Honeywell

Five/Ten-Slot Module Service

LC13-500

LCN Service - 1

Five/Ten-Slot Module Service

LC13-500
Release 500
CE Compliant
9/95

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Revision 01 -– September 11, 1995

About This Publication

This publication provides instructions for use by the system service personnel to service any Five/Ten-Slot Module. It will help you determine how to perform service required on Five/Ten-Slot Modules, identify spare parts, and provide disassembly/assembly instructions for replacing the required part.

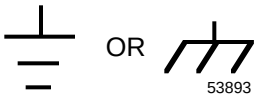
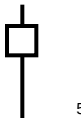
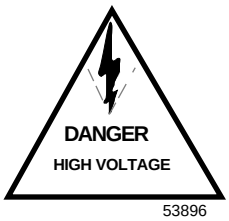
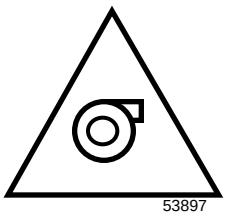
This manual is used to support the *Universal Station Service* manual and the *History Module Service* manual, which are also found in the *LCN Service - 1* binder.

This publication supports TDC 3000^X software release 500 and CE Compliant hardware.

> Any equipment designated as "CE Compliant" complies with the European Union EMC and Health and Safety Directives. All equipment shipping into European Union countries after January 1, 1996 requires this type of compliance—denoted by the "CE Mark."

Change bars are used to indicate paragraphs, tables, or illustrations containing changes that have been made to this manual effective with the EC Release. Pages revised only to correct minor typographical errors contain no change bars.

Standard Symbols

Scope	The following defines standard symbols used in this publication.
ATTENTION	Notes inform the reader about information that is required, but not immediately evident.
CAUTION	Cautions tell the user that damage may occur to equipment if proper care is not exercised.
WARNING	Warnings tell the reader that potential personal harm or serious economic loss may happen if instructions are not followed.
 53893	Ground connection to building safety ground
 53894	Ground stake for building safety ground
 53895	Electrical Shock Hazard—can be lethal
 53896	Electrical Shock Hazard—can be lethal
 53897	Rotating Fan—can cause personal injury

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INTRODUCTION
Section 1

1.1 OVERVIEW

This manual provides detailed instructions for maintenance, testing, troubleshooting and repair of the Five- and Ten-Slot Modules (part of the TDC 3000^X system). A typical Five-Slot Module is shown in Figure 1-1. The troubleshooting, disassembly, and assembly procedures are effective down to the optimum replaceable-unit (ORU) level. A spare parts list (subsection 5.1) contains ORU parts and is keyed to a module exploded view that is also used with the disassembly and assembly procedures.

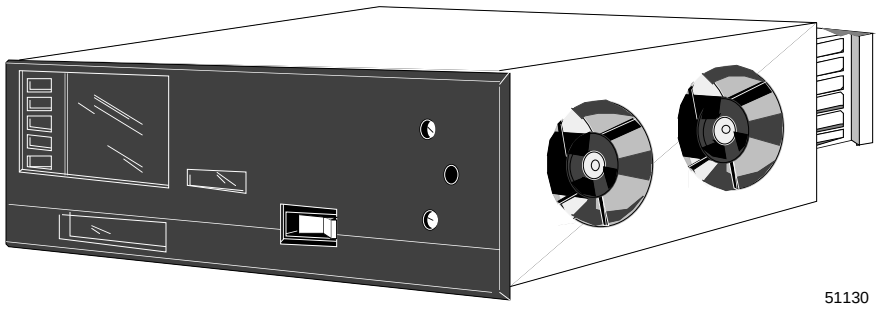

Figure 1-1 — Five-Slot Module

1.2 RELATED PUBLICATIONS

The following publications apply to the TDC 3000X system and should be referred to as required:

Title	Binder
LCN System Installation	LCN Installation
LCN System Checkout	LCN Installation
Universal Station Service	LCN Service - 1
Universal Station (Ergonomic) Service	LCN Service - 1
Universal StationX Service	Universal StationX
Universal StationX (Ergonomic) Service	Universal StationX
History Module Service	LCN Service - 2
Dual Node Module Service	LCN Service - 2
Maintenance Test Operations	LCN Service - 1
System Maintenance Guide	LCN Service - 1
Application ModuleX Service	Application ModuleX

MODULE DESCRIPTION
Section 2

2.1 GENERAL DESCRIPTION

The Five- and Ten-Slot Modules are configured to perform various functions, such as Applications, Gateways, History, and Universal Stations in the TDC 3000^X system. Each module occupies a specific address (node) on the Local Control Network (LCN). Figure 2-1 shows the module functions within a typical TDC 3000^X system.

The configuration flexibility is because of the inter-changeability of the component card assemblies (boards) in the module. In addition to the boards within the module, there are also companion input-output (I/O) boards mounted in a chassis on the rear of the module. The I/O boards facilitate interconnection of the module to the LCN or with the Data Hiway, Universal Control Network (UCN), external devices, and communication lines. The module also contains a power supply, located in the bottom of the unit, and a cooling-fan assembly, located on the right side.

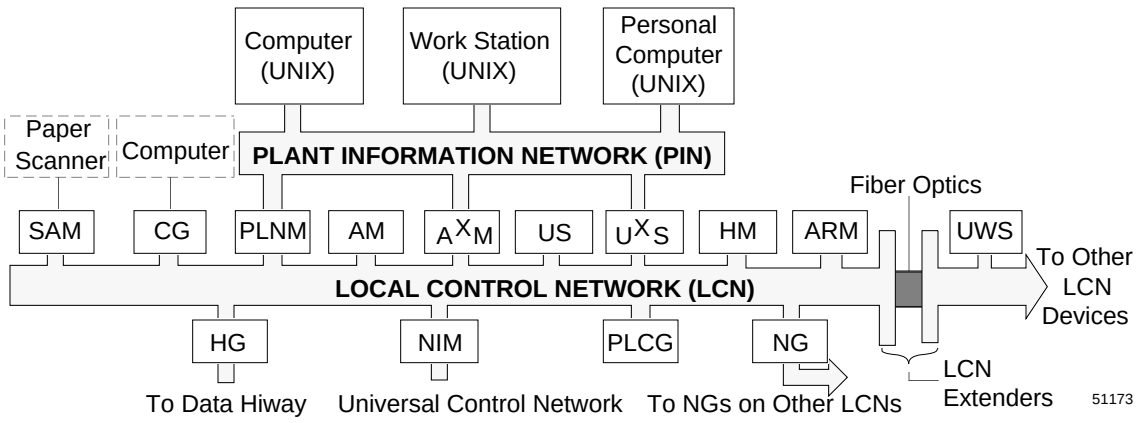

Figure 2-1 — TDC 3000^X Module Functions

The modules are designed to be mounted in the Honeywell TDC 3000^X system equipment cabinet and Universal Station console bays that conform to the industry standard 19-inch rack mount. If mounting racks other than Honeywell's are used, care must be taken to ensure that the cooling-fan air flow is not blocked and that adequate air filtration is provided.

2.1.1 CONTROLS AND FEATURES

The front of the Five/Ten-Slot Module has a single ON/OFF ac power switch that controls the alternating current to the power supply. This switch is shown in Figure 2-2. When the power switch is in the ON position, LED indicators can be seen through the see-through portion of the front cover panel.

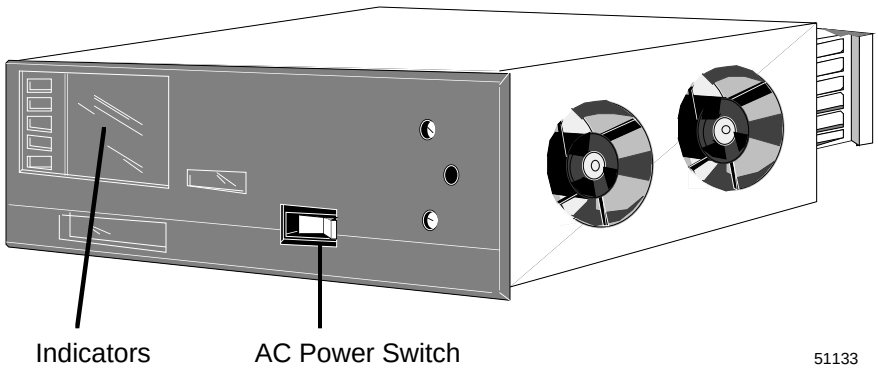

Figure 2-2 — Five-Slot Module Front View

The rear side of the module has several connectors that are used as shown in Table 2-1.

Table 2-1 — Five-Slot Module Connector Usage

CONNECTOR	USAGE
J2	Ac Power Cord
J5	Remote Reset
J7	Precision Clock Input
J8	+5 Vdc and +12 Vdc Power for Peripherals
J9	+5 Vdc and +12 Vdc Power for Peripherals
J10	24 Vdc for Fan Power on Cartridge/Floppy/History Module Assemblies

When a Five-Slot Module that is located in a Universal Station (US) that has a floppy drive or cartridge drive, the power supply (51201436) can be used as a power source to drive the floppy drive or cartridge drive and to power the cooling fan for the cartridge drive. Connector J8 is used for the drive power, but J9 provides the same power connection.

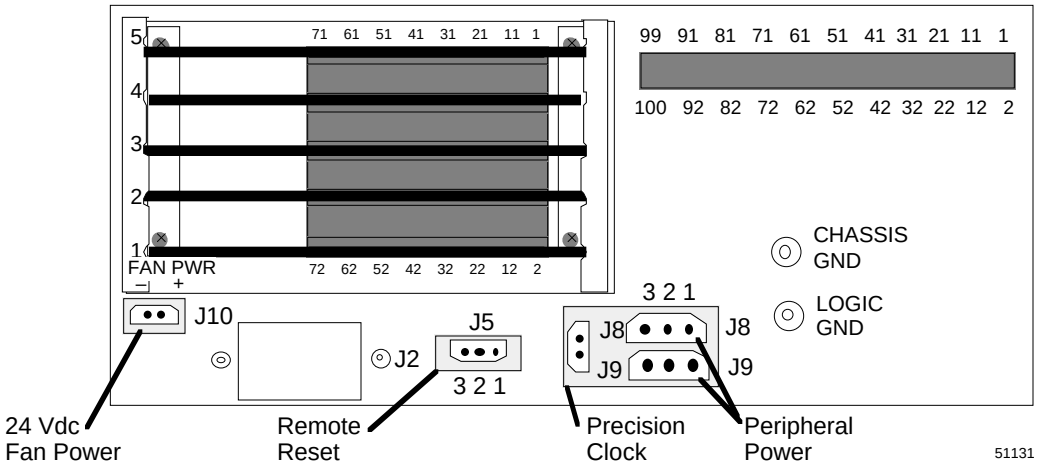

Figure 2-3 — Five-Slot Module Rear View

The CE compliant Five-Slot Module is capable of holding both I/O board designs.

- The original design I/O boards function as they always have.
- The CE compliant I/O boards mount to the card file with screws. This grounds the I/O board face plate and the cable shields that connect to the face plate.

The CE compliant cardfile is the same in all other respects.

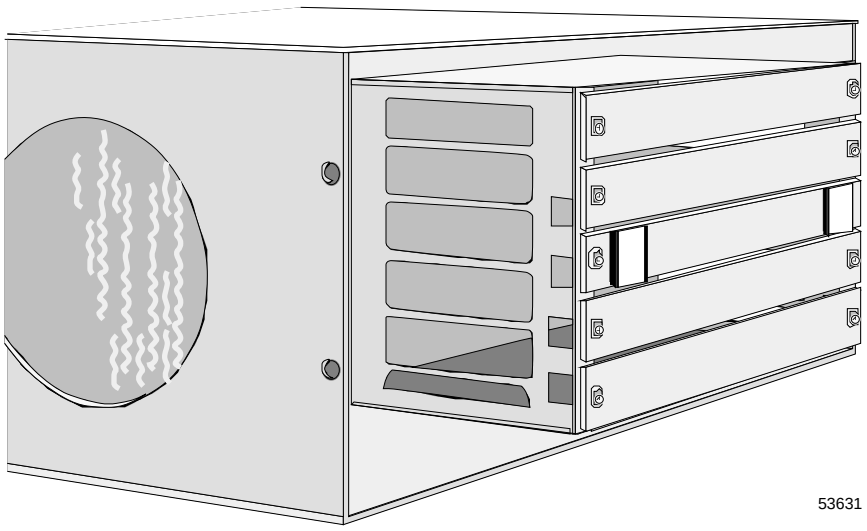

Figure 2-4 — CE Compliant Five-Slot Module I/O Card File

2.2 MODULE CONFIGURATIONS

Module functions are determined by the board complement assigned to them. The board slots on both the front and rear of the unit are numbered from 1-to-5 or 1-to-10 with slot number one at the bottom. Tables 2-7 through 2-25 (odd numbered) show the board arrangements for the various factory-built module types configured to run with the latest software release, R400. Tables 2-8 through 2-26 (even numbered) show the various modules that can be upgraded to the R400 release. Please note that some module types may occur in either Five- or Ten-Slot Module configurations.

Table 2-2 — Configurations and Peripherals

Configuration/ Peripheral	Description	Boards Used
Standard Performance	68000 Processor	EMPU
High Performance	68020 Processor	HMPU or HPK2-x
Interlaced Monitor	"Standard" 19 inch color monitor mounted in the Universal Station and driven by separate red, green, and blue signals on coaxial cables.	PIC, VDG, & VDG I/O or PDG & PDG I/O* or EPDG & PDG I/O**
13" Monitor	A stand-alone color monitor, smaller but electrically similar to the interlaced monitor. Driven by three TTL signals. Used in the Universal Workstation (UWS).	PDG & PDG I/O^{TTL*}
Noninterlaced Monitor	An "Enhanced Display" 19 inch color monitor mounted in the Universal Station offering a sharper, clearer picture than the interlaced monitor. It is driven by a ribbon cable.	EPDG & EPDG I/O or EPDGP I/O
14" Monitor	A stand-alone color monitor, smaller but electrically similar to the noninterlaced monitor. Used in the Enhanced UWS.	EPDG & EPDG I/O or EPDGP I/O
Lower Tier	A part of the Universal Station cabinet containing a monitor. It is mounted in front of the operator, just above the keyboard.	
Upper Tier	An additional location on the Universal Station for a monitor to be mounted above the lower tier. No keyboard is available. A separate Five-10 slot module is required.	
21" FST Monitor	Monitor for Universal Station^{X} that is a flat square tube with high resolution graphics (1280 x 1024 pixels).	TPDG TPDGX TPDG I/O
Hard Disk Drive Tray (HDDT)	Holds one or two disk drives (525 MB or 1 GB) for WSI2 coprocessor.	WSI WSI2 I/O

* There are 2 different types of PDG I/O boards—see Table 2-5.

** If an EPDG board drives a PDG I/O board, it may drive an interlaced monitor.

Module configurations change for several reasons, some of which are:

- Hardware components (such as processors, hard disk drives, cartridge drives, and others) are introduced which offer faster operation, more storage, or more functionality.
- The basic design of peripherals (such as monitors, drives, keyboards, and others) may change, requiring modifications in the electrical circuits servicing them.
- A new software release containing greater functionality may require more execution speed or more memory.

Table 2-2 describes hardware configurations and peripherals which you may encounter in this manual.

2.2.1 Board Application Notes

The board types listed in Tables 2-2 through 2-5 are the current production board types. Table 2-3 briefly describes the features of the newest boards and the minimum software releases that they require.

Many boards, in addition to those listed in Table 2-3, still operate satisfactorily with R400. All of these boards, including brief descriptions and part numbers, are listed in Tables 2-4 and 2-5.

Table 2-4 lists the functional boards that are installed at the front of the 5/10 slot module. Table 2-5 lists the I/O and special-purpose paddle boards that are installed in the back of the module. An I/O board is normally installed directly behind the functional board it serves, as shown in the configuration tables in subsections 2.2.2 through 2.2.11. Special-purpose boards can generally be installed in any unused I/O slot, but check the appropriate service manual if you don't know where a board will operate satisfactorily.

NOTE

Under certain circumstances, the K2LCN OR K4LCN processor board can be used to replace HPK2 and EMPU processors. In the case of EMPU replacement, there may be a performance enhancement. The restrictions and procedures involved in this replacement are covered in detail in Appendix B.

Table 2-3 — Board Replacement Notes

Board Type	Description	Minimum Software Release
EMEM	1 MB memory board used as main memory with MCPU and EMPU boards. This board also is used as additional memory with HMPU and HPK2 boards.	200
EPDG	With the PDG I/O board, operates as a PDG with the interlaced monitor, and can replace the PDG or VDG/PIC.	200
EPDG	With the EPDG or EPDGP I/O board, operates as an EPDG with the noninterlaced monitor. Also has a Cartridge Disk interface.	210M1
EPDGP I/O	EPDGP I/O board (Tab-300) with jumper (J11) for DIRECT or INVERT of vertical sync signal. Vertical sync for 21" FST monitors in XC3000 consoles require inverted sync signal.	300
HMPU	68020 processor and memory (2 MB) board replaced by HPK2 in current production (except in redundant AMs). The HMPU board also contains a floating-point coprocessor.	200 (HG) 210 (All)
HPK2-2	68020 processor with 2 MB of on-board memory that replaces an HMPU, EMPU, and MCPU in all modules except redundant AMs (MCPU is not recommended for R400).	210M1
HPK2-3	68020 processor and memory (same as HPK2-2 with 3 MB).	230
K2LCN-x	68020 combined processor, memory and LCN interface (eliminates LCN board and external memory boards). Available with x = 2, 3, 4, 6, or 8 MB of on board memory.	320
K4LCN-x	68040 combined processor, memory and LCN interface (eliminates LCN board and external memory boards). Available with x = 4, 8, or 16 MB of on board memory, ordered separately.	R500
LLCN	Replacement for LCN board. Uses low power consumption circuits. Operates with LCN I/O board.	Any
QMEM-1	This board type has been withdrawn. Use EMEM for additional memory of 1 megaword increments.	200
QMEM-2, 3, 4	Quad Memory board of 2, 3 or 4 MB capacity. Memory capacity cannot be increased in the field. Each has a unique ID.	300
TPDG	With TPDG I/O drives a 21" FST monitor in a Universal Station^X.	410/U^{X}S R100
TPDGX	With TPDG I/O drives a 21" FST monitor in a Universal Station^X requires WSI2.	410/U^{X}S R200
WSI	Release 100/110 Workstation Interface for Universal Station^X.	410/U^{X}S R100
WSI2	Release 200 Workstation Interface for Universal Station^X. Board has replaceable memory daughter boards in sizes = 2-16 MB, 3 2 MB, 2-32 MB, 64 MB, or 2-64 MB.	410/U^{X}S R200
WSI2R I/O	Replaces WSI I/O in R100 units updated to R200 with WSI2 board.	R200
WSI2 I/O	Used with WSI2 board in new build units and units upgraded from US to UXS (R200) by upgrade kits MP-ZUXCC2 or MP-ZUXNC2.	R200

Table 2-4 — Functional Board Types

Board Type	Description	Part Number
AMR	Redundant AM Interface	51401070-100
CLI	Communications Line Interface	80360206-001
CNI	Communications Network Interface	51401088-100
DHI	Data Hiway Interface	51400700-100
EAMR	Enhanced Application Module Redunancy	51401996-100
EMEM	1 MB Enhanced Memory	51400910-100
EMPU	Enhanced Microprocessor board	51400901-100
EPNI	Enhanced Network Interface	51401583-100
EPDG EPDG-2	Enhanced Peripheral Display Generator	51401286-100 51402089-100
FDC	Floppy Disk Controller	51400669-100
HDDT	Hard Disk Drive Tray	51402176-100
HMPU	High Perf. Module Processor Unit (incl: Coprocessor, 2 MB mem.)	51400978-100
HPK2-2	High Perf. Module Proc. (incl: 2 MB memory, no coprocessor)	51401288-100
HPK2-3	High Perf. Module Proc. (incl: 3 MB memory, no coprocessor)	51401288-200
K2LCN-x	68020 High Density Kernel (2, 3, 4, 6, 8 MB of memory)	51401551-x01
K4LCN-x	68040 High Density Kernel (4, 8, or 16 MB of memory) Separate 4 MB of memory Separate 8 MB of memory Separate 16 MB of memory	51401946-100 51201645-400 51201645-800 51201645-160
LCN	Local Control Network Interface	51400667-100
LLCN	Low Power LCN Interface	51401291-100
MMEM	Memory Board, 1 MB	8036211-100
MMEM	Memory Board, 3/4 MB	8036211-200
NGI	Network Gateway Interface	51401583-200
PDG	Peripheral Display Generator Interface	51400926-100
PLCI	Programmable Logic Controller Interface	51400997-100
PMEM	2 MB Memory	51400903-100
PNI	Process Network Interface	51400955-100
PNM	Process Network Modem	51401163-100
QMEM-x	2 to 4 MB Quad Enhanced Memory (x = 2, 3, or 4 MB)	51401072-x00

(Continued)

Table 2-4 — Functional Board Types (Continued)

Board Type	Description	Part Number
SIO	Serial Input Output Interface	51400655-100
SPC	Smart Peripheral Controller	51401052-100
TPDG	Turbo Peripheral Display Generator	51402000-200
TPDGX	Turbo Peripheral Display Generator (high speed)	51402610-200
VDG	Video Display Generator	51400665-100
WSI	Workstation Interface (16 MB memory)	51304791-300
WSI	Workstation Interface (32 MB memory)	51304791-400
WSI2	Workstation Interface (64 MHz PA-RISC) memory separate	51402083-100
WSI2	Workstation Interface (100 MHz PA-RISC) memory separate	51402083-200

I/O boards with the letters "EC" in the description are EC compatible designs that provide grounding for shielded cables.

