Enhanced Logic Manager Module

User's Guide

Release Independent

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Notices and Trademarks

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About this Publication

This guide provides instructions to plan, install, configure, and troubleshoot the Enhanced Logic Manager Module (ELMM). These instructions are intended for trained personnel to upgrade the obsolete IPC 620 processor based LM to the C300 controller based ELMM.

The LM to ELMM upgrade requires software release **TPN R685.3** or a later version.

Intended Audience

This document is intended only for trained personnel with the knowledge and experience of planning, deigning, and installation of hardware on a standard TPS system.

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title	Doc ID
Dual Node Module Service	LC13-610
Engineer's Reference Manual	SW09-605
C300 Controller Users Guide	EPDOC-XX11-en-431A
Control Hardware Planning Guide	EPDOC-XX23-en-431
Control Hardware Installation Guide	EPDOC-XX21-en-431
Five/Ten-Slot Module Service	LC13-600
Hardware Verification Test System	SW13-511
Logic Manager Service Manual	LM13-685
Maintenance Test Operations	SW11-502
Process Operations Manual	SW11-601
System Maintenance Guide	SW13-500
System Overview	SW70-500
Series C IO User’s Guide	EPDOC-X126-en-431
Universal Control Network Guidelines	UN12-610
Universal Control Network Installation	UN20-500
Universal Control Network Planning	UN02-501
FTE Switch used with LCN cabinet Upgrade Kit Instructions	51195195-384
FTE Cabling Best Practices	WP-07-01-ENG
CF9 Ethernet Switch Upgrade Kit Instructions	51195766-036
EUCN Overview and Planning for Upgrade Kit Instructions	51195766-037
Logic Manager Parameter Reference Dictionary	LM09-640
TPC Rules	
Engineering Wiring Guidelines	
Experion Network Best Practices	
HPM to EHPM Upgrade Kit Instructions	BOM No. 51195766-035

Contents

Figure

1. Introduction

1.1 Overview

Purpose

This document provides necessary information to plan, install, configure, operate, and troubleshoot the Enhanced Logic manager Module (ELMM). The ELMM module shares the same hardware capabilities and form factor as the C300 controller. Instructions specific to ELMM are provided in this document. Adequate references to Experion documentation are provided where required; the referenced documents must be consulted to perform certain tasks mentioned in this document.

Scope

This document covers the information needed to replace LM with ELMM. This includes planning information about activities to be performed on existing LM modules before shutting them down, disassemble LM hardware, replace the LM cabinet, connect the new ELMMs that come pre-loaded in the C300 cabinet, power up and configure ELMM to continue working with the restored checkpoints, and configure C300 logic.

IO wiring and reconfiguration of IOs is beyond the scope of this document. Refer to the Wiring guidelines document for information about the same.

Abbreviations

The following table lists the various acronyms and abbreviations used in this document.

Acronyms	Meaning
DEB	Data Entity Builder
.EB files	Entity Builder files
EHPM	Enhanced High–Performance Process Manager
ELMM	Enhanced Logic manager Module
ENIM	Enhanced Network Interface Module
EUCN	Enhanced Universal Control Network
FOE	Fiber Optic Extender
FTE	Fault Tolerant Ethernet
IOP	Input/Output Processor (module)
LCN	Local Control Network
LM	Logic Manager
MAC	Media Access Control
NIM	Network Interface Module
UCN	Universal Control Network
CF9	A 9-port Control Firewall, (CF9) Level1 Switch that provides eight FTE interface connections for C300 Controllers and Series C FIMs within a control cabinet and one uplink to the supervisory FTE communications network.
C300 controller	Controls logic processing. ELMM logic control interface module to EUCN.
Series C IO	IO modules supported by the C300 controller
PMIO	Process Manager IO

1.2 Solution overview

Modernization

The **Enhanced Logic Manager Module (ELMM)** solution is intended for customers with Honeywell Legacy system (TDC and TPS) using Logic Manager (LM). ELMM is needed to replace the obsolete LM system and is a simple means to modernize the existing control system.

Benefits

Migrating from the obsolete LM platform to an Experion PKS hardware platform with the latest C300 controllers ensures facilities of better lifecycle support. Additional benefits include:

- Replacement of coaxial cables with superior Ethernet, which is much easier to maintain.
- C300, ELMM, and IOs are compact sized controllers requiring less space.
- Retaining intellectual property in legacy assets by conserving applications running on the TPN.
- Retaining peer-to-peer configurations as they are.
- Retaining point processing and checkpoints from the legacy module.

The Solution

The solution includes two major components: (1) ELMM and (2) C300 with series C IOs. Honeywell's ELMM hosts all LMM functions. The C300 replaces the LM's IPC 620 controller and uses a proprietary tool to migrate the LM database and ladder programs to C300 function blocks. The ELMM is connected to the Enhanced Universal Control Network (UCN over FTE) and Experion technology. You can also migrate the Logic Manager database to C300 function blocks, conserve TPN graphics and AM applications, and even retain peer access to HPMs. ELMM communicates with the C300 through the PCDI block configured in the C300.

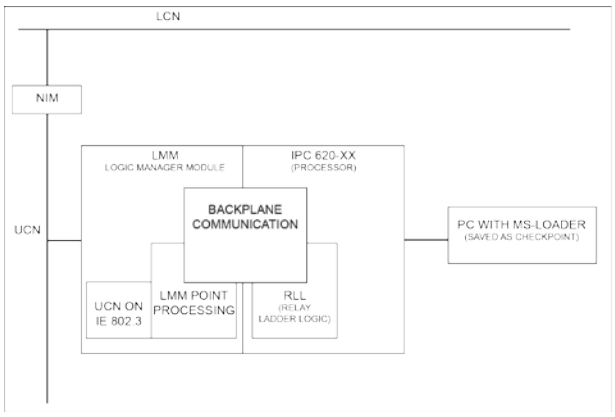


Figure 1-1: Existing LMM architecture

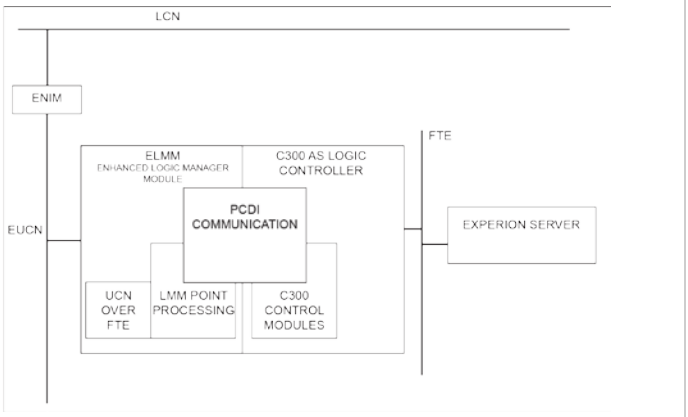


Figure 1-2: ELMM architecture

1.3 Hardware and software requirements

Supported software releases

Software	Requirement
TPN	TPN R685.3 or later. See the *Customer Release Guide CRG-685* for more details.
Firmware	• ULM 301.13 o ENIM boot firmware: EPNI2_3.0 o ELMM boot and app firmware: ELMM_100.17.0 o CF9 firmware version: Minimum JJ ELMM firmware file is included in the ULM media. By default, the firmware files for ELMM are located at: o For a 64-bit machine: *Computer\C:\Program files (x86)\Honeywell\Experion PKS\Engineering Tools\system\Firmware\EUCN\ELMM*. o For a 32-bit machine: *Computer\C:\Program files\Honeywell\Experion PKS\Engineering Tools\system\Firmware\EUCN\ELMM*. • Ctools: R410.1.85.315 (R410 patch)/R430.1-92.0 (R430 patch)/R431.1.31.0 to update the ELMM firmware. See *Section 7* of *Experion Control Hardware and I/O Modules Firmware Upgrade Guide* for more details. • Use Control Firewall Firmware Update Tool to update the Control Firewall firmware. See *Section 7.11* of the HPM_Installation_HP20600_R685 guide to update the Control Firewall firmware.
Experion	• R410.1/R430.1

Hardware requirements

The following list provides hardware components required to set up an ELMM system. Based on your existing LM configuration, the project engineer will provide a complete list of needed hardware. At a minimum, you will need:

Hardware	Description/Model Number
ESV/ESVT	For C300 control configuration and monitoring Downloading firmware to C300 hardware and ELMM
Rittal Cabinet	CC-C8DS01 CC-C8SS01 CU-CBDS01 CU-CBDD01
C300 controller	Depends on existing setup. One redundant pair is a minimum requirement
ELMM	Available as non-redundant or redundant pair
ENIM	Is available
Series C IO	IOs that will replace existing LM IOs.
CF9 Switches	One redundant pair is a minimum requirement.
Cables	• Grounding cables • Power cables • FTE cables • IOL cables • FOE (for remote IOs)

Model Numbers

The following table lists the ELMM Upgrade Kit Model Numbers. Note that when you order this upgrade kit, you will not get a direct replacement. A solution has to be engineered considering your requirements using this upgrade kit.

Model Number	Description
MC-ELMMS1	ENHANCED LOGIC MNGR MODULE SINGLE. Coated module, non redundant
MU-ELMMS1	ENHANCED LOGIC MANAGER MODULE ASSEMBLY. Uncoated module, non redundant

Parts List

The following table lists the parts for kit number **MC-ELMMS1** (LM to ELMM Upgrade Kit).

Part Number	Description	Quantity
51454552-125	ENHANCED LOGIC MANAGER MODULE ASSEMBLY Coated module, non redundant	For a redundant setup, order 2 of these (Same as C300)

The following table lists the parts for kit number **MU-ELMMS1** (LM to ELMM Upgrade Kit).

Part Number	Description	Quantity
51454552-125	ENHANCED LOGIC MANAGER MODULE ASSEMBLY Uncoated module, non redundant	For a redundant setup, order 2 of these (Same as C300)

2. ELMM Planning and Design

2.1 Planning Considerations

Implementing an ELMM solution begins by planning for the following:

- **Network topology**: Understand how ELMM connects to LCN.
- **EUCN Planning**: ELMM connects to EUCN (UCN over FTE). See UCN Planning guide for more details.
- **Site Selection**: Dimensions of existing LM cabinets are marginally different from Series C cabinets that house ELMMs. Analyze this and work out the location of the new cabinet. Wiring and grounding for the new cabinet and its hardware components must be planned. ELMM comes factory-fitted in a Series C cabinet. If your plan is to use an existing UCN cabinet to house the ELMMs, estimate for activities for mounting ELMM hardware and its components and wiring them.
- **ELMM and C300 controllers**: The number of modules needed based on your requirements, or based on the number of LM processors being replaced.
- **ELMM redundancy**: ELMM supports redundancy. Plan the number of controllers and ELMMs required if you want redundancy, or if the LMs being replaced are redundant.
- **IOs**: C300 communicates with an entirely different set of IOs (Series C IOs) compared to LM. Map the existing IOs with their Series C IO or PMIO equivalents in the planning stage itself. If equivalent LM IOs are unavailable, an engineering solution may have to be found. If you have existing remote IOs, connect them via Series C Fiber Optics Extenders.
- **Process wiring techniques**: Study the wiring and grounding requirements of Series C cabinet, Series C IOs, and remote IOs, if any.
- **Unique hardware features**:
    - ELMMs and C300s require FTE cable to connect with CF9s/IE3000 switches, IOs and Experion Server. Plan for FTE cabling and routing.
    - Experion server/ESVT is used for C300 controller configuration and monitoring.
- **Software requirements**: TPN R685.3 or later, Experion R410 or later. CF9 switch configured with version JJ or later.
- **Additional customer responsibilities**: In general, you are responsible for preparing your facility as outlined in this guide and references to other guides provided. In addition:
    - Install this equipment in accordance with applicable statutory requirements such as National Electrical Code (NEC), ANSI/NFPA 70, or the Canadian Electrical Code (CEC), C22.1.
    - Furnish and install (at your expense and sole responsibility) all internal building wiring (including power and signal cables) in accordance applicable standards such as NEC or the CEC.

- Install any power and signal cables according to the applicable standards such as NEC, CEC, and other local regulations and requirements.

