Honeywell

Application Module^{X} Service

AX13-510

TotalPlant

2.2 Hardware Organization

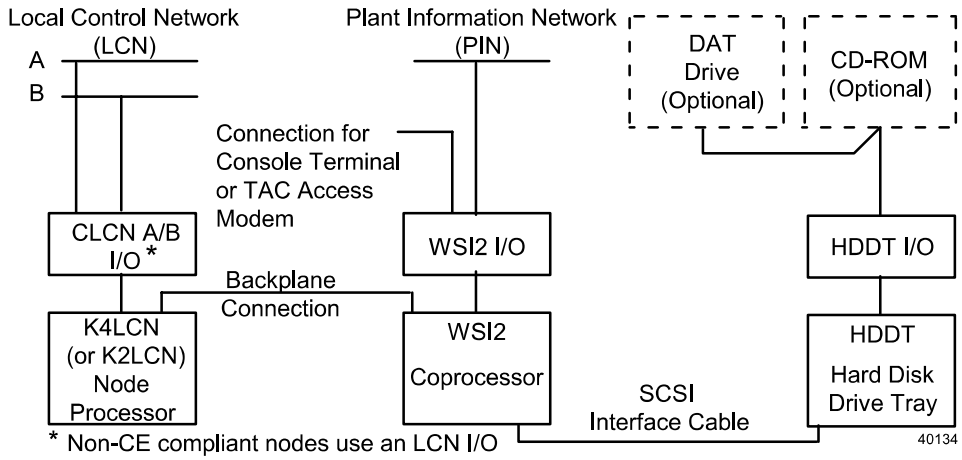
AXM Hardware block diagram

Two versions of A^{X}M hardware will be available. One uses the K2LCN (or K4LCN) board as the LCN node processor and the other uses the HMPU/ LLCN/QMEM combination of boards as the LCN node processor.

The diagrams on the following two pages show the major hardware components that make up the A^{X}M hardware. Pay particular attention to the following:

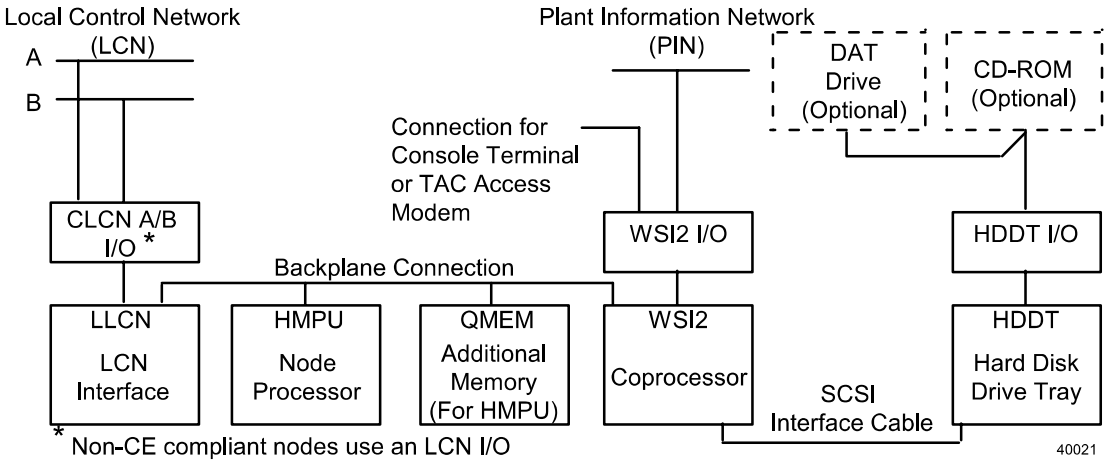
- Names and acronyms of the components
- Interconnection between components
- External connections to:
  - Local Control Network (LCN)
  - Plant Information Network (PIN)
  - "Console terminal" (when required for initial configuration or troubleshooting). A console terminal is a simple keyboard and display device that has no processing capability. Several device types can be used to satisfy this requirement. They are addressed later in this manual.
  - Modem for Technical Assistance Center (TAC) access (if required for complex problem isolation activities).
  - DAT drive (optional) to support hard disk backup, restore, and software update activities. It is also used for recovery activities in the event of some hard disk drive failures.
  - CD-ROM (optional) provides access to the HP-UX online software documentation.