Table 2-5 — I/O Board or Paddle Board Types

Board Type	Description	Part Number
AMR I/O	Redundant AM Interface I/O	51304159-100
AMR I/O	AM Redundancy I/O EC	51304159-200
CLCN-A	LCN I/O Board (Dual Node LCN Coax A I/O Board) EC	51305072-200
CLCN-A	LCN I/O Board (Dual Node LCN Coax A I/O Board) Replaces KLCN-CA	51305072-500
CLCN-A	LCN I/O Board (Dual Node LCN Coax A I/O Board) EC	51305072-800
CLCN-A/B	LCN I/O Board EC	51305072-100
CLCN-A/B	LCN I/O Board	51305072-400
CLCN-A/B	LCN I/O Board EC	51305072-700
CLCN-B	LCN I/O Board (Dual Node LCN Coax B I/O Board) EC	51305072-300
CLCN-B	LCN I/O Board (Dual Node LCN Coax B I/O Board)Replaces KLCN-CB	51305072-600
CLCN-B	LCN I/O Board (Dual Node LCN Coax B I/O Board) EC	51305072-900
CLI I/O	Communications Line Interface I/O (RS-232C)	80360209-001
CLI I/O	Communications Line Interface I/O (RS-449)	80360230-001
CLI/A	Communications Line Interface (RS-449) EC	51196701-100
CNI I/O	Communications Network Interface	51304537-100
CNI I/O	Communications Network Interface I/O Board EC	51304537-200
CS/R	Clock Source/Repeater	51109919-100
CS/R	Clock Source/Repeater (with Precision Clock also called PCS/R)	51304286-100
CS/R	Clock Source/Repeater EC	51304286-200
DHI I/O	Data Hiway Interface I/O	51108088-100
DHI I/O	Data Hiway Interface I/O Board EC	51108088-200
EPDG I/O	Enhanced Peripheral Display Generator I/O	51304270-100
EPDGC-1	Enhanced Peripheral Display Generator I/O Board-1 EC	51402447-100
EPDGC-2	Enhanced Peripheral Display Generator I/O Board-2 EC	51402447-200
EPDGP I/O	Enhanced Peripheral Display Generator I/O (replaces EPDG I/O)	51304584-300
EPLCI I/O	Enhanced Programmable Logic Controller Interface I/O	51304812-100
EPLCI I/O	Enhanced Programmable Logic Controller Interface I/O EC	51304812-200

(Continued)

Table 2-5 — I/O Board or Paddle Board Types (Continued)

Board Type	Description	Part Number
FDC I/O	Floppy Disk Controller I/O	51109336-100
FOC/RCVR	Fiber Optic Link Receiver Board EC	51304161-400
FOC/XMTR	Fiber Optic Link Transmitter Board EC	51304161-300
FOCR	Fiber Optic Clock Receiver	51304161-200
FOCT	Fiber Optic Clock Transmitter	51304161-100
HDDT I/O	Hard Disk Drive Tray I/O	51402176-100
HDDT I/O	Hard Disk Drive Tray I/O Board EC	51304913-200
LCN I/O	Local Control Network Interface I/O	51107403-100
LCNE	Local Control Network Extender	51109881-100
LCNE2	Newer version of LCNE	51304540-100
LCNE2	LCN Extender EC	51304540-200
LCNFL	Local Control Network Fiber Optic Link	51108899-100
LCNFL	LCN Fiber Optic Link EC	51108899-200
MCPU I/O	Processor “typer” I/O (with clock source and RS-232C interface)	51107754-100
MCPU I/O	Processor “typer” I/O (with RS-232C interface only)	51107954-100
NG FOM	Network Gateway Fiber Optic Modem EC (Order from CD Networks as part number 2005A-Honeywell Special)	
NGIO	Network Gateway I/O Board	51304472-100
NIM MODEM	NIM Modem I/O board (put in PNI I/O slot)	51304511-100
NIM Modem	NIM Modem I/O EC	51304511-200
PLCG Relay	Programmable Logic Controller Gateway Relay Board	51304421-100
PLCG Relay	Programmable Logic Controller Gateway Relay Board EC	51304421-200
PLCI I/O	Programmable Logic Controller Interface I/O	51195096-100
PLCI I/O	Programmable Logic Controller Interface I/O Board EC	51195096-200
PNI I/O	Process Network Interface I/O	51303944-100
PNM I/O	Process Network Modem I/O	51303947-100

(Continued)

Table 2-5 — I/O Board or Paddle Board Types (Continued)

Board Type	Description		Part Number
SIO I/O	Serial Input Output Interface I/O		51108843-100
SIOI-OE	Serial Input Output I/O Enhanced		51304814-100
SIOI-OE	Serial Input Output I/O Enhanced	EC	51304814-200
SPC I/O	Smart Peripheral Controller I/O		51304156-100
SPC-2	Smart Peripheral Controller I/O Board		51304907-100
SPC-2	Smart Peripheral Controller I/O Board	EC	51304907-200
SPC-3 I/O	Smart Peripheral Controller I/O Board	EC	51305088-100
TP485	TP485 LCN Interface Board		51304776-100
TP485	TP485 LCN Interface Board		51304776-200
TP485-3	TP485 LCN Interface Board	EC	51304776-300
TP485-4	TP485 LCN Interface Board	EC	51304776-400
TPDG I/O	Turbo Peripheral Display Generator I/O		51304831-200
TPDGC I/O	Turbo Peripheral Display Generator I/O Board	EC	51305075-100
WDC I/O[W1]	Winchester Disk Controller I/O (for WREN I)		51108678-100
WDC I/O[W2]	Winchester Disk Controller I/O (for WREN II)		51108676-100
WDI	Winchester Drive Interface	EC	51304903-200
WDI	Winchester Drive Interface		51304903-100
WSI I/O	Workstation Interface I/O		51304791-100
WSI2 I/O	Workstation Interface 2 I/O		51304924-200
WSI2 I/O	Work Station Interface I/O Board	EC	51304924-200
WSI2R I/O	Workstation Interface 2 I/O (R100 to R200 retrofit)		51304947-100

Older board types (especially memory boards) may be retained while upgrading to the R400 release, provided they meet the constraints listed in Table 2-6 and/or your particular configuration listed in the tables found in subsections 2.2.2 through 2.2.27.

NOTE

K2LCN-2, 3, 4, 6, 8 boards and K4LCN-4, 8, 16 boards do not function with external memory. External memory is never addressed.

Table 2-6 — Processor/Memory Board Compatibility Matrix

	Processor Type		
Memory Board Type	**EMPU** (68000 CPU)	**HMPU** (68020 CPU, 2 MB, with Coprocessor)	**HPK2-2** *Note 4* **or HPK2-3** (68020 CPU with 2 or 3 MB Memory)
MEM—1/4 MEG 51400659-100	YES *Note 1*	NO	NO
MMEM—3/4 MEG 80360211-200	YES *Note 1*	NO	NO
MMEM—1 MEG 580360211-100	YES *Note 1*	NO	NO
EMEM—1 MEG 51400910-100	YES	YES (EMEM must be at Revision E)	YES (EMEM must be at Revision E)
PMEM—2 MEG 51400903-100	YES *Note 2*	NO	NO
QMEM-1—1 MEG (WITHDRAWN)	NO	NO	NO
QMEM-2, -3, -4 2 through 4 MEG 51401072-x00 (x=2,3,4 for 2,3,4 MB)	YES *Note 3*	YES *Note 3*	YES *Note 3*

Note 1 YES, but must have one or more EMEMs (or QMEM-1) in lowest-numbered memory slots.
Note 2 Use PMEM only in Upper Tier US or Universal Workstation—don't use for control.
Note 3 Place QMEM in lowest-numbered memory slot—don't use with MEM or MMEM boards.
Note 4 All HPK2-2 and HPK2-3 boards must be at Revision G or greater.
* CLCN A/B is the EC replacement for the LCN I/O board.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.2 Application Module Configurations

Table 2-7 — Application Module (AM) Factory Configurations Valid for R500

Type	P-MAD15-100		P-MAD16-200		P-MAD17-200	
Slot	Front	Rear	Front	Rear	Front	Rear
5						
4					QMEM-2	
3			EMEM-		AMR	AMR I/O
2 *Note 7*	LLCN	LCN I/O	LLCN	LCN I/O	LLCN	LCN I/O
1 *Note 5*	HPK2-3	*Note 6*	HPK2-3	*Note 6*	HMPU	*Note 6*

Type	P-MAD19-100 (Release 321 or later)		AM Redundancy	
Slot	Front	Rear	Front	Rear
5	QMEM-3			
4	QMEM-2		QMEM-1	
3	AMR	AMR I/O	AMR	AMR I/O
2 *Note 7*	LLCN	LCN I/O	LLCN	LCN I/O
1 *Note 5*	HMPU	*Note 6*	HMPU	*Note 6*

Application Modules upgraded from previous releases with upgrade kit MP-PROC2 will have one of the following configurations.

Table 2-8 — Application Modules Upgraded to R500 Configurations

Type	3 Megaword		4 Megaword		5 Megaword	
Slot	Front	Rear	Front	Rear	Front	Rear
5						
4						
3	AMR	AMR I/O	AMR	AMR I/O	AMR	AMR I/O
2	K2LCN-3	LCN I/O	K2LCN-4	LCN I/O	K2LCN-6	
1		*Note 6*		*Note 6*		

Type	6 Megaword		7 Megaword	
Slot	Front	Rear	Front	Rear
5				
4				
3	AMR	AMR I/O	AMR	AMR I/O
2	K2LCN-6	LCN I/O	K2LCN-8	LCN I/O
1		*Note 6*		*Note 6*

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.3 Application Module Configurations (CE Compliant)

Release 500 Application Modules are built in Dual Nodule Module versions only.

Table 2-9 — Redundant Application Module (AM) R500 Factory Configurations—Five-Slot

Type	**MP-AMDC34-100 MP-AMDC34-200 MP-AMDC34-300**		**MP-AMDC44-100 MP-AMDC44-200 MP-AMDC44-300**		**MP-AMDH46-100 MP-AMDH46-200 MP-AMDH46-110**	
Slot	Front	Rear	Front	Rear	Front	Rear
5						
4						
3	QMEM-2		QMEM-2		QMEM-4	
2 *Note 7*	LLCN	CLCN	LLCN	CLCN	LLCN	CLCN
1 *Note 5*	HMPU	*Note 6*	HMPU	*Note 6*	HMPU	*Note 6*

Type	**MP-AMDR13-100 MP-AMDR13-200**		**MP-AMDR14-100 MP-AMDR14-200**		**MP-AMDR16-100 MP-AMDR16-200**	
Slot	Front	Rear	Front	Rear	Front	Rear
5			QMEM-2			
4	QMEM-4		QMEM-3		QMEM-4	
3	AMR	AMR	AMR	AMR	AMR	AMR
2 *Note 7*	LLCN	CLCN	LLCN	CLCN	LLCN	CLCN
1 *Note 5*	HMPU	*Note 6*	HMPU	*Note 6*	HMPU	*Note 6*

Type	**MP-AMDR17-100 MP-AMDR17-200**		Reserved		Reserved	
Slot	Front	Rear				
5	QMEM-2					
4	QMEM-3					
3	AMR	AMR				
2 *Note 7*	LLCN	CLCN				
1 *Note 5*	HMPU	*Note 6*				

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

Table 2-10 — Redundant Application Module (AM) R500 Factory Configurations—Five-Slot

Type	**MP-AMDR13-100 MP-AMDR13-200 2 Mw**		**MP-AMDR14-100 MP-AMDR14-200**		**MP-AMDR16-100 MP-AMDR16-200 4 Mw**	
Slot	Front	Rear	Front	Rear	Front	Rear
5			EMEM			
4	QMEM-2		EMEM		QMEM-4	
3	AMR	AMR (I/O)	AMR	AMR (I/O)	AMR	AMR (I/O)
2 *Note 7*	LLCN	CLCN	LLCN	CLCN	LLCN	CLCN A/.B
1 *Note 5*	HMPU	*Note 6*	HMPU	*Note 6*	HMPU	*Note 6*

Type	**MP-AMDR17-100 MP-AMDR17-200 7 Mw**		Reserved		Reserved	
Slot	Front	Rear				
5						
4	QMEM-4					
3	AMR	AMR (I/O)				
2 *Note 7*	LLCN	CLCN A/.B				
1 *Note 5*	HMPU	*Note 6*				

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.4 Application Module^X Configurations

Application Module^X software releases are controlled by a separate release system and are "release independent" of LCN software releases. Refer to *Application Module^X Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.5 Computer Gateway Configurations

Computer Gateways upgraded from previous releases with upgrade kit MP-ZPROC2 will have one of the following configurations.

Table 2-11 — Computer Gateway (CG) Upgraded to R500 (Non-CE Compliant)

Type	2 Megword		P-MCE12-200	
Slot	Front	Rear	Front	Rear
5	CLI	CLI/A I/O**	CLI	CLI/A I/O**
4				
3				
2 *Note 7*	K2LCN-2	LCN I/O	LLCN	LCN I/O
1 *Note 5*			HPK2-2	*Note 6*

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.
** CLI/A I/O is the EC replacement for the CLI I/O board.

2.2.6 Computer Gateway Configurations (CE Compliant)

This module is only available in a Dual Node Module for R500 factory built configurations. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.7 Hiway Gateway Configurations

Hiway Gateways upgraded from previous releases with upgrade kit MP-ZPROC2 will have one of the following configurations.

Table 2-12 — Hiway Gateway (HG) Upgraded to R500 (Non-CE Compliant)

Type	2 Megaword		P-MHG13-100	
Slot	Front	Rear	Front	Rear
5	DHI	DHI I/O	DHI	DHI I/O
4				
3				
2 *Note 7*	K2LCN-2	LCN I/O	LLCN	LCN I/O
1 *Note 5*			HPK2-2	*Note 6*

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

2.2.8 Hiway Gateway Configurations (CE Compliant)

This module is only available in a Dual Node Module for R500 factory built configurations. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.9 History Module Configurations

History Modules upgraded from a previous releases with upgrade kit MP-ZPROC3 will have one of the following configurations.

Table 2-13 — History Module (HM) Upgraded to R500 Non-CE Compliant (WREN III only)

Type	3 megaword		3 megaword	
Slot	Front	Rear	Front	Rear
5	SPC	SPC I/O	SPC	SPC I/O
4				
3			EMEM	
2 *Note 7*	K2LCN-3	LCN I/O	LLCN	LCN I/O
1 *Note 5*			HPK2-2	*Note 6*

Table 2-14 — WDA History Module (HM) R500 Factory Built (CE Compliant)

Type	3 megaword		4 megaword	
Slot	Front	Rear	Front	Rear
5	Note xx		Note xx	
4	WDA	WDI	WDA	WDI
3				
2	SPC	SPC-2	SPC	SPC-2
1	K2LCN-3	LCN I/O	K4LCN-3	LCN I/O

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.
Note xx Winchester Drive Assemblie (WDA) require two slots.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.10 History Module Configurations (CE Compliant)

Table 2-15 — History Module (HM) R500 Factory Configurations (Winchester Disk Assembly)

Type	**MP-HMSD84-100 MP-HMSD84-200 MP-HMSD84-300 MP-HMSR84-100 MP-HMSR84-200 MP-HMSR84-300 MP-HMDD84-100 MP-HMDD84-200 MP-HMDD84-300 MP-HMDR84-100 MP-HMDR84-200 MP-HMDR84-300**		**MP-HMSD92-100 MP-HMSD92-200 MP-HMSD92-300 MP-HMDD92-100 MP-HMDD92-200 MP-HMDD92-300 MP-HMSR92-100 MP-HMSR92-200 MP-HMSR92-300 MP-HMDR92-100 MP-HMDR92-200 MP-HMDR92-300**	
Slot	Front	Rear	Front	Rear
5	Note xx		Note xx	
4	WDA	WDI ***	WDA	WDI ***
3				
2	SPC	SPC2 I/O**	SPC	SPC2 I/O**
1	K2LCN-3	CLCN A/B*	K4LCN-4	CLCN A/B*

* CLCN A/B is the EC replacement for the LCN I/O board.
** SPC-2 I/O is the EC replacement for the SPC I/O board.
*** WDI is the EC replacement for the WDI I/O board.
Note xx Winchester Drive Assemblies (WDA) require two slots.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.11 Network Gateway

History Modules upgraded from previous releases with upgrade kit MP-ZPROC3 will have one of the following configurations.

Table 2-16 — Network Gateway (NG) Upgraded to R500 (Non CE Compliant)

Type	High Performance Only	
Slot	Front	Rear
5		
4 *Note 14*	NGI	NGI ** or NG FOM***
3	NGI	NGI ** or NG FOM***
2	K2LCN-2	LCN I/O
1		

Note 14 The NGI and NGIO in Slot 4 are optional. They are present for a redundant cable NG.
** NGI is the EC replacement for the NGI I/O board.
*** NG FOM is the EC replacement for the NG fiber optic I/O board.

2.2.12 Network Gateway (CE Compliant)

This module is only available in a Dual Node Module. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.13 Network Interface Module Configuration

The PNM, PNM I/O, and PNI I/O boards and the mini-coax can be replaced by the NIM MODEM board. This is done by installing the NIM MODEM Field Replacement Kit, 51195760. The new NIM MODEM board is shown as an alternate configuration in Tables 2-17 and 2-18 below.

Table 2-17 — Network Interface Module (NIM) R400 Factory Configuration

Type	P-MNIM1-200		Alternate Configuration		Alternate Configuration	
Slot	Front	Rear	Front	Rear	Front	Rear
5	PNM	PNM I/O	PNM	PNM I/O		
4	EPNI	PNI I/O	EPNI	PNI I/O	EPNI	NIM Modem
3	EMEM					
2 *Note 7*	LLCN	LCN I/O	LLCN	LCN I/O	LLCN	LCN I/O
1	HPK2-2	*Note 6*	HPK2-3	*Note 6*	HPK2-3	*Note 6*

Table 2-18 — Network Interface Module (NIM) Upgrade to R400 Configuration

Type	High Performance Only		Alternate Configuration	
Slot	Front	Rear	Front	Rear
5	PNM	PNM I/O		
4	EPNI	PNI I/O	EPNI	NIM Modem
3	EMEM		EMEM	
2 *Note 7*	LCN	LCN I/O	LCN	LCN I/O
1 *Note 5*	HMPU	*Note 6*	HMPU	*Note 6*

Note 5 HMPU and HPK2-2 or HPK2-3 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

2.2.14 Network Interface Module Configuration (CE Compliant)

This module is only available in a Dual Node Module. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.15 PLC Gateway Configurations

PLC Gateways upgraded from previous releases with upgrade kit MP-ZPROC2 will have one of the following configurations.