2.2 Network Planning

The existing LM architecture and the ELMM architecture diagrams are provided so you can note the differences. While the LM connected to the LCN through NIMs over LCN trunk cables, the ELMM connects to the LCN via ENIMs. ELMMs connect to CF9 Switches over the FTE network. The CF9s then connect to L2 switches to the ENIMs.

In an LM system LCS is replaced with C300, LMM with ELMM.

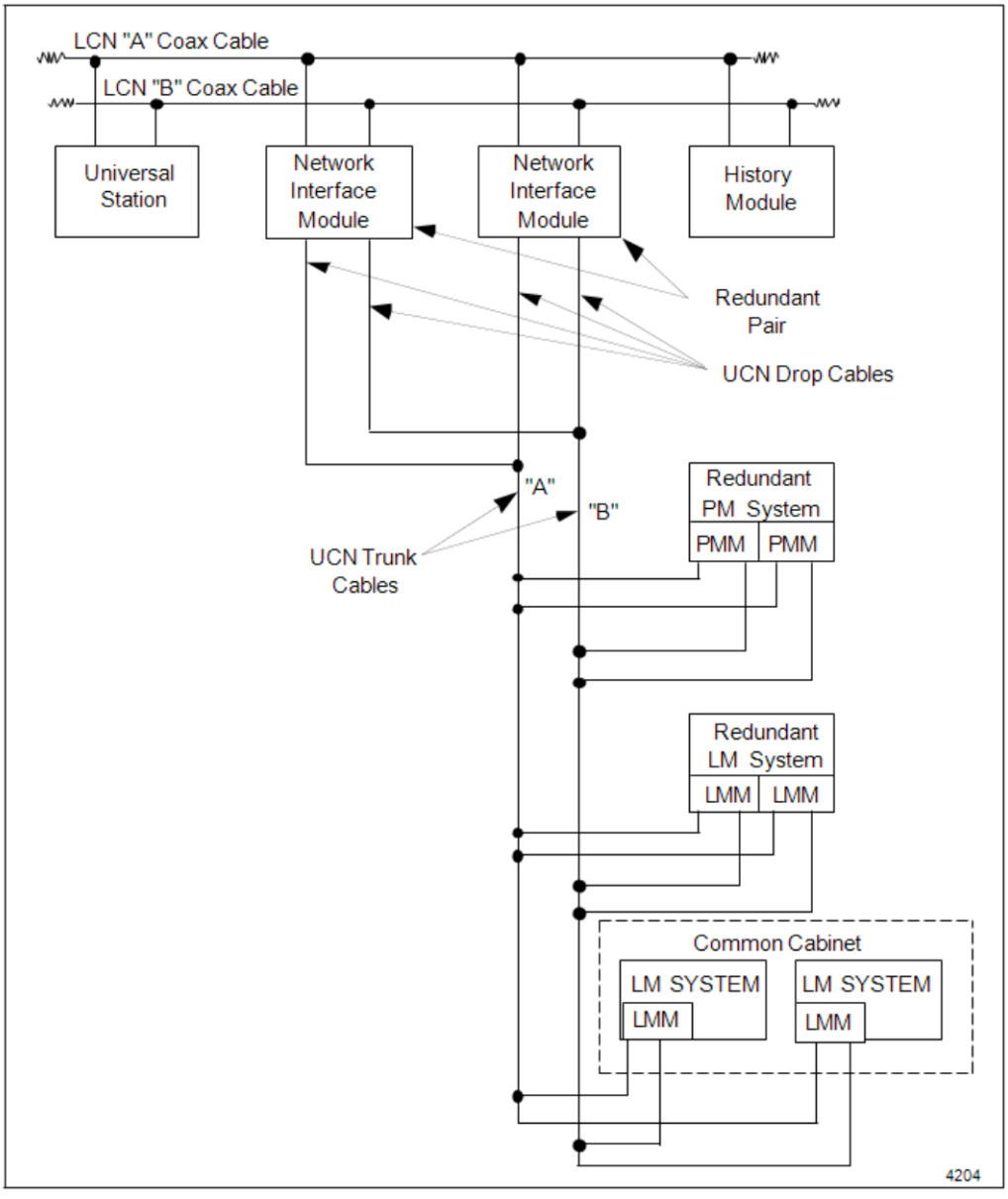


Figure 2-1: LMM topology diagram

The following schematic helps you understand how ELMM is connected to the LCN.

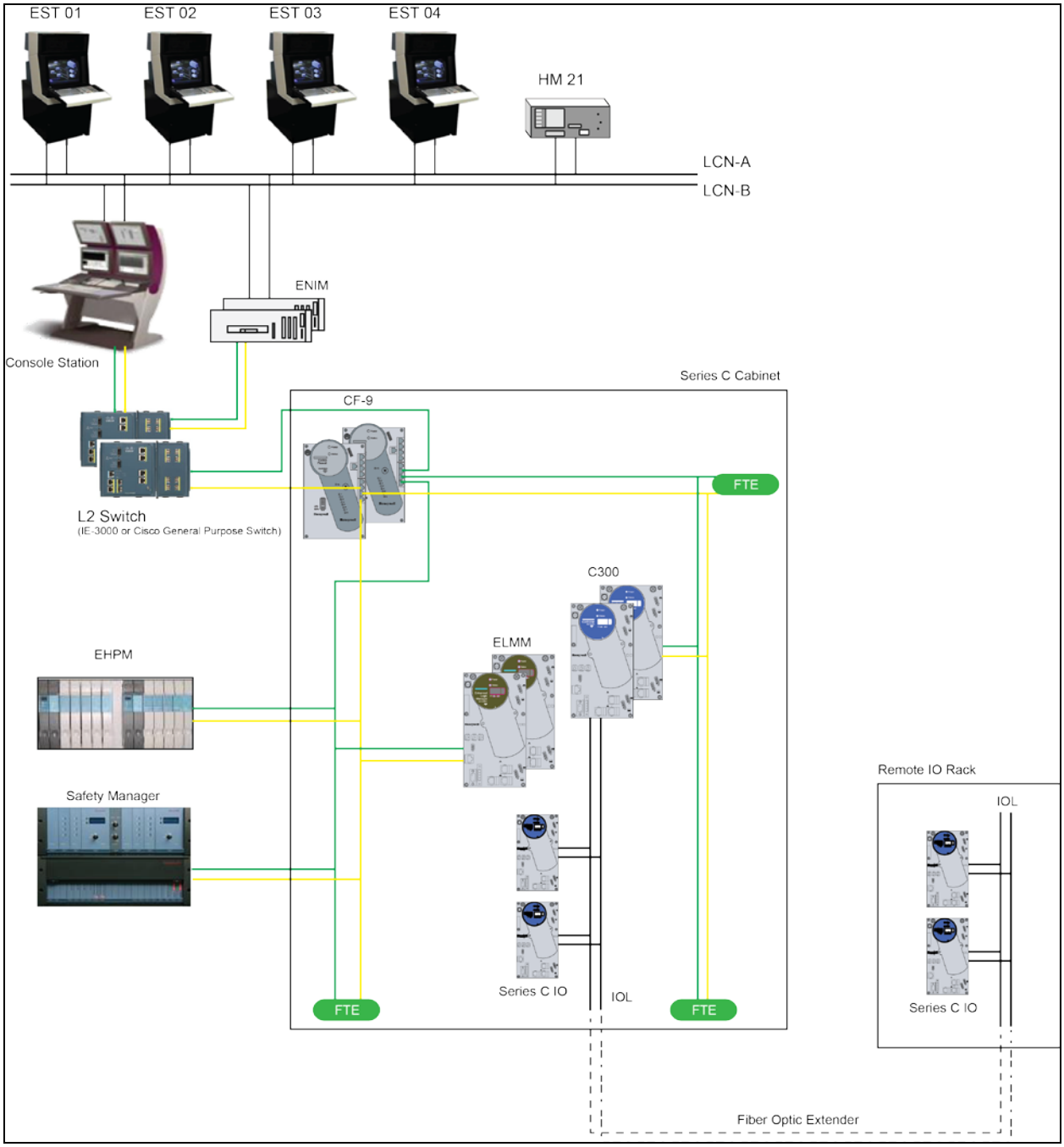


Figure 2-2: ELMM topology diagram

Similar to LMs, ELMMs can work either a redundant pair or a non-redundant module.

In case of a smaller network topology, C300 and ELMM nodes can be connected to the same CF9. The redundant pairs should connect to the same CF9.

For large Experion installations (more than 10 FTE nodes in the existing EPKS network), C300 and ELMM modules, even though present in the same cabinet, must not be connected to the same pair of CF9s.

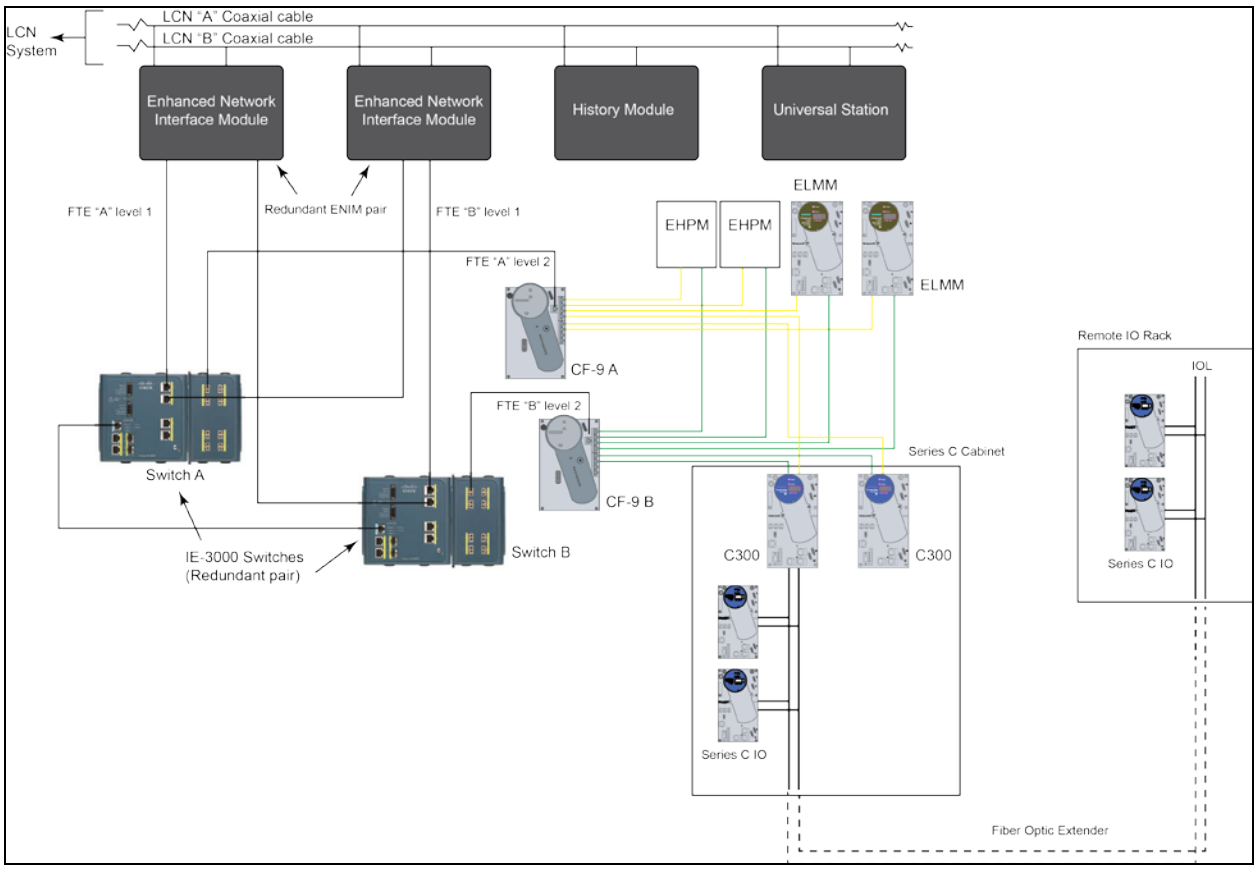


Figure 2-3: Sample topology of a small Experion network with ELMM and C300 connected to the same CF-9 switch pair

