testing: _PAA0
```

```
Test 1:    EXTERNAL MAINT. LOOP PATH "A"
Test 2:    EXTERNAL MAINT. LOOP PATH "B"
Test 3:    EXT. MAINT. LOOP "RECEIVERS DISABLED"
Test 4:    EXT. MAINT. LOOP "ABORTING TRANSMISSION"
Test 5:    "ACKNOWLEDGE TIMEOUT" TEST
Test 6:    EXTERNAL BUS LONGWORD WRITE TO ITSELF (LOCAL STORE)
..End of run, 0 errors detected, pass count is 1,
  time is 15-JUL-1985 00:40:10.22
```

### Trace Printout for Repair Diagnostic EVCKG

## Repair-Level Diagnostics for the CIBCI (Cont.)

- EVCKG
  - Seventh of seven repair-level diagnostics for the CIBCI.
  - Six tests.
- Section  
EXT\_MLOOP                      External Maintenance Loop Tests
- Event Flags
  - Flag 6 is used for microlooping.
  - Flag 7 is used for extended header.
  - Flag 8 is used for extended ACK timeout (test 5).
  - Flag 10 allows up to 64 no-response retries when running tests 1 and 2.
- Operation
  - QUICK feature not implemented.
  - No Summary report is issued.
  - Execution time is 35 seconds.

## Repair-Level Diagnostics for the CIBCA

-----

DS> SEL PAA0  
DS> LOAD EVGCA  
DS> START

.. Program: EVGCA, CIBCA T1015 Repair Level Diagnostic Part I, revision 2.0, 13 tests,  
at 14:16:01.92.

Testing: \_PAA0

Test 1: Device Type/BIIC Configuration Register Test  
Port Revision(Hex): 03

Link Revision(Hex): 43

Bca Adapter SelfTest (Port & Link) Completed Successfully

Test 2: BI Control and Status Register Test

Test 3: BI Required Registers Test

Bca Register Access Test

Bca Register Data Pattern Test for Bus Error Register

Bca Register Data Pattern Test for Error Interrupt Control Register

Bca Register Data Pattern Test for Interrupt Destination Register

Bca Register Data Pattern Test for Ip Interrupt Mask Register

Bca Register Data Pattern Test for Ip Interrupt Destination Register

Bca Register Data Pattern Test for Ip Interrupt Source Register

Test 4: General Purpose Device Registers Test

Bca Register Data Pattern Test for Port Queue Block Base Register

Bca Register Data Pattern Test for Port Failing Address Register

Bca Register Data Pattern Test for Port Parameter Register

Bca Register Data Pattern Test for Port Error Register

Test 5: User CSR Space Register Test

Bca Register Data Pattern Test for Receive Console Data Register

Test 6: PSR/PMCSR Register Test

Test 7: CIBCA Specific Register Test

Bca Register Data Pattern Test for the Port Maintenance Control/Status Register

Test 8: Local Store Address Read/Write Test

Test 9: Local Store Data Read/Write Test

Test 10: Local Store Dynamic Memory Test

Test 11: Control Store (CS) Address Test

Test 12: Control Store Read/Write Ram Test

Test 13: Control Store Ram Dynamic Memory Test

.. End of run, 0 errors detected, pass count is 1.

time is 28-DEC-1987 14:17:29.44

Trace Printout for Repair Diagnostic EVGCA



## Repair-Level Diagnostics for the CIBCA (cont)

---

- o EVGCA

- first of five repair-level diagnostics for CIBCA
- Thirteen tests

- o Section

REGISTER

BCA Register stuck bit tests

- o Event Flags

- Flag 1 enables BI selftest for each pass

## Repair-Level Diagnostics for the CIBCA (cont)

---

DS> RUN EVGCB

.. Program: EVGCB, CIBCA T1015 Repair Level Diagnostic Part II, revision 2.1, 16 tests,  
at 14:17:54.30.  
Testing: \_PAA0

Test 1: <EEPROM Integrity Verification Test>  
Test 2: <Internal Bus Branch/Sequencer Jump Test - (Ucode Used)>  
Test 3: <AM2910-A Microprogram Controller UPC+1 Test>  
Test 4: <Micro-Controller Call To/ Return From Subroutine Test>  
Test 5: <AM2910-A Micro-controller Pop Micro Stack Test (Ucode Used)>  
Test 6: <AMD29116 Single Operand Instruction Test (Src) to (Dst)>  
Test 7: <29116 Double Operand Instruction Test (Src) to (Dst)>  
Test 8: <Instruction Tests for 29116 Shift Left and Right.>  
Test 9: <Uproc Instr Test for Rotate By n Bit(s) Shift Instructions>  
Test 10: <29116 Uproc Instr Tst for Bit Oriented Instr.>  
Test 11: <Uproc Bit Oriented Instr RAM/ACC Minus Bit "N".>  
Test 12: <Bit Oriented Instr Set Dlatch Bit N, Dlatch(Src) & Ram(Dst)>  
Test 13: <Bit Oriented Instr, Reset BIT in RAM Test.>  
Test 14: <Bit Oriented Instr, Reset BIT in Accumulator Test.>  
Test 15: <Bit Oriented Instr Reset BIT in DLATCH Test.>  
Test 16: <BIT ORIENTED AND BRANCH INSTR RAM Bit Test>  
.. End of run, 0 errors detected, pass count is 1,  
time is 28-DEC-1987 14:18:40.56

Trace Printout for Repair Diagnostic EVGCB

## Repair-Level Diagnostics for the CIBCA (cont)

### o EVGCB

- second of five repair-level diagnostics for CIBCA
- Sixteen tests

### o Section

REGISTER	Checks for correct EEPROM data
MICROCONTROLLER	Microprogram control functions
MICROPROCESSOR	Check 29116

### o Event Flags

- Flag 1 enables BI selftest for each pass
- Flag 6 used for microlooping

## Repair-Level Diagnostics for the CIBCA (cont)

---

DS> RUN EVGCC

.. Program: EVGCC, CIBCA T1015 Repair Level Diag Part III, revision 2.1, 23 test  
s, at 14:19:07.58.  
Testing: \_PAA0

Test 1: <BIT ORIENTED AND BRANCH INSTR ACC Bit Test>  
Test 2: <BIT ORIENTED AND BRANCH INSTR DLATCH BIT TEST>  
Test 3: <BIT ORIENTED 29116 INSTR. WITH LOAD RAM BIT AS SRC TEST>  
Test 4: <BIT ORIENTED 29116 INSTR. WITH LOAD RAM .NOT. BIT TEST>  
Test 5: <BIT ORIENTED 29116 INSTR. WITH LOAD ACC BIT TEST>  
Test 6: <BIT ORIENTED 29116 INSTR. WITH LOAD ACC .NOT. BIT TEST>  
Test 7: <BIT ORIENTED 29116 INSTR WITH LOAD Y BUS BIT AS SRC TEST>  
Test 8: <BIT ORIENTED 29116 INSTR. WITH LOAD Y BUS .NOT. BIT TEST>  
Test 9: <BIT ORIENTED 29116 INSTR ADD RAM BIT N, RAM AS SRC TEST>  
Test 10: <BIT ORIENTED 29116 INSTR ADD ACC BIT N, ACC AS SRC TEST>  
Test 11: <BIT ORIENTED 29116 INSTR ADD DLATCH BIT N, DLATCH SRC TEST>  
Test 12: <BIT ORIENTED 29116 INSTR. ROTATE AND MERGE BIT TEST>  
Test 13: <BIT ORIENTED 29116 INSTR ROTATE AND COMPARE BIT TEST>  
Test 14: <BIT ORIENTED 29116 PRIORITIZE INSTRUCTION TEST>  
Test 15: <29116 CRC FORWARD AND REVERSE TEST>  
Test 16: <29116 MICROPROCESSOR NO-OP INSTRUCTION TEST>  
Test 17: <29116 INTERNAL REGISTER ADDRESS TEST>  
Test 18: <LS/VIRTUAL CIRCUIT DESCRIPTOR TABLE VIA MICROCODE TEST>  
Test 19: <LS/VCDT FLOATING ONE'S VIA MICROCODE TEST>  
Test 20: <LS/VCDT FLOATING ZERO VIA MICROCODE TEST>  
Test 21: <LS/VCDT ONE'S DOWN VIA MICROCODE TEST>  
Test 22: <LS/VCDT ZERO DOWN VIA MICROCODE TEST>  
.. End of run, 0 errors detected, pass count is 1.  
time is 28-DEC-1987 14:20:05.60

Trace Printout for Repair Diagnostic EVGCC

## Repair-Level Diagnostics for the CIBCA (cont)

---

### o EVGCC

- third of five repair-level diagnostics for CIBCA.
- twenty-three tests.

### o Section

MICROPROCESSOR  
LOCAL\_STORE

Check 29116  
Test for stuck bits in local store  
and VCDT

### o Event Flags

- Flag 1 enables BI selftest for each pass.
- Flag 6 used for microlooping. *MANUE ONLY*

## Repair-Level Diagnostics for the CIBCA (cont)

DS> START

.. Program: EVGCD, CIBCA T1015 Repair Level Diagnostic Part II, revision 2.0, 21 tests,  
at 14:22:22.78.  
Testing: \_PAA0

Test 1: <Register Dual Address Test>  
Test 2: <LS/VCDT Parity Error Test(Ucode used)>  
Test 3: <Interrupt Test (Ucode used)>  
Test 4: <Mte During Interrupt Test(Ucode used)>  
Test 5: <Microword Verification Test(Ucode used)>  
Test 6: <Control Store Parity Error (CSPE) Test>  
Test 7: <"29116 Condition Code Branch and Mux Test(Ucode used)>  
Test 8: <Maintenance Timer Disable Branch Test(Ucode used)>  
Test 9: <Tick Branch Test(Ucode used)>  
Test 10: <IB Register Read/Write Loopback Test(Ucode used)>  
Test 11: <BCAI Register Test(Ucode used)>  
Test 12: <Register Written Test(Ucode used)>  
Test 13: <BI Master Read/Write Test(Ucode used)>  
Test 14: <Power Fail Test With Power Disable Set Test(Ucode used)>  
Test 15: <CBOR/CBIR Data Transfer Test(Ucode used)>  
Test 16: <Command Address/Byte Count Register - Port Initiated Write Test(Ucode used)>  
Test 17: <Data Mover Loopback Test(Ucode used)>  
Test 18: <Data Mover Read/Write to Host\_ Memory Test(Ucode used)>  
Test 19: <Page Over Flow Test(Ucode used)>  
Test 20: <Suspend and Release II Bus Test(Ucode used)>  
Test 21: <Suspend And Release CILP Bus Test(Ucode used)>  
.. End of run, 0 errors detected, pass count is 1,  
time is 28-DEC-1987 14:23:04.20

Trace Printout for Repair Diagnostic EVGCD

## Repair-Level Diagnostics for the CIBCA (cont)

---

### o EVGCD

- fourth of five repair-level diagnostics for CIBCA.
- twenty-one tests.

### o Section

REGISTER	Various registers checked
MICROCONTROLLER	Microword verification
MICROPROCESSOR	Condition code branch check
INTERRUPT	MTE and parity error interrupt check
DATAMOVER	BI-to-CI data flow check
LINK	CBOR/CBIR data transfer test

### o Event Flags

- none available

# Repair-Level Diagnostics for the CIBCA (cont)

DS> RUN EVGCE

.. Program: EVGCE CIBCA T1025 Repair Level Diagnostic, revision 3.1, 15 tests,  
at 14:23:37.11.  
Testing: \_PAA0

Test 1: Link Configuration & CILP Bus Integrity Test  
Microcode Module EVGCN, Test # 30

Contents of CONFIGURATION Register 0

True Node Address : 00  
Cluster Size : 00  
Extended Ack : 00  
Extended Header : 00  
Disable Arb : 00  
Delta Time : 00

Contents of CONFIGURATION Register 1

Complement Node Address : FF  
Boot Time : 0F

READS  
JUMPERS  
FOR 200

Test 2: Packet Buffer Data Integrity Test  
Microcode Module EVGCN, Test # 31  
Test 3: Transmit External/Internal Loopback \*\*NOT EXECUTED\*\*  
Test 4: Transmit with Internal Loopback Set Test  
Microcode Module EVGCN, Test # 33  
Test 6: Force Transmit Parity Error in Internal Loopback Test  
Microcode Module EVGCN, Test # 35  
Test 7: Invalid Complement Destination Node Number Test  
Microcode Module EVGCN, Test # 36  
Test 8: True/Complement Destination Node Number Swap Test  
Microcode Module EVGCN, Test # 37  
Test 9: Bad CRC Test  
Microcode Module EVGCN, Test # 38  
Test 10: Negative (NAK) Acknowledgement Test  
Microcode Module EVGCN, Test # 39  
Test 11: Transmit Abort Test  
Microcode Module EVGCN, Test # 40  
Test 12: Extended Link Configuration Test  
Microcode Module EVGCN, Test # 41  
Test 13: Valid CI Node Number Test, All Combinations  
Microcode Module EVGCN, Test # 42  
Test 14: Internal Interaction Test  
Microcode Module EVGCN, Test # 43  
Test 15: Arbitration Time Test  
Microcode Module EVGCN, Test # 44  
.. End of run, 0 errors detected, pass count is 1,  
time is 28-DEC-1987 14:25:16.58

Trace Printout for Repair Diagnostic EVGCE



## Repair-Level Diagnostics for the CIBCA (cont)

### o EVGCE

- fifth of five repair-level diagnostics for CIBCA.
- fifteen tests.

### o Section

EXTERNAL\_LOOP

Loop externally on CI

### o Event Flags

- none available

## Functional Diagnostics

DS> LOAD EVGAA  
DS> SET EVENT FLAGS 1, 2  
DS> SET FLAGS TRACE, HALT  
DS> START/PASS:5

..Program: EVGAA - CI FUNCTIONAL PART I. Revision 2.5, 17 tests.  
at 00:48:21.95  
Testing: \_PAA0

EVENT FLAG 1:  
DIAGNOSTIC WILL LOAD CI RAM UCODE  
FROM THE DEFAULT LOAD PATH.

EVENT FLAG 2:  
OUTPUT THE PORT QUEUE ENTRIES.

EVENT FLAG 3:  
INVOKES THE REQUEST ID LOOP FUNCTION.

ROM REVISION = 3      WCS REVISION = 4

Test 1:    CLUSTER CONFIGURATION

CLUSTER CONFIGURATION -- PATH A  
\*\*\*\*\*

NOTE:  
YOU CANNOT DIFFERENTIATE BETWEEN A CI780 AND CI750 REMOTELY.

<u>NODE #</u>	<u>DEVICE TYPE</u>	<u>ROM/WCS REV.</u>	<u>PORT FUNCTIONALITY</u>	<u>PATH TYPE</u>
0	CI7X0	3 4	FFFFFF00(X)	DUAL PATH

CLUSTER CONFIGURATION -- PATH B  
\*\*\*\*\*

<u>NODE #</u>	<u>DEVICE TYPE</u>	<u>ROM/WCS REV.</u>	<u>PORT FUNCTIONALITY</u>	<u>PATH TYPE</u>
0	CI7X0	3 4	FFFFFF00(X)	DUAL PATH

Test 2:    SETCKT TEST WITH VARIOUS MASKS AND M\_VALUES  
Test 3:    SETCKT TEST FOR EACH VALID PORT  
Test 4:    SETCKT TEST FOR NVALID PORT  
Test 5:    REQID TEST  
Test 6:    REQID TEST WITH 6 PACKETS ON DGFQ  
Test 7:    DATAGRAM DISCARD TEST  
Test 8:    RESPONSE QUEUE AVAILABLE INTERRUPT TEST  
Test 9:    SEND DATAGRAM -SND0G- TEST  
Test 10:   SNOMSG TEST WITH NOVIRTUAL CIRCUIT TEST  
Test 11:   SEND MESSAGE TEST, CROSSING PAGE BOUNDARY  
Test 12:   MESSAGE LENGTH TEST  
Test 13:   PACKET SIZE VIOLATION TEST  
Test 14:   SEND LOOPBACK -SNDLB- TEST  
Test 15:   SNDLB TEST, FULL BUFFER PATH A  
Test 16:   SNDLB TEST, FULL BUFFER PATH B  
Test 17:   SNDLB TEST, BOTH PATHS

..End of run, 0 errors detected, pass count is 1,  
time is 15-JUL-1985 00:50:40.36

DS>

Trace Printout for Functional Diagnostic EVGAA

## Functional Diagnostics (Cont.)

- EVGAA

- First of two CI functional diagnostics for the CI780, CI750, or CIBCI.
- Seventeen tests.

- Event Flags

*★* Flag 1 is used to load CI microcode before the start of each pass. If clear, the code presently in CI RAM will be used.

- Flag 2 outputs the contents of the port queue entries *← PRINTS BUNCH OF JUNK DON'T NEED TO SEE NO GOOD DATA!*

*★* Flag 3 is used for monitoring a particular node and path.

- Operation

- QUICK feature not implemented.
- No Summary report is issued.
- Execution time is between 40 to 60 seconds (depending on the particular interface being used).

*NOTE:*

When using Event Flag 1 (loading new microcode before starting functional diagnostics), be sure CI780.BIN is accessible via the DEFAULT LOAD device.

*OR  
CIBCA.BIN*

## Functional Diagnostics (Cont.)

```
DS> LOAD EVGAB
DS> CLEAR EVENT FLAG 1, 2
DS> SET FLAGS TRACE, HALT
DS> START/PASS:5
```

```
..Program: EVGAB - CI FUNCTIONAL PART II, revision 2.5, 12 tests,
at 00:50:54.31.
Testing: _PAA0
```

```
ROM REVISION = 3    WCS REVISION = 4
```

```
Test 1:  SEND DATA TEST, WITH OFFSET COMBINATIONS
Test 2:  REQUEST DATA TEST, WITH OFFSET COMBINATIONS
Test 3:  INVALIDATE TRANSLATION CACHE TEST
Test 4:  SNDMDAT TEST, ENABLED/MAINTENANCE STATE
Test 5:  SNDMDAT TEST, ENABLED STATE
Test 6:  REQMDAT TEST, ENABLED/MAINT STATE
Test 7:  REQMDAT TEST, ENABLED STATE
Test 8:  SEND RESET TEST IN ENABLED STATE
Test 9:  QUEUE CONTENTION TEST
Test 10: BUFFER READ ACCESS TEST
Test 11: BUFFER WRITE ACCESS TEST
Test 12: WRITE TO GLOBAL BUFFER TEST
```

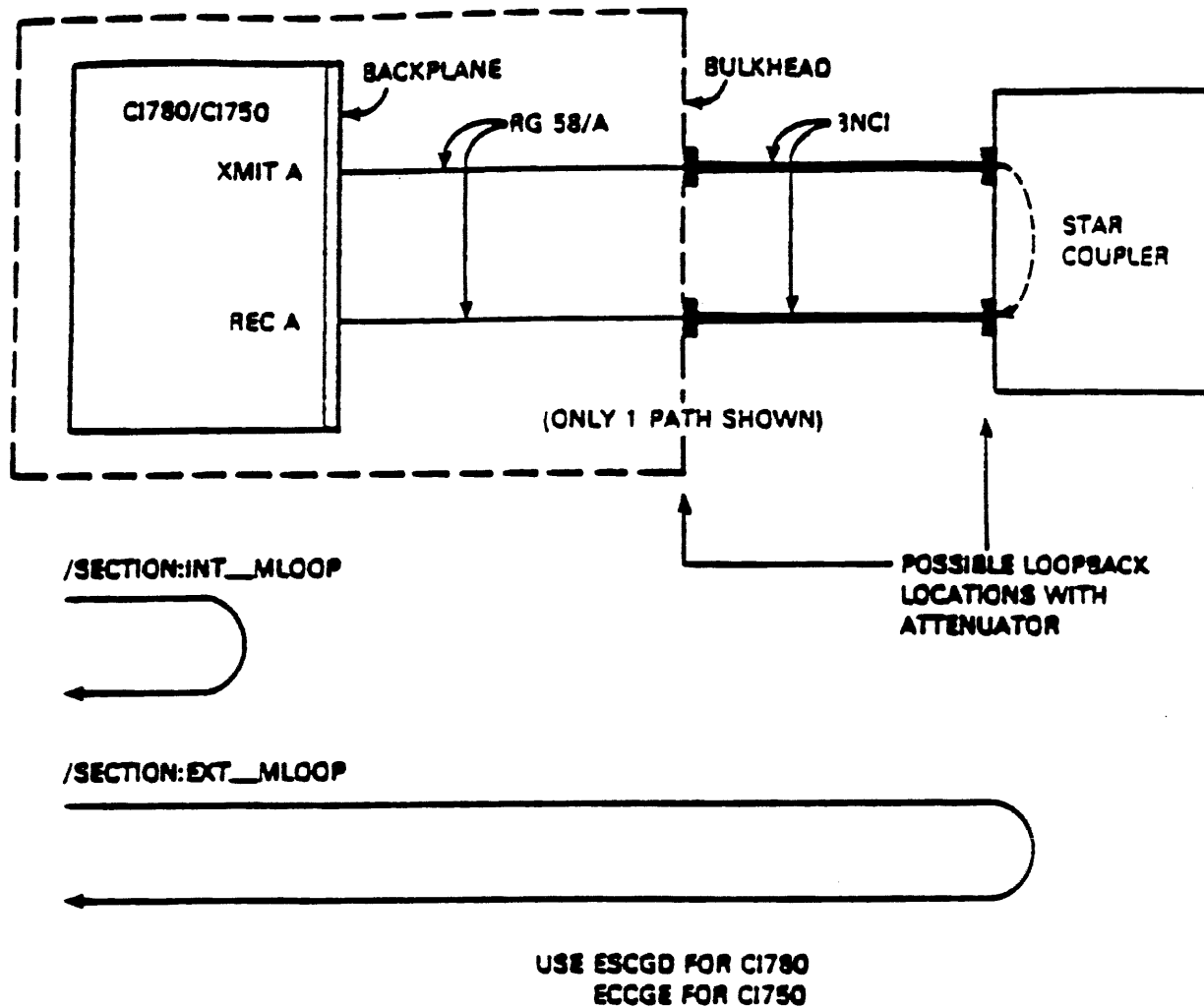
```
..End of run, 0 errors detected, pass count is 1,
time is 15-JUL-1985 00:52:29.92
DS>
```

### Trace Printout for Functional Diagnostic EVGAB

## Functional Diagnostics (Cont.)

- **EVGAB**
  - Second of two CI functional diagnostics for the CI780, CI750, or CIBCI.
  - Twelve tests.
- **Event Flags**
  - Flag 1 is used to load CI microcode before the start of each pass. If clear, the code presently in CI RAM will be used.
  - Flag 2 outputs the contents of the port queue entries.
- **Operation**
  - QUICK feature is not implemented.
  - No Summary report is issued.
  - Execution time is between 40 to 60 seconds (depending on the particular interface being used).

**NOTE:** When using Event Flag 1 (loading new microcode before starting functional diagnostics), be sure CI780.BIN is accessible via the LOAD PATH you are presently using.



TK-1089

### Looping Data on the CI Bus

VMS V5  
 VAXPAX V33 BAD - ONLINE DIAG DRIVERS SCREWED UP  
 V34 GOOD

## EVXCI: Cluster Exerciser

- A level 2R multi-purpose exerciser that provides local CI interface functional testing, as well as a means of determining the ability of VAXcluster nodes, to reliably communicate using the CI Bus.
- The exerciser is found on the VAXPAX distribution medium under the product name of CIE081.  
 NOT IN REV 33 DIAGS  
 GO TO REV 34
- CIE081 must be installed under SYS\$UPDATE:VMSINSTAL into the SYS\$SYSMAINTENANCE directory.
- Follow these steps to run the CI Exerciser:
  - Install CIE081 from the VAXPAX kit.
  - Execute CIELOAD.COM at <sup>EACH</sup> node.
  - Define CIE as a foreign command.
  - Run the exerciser by typing CIE.
  - On nodes that the exerciser cannot find responders on, execute the CIELOAD.COM to load the drivers.
  - Run the exerciser again.

\$> TYPE EVNDX, SEQ  
 WILL GIVE REV OF VAXPAX THAT  
 DIAGS CAME FROM

ON HSC'S

HSC> RUN SETSHO

SETSHC> SHOW LOAD

LOOK FOR RS. IF NOT THERE DO

① SETSHO> SET LOAD RS

② SETSHO> ENABLE REBOOT  
 4-51

③ SETSHO> EXIT

④ REBOOT? YES

CI Port Diagnostics

# Sample Run of EVXCI

Welcome to node WRAITH on the  
Santa Clara Educational Services Hardware Cluster

Please enter your username followed by a carriage return. Now, enter your password (it will not echo) and a carriage return.