Table 2-19 — PLC Gateway (PLCG) Upgraded to R500 (Non-CE Compliant)

Type	2 Megaword		P-MLCG3-100	
Slot	Front	Rear	Front	Rear
5	PLCI	PLCI I/O**	PLCI	PLCI I/O**
4				
3				
2 *Note 7*	K2LCN-2	LCN I/O	LLCN	LCN I/O
1 *Note 5*			HPK2-2	*Note 6*

Note 5 HMPU and HPK2-2 boards are interchangeable except in the Redundant AM.
Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.
** PLCI is the EC replacement for the PLCI I/O.

2.2.16 PLC Gateway Configuration (CE Compliant)

This module is only available in a Dual Node Module. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.17 Plant Network Module Configurations

Table 2-20 — Plant Network Module (PLNM) R400 Factory Configurations

Type	High Performance	
Slot	Front	Rear
5		
4	CNI	CNI I/O
3		
2 *Note 7*	LLCN	LCN I/O
1	HPK2-2	

Note 7 LCN and LLCN (Low Power LCN) boards are interchangeable.

2.2.18 Plant Network Module Configurations (CE Compliant)

This module is only available in a Dual Node Module. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.19 Universal Station Configurations

Universal Stations upgraded from previous releases with upgrade kit MP-ZPROC4 or MP-ZPROC6 will have one of the following configurations. USs with Operator personality require 4 Mw of memory. USs with Universal personality require 6 Mw of memory.

Table 2-21 — Universal Station (US) Upgraded to R500 (Non CE Compliant)

Type	4 Mw (Operator)		6 Mw (Universal)	
Slot	Front	Rear	Front	Rear
5	EPDG	EPDG I/O	EPDG	EPDG I/O
4				
3				
2	K2LCN-4	LCN I/O	K2LCN-6	LCN I/O
1		*Note 6*		*Note 6*

Table 2-22 — Universal Station (US) Upgraded to R500 (Non CE Compliant)

Type	4 Mw (Operator)		6 Mw (Universal)	
Slot	Front	Rear		
10				
9				
8				
7				
6 *Note 11*	SIO	SIO I/O	SIO	SIO I/O
5 *Note 10*	(Do Not Use)		(Do Not Use)	
4	EPDG	EPDG I/O	EPDG	EPDGP I/O
3 *Note 9*	FDC	FDC I/O	FDC	FDC I/O
2	K2LCN-4	LCN I/O	K2LCN-6	LCN I/O
1		*Note 6*		*Note 6*

Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.
Note 9 These slots may contain optional FDC & FDC I/O or SPC & SPC I/O boards.
Note 10 Do not use the slot above EPDG—use only certain boards in the 2nd slot above EPDG.
Note 11 SIO & SIO I/O boards are optional.

2.2.20 Universal Station Configurations (CE Compliant)

This module is only available in a Dual Node Module. Refer to *Dual Node Module Service*.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.21 Universal Station^{X} (U^{X}S) Configurations

Table 2-23 — Universal Station^{X} (U^{X}S) R100Configurations

Type	MP-MMUSX1, 2, 3, 4	
Slot	Front	Rear
5	TPDGX	TPDG I/O
4		
3		
2 *Note 16*	WSI	WSI I/O
1	K2LCN-8	LCN I/O

Table 2-24 — Universal Station^{X} (U^{X}S) Release 200

Type	Upgrade Kit MP-ZRSKUG Installed		Upgrade Kit MP-ZUXCC2 or MP-ZUXNC2 Installed		Upgrade Kit MP-MUSX13, 14, 15, 16 Installed	
Slot	Front	Rear	Front	Rear	Front	Rear
5	TPDGX	TPDG I/O	TPDGX	TPDG I/O	TPDGX	TPDG I/O
4						
3			HDDT	HDDT I/O	HDDT	HDDT I/O
2	WSI2	WSI2R I/O	WSI2	WSI2 I/O	WSI2	WSI2 I/O
1	K2LCN-8	LCN I/O	K2LCN-8	LCN I/O	K2LCN-8	LCN I/O

Type	MP-MMUSX1, 2, 3, 4		Upgrade Kit MP-ZUXCC2 or MP-ZUXNC2 Installed		Upgrade Kit MP-MUSX13, 14, 15, 16 Installed	
Slot	Front	Rear	Front	Rear	Front	Rear
5	TPDGX	TPDG I/O	TPDGX	TPDG I/O	TPDGX	TPDG I/O
4						
3			HDDT	HDDT I/O	HDDT	HDDT I/O
2	WSI2	WSI2R I/O	WSI2	WSI2 I/O	WSI2	WSI2 I/O
1	K2LCN-8	LCN I/O	K2LCN-8	LCN I/O	K2LCN-8	LCN I/O

Note 16 Use 51402030-100 for 16 MB Workstation Interface (WSI).
Use 51402030-200 for 32 MB Workstation Interface (WSI).

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.22 Universal Station^{X} (U^{X}S) Configurations (CE Compliant)

Table 2-25 —WSI2 Board Assemblies Applications

Model Number	Operation	Graphics RAM for 2nd Monitor	Part Number
MP-MUSX33 (Classic) MP-MUSX35 (Ergonomic)	64 MHz	No	51402083-100
MP-MUSX41 (Classic) MP-MUSX43 (Ergonomic)	100 MHz	No	51402083-200
MP-MUSX34 (Classic) MP-MUSX36 (Ergonomic)	64 MHz	YES	51402083-300
MP-MUSX42 (Classic) MP-MUSX44 (Ergonomic)	100 MHz	YES	51402083-400

Table 2-26— Universal Station^{X} (U^{X}S) Configurations (EC)

Type	MP-MUSX33 ,34,35,36,41,42	
Slot	Front	Rear
5	TPDGX	TPDGC
4		
3	HDDT	HDDT
2 *Note 15*	WSI2	WSI2
1	K2LCN-8	CLCN A/B*

Note 15 Two versions of the WSI2 board are available to provide either the 64 MHz (minimum configuration) or 100 MHz (high-level configuration) coprocessor.

* CLCN A/B is the EC replacement for the LCN I/O board.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.23 Universal Workstation Configurations

Universal Workstations upgraded from previous releases with upgrade kit MP-ZPROC4 or MP-ZPROC6 will have one of the following configurations.

Table 2-27 — Universal Workstation Updated to R500 (Non-CE Compliant)

Type	4 Mw (Operator)		Mw (Universal)	
Slot	Front	Rear	Front	Rear
5	EPDG	EPDG I/O	EPDG	EPDG I/O
4				
3				
2	K2LCN-4	LCN I/O	K2LCN-6	LCN I/O
1		*Note 6*		*Note 6*

Table 2-28 — Universal Workstation R500 (CE Compliant) Factory Built

Type	MP-UWSM07 4Mw (Operator) (68040)		MP-UWSM07 8Mw (Universal) (68040)	
Slot	Front	Rear	Front	Rear
5	EPDG	EPDGC	EPDG	EPDGC
4				
3				
2	K4LCN-8	CLCNC A/B*	K4LCN-6	CLCNC A/B*
1		*Note 6*		*Note 6*

Note 6 Optional clock source/typer boards CS/R or MCPU I/O (see Table 2-5) may be included with any module type. Clock sources are generally placed in either the HG or NIM module.

* CLCN A/B is the EC replacement for the LCN I/O board.

2.2.24 Universal Workstation Configurations (CE Compliant)

Information not available at this time.

CAUTION

Power must be removed from the module whenever you are removing or installing any board, including an I/O paddle board. Be sure that an I/O paddle board is installed in the correct slot; some boards have only one slot that they can be installed in without causing damage. I/O paddle boards plugged into the wrong slot can cause traces on the backplane to burn open.

2.2.25 Scanner Application Module Configuration

Table 2-29 — Scanner Application Module (SAM) Updated To R500 Non-CE Compliant

Type	QC-SAM101	
Slot	Front	Rear
5	CCP-4	CLM I/O
4		
3	QMEM-4	
2	LLCN	LCN I/O
1	HMPU	

2.2.26 Scanner Application Module Configuration (CE Compliant)

Information not available at this time.

2.3 FRONT PANEL

Controls on the front panel consist of a POWER switch, a RESET button, and a MARGIN switch or jumper. The function and operation of the POWER and RESET controls are discussed elsewhere in this manual. The MARGIN switch or pin jumper is a power supply test/maintenance diagnostic aid and should be left in the NOM position at all times.

The front panel contains indicators that monitor module performance and serve as an aid in fault isolation. The indicators consist of light emitting diodes (LED) and a 3-digit alphanumeric display. The LED indicators on the bottom left of the front panel give an indication of the power supply status and an indicator on the right center of the panel lights if a fan module fails. LEDs on each of the boards are used in conjunction with the alphanumeric display to isolate malfunctions on the boards. Further information on the use of the module indicators is located in Section 3 of this manual.

2.4 REAR PANEL

The rear panel contains the I/O board chassis power cable, a 100-pin backplane breakout board, and a grounding lug. As shown in Tables 2-2 and 2-3, the I/O boards are installed in the chassis in the slot corresponding in number to the applicable board installed in the front of the module. All communication with the LCN or the Data Hiway is through the I/O boards. The coaxial cables that run to the boards are connected by a tee connector with the output side of the tee going to the next board (or to a terminating load on the last tee in a series). The I/O board coax connectors are marked A and B; make sure that the A cable connects to the A connector and that the B cable is connected to the B connector. Ribbon cables are used to connect to such items as the Winchester drive module. Other connectors, for example RS-232C or RS-449 on the Computer Gateway, are also used.

2.5 FIELD ADJUSTMENT

There are no field adjustments for the module. The LCN I/O (CLCN A/B for CE Compliant) board, however, has a module address jumper pack that must be characterized for the particular node address it occupies on the LCN. Refer to subsection 8.1 of the *LCN System Installation Manual* for system pinning.

2.6 EPDGP I/O BOARD PINNING

The EPDGP I/O board, if present, has pinning options to set the default background shade for the CRT if a palette has not been set in a schematic (Set Palette is a new command in Release 320). You may find additional information on the Set Palette command in the *Picture Editor Reference Manual* in the *Implementation/Engineering Operations - 2* binder. The EPDGP also has a configuration option that is set for either the Engineer's Keyboard or the Supervisor's Keyboard. (If both keyboards are installed, the EPDGP is set up for the Supervisor's Keyboard, and the Engineer's Keyboard is connected into the Supervisor's Keyboard.) Figure 2-6 shows the keyboard and CRT background options for the EPDGP I/O.

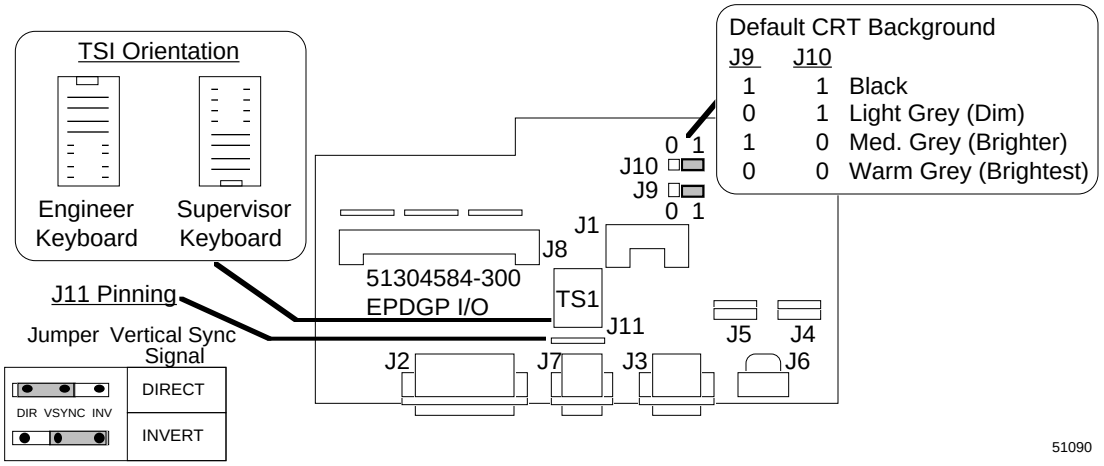

Figure 2-5 — CRT Background Shade Pinning on the EPDGP I/O

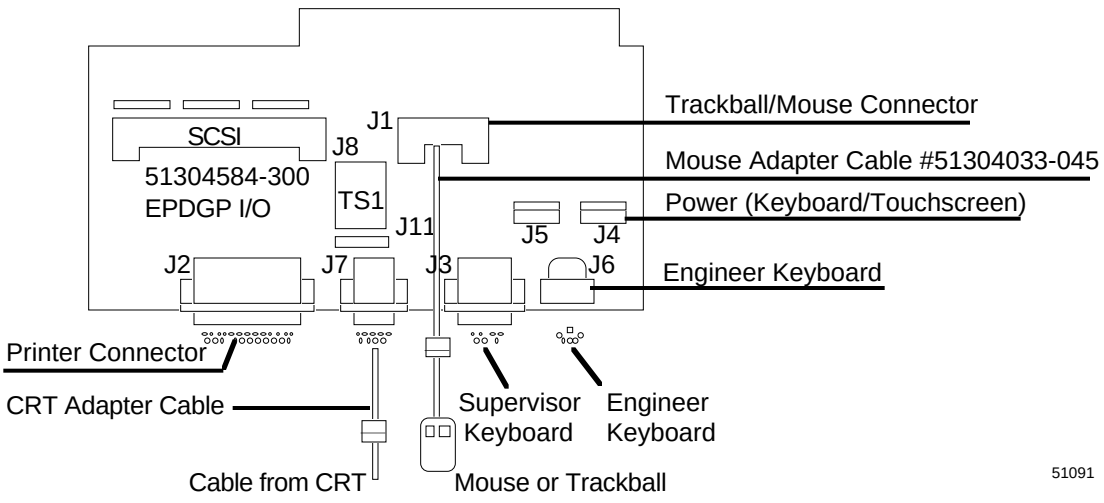

Figure 2-6 — EPDGP-I/O Cabling

EPDGP I/O boards can be pinned for default background shading as shown in Figure 2-5.

Vertical sync for the monitor is pinned as shown below.

Universal Station Type	EPDGP I/O Assembly
Classic with keyboard power supply	51304584-100
Classic without keyboard power supply	51304584-200
Ergonomic furniture with 21” FST monitor	51304584-300

2.7 EPDGC BOARD PINNING (CE Compliant)

The EPDGC board is the CE Compliant version of the EPDGP I/O board.

The EPDGC board, if present, has pinning options to set the default background shade for the CRT if a palette has not been set in a schematic. You can find additional information on the Set Palette command in the *Picture Editor Reference Manual* in the *Implementation/Engineering Operations - 2* binder. Figure 2-7 shows the CRT background options for the EPDGC I/O board.

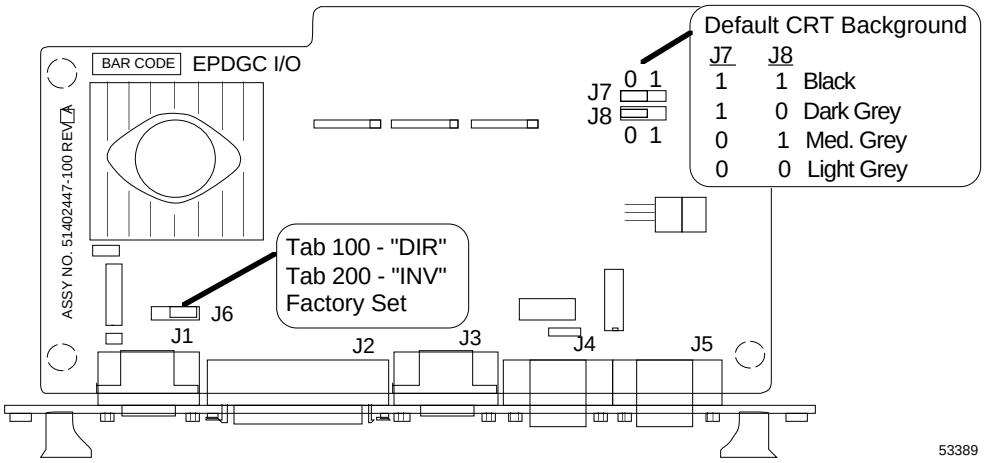

Figure 2-7 — EPDGC Pinning

2.8 LCN I/O ADDRESS PINNING

There are no LCN module adjustments; however, the LCN I/O boards have an address pack that must be characterized for the particular node it occupies on the LCN. This normally is done for each system during factory test.

The address of the nodes in an LCN must start with "1" and be assigned in increasing numerical order. In planning for future additions to the system, reserve a number or set of numbers for that. All other addresses are assigned in the order of module placement. Nodes can be added later during system expansion, and can be done so without changing original assignments if gaps in the node numbering are placed to allow more node numbers to be added later. At this time, a topology map should be initiated and maintained.

If the LCN I/O or K2LCN board is replaced on site, or if an additional module is added, the new board or module (including the Universal Work Station) must be set up for the node it will occupy; for example, Figures 2-8 and 2-10 show the location of the address pack on the LCN I/O board and the K2LCN board, jumpered for an address of three (3).

CAUTION

The address pinning is logically ORed together if an LCN I/O board is used with a K2LCN board. **The address must be pinned only on the LCN I/O board.**

For Data Hiway device addressing and response priorities, refer to *Data Hiway Subsystem Site Planning* manual. For the Process Interface Units (PIUs), refer to HLPIU-M, LLPIU-M, or LEPIU-M Service manuals.

For peripheral device pinning or function/selection, refer to the *Universal Station Service* manual.

For keyboard pinning options on the Universal Work Station, refer to Appendix A, paragraph A.7.

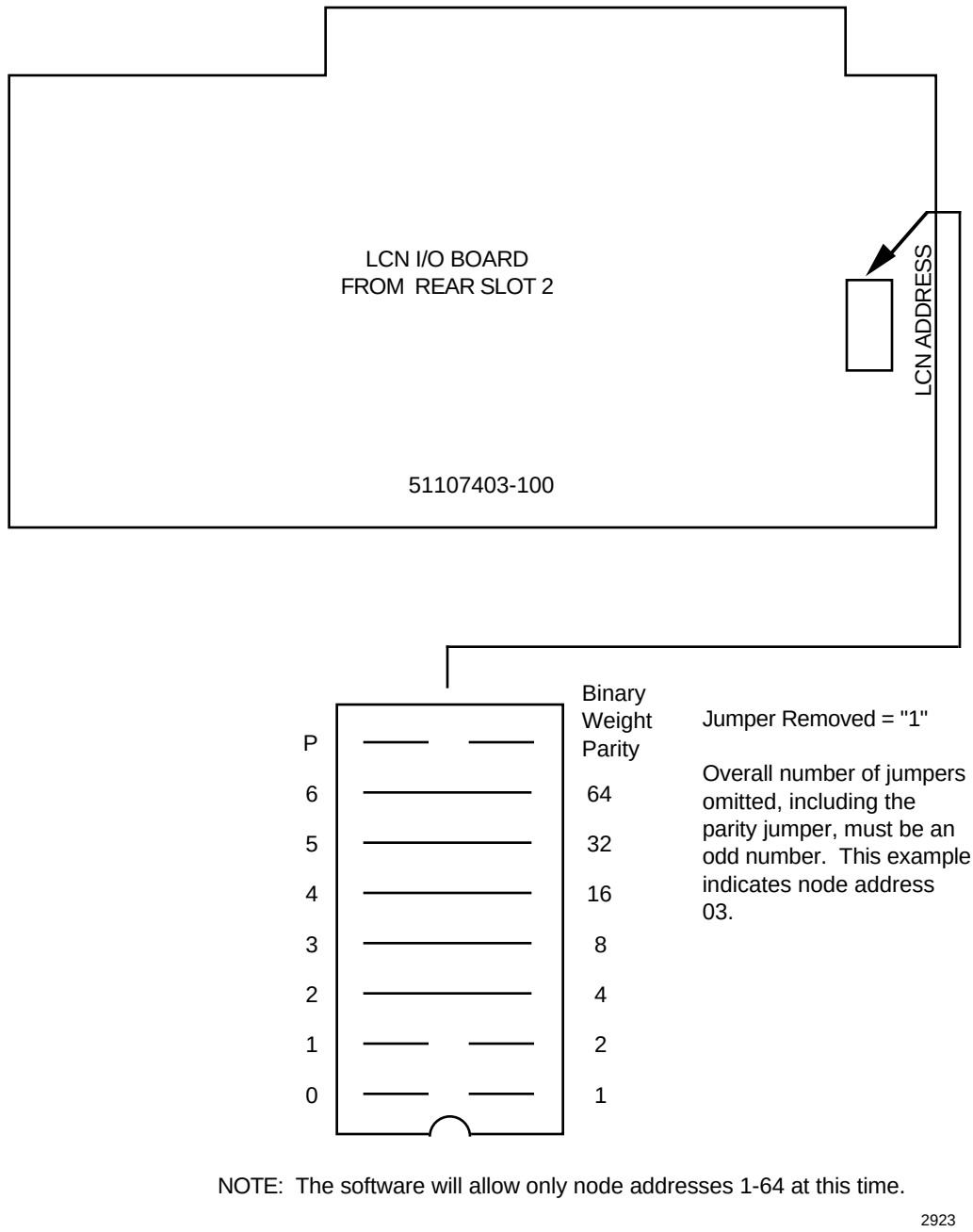

Figure 2-8 — LCN I/O Node Address Jumpers

2.9 CLCN A/B ADDRESS PINNING

The CLCN A/B board is the CE Compliant version of the LCNI/O board.