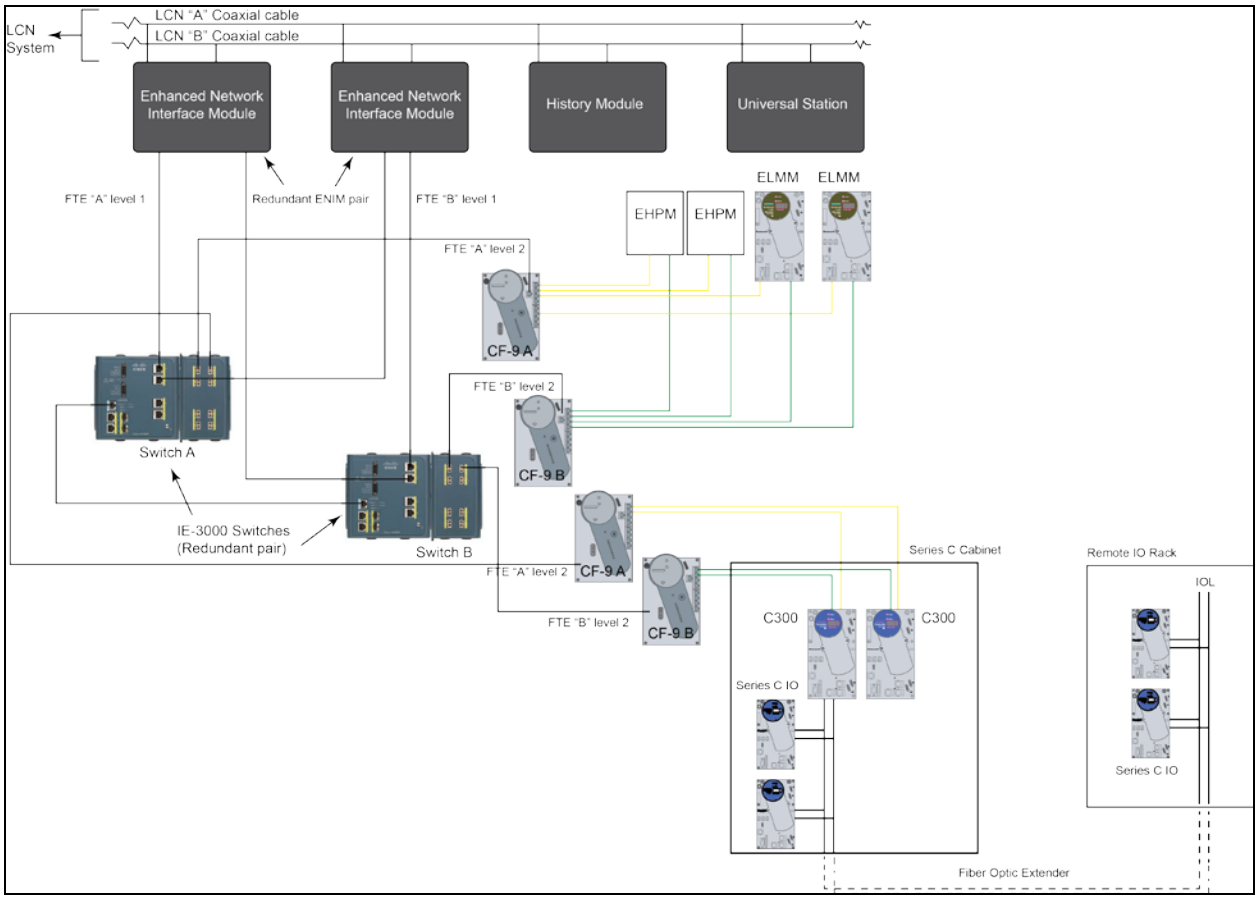


Figure 2-4: Sample topology of a large Experion network with ELMM and C300 connected to separate CF-9 switch pairs

Project engineers are best suited to select the appropriate solution based on your system topology.

2.3 Site selection

Site selection is an important factor in planning and preparing for the installation of an ELMM system. Cabinet dimensions, existing location, accessibility of cabinets, wiring, IO cable lengths, presence of remote IOs, are all key considerations when making your space assessment.

Space assessment for cabinets

There is a minor variation in the dimensions of the cabinets being replaced. Ensure you have taken adequate care to house the new cabinet in a safe and accessible location. A good plan would entail making a space assessment by factoring in the difference in the dimensions of the cabinets being replaced.

See the following table to note the difference in cabinet dimensions.

LM cabinet dimensions			
	Width (meters/inches)	Depth (meters/inches)	Height (meters/inches)
MU-CBSM01 (Single Access Cabinet)	0.8/31.5	0.55/21.75	2.1/81.5
MU-CBDM01 (Dual Access Cabinet)	0.8/31.5	0.8/31.5	2.1/81.5
MU-CBSX01 (Single Access Cabinet)	0.8/31.5	0.5/19.7	2/78.9
MU-CBDX01 (Dual Access Cabinet)	0.8/31.5	0.8/31.5	2/78.9
Series C cabinet dimensions			
CC-C8SS01 (Single Access Cabinet)	0.8/31.5	0.505/19.89	2.002/78.8
CC-C8DS01 (Dual Access Cabinet)	0.8/31.5	0.8/31.5	2.002/78.8

Follow the guidelines mandated at your site for replacing the LM cabinet with the new Series C cabinet. In addition, bear in mind the following:

Each cabinet can accommodate a maximum of nearly 25 Series C IOs. The remaining space is taken up by the redundant C300s and redundant/non-redundant ELMMs. Based on your requirement, you will have to plan for the additional IOs that you may not be able to accommodate on the same cabinet.

In addition, Wiring, grounding, cable entry to the cabinet have to be assessed to ensure cabinets are placed in a safe and accessible location. Depending on the location of the new cabinet, plan how to route IO cables to the new cabinet.

Sample IO configuration

Series C IOs replace all existing LM IOs. As they differ in form, number of available channels, and in the way they are mounted in the cabinet, assess the number of Series C IOs you will require.

An example is shown here to demonstrate the calculations you will have to make to house the Series C IO modules that replace the LM IOMs.

LM Hardware	*ELMM Hardware*
Primary LM	ELMM + redundant C300 pair
Secondary LM	Redundant ELMM
4 IO racks = 44 IO modules Each IO module can have 8,16,24 or 32 channels	Each Series C IO has 32 channels
Assuming all IO modules have 8 channels	You will need 11 Series C IOs
Assuming all IO modules have 16 channels	You will need 22 Series C IOs
Assuming all IO modules have 32 channels	You will need 44 Series C IOs

Each cabinet can accommodate a maximum of nearly 25 Series C IOs. The remaining space is taken up by the redundant C300s and redundant/non-redundant ELMMs. Based on your requirement, you will have to plan for the additional IOs that you may not be able to accommodate on the same cabinet.

Remote IOs connect to Series C IO modules within the cabinet via Fiber Optic Extenders (FoE). Installing remote IOs involves calculating the length of these cables and routing them.

Prepare a plan to identify and reuse cables salvaged from the LM cabinet that you may want to reuse.

2.4 ELMM/C300 Controllers

ELMM, the C300 based hardware module, hosts the LMM functions and replaces the LM system. ELMM has the same form factor as the C300 controller and is designed to retain point processing and checkpoints of LMM. Redundancy is supported.

The C300 Controller is a distributed process controller and I/O gateway for the Experion system. With only a few exceptions, the C300 Controller fully supports configuration, load and execution of the standard function blocks supported in previous Experion releases (R210 and later).

A typical ELMM implementation has ELMM modules installed in the Series C cabinet as specified in Series C Controller Hardware Configuration Rules document (51199352_revx.docx). Each ELMM system consists of one ELMM module (redundant or non-redundant) based on your requirement, one redundant C300 module and other IOMs including remote IOs dictated by your requirements.

Building an ELMM system is similar to building a C300 system with the following additions:

1. ELMM module is mounted in the cabinet and uses the C300 IOTA. Being configurable as redundant or non-redundant, the ELMM module needs FTE cables — for redundancy connection or simply to connect to CF9s.
2. You have an option to add an additional pair of CF9s (in addition to what came in the C300 cabinet) to connect the ELMM node.
3. The C300 in the ELMM cabinet system will always be redundant.
4. ELMM uses C300 IOTA. Space for C300 IOTAs to mount ELMM modules is provided in the cabinet.

ELMM can be ordered as either a redundant pair or a non-redundant standalone module to suit your requirement. Similar to C300, a redundant ELMM also consists of two ELMM modules.

See the *Control Hardware Planning Guide EPDOC-XX23-en-431*, and *C300 Controller Users Guide EPDOC-XX11-en-431* for information related to planning ELMM/C300 controller planning and design.

2.5 ELMM Input Outputs

The ELMM/C300 IOs will replace all existing LM IOs and remote IOs. In the ELMM system, C300 communicates with Series C IOs and PM IOs. At this stage, it is critical that you analyze and plan for IO replacement by mapping existing LM IOs with C300 IO equivalents.

A mapping of LM IOs with their Series C IO equivalents is presented here.

Sl. No.	MOD TYPE	LM MODULE	LM MODULE DESCRIPTION	CHANNELS	C300 EQUIVALENT MODULE	C300 IOTA (with extenders)	C300 MODULE DESCRIPTION	CHANNELS
1	AI	621-0022-AR	0-20 mA Isolated Analog Input	8	CC-PAIH01		High Level Analog Input[1]	16
2	AI	621-0022-VR	0-10 V Isolated Analog Input	8	CC-PAIH01		High Level Analog Input[1]	16
3	AO	621-0010-AR	4-20 mA Analog Output	4	CC-PAOH01		Analog Output	16
4	AO	621-0010-VR	0-10 V Analog Output	4			Analog Output[2]	16
5	DI	621-1100R	115 Vac/Vdc Discrete Input	8	CC-PDIH01	CC-TDI110	High Voltage Digital Input (IOM supports both 120 and 240 volts AC)[3]	32
6	DI	621-1101R	115 Vac/Vdc Isolated Discrete Input	6	CC-PDIH01	CC-TDI110	High Voltage Digital Input (IOM supports both 120 and 240 volts AC)[4]	32
7	DI	621-1160R	115 Vac Discrete Input	16/32	CC-PDIH01	CC-TDI110	High Voltage Digital Input (IOM supports both 120 and 240 volts AC)[5]	32
		621-1250R	240 Vac Discrete Input	16	CC-PDIH01	CC-TDI220	High Voltage Digital Input (IOM supports both 120 and 240 volts AC)	32
8	DI	621-1500R	24 Vac/Vdc Discrete Input	8	CC-PDIL01	CC-TDIL01	Low Voltage Digital Input (24 volts DC)[6]	32
9	DI	621-3552R	24 Vdc Sink Fast Response Discrete Input	16	CC-PDIL01	CC-TDIL01	Low Voltage Digital Input (24 volts DC) [6]	32
10	DI	621-3560R	24 Vdc Sink Discrete Input	16	CC-PDIL01	CC-TDIL01	Low Voltage Digital Input (24 volts DC) [6]	32
11	DI	621-4500R	12-24 Vdc Source Discrete Input	8	CC-PDIL01	CC-TDIL01	Low Voltage Digital Input (24 volts DC) [6]	32
13	DI	621-3580	24Vdc Discrete input	32	CC-PDIL01	CC-TDIL01	Low Voltage Digital Input (24 volts DC)	32
14	DO	621-0007R	Reed Relay Output	6	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC)	32

15	DO	621-2100R	115 Vac Discrete Output	8	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC)[7]	32
16	DO	621-2101R	115 VAC Isolated Discrete Output	6	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
17	DO	621-2150R	115 Vac Discrete Output	16	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
18	DO	621-6550R	24 Vdc Source Discrete Output	16	CC-PDOB01	CC-TDOB01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
19	DO	621-6500R	12-24 Vdc Source Discrete Output	8	CC-PDOB01	CC-TDOB01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
20	DO	621-6503R	12-24 Vdc Source Self-Protected Discrete Output	8	CC-PDOB01	CC-TDOB01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
21	DO	621-2102R	115 Vac Self protected Discrete Output	8	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
23	DO	621-6575	24Vdc Discrete output	32	CC-PDOB01	CC-TDOB01	Bussed Low Voltage Digital Output (24 volts DC) [7]	32
22	DO	621-2200R	230 Vac Discrete Output	8	CC-PDOB01	CC-TDOR01	Bussed Low Voltage Digital Output (24 volts DC)	32
24	Special I/O	621-0024R	Pulse Input Module	4			No direct replacement available	
25	Special I/O	621-0025R	Resistance Temperature Detector Module	8	CC-PAIM01		No direct replacement available[8]	
26	Special I/O	621-0020R	Universal Analog Input Module	16			No direct replacement available[8]	

Color legend

------	**Fully compatible**
------	**Partially compatible**
------	**Major difference in the specifications**
------	**No direct replacement**

Notes:

[1]

- Supports only 4 differential channels per module.
- No channel to channel isolation specified.