If you have problems logging on, see your instructor!

THIS IS THE STANDARD CLASS VAX/VMS SYSTEM! ! !

Username: FIELD

Password:

Welcome to VAX/VMS version V4.4 on node WRAITH

Last interactive login on Friday, 11-MAR-1988 09:04

Last non-interactive login on Friday, 19-FEB-1988 15:58

\$ SET DEFAULT SYSSMAINTENANCE

\$ DIR

\$ > DIR CIE\*.★

Directory SYSSYSROOT:[SYSMAINT]

DUCT.EXE;1            DUCT.RELEASE\_NOTES;1

DUCT\_CURR\_ACCT.TMP;1

Total of 3 files.

Directory SYSSCOMMON:[SYSMAINT]

8200_RELEASE_NOTES.DOC;1	ACCEPT.COM;1	ACCESS.BPN_8600;1
ANYBOO.COM_8600;1	BINCOM.SAV_8600;1	BOOT._8600;1
CCSNOOP.BIN;1	CDF860.DAT_8600;2	CDF865.DAT_8600;2
CI780.BIN;1	CI780.BIN;1	CI780.BIN;1
CIBCA.BIN;14	CIBOO.COM_8600;1	CIE081.A;3
CIE081.C;1	CIE081.RELEASE_NOTES.DOC;1	CIE081.B;2
CNSL.COM_8600;1	CONLIST.LIS_8600;40	CONLIST_NODIAG.LIS_8600;22

\*Y



## Sample Run of EVXCI (Cont.)

\$ @SYSSUPDATE:VMSINSTAL

VAX/VMS Software Product Installation Procedure V4.4

It is 13-MAR-1988 at 10:48.

Enter a question mark (?) at any time for help.

%VMSINSTAL-W-NOTSYSTEM, You are not logged in to the SYSTEM account.

%VMSINSTAL-W-DECNET, Your DECnet network is up and running.

\* Do you want to continue anyway [NO]? YES

\* Are you satisfied with the backup of your system disk [YES]? YES

\* Where will the distribution volumes be mounted: SYSSMAINTENANCE:

Enter the products to be processed from the first distribution volume set.

\* Products: CIE081

The following products will be processed:

CIE V8.1

Beginning installation of CIE V8.1 at 10:48

%VMSINSTAL-I-RESTORE, Restoring product saveset A...

%VMSINSTAL-I-RESTORE, Restoring product saveset B...

%VMSINSTAL-I-RESTORE, Restoring product saveset C...

Linking drivers and EVXCI...

Enter Y[es] to purge old files: YES

Control will now be returned to VMSINSTAL, which will actually  
move the files to their destination directories.

CIE version 8.1 has been copied to SYSSCOMMON:[SYSMAINT]

To run the CI Exerciser, make CIE a foreign command in your LOGIN.COM file.

Example:

CIE :== " \$ SYSSCOMMON:[SYSMAINT]Evxcie.exe "

%VMSINSTAL-I-MOVEFILES, Files will now be moved to their target directories...

Installation of CIE V8.1 completed at 10:49

Enter the products to be processed from the next distribution volume set.

\* Products: EXIT

VMSINSTAL procedure done at 10:50

## Sample Run of EVXCI (Cont.)

\$ @CIELOAD

CXDRIVER and CYDRIVER have been loaded successfully.

\$ CIE == "\$ SYSSCOMMON:[SYSMAINT]EVXCI.EXE"

\$ CIE

Local Port can NOT connect with remote node. Node will be deselected.

Please, make sure that ULAIRI has loaded responder driver (CYDRIVER)

Node ULAIRI has been deselected.

-----  
Testing from WRAITH, PAA0 Node address 02, Number of nodes = 02  
\*\*\*\*\*

Node Name	Node #	Hardware Type	Status
SAURON	01	HS50	Open
MELKOR	00	HS50	Open

... Computer Interconnect Exerciser, ZZ-EVXCI Version 8.1  
Started at 13-MAR-1988 10:55:12.11

Testing WRAITH, node number 02

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE  
TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION  
TEST #8 SEND DATAGRAM  
TEST #9 RECEIVE DATAGRAM  
TEST #10 DATAGRAM DATA  
TEST #11 MULTIPLE DATAGRAM  
TEST #12 RESPONDER WRITE BUFFER  
TEST #13 RESPONDER READ BUFFER  
TEST #14 CONTROLLER READ BUFFER  
TEST #15 CONTROLLER WRITE BUFFER  
TEST #16 READ WRITE BUFFER DATA  
TEST #17 MULTI READ WRITE BUFFER DATA  
TEST #18 THIRD PARTY CONFIGURATION

Test skipped, no third party at this time.

## Sample Run of EVXCI (Cont.)

TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
    Test skipped, no third party at this time.  
TEST #20 ACTIVITY GENERATION  
    Test skipped, no third party at this time.  
TEST #21 PERFORMANCE COUNTERS  
    Test skipped, no third party at this time.

Testing SAURON, node number 01

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE  
TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION  
TEST #8 SEND DATAGRAM  
TEST #9 RECEIVE DATAGRAM  
TEST #10 DATAGRAM DATA  
TEST #11 MULTIPLE DATAGRAM  
TEST #12 RESPONDER WRITE BUFFER  
TEST #13 RESPONDER READ BUFFER  
TEST #14 CONTROLLER READ BUFFER  
    Test skipped, unit does not support required CI functions.  
TEST #15 CONTROLLER WRITE BUFFER  
    Test skipped, unit does not support required CI functions.  
TEST #16 READ WRITE BUFFER DATA  
TEST #17 MULTI READ WRITE BUFFER DATA  
TEST #18 THIRD PARTY CONFIGURATION  
TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
TEST #20 ACTIVITY GENERATION  
TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
02	00000020	00000000	00000000	00000020	00000000	00000000
01	00000022	00000000	00000000	0000001E	00000000	00000000

Testing MELKOR, node number 00

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE

## Sample Run of EVXCI (Cont.)

TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION  
TEST #8 SEND DATAGRAM  
TEST #9 RECEIVE DATAGRAM  
TEST #10 DATAGRAM DATA  
TEST #11 MULTIPLE DATAGRAM  
TEST #12 RESPONDER WRITE BUFFER  
TEST #13 RESPONDER READ BUFFER  
TEST #14 CONTROLLER READ BUFFER

Test skipped, unit does not support required CI functions.

TEST #15 CONTROLLER WRITE BUFFER

Test skipped, unit does not support required CI functions.

TEST #16 READ WRITE BUFFER DATA

TEST #17 MULTI READ WRITE BUFFER DATA

TEST #18 THIRD PARTY CONFIGURATION

TEST #19 THIRD PARTY READ WRITE BUFFER DATA

TEST #20 ACTIVITY GENERATION

TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
02	00000037	00000000	00000000	0000002B	00000000	00000000
00	0000001F	00000000	00000000	00000021	00000000	00000000
01	0000000F	00000000	00000000	00000013	00000000	00000000

... End of run, 3 nodes tested, 0 errors detected, pass count is 1.

Ending time 13-MAR-1988 10:56:26.16

\$ SET HOST ULAIRI

Welcome to node ULAIRI on the  
Santa Clara Educational Services Hardware Cluster

Please enter your username followed by a carriage return.  
Now, enter your password (it will not echo) and a carriage  
return.

If you have problems logging on, see your instructor!

**THIS IS THE STANDARD CLASS VAX/VMS SYSTEM! ! ! !**

Username: FIELD

Password:

Welcome to VAX/VMS version V4.4 on node ULAIRI

Last interactive login on Sunday, 13-MAR-1988 11:18

Last non-interactive login on Friday, 19-FEB-1988 15:58

## Sample Run of EVXCI (Cont.)

\$ @CIELOAD

CXDRIVER and CYDRIVER have been loaded successfully.

\$ LO

FIELD logged out at 13-MAR-1988 11:31:48.43

%REM-S-END, control returned to node \_WRAITH::

\$ CIE == "\$ SYSSCOMMON:[SYSMAINT]EVXCI.EXE"

\$ CIE

-----  
ATesting from WRAITH, PAAO Node address 02, Number of nodes = 03  
.....

Node Name	Node #	Hardware	Type Status
SAURON	01	HS50	Open
MELKOR	00	HS50	Open
ULAIRI	04	8600	Open

... Computer Interconnect Exerciser, ZZ-EVXCI Version 8.1  
Started at 13-MAR-1988 11:19:35.23

Testing WRAITH, node number 02

TEST #1 LOCAL CONFIGURATION

TEST #2 CONNECT

TEST #3 BASIC MESSAGE

TEST #4 MESSAGE DATA

TEST #5 MULTIPLE MESSAGE

TEST #6 CTP FUNCTIONALITY

TEST #7 REMOTE CONFIGURATION

TEST #8 SEND DATAGRAM

TEST #9 RECEIVE DATAGRAM

TEST #10 DATAGRAM DATA

TEST #11 MULTIPLE DATAGRAM

TEST #12 RESPONDER WRITE BUFFER

TEST #13 RESPONDER READ BUFFER

TEST #14 CONTROLLER READ BUFFER

TEST #15 CONTROLLER WRITE BUFFER

TEST #16 READ WRITE BUFFER DATA

TEST #17 MULTI READ WRITE BUFFER DATA

TEST #18 THIRD PARTY CONFIGURATION

Test skipped, no third party at this time.

TEST #19 THIRD PARTY READ WRITE BUFFER DATA

Test skipped, no third party at this time.

TEST #20 ACTIVITY GENERATION

Test skipped, no third party at this time.

TEST #21 PERFORMANCE COUNTERS

Test skipped, no third party at this time.

## Sample Run of EVXCI (Cont.)

Testing SAURON, node number 01

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE  
TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION  
TEST #8 SEND DATAGRAM  
TEST #9 RECEIVE DATAGRAM  
TEST #10 DATAGRAM DATA  
TEST #11 MULTIPLE DATAGRAM  
TEST #12 RESPONDER WRITE BUFFER  
TEST #13 RESPONDER READ BUFFER  
TEST #14 CONTROLLER READ BUFFER

Test skipped, unit does not support required CI functions.

TEST #15 CONTROLLER WRITE BUFFER

Test skipped, unit does not support required CI functions.

TEST #16 READ WRITE BUFFER DATA  
TEST #17 MULTI READ WRITE BUFFER DATA  
TEST #18 THIRD PARTY CONFIGURATION  
TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
TEST #20 ACTIVITY GENERATION  
TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
02	00000024	00000000	00000000	0000001C	00000000	00000000
01	0000001A	00000000	00000000	00000026	00000000	00000000

Testing MELKOR, node number 00

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE  
TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION  
TEST #8 SEND DATAGRAM  
TEST #9 RECEIVE DATAGRAM  
TEST #10 DATAGRAM DATA  
TEST #11 MULTIPLE DATAGRAM  
TEST #12 RESPONDER WRITE BUFFER  
TEST #13 RESPONDER READ BUFFER

## Sample Run of EVXCI (Cont.)

TEST #14 CONTROLLER READ BUFFER

Test skipped, unit does not support required CI functions.

TEST #15 CONTROLLER WRITE BUFFER

Test skipped, unit does not support required CI functions.

TEST #16 READ WRITE BUFFER DATA

TEST #17 MULTI READ WRITE BUFFER DATA

TEST #18 THIRD PARTY CONFIGURATION

TEST #19 THIRD PARTY READ WRITE BUFFER DATA

TEST #20 ACTIVITY GENERATION

TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
02	00000035	00000000	00000000	0000002D	00000000	00000000
00	0000001F	00000000	00000000	00000021	00000000	00000000
01	00000013	00000000	00000000	0000000F	00000000	00000000

Testing ULAIRI, node number 04

TEST #1 LOCAL CONFIGURATION

TEST #2 CONNECT

TEST #3 BASIC MESSAGE

TEST #4 MESSAGE DATA

TEST #5 MULTIPLE MESSAGE

TEST #6 CTP FUNCTIONALITY

TEST #7 REMOTE CONFIGURATION

TEST #8 SEND DATAGRAM

TEST #9 RECEIVE DATAGRAM

TEST #10 DATAGRAM DATA

TEST #11 MULTIPLE DATAGRAM

TEST #12 RESPONDER WRITE BUFFER

TEST #13 RESPONDER READ BUFFER

TEST #14 CONTROLLER READ BUFFER

TEST #15 CONTROLLER WRITE BUFFER

TEST #16 READ WRITE BUFFER DATA

TEST #17 MULTI READ WRITE BUFFER DATA

TEST #18 THIRD PARTY CONFIGURATION

TEST #19 THIRD PARTY READ WRITE BUFFER DATA

TEST #20 ACTIVITY GENERATION

TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
02	00000C8B	00000000	00000300	00000CA0	00000000	00000000
04	00000CA2	00000004	00000002	00000C3F	00000006	00000000
01	00000013	00000000	00000001	00000015	00000000	00000002
00	00000012	00000001	00000001	00000011	00000000	00000003

... End of run, 4 nodes tested, 0 errors detected, pass count is 1.

Ending time 13-MAR-1988 11:21:21.53

## Sample Run of EVXCI (Cont.)

\$ SET HOST ULAIRI

Welcome to node ULAIRI on the  
Santa Clara Educational Services Hardware Cluster

Please enter your username followed by a carriage return.  
Now, enter your password (it will not echo) and a carriage  
return.

If you have problems logging on, see your instructor!

**THIS IS THE STANDARD CLASS VAX/VMS SYSTEM! ! ! !**

Username: FIELD

Password:

Welcome to VAX/VMS version V4.4 on node ULAIRI  
Last interactive login on Sunday, 13-MAR-1988 11:18  
Last non-interactive login on Friday, 19-FEB-1988 15:58  
\$ CIE == "\$ SYSSCOMMON:[SYSMAINT]EVXCI.EXE"  
\$ CIE

-----  
Testing from ULAIRI, PAAO Node address 04, Number of nodes = 03  
.....

Node Name	Node #	Hardware Type	Status
SAURON	01	HS50	Open
WRAITH	02	8600	Open
MELKOR	00	HS50	Open

... Computer Interconnect Exerciser, ZZ-EVXCI Version 8.1  
Started at 13-MAR-1988 11:22:44.89

Testing ULAIRI, node number 04

TEST #1 LOCAL CONFIGURATION  
TEST #2 CONNECT  
TEST #3 BASIC MESSAGE  
TEST #4 MESSAGE DATA  
TEST #5 MULTIPLE MESSAGE  
TEST #6 CTP FUNCTIONALITY  
TEST #7 REMOTE CONFIGURATION



## Sample Run of EVXCI (Cont.)

TEST #8 SEND DATAGRAM  
 TEST #9 RECEIVE DATAGRAM  
 TEST #10 DATAGRAM DATA  
 TEST #11 MULTIPLE DATAGRAM  
 TEST #12 RESPONDER WRITE BUFFER  
 TEST #13 RESPONDER READ BUFFER  
 TEST #14 CONTROLLER READ BUFFER  
 TEST #15 CONTROLLER WRITE BUFFER  
 TEST #16 READ WRITE BUFFER DATA  
 TEST #17 MULTI READ WRITE BUFFER DATA  
 TEST #18 THIRD PARTY CONFIGURATION  
     Test skipped, no third party at this time.  
 TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
     Test skipped, no third party at this time.  
 TEST #20 ACTIVITY GENERATION  
     Test skipped, no third party at this time.  
 TEST #21 PERFORMANCE COUNTERS  
     Test skipped, no third party at this time.

Testing SAURON, node number 01

TEST #1 LOCAL CONFIGURATION  
 TEST #2 CONNECT  
 TEST #3 BASIC MESSAGE  
 TEST #4 MESSAGE DATA  
 TEST #5 MULTIPLE MESSAGE  
 TEST #6 CTP FUNCTIONALITY  
 TEST #7 REMOTE CONFIGURATION  
 TEST #8 SEND DATAGRAM  
 TEST #9 RECEIVE DATAGRAM  
 TEST #10 DATAGRAM DATA  
 TEST #11 MULTIPLE DATAGRAM  
 TEST #12 RESPONDER WRITE BUFFER  
 TEST #13 RESPONDER READ BUFFER  
 TEST #14 CONTROLLER READ BUFFER  
     Test skipped, unit does not support required CI functions.  
 TEST #15 CONTROLLER WRITE BUFFER  
     Test skipped, unit does not support required CI functions.  
 TEST #16 READ WRITE BUFFER DATA  
 TEST #17 MULTI READ WRITE BUFFER DATA  
 TEST #18 THIRD PARTY CONFIGURATION  
 TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
 TEST #20 ACTIVITY GENERATION  
 TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
04	00000024	00000000	00000000	0000001C	00000000	00000000
01	00000025	00000000	00000000	0000001B	00000000	00000000

## Sample Run of EVXCI (Cont.)

Testing WRAITH, node number 02

TEST #1 LOCAL CONFIGURATION  
 TEST #2 CONNECT  
 TEST #3 BASIC MESSAGE  
 TEST #4 MESSAGE DATA  
 TEST #5 MULTIPLE MESSAGE  
 TEST #6 CTP FUNCTIONALITY  
 TEST #7 REMOTE CONFIGURATION  
 TEST #8 SEND DATAGRAM  
 TEST #9 RECEIVE DATAGRAM  
 TEST #10 DATAGRAM DATA  
 TEST #11 MULTIPLE DATAGRAM  
 TEST #12 RESPONDER WRITE BUFFER  
 TEST #13 RESPONDER READ BUFFER  
 TEST #14 CONTROLLER READ BUFFER  
 TEST #15 CONTROLLER WRITE BUFFER  
 TEST #16 READ WRITE BUFFER DATA  
 TEST #17 MULTI READ WRITE BUFFER DATA  
 TEST #18 THIRD PARTY CONFIGURATION  
 TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
 TEST #20 ACTIVITY GENERATION  
 TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POACK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>PIACK</u>	<u>PINAK</u>	<u>PINORSP</u>
04	00000E18	00000000	00000001	00000E95	00000004	00000300
02	00000E29	00000005	00000000	00000E62	00000004	00000301
01	00000011	00000000	00000002	0000001A	00000005	00000000

Testing MELKOR, node number 00

TEST #1 LOCAL CONFIGURATION  
 TEST #2 CONNECT  
 TEST #3 BASIC MESSAGE  
 TEST #4 MESSAGE DATA  
 TEST #5 MULTIPLE MESSAGE  
 TEST #6 CTP FUNCTIONALITY  
 TEST #7 REMOTE CONFIGURATION  
 TEST #8 SEND DATAGRAM  
 TEST #9 RECEIVE DATAGRAM  
 TEST #10 DATAGRAM DATA  
 TEST #11 MULTIPLE DATAGRAM  
 TEST #12 RESPONDER WRITE BUFFER  
 TEST #13 RESPONDER READ BUFFER  
 TEST #14 CONTROLLER READ BUFFER

Test skipped, unit does not support required CI functions.

TEST #15 CONTROLLER WRITE BUFFER

Test skipped, unit does not support required CI functions.

## Sample Run of EVXCI (Cont.)

TEST #16 READ WRITE BUFFER DATA  
TEST #17 MULTI READ WRITE BUFFER DATA  
TEST #18 THIRD PARTY CONFIGURATION  
TEST #19 THIRD PARTY READ WRITE BUFFER DATA  
TEST #20 ACTIVITY GENERATION  
TEST #21 PERFORMANCE COUNTERS

<u>NODE</u>	<u>POCK</u>	<u>PONAK</u>	<u>PONORSP</u>	<u>P1ACK</u>	<u>P1NAK</u>	<u>P1NORSP</u>
04	0000026C	00000000	00000000	000002C3	00000000	00000000
00	0000001C	00000000	00000000	00000025	00000003	00000001
01	00000012	00000001	00000001	00000011	00000000	00000000
02	000002DE	00000001	00000000	0000031E	00000004	00000301

... End of run, 4 nodes tested, 0 errors detected, pass count is 1.  
Ending time 13-MAR-1988 11:24:34.16

\$ LO  
FIELD logged out at 13-MAR-1988 11:31:48.43  
%REM-S-END, control returned to node \_WRAITH::  
\$ LO  
FIELD logged out at 13-MAR-1988 11:31:48.43

## **CI PORT REGISTERS**

# CI Port Registers

## Lesson Introduction

The CI Port has two types of registers called hardware registers and microcode registers. The hardware registers are defined by the hardware at all times. The microcode registers are created in the Local Store by the microcode upon initialization and are defined only when the functional microcode is running.

This lesson addresses the location and contents of the CI Port registers.

## Lesson Objectives

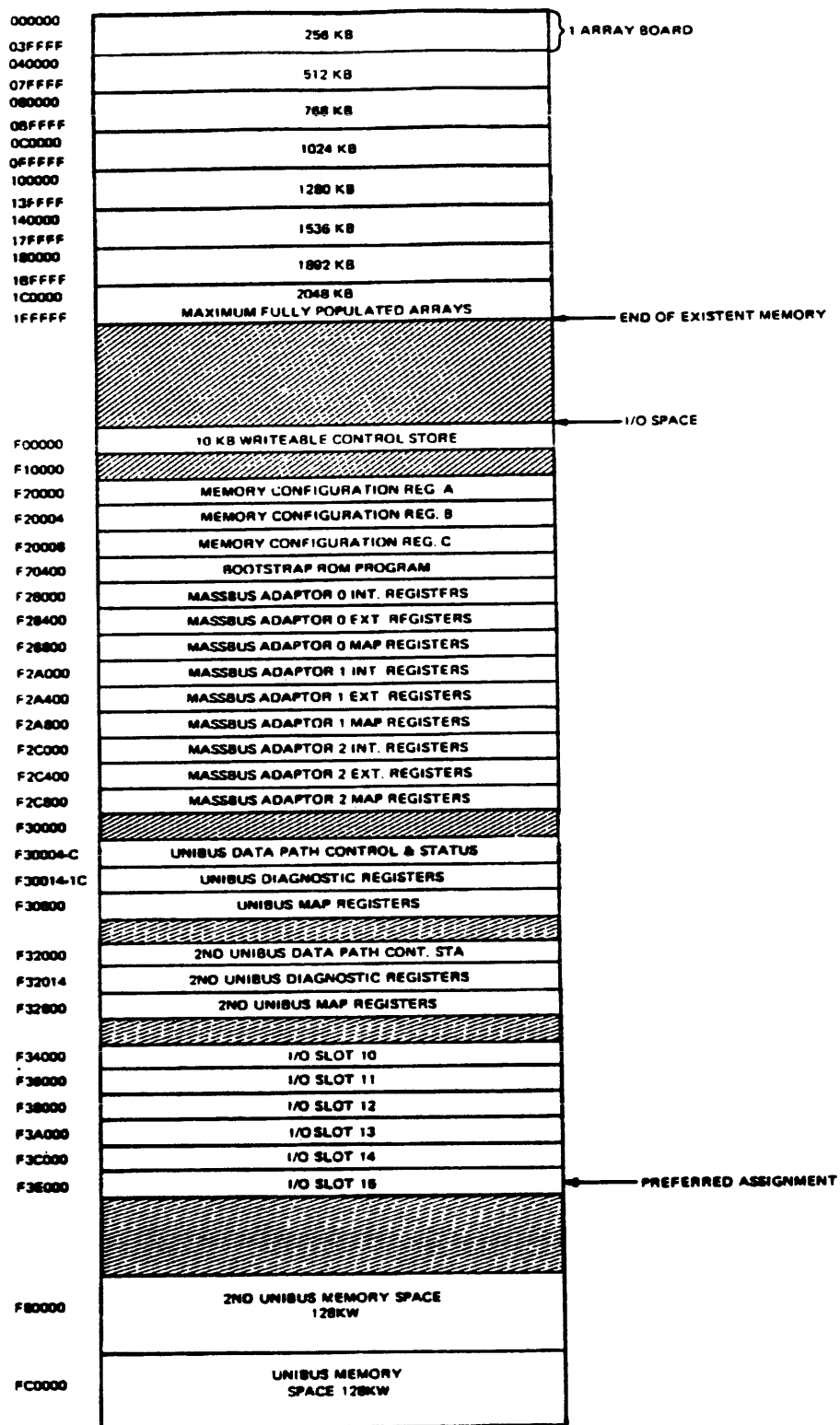
1. Analyze an event log printout to find a suspected defective CI FRU.
2. Calculate a registers address and then examine that register from the VAX Console Terminal.
3. Examine and deposit data to and from the Control Store, Local Store, and VCDT.
4. Identify the current condition of the CI Port from the interface registers.

## Lesson Outline

- I. Physical Address Space Map
- II. CI Port Hardware Registers
- III. CI Port Microcode Registers
- IV. Device Specific Registers

## **CI750 Address Assignment**

- Preferred assignment within VAX 750 address map is I/O slot 15.