There are no LCN module adjustments; however, the CLCN A/B boards have an address pack that must be characterized for the particular node it occupies on the LCN. This normally is done for each system during factory test.

The address of the nodes in an LCN must start with "1" and be assigned in increasing numerical order. In planning for future additions to the system, reserve a number or set of numbers for that. All other addresses are assigned in the order of module placement. Nodes can be added later during system expansion, and can be done so without changing original assignments if gaps in the node numbering are placed to allow more node numbers to be added later. At this time, a topology map should be initiated and maintained.

If the CLCN A/B or K2LCN board is replaced on site, or if an additional module is added, the new board or module (including the Universal Work Station) must be set up for the node it will occupy; for example, Figures 2-9 and 2-10 show the location of the address pack on the CLCN A/B board and the K2LCN board, jumpered for an address of three (3).

CAUTION

The address pinning is logically ORed together if an CLCN A/B board is used with a K2LCN board. **The address must be pinned only on the CLCN A/B board.**

For keyboard pinning options on the Universal Work Station, refer to Appendix A, paragraph A.7.

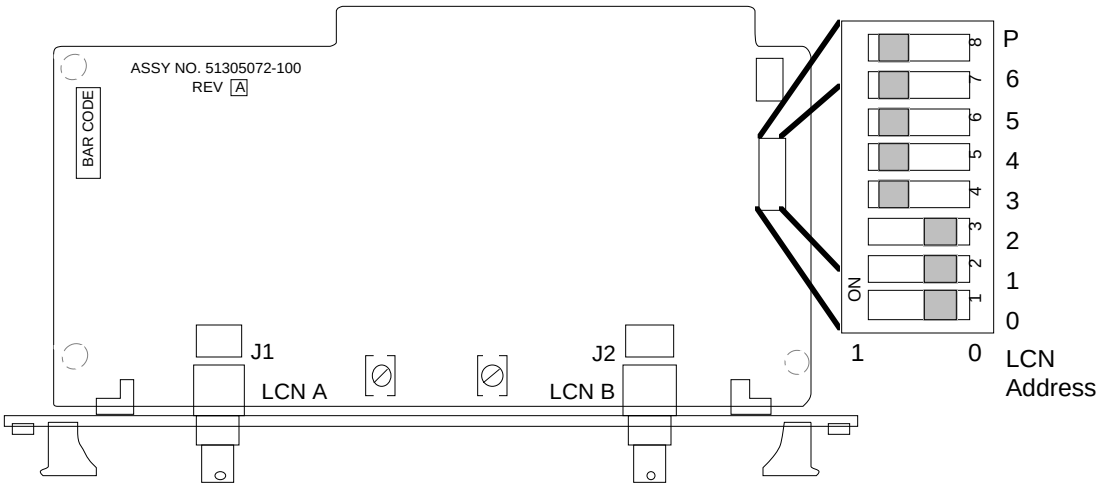

Figure 2-9 — CLCN A/B Node Address Jumpers

2.10 K2LCN NODE ADDRESS PINNING

If a node does not have an LCN I/O (or CLCN A/B) board, the address must be pinned on the K2LCN as shown below.

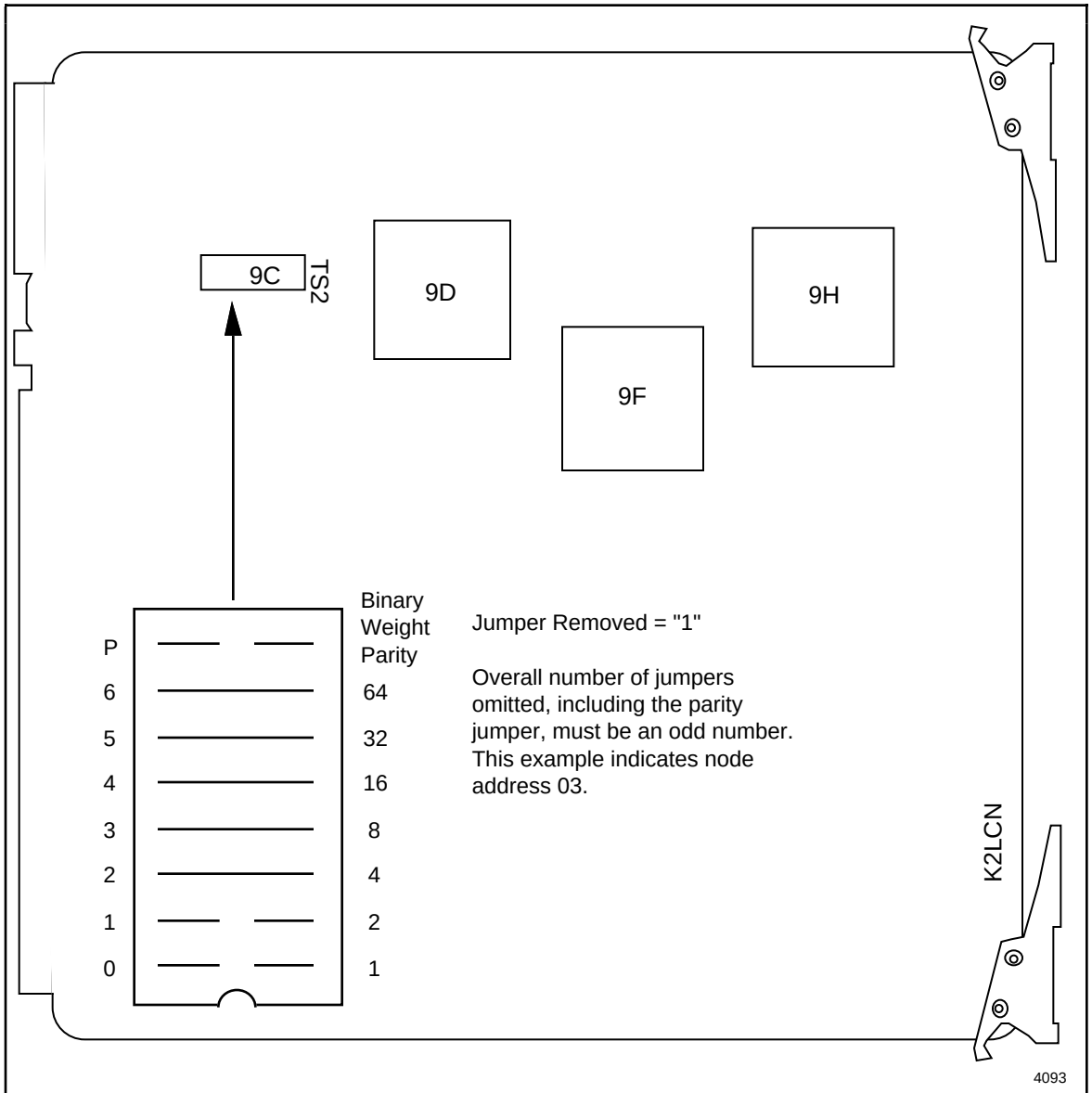

Figure 2-10 — K2LCN Address Pinning

2.11 NIM MODEM BOARD PINNING

Location SW1 has the revision pinning for the NIM Modem board. This pinning reflects the revision of the board and **is never to be changed unless the board is updated**.

Location SW2 has the pinning for the UCN node address. This address is a binary weighted number and is used only in the **Test** mode. The address entered, is the address of the primary NIM and must be an odd number with odd parity (an odd number of switches must be in the ON position). See Figure 2-11.

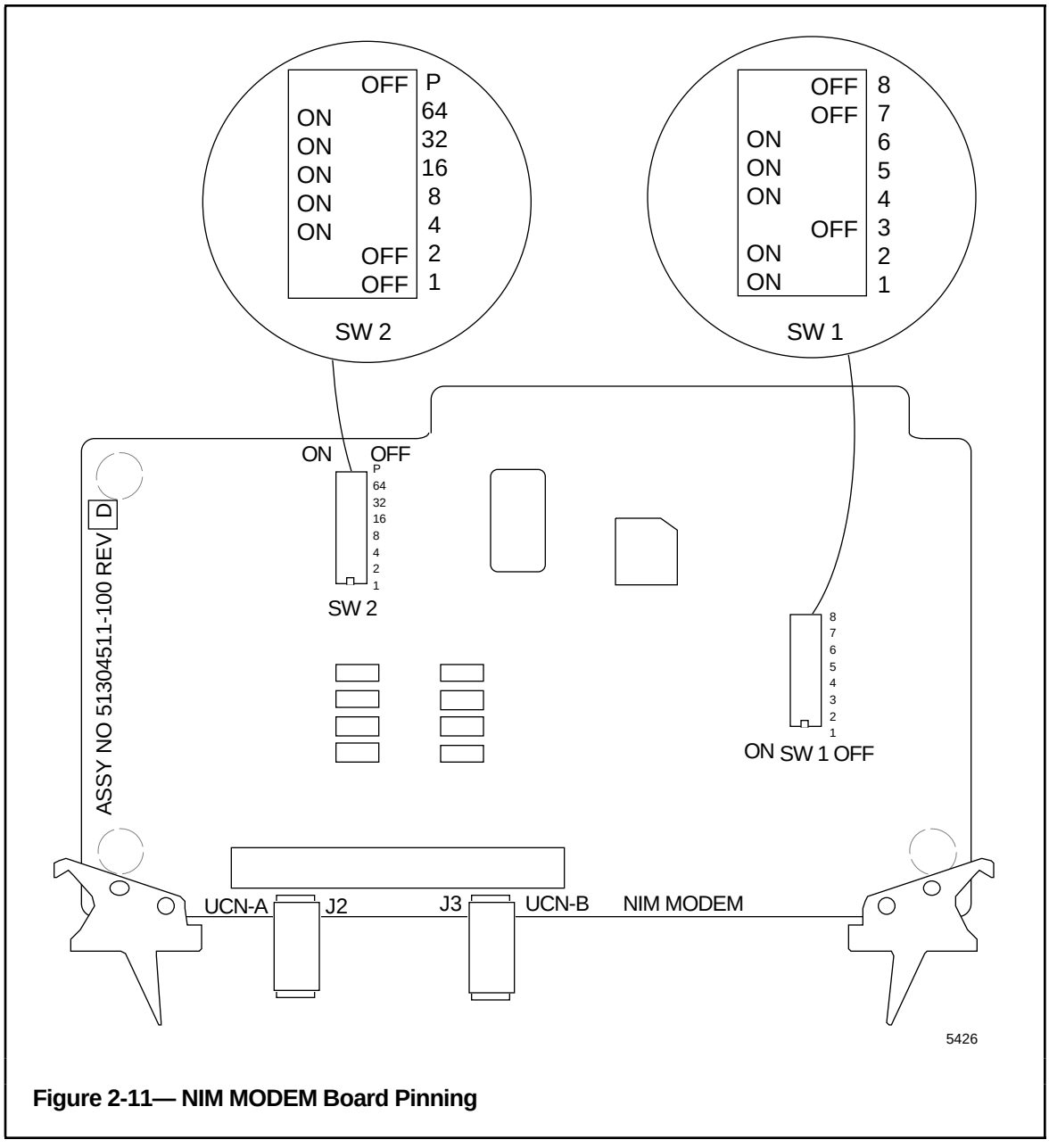

Figure 2-11— NIM MODEM Board Pinning

2.12 NIM MODEM BOARD PINNING (CE Compliant)

The NIM board is the CE Compliant version of the NIM Modem board.

Location SW1 has the revision pinning for the NIM Modem board. This pinning reflects the revision of the board and **is never to be changed unless the board is updated**.

Location SW2 has the pinning for the UCN node address. This address is a binary weighted number and is used only in the **Test** mode. The address entered, is the address of the primary NIM and must be an odd number with odd parity (an odd number of switches must be in the ON position). See Figure 2-12.

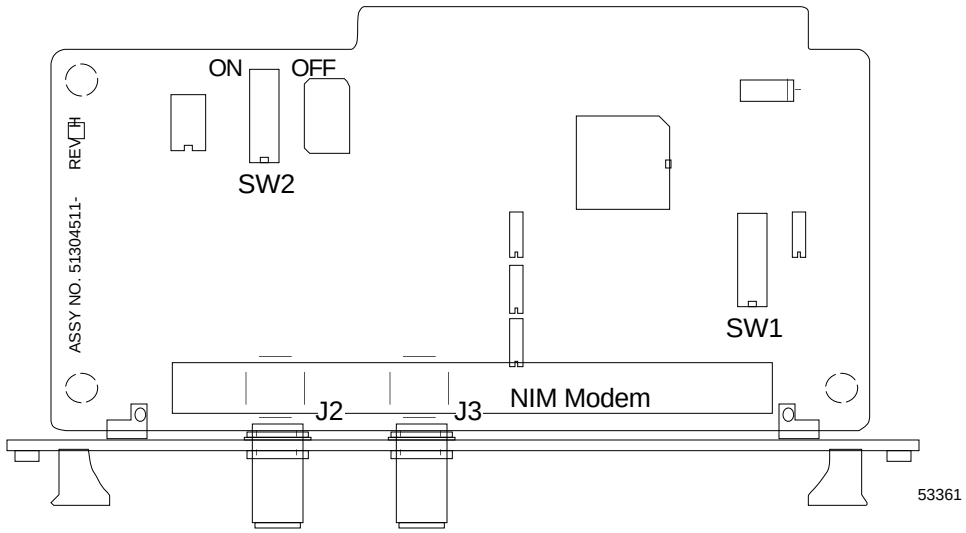

Figure 2-12 — NIM Modem Board Pinning

2.13 WORKSTATION INTERFACE (WSI) PREPARATION

The WSI board has a Normal Shutdown switch that should be in the NORMAL position. The SHUTDOWN position disables the Work Station Processor and returns the node to a UNP personality.

WSI boards have a real-time battery that must be activated as shown in Figure 2-13.

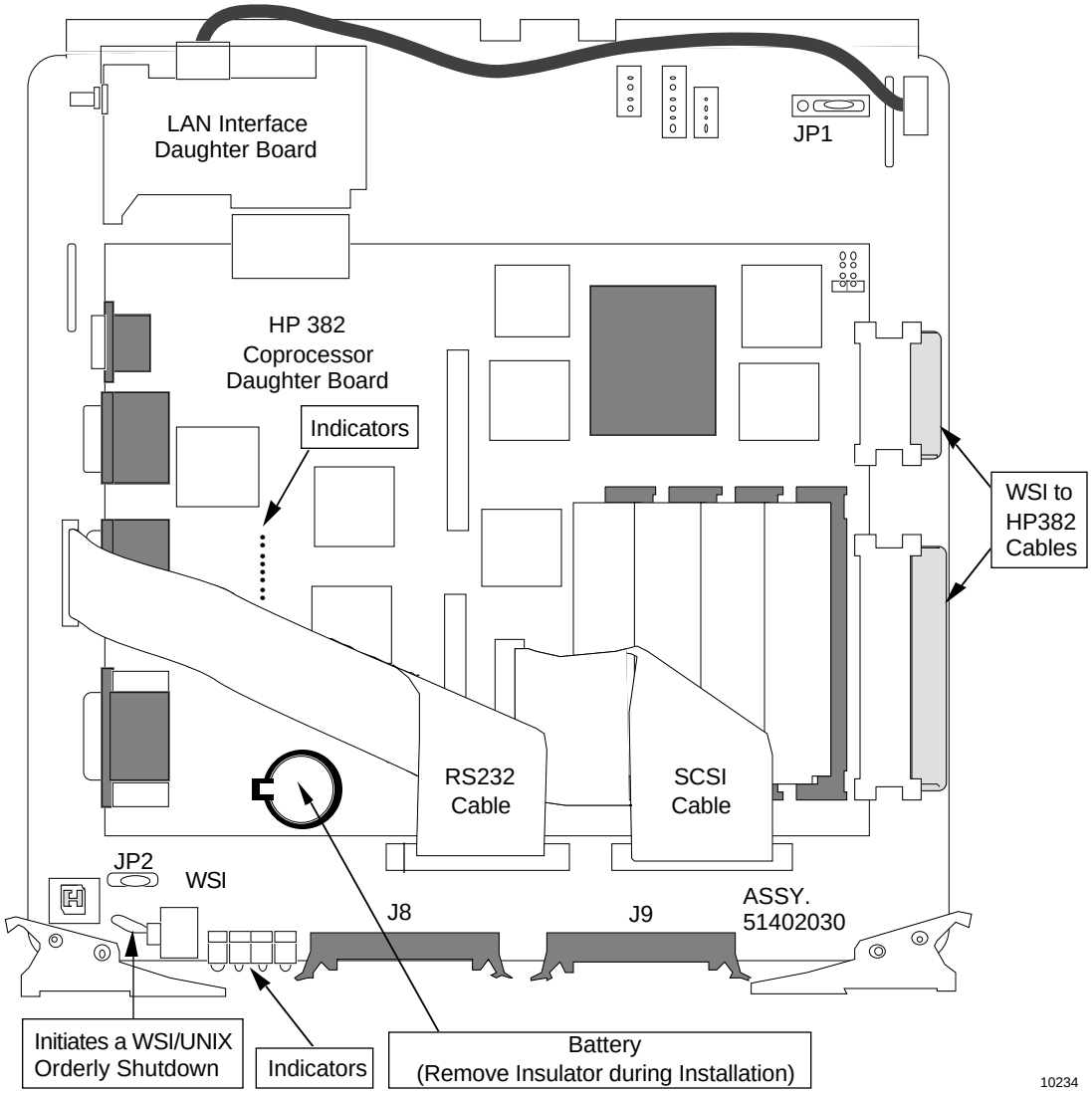

Figure 2-13 — WSI Board Preparation

2.14 WORKSTATION INTERFACE I/O (WSI I/O) PINNING

A Universal Station^X node contains a WSI I/O board that is to be pinned as shown in Figure 2-14.