- Inferior specifications for Normal mode and
- Common mode input voltage.
- Does not support 0-10V, 0-20mA and Bipolar inputs

[2]

CC-PAOH01 does not support Voltage output

[3]

Off state leakage current specification is less. May require external resistor to drain extra leakage current.

[4]No channel to channel isolation

[5]

Fusible resistor inputs not available

Input to Logic isolation is only upto 1500V AC/DC"

[6]

AC Input not supported.

Input delay is 5 ms which is two times the existing specification."

[7]

"Relay output instead of solid state output.

No Fusible resistor / Fuse protection at the outputs.

No Self protection"

[8]

No direct replacement available

ATTENTION: LM IO modules that do not have a C300 equivalent module are not supported. An alternative engineering solution is recommended.

Remote IOs

To replace existing remote IOs, use Fiber Optic Extenders to connect IOLs in the cabinet (Series C or PM IOs) with IOLs in the remote location. A detailed discussion of Series C I/O Link Fiber Optic Extenders (FOE) is provided in the *Series C IO Users Guide EPDOC-X126-en-431*.

See the following guides for planning and design information about Series C IO modules:

Control Hardware Planning Guide EPDOC-XX23-en-431

Control Hardware Installation Guide EPDOC-XX21-en-431

Series C IO Users Guide EPDOC-X126-en-431

2.6 Process wiring techniques

In the planning stage itself, label field wiring with new module and channel identification prior to removal. Some IO modules have terminal blocks with friction fit connectors. Others have screw terminals. Determine if the field wiring is of appropriate size and length for the new module connections.

Cabling Considerations for Series C Components

FTE and IOLINK Cabling

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

Connecting IOMs and field devices through I/O Termination Assemblies

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

Grounding and power considerations - IOTA boards

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

Grounding requirements

See the section, 'Series C hardware configuration' of the *Control Hardware Planning Guide* for details.

Power entry guidelines for Series C cabinet

See the section, '*Selecting power entry accessories*' from the *Control Hardware Planning Guide EPDOC-XX23-en-431* document for details on how to supply AC line power wiring through Standard Power Entry or Optional Power Entry to the Series C cabinet power supplies and fan assemblies.

See the section, 'Install ELMM', and follow additional guidelines provided to ensure you have made adequate preparations for installing the new Series C cabinet.

All details related to precautions, recommendations, and wiring procedures are provided in the following user guides:

Control Hardware Planning Guide EPDOC-XX23-en-431

Control Hardware Installation Guide EPDOC-XX21-en-431

C300 Controller Users Guide EPDOC-XX11-en-431

Series C IO Users Guide EPDOC-X126-en-431

2.7 Unique hardware features

For information related to setting up FTE infrastructure for the ELMM system, see the following guides:

Fault Tolerant Ethernet Overview and Implementation Guide EPDOC-XX37-en-431

Control Hardware Planning Guide EPDOC-XX23-en-431

Control Hardware Installation Guide EPDOC-XX21-en-431

C300 Controller Users Guide EPDOC-XX11-en-431

Series C IO Users Guide EPDOC-X126-en-431

3. ELMM Installation

3.1 Overview

Disassemble and remove LM

Before ELMM installation can begin, you must disassemble existing LM equipment and safely transport it away from the site. Exercise caution to power down equipment – cabinet, card files, IOs, remote IO racks - and follow all instructions provided in this guide and the guides referenced herein when uninstalling LM equipment.

Label field wiring with new module and channel identification prior to removal. Some IO modules have terminal blocks with friction fit connectors. Others have screw terminals. Determine if the field wiring is of appropriate size and length for the new module connections.

Install ELMM

The hardware required to replace your existing LM with ELMM is factory built and shipped. Ensure proper cabling is done by trained technicians using appropriate equipment.

Based on your requirements, Honeywell's project engineer calculates the number of ELMM modules, C300s, CF9 switches, L2 switches, and IOs (mapped to equivalent IPC IO modules being replaced) required to replace your existing LM system. After gathering your requirement, the engineer designs a solution consisting of the appropriate hardware modules required and feeds the same to the TPC tool. This tool then generates a BOM which Honeywell uses to build the required ELMM solution.

You will receive a cabinet fitted with all the hardware. Install the cabinet at the planned location. Ensure proper cabling supplies rated power to the cabinet and equipment. Connect IOs and remote IO to the C300 controller as per plan.

3.2 LM Shutdown and Hardware Disassembly

After a plan to replace LM with ELMM is in place, begin to shutdown and disassemble LM hardware. The sequence of steps to power down and disassemble LM hardware is provided here.

Step	Action
1	Prepare the LM for shutdown. Record the existing UCN and UCN Network address information in the EUCN Configuration Data Checklist entries for NIMs.
2	Checkpoint LMs.
3	Record the switch settings of the existing LM for future reference.
4	Generate ladder logic files.
5	Generate UCN & Node specific EB files.
6	Shutdown LM from Native Window.
7	Power down LM hardware and remove wiring.
8	Remove card files and modules from the cabinet.
9	Remove the cabinet.

3.3 Preparing the LM for shutdown

Ensure the following checklist items are completed to prepare the LM for shutdown.

Item	Reference
Record the existing UCN and UCN Network address information for NIMs in the EUCN Configuration Data Checklist attached to this document.	
Checkpoint and take a backup of LM checkpoint files.	See Section 21 of Engineer's Reference Manual SW09-605 Checkpoint LM in this document for more details.
Checkpoint all LMs on the UCN and shut them down before shutting down the NIMs.	See Section 21 of Engineer's Reference Manual SW09-605
Record DIP switch settings on the existing LMs for future reference.	
Record the DIP switch settings on the Serial IO Module.	
Generate and save Ladder logic files.	
Generate and save UCN and Node specific EB files.	

Checkpoint LM

Data checkpointing is performed to maintain up-to-date device settings in the event a device is taken out of service. Prior to replacing LM with ELMM, checkpoint NIM and LM to save existing data.

The following diagram gives a snapshot of the checkpointing process.

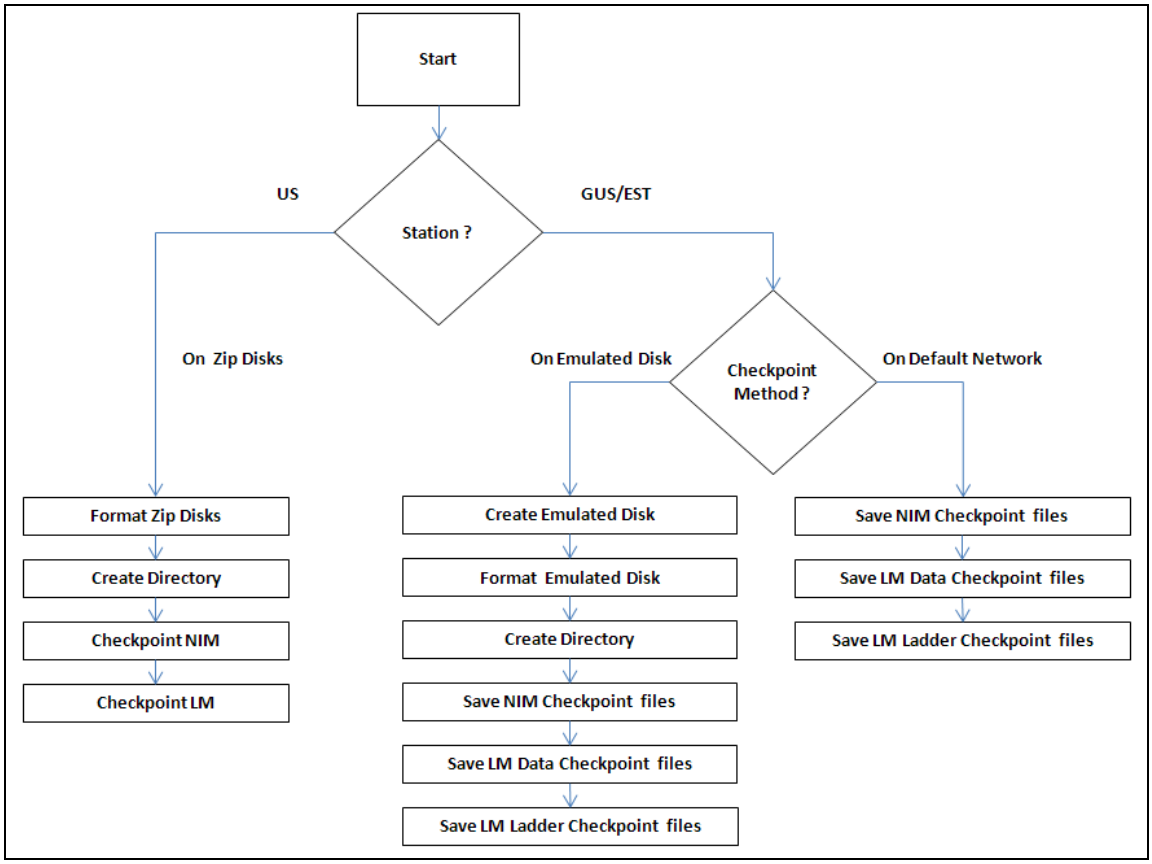


Figure 3-1: Overview of the checkpointing process

See Section 21 of the *Engineer's Reference Manual* for more details.

Record Current LM Card File Configuration

It is important you record the switch settings of the existing LM for future reference. Ensure you complete this activity before disassembling the LM hardware.

See *chapter 2* of the *LM Service manual LM13500* for information about switch settings on the LM card file.

Generate Ladder Logic files

Generate and save the following files before shutting down the LM.

- PRN file
- Label File
- Force List

See the *Data Entity Builder Manual SW11-611* and the *620 WinLoader, Version 5.4, User Manual* for additional information.

Generate UCN & Node specific EB files

See the *Data Entity Builder Manual SW11-611* for additional information about Print entities.

See Appendix D (for Exception Building) and Appendix E (for Creating Exception Build Files from IDFs) of the *System-startup-guide-cd-rom-sw11600* document.

3.4 Shut down LM

After checkpointing LMs and backing up ladder logic and EB files, proceed to shutdown LMs and disassemble the LM hardware and remove the cabinet. This section details procedures to shut down the LM system and remove the hardware and cabinet.

The following tasks must be performed in the given order for a safe and successful shutdown of LM hardware.

Step	Action
1	In case of a redundant LM processor, shutdown the backup LM processor from Native Window.
2	Shutdown primary LM processor from Native Window.
3	It is recommended you isolate power to IOs in the bottom-up order i.e., remove power to the IO card file at the bottom first, followed by the one above it and so on.
4	Isolate power to the secondary LM processor card file by disconnecting power cord from power source.
5	Isolate power to the primary LM processor card file by disconnecting power cord from power source.
6	Record switch settings of primary and secondary LM processor cards.
7	Record switch settings of SIOM/PLDM cards.
8	Isolate power to remote IOs and record switch settings of SIOM.

3.5 Shut down LM from Native Window

From an R6xx LCN station – for instance, US, GUS, ES-T, or PCUS, perform the following procedure to shut down the R6xx LM. For information about Displays see the *Logic Manager Service LM13-685* manual.

Step	Action
1	Depress the **<SYST STAT>** (System Status) key on the system console to invoke the System Status display.
2	Choose the NIM node in the display grid that the LM is resident on and then select the **NTWK/HWY STATUS** target to invoke the UCN Status display.
3	Choose the LM of interest on the display grid and then select the **DETAIL STATUS** target on the UCN Status display.

Step	Action
	For redundant nodes, perform steps 4 and 5. For a non redundant node, skip to step 6.
4	Choose the secondary LM (Status shows BACKUP) and then select **RUN STATES** target.
5	Choose the **SHUTDOWN** target and execute the command by selecting the **ENTER** target. The secondary LM enters the **ALIVE** state.
6	Choose the primary LM (Status shows OK) and then select **RUN STATES** target.
7	Choose the **IDLE** target and execute the command by selecting the **ENTER** target. The LM enters the **IDLE** state.
8	Choose the **SHUTDOWN** target and execute the command by selecting the **ENTER** target. The LM enters the **ALIVE** state.