K2LCN/K4LCN hardware version



HMPU hardware version

The following diagram illustrates the HMPU version of hardware.



2.3 Board Slot Definition

Overview of chassis types

The A^XM will appear in two types of LCN node hardware chassis. They are

Five-slot chassis (when using a K2LCN/K4LCN node processor)

Ten-slot chassis (when using an HMPU node processor)—This specific Ten-slot chassis has a split backplane with 6 slots (bottom) dedicated to one LCN node and 4 slots (top) for another LCN node. This Ten-slot chassis has been used in other special LCN applications. A second node in slots 7-10 is not allowed in the case of an A^XM.

Five-Slot board placement

The following tables show the A^XM board placement for the Five-slot chassis using the K4LCN or K2LCN node processor.Two versions of board placement are used depending on the size of the coprocessor memory which is located on the WSI2 board. The 256 megabyte size requires additional space above the WSI2 board.

Table 2-1 Five-Slot Chassis Board Locations (32/64/128 MB Coprocessor Memory Sizes)

Slot	Front	Rear
5	Optional Application Board	
4	Hard Disk Drive Tray (occupies two slots)	
3		HDDT I/O
2	WSI2 *	WSI2 I/O
1	K2LCN-8 or K4LCN-8 (or -16)	CLCN A/B or LCN I/O **

Table 2-2 Five-Slot Chassis Board Locations (with 256 MB Coprocessor Memory)

Slot	Front	Rear
5	Hard Disk Drive Tray (occupies two slots)	
4		HDDT I/O
3	(Space for extra WSI2 Memory) WSI2 *	
2		WSI2 I/O
1	K2LCN-8 or K4LCN-8 (or -16)	CLCN A/B or LCN I/O **

* Two versions of the WSI2 board are available to provide the 64 MHz and 100 MHz coprocessors.

** Non-CE Compliant versions use the LCN I/O.

Ten-slot board placement

The following two tables show the A^{X}M board placement for the 10-slot chassis using the HMPU node processor. Two versions of board placement are used depending on the size of the coprocessor memory which is located on the WSI2 board. The 256 megabyte size requires additional space above the WSI2 board.

Slots 7 through 10 do not share a common backplane for interconnection with slots 1 through 6.

The Hard Drive Disk tray does not depend on the backplane for signal interconnection with other slots. It only uses the slots it occupies to obtain power, which is common to all slots.

Table 2-3 Ten-Slot Chassis Board Locations

Slot	Front	Rear
10	Unusable slot	
9	Unusable slot	
8	Hard Disk Drive Tray	
7	(occupies two slots)	HDDT I/O
6	WSI2 *	WSI2 I/O
5	Optional Application board	
4	Optional memory board	
3	QMEM-4	
2	LLCN	CLCN A/B or LCN I/O **
1	HMPU	

* Two versions of the WSI2 board are available to provide the 64 MHz and 100 MHz coprocessors.

** Non-CE Compliant versions use the LCN I/O.

Table 2-4 Ten-Slot Chassis Board Locations (with 256 MB Coprocessor Memory)

Slot	Front	Rear
10	Unusable slot	
9	Unusable slot	
8	Hard Disk Drive Tray	
7	(occupies two slots)	HDDT I/O
6	(Space for extra WSI2 memory)	
5	WSI2 *	WSI2 I/O
4	Optional Application board	
3	QMEM-4	
2	LLCN	CLCN A/B or LCN I/O **
1	HMPU	

* Two versions of the WSI2 board are available to provide the 64 MHz and 100 MHz coprocessors.

** Non-CE Compliant versions use the LCN I/O.

2.4 Power Supply

Introduction

The A^XM node contains a power supply (55 amp) that is used in many other LCN node types.

It is capable of producing output voltage margins of +5% and -5% that, in some cases, are used in factory test and troubleshooting activities. This margining is controlled by the jumper on the face of the power supply. See the following diagram.