The WSI I/O has pinning required:

- for LAN connection type
  - BNC type cable connection
  - AUI type cable connection
- for Logic ground connection to chassis ground
  - In a Universal Station^X connect logic ground to chassis ground

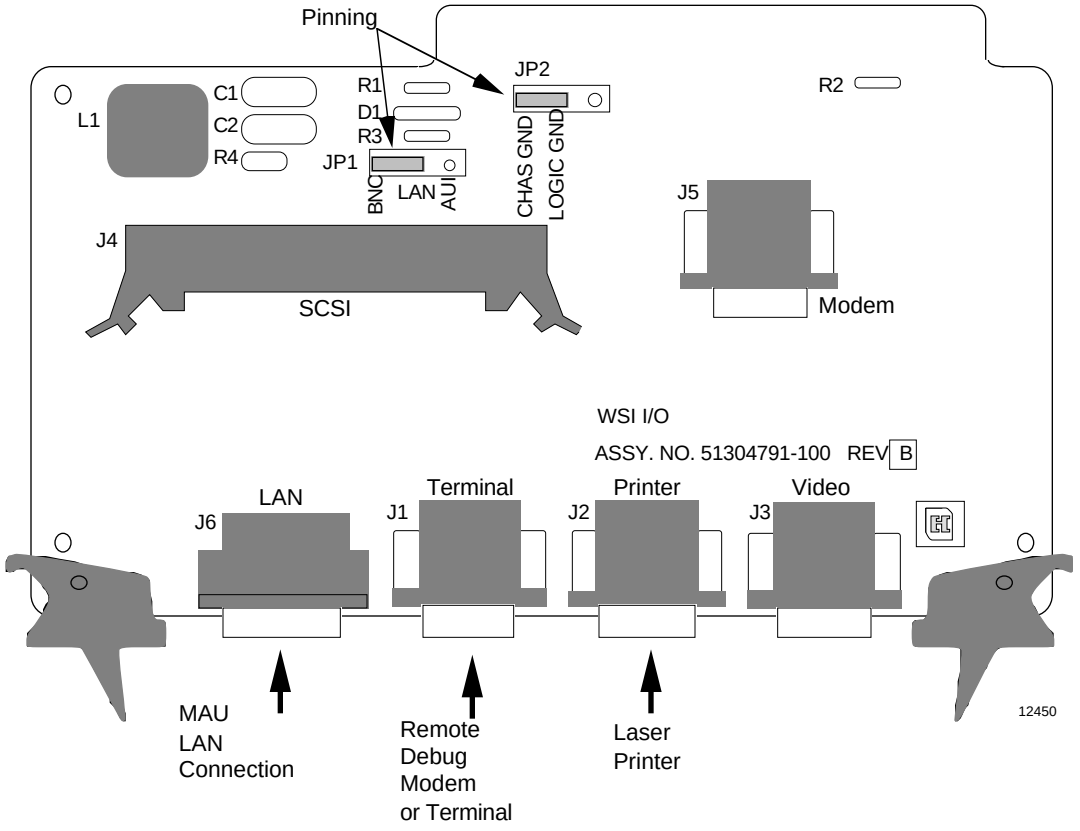

Figure 2-14 — WSI I/O Pinning

2.15 TPDG I/O PINNING

TPDG I/O pinning selects the monitor background color present before the color palate is activated. Four shades of gray are selected using J10 and J11 in combinations.

COLOR	J10	J11
Black	0	0
Light Gray	0	1
Medium Gray	1	0
Warm Gray	1	1

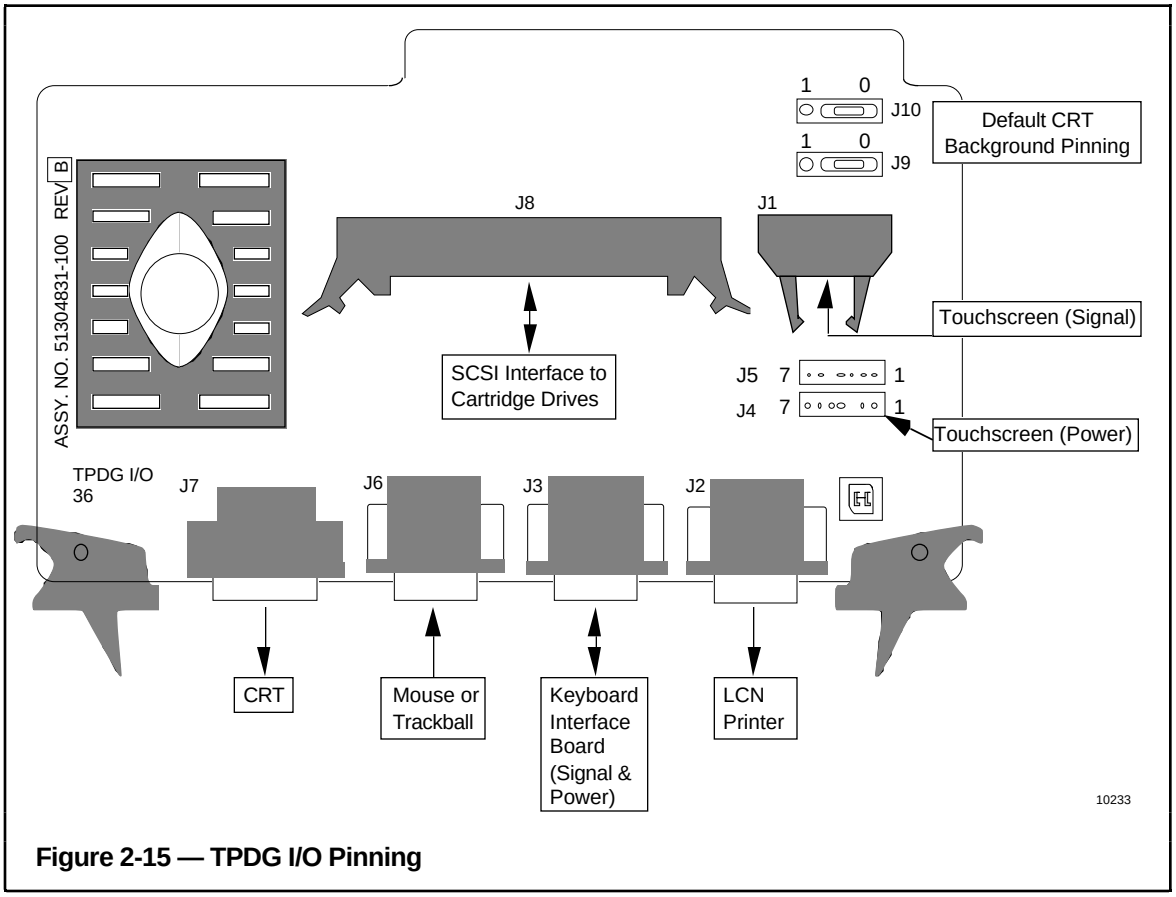

Figure 2-15 — TPDG I/O Pinning

2.16 TPDGC I/O PINNING

The TPDGC is the EC Compatible version of the TPDG I/O board.

TPDGC pinning selects the monitor background color present before the color palate is activated. Four shades of gray are selected using J7 and J8 in combinations.

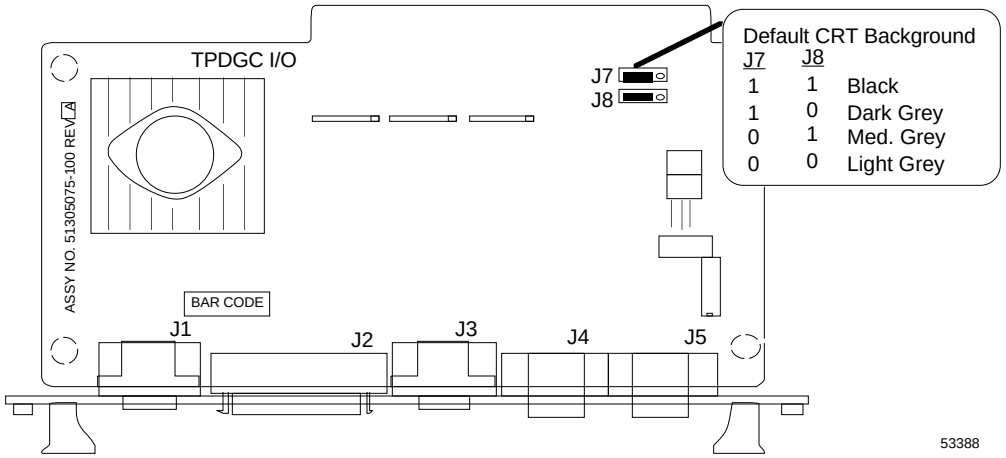

Figure 2-16 — TPDGC Pinning

2.17 WSI2 PINNING

WSI2 has one jumper. It should be installed as shown below.

Processor Type	J10
HMPU	Out
K2LCN	In

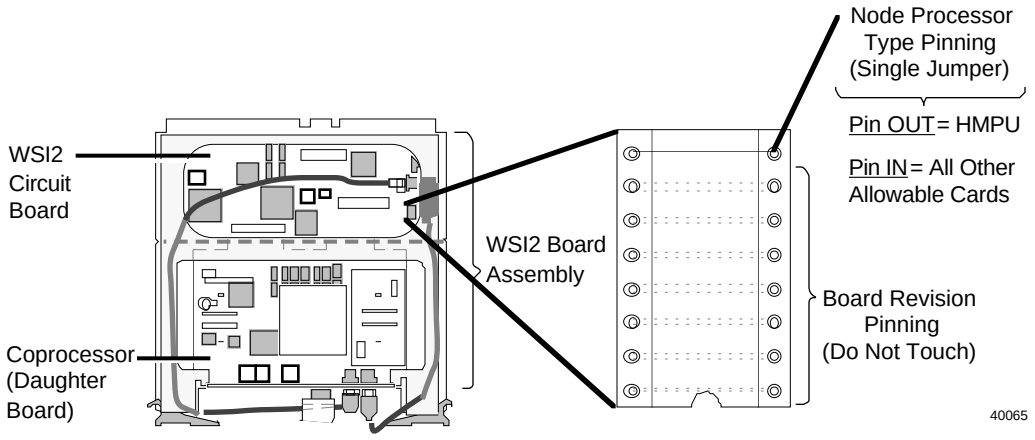

Figure 2-17 — WSI2 Pinning

2.18 PRECISION CLOCK PINNING (POWER SUPPLY REPLACEMENT)

NOTE

New Five-Slot and Ten-Slot power supplies that are CE compliant went into production in 1995. These power supplies have precision clock pinning just as their predecessors.

The usual system configuration has the clock pinning in the power supply configured for an internal clock (see Figure 2-18, 2-19, 2-21, or 2-22).

If the Precision Clock Source option is installed, this pinning is changed from internal to external. Also, when this option is installed, a label is placed on the back of the module listing the option. In addition, there is a cable connecting JC on the Precision Clock Source card (located in an I/O slot at the rear of the module) to connector J7 on the rear chassis of the module, as shown in Figure 2-20.

If you replace the power supply, verify the clock option you are using and check that either internal or external pinning has been selected as in Figure 2-18, 2-19, 2-21, or 2-22. Note you may be using one of four different power supply designs, but the pinning differences between them are easily recognized.

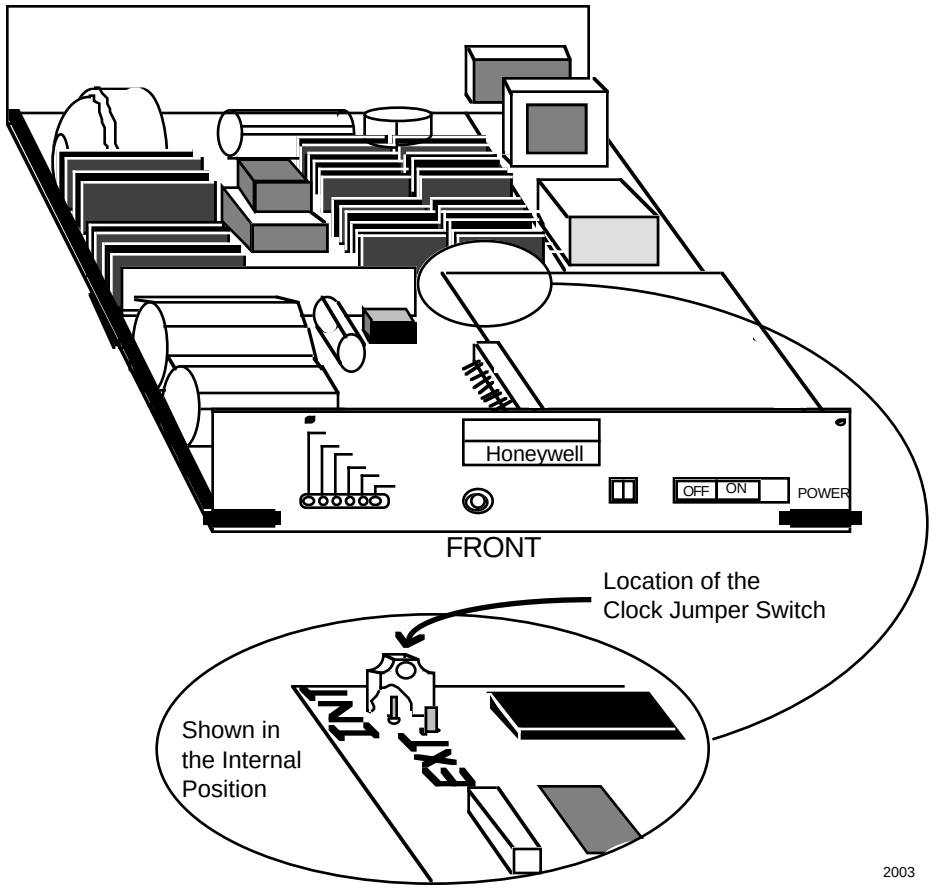

Figure 2-18 — Power Supply Showing Location of Clock Jumper

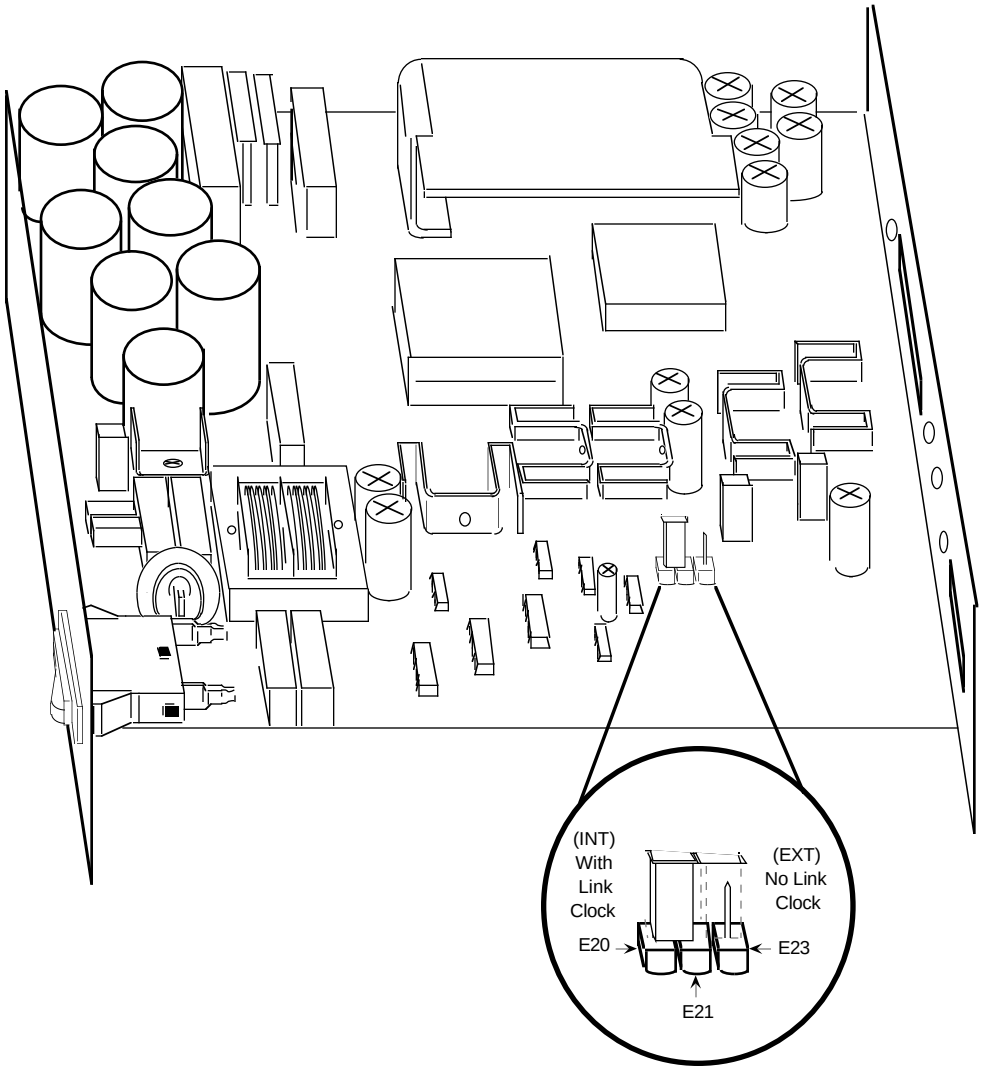

Figure 2-19 — Enhanced Power Supply Showing Location of Clock Jumper 2889

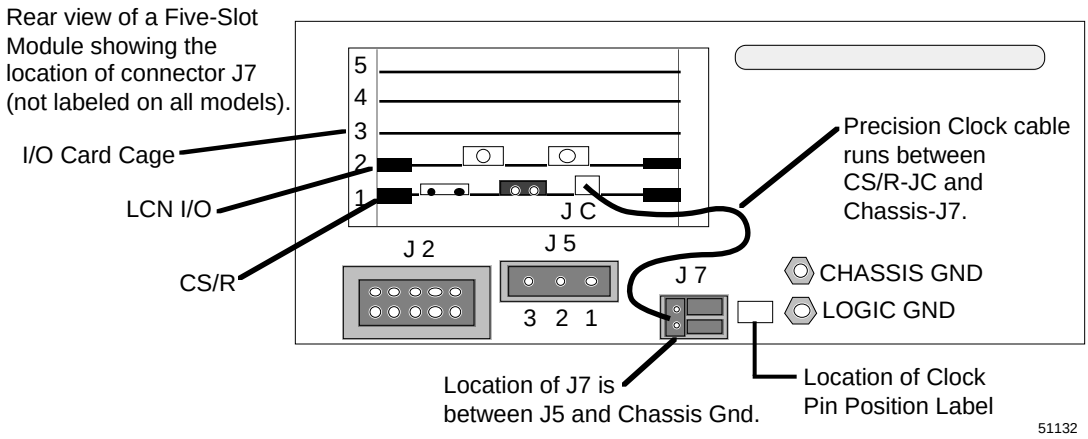

Figure 2-20 — Precision Clock Jumper from CS/R to Power Supply

2.19 CE COMPLIANT POWER SUPPLY PRECISION CLOCK PINNING

The CE Compliant power supplies are pinned as shown in Figure 2-21 and 2-22. The cable from the CS/R is the same as with the older supplies.

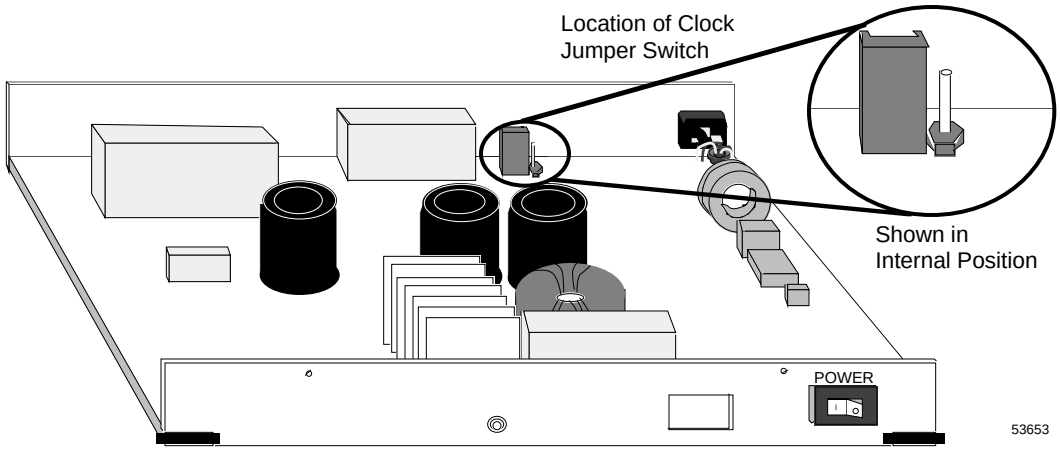

Figure 2-21 — CE Compliant Five-Slot Module Power Supply Precision Clock Pinning

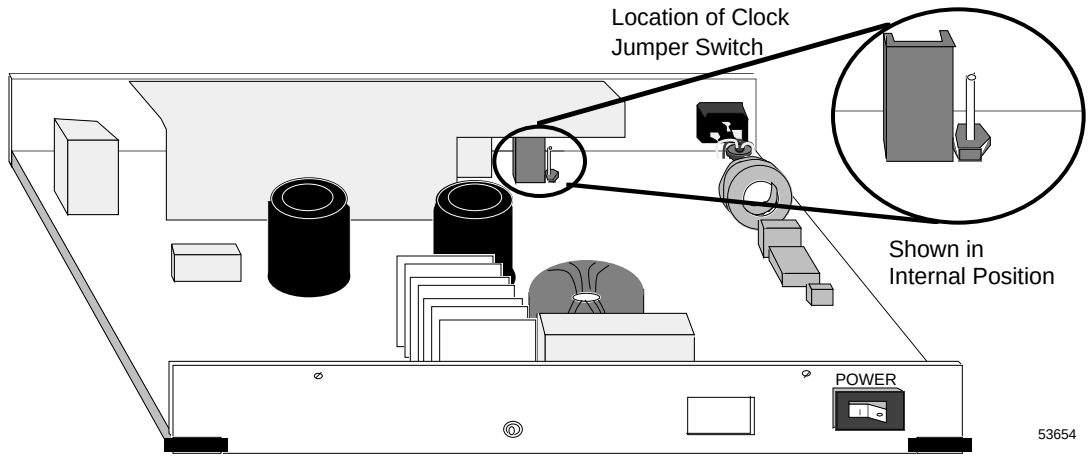

Figure 2-22 — CE Compliant Ten-Slot Module Power Supply Precision Clock Pinning

Connect the cable between JC on the CS/R board and J7 on the card file as shown in Figure 2-23.