3.6 Shut down LM

You can now proceed to shutdown the LM by isolating power to the LM hardware and cabinet.

Typically, the Logic Manager card files are installed in the single or dual access cabinets as depicted in the following diagram. The redundant IPC 620 processors sit at the top of the cabinet followed by the Serial IO card files underneath. Follow a bottom-up approach when isolating power to the LM system. Power is isolated to the bottom most IO card file followed by the one above it and so on. When isolating power to the IPC 620 processors, shut down the secondary processor before the primary. If remote IO racks are present, isolate power and remove the Serial Link cable.

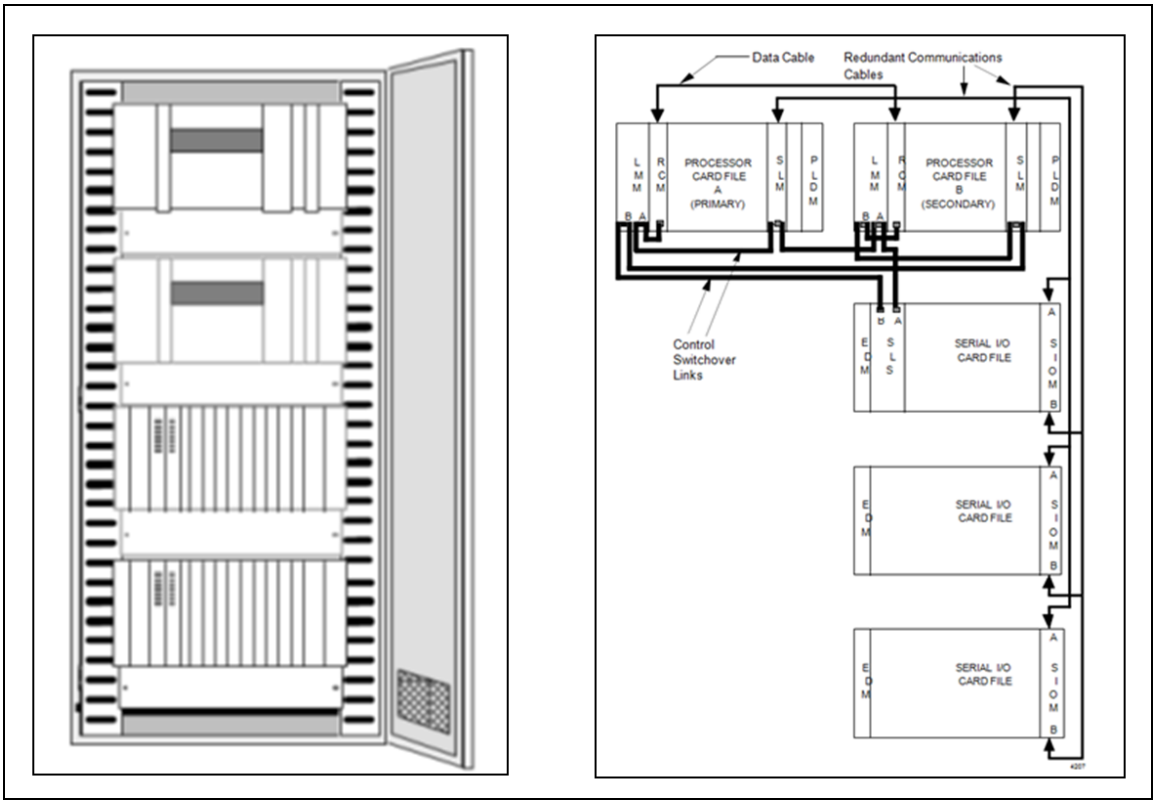


Figure 3-2: Arrangement of LM card files in LM cabinet showing typical IO connections

Assumptions and Cautions

Before you work on any electronic equipment, read and follow the safety guidelines to help protect the system from potential damage and ensure personal safety.

TIP

- Only qualified personnel must perform this upgrade.
- When disconnecting a cable, pull on its connector or on its strain-relief loop, not on the cable itself. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Ensure that both connectors are correctly oriented and aligned.

CAUTION: To guard against electrical shock, always turn off any electronic equipment before removing any covers or boards.

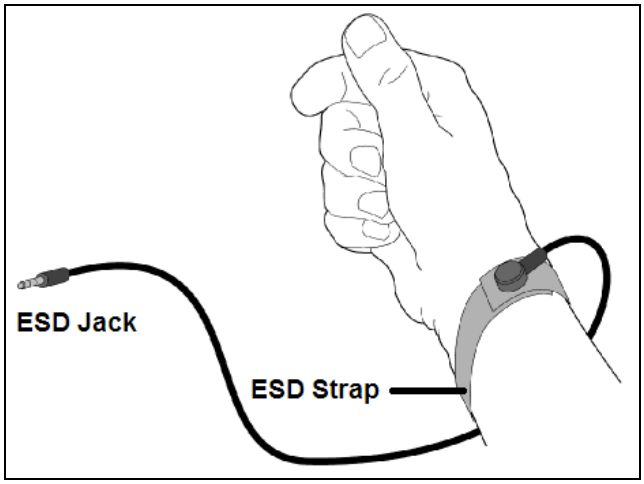
ESD HAZARD: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its mounting bracket.

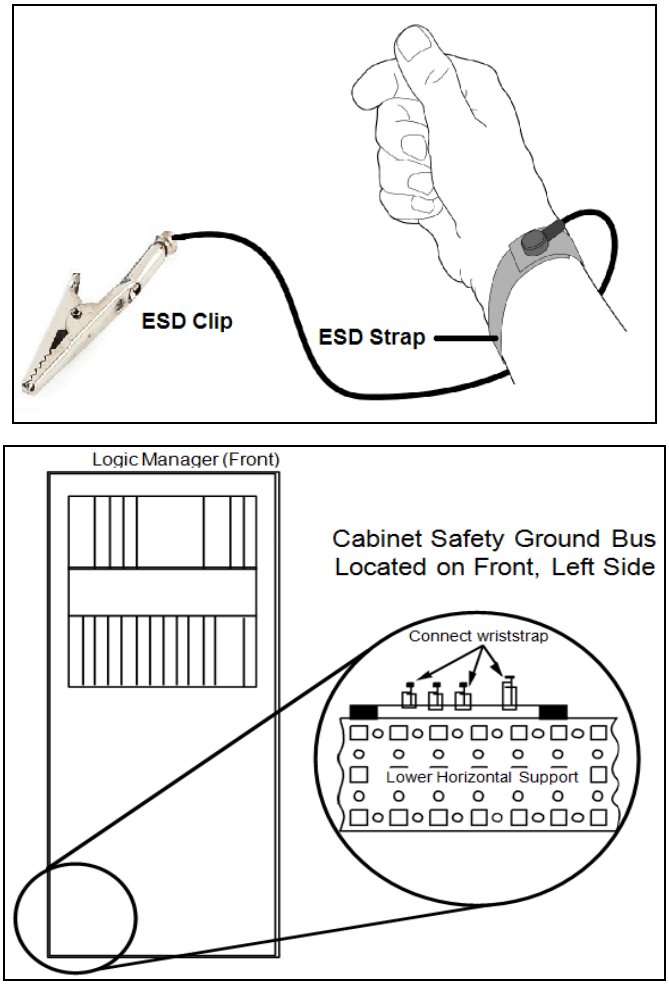
Electrostatic Discharge Protection

CAUTION

While removing, handling, and installing Logic Manager System components, it is extremely important that you wear an Electrostatic Discharge (ESD) wrist strap that is properly connected to ground. Be sure power to the equipment is off. Slip the strap on your wrist like a wristwatch and connect its clip to the ground bus located inside the front, left side of the cabinet.

Wearing an approved ESD wrist strap does not increase the danger of electrical shock.





ESD Wrist strap Connection in the Logic Manager Cabinet

Be sure to store any electronic component in a static-safe carrying pouch whenever it is not in use.

An ESD kit is available through Honeywell. Contact your Honeywell representative and ask for part number 30185-H.

3.7 Remove LM hardware

LM hardware removal can proceed in one of two ways.

1. Disassemble IO files from each IO card file and then remove the card files.
2. Remove the card files directly.

If you plan to reuse cables, tag them and safely store them so they can be identified.

Identify Components for Disassembly

- Logic Manager Processor Card File
- Logic Manager Redundant Processor Card File
- I/O Card Files
- Remote IO racks
- Power cables
- IO cables
- UCN cables
- UCN taps

Disassembly Procedure

Use the following procedure to disassemble the LM hardware.

Step	Action
1	Shut down power supply to the LM processor, LM redundant processor, and all IO racks (local and remote). TIP: Make sure no LED is lit up in any of the racks signifying power has been isolated from the racks.
2	Disconnect the power cables to remove power from the LM Processor card file, LM Redundant Processor card file, and I/O Card Files. 

Step	Action
3	Disconnect the I/O Link Interface cables from the card files. Note that some IO modules have terminal blocks with friction fit connectors while others have screw terminals. The I/O Link Interface cables can be reused. 
4	Remove any unused UCN drop cables, taps, and tap mounting brackets.  

Step	Action
5	Loosen, but do not remove the four screws holding the card file to its support. 
6	Grasp the card file firmly and lift it about 1 cm (1/2 in.) to release the file into your hands.
7	If you have remote IO racks, isolate power and remove the Serial Link cable.

3.8 Remove Module

Use the following procedure to remove the Logic Manager System module.

Step	Action
1	Remove power from the Logic Manager processor card file by placing the power breakers in the off position. **WARNING**: Do not use the power supply module fuse as a means of disconnecting power from the card file. Each card file must have its own individual circuit breaker for this purpose.
2	Before removing a Logic Manager System module, connect your ESD wrist strap to the cabinet ground bar, or if the equipment is panel mounted, connect your ESD wrist strap to the panel ground.

Step	Action
3	Cabling must first be disconnected from the front of the module to be removed. The connection method varies. Power supply module cable disconnection requires the removal of individual wires from its terminal strip. Control modules are connected to cables with friction fit connectors, requiring a small amount of pulling force to release the cable. Figure 3-3 through Figure 3-7 show various typical system cable configurations for both redundant and non-redundant serial or parallel I/O. The I/O point modules in the I/O card file employ terminal block connectors which pivot away from the front of the module and thereby eliminate the need to disconnect each individual terminal block wire. a. I/O modules may be removed from an I/O card file while power is applied to the card file IF: i. The I/O system is a serial I/O configuration. ii. A 621-9938R SIOM is used in each of the I/O car files. iii. the I/O module has an “R” suffix in the model number
4	Modules are released and removed by two different methods. Five modules, those behind a five module wide metal cover plate on the Processor card file, are removed by simultaneously pulling on the upper and lower extractor levers. The metal cover plate is first removed by loosening the four thumbscrews that hold the plate in place. All other modules are removed by loosening their thumbscrews and pulling the module gently forward. Very little force is required.
5	When the module is free from its connector, carefully slide it out on the card rails and into your hands. Immediately place the module in a static safe pouch for transport.