- Base address is F3E000.



74-18493

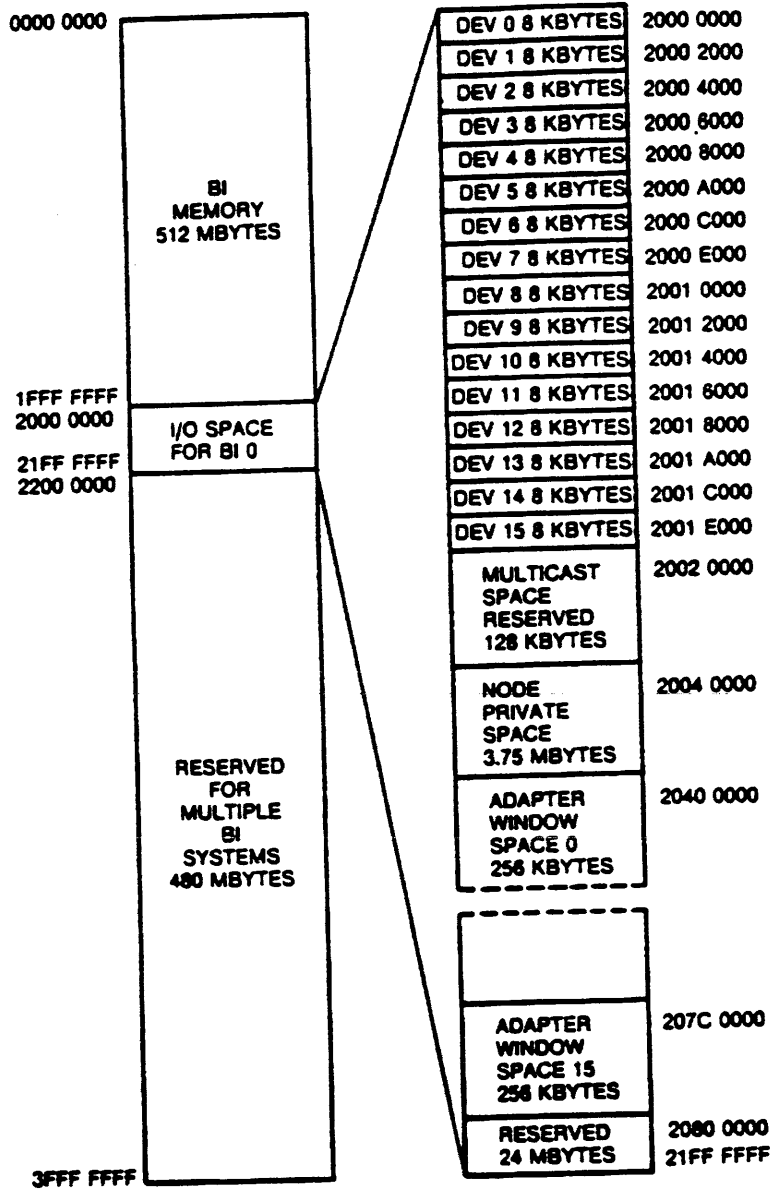
## VAX-11/750 Physical Address Space Map

## **CIBCI Address Assignment**

- The address for the CIBCI is a BI node number within the VAXBI I/O space.
- The normal default address is 2000A000, which is BI node 5.



# BIG PICTURE VAXBI I/O SPACE

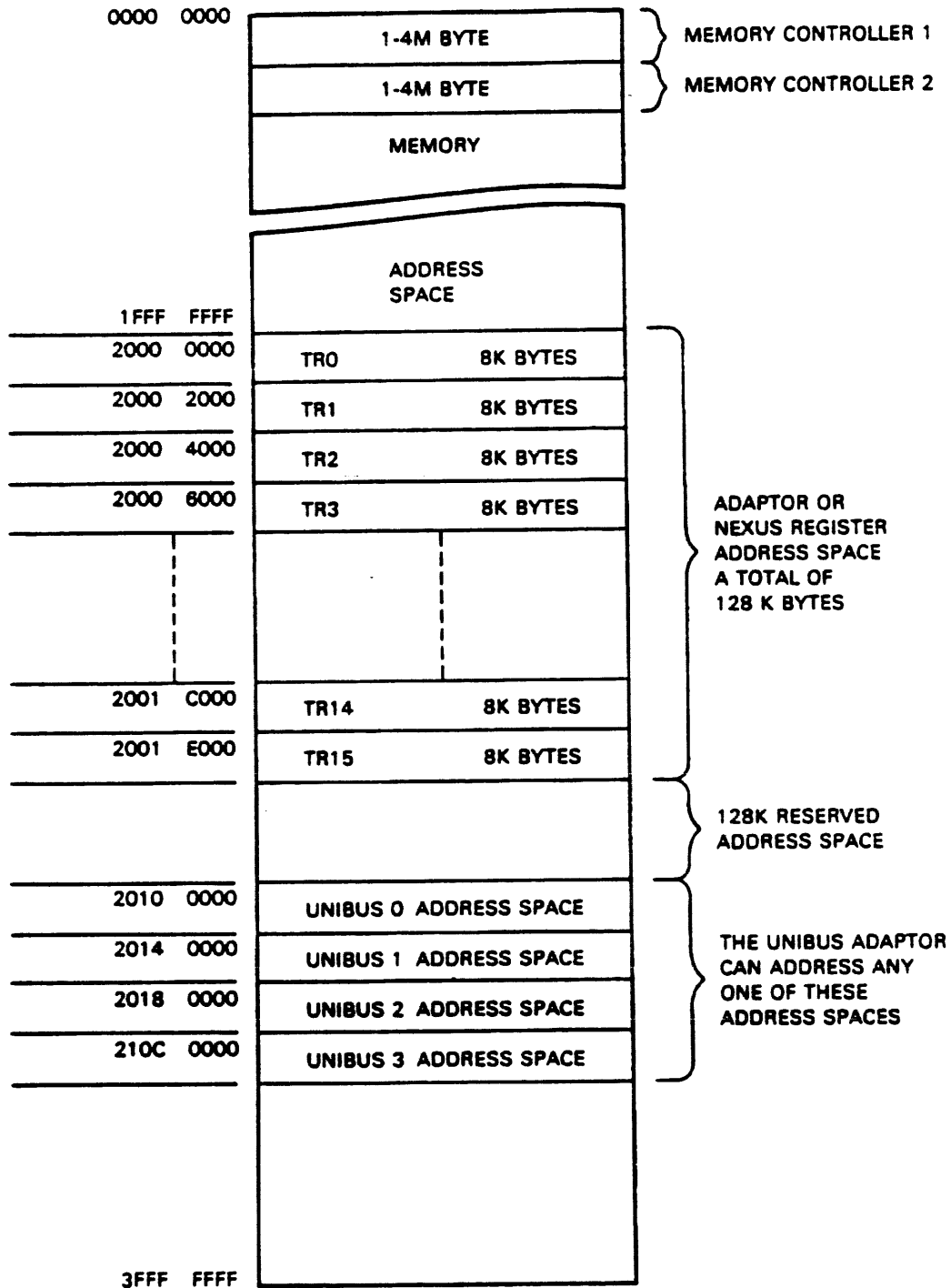


## VAXBI I/O Address Space

## **CI780 Address Assignment**

The preferred address for the CI780 within the VAX 780 is at 2001C000 (TR14).

30-BIT PHYSICAL  
BYTE ADDRESSES



TK-10496

VAX-11/780 Physical Address Space Map

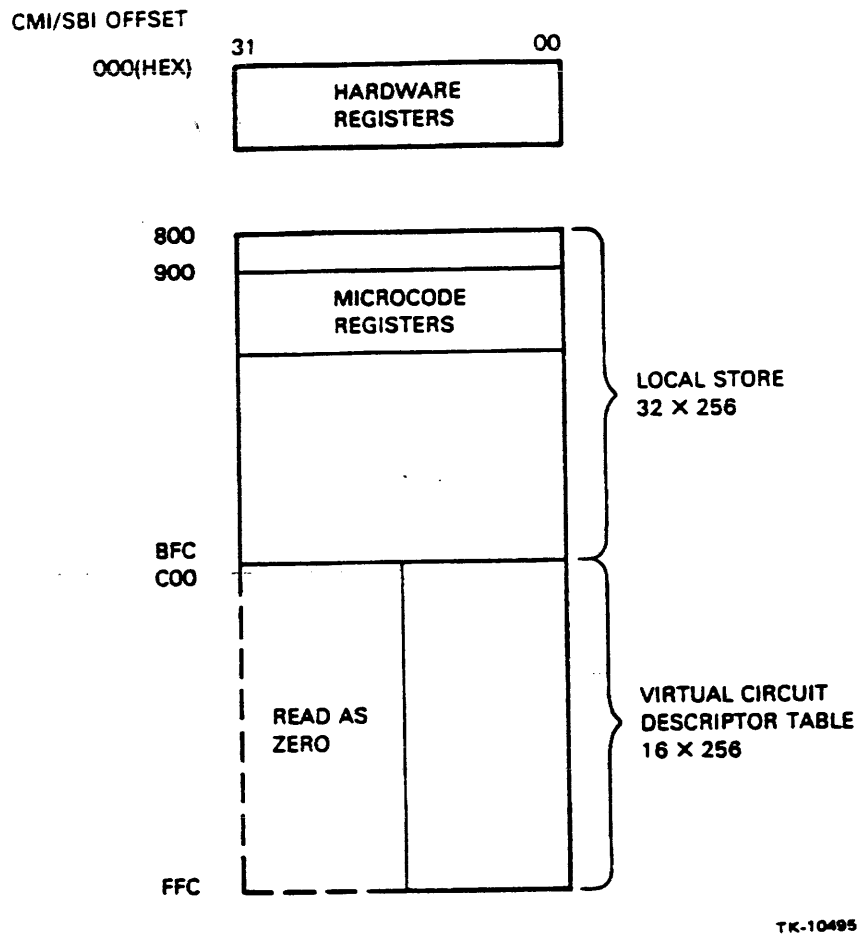
## CI780 Address Assignment on the VAX 8600

- The CI interface for the VAX 8600 can be attached to one of two SBI interfaces.
- Normal placement is on SBIA 0 with a base address assignment of 2001C000 (same as VAX 780), which is TR #14.

ONLY 1 CI ON 2 SBI MACHINE

TR#	SBIA 0		SBIA 1	
	Byte Address	Longword Address	Byte Address	Longword Address
1	20002000	8000800	22002000	8800800
2	20004000	8001000	22004000	8801000
3 DW0	20006000	8001800	DW4	22006000 8801800
4 DW1	20008000	8002000	DW5	22008000 8802000
5 DW2	2000A000	8002800	DW6	2200A000 8802800
6 DW3	2000C000	8003000	DW7	2200C000 8803000
7	2000E000	8003800		2200E000 8803800
8* RH0	20010000	8004000	RH4	22010000 8804000
9* RH1	20012000	8004800	RH5	22012000 8804800
10* RH2	20014000	8005000	RH6	22014000 8805000
11* RH3	20016000	8005800	RH7	22016000 8805800
12	20018000	8006000		22018000 8806000
13	2001A000	8006800		2201A000 8806800
14	2001C000	8007000		2201C000 8807000
15	2001E000	8007800		2201E000 8807800

\*RH780



CI Port Address Space Map

## CI Port Hardware Registers

There are four hardware registers common to the CI750, CI780, and CIBCI interfaces:

- Configuration Register (CNFGR) -- located on the SBI Interface module (CI780), CMI Interface module (CI750), and the Adapter Control module (CIBCI).
- Port Maintenance Control and Status Register (PMCSR) -- located on the Data Path module for all three interfaces.
- Maintenance Address Register (MADR) -- located on the Packet Buffer module for all three interfaces.
- Maintenance Data Register (MDATR) -- located on the Packet Buffer module for all three interfaces.

These registers are not part of any memory on the CI Interface. The following diagram shows the byte offsets to each of these registers:

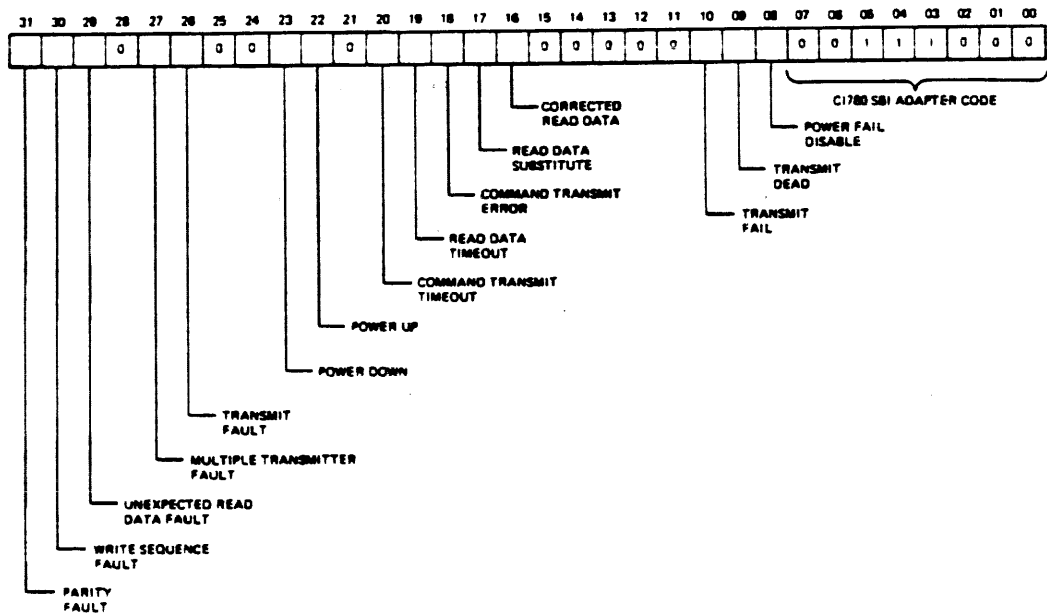
<u>CI750</u>	<u>CI780</u>	<u>CIBCI</u>	HARDWARE REGISTERS
000	000	100	CNFGR
004	004 or 010	110	PMCSR
014	014	114	MADR
018	018	118	MDATR

CIBCA    USES NO CNFGR

N/A	CNFGR
1004	PMCSR
1008	MADR
100C	MDATR

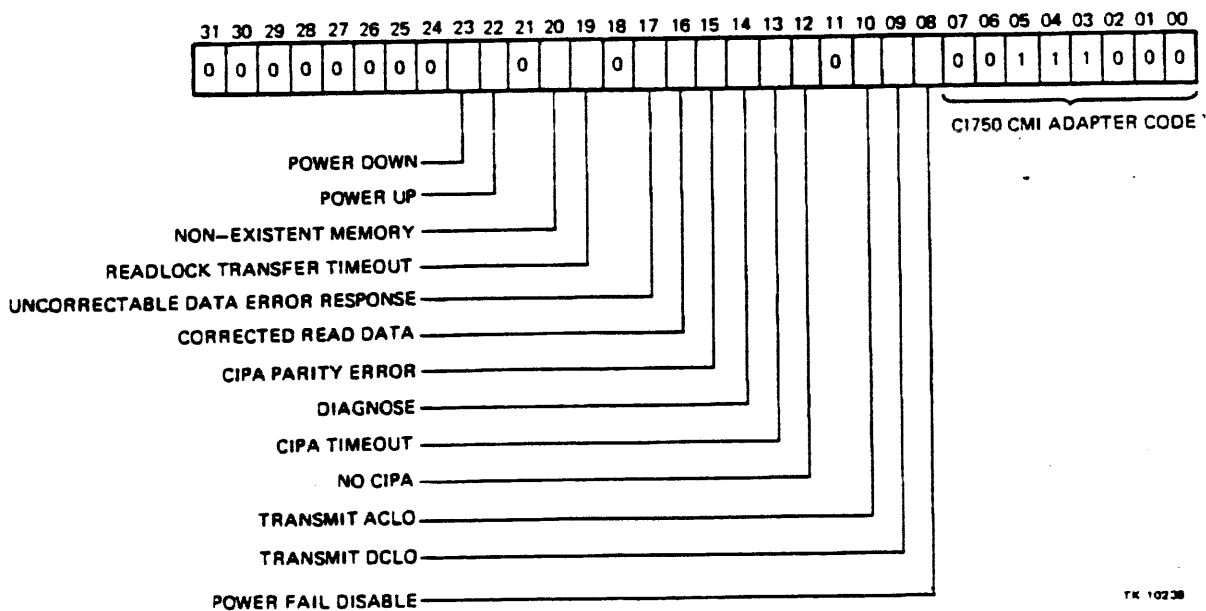
# Configuration Register (CNFGR) for CI780

- Byte offset = 0.
- SBI fault bits.
- Port status bits.
- Error bits.



## Configuration Register (CNFGR) for CI750

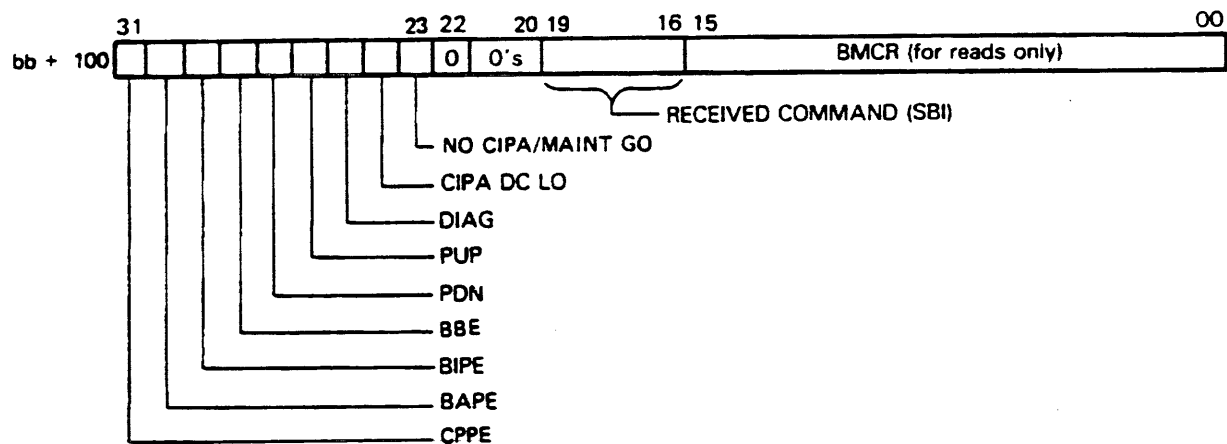
- Byte offset = 0.
- Port status bits.
- Error bits.





## Configuration Register (CNFGR) for CIBCI

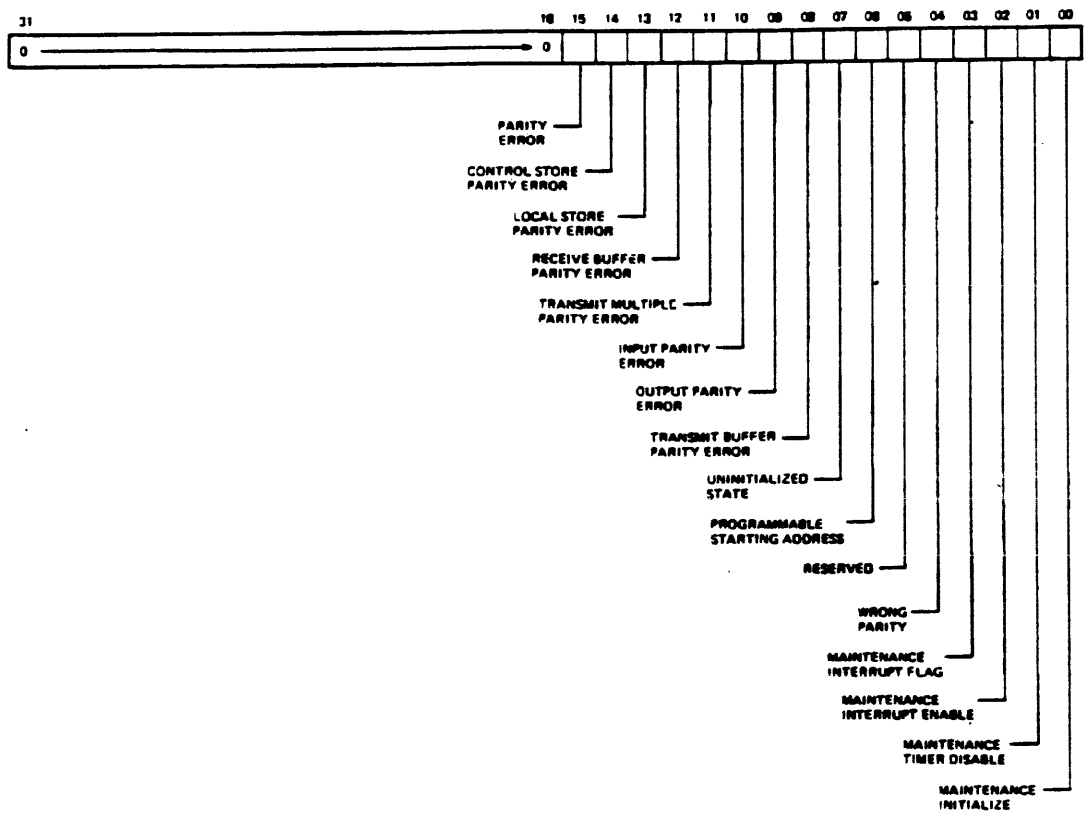
- Byte offset = 100.
- Port status bits.
- Error bits.



MKV84-2930

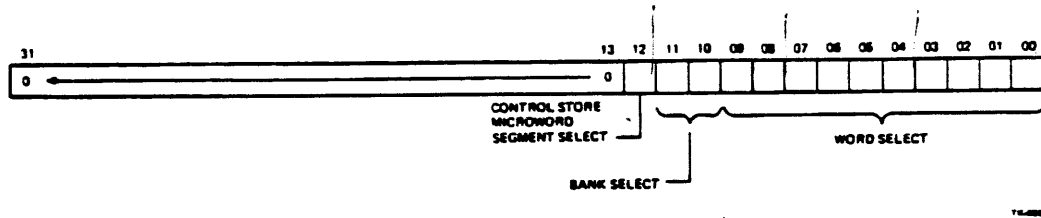
## Port Maintenance Control and Status Register (CI750, CI780, CIBCI)

- Port hardware error flags.
- Interrupt and port initialization control bits.
- Byte offset 4 or 10 for CI780.
- Byte offset 4 for CI750.
- Byte offset 110 for CIBCI.
- Bit zero not used in CIBCI.



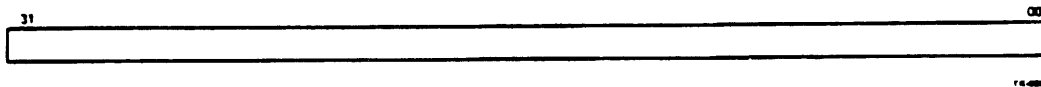
## Maintenance Address Register (MADR)

- Byte offset = 14 for CI750 and CI780.
- Byte offset = 114 for CIBCI.
- Addresses the Control Store for loading and verifying the microcode.
- Contains the starting address of the microcode.
- Can only be read/written when port is in uninitialized state (microcode is stopped).



## Maintenance Data Register (MDATR)

- Byte offset = 18 for CI750 and CI780.
- Byte offset = 118 for CIBCI.
- Provides access to the Control Store location pointed to by MADR.
- Used to initially load and verify the microcode.
- Valid only when the port is in the uninitialized state (microcode is stopped).