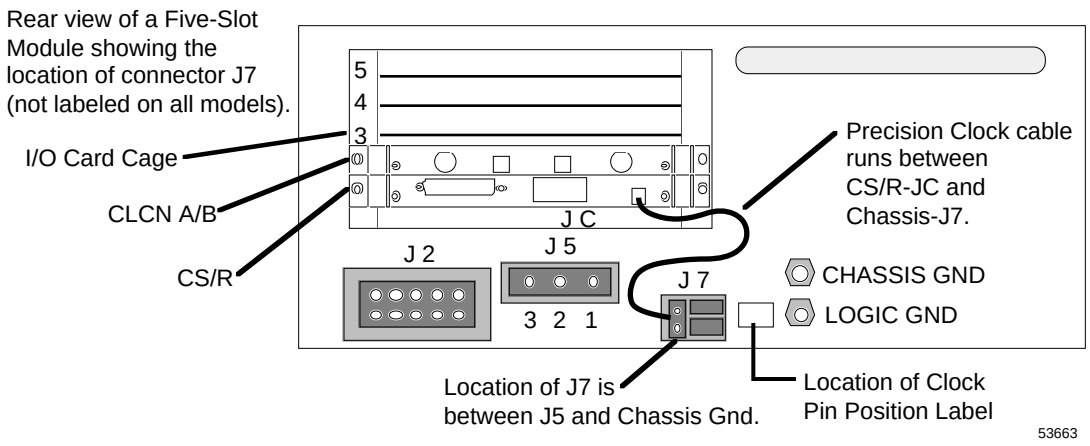

Figure 2-23 — Precision Clock Jumper from CE Compliant CS/R to Power Supply

2.20 MODULE GROUNDING

Refer to LCN System Installation in the LCN Installation binder for information on grounding Five-Slot Modules.

TEST/TROUBLESHOOTING
Section 3

3.1 TESTS

The Module is tested through firmware (in hardware) and software checks. Firmware tests built into the module provide two similar means of functionally checking the unit, whether or not it is connected to the LCN. The first firmware test starts when power is applied. Pressing the **RESET** button initiates a second (slightly different) firmware test.

Software tests start after the module is connected to the system. Loading the module personality, for example, initiates a software Quality Logic Test (QLT).

Figure 3-1 is a flow diagram showing the relationship of the hardware and software tests.

3.2 TEST PROCEDURES

NOTE

Each module must have a processor, memory, LCN interface, and LCN input/output paddle-board installed before it can be tested. Some functions, such as processor and memory, may be physically located on the same board.

Initiate power-up tests by setting the power switch to on. Note that the red LEDs on the boards light for a few seconds (less than 1.5 minutes). Then they should turn off and the green LEDs turn on as the node passes its Quality Logic Tests. When the tests are complete, each node's alphanumeric display indicates its node address.

Check the power supply **ERROR** and **POWER OK** LEDs and the **FAN ALARM** LED to ensure that no red LEDs are on and that the green **POWER OK** LED lights.

If this is not a History Module, press the **RESET*** button. The red LEDs momentarily go on as above, then go out when the green LEDs come on. Recheck the power supply, board, and fan LEDs as above. Note that each alphanumeric display indicates its node address.

If any of the above conditions does not pass, refer to subsection 3.3, *Troubleshooting*.

* WARNING: In the case of the History Module only, if you press the RESET button indiscriminately while the system is operating, you may cause damage to the data stored on the hard disk. See subsection 3.2, *Troubleshooting* in the *History Module Service* manual, part of the *Service* binder, for complete details.

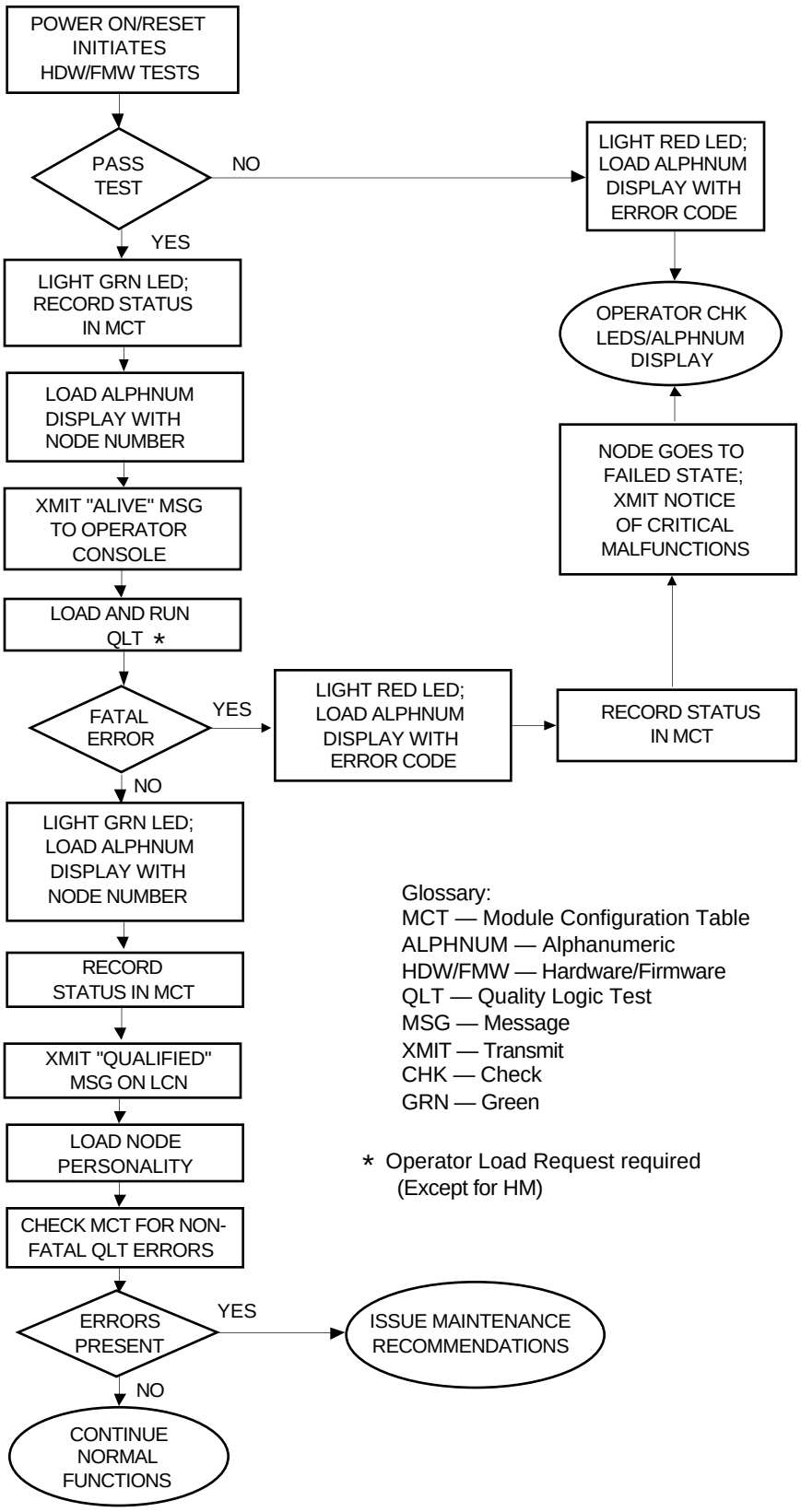

Figure 3-1 — Testing Flow Diagram

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3.3 TROUBLESHOOTING

The troubleshooting procedures are grouped by affected ORU and are keyed to the LED indicators and the alphanumeric display. First, a malfunction symptom is listed, then instructions are given to check or replace parts in order of the most likely causes. In the following procedures, the indicated LEDs are red unless otherwise stated. Refer to subsection 4 for disassembly and assembly instructions. Always turn power off before removing or replacing a part on the module, as this protects equipment from voltage transients and ensures proper initialization. If you can't correct the fault by performing these procedures, refer to Appendix A for alphanumeric display troubleshooting. If you still cannot isolate the fault, contact the Honeywell Technical Assistance Center (HTAC).

CAUTION

All assemblies used in this Module are likely to contain electrostatically sensitive devices. Use a personnel grounding strap and grounded work surfaces and equipment. Store and transport parts only in electrostatically safe containers.

HMPU, HPK2-2, HPK2-3) have indicators on the front of the board to indicate error conditions. HMPU, HPK2-2, and HPK2-3 boards have a bar display with no labels as shown in Figure 3-2.

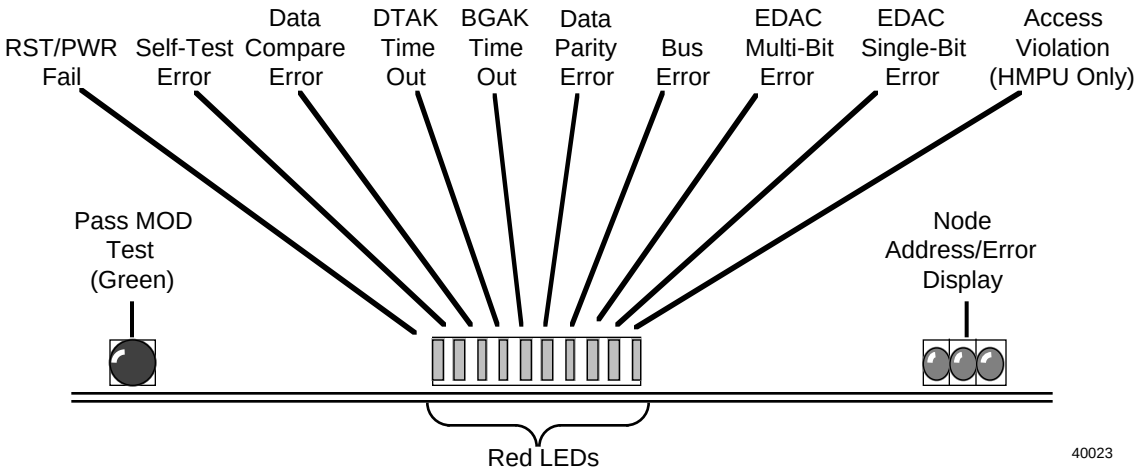


Figure 3-2 — HMPU, HPK2-2, HPK2-3 Indicators

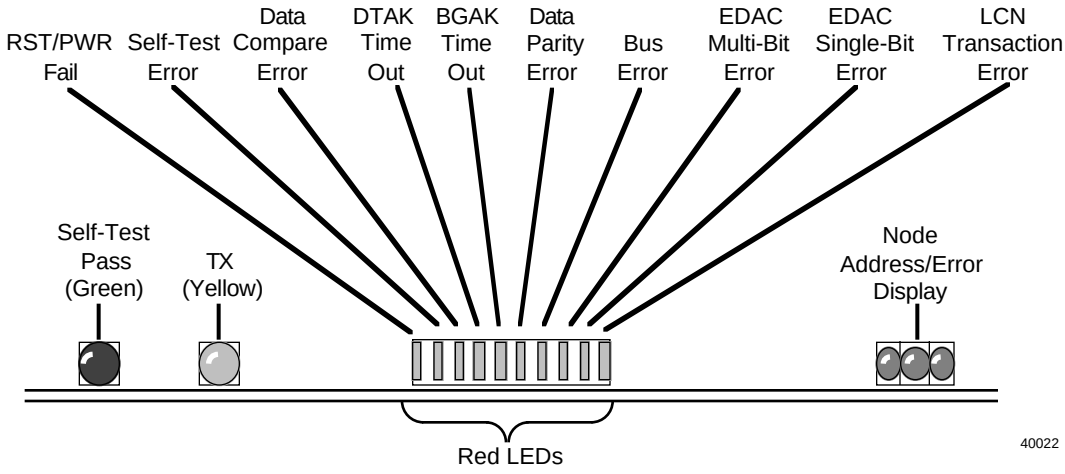


Figure 3-3 — K2LCN/K4LCN Diagnostic Indicators

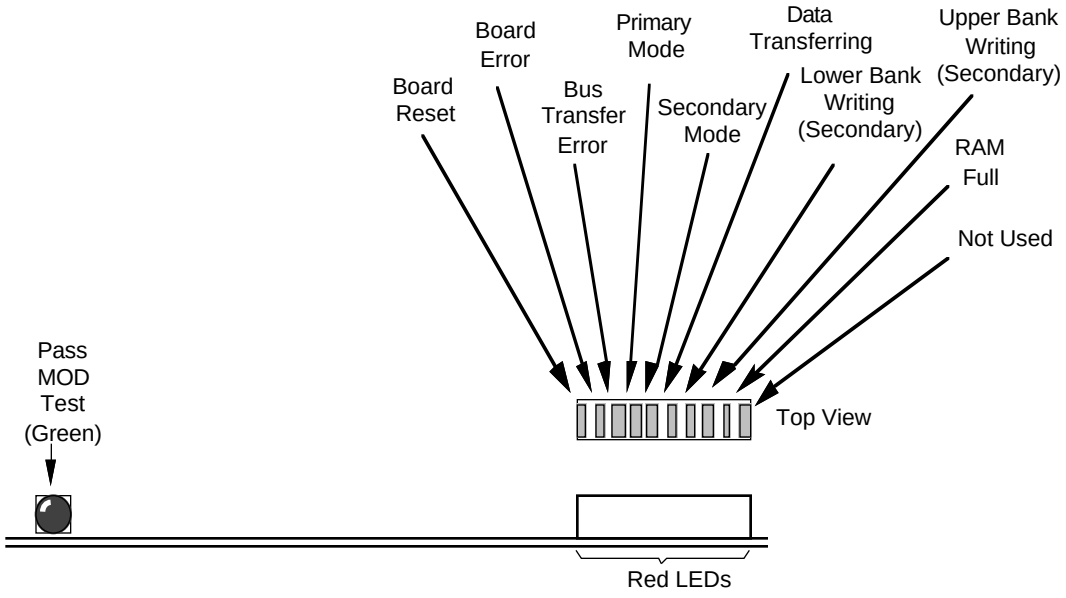


Figure 3-4 — AMR Indicators

4251

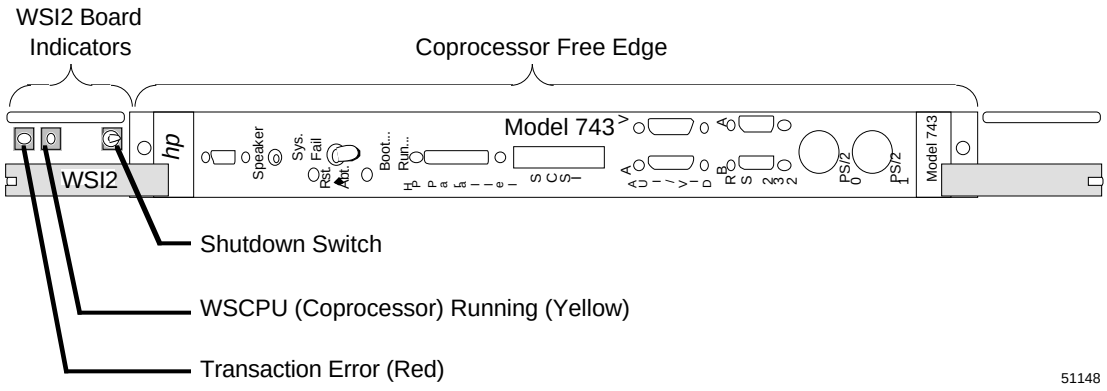


Figure 3-5 — WSI2 Indicators

3.3.1 Power Supply/Fan

No LEDs light at all.

- Check power cord and power switch.
- Replace power supply.

Any power-status panel LED (but not **OVER TEMP**) on or green **PWR OK** LED off.

- Replace power supply.

OVER TEMP or **FAN ALARM** LED on

WARNING

Keep fingers and other objects clear of fans. They have rotating parts and sharp fan blades.

- With power applied to the module, loosen the two quarter-turn bail-headed fasteners holding the fan assembly, and quickly slide the assembly out of the module. If the fans are not broken, they will remain turning for a few seconds. After the fans have stopped, check for bearing drag by attempting to rotate the blades with your fingers.
- If one or more fans are not turning or if bearings are dragging, replace fan assembly.
- If problem is still not corrected, check the fan power connector at the backplane or replace the power supply.

NOTE

Remove module front panel to view board LEDs. Check the alphanumeric display. The first two digits are the failed-unit slot number and the last digit is the failed test number.

3.3.2 Controller Boards (LCN, FDC, WDC, DHI, CLI, CNI, SIO, SPC)

SELF TST/ERR light does not go out.

- Ensure that I/O board is properly installed.
- Replace controller board.
- Replace I/O board. Note: The LCN I/O board has a 14-pin bus-wire node address DIP on the right side. When replacing LCN I/O boards, transfer the old DIP or individual clips to the new replacement board.

SELF TST/ERR light goes out, but **PASS MOD TEST** (green) light does not light on one controller.

- Replace controller board, and boards in slots below it one at a time.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

SELF TST/ERR light goes out, but **PASS MOD TEST** (green) light does not light on all controllers.

- Replace HMPU, HPK2, K2LCN, or K4LCN.
- Remove top controller board, then apply power. Repeat for each controller board until fault is cleared. Retry extracted boards.

BUS TRAN ERR light is lighted on controller, and **DTAK TIME OUT** is lit on the HMPU, HPK2, K2LCN, or K4LCN.

- Replace controller board and boards in slots below it one at a time.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

BUS TRAN ERR light is lit on a controller, and **BGAK TIME OUT** is lit on the HMPU, HPK2, K2LCN, or K4LCN.

- Check for more than two open slots between boards.
- Remove top controller board, then apply power. Repeat for each controller board until fault is cleared. Retry extracted boards.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.3 PIC and VDG Boards

SELF TST/ERR light does not go out on PIC or VDG.

- Replace PIC.
- Replace VDG.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

SELF TST/ERR light goes out on PIC and **PASS MOD TEST** (green) light is on, but **SELF TST/ERR** light is lit on VDG.

- Ensure that VDG-PIC cables are present and tight on the front of the unit.
- Replace VDG.
- Replace PIC.

SELF TST/ERR light goes out on PIC and VDG, but **PASS MOD TEST** (green) light does not light on PIC.

- Replace PIC.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

BUS TRAN ERR is lighted on PIC and **DTAK TIME OUT** is lit on EMPU, HMPU, or HPK2, K2LCN, or K4LCN but the **BUS ERR** light is not on.

- Replace PIC.
- Replace HMPU, HPK2, K2LCN, or K4LCN

BUS TRAN ERR is lighted on PIC and **DTAK TIME OUT** and **BUS ERR** is lit on EMPU, HMPU, HPK2, K2LCN, or K4LCN.

- Replace PIC.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.4 Memory Boards (MMEM, EMEM, PMEM, QMEM)

Refer to the configuration table (subsections 2.2.2 through 2.2.27) for your module and verify the memory boards are in the correct slots. Also check each memory board for proper compatibility and relationship to other memory boards. Refer to Table 2-5.

PASS MOD TEST (green) does not light on one board.

- See if board works in another chassis slot.
- Replace MMEM, EMEM, PMEM, or QMEM.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

MULT BIT ERR is lit on MMEM, EMEM, PMEM, or QMEM, and **DTAK TIME OUT** and **BUS ERR** are lit on EMPU, HMPU, HPK2, or just **MULT BIT ERR** and **BUS ERR** are on.