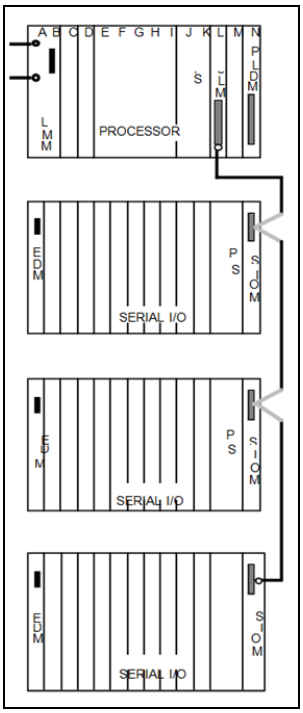


Figure 3-3: Nonredundant Single Channel Serial I/O Multidrop Cable Configuration

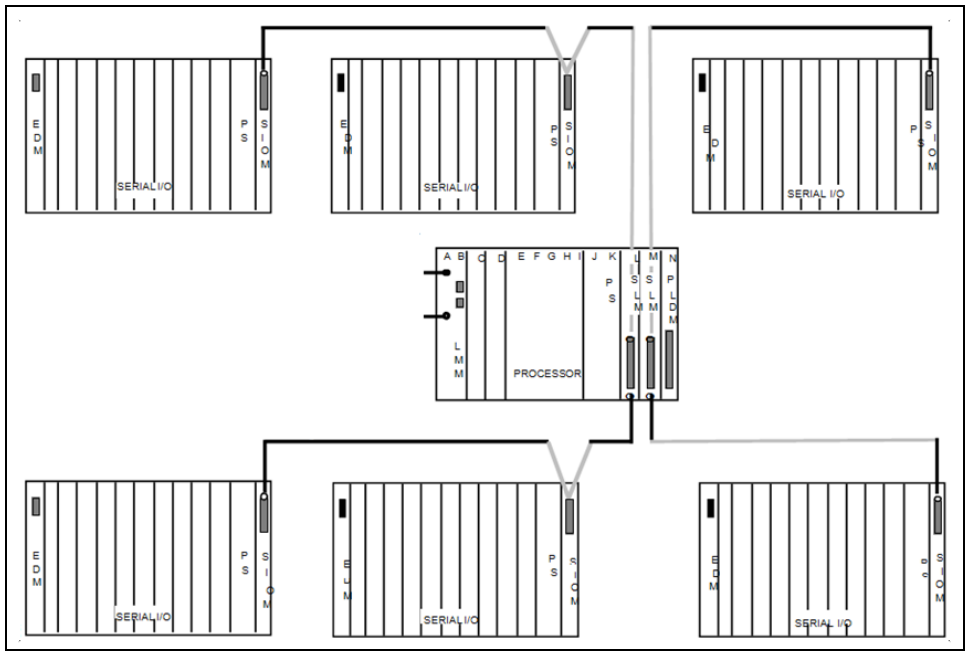


Figure 3-4: Nonredundant Four Channel Serial I/O Multidrop Cable Configuration

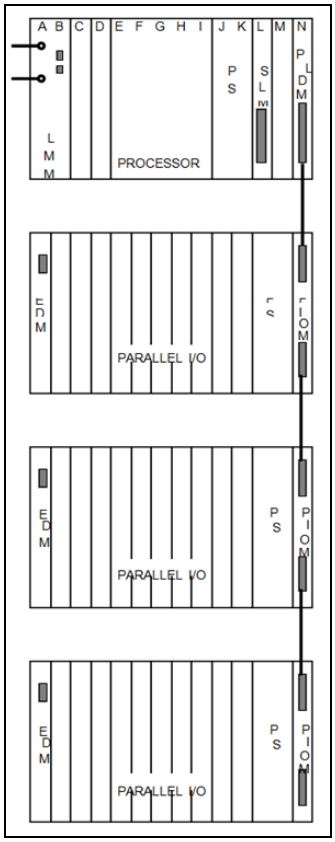


Figure 3-5: Nonredundant Parallel I/O Cable Configuration

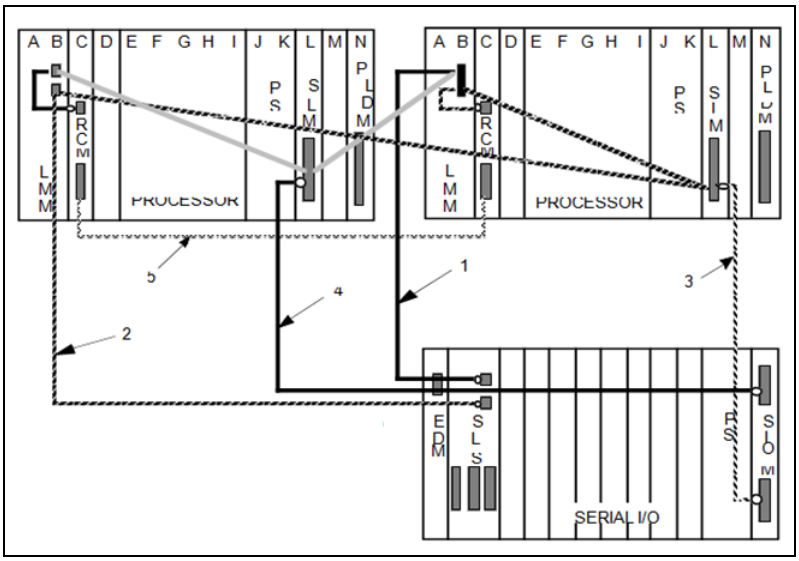


Figure 3-6: Redundant Serial I/O Cable Configuration

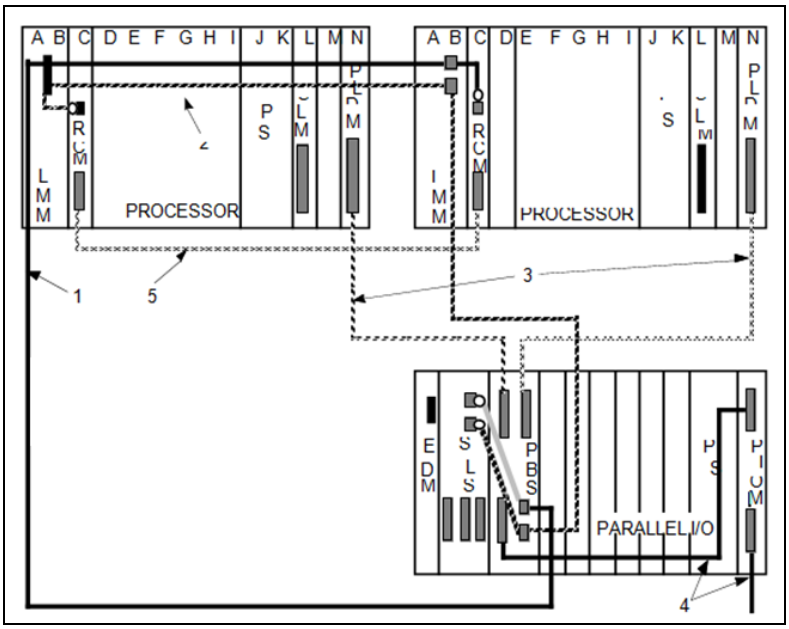


Figure 3-7: Redundant Parallel I/O Cable Configuration

3.9 Remove Card File

Use the following procedure to remove the card file.

Step	Action
1	Remove power from the equipment.
2	Disconnect all cables attached to the card file modules.
3	Loosen, but do not remove the four screws holding the card file to its support.
4	Grasp the card file firmly and lift it about 1 cm (1/2 in.) to release the file into your hands.

3.10 Remove Cabinet

See the section, ELMM Planning and Design, and read the following additional guidelines to ensure you have made adequate preparations for installing the new Series C cabinet to house the ELMM hardware.

- You will be replacing one of four existing LM cabinets [MU-CBSM01, MU-CBDM01, MU-CBSX01, MU-CBDX01] with one of two new Series C cabinets [CC-C8SS01, CC-C8DS01]. See the section, 3.12 Replace LM cabinet with Series C cabinet, for variations in size of the cabinets being replaced.
- Perform a space assessment to ensure you have adequate space for the new cabinet.
- Use the tips provided for wiring changes provided in the engineering guidelines document to ensure power, grounding, IO cabling, and other safety precautions are followed before isolating power to the cabinet and moving it.

3.11 Install ELMM

This section provides information about cabling and connecting the ELMM hardware. IO and Marshaling cabling information is not in the scope of this document. The ELMM configuration you ordered is assembled and mounted in the cabinet by Honeywell.

After you have selected a suitable location for your system equipment, use the following checklist to monitor the events that must occur prior to the actual delivery and installation of your system.

Event	Completed?
Determine the requirements, if any, of additional electrical power, power conditioning, or grounding; arrange for its installation.	
Determine the locations, pathways, and types of communications data-lines; arrange for their installation.	
Implement Electrostatic Discharge (ESD) and ElectroMagnetic Interference (EMI) reduction measures.	

Assumptions and Cautions

Before you work on any electronic equipment, read and follow the safety guidelines to help protect the system from potential damage and ensure personal safety.

TIP

- Only qualified personnel with working knowledge of C300 controllers must perform this upgrade.
- When disconnecting a cable, pull on its connector or on its strain-relief loop, not on the cable itself. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Ensure that both connectors are correctly oriented and aligned.

CAUTION: To guard against electrical shock, always turn off any electronic equipment before removing any covers or boards.

ESD HAZARD: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its mounting bracket.

Installation Tools

See the *C300 Controller Users Guide EPDOC-XX11-en-431A and Control Hardware Planning Guide EPDOC-XX23-en-431*for a list of tools you will need to install hardware.

Overview of Tasks

Based on your requirement, the Series C cabinet factory-fitted with ELMMs and IO modules will be delivered. However, if you choose to install the hardware yourself, the following tasks, in the order prescribed, must be performed.

Task	Go to:	Done?
Replace LM cabinet with C300 cabinet	Replace LM cabinet with Series C cabinet (CC-C8DS01, CC-C8SS01)	
Install the carrier adapter assembly is in the Series C cabinet	*Control Hardware Planning Guide EPDOC-XX23-en-431* *C300 Controller Users Guide EPDOC-XX11-en-431*	
Mount the CF9 IOTAs on the backplane	Control Firewall User's Guide *Control Hardware Planning Guide EPDOC-XX23-en-431* *C300 Controller Users Guide EPDOC-XX11-en-431*	
Mount the C300 and ELMM IOTAs on the backplane	*C300 Controller Users Guide EPDOC-XX11-en-431*	

Task	Go to:	Done?
Mount the Series C IOTAs on the backplane	*Series C IO Users Guide EPDOC-X126-en-431* *Control Hardware Planning Guide EPDOC-XX23-en-431*	
Mount the backplane on the carrier in the cabinet	*C300 Controller Users Guide EPDOC-XX11-en-431*	
Mount the CF9 module on the CF9 IOTA	Control Firewall User's Guide *Control Hardware Planning Guide EPDOC-XX23-en-431*	
Mount the RAM battery backup assembly on the carrier	*C300 Controller Users Guide EPDOC-XX11-en-431*	
Mount the C300 module on the C300 IOTA	*Control Hardware Planning Guide EPDOC-XX23-en-431*	
Mount the Series C IO on the Series C IOTA	*Series C IO Users Guide EPDOC-X126-en-431* *C300 Controller Users Guide EPDOC-XX11-en-431*	
Series C cabinet Cabling	*Control Hardware Planning Guide EPDOC-XX23-en-431*	
Series C components Cabling	*Control Hardware Planning Guide EPDOC-XX23-en-431*	
Power and Grounding requirements	*Control Hardware Planning Guide EPDOC-XX23-en-431*	

3.12 Replace LM cabinet with Series C cabinet (CC-C8DS01, CC-C8SS01)

Follow the guidelines mandated at your site for replacing the LM cabinet with the new Series C cabinet. There is a minor variation in the dimensions of the cabinets being replaced. Ensure you have taken adequate care to house the new cabinet in a safe and accessible location.

See the 'Site selection' section for more information.

Detailed information about preparing the site, transporting and installing Series C cabinets is provided in the *Control Hardware Planning Guide EPDOC-XX23-en-431*.

3.13 Install ELMM hardware

The ELMM module shares the same hardware capabilities and form factor as the C300 controller. Use the same instructions provided in the section C300 Controller installation and upgrades of *C300 Controller Users Guide EPDOC-XX11-en-431* to complete installing the ELMM module.

See Figure 2-3: Sample topology of a small Experion network with ELMM and C300 connected to the same CF-9 switch pair

See Figure 2-4: Sample topology of a large Experion network with ELMM and C300 connected to separate CF-9 switch pairs

Connect FTE cables to CF9 Ethernet switches

Perform the steps outlined here to connect FTE cables to CF9 Ethernet switches.