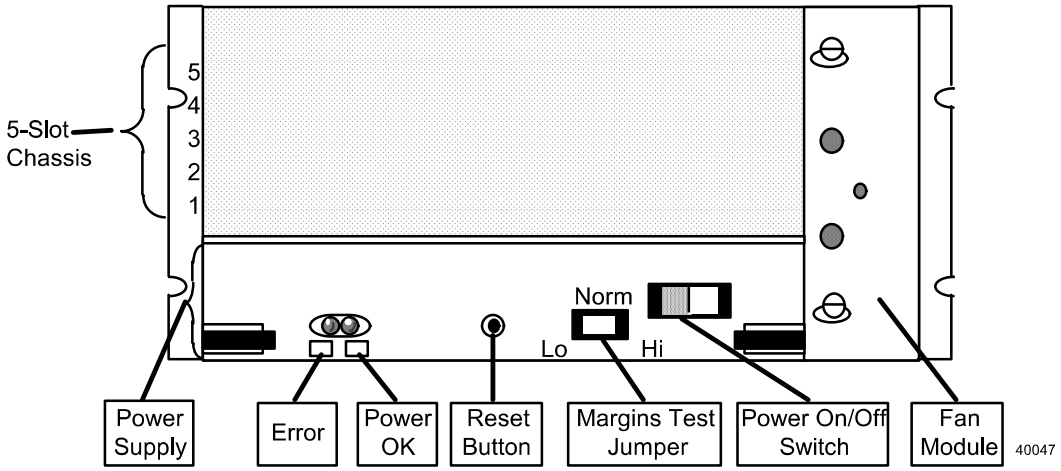
Similar power supplies are used in both the K2LCN/K4LCN (Five-slot) and HMPU (Ten-slot) versions of A^XM.

Node power margin restrictions

> **WARNING**
>
> The low power margin (-5%) must never be used in the A^XM. The coprocessor and hard disk drive design allows for only a -2.5% margin. Using -5% margins will produce unpredictable results.
>
> The high (+5%) power margin can be used by factory test and during troubleshooting activities. Honeywell does not recommend using any power margins while a node is on process.

Node power supply diagram

The following diagram shows the power supply in a Five-slot chassis (K2LCN/K4LCN version). A similar power supply is used in the Ten-slot chassis (HMPU version).



3. Hardware Description of LCN Node Processors

3.1 K2LCN-X Node Processor

Overview

The K2LCN processor board contains all of the essential parts to make up the kernel portion of any LCN node. It includes a 68020 processor, LCN interface circuits, and 6 or 8 megawords of on-board memory (for AXM). It does not have floating point calculation hardware capability. The exact memory size is determined by which option is purchased. A minimum of 6 megawords is required to support R500 software.

Changing memory size requires the replacement of the current K2LCN board with a board containing the proper memory complement. This board cannot be upgraded in the field.

The K2LCN board memory size is easily recognized by the -X portion of the name on the left extraction lever; i.e., K2LCN-6 = 6 megawords or K2LCN-8 = 8 megawords.

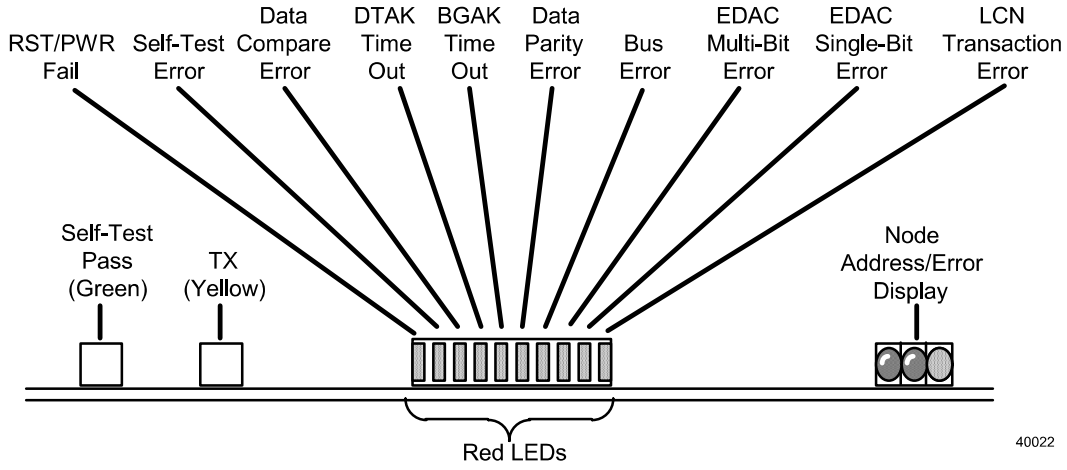
K2LCN indicators

The K2LCN board indicators are visible from thefree edge of the board while the board is installed in a module chassis. The indicators provide a visual indication regarding the present condition of the board.