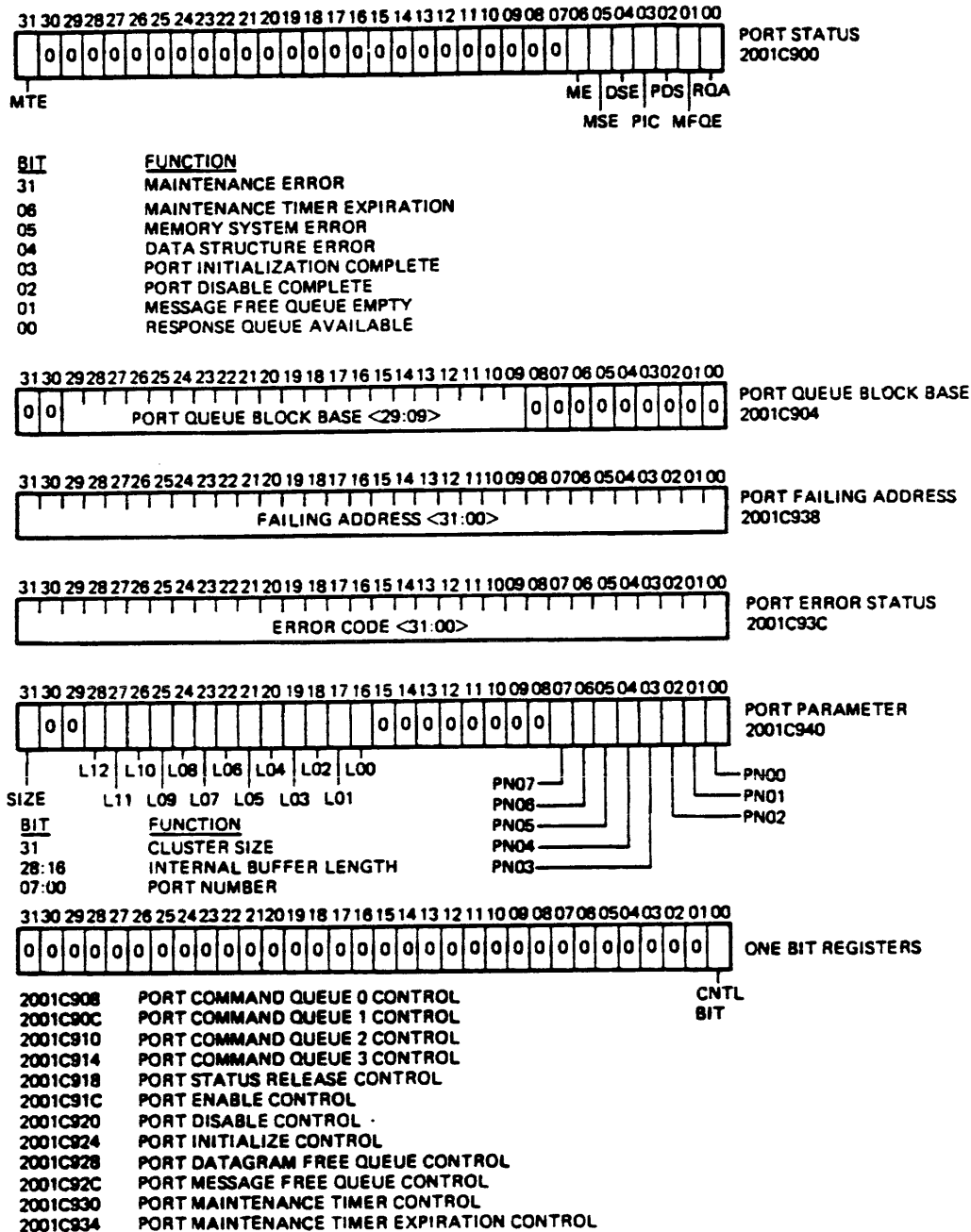
## Microcode Registers (in Local Store)

OFFSET		
900	PSR	BIT 31 COMES FROM HARDWARE
904	PQBBR	
908	PCQ0CR	
90C	PCQ1CR	
910	PCQ2CR	
914	PCQ3CR	
918	PSRCR	
91C	PECR	
920	PDCR	
924	PICR	BIT 0 GOES TO HARDWARE
928	PDFQCR	
92C	PMFQCR	
930	PMTCR	
934	PMTECR	
938	PFAR	
93C	PESR	
940	PPR	

TK-10802

### Microcode Register Summary

## Microcode Registers (in Local Store) (Cont.)



TK-8938

## Microcode Register Breakdown

## **Device-Specific Registers**

### **CI750 Diagnostic Registers**

- Provide diagnostic access to internal circuitry on the CMI interface board.
- Registers

CMD/ADDR HI

ADDR LO

BYTE MASK

XMIT FILE HI

XMIT FILE LO

RCV FILE HI

RCV FILE LO

### **CIBCI-Specific Registers**

- Registers

BCI CONTROL

USER INTERRUPT CONTROL

**CI750/CI780/CIBCI INTERNALS**

# **CI Functional Description**

## **Lesson Introduction**

This module is a detailed look at the CI Interface. The material is presented in two parts. The first is a general description of each module. The second is a more detailed look at each module.

The CI Interface is functionally divided into five parts: 1) the interface to the system CPU and memory, 2) the Data Paths section, which includes the 2901 ALU, 3) the Transmit and Receive Buffers, 4) the Control Store microsequencer, and 5) the interface to the CI Bus. Flow control through each section is discussed, through the use of block diagrams, with particular attention to the CI Port diagnostics discussed previously.

## **Lesson Objectives**

1. Describe the major functions of the CI Interface and identify which FRU performs each function.
2. Identify the module on which each hardware section resides.
3. Describe the source, destination, function, and error detection method for each of the major buses.
4. Identify the possible loopback paths in the hardware.
5. Describe how CI Bus arbitration is handled.
6. Describe the interaction between the microcode and the hardware.
7. Trace the flow of data through the CI Interface.

## **Lesson Outline**

- I. General Overview
- II. Link Module
- III. Packet Buffer Module
- IV. Control Store
- V. Data Path
- VI. System Interface



## CI Module Overview

Some of the modules that compose the three different interfaces (CI750, CI780, CIBCI) are identical. The following chart summarizes which modules are shared and which modules are unique to a particular interface:

<u>Module</u>	<u>Part #</u>	<u>CI750</u>	<u>CI780</u>	<u>CIBCI</u>
Link (ILI)	EITHER <sup>L0118</sup> L0100	X	X	X
Packet Buffer (PB)	L0101	X	X	X
Data Path (CDP)	L0400	X		X
Data Path (IDP)	L0102		X	
SBI Interface (ISI)	L0104		X	
CMI Interface (CCI)	L0009	X		
BAC	T1017			X
BAD	T1018			X

CIBCA-A

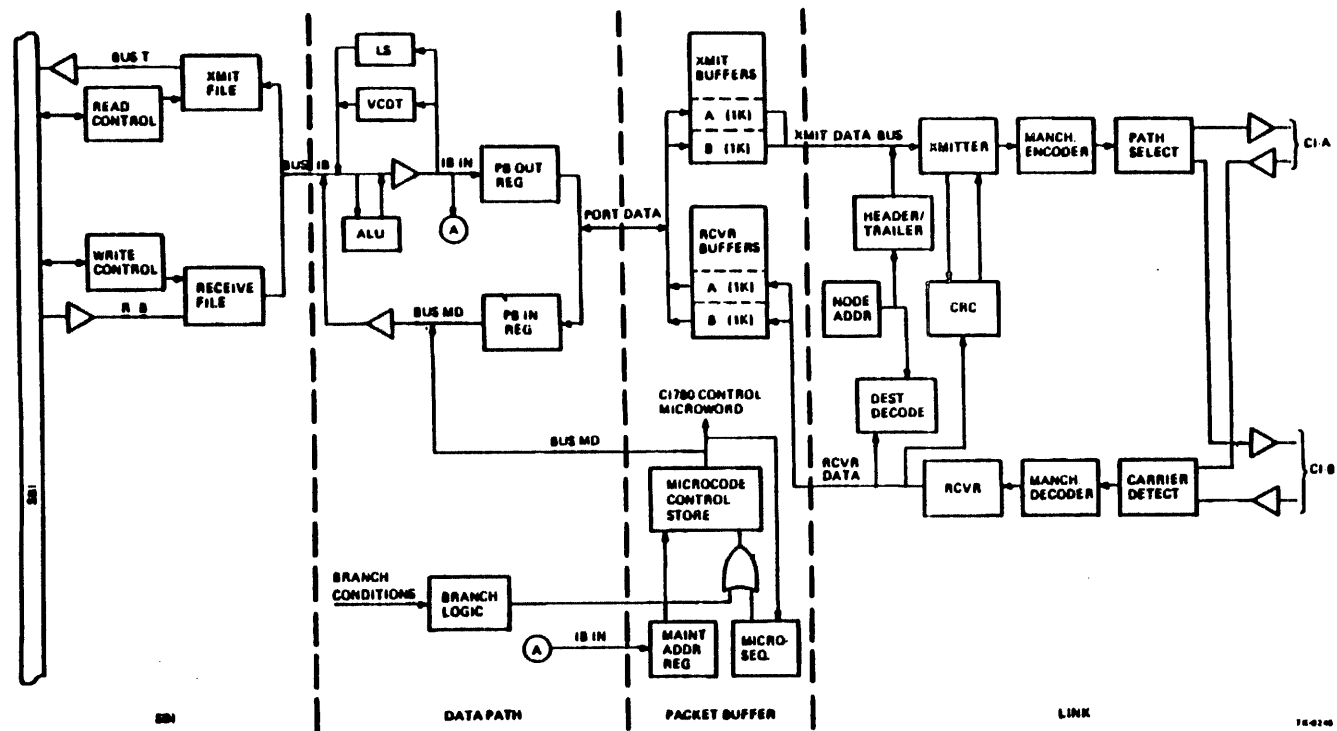
CIBCA-B

CONTROL T1015

T1045

LINK T1025

T1046



CI780 Functional Block Diagram

Link Interface (ILI) L0100 or  
L0118

- Parallel-to-serial and serial-to-parallel conversions.
- Manchester encoding (PE).
- Node address switches (true and complement).
- Path selection circuitry.
- Arbitration logic for CI Bus.
- Carrier detection.
- Shared CRC for transmit and receive.
- PAL and ECL logic.
- Data loopback capability for diagnostic purposes.
- Red LED indicates that the internal loopback path is selected but not necessarily in use.
- Green LED indicates external activity on transmit or receive lines.



NOTE -

REFERENCE  
THE

HSC INSTALL MANUAL  
FOR REVISIONS!

(APPENDIX B)

## Packet Buffer Module (IPB) L0101

- Microcode Control Store
  - 48 × 3K storage for microcode.
  - 1K is PROM.
  - 2K is RAM.
- Maintenance Access Register
  - Used to specify the address at which to load the microcode.
  - Can be used to specify the starting address for microcode initiation.
- Microsequencer for control of the microcode execution sequence.
- Red LEDs for Control Store address selected.
- Transmit and Receive Buffers
  - Double buffered.
  - Each section holds 1K bytes.
- *MADR — MAINT. DATA REG.*



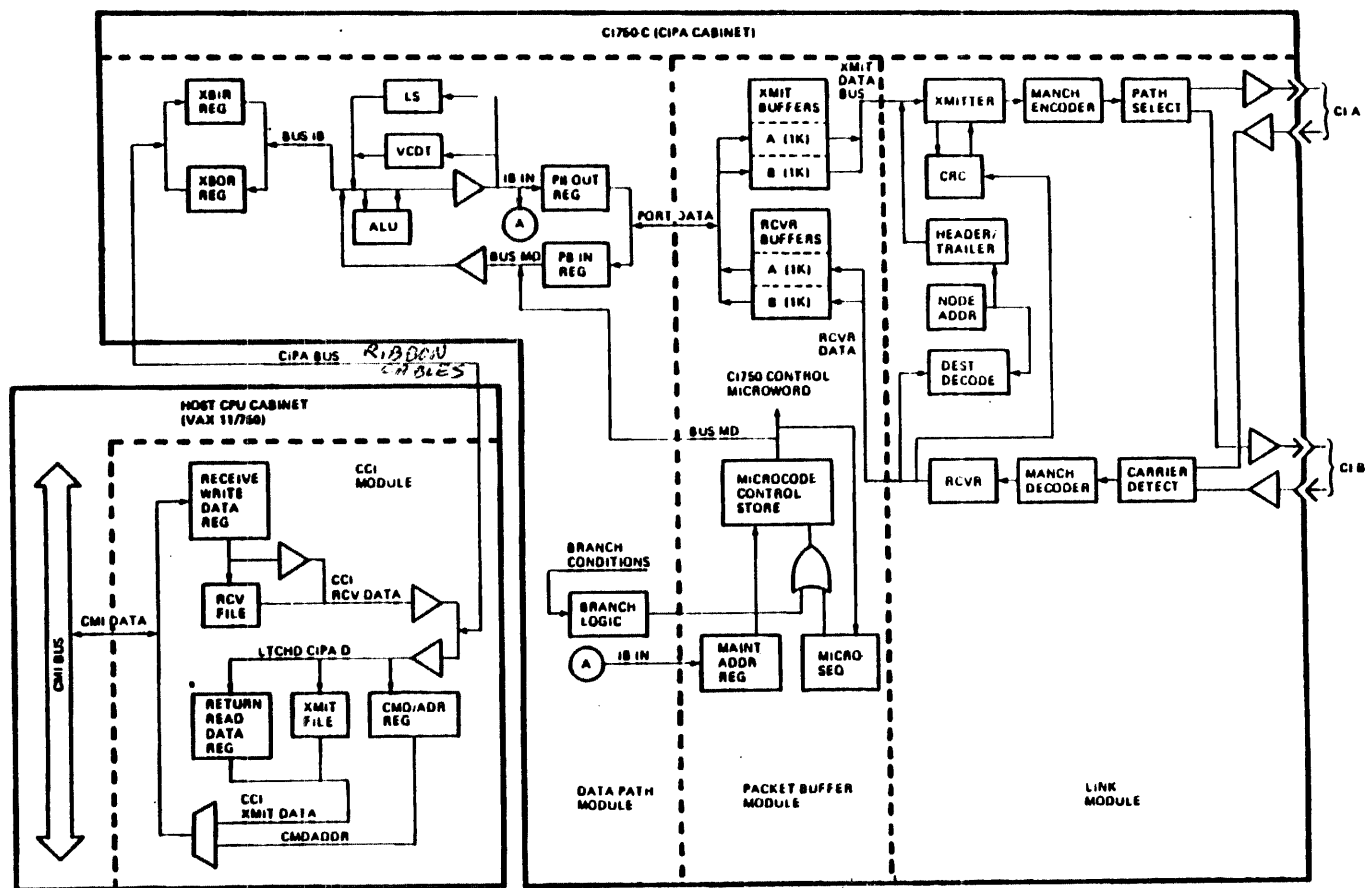
## Data Path Module (IDP) L0102

- LS (Local Store)
  - 256 × 32 RAM
  - Status storage and scratchpad for microcode.
- VCDT (Virtual Circuit Descriptor Table)
  - 256 × 16 RAM
  - Storage for the status of connections (virtual circuits) between nodes.
- Bus IB provides a 32-bit data path.
- Eight 4-bit 2901 ALUs in parallel make a 32-bit ALU.
- PB OUT and PB IN registers perform 32-to-8 and 8-to-32 bit conversions.
- Microsequencer branch logic located here.

## SBI Interface Module (ISI) L0104

- Interface Section
  - All SBI protocol is implemented here.
  - SBI clock signals provide internal timing for the CI780.
- Transmit and Receive Files
  - Used for packet and data transfers (not for register access).
  - Double buffered
    - a. Two sections (A and B).
    - b. Each section is separate and holds two longwords of data.
    - c. One section can be loaded while the other section is emptied.
- Receive Data Register and Return Read Register
  - Used when accessing registers on the data path module.
  - Each holds one longword at a time.
- Types of Logic
  - Programmed Array Logic (PAL): Smart board
  - Emitter Coupled Logic (ECL)
    - a. Used for SBI clocks (high-speed logic).
    - b. Uses -5 volts supplied from the CPU power supply.
- `CONFGR` - CONFIG. REGISTER



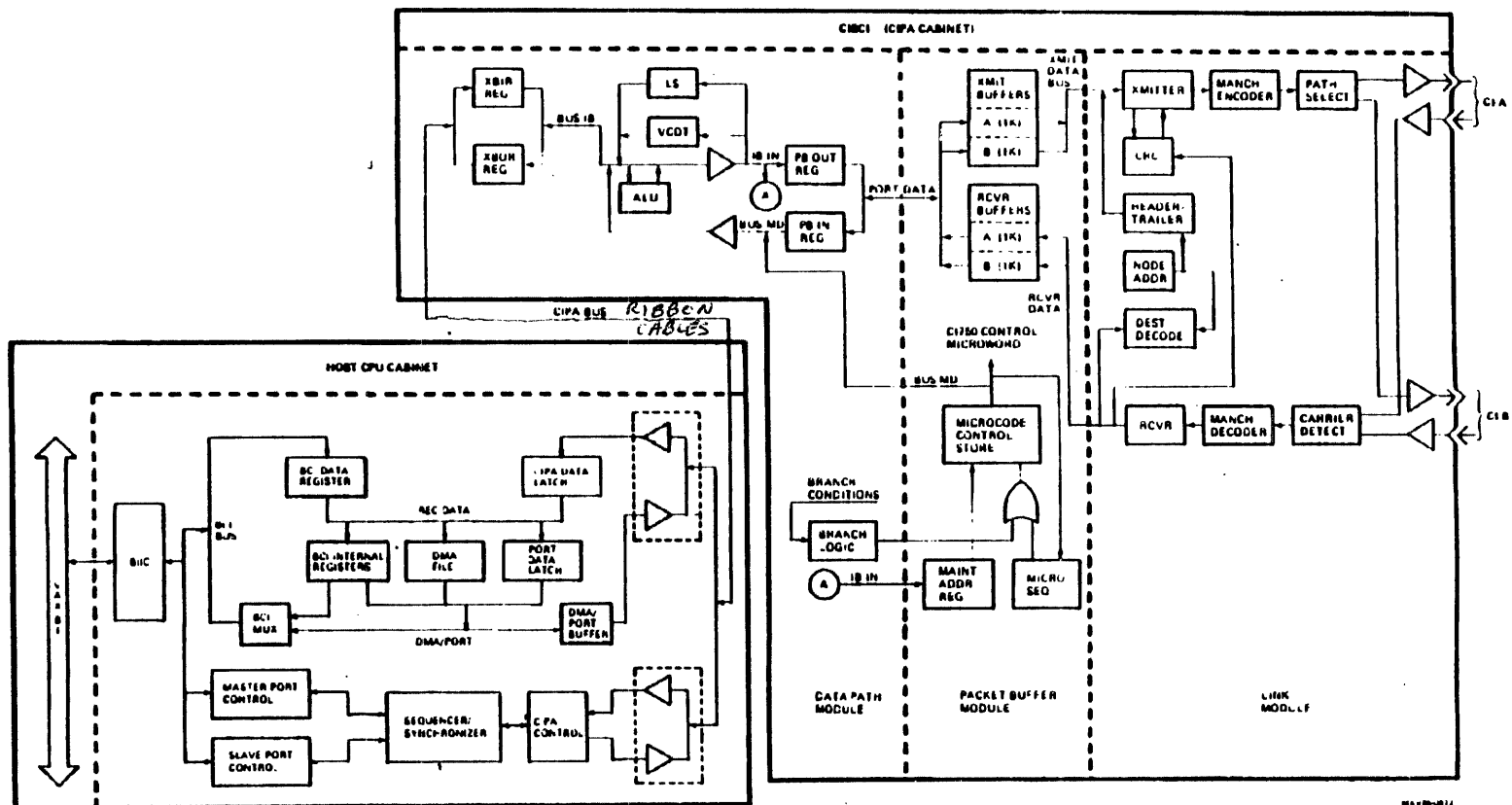


CI750 Block Diagram



## CI750 Module Functions

- Link Interface Module (ILI) L0100 -- same as CI780.
- Packet Buffer Module (IPB) L0101 -- same as CI780.
- Data Path Module (CDP) L0400 -- same as CI780 except XBOR (External Bus Out Register) and XBIR (External Bus In Register) provide a CIPA bus interface to the CMI Interface board.
- CMI Interface Module (CCI) L0009
  - CMI Interface signals.
  - Transmit and receive files.
  - Receive data register and return read register.
  - Controlled by PAL.
  - CIPA bus interface circuitry.



CIBCI Block Diagram

## **CIBCI Module Functions**

- Link Interface Module (ILI) L0100 -- same as CI780.
- Packet Buffer Module (IPB) L0101 -- same as CI780.
- Data Path Module (CDP) L0400 -- same as CI780 except XBOR (External Bus Out Register) and XBIR (External Bus In Register) provide a CIPA bus interface to the BICA Interface boards.
- VAXBI to CIPA Interface (BICA) Modules: BAC and BAD
  - The BIIC (Backplane Interconnect Interface Chip) interfaces the BI bus to the CIPA box through the synchronous BCI (BI Chip Interface) bus.
  - The DMA file and Port Data Latch act as buffers for data passing from BI to CIPA box (or vice versa).
  - The BIIC chip performs all necessary arbitration on the BI bus.
  - The port register contents (on the DP or PB boards) are not read directly, but are loaded into the Port Data Latch for reading, or moved into the Port Data Latch by the BCI side for writing.

## **THE LINK BOARD**



### Link Simplified Block Diagram

## Link Board Operation

- In order to receive or transmit a packet, the Link board functions can be reduced to four basic operations:
  - Reception of an information packet.
  - Transmission of an ACK/NACK packet.
  - Transmission of an information packet.
  - Reception of an ACK/NACK packet.
- Control of the Link hardware is a function of commands from the Packet Buffer (PB) board (type of operation to perform) and conditions sensed by the logic during the operation.
- Programmable Array Logic (PAL) chips are used to define/monitor the various hardware states that occur during each of the four basic operations.
- ECL (Emitter-Coupled Logic) voltage levels are used from the XMIT SERIAL SHIFT REG out to the CI cable (on the transmit side) and from the RCVT OUTPUT REG out to the CI cable (on the receive side).

SLAVE  
TO  
IPB

## Arbitration for CI Bus

- Based on the countdown of the specific number of "quiet slots" while monitoring for carrier detect:

$$TICK = 114 ns$$

$$1 \text{ quiet slot} = 800ns = 7 \text{ TICKS}$$

- Number of quiet slots to be counted down determined by the number of nodes attempting to transmit:

initial count =  $N + I + 1$  where:

$N$  = 16 (maximum allowable nodes)

$I$  = node number

- If a carrier is detected during countdown, the winning node number is determined and following action taken:

winning node greater, then reset count to  $(N + I + 1)$

winning node less, then reset count to  $(I + 1)$

- Allows competing nodes access to the bus with the lowest-numbered node having the highest priority.