- Replace MMEM, EMEM, PMEM, or QMEM.
- Replace HMPU, HPK2, K2LCN or K4LCN.

SING BIT ERR is lit.

- Replace MMEM, EMEM, PMEM, or QMEM.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

MULT BIT ERR is lit on MMEM, EMEM, PMEM, or QMEM and **DTAK TIME OUT** is lit on EMPU, HMPU, HPK2, K2LCN, or K4LCN, but **BUS ERR** is not on.

- Replace MMEM, EMEM, PMEM, or QMEM.
- Look for a **BUS TRAN ERR** light on a controller board, and replace that board.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.5 Processor Boards (EMPU, HMPU, HPK2, K2LCN, or K4LCN)

DATA PAR ERR and **BUS ERR** are lit on EMPU, HMPU, HPK2, K2LCN, or K4LCN.

- Check the alphanumeric display. The first two characters denote the slot number of the failed board. (The third is the failed test number.)
- Replace indicated board.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.6 PDG , EPDG, TPDG, or TPDGX Board

SELF TST/ERR light does not go out on PDG/EPDG.

- Replace I/O card (EPDG I/O, EPDGP I/O, TPDG I/O, or TPDGC).
- Replace PDG, EPDG, TPDG, or TPDGX.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

SELF TST/ERR light goes out on PDG, EPDG, TPDG, or TPDGX, but **PASS MOD TEST** (green) light does not light on PDG, EPDG, TPDG, or TPDGX.

- Replace I/O card.
- Replace PDG, EPDG, TPDG, or TPDGX.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

BUS TRAN ERR is lit on PDG, EPDG, TPDG, or TPDGX and **DTAK TIME OUT** is lit on the HMPU, HPK2, K2LCN, or K4LCN, but the **BUS ERR** light is not on.

- Replace I/O card.
- Replace PDG, EPDG, TPDG, or TPDGX.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

BUS TRAN ERR is lit on PDG, EPDG, TPDG, or TPDGX and **DTAK TIME OUT** and **BUS ERR** is lit on the EMPU, HMPU, HPK2, K2LCN, or K4LCN board.

- Replace I/O card.
- Replace PDG, EPDG, TPDG, or TPDGX.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.7 EPNI and PNM Boards

The EPNI and PNM boards are controller boards which interface the bus and processor in a similar way as the controller boards listed in Section 3.3.2. First, check the **SELF TST/ERR** light (red; should be out) and **PASS MOD TEST** light (green; should be on) on the EPNI and PNM boards.

The **SELF TST/ERR** light (red) is driven by a microprocessor on the EPNI board. If it is on, check for the following causes:

- There was a hardware failure on the EPNI board.
- A problem was detected on-line (for instance, there may have been a EPNI local RAM parity error or a duplicate address may have been detected).
- The node was shut down (stunned) due to a watchdog timeout.
- The number of raw errors detected exceeded a pre-set threshold, causing the software on the EPNI board to enter the failed state.

If the state of the **SELF TST/ERR** light and **PASS MOD TEST** light are correct, continue with this instruction. Under normal system operating conditions the following indicators and connections are present on the EPNI/PNM boards.

- **Red LEDs** are out.
- **Green LEDs** are lit.
- **Yellow LEDs** either blink on and off (indicating traffic) or stay on (heavy traffic).
- **The ribbon cable** which connects between the PNM and PNI I/O paddleboards is firmly fastened in place.
- **The two mini-coax cables** which connect between the PNM board and the PNM I/O paddleboard are firmly fastened in place.
- **The TX yellow indicators** blink (or remain steadily on) as data traffic is sent. The two indicators on the EPNI and PNM boards monitor identical circuits and blink or light in unison. Transmit data is sent simultaneously on both cables.
- **One of the RCVE CABLE yellow indicators** on the PNM board blinks (or remains steadily on) as data traffic is received. The UCN signal is first received on one cable for about 15 minutes, then the receiver is switched to the other cable to maintain confidence.

Check that there are no disconnected or broken cables. If part of the UCN has failed, the failure reporting and diagnostic tests included in the software will help isolate the problem.

3.3.8 Fiber Optic Extender Boards (LCNE/LCNE2, FOC/XMTR, FOC/RCVR LCNFL, CS/R)

NOTE

The LCNE2 board is a later revision of the LCNE board. They are functionally equivalent and your system may include either or both.

3.3.8.1 Normal Indicators

Under normal system operating conditions the following indicators and switch settings are present on the boards that are a part of the LCN Extender Set.

- Red LEDs are out.
- Green LEDs are lit.
- Yellow LEDs are either blinking on and off (indicating traffic) or stay on (heavy traffic).
- RUN/RESET switch on the LCNE is in the run position.

3.3.8.2 Troubleshooting Indicators

If a remote segment has gone dead, check the following:

1. **Red LED on all LCNE boards should be off**. If a red LED is on, the Antijabber Flag is set. The failure that caused this to happen is on the board with the LED on. Replace that board using the procedures in *LCN Guidelines.* See Section 7, *LCNE and Fiber Optic Link Service*, in that manual.

2. **Green LED on LCNE, FOCR, LCNFL boards must be on steady**. If a green LED is not lit (or is flickering), there is not enough light power being received from the fiber optic cable. Check the following:

    a. Cable integrity: Check for cut, damaged, or kinked cable.

    b. Light received: Measure the light power at the receiving end of the cable. A minimum of 2.5 µW must be measured.

    c. Light transmitted: Measure the light power at the transmitter, a minimum of 50 µw must be measured, using a one meter length of fiber optic cable.

3. **Yellow indicators should blink as data traffic is passed**.

If a fiber optic connection that had previously worked ceases to do so, and no fault can be found with the LCNE/FOCT/FOCR boards, make the power measurements discussed in *LCN Guidelines*, part of the *LCN Installation* binder. See Section 5, *Post-Installation Power Measurement,* in that manual.

3.3.9 NGI Board

SELF TST/ERR light does not go out.

- Ensure that NGIO board is properly installed.
- Replace NGI board.
- Replace NGIO board.

SELF TST/ERR light goes out, but **PASS MOD TEST** (green) light does not light on one NGI board.

- Replace NGI board, and then board in slot below it, if present.
- Replace HPK2, K2LCN, or K4LCN.

SELF TST/ERR light goes out, but **PASS MOD TEST** (green) light does not light on any controllers.

- Replace HPK2, K2LCN, or K4LCN.
- Remove top NGI board, then apply power. Repeat for each board until fault is cleared. Retry extracted boards.

BUS TRAN ERR light is lighted on NGI and **DTAK TIME OUT** is lighted on the HPK2.

- Replace NGI board and board in slot below it, if present, one at a time.
- Replace HPK2, K2LCN, or K4LCN.

BUS TRAN ERR light is lighted on NGI, and **BGAK TIME OUT** is lighted on the HPK2, K2LCN, or K4LCN.

- Remove top NGI board, then apply power. Repeat for each board until fault is cleared. Retry extracted boards.
- Replace HPK2, K2LCN, or K4LCN.

The **TX** (yellow) light indicates transmit activity. If this light is not on, troubleshoot the Plant Information Network (PIN) cables and other interfaces.

CAUTION

There is a test jumper on the front of the NGI board (near the indicator lamps described above). This jumper has two positions, **TEST** and **NORMAL**. This jumper should always be in the **NORMAL** position when the network is operating. Placing this jumper in the **TEST** position can disrupt operation of other nodes operating on the PIN.

3.3.10 PLCI Board

NOTE

For additional information on troubleshooting the PLCI board, refer to the *PLC Gateway Planning, Installation, and Service* manual in the *Implementation/PLC Gateway* binder.

SELF TST/ERR light does not go out.

- Ensure that PLCI I/O board is properly installed.
- Replace PLCI board.
- Replace PLCI I/O board.

SELF TST/ERR light goes out, but **PASS MOD TEST** (green) light does not light on one controller.

- Replace PLCI board.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

SELF TST/ERR light goes out, but comes back on after the HG personality has been loaded.

- Incorrect software release or incorrect configuration. Refer to the *Programmable Logic Controller Gateway Planning, Installation, and Service* manual in the *Implementation/PLC Gateway* binder.
- Replace PLCI board.
- Replace HMPU, HPK2, K2LCN, or K4LCN board.

BUS TRAN ERR light is lighted on PLCI.

- Replace PLCI board.
- Replace HMPU, HPK2, K2LCN, or K4LCN.

3.3.11 WSI2 Board

NOTE

For additional information on troubleshooting the WSI2 board, refer to the *Application Module*^{X} manual in the *Implementation/PLC Gateway* binder.

Transaction Error (red LED) light is lit. This indicates a module bus communication error.

- Replace K2LCN-8, or K4-LCN8 (or HMPU).
- Replace TPDG or TPDGX.
- Replace WSI.

DISASSEMBLY/ASSEMBLY
Section 4

4.1 DISASSEMBLY

WARNING

To protect equipment from voltage transients and ensure reliable operation, always turn power off before removing or replacing boards or any other part on a Five/Ten-Slot Module.

Disassemble the module only to the extent necessary to service or replace defective parts. The following procedures may require the use of a blade-tip screwdriver, nut drivers, a personnel grounding strap, and antistatic fixtures and equipment. Item numbers called out in the procedures refer to ballooned numbers in the exploded module diagram, Figure 4-1, and are keyed to the item numbers in *Spare Parts*, Section 5.

1. Remove front panel (1) by turning two quarter-turn fasteners on the right side of the panel and swinging panel out.

CAUTION

All assemblies used in this module are likely to contain electrostatically sensitive devices. Use a personnel grounding strap and grounded work surfaces and equipment. Store and transport parts only in electrostatically safe containers.

2. Remove boards (2) by pulling out on retainers and sliding boards out of chassis.
3. Remove fan assembly (3) by loosening the two quarter-turn bail-headed fasteners and sliding the assembly out of the module.
4. Remove* fan (4) by removing four screws (7), washers (6) and nuts (5), or by drilling out the heads of the rivets. Disconnect fan connector from printed-wire board.
5. Remove power supply (8) by pulling retainers, and sliding out of chassis.
6. Remove* board (9) from power supply by removing nuts (10) and washers (11) and sliding the board out of connector.
7. Remove I/O boards (12) from rear chassis.

* The power supply circuit board and individual fans are not replaceable items on current production units; the complete power supply or fan assembly is furnished at the ORU level.

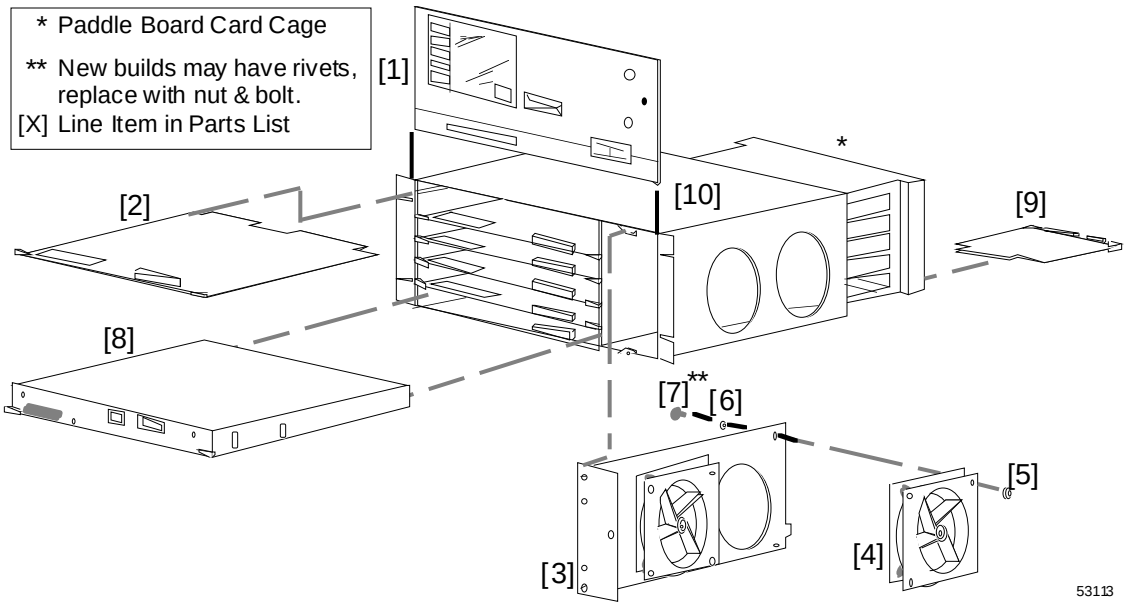


Figure 4-1 — Module Exploded View

NOTE

Before inserting a replacement board:

1. Make certain that the replacement board is at a revision level equal to or later than the board being replaced.
2. Make certain that any pins or switch settings (e.g., the node address on the LCN I/O board) match those on the board being replaced.

4.2 ASSEMBLY

1. Assemble I/O boards (9) to rear chassis, taking care not to damage connectors, and secure board retainers. Also, be sure that the I/O boards match the primary boards.
2. Insert power supply (8) into chassis and secure retainers.
3. Check air-flow direction arrow on fan and assemble* fan (4) to fan assembly and secure with screws (7), washers (6), and nuts (5). Connect fan connector to printed-wiring board.
4. Insert fan assembly (3) into chassis and secure bail-headed screws.
5. Insert boards (2) into chassis and secure retainers. If present, connect ribbon cables between VDG and PIC boards.
6. Assemble front panel (1) to chassis and secure quarter-turn fasteners.

* The power supply circuit board and individual fans are not replaceable items on current production units; the complete power supply or fan assembly is furnished at the ORU level.

SPARE PARTS
Section 5

5.1 INTRODUCTION

Table 5-1 lists spare parts for the module. Those parts at the Optimum Replaceable Unit (ORU) level are marked with an asterisk (*). The listing is arranged in item-number order with the items keyed to the call-out balloons in Figure 4-1. Also listed are those boards required for the various five- and ten-slot module configurations, reference Tables 2-4 and 2-5. In some cases, more than one part is assigned to an item number (for instance any one of several board assemblies can occupy a slot in the module). In this case, the list is in alphabetical order.

Those parts that are CE Compliant are labled as such in the table.

Table 5-1 — Parts List

Item	Description	Part Number
1	Five-Slot Module Cover Assembly	51400918-100
	Ten-Slot Module Cover Assembly	51400919-100
2	Refer to Table 2-4 in Section 2 for the specific board type	
3	5-Slot Fan Assembly (small)	* 51400646-100
	10-Slot Fan Assembly (large)	* 51400647-100
4	Fan, Tubaxial, DC	51190876-100
5	Nut, Hex, Lock, Nylon Insert, M 3.5	N/A
6	Washer, Flat, M 3.5	N/A
7	Mach Scr, Panhd, Cross Pt, M 3.5 X 20MM Long	N/A
8	Capacitor Alu Electro	51190064-416
	Capacitor Alu Electro	51190064-433
	Logic Power Supply (5-Slot) — P.S. Replacement Kit	* 51206653-100
	Logic Power Supply (10-Slot) — P.S. Replacement Kit	* 51206654-100
	LCN Power Supply Replacement Kit (includes new power cord)—New **CE Compliant Power Supply for all modules**	
	Dual Node, Classic Furniture 120 Vac	* 51402184-100
	Dual Node, Classic Furniture 240 Vac	* 51402184-200
	Dual Node, Classic Furniture 120/240 Vac	* 51402184-300
	Five-Slot, Classic Furniture 120 Vac	* 51402184-400
	Five-Slot, Classic Furniture 240 Vac	* 51402184-500
	Five-Slot, Classic Furniture 120/240 Vac	* 51402184-600
	Ten-Slot, Classic Furniture 120 Vac	* 51402184-700
	Ten-Slot, Classic Furniture 240 Vac	* 51402184-800

(Continued)

Those parts that are CE Compliant are labled as such in the table.

Table 5-1 — Parts List (Continued)

Item	Description	Part Number
9	Refer to Table 2-5 in Section 2 for the specific board type	
10	5-Slot Module for Classic Furniture	* 51195499-100
	5-Slot Module for Operator Interface Station (Ergonomic Furniture)	* 51197068-100
	5-Slot Module for Classic Furniture (CE Compliant)	* 51196692-100
	5-Slot Module for Ergonomic Furniture (CE Compliant)	* 51196729-100
	10-Slot Module	* 51108893-100
	10-Slot Module, 6/4 Split Node	* 51108893-200
	10-Slot Module, 6/4 Split Node (for Classic Furniture and Micro TDC 3000—CE Compliant)	* 51196730-100
MISC.	Mini Coax Cable Set (from PNM board to PNM I/O board)	51190896-100
	PIC/VDG Interface Cable	51303410-007
	PIC/VDG (also PNI/PNM) Interface Cable	51303627-003
	Power Cord, 125 V	51303508-100
	Power Cord, 250 V	51303508-200
	Connector BNC	51190728-105
	AM/HMPU Interface Cable (also for WSI/TPDG)	51304197-100
	AM Redundant Cable	51304198-100

STARTUP
Section 6

6.1 VISUAL CHECKS

- Check Module power and signal cables to ensure that they are present and tight.
- Check ground strap on rear of chassis for good connection.
- Ensure that all boards and power supply are fully inserted into the connectors and that board retainers are secured.

6.2 INITIALIZE MODULE

- Turn POWER switch on. After 1.50 minutes or less, all red LEDs are off and all green LEDs are on, and the alphanumeric display indicates the node address of the module. If not, check indicators and LEDs in accordance with subsection 3.2, *Test Procedures*.
- If this is not a History Module, press the **RESET*** button. Check displays and LEDs as above.

NOTE

When you replace or restart a board or module with an outstanding maintenance recommendation, be sure to make an SMCC corrective action entry. Otherwise, the system will not start a recount of errors.

* WARNING: In the case of the History Module only, if you press the RESET button indiscriminately while the system is operating, you may cause damage to the data stored on the hard disk. See subsection 3.2 *Troubleshooting* in the *History Module Service* manual, part of the *Service* binder, for complete details.

ALPHANUMERIC DISPLAYS
Appendix A

The alphanumeric display enhances the man-machine interface by displaying hardware/ firmware and software-driven messages. In interpreting the messages, special attention should be paid to the left-most element. As shown in Figure A-1, this element can have four distinct states, and the correct reading of the display is critical to understanding the message.

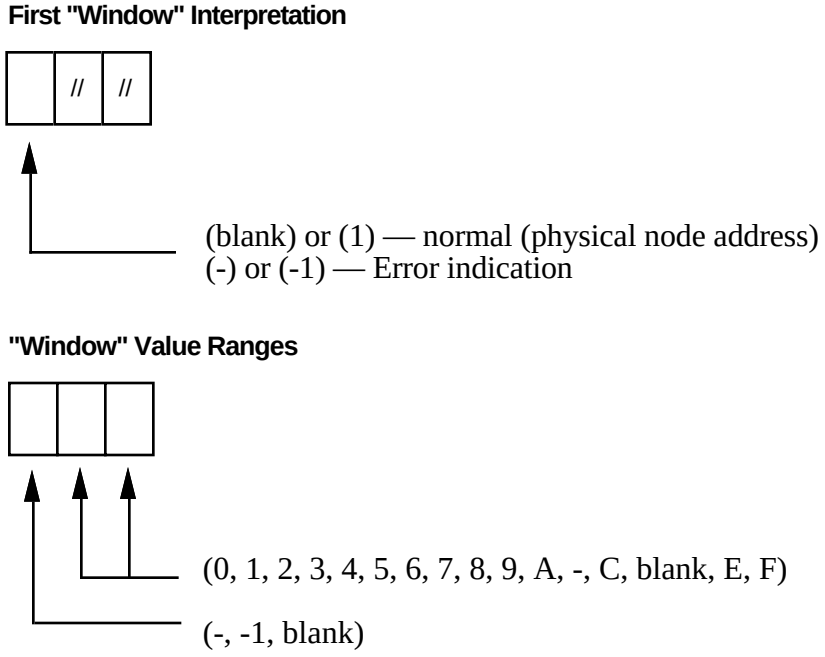


Figure A-1 — Three-Window Display Interpretation 2470

NOTE

The error code interpretations that follow do not apply while the node is executing test software such as HVTS.

A.1 RECOMMENDED ACTIONS FOR SPECIFIC CODE OCCURRENCES

Please note, when multiple recommendations are given for a window code-value, they are organized in order from most to least likely.