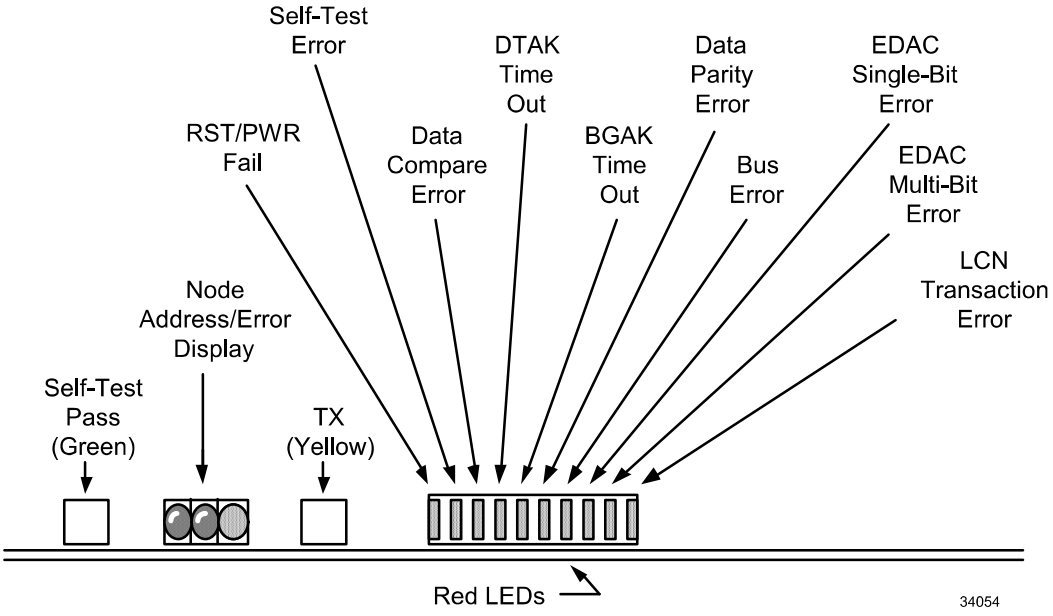
Two illustrations of the indicators follow. The first illustration shows the indicator layout on an early production K2LCN board, assembly 51401551-x00. The second illustration shows the indicators on the latest production K2LCN board, assembly 51402615-x00.

The indicators provide identical information on both boards.

The indicators on the early production K2LCN board, assembly 51401551-x00, are shown in the following illustration.



The indicators on the latest production K2LCN borad, assembly 51402615-x00, are shown in the following illustration.



Indicator description

The following table provides descriptions of the indicators on the K2LCN board. Reference the preceding diagrams.

Table 3-1 K2LCN Board Indicators

LED	Description	Suspected cause if abnormal
Self-Test Pass	On after board passes self-test. Normally on.	K2LCN
TX	On when transmitting on the LCN. Normally on or flashing rapidly.	K2LCN
RST/PWR fail	On when a reset operation caused by the reset button or power on is in progress. Normally off.	K2LCN
Self-Test Error	On to indicate a board self-test error. Normally off.	K2LCN
Data Compare Error	On to indicate an on-board data compare error. Normally off.	K2LCN
DTAK Time Out	On to indicate a Data Transfer Acknowledge failure. Normally off.	K2LCN
BGAK Time Out	On to indicate a Bus Grant Acknowledge failure. Normally off.	K2LCN or other board(s) in chassis
Data Parity Error	On to indicate an on-board data parity error. Normally off.	K2LCN
Bus Error	On to indicate a detected backplane bus parity error. Normally off.	K2LCN, other board(s) in chassis, or backplane
EDAC Single-Bit Error	On to indicate a single-bit (correctable) RAM error. Normally off.	K2LCN
EDAC Multiple-Bit Error	On to indicate a multiple-bit (uncorrectable) RAM error. Normally off.	K2LCN
LCN Transaction Error	On to indicate communication problems with the LCN. Normally off.	K2LCN or CLCN A/B (LCN I/O) or LCN network