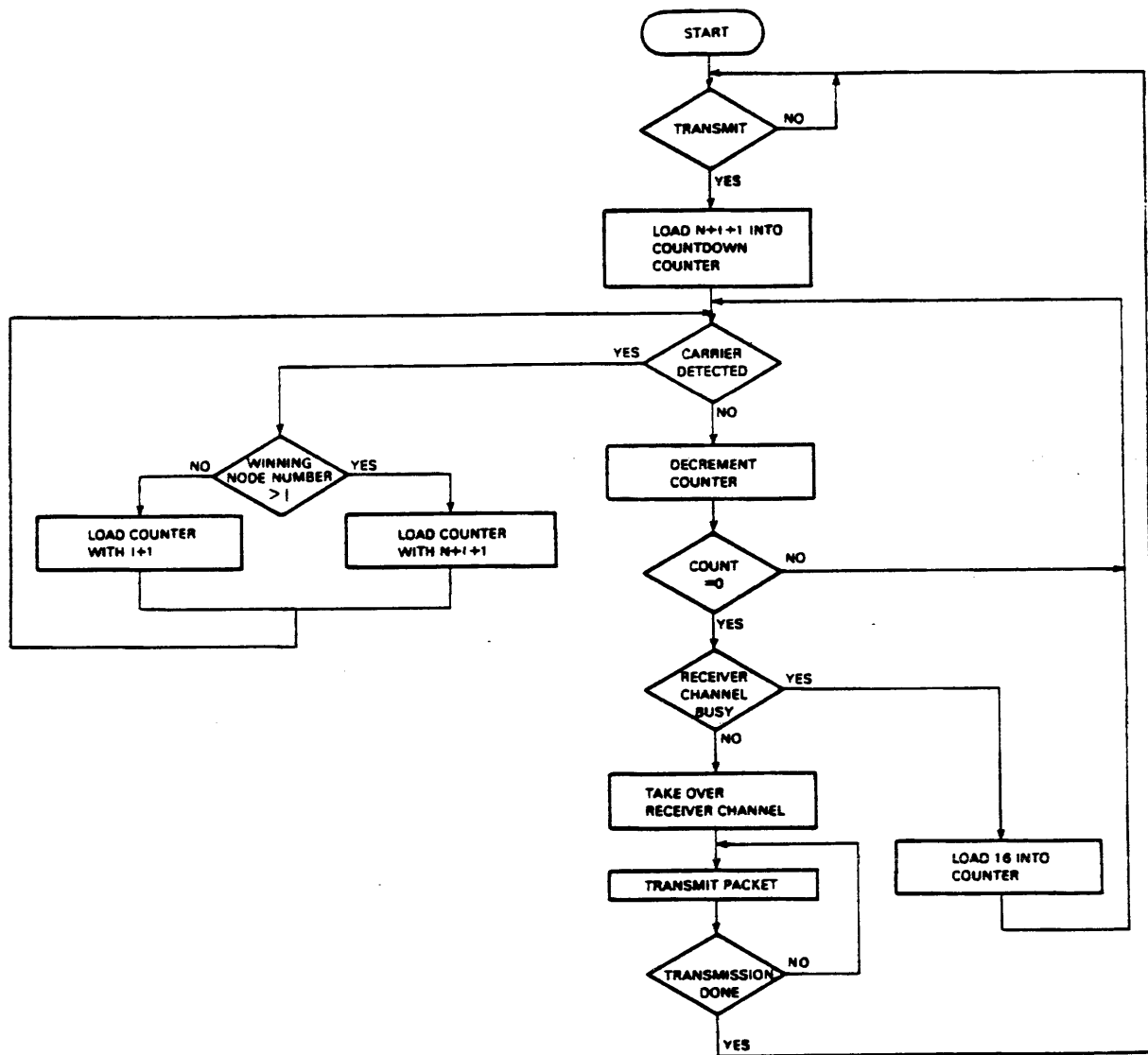
→ THIS IS WHY HSC'S @ LOWEST #



REFERENCE

PAGE 2-38

IN CIBCI TECH. DESCRIPT MAN



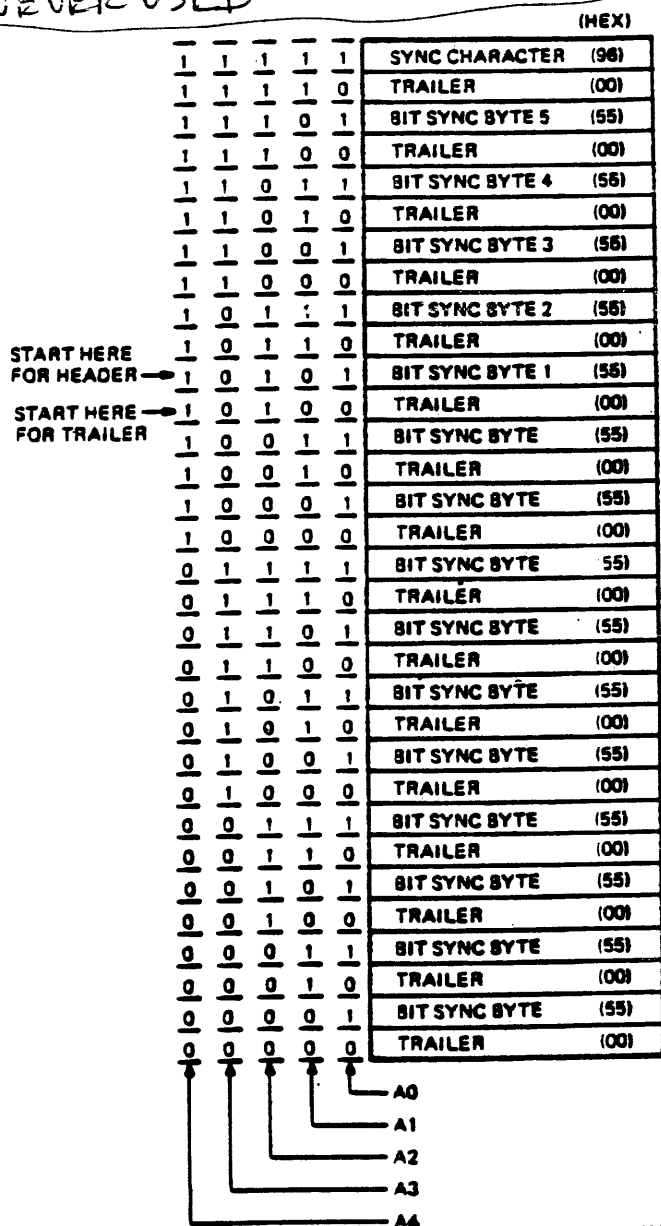
MKV85-0785

Arbitration Flow Diagram



## Sync/Trailer PROM Space

- Used during transmit operation, controlled by transmit control logic.
- Address line A0 determines type of PROM output (sync or trailer) while lines A4:A2 change (count) to determine the correct number of sync/trailer bytes.
- Lower area of PROM reserved for possible expansion.  
*NEVER USED*

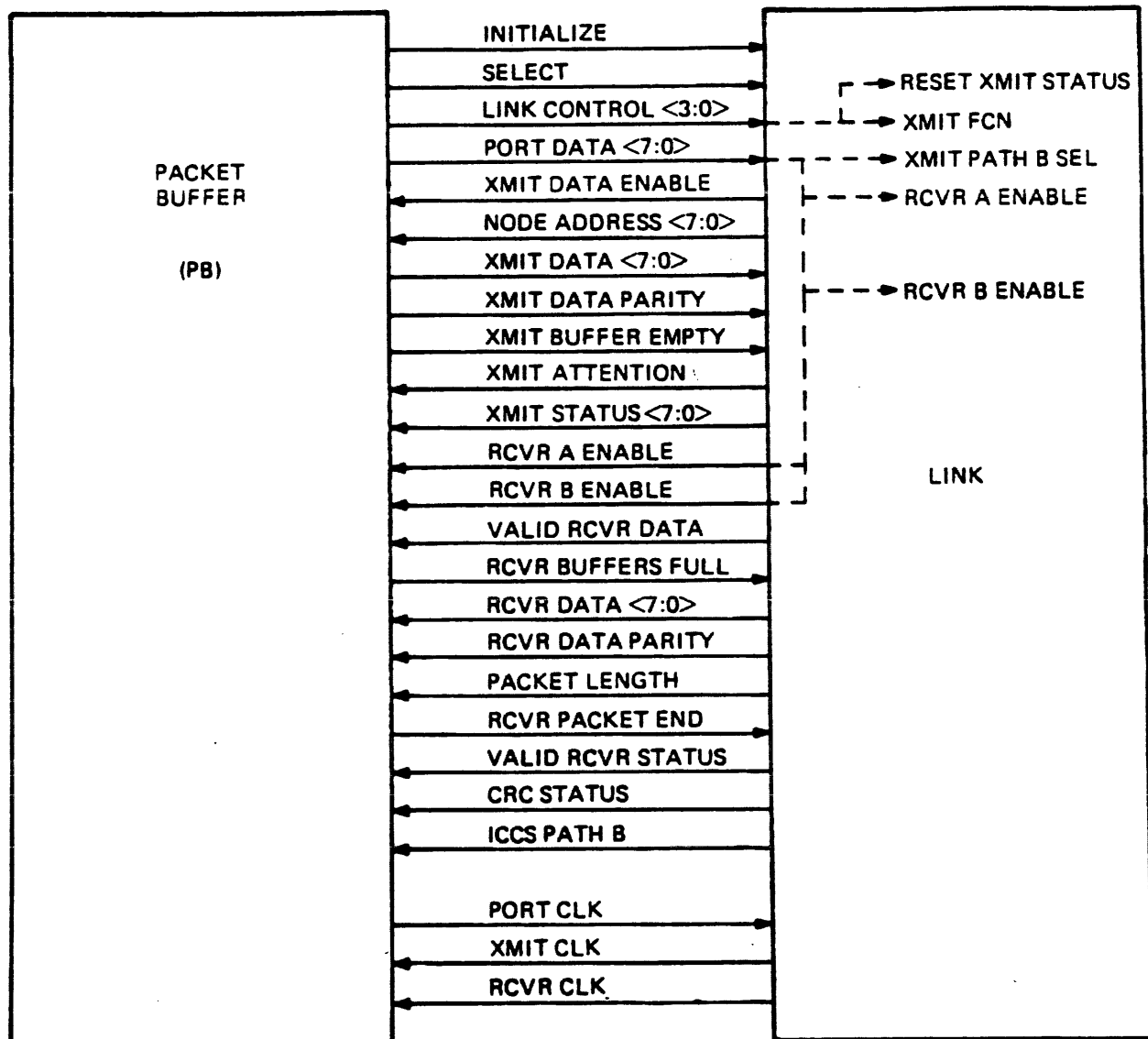


TK - 8598

## Sync/Trailer PROM Space

## Link Interface Signals

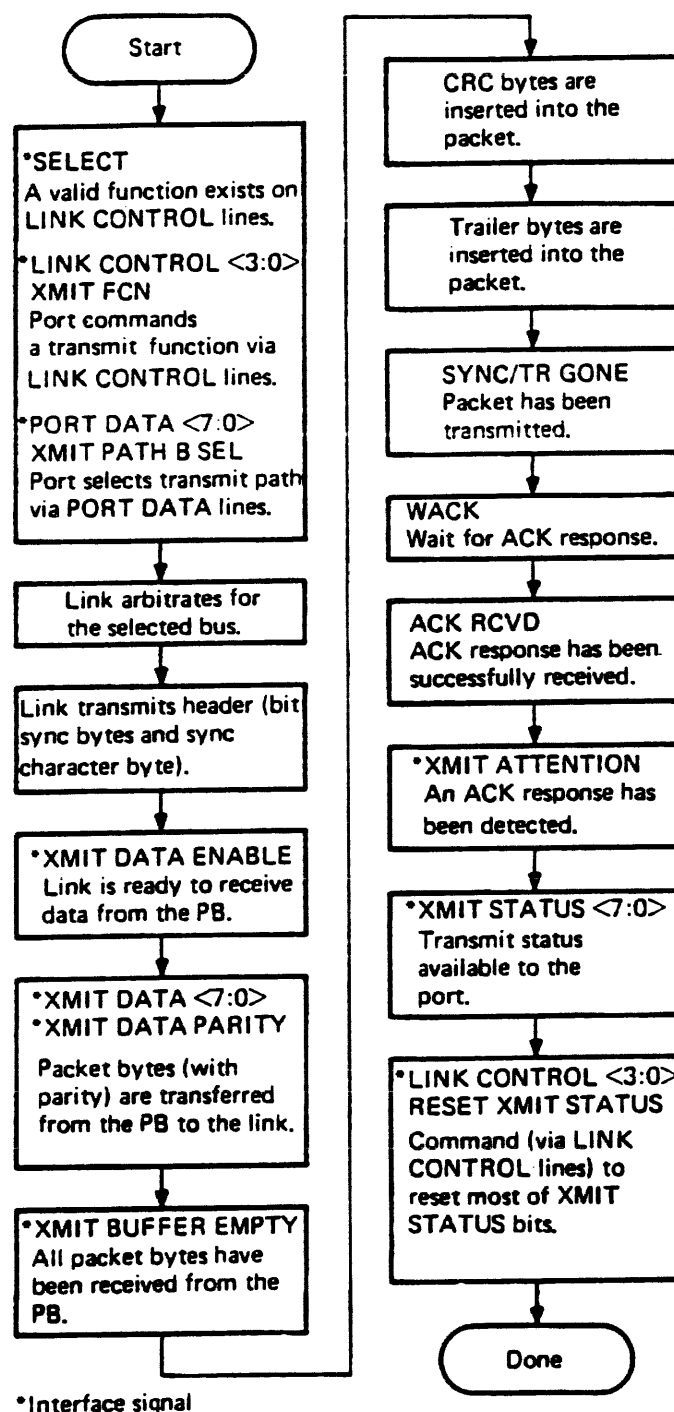
The following three figures illustrate how the Link board is controlled by signals from the Packet Buffer board. The first diagram shows the Link/Packet Buffer interface signals. The flow diagrams highlight these signals to illustrate their role in a typical transmit or receive operation.



TK-8615

## Link Interface Signals

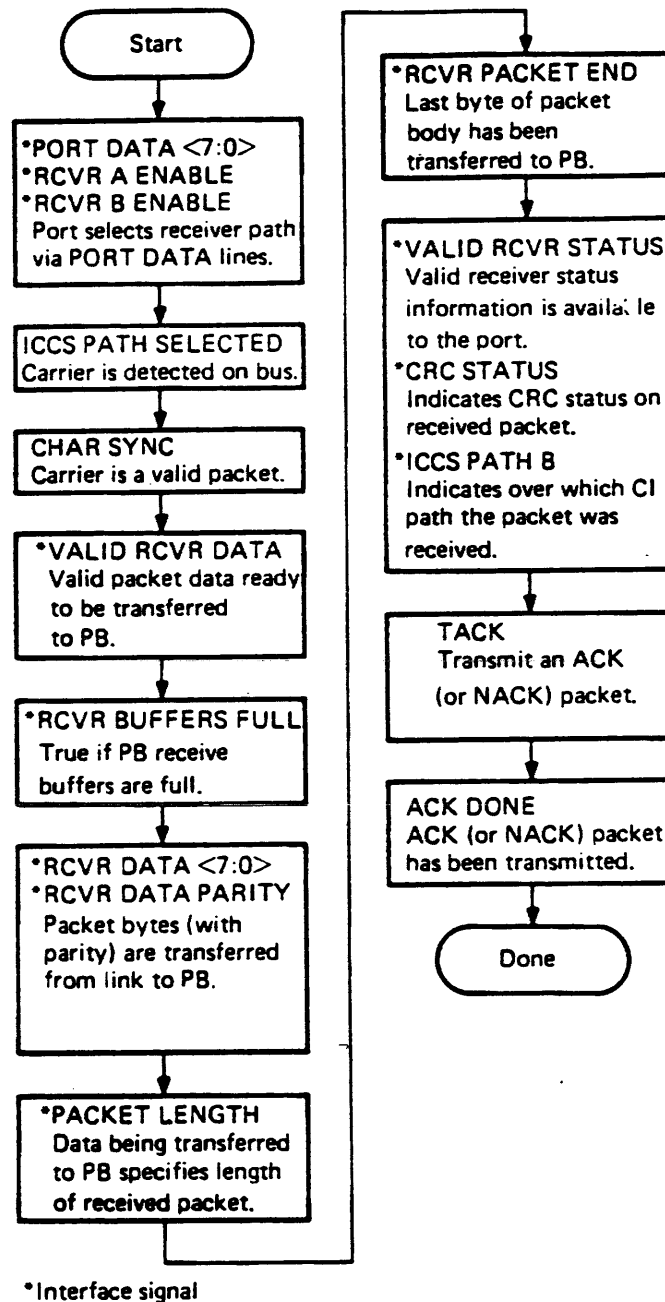
## Link Interface Signals (Cont.)



TK-8601

Interface Flow Diagram -- Transmit Operation

## Link Interface Signals (Cont.)



TK-8602

Interface Flow Diagram -- Receive Operation

# **THE PACKET BUFFER BOARD**

## Packet Buffer Board Operation

- All CI-bound packets flow through the PB board
- Transmit buffer (TBUF) contains an A and a B section, each section being 1Kb in size.
- Receive buffer (RBUF) contains an A and a B section, each section being 1Kb in size.
- Buffers are loaded and read under control of port microcode, all transfers can be reduced to six operations:

TBUF load

Transmit

RBUF load

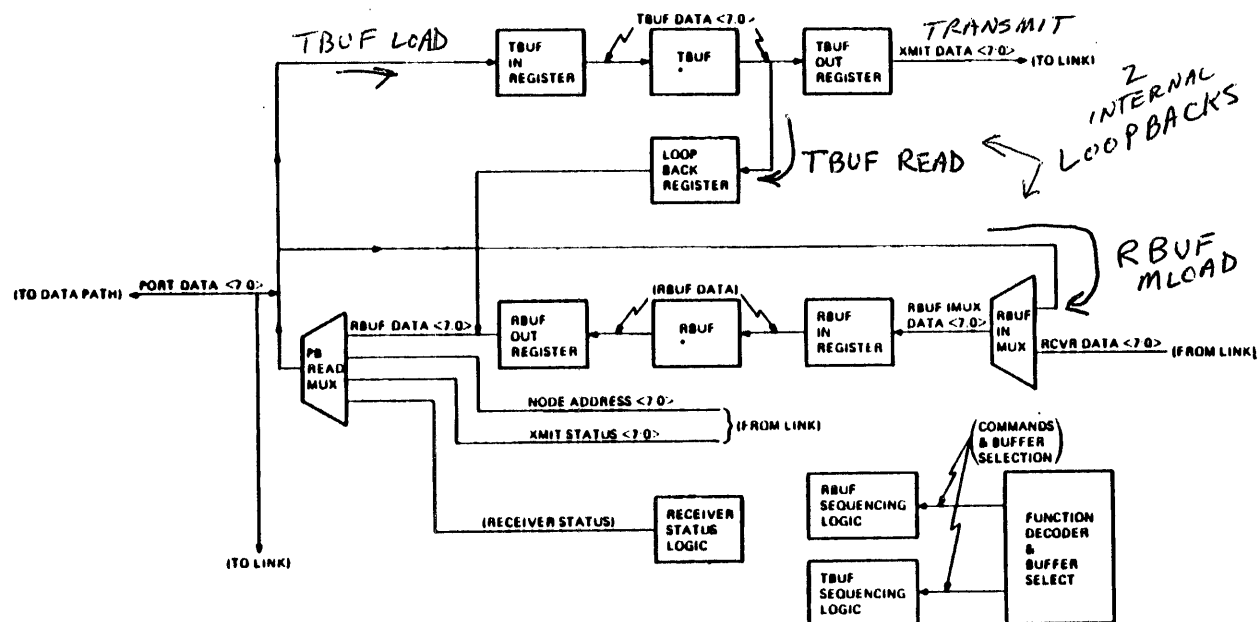
RBUF read

TBUF read

RBUF MLOAD

- Addressing on RBUF is controlled by the counter derived from the "packet length" section of the received packet.