Recommendations marked with * indicate an unimplemented code-value. Any such occurrence should be brought to the attention of Honeywell TAC.

Window values marked as | // | are "don't care" values.

| - | 0 | // |

Replace HMPU/HPK2/K2LCN/K4LCN*.

| - | 1 | n |

n=(-) Replace HMPU/HPK2/K2LCN/K4LCN; replace boards in slots 2 through 10 in turn.

n=(1 thru 7) Replace HMPU/HPK2/K2LCN/K4LCN.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

| - | 2 | n |

n=(1 thru 7) Replace board in slot 2; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

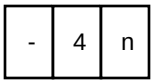
n=(-) or (C) Replace board in slot 2; replace HMPU/HPK2/K2LCN/K4LCN; replace boards in slots 3 through 10 in turn; replace the module backplane or chassis assembly.

n=(other) Replace EMPU/HMPU/HPK2/K2LCN*.

| - | 3 | n |

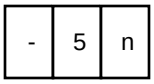
n=(1 thru 7), (-) or (C) Replace board in slot 3; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.



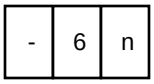
n=(1 thru 7),
(-) or (C) Replace board in slot 4; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN



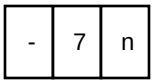
n=(1 thru 7),
(-) or (C) Replace board in slot 5; replace EMPU/HMPU/HPK2/K2LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.



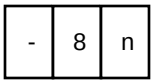
n=(1 thru 7),
(-) or (C) Replace board in slot 6; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.



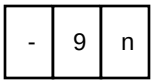
n=(1 thru 7),
(-) or (C) Replace board in slot 7; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

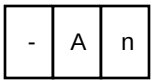


n=(1 thru 7),
(-) or (C) Replace board in slot 8; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

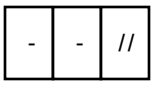
n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.



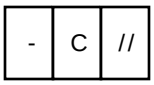
n=(1 thru 7), (-) or (C)	Replace board in slot 9; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.
n=(other)	Replace HMPU/HPK2/K2LCN/K4LCN*.



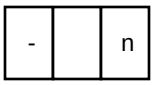
n=(A) or (C)	Replace EMPU/HMPU/HPK2/K2LCN.
n=(other)	Replace HMPU/HPK2/K2LCN/K4LCN*.



Replace HMPU/HPK2/K2LCN/K4LCN*.



Replace HMPU/HPK2/K2LCN/K4LCN*.



n=(A)	If value persists beyond 30 seconds, replace HMPU/HPK2/K2LCN/K4LCN.
n=(other)	Replace HMPU/HPK2/K2LCN/K4LCN*.

n=(0)	An unexpected interrupt has occurred, replace HMPU/HPK2/K2LCN/K4LCN*.
n=(1)	Replace HMPU/HPK2/K2LCN/K4LCN; replace boards in slots 2-10 in turn.
n=(2)	No working DRAM, replace or add memory board(s).
n=(3)	Suspected program error, replace HMPU/HPK2/K2LCN/K4LCN.
n=(other)	Replace HMPU/HPK2/K2LCN/K4LCN*.

-	F	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	0	n

n=(1 thru 7), (-) or (C) Replace board in slot 10; replace HMPU/HPK2/K2LCN/K4LCN; replace the module backplane or chassis assembly.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	1	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	2	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	3	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	4	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	5	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	6	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	7	n

n=(0), (1) Check/replace LCN cable.

n=(2 thru 5) Replace LCN interface board.

n=(6) Replace Winchester (drive or interface).

n=(7 thru 9) Reload node, replace HMPU/HPK2/K2LCN/K4LCN.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN* or other board in the node that could be hanging up the bus.

-1	8	n

n=(0 thru 2) Replace PIC board.

n=(3) Reload node, replace HMPU/HPK2/K2LCN/K4LCN.

n=(4,5,9) Reboot system.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	9	n

n=(0,3,4,5) Reboot system.

n=(1 or 2) Record error messages and call Honeywell TAC.

n=(6) Use SMCC to find defective board.

n=(A) Replace LCN/LLCN/K2LCN

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	A	//

Replace MCPU/EMPU/HMPU/HPK2/K2LCN*.

-1	-	//

Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	C	//	Replace HMPU/HPK2/K2LCN/K4LCN*.

-1		//	Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	E	n	Replace HMPU/HPK2/K2LCN/K4LCN*.

n=(1 thru 9), or (A) Replace board in corresponding slot number.

n=(other) Replace HMPU/HPK2/K2LCN/K4LCN*.

-1	F	n

n=(0 thru 8) Replace HMPU/HPK2/K2LCN/K4LCN.

n=(9) or (A) Replace HMPU/HPK2/K2LCN/K4LCN*.

n=(-) or (C) Replace LCN-interface board; if error repeats, look for bus problems.

n=(E) Replace memory boards; if multiple memory boards failed, look for bus or interactive problems.

n=(F) Replace HMPU/HPK2/K2LCN/K4LCN

.

n=(other) Check and/or replace backplane or chassis assembly.

REPLACEMENT OF HPK2 OR EMPU WITH K2LCN
Appendix B

This appendix gives the procedure for replacing an HPK2 or EMPU processor with a K2LCN. It also gives the restrictions and conditions that apply to the replacement procedure.

B.1 INTRODUCTION

This procedure enables a trained technician to replace an HPK2 OR EMPU processor board with a high density 68020-based K2LCN processor board in a Five-Slot or Ten-Slot Module LCN node. The K2LCN board requires software release R320 (or later). To be a candidate for this replacement, the module cannot contain a Clock Source/Repeater board, nor can the processor board to be replaced be a HMPU, or any processor with special firmware (such as PCIM). If the module is one of a redundant pair, both processor boards must be replaced with K2LCNs. The K2LCN board provides a processor, LCN interface, clock translation, and contains two to six megawords of on-board memory. It requires no external memory boards, so this procedure includes removal of all memory boards from the module as well as removal of the LCN interface boards and the HPK2 or EMPU processor board.

WARNING

REPLACING AN HPK2 OR EMPU WITH A K2LCN REQUIRES TURNING OFF POWER TO THE NODE, AND MUST BE PERFORMED AT AN APPROPRIATE TIME TO AVOID DISTURBANCE TO THE PROCESS AND POTENTIALLY HAZARDOUS CONSEQUENCES TO EQUIPMENT AND PERSONNEL. DETERMINE IN ADVANCE THAT THE SCHEDULING OF THIS PROCEDURE IS IN ACCORDANCE WITH PROPER SYSTEM OPERATION.

WARNING

THE K2LCN CANNOT BE USED IN ANY MODULE CONTAINING A CLOCK SOURCE/REPEATER (CS/R) BOARD. INSTALLING A K2LCN IN THE SAME MODULE WITH A CS/R BOARD MAY DAMAGE THE BACKPLANE AND CAUSE THE ENTIRE MODULE TO FAIL.

B.2 RESTRICTIONS TO TOTAL REPLACEMENT

If you are contemplating the replacement of all HPK2 and EMPU processors in Five/Ten-Slot Modules, be aware that the Clock Source/Repeater board is the single point ground connection for the LCN cable shield. Therefore, even if the 12.5 kHz (Subchannel) clock function is not being used, a CS/R or other grounding means is still required on each coax segment.

Dual Node Modules can be connected to provide that single point ground without requiring a CS/R. See *Dual Node Module Service* in this binder. If there are no Dual Node Modules on the coax segment to provide that ground, then total replacement can only be accomplished by replacing two Five-Slot Modules with two Dual Node Modules.

B.3 PREREQUISITES

The system must be up and running on Software Release 320 or later before performing the processor replacement. You must have an LCN I/O card of revision T or later (either in the module or in spares). If the card in your module is an LCNFL, it (or one in spares) must be a revision F (or later).

B.4 NODE APPLICABILITY

Check that the K2LCN replacement is applicable to the intended node:

1. Visually confirm that there is **NOT** a Clock Source/Repeater (CS/R) board in the rear of the module. If there is a CS/R board and if it is necessary to replace the processor board in this node, replace it with the same type processor board. Obtain the same type processor board from the spare parts supply or from another node in the network. If you remove a processor from another node, replace it with a K2LCN per this procedure. Be sure, however, that the memory and other requirements of this procedure are met.

2. Check to be sure the processor to be replaced is not an HMPU (the HMPU cannot be replaced by a K2LCN).

3. For performance compatibility, processor board types in redundant node pairs should not be mixed. If you must replace a processor board and the affected node is one of a redundant pair, a K2LCN processor board must be installed in its partner also. See subsection B.6 below.

B.5 MEMORY SIZE

Determine the amount of memory in the node, including all memory boards and any memory on the processor board to be replaced. The replacement K2LCN must have at least this much memory. Having more memory is not a problem. Because the K2LCN board is available with different memory sizes, ensure you are installing the right size by comparing the tab portion (last three digits) of the part number on your board with the following table:

51401551-200 = 2 megawords	51401551-400 = 4 megawords
51401551-300 = 3 megawords	51401551-600 = 6 megawords

B.6 REDUNDANT MODULE REPLACEMENTS

1. This section applies only to a redundant Network Interface Module (NIM), Hiway Gateway (HG), or Programmable Logic Controller Gateway (PLCG). A **redundant Application Module (AM) requires HMPU processors and is not eligible for this replacement**.

2. Determine in which unit, the primary or secondary, you want to perform the replacement first. The recommended procedure would have you replace the processor in the primary unit first. This will require that you fail-over the primary to the secondary, making the primary available and allowing you to confirm good operation of both units. It is acceptable to perform the replacement to the secondary first, but you will not have validated the secondary's good operation prior to the board changes. In either case, you **must be certain that the intended unit is the backup**. When it is necessary to cause an intentional fail-over, follow the procedure below:

   At a Universal Station, perform a Shutdown to the intended unit. This will cause an "orderly" shutdown to the "POWER ON" condition and notify all nodes that the unit is being shut down, as well as cause the backup to take over as the active unit. If the backup, now the active primary, has successfully performed the "takeover," you are ready to proceed to subsection 1.7, step 2, below. When subsections B.7 through B.10 are completed on the first unit, repeat them on the second unit.

B.7 DISASSEMBLY

1. If the node is "ON LINE," go to a Universal Station and execute a shutdown to the intended unit. This will perform a "controlled" shutdown to the "POWER ON" condition and notify all nodes that the unit is being shut down.

2. Place the ac power switch on the front of the module in the OFF position.

3. Remove the front cover by removing the screws and swinging the right side of the cover out one inch and then pulling it out to the right.

4 Be sure to observe proper ESD prevention practices, especially while handling boards during the following steps, including subsection B.9, Reassembly.

5. Remove the HPK2 or EMPU board from Slot 1 and the LCNI or LLCN board from Slot 2 at the front of the module.

6. Remove any memory boards in Slots 3 or 4 at the front of the module.

7. At the rear of the module, remove the LCN A and B coax cables from the LCN I/O card, one at a time, by removing the tee connector from the board and **not** by removing either cable from the tee connector. Make sure the system is still operational on both cables as it was prior to this step. Remove the LCN I/O card from Slot 2.

   If the module is a single remote node connected with an LCNFL, the LCNFL must be removed and checked to see if it is revision F (or later). If it is earlier than revision F, an **LCNFL with revision F (or later) must be obtained**.

B.8 REASSEMBLY

1. Check that the LCN I/O card you have is revision T (or later). Set the correct node address into the LCN I/O card and install it in **Slot 1** in the rear of the module. (Or the LCNFL, if one was removed in step 6 above. If a replacement LCNFL had to be obtained for revision F, set the correct node address in it, and install it in I/O **Slot 1**.) Reconnect the coax tee-connectors, being careful to connect the A and B cables to their respective connectors on the board.

2. Make sure there are no address jumpers in the address pinning block TS2 at location 9C on the K2LCN board in the K2LCN. Install the board in Slot 1 in the front of the module.

3. Configuration Rules require that no more than two empty slots remain between the K2LCN and the next board. If you have removed an LCN interface board and two memory boards, you will now have to move the personality/peripheral board (EPDG, CLI, SIO, DHI, etc.) in Slot 5, and its associated I/O board in the rear of the module, down to Slot 4 or below. The preference is to fill the module from the bottom up, mounting the personality/peripheral board in Slot 2. An EPDG must have one or more empty slots above it. If your Universal Station has Trend Pen Recorders, the SIO and SIO I/O boards should be placed between the K2LCN and the EPDG (and their I/O boards).

4. Fasten the replacement kit label to the rear of the module chassis next to the original label.

5. Replace front cover.

6. Place the ac power switch on the front of the module in the ON position.

B.9 TEST

Observe the indicators at the front of the module and especially on the K2LCN board. If a fault occurs, refer to Section 3 of this manual.

B.10 STARTUP

Restart the node, loading the node's specific personality and database, as required. Refer to the *Engineer's Digest.*

REPLACEMENT OF EMPU, HMPU, HPK2, OR K2LCN WITH K4LCN
Appendix C

This appendix gives the procedure for replacing an EMPU, HPK2, or K2LCN processor/LCN/memory with a K4LCN. It also gives the restrictions and conditions that apply to the replacement procedure.

C.1 INTRODUCTION

This procedure enables a trained technician to replace an EMP/LCN/memory, HPK2/LCN/memory, or K2LCN processor board with a high density, 68040-based K4LCN processor board in a Five-Slot or Ten-Slot Module LCN node. The K4LCN board requires software release R500 (or later). To be a candidate for this replacement, the module **cannot** contain a Clock Source/Repeater board, or any processor with special firmware (such as PCIM). If the module is one of a redundant pair, both processor boards must be replaced with K4LCNs. The K4LCN board provides a processor, LCN interface, clock translation, and contains four, eight, or sixteen megawords of on-board memory.

WARNING

REPLACING BOARDS WITH A K4LCN REQUIRES TURNING OFF POWER TO THE NODE, AND MUST BE PERFORMED AT AN APPROPRIATE TIME TO AVOID DISTURBANCE TO THE PROCESS AND POTENTIALLY HAZARDOUS CONSEQUENCES TO EQUIPMENT AND PERSONNEL. DETERMINE IN ADVANCE THAT THE SCHEDULING OF THIS PROCEDURE IS IN ACCORDANCE WITH PROPER SYSTEM OPERATION.

WARNING

THE K4LCN CANNOT BE USED IN ANY MODULE CONTAINING A CLOCK SOURCE/REPEATER (CS/R) BOARD. INSTALLING A K4LCN IN THE SAME MODULE WITH A CS/R BOARD MAY DAMAGE THE BACKPLANE AND CAUSE THE ENTIRE MODULE TO FAIL.

C.2 RESTRICTIONS TO TOTAL REPLACEMENT

If you are contemplating the replacement of all K4LCN processors in Five/Ten-Slot Modules, be aware that the Clock Source/Repeater board is the single point ground connection for the LCN cable shield. Therefore, even if the 12.5 kHz (Subchannel) clock function is not being used, a CS/R or other grounding means is still required on each coax segment.

Dual Node Modules can be connected to provide that single point ground without requiring a CS/R. See *Dual Node Module Service* in this binder. If there are no Dual Node Modules on the coax segment to provide that ground, then total replacement can only be accomplished by replacing two Five-Slot Modules with two Dual Node Modules.

C.3 PREREQUISITES

The system must be up and running on Software Release 500 or later before performing the processor replacement. **You must have an LCN I/O card of revision T or later** (either in the module or in spares). **If the card in your module is an LCNFL, it (or one in spares) must be a revision F (or later).**

C.4 NODE APPLICABILITY

Check that the K4LCN replacement is applicable to the intended node:

1. Visually confirm that there is **NOT** a Clock Source/Repeater (CS/R) board in the rear of the module. If there is a CS/R board and if it is necessary to replace the processor board in this node, replace it with the same type processor board. Obtain the same type processor board from the spare parts supply or from another node in the network. If you remove a processor from another node, replace it with a K4LCN per this procedure. Be sure, however, that the memory and other requirements of this procedure are met.

2. For performance compatibility, processor board types in redundant node pairs should not be mixed. If you must replace a processor board and the affected node is one of a redundant pair, a K4LCN processor board must be installed in its partner also. See subsection C.6 below.

C.5 MEMORY SIZE

Determine the amount of memory in the node, including all memory boards and any memory on the processor board to be replaced. The replacement K4LCN must have at least this much memory. Having more memory is not a problem. Because the K4LCN board is available with different memory sizes, There are three upgrade kits.

Function	Upgrade Kit Model Number	K4LCN Part Number	Memory Part Number
K4LCN Board—4 Mw	MP-ZPRC04	51401996-100	51201645-400
K4LCN Board—8 Mw	MP-ZPRC06	51401996-100	51201645-800
K4LCN Board—16 Mw	MP-ZPRC16	51401996-100	51201645-160

C.6 REDUNDANT MODULE REPLACEMENTS

1. This section applies only to a redundant Network Interface Module (NIM), Hiway Gateway (HG), or Programmable Logic Controller Gateway (PLCG).

2. Determine in which unit, the primary or secondary, you want to perform the replacement first. The recommended procedure would have you replace the processor in the primary unit first. This will require that you fail-over the primary to the secondary, making the primary available and allowing you to confirm good operation of both units. It is acceptable to perform the replacement to the secondary first, but you will not have validated the secondary's good operation prior to the board changes. In either case, you **must be certain that the intended unit is the backup**. When it is necessary to cause an intentional fail-over, follow the procedure below:

   At a Universal Station, perform a Shutdown to the intended unit. This will cause an "orderly" shutdown to the "POWER ON" condition and notify all nodes that the unit is being shut down, as well as cause the backup to take over as the active unit. If the backup, now the active primary, has successfully performed the "takeover," you are ready to proceed to subsection 1.7, step 2, below. When subsections C.7 through C.10 are completed on the first unit, repeat them on the second unit.

C.7 DISASSEMBLY

1. If the node is "ON LINE," go to a Universal Station and execute a shutdown to the intended unit. This will perform a "controlled" shutdown to the "POWER ON" condition and notify all nodes that the unit is being shut down.

2. Place the ac power switch on the front of the module in the OFF position.

3. Remove the front cover by removing the screws and swinging the right side of the cover out 1 inch and then pulling it out to the right.

4 Be sure to observe proper ESD prevention practices, especially while handling boards during the following steps, including subsection C.9, Reassembly.

5. Remove the EMPU, HPK2, K2LCN, LCN and all memory boards from the front of the module.

6. At the rear of the module, remove the LCN A and B coax cables from the LCN I/O card, one at a time, by removing the T-connector from the board and **not** by removing either cable from the T-connector. Make sure the system is still operational on both cables as it was prior to this step. Remove the LCN I/O card from Slot 2.

   If the module is a single remote node connected with an LCNFL, the LCNFL must be removed and checked to see if it is revision F (or later). If it is earlier than revision F, an **LCNFL with revision F (or later) must be obtained**.

C.8 REASSEMBLY

1. **Check that the LCN I/O card you have is revision T (or later).** Set the correct node address into the LCN I/O card and install it in **Slot 1** in the rear of the module; (or the LCNFL, if one was removed in step 6 above. If a replacement LCNFL had to be obtained for revision F, set the correct node address in it, and install it in I/O **Slot 1**). Reconnect the coax T-connectors, being careful to connect the A and B cables to their respective connectors on the board.

2. Make sure there are no address jumpers in the address pinning block TS2 at location 9C on the K4LCN board. Install the board in Slot 1 in the front of the module.

3. Configuration Rules require that no more than two empty slots remain between the K4LCN and the next board. If there are more than two empty slots above the K4LCN, you will now have to move the personality/peripheral board (EPDG, CLI, SIO, DHI, etc.) in Slot 5, and its associated I/O board in the rear of the module, down to Slot 4 or below. The preference is to fill the module from the bottom up, mounting the personality/peripheral board in Slot 2. An EPDG must have one or more empty slots above it. If your Universal Station has Trend Pen Recorders, the SIO and SIO I/O boards should be placed between the K4LCN and the EPDG (and their I/O boards).

4. Fasten the replacement kit label to the rear of the module chassis next to the original label.

5. Replace front cover.

6. Place the ac power switch on the front of the module in the ON position.

C.9 TEST

Observe the indicators at the front of the module and especially on the K4LCN board. If a fault occurs, refer to Section 3 of this manual.

C.10 STARTUP

Restart the node, loading the node's specific personality and database, as required. Refer to the *Engineer's Digest.*

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