K2LCN Pinning

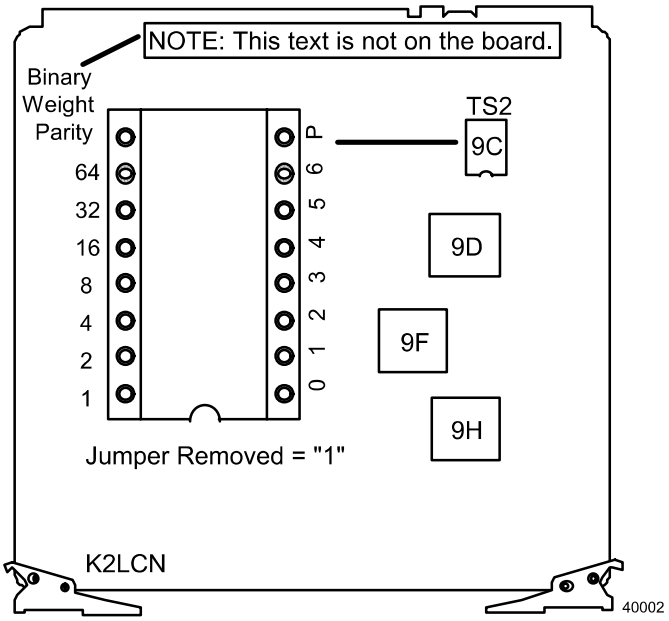
The K2LCN board has an LCN node number pinning feature on the board itself. This feature is duplicated on the CLCN A/B I/O or LCN I/O board that is installed directly behind the K2LCN board in the $A^{X}M$ Five-Slot Module chassis.

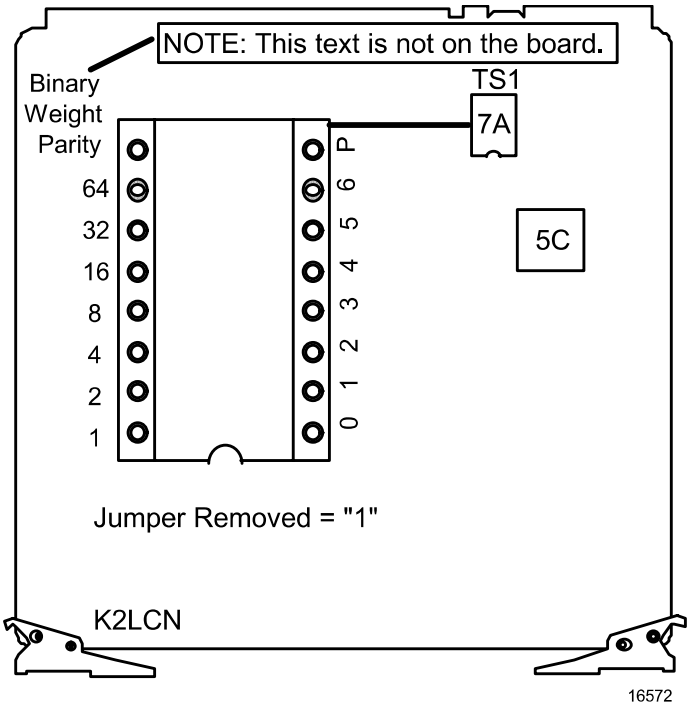
ATTENTION

The address pinning jumpers must all be removed from the K2LCN board when it is used in conjunction with an CLCN A/B I/O (or LCN I/O) board. The node number pinning must be done on the CLCN A/B I/O (or LCN I/O) board in this case.

The K2LCN board pinning requirement for the $A^{X}M$ is shownin the following two illustrations.

The first illustration shows the location of the address pinning lbock on the early production K2LCN board, assembly 51401551-x00. The second illustration shows the location of the address pinning block on the latest production K2LCN board, assembly 51402615-x00.


NOTE: This text is not on the board.
Binary
Weight
Parity
64
32
16
8
4
2
1
P
6
5
4
3
2
1
0
TS2
9C
9D
9F
9H
Jumper Removed = "1"
K2LCN
40002


NOTE: This text is not on the board.
Binary
Weight
Parity
64
32
16
8
4
2
1
P
6
5
4
3
2
1
0
TS1
7A
5C
Jumper Removed = "1"
K2LCN
16572

3.4 CLCN A/B I/O Board (or LCN I/O Board)

Overview

This board provides the physical interface to the LCN cables. It is used with both versions of node processors (K2LCN/K4LCN and HMPU).