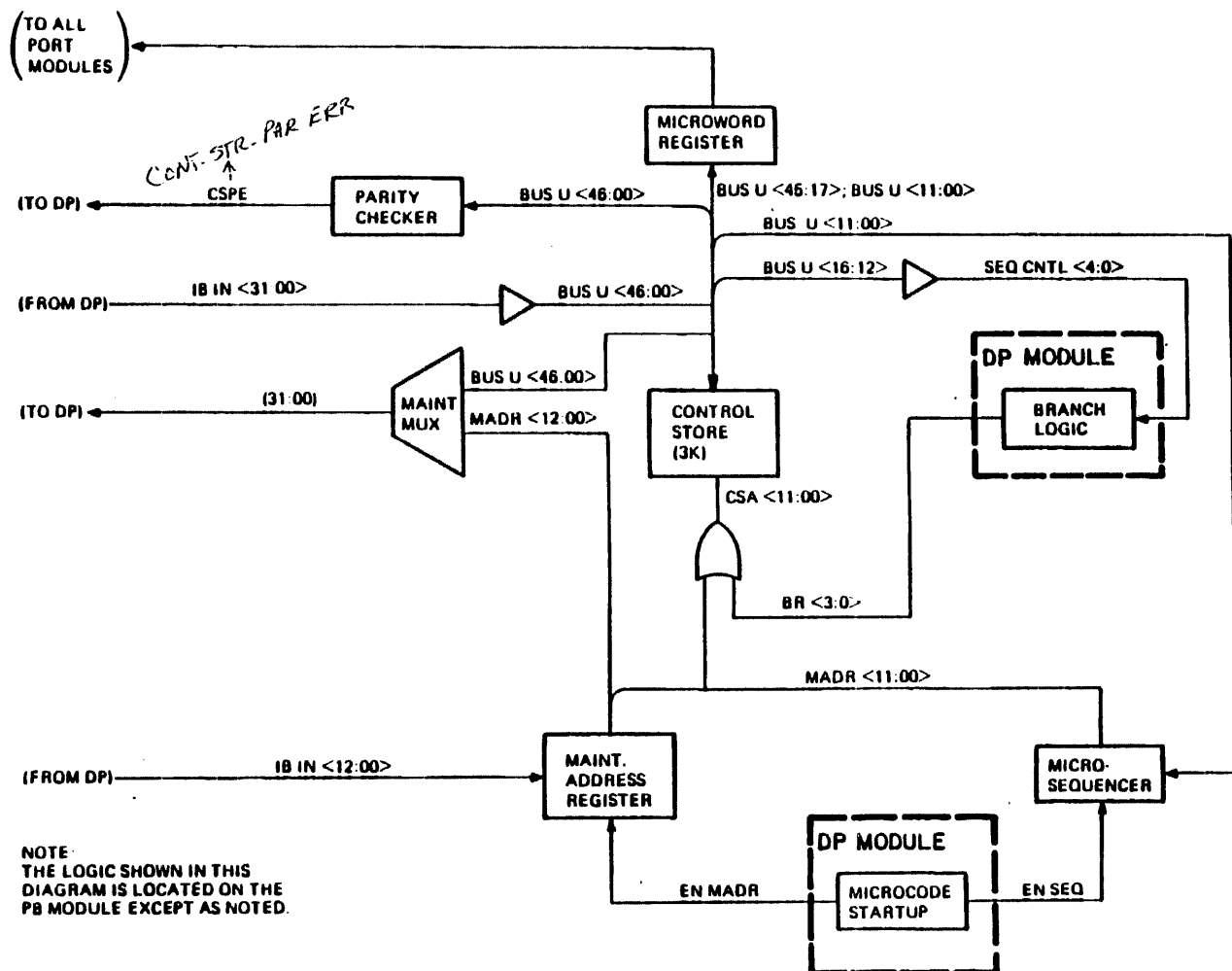
JUST BUFFER SECTION SHOWN



\* COMMON I/O

TA-7184

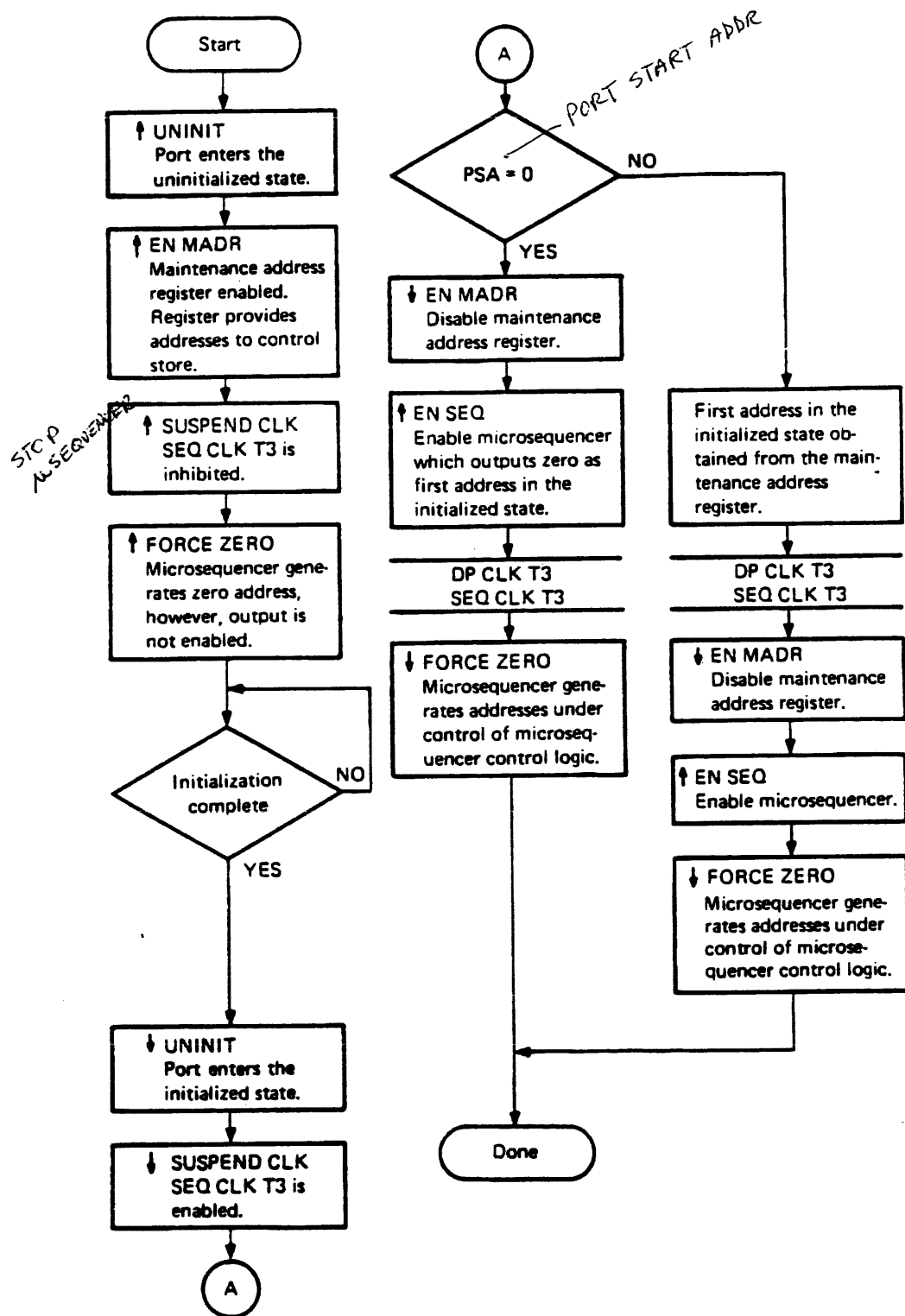
Packet Buffer Data Flow



MAV84 0130

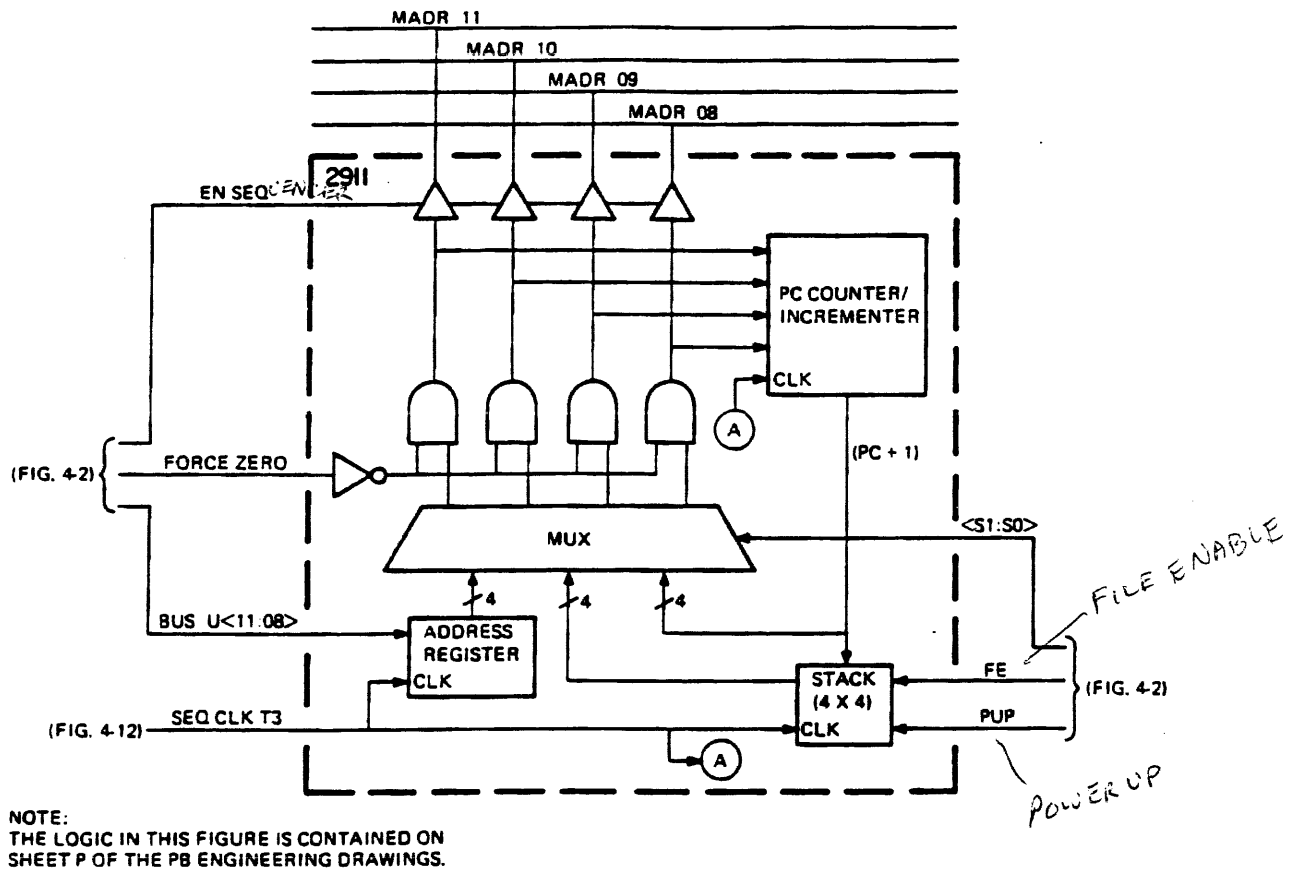
Control Store Simplified Block Diagram





TK-8719

Microcode Start-Up Flow Diagram

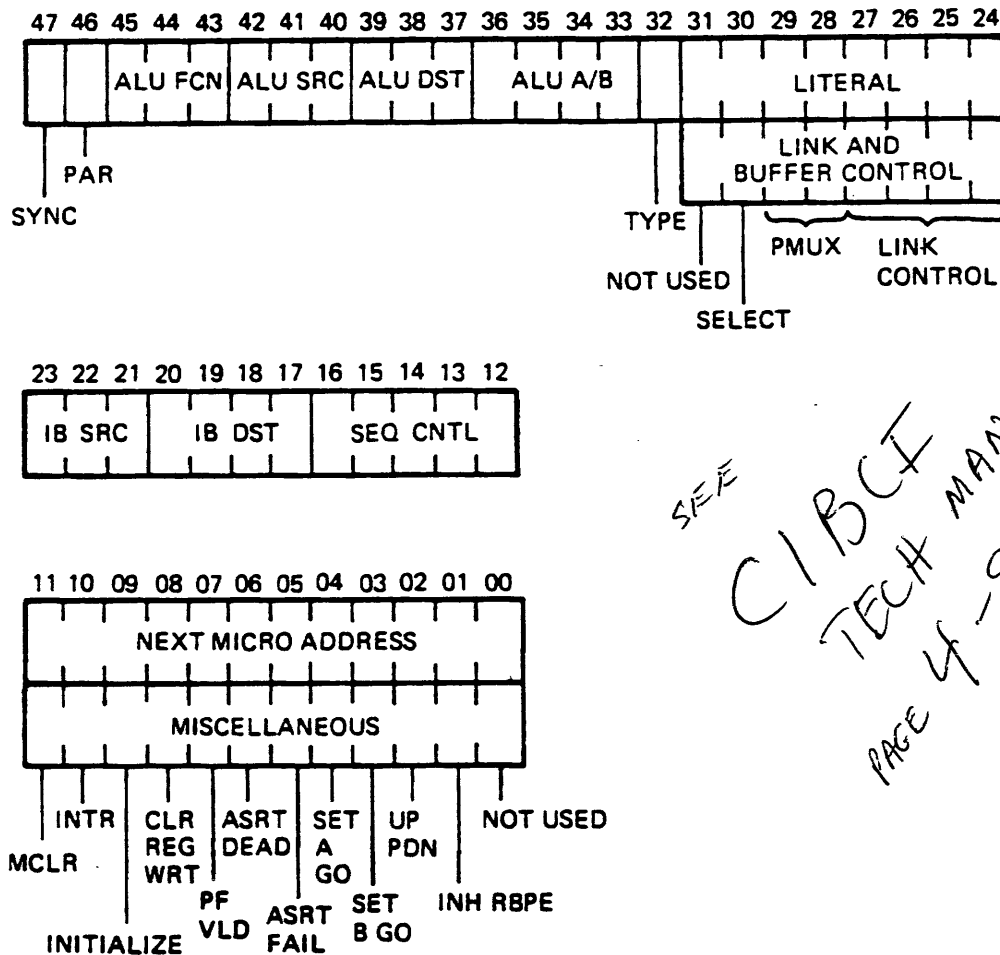


TK 8723

## The 2911 Microsequencer

## The Microword

Output from the Control Store is a 48-bit microword, most of which passes into the microword register. The output of the microword register provides control signals to all of the port modules as well as address values for the next microinstruction.



SEE  
CIBCI  
TECH MAN.  
PAGE 4-8

TK-6720

## Microword Fields

## **THE DATA PATH BOARD**

## Data Path Board Operation

- Contains three 32-bit wide buses:

IB Bus (internal bus)

MD Bus (miscellaneous data)

IB IN Bus

- Data sources for the IB:

LS RAM (Local Store)

VCDT RAM Circuit Descriptor Table)

2901A ALU

Microword from CS (Control Store)

MADR

PMCSR

PB IN REG

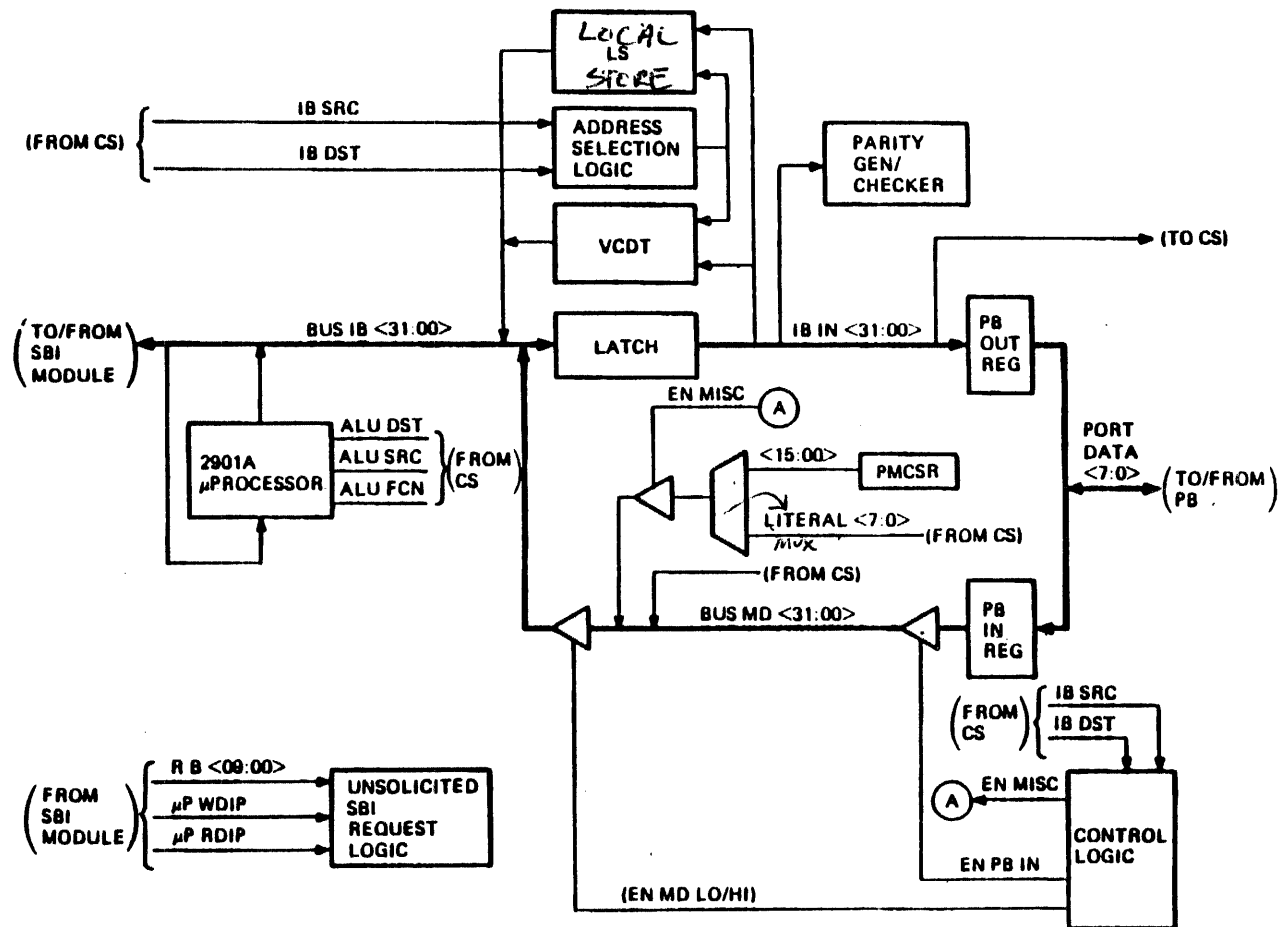
Microword literal field

SBI Interface or XBIR Register (depending on the type of CI Interface being used)

- Local Store is  $256 \times 32$  RAM VCDT is  $256 \times 16$  RAM
- When the port is under microword control, the IB DST field and the IB SRC field select internal bus (IB) destination and source respectively.



### Data Path Module Block Diagram (CI750, CIBCI)

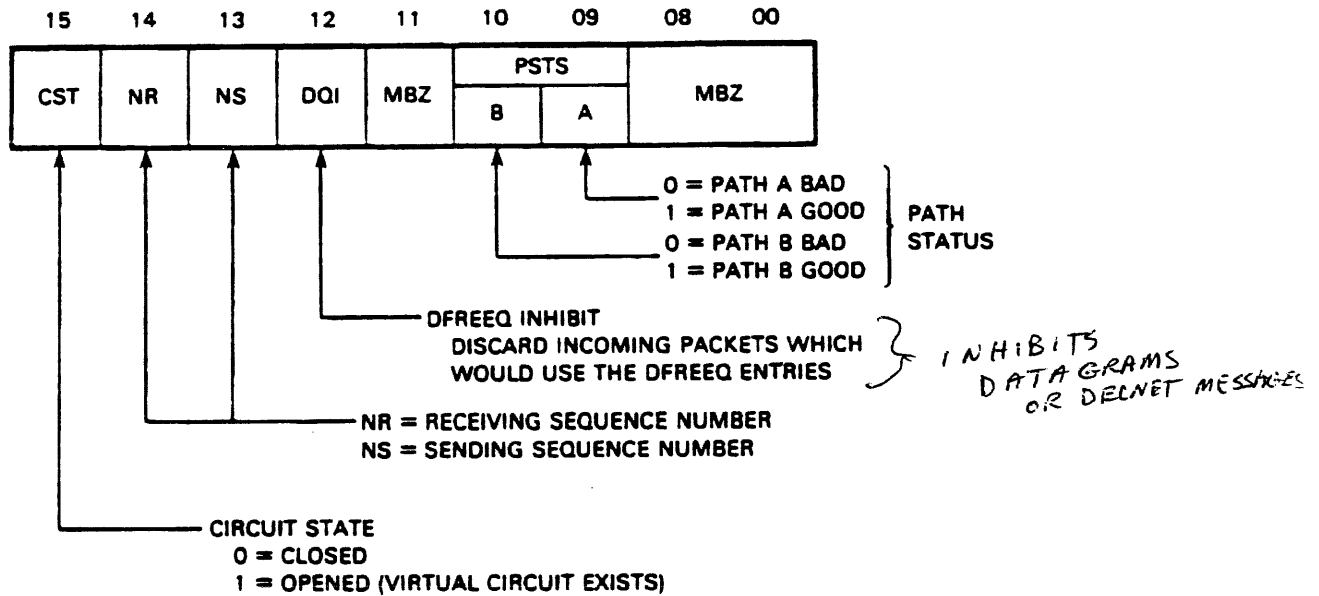


TK 6859

Data Path Block Diagram (CI780)

## The Virtual Circuit Descriptor Table

The VCDT contains important information used by the high-level cluster software (connection manager) to direct/coordinate packet transfer throughout the cluster. It is actually built by the port driver and microcode working together. Here is a sample entry (one per node):



TK-10549

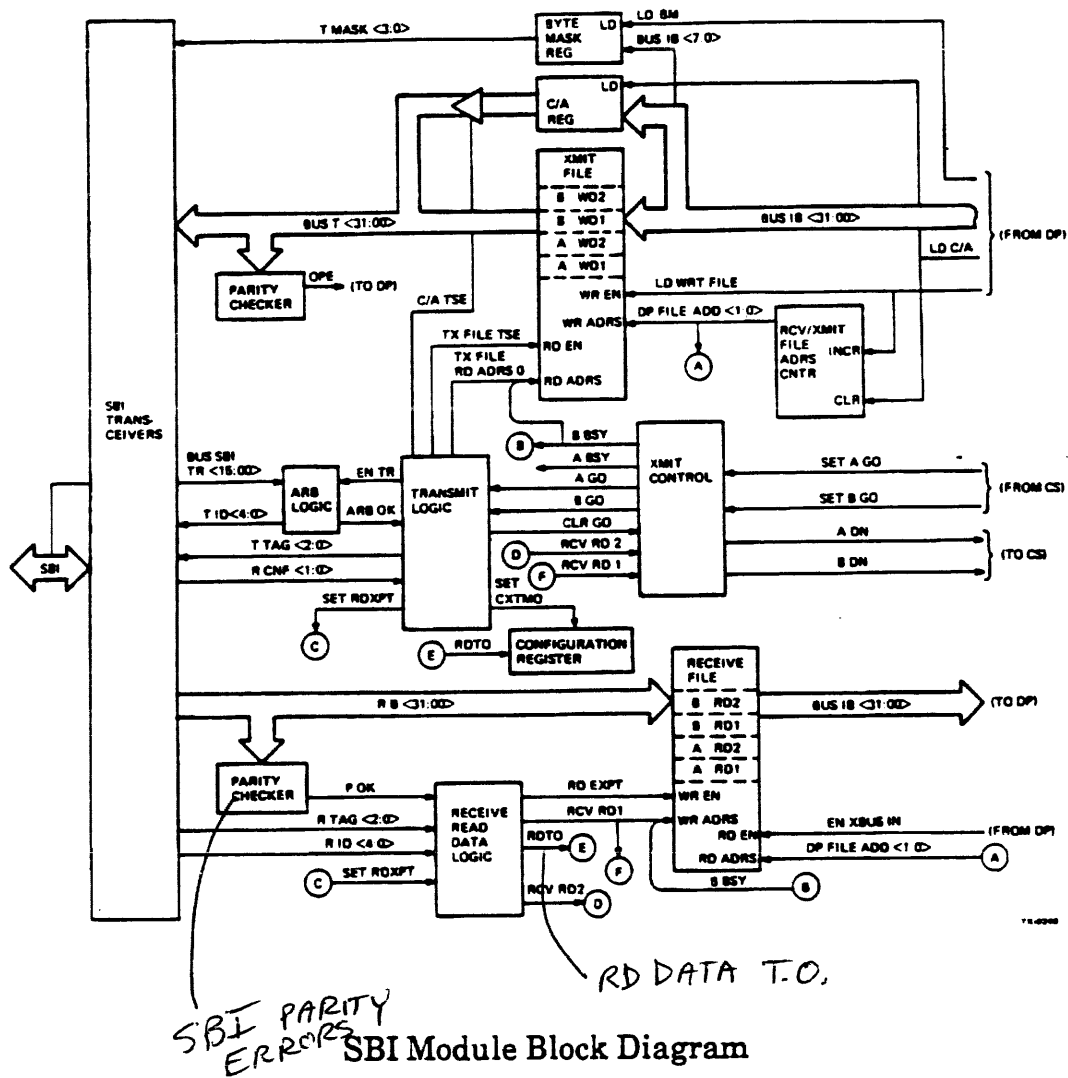
### Virtual Circuit Descriptor Table Entry

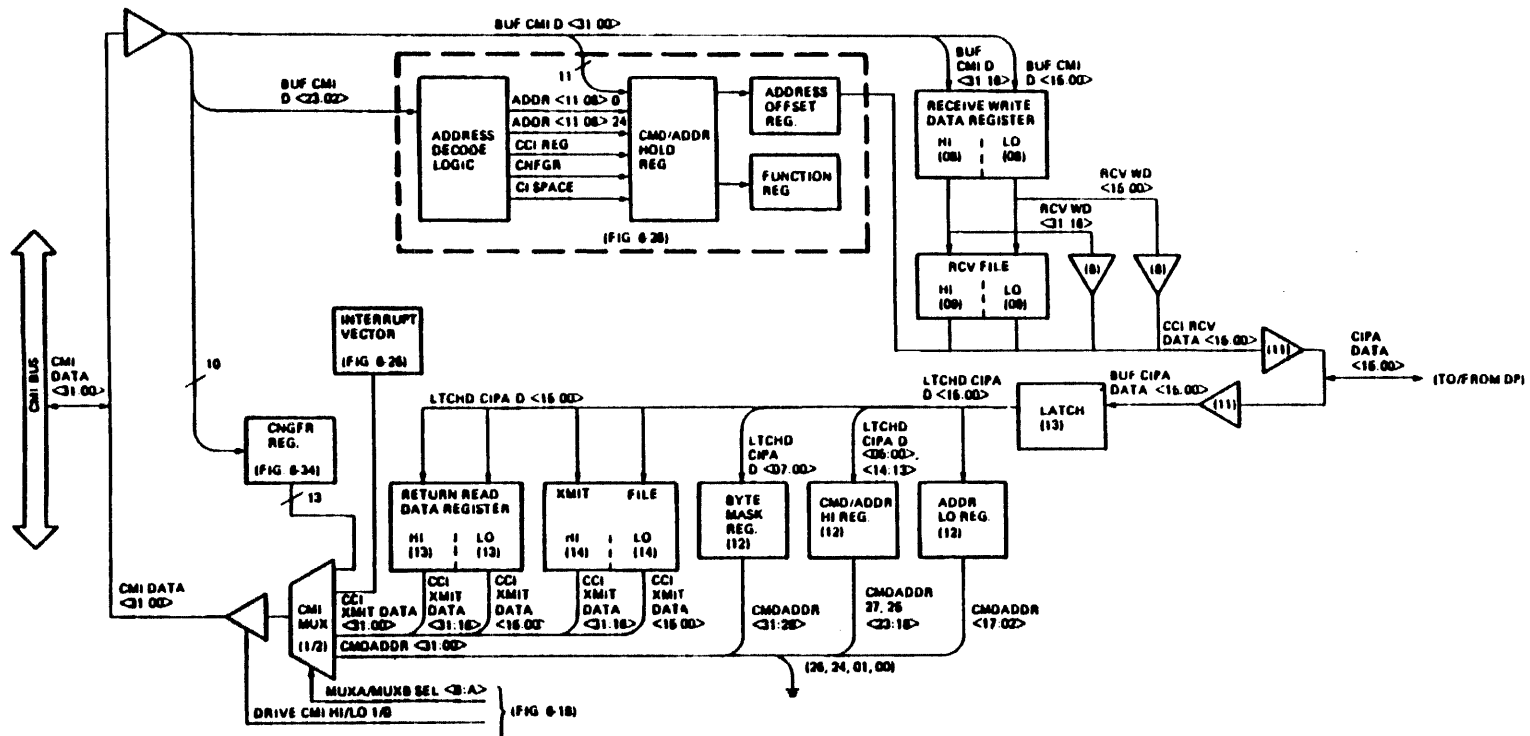


**THE SBI INTERFACE**

**THE CMI INTERFACE**

**THE BICA INTERFACE**

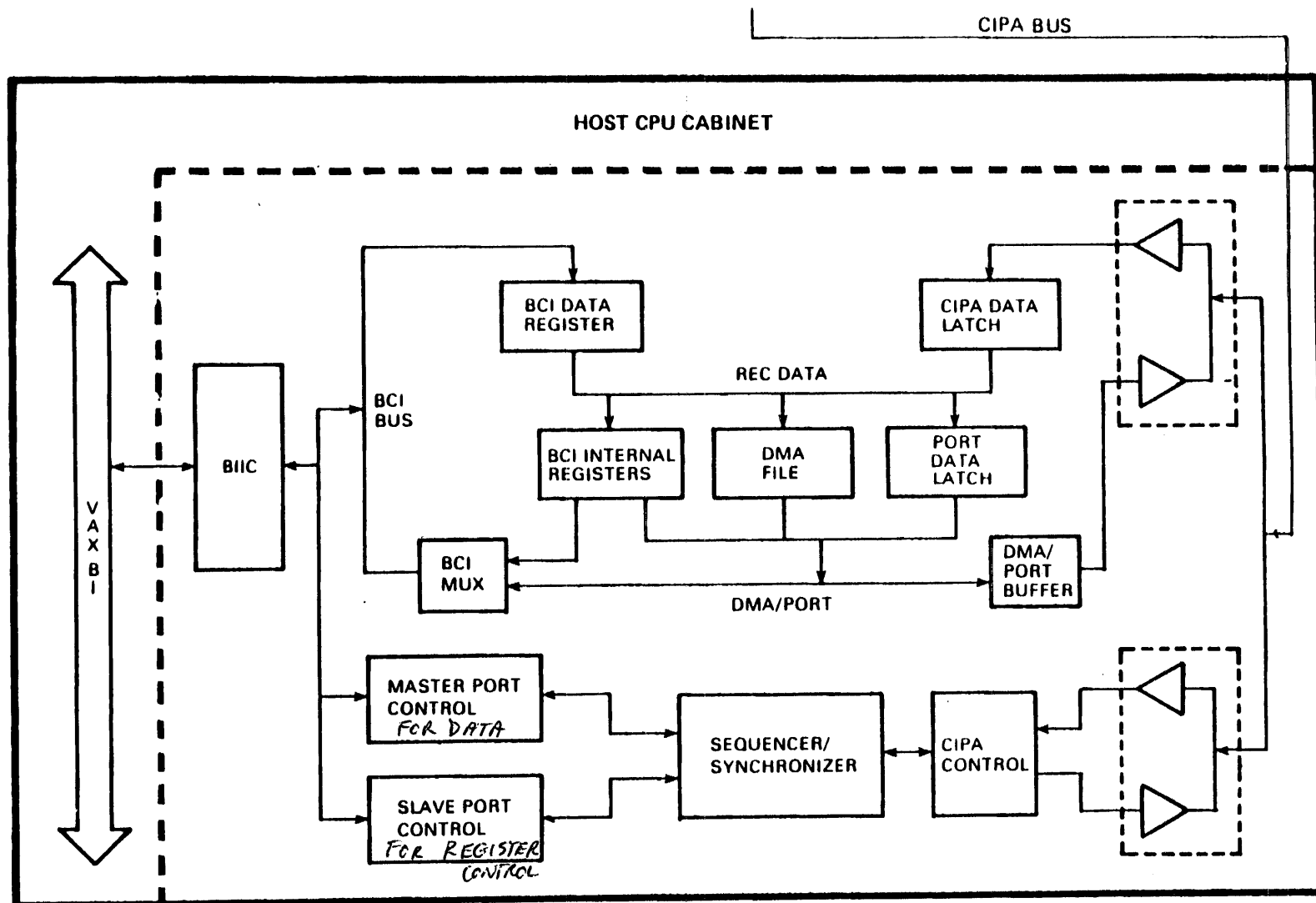




NOTE  
NUMBER DESIGNATIONS IN PARENTHESES  
REFER TO ENGINEERING DRAWINGS  
CONTAINING CORRESPONDING LOGIC

MR 100 0200

CI750 Interface Block Diagram (CCI)



CIBCI Interface (BICA Modules)

## DKUTIL AND VERIFY UTILITIES

---

The purpose of this lab is to give you some exposure to two utilities that can be used to show the state of any disk connected to the HSC. This lab should also help reenforce your understanding of DSDF (Digital Standard Disk Format) and BBR (Bad Block Replacement).