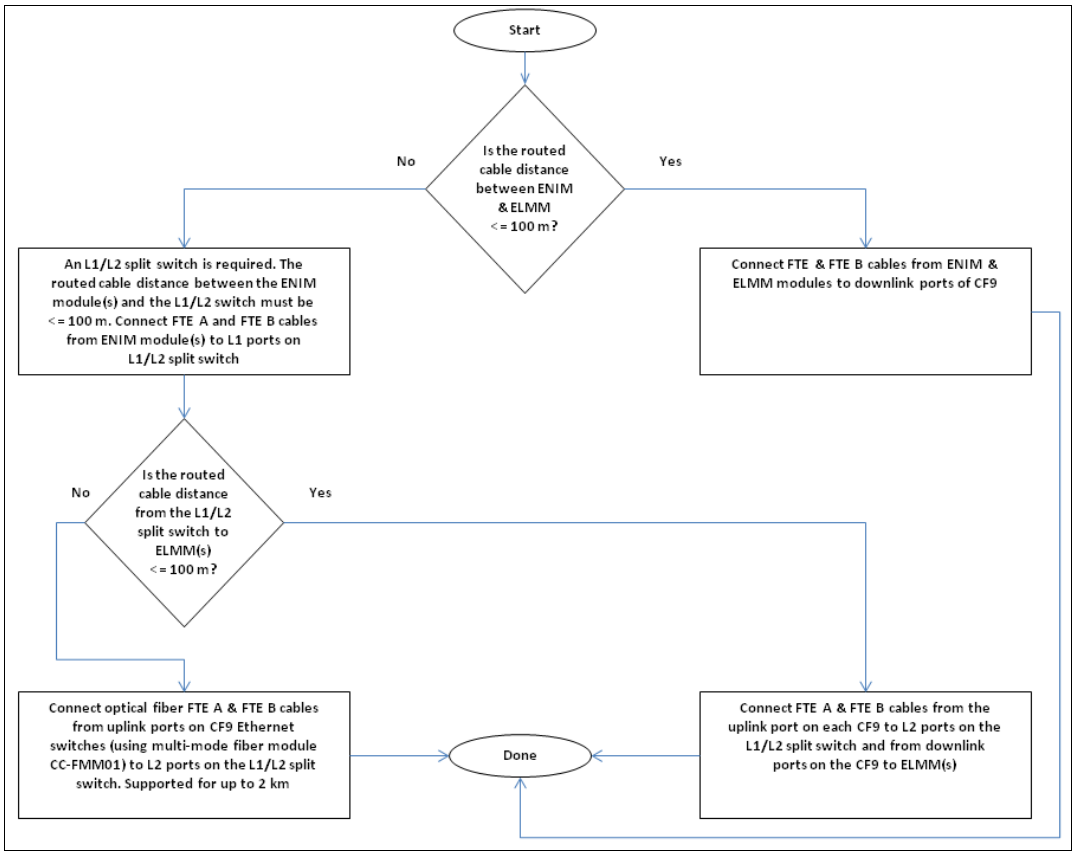


Figure 3-8: Logic diagram to connect the FTE cables to the CF9 Ethernet switches

Ensure that the connectors are plugged in straight and there is no strain on the cable.

	REFERENCE - EXTERNAL For information about specification and installation of copper and fiber optic cabling to support FTE systems, refer to FTE Cabling Best Practices (WP-07-01-ENG).

3.14 Provide strain-relief to FTE cables

You must provide proper strain-relief to the FTE cables that are connected to the Ethernet switches. Not providing adequate strain relief to the FTE cables can cause intermittent connections.

The FTE cables must be of an appropriate length. Ensure that there is sufficient cable length to provide the minimum required bend radii. However, excess cable length must be minimized such that it is easy to manage inside the FTA tray cable channel.

For more information, see the *Experion Network Best Practices* and the *HPM to EHPM Upgrade Kit Instructions*.

Series C Cabinet Cabling

The following graphic is an example of a possible configuration connection in the Series C cabinet. Your configuration may vary based on the module layout of your cabinet.

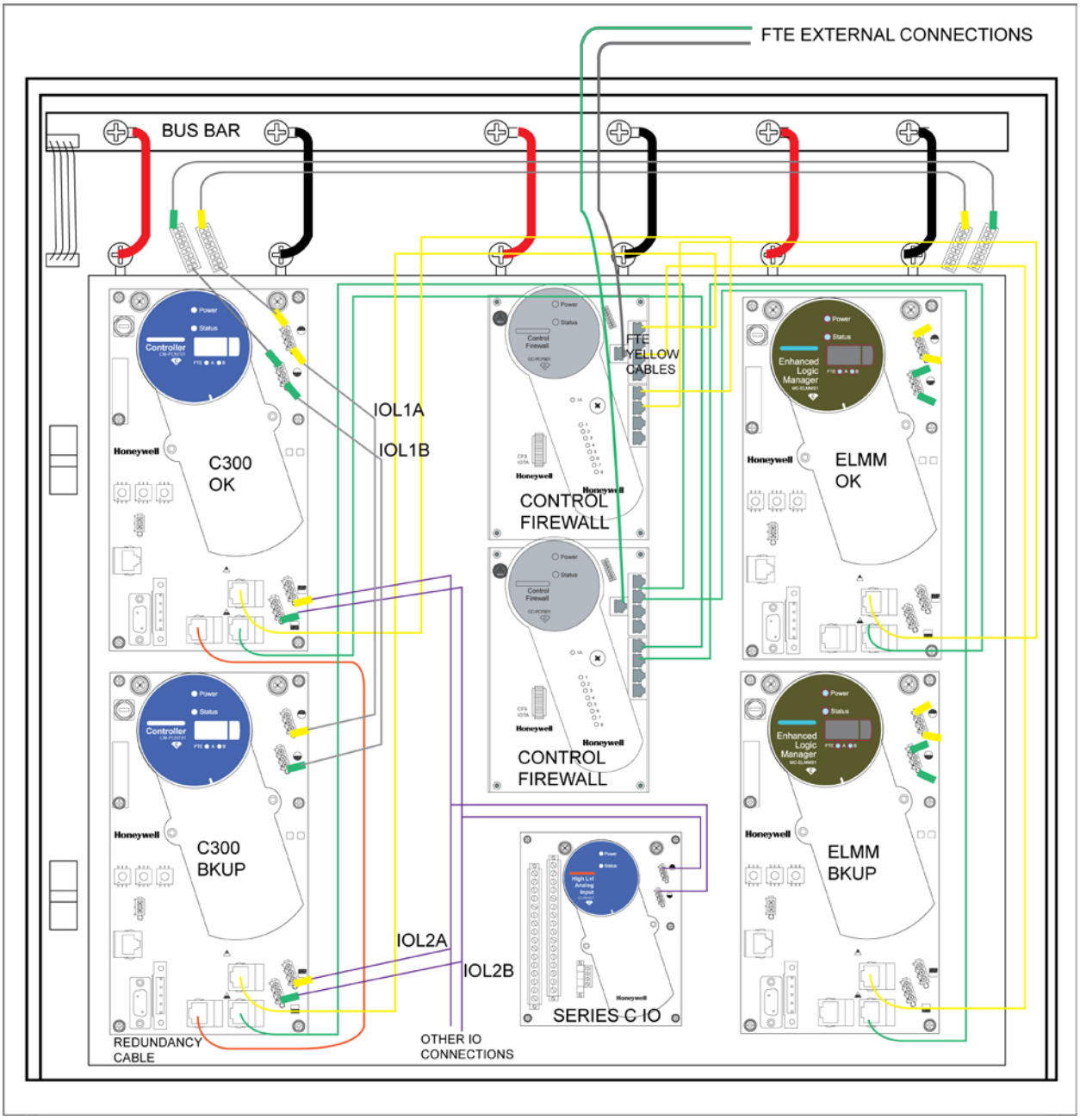


Figure 3-9: Series C cabling

The following table defines cable type and usage in the following graphic.

Cable	Color	Purpose
FTE –A	Yellow	Connect controller to firewall (point-to-point)
FTE – B	Green	Connect controller to firewall (point-to-point)
FTE - Redundant	Orange	Private path between primary and secondary controller (point-to-point)
IOL1A	Grey/yellow	Connect controller to I/O
IOL1B	Grey/green	Connect controller to I/O
IOL2A	Violet/yellow	Connect primary controller to secondary controller and then to I/O
IOL2B	Violet/green	Connect primary controller to secondary controller and then to I/O

3.15 Cabling Considerations for Series C Components

Installation Declarations

ATTENTION

This equipment shall be installed in accordance with the standard requirements such as National Electrical Code (NEC), ANSI/NFPA 70, or the Canadian Electrical Code (CEC), C22.1. It is supplied as "open equipment" that is intended to be mounted on a sub-panel within an enclosure. The suitability of the enclosure and installed system shall be acceptable to the local "authority having jurisdiction," as defined in the NEC, or "authorized person" as defined in the CEC.

ESD HAZARD

Electrostatic discharge can damage integrated circuits or semiconductors if you touch connector pins or tracks on a printed wiring board.

- Touch a grounded object to discharge static potential
- Wear an approved wrist-strap grounding device
- Do not touch the wire connector or connector pins
- Do not touch circuit components
- If available, use a static safe workstation
- When not in use, keep the component in its static shield box or bag

WARNING

Unless the location is known to be non-hazardous, do not:

- Connect or disconnect cables
- Install or remove components
- Install or remove isolators

While the control system is powered.

FTE and IOLINK Cabling

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

Connecting IOMs and field devices through I/O Termination Assemblies

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

Grounding and power considerations - IOTA boards

See the section Series C hardware configuration of the *Control Hardware Planning Guide* for details.

3.16 Grounding requirements

See the section, 'Series C hardware configuration' of the *Control Hardware Planning Guide* for details.

Power entry guidelines for Series C cabinet

See the section, '*Selecting power entry accessories'* from the *Control Hardware Planning Guide EPDOC-XX23-en-431* document for details on how to supply AC line power wiring through Standard Power Entry or Optional Power Entry to the Series C cabinet power supplies and fan assemblies.

See the section, 'Install ELMM', and follow additional guidelines provided to ensure you have made adequate preparations for installing the new Series C cabinet.

3.17 EUCN installation

This section provides references to documentation available for installing the hardware and software for completing the EUCN installation.

Hardware

For hardware installation procedures and cabling information, see the following documents.

For information about	Refer
Topology	Network Planning section of this document.
FTE network and planning	Section 8 and 9 of Universal Control Network Planning UN02501 R684
Cabling information	Section 2.6 to 2.13 of Universal Control Network Installation UN20500 R684
EUCN Power-On Test	Section 5.6 of Universal Control Network Installation UN20500 R684
Ethernet switch installation & configuration	Section 16 and 17 of TPN System Installation SW20600
CF9 Switch installation	Section 7.10 of HPM Installation HP20600 R685

CF9 uplink cable connection

Use the ninth port on the CF9 to provide an uplink to the supervisory FTE network and level 2 control. Also see Fig 2-2 of *Universal Control Network Installation UN20500* document.

Redundant ELMM considerations

Connect both ELMMs to the same CF9 pair.

Primary ELMM must be configured with an odd number between 1-509. Secondary will be the following even number.

Note: Third port redundancy is not supported by redundant ELMM modules.

4. ELMM Configuration and Operations

4.1 Pre-configuration checklist

Use this checklist of items to complete tasks before beginning ELMM configuration.

Step	Task
1	The supported software and firmware versions are installed and running. **Software** TPN R685.3 or later. See the *Customer Release Guide CRG-685* for more details. **Firmware** • ULM 301.13 o ENIM boot firmware: EPNI2_3.0 o ELMM boot and app firmware: ELMM_100.17.0 Use Ctools to verify and ensure this version is installed. o CF9 firmware version: Minimum JJ ELMM firmware file is included in the ULM media. By default, the firmware files for ELMM are located at: o For a 64-bit machine: *Computer\C:\Program files (x86)\Honeywell\Experion PKS\Engineering Tools\system\Firmware\EUCN\ELMM*. o For a 32-bit machine: *Computer\C:\Program files\Honeywell\Experion PKS\Engineering Tools\system\Firmware\EUCN\ELMM*. • Ctools: R410.1.85.315 (R410 patch)/R430.1-92.0 (R430 patch)/R431.1.31.0 to update the ELMM firmware. See *Section 7* of *Experion Control Hardware and I/O Modules Firmware Upgrade Guide* for more details. • Use Control Firewall Firmware Update Tool to update the Control Firewall firmware. See *Section 7.11* of the HPM Installation HP20600 R685 guide to update the Control Firewall firmware. **Experion** R410.1/R430.1
2	Ensure LM checkpoint backup is present.
3	Complete configuration of Series C IOs.
4	Check cable connections.