LCN address pinning

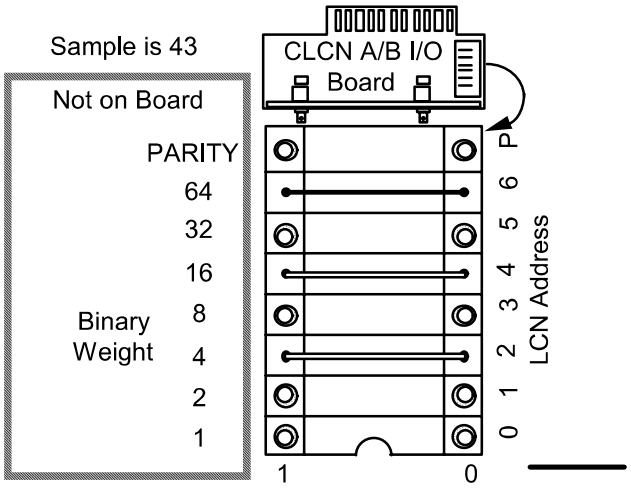
The A^{X}M LCN address pinning feature for defining the LCN physical node number is located on this board. These address jumpers must be properly configured at the time of hardware installation.

See the *Five/Ten-Slot Service* manual for additional pinning details.Reference: >> LCN I/O Pinning (Section 2.8)

CAUTION

Conflict in pinning possible—The K2LCN (or K4LCN) processor board has a duplicate LCN node pinning feature. The address jumpers on the K2LCN/K4LCN must all be removed when it is used in conjunction with an CLCN A/B I/O (or LCN I/O) board.

The LCN node address pinning on a LCN I/O board is illustrated in the diagram below. The pinning is identical on the CLCN A/B board.



Jumper Out = 1
Jumper In = 0

The overall number of jumpers out, including the parity jumper, must be an odd number.

Note that addresses 0-127 could be set, but software will allow only node addresses 1-64.

The 1 and 0 refer to DIP switch positions when a switch assembly is installed in place of the jumper block.

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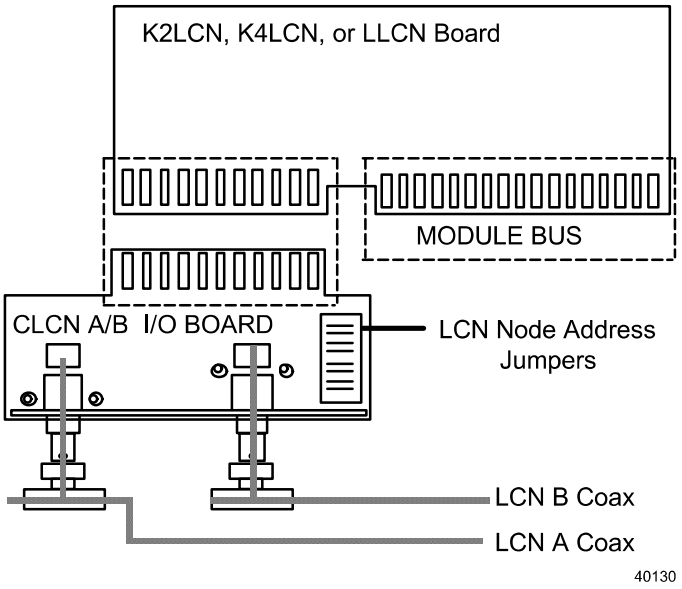
LCN cable connections

The A^{X}M node processor is connected to the LCN cable network. These LCN cables (A and B) are connected to the CLCN A/B I/O (or LCN I/O) board as shown in the following diagram. This cabling scheme is the same for each LCN node that uses the CLCN A/B I/O (or LCN I/O) board.



3.5 Node Processor Related Board Replacement

Overview

Node power must be turned off for the purpose of changing circuit boards in the A^{X}M node.

> ***WARNING***
>
> **Damage can result—**Circuit board damage can result if you do not practice proper ESD procedures or attempt to remove/ insert a circuit board with node power applied.

> *CAUTION*
>
> **Mandatory steps—**It is mandatory that appropriate software shutdown procedures are followed for the A^{X}M coprocessor prior to removing power from the node.
>
> Failure to do so can cause damage to the HP-UX file structure on the coprocessor hard disk.

> **ATTENTION**
>
> It is also highly recommended that you perform a node processor software shutdown when preparing to power off the A^{X}M node. This provides for an orderly departure from the LCN network.