- ✓ 1.) Run VERIFY on one of the disks attached to your HSC. Answer "no" to the question "Print informational (non-warning) messages?".
- 2.) Take a look at the print-out and answer the following questions:
  - a.) How many physical blocks (PBNs) were found bad at the factory? \_\_\_\_\_
  - b.) How many bad LBNs were listed in the RCT? \_\_\_\_\_
  - c.) Will the contents of the FCT ever be larger than that of the RCT? \_\_\_\_\_
  - d.) Pick any PBN from the FCT and <sup>try to</sup> find it in the RCT.
  - e.) Pick an LBN from the RCT and find out to which cylinder and head it belongs by using the formulas given below:

$$\text{CYLINDER} = \frac{\text{LBN}}{\text{BPC}} \quad (\text{discard fraction})$$

$$\text{HEAD} = \frac{\text{LBN} - (\text{CYL} * \text{BPC})}{\text{BPT}} \quad (\text{discard fraction})$$

	BPC (Blocks/cylinder)	BPT (Blocks/track)
RA60	252	42
RA80	434	31
RA81	714	51
RA82	855	57

- f.) If the FCT were "null", what part of this print-out would be missing? \_\_\_\_\_
- g.) Looking at the RCT, how can you identify any non-primary revectorors.

- 3.) Rerun VERIFY, but this time answer "yes" to the question "Print informational (nonwarning) messages?" and "yes" to the question "report transient errors by blocks?".

Notice the difference between this run and the previous one.

a.) Would a "transient" error be eliminated by running the formatter? \_\_\_\_\_

b.) Do bad RBNs get revectorized? \_\_\_\_\_  
If not, what happens to them? \_\_\_\_\_

- 4.) Now lets use DKUTIL to find-out more information about the disk. Use the DISPLAY command to get the drive's characteristics.

a.) What is the drive's ECC threshold? \_\_\_\_\_

b.) How many sectors are there in one track? \_\_\_\_\_

c.) How many physical sectors are there on the whole disk? \_\_\_\_\_

- 5.) Using the DUMP command, pick an LBN from the RCT (get this off your verify printout) and dump it to the console.

a.) Locate the header, data, EDC and ECC areas.

b.) Can you find the header code?

- 6.) Now use the REVECTOR command to force a bad block replacement. Use one of the previously dumped LBNs.

a.) Does the revector command work for any LBN? \_\_\_\_\_

b.) Does the revector command work for an RBN? \_\_\_\_\_

c.) How would you find-out the new location of the block (blocks) you just revectorized?

\_\_\_\_\_  
\_\_\_\_\_  
(try using the SET ERROR INFO command and see if a print-out will occur upon using the REVECTOR command, this should tell you the new LBN.)

## SETSHO UTILITY

-----

The SETSHO utility is used to examine/change internal operating parameters of the HSC. Information on how to use it is in chapter 6 of the HSC User Guide, not the HSC70 Service Manual. A summary of all the available commands is on page 6-5 of the HSC User Guide.

- \_\_\_ 1. What does SET HOST do? \_\_\_\_\_
- \_\_\_ 2. What does SET <unit id> HOST\_ACCESS do? \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 3. Can the two above-named commands be used to dedicate one disk to one node? \_\_\_\_\_
- \_\_\_ 4. What does SHOW MEMORY display? \_\_\_\_\_
- \_\_\_ 5. When would you use the SET MEMORY ENABLE ALL command? \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 6. What commands would you use to enable periodic and automatic diags? \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 7. Does SHOW CI tell you what nodes are out on the cluster? \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 8. Which command can you use to see what nodes are seen by the HSC CI manager software? \_\_\_\_\_
- \_\_\_ 9. The contents of the errorlog on every host connected to the HSC can be partially controlled by what SETSHO command? \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 10. The type of information printed-out on the HSC console is controlled by what SETSHO command? \_\_\_\_\_
- \_\_\_ 11. What command would you use to get a snapshot of all the requestors in the HSC? \_\_\_\_\_
- \_\_\_ 12. Under the SETSHO prompt, type SHO SYS and refer to page 6-78 (HSC User Guide) for an explanation of all the fields displayed.
- \_\_\_ 13. If you found that you were unable to connect to the HSC from a remote terminal using DUP, what SETSHO command would help you with this problem? \_\_\_\_\_

- \_\_\_ 14. From a cluster perspective, which SETSHO parameters would consider the most important for proper operation of the cluster as a whole?
- \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- \_\_\_ 15. Which SETSHO paramater is very important if you are going to dual-port drives between two HSCs? \_\_\_\_\_
- \_\_\_ 16. What setting would you recommend for the DUMP/NODUMP parameter? \_\_\_\_\_
- \_\_\_ 17. Try changing some of these parameters found in the HSC User Guide. Changing some of these require a reboot of the HSC. What page of the User Guide tells you which parameters will force an HSC reboot when you exit the SETSHO utility?
- \_\_\_\_\_



## HSC Offline Diagnostics

THE STUDENT WILL FIND CHAPTER 4 OF THE HSC50 MANUAL AND CHAPTER 6 OF THE HSC70 MANUAL VERY HELPFULL.

- \_\_\_ 1. Load the OFFLINE diagnostic tape or floppy disk into the drive.
- \_\_\_ 2. Press the init button on the operator control panel.
- \_\_\_ 3. The offline diagnostic loader will go through a series of tests then display the offline diagnostic prompt:

ODL>

- \_\_\_ 4. Under the ODL> you can do a group of commands. They are found on pages 4-8 and 4-9 of the HSC50 Service manual and page 6-22 of the HSC70 manual. The first command you should try would be help. So type *HELP* after the ODL> prompt.
- \_\_\_ 5. Another usefull command would be SIZE. Go ahead try it. This command sizes up your system and shows you what is available to test.

How many requesters do you have in your HSC?

---

What are they?

---

What slots are they in?

---

What is the Requestor number for the K.CI?

---

What size is your Control Memory?

---

## HSC OFFLINE DIAGNOSTIC LAB

### INTRODUCTION

The purpose of this lab is to familiarize the student with the HSC's Offline diagnostics, their setup and operation.

### OBJECTIVE

At the completion of this lab, the student will be able to:

- Set up the HSC to run the Offline diagnostics

- Use all Offline diagnostic loader commands

- Run all Offline diagnostics

- How to interpret all HSC Offline diagnostics error printouts

- Isolate a failing HSC module

### REFERENCE MATERIAL

- HSC User Guide

- HSC50/70 Service Manuals

- Student Guide

What is the size of Data Memory?

---

What is the size of Program Memory?

---

6. Under the ODL> prompt there are a limited amount of test commands. Using your manual, lets try running these tests. In the service manual, there is an error summary report after each test description. Use this to interpret any errors that might occur. The HSC Offline tests are:

TEST MEMORY (PG 6-73 HSC70 service manual)

How long would it take for a complete pass through Program memory?

---

What number would you use to specify Data memory?

\_\_\_ (0) \_\_\_ (1) \_\_\_ (2)

What do you have to remember about the default parameters?

---

What would cause an error number #2?

---

What would cause an error number #12?

---

What is test number 2?

---

## VTDPY LAB

1. Run VTDPY on the HSC and answer the following questions.

a. How many disks are on the HSC and what are their #s and status?

---

b. How many VAXes are communicating with this HSC and who are they?

---

c. How many tape drives are on the system and what is their status?

---

d. What processes are running on the system and how much CPU time?

---

---

\_\_\_ TEST MEMORY BY K (PG 6-57 HSC70 manual)

Can this test be used to test Program memory?

\_\_\_ YES \_\_\_ NO

Can you use requestor 0 for this test?

\_\_\_ YES \_\_\_ NO

What number do you use to test Control memory?

\_\_\_ (0) \_\_\_ (1) \_\_\_ (2)

How many passes could you specify for this diagnostic?

---

Error numbers 000 - 007 specify what memory?

\_\_\_ Data \_\_\_ Control \_\_\_ Program

What does error number 11 specify?

---

How many tests make up this diagnostic?

---

\_\_\_ TEST K (PG 6-43 HSC70 manual)

What tests are legal for a K.SDI?

---

What tests are legal for a K.CI?

---

Where do these tests come from?

---

What would an error number 9 indicate?

---

Unexpected traps would give me error numbers \_\_\_\_ or \_\_\_\_

Test #11 for the K.CI would test what board?

\_\_\_\_ K.PLI    \_\_\_\_ PACKET BUFFER    \_\_\_\_ LINK

What test number tests the DATA BUS on the K.SDI?

\_\_\_\_ (0)    \_\_\_\_ (2)    \_\_\_\_ (6)    \_\_\_\_ (10)

What test number tests the SERDES on the K.STI?

\_\_\_\_ (0)    \_\_\_\_ (3)    \_\_\_\_ (7)    \_\_\_\_ (11)

\_\_\_\_ TEST BUS                      (PG 6-33 HSC70 manual)

How many working Requestors are required for this diagnostic?

\_\_\_\_ (1)    \_\_\_\_ (2)    \_\_\_\_ (4)    \_\_\_\_ (none)

What memories could you use in this diagnostic?

\_\_\_\_ Data    \_\_\_\_ Control    \_\_\_\_ Program    \_\_\_\_ ALL

Could you interact with the Load device?

\_\_\_\_ YES    \_\_\_\_ NO

What would an error number 1 indicate?

---

What error numbers are specific to the HSC50 only?

---

What would an error number 15 for a HSC70 mean?

---

TEST REFRESH

(PG 6-100 HSC70 manual)

How many patterns are used to test each memory bit?

\_\_\_ (1) \_\_\_ (3) \_\_\_ (5)

What memories are tested by this diagnostic?

\_\_\_ Data \_\_\_ Control \_\_\_ Program \_\_\_ All

What does error number 4 indicate?

---

What is the pattern used in test #2?

\_\_\_ (000000) \_\_\_ (17777777) \_\_\_ (10101000)

TEST OCP

(PG 6-104 HSC70 manual)

What does error number 1 mean?

---

What does test #3 test?

\_\_\_ Init switch \_\_\_ Online switch \_\_\_ Fault switch

7. Also under the ODL> prompt there are two commands called EXAMINE and DEPOSIT, that will allow you to examine and deposit into locations in the HSC. Appendix A of the HSC50 service manual list some of these locations. Lets try using some of these.

\_\_\_ ODL>E 17770056 This is the Serial number register (of the P.ioc)  
\_\_\_ ODL>E 17770046 This is the K Status register  
\_\_\_ ODL>E 17770042 This is the Switch register  
\_\_\_ ODL>E 17777564 This is the Transmit Status register for the console

Here is one, type BREAK key on console keyboard. At the @ sign type

What happens? \_\_\_\_\_

8. You can also do LOAD and START commands. Try some under the ODL> prompt do a LOAD <file name> where the file name is any program on the Diagnostic cassette or floppy disk. You can find out what is on the tape or floppy disk by doing a directory command under the HSC> prompt.

EXAMPLE: HSC50>DIR DD1: with the diagnostic tape in drive 1.

EXAMPLE: HSC70>DIR DX0:

After you load the program do the START command to run it.



How many tape patterns do you have?

What is Data pattern #3

What is Data pattern #17?

Up to how many minutes could you run this diagnostic?

What is Error #7 of this diagnostic mean?

What is Error #12 of this diagnostic mean?

What does Disk Error #102 mean?

What does Tape Error # 201 mean?

What does test #6 do?

What does test #10 do?

\_\_\_ ILRX33 PG 5-2 HSC70 service manual [HSC70 only]

Does this test require a scratch diskette?

\_\_\_ YES \_\_\_ NO

What does Error #3 mean?

---

How many tests make up this diagnostic?

---

\_\_\_ ILTU58 PG 4-7 HSC50 service manual [HSC50 ONLY]

Does this test require a scratch cassette?

\_\_\_ YES \_\_\_ NO

## HSC50/70 INLINE Diagnostics

THE STUDENT WILL FIND CHAPTER 5 IN THE HSC70 MANUAL OR CHAPTER 4 OF THE HSC50 MANUAL HELPFUL.

INLINE DIAGNOSTICS ARE DIAGNOSTICS THAT WILL RUN WHILE THE HSC IS BOOTED UP AND RUNNING CLUSTER SOFTWARE OR AS A STANDALONE UNIT.

INLINE DIAGNOSTICS RUN UNDER THE HSC> PROMPT. THE DEVICE THAT YOU ARE TESTING MUST NOT BE ONLINE TO ANY CLUSTER MEMBERS. IF IT IS, IT MUST BE DISMOUNTED FROM THAT NODE.

1. The first operation is to bring up the HSC> prompt, that is done by booting up the system cassette or floppy disk. When it boots do a "CONTROL Y" to bring up the HSC> PROMPT. The INLINE diagnostics will be found on the System tape. You can do a directory command to see them.

To start a test just type RUN <device name>:<test name> and answer the questions.

EXAMPLE HSC70>RUN DX0:ILMEMY for memory test on HSC70

HSC50>RUN DD0:ILMEMY for memory test on HSC50

2. Lets start to run all the INLINE diagnostics for practice. In the HSC70 manual there is an Appendix [D] on Interpretation of status bytes that you can use to find any failures. Also chapter 5 after each test printout.

\_\_\_\_ ILMEMY PG 5-6 HSC70 service manual

What user supplied parameters are needed for this test?

\_\_\_\_\_

Exactly what part of memory does ILMEMY test?

\_\_\_\_\_

\_\_\_\_ ILDISK PG 5-9 HSC70 service manual

The INLINE disk diagnostic runs on what cylinders?

\_\_\_\_\_

What prefix is used before the disk drive number?

What are the three FRUs that are tested using this diagnostic?

Why could you receive an Error code of 03 for this test?

What would an Error 07 mean for this diagnostic?

What would an Error 30 mean for this diagnostic?

What does Test 7 do under the ILDISK diagnostic?

What does Test 12 do under the ILDISK diagnostic?

ILTAPE PG 5-31 HSC70 service manual

What is the prefix used before the drive number for this test?

What number would you use to select a density of 6250?

How many Data patterns do you have?

What does an Error 2 mean for this diagnostic?

# HSC INLINE DIAGNOSTIC LAB

## INTRODUCTION

The purpose of the INLINE diagnostic lab, is to familiarize the student with the setup and operation of the INLINE diagnostics for the HSC.

## OBJECTIVE

After completing this lab, the student will be able to:

- Set up HSC devices to run INLINE diagnostics

- Run all INLINE diagnostics

- Interpret INLINE error printouts

- Isolate HSC failures from storage device failures

## REFERENCE MATERIALS

- HSC50/70 Service Manuals

- HSC User's Guide

- Student Guide

What does an Error 14 mean for this diagnostic?

What does an Error 31 mean for this diagnostic?

Name the three FRUs this diagnostic tests?

\_\_\_ ILTCOM PG 5-47 HSC70 service manual

What is the purpose of this diagnostic?

What is an error 2 for this diagnostic?

What is an Error 5 for this diagnostic?

\_\_\_ ILEXER PG 5-51 HSC70 service manual

Can you run this diagnostic through DUP?

\_\_\_ YES \_\_\_ NO

Can you use this diagnostic to access user areas?

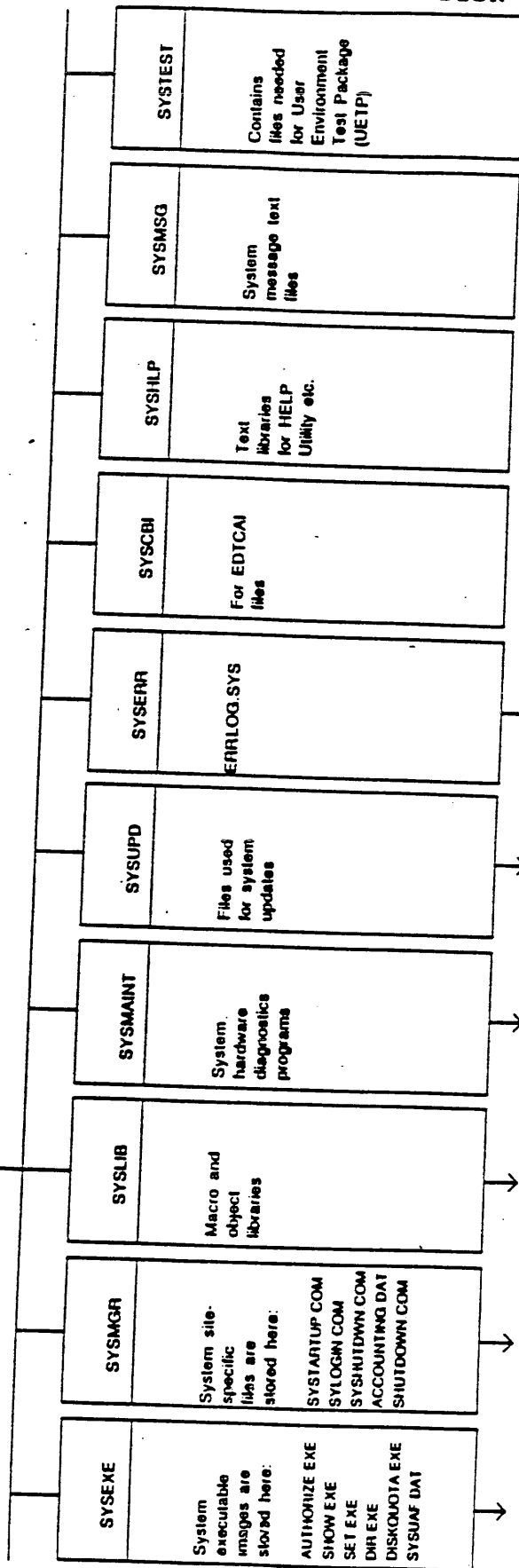
\_\_\_ YES \_\_\_ NO

How many disk Data patterns do you have?

# SYSTEM DIRECTORIES ON DISK

000000 MASTER FILE DIRECTORY

SYS0



SYS\$ERRLOG

SYS\$UPDATE SYS\$MAINTENANCE

SYS\$LIBRARY

SYS\$SYSTEM

→ SYS\$SYSROOT - DBA0 [SYS0]

→ SYS\$SYSTEM - SYS\$SYSROOT:[SYSEXE]

117694

# REGISTER QUIZ

1. WHICH 2 REGISTERS ENABLE ACCESS TO THE CONTROL STORE?

*MADR MPATR*

2. WHICH 2 HARDWARE REGISTERS ARE USED FOR ERROR REPORTING?

*PMCSR CNV FGF PFSR*

3. IF BIT 3 (MAINT INTERRUPT FLAG) IS SET IN THE PMCSR, WHAT ELSE SHOULD YOU CHECK?

*PSR is valid.*

4. WHICH REGISTER IS USED TO START THE CI MICROPROCESSOR?

*PICR BTO*

5. WHICH REGISTER IS USED TO STOP THE CI MICROPROCESSOR?

*PMCSR BTO*

6. HOW DO MICROCODE REGISTERS DIFFER FROM HARDWARE REGISTERS?

*Microcode Reg are not valid*



HSC50 Version V39A 18-Oct-1989 20:11:24 System LULU

SINI-E Seq 1. at 17-Nov-1858 00:00:27.80

Parity Error (Trap thru 114)

process DISK

PC 027710

PSW 140000

Lo err adr 160656

Hi err adr 000060

WBUSR 025625

^C

HSC> R ILEXER

KNON-F Program File Not Found on Specified Unit

HSC> R DD1:ILEXER

ILEXER>D>23:25 Execution Starting

Drive Unit Number (U) [1]? ^P

Drive Unit Number (U) [1]? D2

Access User Data Area (YN) [N]? Y

Are You Sure (YN) [N]? Y

Start Block Number (D) [0]?

End Block Number (D) [0=MAX]?

Enable Bad Block Replacement (YN) [N]?

Initial Write Test Area (YN) [N]?

Sequential Access (YN) [N]?

Read Only (YN) [N]?

Data Pattern Number (0-15) (D) [15]?

Write Only (YN) [N]?

Data Compare (YN) [N]? Y

Data Compare Always (YN) [N]?

Another Drive (YN) [1]? N

Minimum Disk Transfer Length in Sectors (1 TO 400) [10]?

CI DIAGNOSTIC QUIZ

EV X77  
EVERY VAX

1. WHAT IS THE NAME OF THE DIAGNOSTIC TO TEST:

A. CCI MODULE CNFGR REGISTER?

↓  
ECCGA  
~~ECCGB~~ WRONG?

B. 2911 MICROSEQUENCER ON THE CI780? EVCCB

C. THE CI CABLES ON THE CIBCI? EVKKG

D. COMMUNICATIONS BETWEEN NODES? EVXCI

E. TRANSMIT BUFFER ON THE CI780? EVGGL

uses  
Existing  
code

F. CIBCA MICROCODE? EVBAA

G. TO RELOAD THE CIBCA-BA MICROCODE?

RUN EVGAA  
setEvent1

OR RUN EVGPA  
update Eproms

2. WHAT DIAGNOSTIC SHOULD YOU RUN TO TEST THE VIRTUAL CIRCUIT TO AN INTERMITTANT HSC? WHERE AND HOW SHOULD YOU RUN IT ??

Level 3 EVGAA set flag 3

3. IF YOU'RE RUNNING EVGGB ON A BUSY CLUSTER AND GETTING ERRORS ON THE EXTERNAL LOOP TESTS, WHAT SHOULD YOU TRY ?

set flag 10 p. 4-17

set event 10

# INTRO TO CLUSTER AND CI QUIZ

1. WHAT ARE THE MAJOR DIFFERENCES BETWEEN A CLUSTER AND A NETWORK ?  
*cluster - tightly coupled      network - loosely coupled*

2. WHICH PIECE OF HARDWARE IS THE HUB OF THE CLUSTER ?

*STAR coupler*

3. WHICH PIECE OF SOFTWARE IS RESPONSIBLE FOR INTERNODE COMMUNICATIONS

*Software communication services*

4. WHICH PIECE OF SOFTWARE ENABLES QUEUE RESOURCE SHARING ?

*Distributed job controller*

5. WHAT IS THE DIFFERENCE BETWEEN DESTINATION AND COMPLIMENT ?

*Switch settings*

6. WHAT IS CONTAINED IN THE BODY OF AN ACK PACKET ?

*Nothing<sup>1</sup> in Ack packet body*

7. WHAT IS THE DIFFERENCE BETWEEN A NACK AND A NORESPONSE ?

*NACK - unsuccessful reception because buffer is full  
NO\_RSP - unsuccessful reception because of collision, CRC error, and so forth.*

8. WHAT IS THE DIFFERENCE BETWEEN A VIRTUAL CIRCUIT AND A SOFTWARE CONNECTION ?

*Virtual - code in controllers      logical connection between port drivers      system nodes  
Software - drivers used for connections between nodes + disks*

9. LIST THE 3 TYPES OF INFORMATION PACKETS AND WHAT EACH ARE USED FOR.

- A. seq      for transfer
- B. ~~DATA~~ *data* ~~gram~~ *gram*
- C. block ~~transfer~~ *transfer*

10. WHAT CI IS USED IN THE VAX 86XX AND WHY ?

*CI 780*

11. WHAT IS THE CIPA BOX USED FOR ?

*contains - p module / p module / link module*

12. NAME THE 4 MODULES THAT MAKE UP A CI780 (INCLUDE ENGINEERING TERMS)

*SIBI Interface module L0104      Link Interface module L0100  
DATA PATH module L0102  
Packet Buffer module L0101*

13. WHAT'S THE DIFFERENCE BETWEEN A NODE ADDRESS PLUG AND A NODE SWITCH

*CI node number.*

14. WHAT'S THE DIFFERENCE BETWEEN THE CIBCA-AA AND CIBCA-BA AND WHAT ARE THEIR MODULE NUMBERS ?

*BA - microcode from ROM*

*AA - microcode from console media*

# HSC QUIZ 1

1. HOW MANY RA DISKS CAN EXIST ON AN HSC50/70/40 ?

32 / 24 / 12

2. HOW MANY DC POWER SUPPLIES EXIST IN AN HSC50/70/40 ?

2 in 10 HSC 70 always has both supplies.

3. HOW MANY DISK/TAPE REQUESTORS CAN YOU HAVE ON AN HSC50 BEFORE YOU NEED MORE DC POWER ?

3

4. WHAT ARE THE 2 BLANK INDICATOR ON THE OCP USED FOR ?

Fault Display

5. HOW IS POWER REMOVED FROM THE CARD CAGE IN ORDER TO SWAP MODULES ?

D.C. Power Switch 1-11

6. LIST ALL THE DIFFERENCES BETWEEN THE HSC50 AND THE HSC70.

See page 1-9

7. WHAT IS THE TOTAL NUMBER OF MODULES THAT CAN EXIST IN EACH HSC ?

50	40	70
11	8	13

8. WHAT IS CRONIC ?

HSC O.S.

9. WHAT REQUESTOR NUMBER WILL THE K.CI ALWAYS BE ?

1

10. WHERE IS THE -5.2 VOLTAGE CHECKED ?

Back of P.S. +V2

P.O.C P.O.J

11. WHERE IS THE PROGRAM MEMORY FOR THE P.IOJ ?

1-2-6 HSC I/O Private Program Memory

12. WHICH MEMORIES CAN THE K.PLI ACCESS ?

1-3-6 control memory }  
DATA memory }

13. WHY DO THE K'S HAVE DUAL MICROSEQUENCERS ?

one for control  
one for DATA

14. IN WHAT ORDER DO THE YELLOW LEDS ON THE P.IDJ TURN OFF ?

2-13 Vol 2 1, 4, 3, 2, 5

15. WHAT TESTS ARE IN THE ROM SEQUENCE FOR THE HSC70 ?

Init P.IDJ 3-15  
Init PID

16. WHAT LED SHOULD BE LIT ON THE K.SDI AFTER BOOTING THE OFFLINE TAPE ?

red

17. IF YOU BOOT THE HSC WITH NO MEDIA IN THE DRIVE, WHAT FAULT WOULD YOU GET ?

code 23 3-8

18. WHAT STEPS ARE NEEDED TO GET TO THE ODL> PROMPT ?

Ding tape push in it

19. WHAT COMMAND INITIS ALL THE REQUESTORS ?

rise - checks the bus

20. WHAT TESTS ARE USED TO DIAGNOSE PROGRAM MEMORY ?

test mem test refresh

21. WHAT ARE THE TWO WAYS TO EXIT UDDT,...WHICH SHOULD YOU TRY FIRST ?

1) @ P - proceed

2) @ 173000 G

# CI780 PORT REGISTER LAB FOR VAX8600/8650

## INTRODUCTION

The purpose of this lab is to introduce the student with the use of the CI port registers using a VAX8600/8650.

## OBJECTIVE

After completing this lab the student will be able to:

- Identify all CI780 registers

- Explain the use of all CI780 registers

- Use the CI780 registers to modify Cluster operation

- Use the CI780 registers to troubleshoot the CI780 port adapter

## REFERENCE MATERIAL

- CI780 User's Guide

- Student Guide

## CI780 Port Adapter Registers

Since the VAX8600/8650 can have two SBI buses, the CI780 can have two base address ranges. For SBIA0, the base address of the CI port is 2001C000 for SBIA1 the CI780 the base is 2201C000. These are the base numbers that all the register offsets will be added to.

The 8600 CPU in this lab only has one SBI adapter (in SBIA0) so the base address will be 2001C000.

1. Halt the CPU by doing a CTRL P.
2. Examine the CI port Configuration register:

>>>E/P/L 2001C000

What is its address? \_\_\_\_\_

What is the CI adapter code? \_\_\_\_\_

Is this code the same for CI780 and CI750? \_\_\_\_\_

What bit sets if the port detects an SBI parity error? \_\_\_\_\_

What bit sets if we have Corrected Read Data? \_\_\_\_\_

3. Examine the Port Maintenance and Status register.

What is its address? \_\_\_\_\_

What bit tells me if the microcode is running? \_\_\_\_\_

How can I stop the microcode? \_\_\_\_\_

What bit is set for Even Parity? \_\_\_\_\_

What bit do you set if you want to force the microcode to start at a location in the Port Maintenance register? \_\_\_\_\_

4. Examine the Port Maintenance Address register.

What is its address? \_\_\_\_\_

How can I tell it to read or write to the high segment of the 47 bit microcode? \_\_\_\_\_

What must I do before I can use this register? \_\_\_\_\_

Deposit a 400 into this register. What do you see in the LEDS on the Packet Buffer board? \_\_\_\_\_

Deposit FFFFFFFF into the Maintenance Data register (BASE + 18) and read it back. \_\_\_\_\_

Deposit a 1400 into the Maintenance Address Register. Why doesn't 1400 appear in the LEDs? \_\_\_\_\_

Now deposit FFFFFFFF into this location using the Maintenance Data register. What does it read out when you examine this location?  
\_\_\_\_\_

Why? \_\_\_\_\_

5. Examine the Port Status register.

What is its address? \_\_\_\_\_

Where is this address located? \_\_\_\_\_

What bit tells me that the port initialization is complete?  
\_\_\_\_\_

6. Examine the Port Parameter register.

What is its address? \_\_\_\_\_

What does the 3F8 in the register mean? \_\_\_\_\_

What is its port number? \_\_\_\_\_

Does it match your port number? \_\_\_\_\_

What register and address would I use to find the failing memory address? \_\_\_\_\_

What address is the Port Initialize Control register at? \_\_\_\_\_

What bit is the only one used in this register? \_\_\_\_\_

7. Because we have been using location 400 and others we have destroyed portions of the microcode in the ram. Before doing the next step reload the microcode into ram by running the functional diagnostic with event flag 1 set.



8. Halt the system again by doing a CTRL P to put you back in console mode.

9. Let's halt the microcode:

>>>D 2001C004 1

Examine this location, bit 7 should now be a one:

>>>E 2001C004

Let's set the Programmable starting bit to a one.

>>>D 2001C004 40

Now set the address 400 into the Maintenance Address register.

>>>D 2001C014 400

Now start the microcode by setting a bit into the Port Initialize Control Register.

>>>D 2001C924 1

Now check to see if the port microcode has started.

>>>E 2001C004

Bit seven should be clear (0)

10. Now try examining the CI registers under the Diagnostic Supervisor. Boot the supervisor off the RL02 andd run the functional diagnostic EVGAA with event flat 1 set.

11. Try to deposit into the Maintenance Address register with the microcode running:

DS>D 2001C014 422

What happens? \_\_\_\_\_

Try to deposit into the Maintenance Data register with the microcode still running.

What happens? \_\_\_\_\_

Stop the microcode and try again, watch the LEDs on the Packet Buffer board while you do this.

Now can you do deposits? \_\_\_\_\_

12. Deposit FFF into address 400 (starting address of microcode). Now try to run EVGAA without reloading the microcode (event flag 1 clear).

Can you explain what happens? \_\_\_\_\_

## CI780 DIAGNOSTIC LAB

### INTRODUCTION

The purpose of this lab is to familiarize the student with the setup and use of the CI port diagnostics for CI780.

### OBJECTIVE

At the completion of this lab, the student will be able to:

- Set up the Diagnostic Supervisor to run CI port diagnostics.

- Run all CI780 repair level diagnostics

- Run all CI780 functional diagnostics

- Understand how the cluster environment affects the running of the Diagnostic Supervisor

- Isolate a failing module

### REFERENCE MATERIAL

- CI780 User's Guide

- Student Guide

## CI780 PORT ADAPTER DIAGNOSTICS

1. All of the diagnostics for the CI port are all level 3. This means that they all must be run offline under the Diagnostic Supervisor. Use pages 3-1 thru 3-3 of the CI780 User's Guide as reference.
2. After you bring up the DS> prompt, you have to attach the devices you want to test and select them.

ex. DS>ATTACH CI780 SBI PAA0 14 4 2  
DS>SEL PAA0

Or you could run the autosizer program EVSBA from the cassette or disk.

ex. DS>RUN EVSBA

After it is done, do your SELECT command.

3. After you have done the setup, you can now run the repair diagnostics. There are four of these diagnostics EVCGA thru EVCGD. To run the diagnostic type from the DS> prompt RUN (diagnostic name).

ex. DS>RUN EVCGA

\_\_\_ EVCGA

\_\_\_ EVCGB

\_\_\_ EVCGC

\_\_\_ EVCGD

After you have run the diagnostics in the default mode try running them with different sections enabled. An example would be to run EVCGE with the manual section.

ex. DS>RUN EVCGD/SECTION:MANUAL

Try this and other sections with the rest of the port repair level diagnostics. Remember some tests run only in the manual mode. To find out what sections are valid type HELP (DIAG NAME) SECTIONS.

What sections are valid for EVCGA? \_\_\_\_\_

What sections are valid for EVCGB? \_\_\_\_\_

What sections are valid for EVCGC? \_\_\_\_\_

What sections are valid for EVCGD? \_\_\_\_\_

---

Try also to run the diagnostics with event flags. To find the event f that are legal for each diagnostic type HELP (DIAG NAME) EVENT\_FLAG).

What flags are legal for EVCGA? \_\_\_\_\_

What flags are legal for EVCGB? \_\_\_\_\_

What flags are legal for EVCGC? \_\_\_\_\_

What flags are legal for EVCGD? \_\_\_\_\_

- Now lets try to run the Functional diagnostics EVGAA and EVGAB. Remen if you run the repair level diagnostics first you will have to set ev flag 1 to bring CI780.bin into memory and place it in the ram section of the Packet Buffer board. Since CI780.bin is not normally found in field account you might have to set your load path or put it into the field service account.

Type DS>LOAD EVGAA

Type from the DS> prompt SET EVENT 1

Now type DS>START

Also try setting event flag 2 and 3 and observe the print out.

Try running EVGAB now.

REMEMBER THESE DIAGNOSTICS ARE VERY DEPENDENT ON THE REV LEVELS OF CI780.BIN AND DIAGNOSTICS.

## PART 2: BOOTING DIAGNOSTIC SUPERVISOR FROM AN HSC DISK

› load the Diagnostics from the HSC disk type:

```
>>>@diaboo.cmd      This file was created to boot the Diagnostic
                     Supervisor from the HSC for this VAX.
```

Type the following:

```
DS> dir      [000000.VMS$COMMON.SYSMAINT]
DS> set load {sys$common.sysmaint}-
DS> dir
```

. Attach the CI780, or run the autosizer, then run EVCGA. Now try to run EVCGB. Try the DIR command.

What happens? \_\_\_\_\_

Why? \_\_\_\_\_

What does this tell you about putting CI port diagnostics on the HSC

Disk? \_\_\_\_\_

## CLUSTER QUIZ

1. HOW IS QUORUM CALCULATED?
2. WHAT IS PARTITIONING AND WHY IS IT DANGEROUS?
3. HOW DOES THE VAX KNOW WHICH ROOT TO LOAD ITS OPERATING SYSTEM FROM?
4. WHAT DO R2 AND R3 DEFINE IN THE BOOT PROCESS?
5. HOW DO YOU TELL VMB.EXE THAT THE SYSTEM DISK IS DUAL PORTED, AND WHY WOULD YOU.
6. WHAT DOES REMOVE\_NODE DO IN SHUTDOWN?
7. HOW IS CLUSTER\_SHUTDOWN USED TO BRING THE WHOLE CLUSTER DOWN AND WHY?
8. WHAT WOULD A DEVICE NAME OF \$215\$DUA1: TELL YOU ABOUT THE DEVICE?
9. WHAT ARE THE STEPS (COMMANDS) REQUIRED TO SERVE AND MOUNT A DUAL PORTED DISK TO A CLUSTER?
10. HOW DOES VMB.EXE KNOW THAT THE SYSTEM DISK IS A MEMBER OF A SHADOW SET? HOW DOES IT KNOW WHICH SET?
11. WHEN WOULD YOU USE THE DIAG SUPERVISOR SET LOAD COMMAND IN A CLUSTER AND WHY?
12. WHY IS THE TOP LEVEL SYSMAINT DIRECTORY NOT USED ON A VMS\_V5 SYSTEM?
13. WHAT TWO THINGS SHOULD YOU ALWAYS CHECK ON A CLUSTER BEFORE SHUTTING DOWN A NODE?

14. SYS#SYSROOT IS WHAT KIND OF LOGICAL NAME?
15. WHAT ARE THE EQUIVALENCY STRINGS FOR THE SEARCHLIST SYS#SYSROOT?
16. HOW CAN YOU GUARANTEE THE SHOW CLUSTER WILL NOT ONLY GIVE ME ALL THE INFORMATION YOU NEED BUT WILL DO SO WITH A SINGLE COMMAND?  
-----
17. WHAT SYSGEN PARAMETERS SET UP A QUORUM DISK?
18. IF A VAX SYSTEM WILL NOT BOOT THROUGH THE CI, BUT ALL DIAGS PASS, WHAT SHOULD YOU CHECK ON THE HSC?.....ON OTHER SYSTEMS?
19. IF QUORUM IS LOST ON A CLUSTER, WHAT ARE YOUR OPTIONS?  
(LIST THEM IN PREFERRED ORDER)  
A.  
B.  
C.
20. IF AN NI NODE WIL NOT BOOT, BUT ALL DIAGS PASS, WHAT SHOULD YOU CHECK?



This is an example as to how to get into the system without knowing a PASSWORD...works for a VAX8200/8250/8300/8350.

Notice the fact that there are blank lines in between some of the different commands that you have to type in. The messages that the system will present to you, are NOT included.

>>> B/R5:1 DU40                   ;; we assume that the system device is DU40.

SYSBOOT> SET/STARTUP=OPA0:

SYSBOOT> EXIT

\$ SET NOON

\$ SPAWN

\$ @SYS\$SYSTEM:STARTUP.COM

\$ SET DEF SYS\$SYSROOT:[SYSEXE]

\$ RUN AUTHORIZE

UAF> MOD SYSTEM/PASS=8200MAINT

UAF> EXIT

\$ ^P                   ; halts the system abruptly, not recommended for normal  
                      ; operation.

>>> H                   ; This command is here to keep the VAX 11/780 "gurus"  
                      ; satisfied, it is not needed.

>>> I

>>> B DU40

\$ @SYS\$SYSTEM:STARTUP.COM           ; after this command, wait a few  
                                     ; seconds, then type <CR>

USERNAME: SYSTEM

PASSWORD: 8200MAINT

;; We must now set the system to point to the normal STARTUP  
;; program.

CR SYSGEN  
SYSGEN> SET/STARTUP=SYS\$SYSROOT:STARTUP.COM  
SYSGEN> WRITE CURRENT  
SYSGEN> EXIT  
\$ @SYS\$SYSTEM:SHUTDOWN  
<CR>  
<CR>  
<CR>  
<CR>  
<CR>  
<CR>  
<CR>  
<CR>

;; Now the system has at least one known password.....have fun !!!

THAT'S ALL FOLKS!!.

The attached information is from the CSSE Mass storage west Group  
It contains important HSC Controller information  
(The following article can be found in the CSSE STARS database)  
=====

FROM: Ron Repka  
DEPT: Maintainability Eng.  
LOC.: CX01-2/Q12  
TEL.: 303-548-6195/522-6195  
ENET: SSDEVO::REPKA

SUBJECT: PERFORMANCE CONSIDERATIONS FOR HSC CONTROLLERS.

## 1 INTRODUCTION

There have always been performance considerations with regards to configuring devices on the HSC. Until recently, these considerations were important, but not extremely critical because the speed of the available devices did not tax the bandwidth of the HSC. With the introduction of the RA82, RA90, TA90, and RA70, configuring for maximum performance has become very important. In addition, if this is not done, not only will there be a effect in performance, but data buss contention caused errors may also occur, such as data buss overruns, drat seek timeouts, and EDC errors.

Some general rules can be given, but things such as the customer's application and the usage of the devices also need to be considered when looking at the overall configuration. This memo will try to provide some general guidelines and some understanding of what effects performance in the HSC and and to what degree.

There are several things to keep in mind when configuring a device on a HSC.

1. Only one device on a requestor can transfer data at one time.
2. Shadow set members need to be on separate requestors.
3. Requestor priority.
4. The speed of the device.

Sections 2, 3 and 4 will discuss these points in detail. Section 5 will offer some configuration guidelines, and section 6 discusses a performance issue specific to single ported drives.

## 2 ONLY ONE DEVICE ON A REQUESTOR CAN TRANSFER DATA AT A TIME.

Each requestor can support 4 devices, however, only one of these devices can transfer data at any one time. While one device is transferring data, other devices can be seeking or positioning tape. This means, the fewer fast and heavily used devices on any one requestor the better the performance.

There is no significant performance difference between individual ports within a requestor.

## 3 SHADOW SET MEMBERS MUST BE ON SEPARATE REQUESTORS.

This is a most important performance consideration. When the HSC picks which drive to read from on a shadow set, the first check made is for members on the same requestors. If all members are on the same requestor, the HSC just uses the primary member and does no read optimization at all. This means the same drive is always used on reads and the speed advantage of reads in a shadow set are lost. On writes, only one drive can be written to at any one time while simultaneous writes could occur if the drives were split across different requestors.

## 4 REQUESTOR PRIORITY AND DEVICE SPEED.

Requestor priority in the HSC is used two different ways. The first, and the most obvious, is if two requestors are contending for the data buss at the same time, the higher priority (higher numbered) requestor wins.

The second way requestor priority is used is not so obvious and requires some further explanation.

Each device connected to the HSC reports back it's transfer rate to the HSC when it is brought on line. The HSC uses this to allocate bandwidth on the data buss along with requestor priority. A RA90 needs every 3rd data buss cycle with it's high transfer speed so this means 3 RA90s can transfer data at the same time. The RA70 needs only every 5th cycle so 5 RA70s can transfer at the same time. This is assuming the drives are on separate requestors. The requestor module buffers less than 2 words, so if the RA90 cannot get the buss for 3 consecutive cycles, a data buss overrun will occur.

This works very well as long as the faster devices are at the higher requestor numbers. If a RA90 is running with 3 RA70s, the RA90 will always get the buss when it needs it as long as it is at a higher requestor number. However, if the RA90 is installed at a lower requestor number than the RA70s, it is possible that 3 RA70s will lock out the RA90 for 3 cycles and cause an overrun condition. To prevent this, the HSC checks the speed and priority of the devices, and if it detects a slower device at a higher priority, it allocates the slower

device the same bandwidth as the faster device.

For example, if RA70s were placed higher than RA90s, the HSC would consider the RA70 the same speed as RA90s and would allow only 3 RA70s to transfer at the same time or any combination of 3 RA90s/RA70s. This ensures the RA90 will get at least the one out of every 3 cycles it needs. This also means 40% of the HSC bandwidth would not be utilized. For this reason, it is very important to configure devices according to their relative transfer speeds. The relative speeds of currently supported devices from the fastest to the slowest is:

TA90  
RA90  
RA82  
RA81  
RA60  
RA70  
RA80  
TA78/79/81

TA78/79/81 tape drives, unlike disk drives, do not have steady transfer rates due to the irregularities of tape movement. Instead, their transfer rates are very erratic and bursty in nature. For this reason, they can cause bandwidth problems for other devices if given higher priority on the data buss, even though their "average" transfer rate is much slower. For this reason it is especially important to keep them at the lowest requestor numbers. This means they cannot be mixed on the same requestor with the cached TA90 which must be at the highest requestor numbers.

## 5 GUIDELINES

Based on the above information, some basic guidelines can be formulated to aid in configuring the HSC and it's devices. First, configure the devices of different device types according to the following criteria in order of priority;

1. TA78/79/81 tape drives must be at the lowest requestor numbers. TA90s must be at the highest requestor numbers and cannot share a requestor with TA78/79/81 type drives.
2. Shadow set members must be on separate requestors. This has the highest performance impact and the highest priority.
3. Faster devices should be installed on higher requestor numbers. This ensures the maximum possible transfer rate will be maintained and eliminates the possibility of data buss contention caused errors. Having shadow members on separate requestors may conflict with this rule, in which case, shadow members on different requestors takes priority.

4. Faster and high usage devices should be on requestors by themselves, or as few of these devices on any one requestor as possible.

Finally, after configuring the different device types using the above guidelines, look at the devices of the same type. When configuring devices of the same type, usage of each device needs to be considered along with requestor priority and the fact that a requestor can only transfer from one port at a time to determine the best configuration.

For example, the heaviest used device of one type, might be placed on a requestor by itself, or with a device that is seldom used and possibly placed at the highest requestor number of the devices of that same type. Some judgment will have to be used here along with some knowledge of the customer's application.

#### 6 ADDITIONAL PERFORMANCE CONSIDERATION FOR SINGLE PORTED DISK DRIVES.

VMS version 5.0 increased the frequency of performing it's Determine Access Path processing (DAP). DAP processing is used by VMS to periodically cause the disk drives to release their ports so VMS can determine all access paths to all drives. What this translates to in the HSC/drive is a topology command being sent to the drive. This topology command causes the drive to release it's selected port and send an attention/available to the other port if the port button is selected. During this time the drive is unavailable for disk transfers, however, in a normal dual ported configuration it takes only a few milliseconds for the attention/available and the HSC response.

The problem occurs when the drive has both port buttons selected and is only connected to one controller. In that case, the drive sends the attention/available on the unconnected port, and sits there and waits for a response until it eventually times out after about 2 seconds. This means all IO to the drive stalls for 2 seconds every time VMS calls DAP processing. Currently this will happen only every 6 minutes but VMS is expected to increase this frequency in the future.

Even though DAP processing is relatively infrequent now, it is important for the Customer and Field Service to understand that there still is some effect on performance by keeping both port buttons selected on single ported drives and this may be of larger concern in the future.

===== END =====