Locating shutdown procedure

Software shutdown procedures for the A^{X}M coprocessor are documented in Section 3 of the *Application Module^{X} System Administration* manual. Reference >> Application Module^{X} System Administration manual (Section 3.5).

Board Removal/ Replacement Procedure

Table 3-7 Board Replacement Procedure

Step	Action
1	Turn off power using the switch on the node power supply.
2	Remove the board .
3	Verify that the replacement board pinning matches the existing board.
4	Insert the replacement board .
5	The node is now ready for power on and loading.
6	Perform the node loading procedures. Reference: >> *A^{X}M System Administration* manual (Section 3).

4. Hardware Description of Coprocessor

4.1 WSI2 Board Description

Overview

The basic WSI2 board contains the coprocessor interface circuits required to adapt the coprocessor into the A^{X}M node hardware. Reference the diagram below.

A coprocessor daughter board connects to the WSI2 mother board through a specially provided connector on the WSI2 board. Several small cables are also used to complete the total coprocessor to WSI2 board connections.

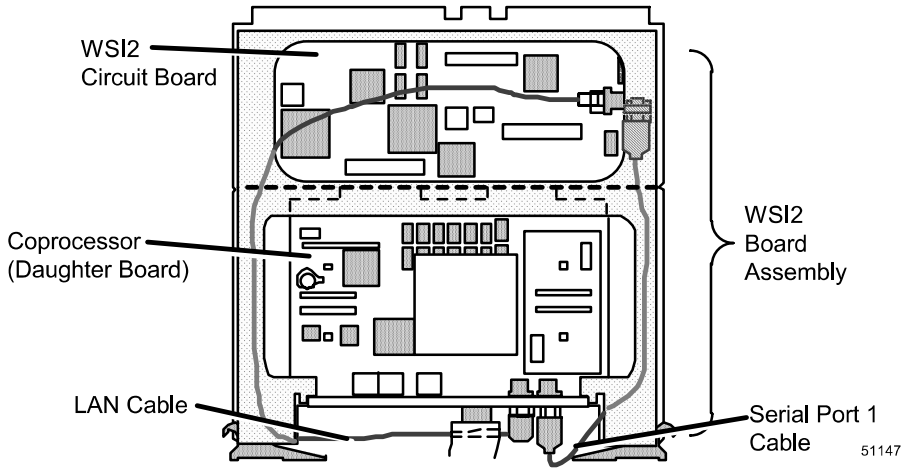
The WSI2 board is normally referred to as a board assembly which includes the coprocessor daughter board (with its associated memory) and all on board cables.

Neither coprocessor (daughter board) nor the WSI2 (mother board) is separately field replaceable. The complete WSI2 assembly will be available as a single spare part.

The coprocessor memory (mounted on the coprocessor daughter board) is ordered separately. The Spare Parts section of this manual supports this ordering concept. Reference: Coprocessor Memory and Battery.

WSI2 board illustration

The diagram below illustrates how the WSI2 board assembly is organized.



WSI2 Board indicators (LEDs) and switch

The diagram below shows two indicators and a switch at the left. These are the WSI2 board indicators. These indicators are directly visible with the chassis front cover in place. The indicators are described as follows:

- Transaction error (red LED)

Indicates that a data parity error or bus error was encountered during normal operation on the backplane module bus.

- WSCPU running (yellow LED)

When on indicates that the coprocessor software (HP-UX) is up and running.

- Shutdown Switch

The switch can be used to force a coprocessor (HP-UX) shutdown. It is recommended that the keyboard method (as documented in the *A*^{X}*M System Administration* manual) be used whenever possible. Reference: >>*A*^{X}*M System Administration* manual (Section 3.5).

The positions of this switch are defined as follows:

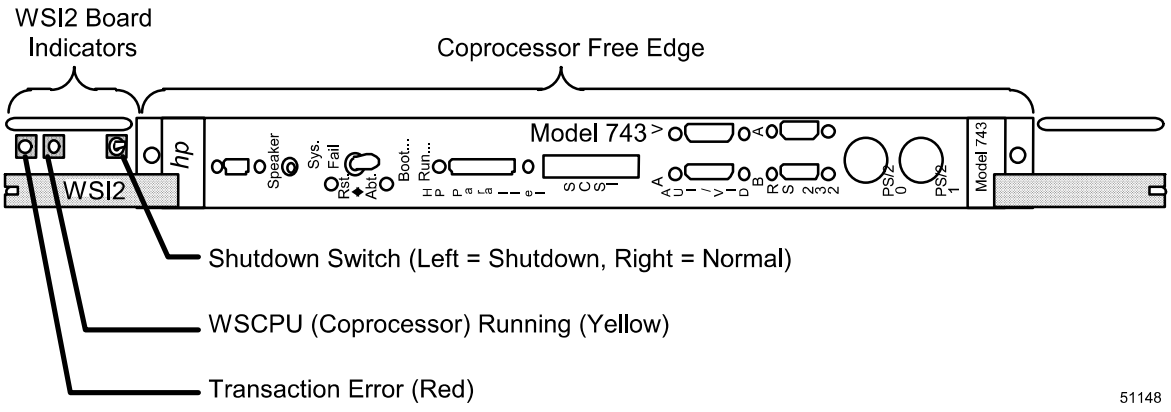
To the left = Shutdown

To the right = Normal

- The remainder of the diagram shows the connectors and indicators on the coprocessor daughter board free edge. They are defined in a later diagram.

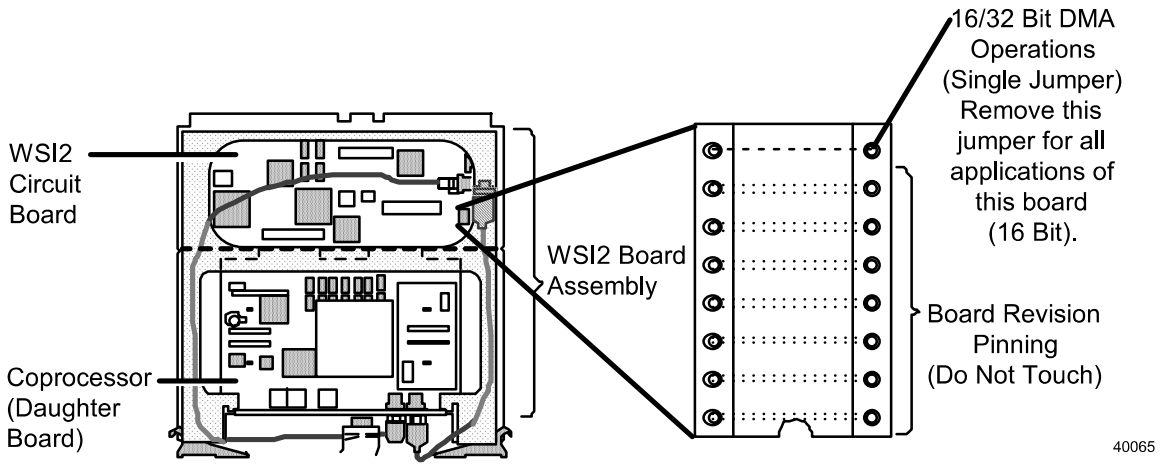
WSI2 board indicators

The diagram below describes the indicators on the WSI2 mother board. The coprocessor daughter board portion is covered later in this section.



WSI2 board pinning

The WSI2 board has only one pinned option. The pinning defines if an HMPU board or a K2LCN/K4LCN board is used as the node processor. The interface to the HMPU node processor is somewhat different from the K2LCN/K4LCN node processors.



11.4 LCN Node Processor Parts

Node processor parts list

The following table provides the part numbers for the Node processor components.

Table 11-3 LCN Node Processor Related boards Parts List

Assembly Number	Description
51401551-801	K2LCN (with 8 megawords of on-board memory)
51402615-800	K2LCN (with 8 megawords of on-board memory)
51401946-100	K4LCN (does not include memory daughter (mezzanine) board—order separately below)
51201759-160	16 megaword K4LCN memory daughter (mezzanine) board
51201645-800	8 megaword K4LCN memory daughter (mezzanine) board
51402755-100	K4LCN (does not include DIMM memory board— order separately)
51201793-160	16 megaword K4LCN DIMM memory board
51201793-800	8 megaword K4LCN DIMM memory board
51400978-100	HMPU (node processor board)
51401072-400	QMEM-4 (additional memory for HMPU)
51401072-200	QMEM-2 (additional memory for HMPU)
51401291-100	LLCN Board
CE Compliant 51305072-100	CLCN A/B Board (provides LCN connection)
Non-CE Compliant 51107403-100	LCN I/O Board (provides LCN connection)