4.2 Configuration overview

After installing the hardware, you are now ready to power up the ELMM hardware and perform the configuration. This section provides information about providing Ethernet IP addresses, powering up ELMM, performing diagnostic checks, and configuring ELMM. The major tasks involved in configuring ELMM are as follows.

Step	Task
1	Startup Experion Server and BOOTP server.
2	Power on ENIM and ELMM.
3	Perform hardware diagnostics tests.
4	Load the redundant/non-redundant ELMM with LM personality and database.

4.3 Startup Experion Server/ESVT Node and BOOTP server

BOOTP server

The BOOTP is a low-level protocol that provides configuration to other nodes on a TCP/IP network with the Windows operating system. The BOOTP configuration files let you automatically assign IP addresses to the Ethernet module. You can also obtain subnet masks and gateway addresses from BOOTP.

Ensure BOOTP Server service is running. See *section 4.2.2* of the *Fault Tolerant Ethernet Bridge Implementation Guide EPDOC-XX35-en-431* for details about starting the service in case it is not running.

The Ethernet module factory default setting is BOOTP enabled. Upon power up, the Ethernet module sends a message to the BOOTP server on the network with its physical (or MAC) address. The server compares the MAC address to those in its look-up table in the configuration file and sends a message back to the module with the appropriate IP address.

Base IP address

The base IP address consists of the following:

- The first number in the address represents the network number.
- The second number in the address represents the community number.
- The third number is user-defined.
- The last number represents the Device Index of the embedded node which is usually 0.

The IP address consists of the base IP address + device index (configured on the rotary switches of the node).

- For ELMM/C300, the rotary switches are located on the ELMM/C300 IOTA.

CAUTION

Changing the base IP address of BOOTP server and rebooting the ELMM/C300 results in a mismatch in the base IP address settings. This mismatch might result in a loss of view to the EUCN nodes.

- A valid Device Index has a range from 1-509.

TIP

If a board obtains an IP address from a BOOTP server, then that IP address is retained in memory. The IP is maintained even if the server is not present on subsequent reboots.

If the default IP address in the BOOTP server is changed or if the Device Index is changed on the node, then the IP is overwritten on node reboot.

To clear the IP information from memory, set the device index to 0.

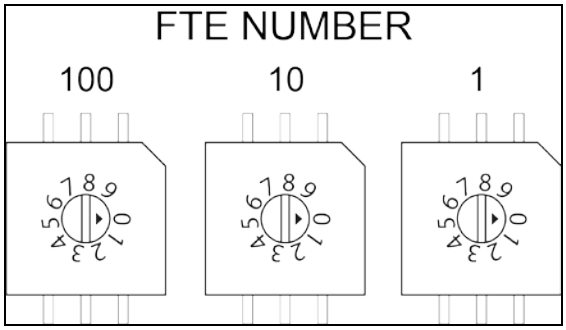
ELMM & C300 Device Index setting

The first three octets of the IP address for ELMM and C300 are provided by the BOOTP server. The fourth octet is set using the Device Index Setting on the C300/ELMM IOTA and the Station's Engineering Main Menu.

Provide the device index setting for ELMM and C300 modules on the IOTA (hardware setting) and also on the Station's Engineering Main Menu (soft setting).

Rotary Switch setting (hardware setting)

Set the Device Index (FTE DEVICE INDEX) of the controller according to the site documentation by turning the three rotary decimal switches located on the IOTA board. Set the switches to the three digit address ranging from 001 to 509. The leftmost switch (100) is used to set the hundreds digit. The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit.



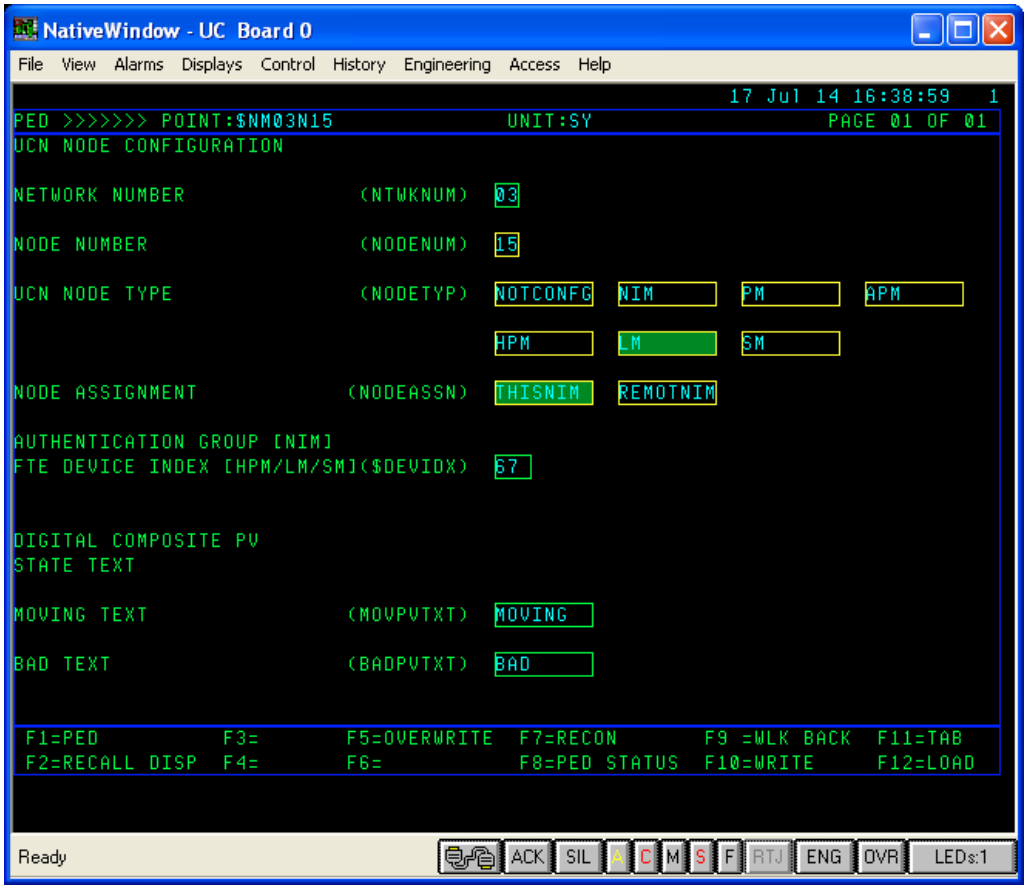
The Device Index of all non-redundant C300 controllers and ELMMs (primary C300 controllers and primary ELMMs in case of redundant topology) must be an odd number address.

Note: The FTE DEVICE INDEX setting on the switches should match the Device Index number entered on the Station's Engineering Main Menu.

Configure UCN node

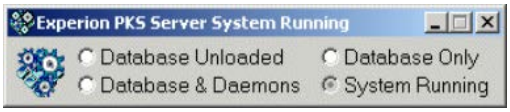
To set the device index from the Station's Engineering Main menu:

Step	Action
1	On the Engineering Main menu, click **Network Interface Module**.
2	Click **UCN Node Configuration**.
3	Specify the **FTE Device Index ($DEVIDX)** setting. This must be the same odd numbered address you entered on the ELMM's IOTA as described in the previous section.

Step	Action
4	Press **Ctrl + (F12)** on the key board to load the changes. 

Ensure Experion Server is running

To start the Experion server:

Step	Action
1	Choose **Start** > **All Programs** > **Honeywell Experion PKS** > **Server** > **Start-Stop Experion Server**. The Experion PKS Server dialog box appears.
2	If the Experion Server dialog box appears in simple mode, click the icon to the left of the title bar, and choose **Advanced** > **Full**.
3	Ensure the Experion server is running. 

4.4 EUCN Connection

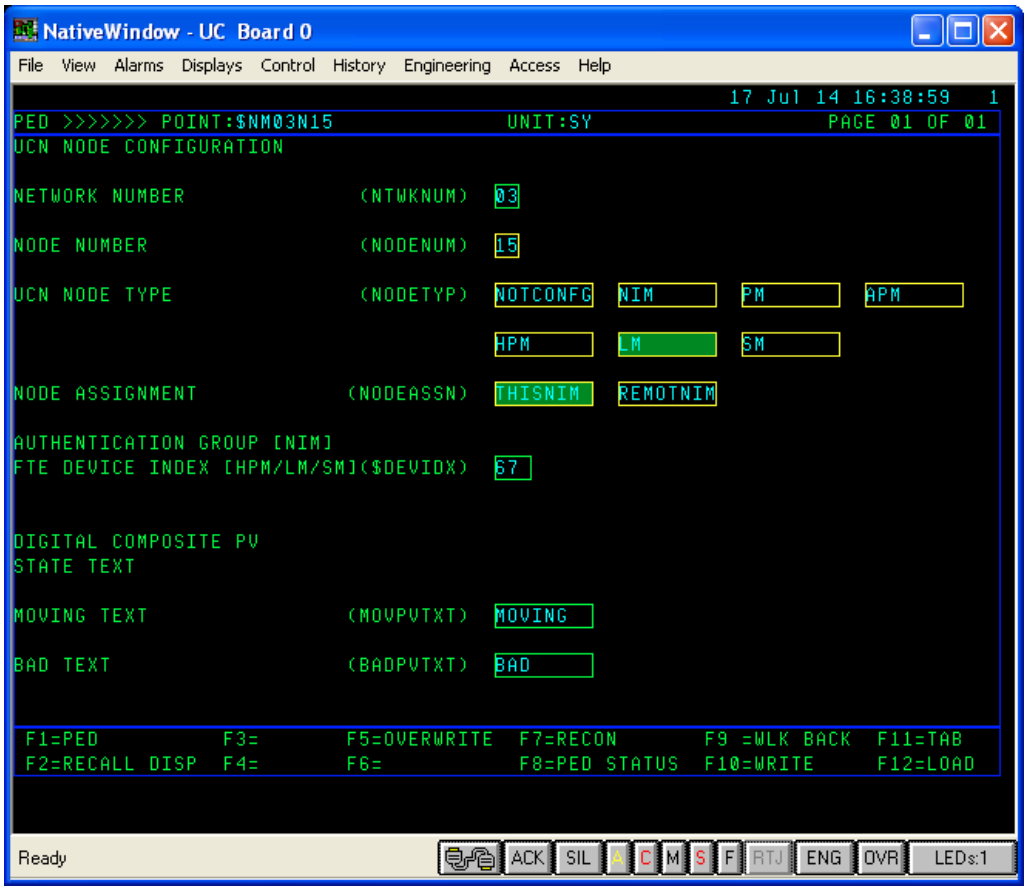
This section describes the procedure for connecting ELMM, non-redundant or redundant, to the Enhanced Universal Control Network (EUCN).

UCN Node Address Selection

With ELMM, DIP switches are no longer used to provide the node address. Instead, you can set the node address from the Station's Engineering Main menu.

To specify a node address:

Step	Action
1	On the Engineering Main menu, click Network Interface Module.
2	Click UCN Node Configuration.
3	Specify the following details to configure the UCN node: • Network Number • Node Number • UCN Node Type. Select LM • Node Assignment – Select ThisNIM • Device Index from rotary switch setting
4	Press Ctrl + (F12) on the key board to load the changes.

Step	Action
	
To modify a node address:	
1	Reboot LMM.
2	Set the UCN node number using the same procedure as Specifying a node address.

4.5 Power on ELMM

ELMM start up

The ELMM module executes a series of tasks automatically when power is applied to the controller module. These tasks include:

- Power-On Self Test (POST) to verify the presence and integrity of the controller module hardware.
- Initialization of the hardware and software environment
- Determination of whether to transition to the application image, if present.

The following table summarizes the controller start up activity and execution of the POST upon power up. Figure 4-1: ELMM Startup and Boot Mode indications illustrates the startup routine and Boot mode controller states.

Step	Action
1	The ELMM Power LED lights upon insertion of the module onto a powered IOTA board.
2	The ELMM boots up using firmware installed in the flash memory. (Initial firmware boot image is installed in the factory.)
3	A Power-On Self Test (POST) is performed as part of the ELMM start up. Controller display shows T*nnn*, where *nnn* indicates the number of the test currently being executed during POST.
4	The Status LED briefly shows all of its colors (Red, Green, Orange), and then remains solid Red until POST completes.
5	The four-character display walks through a series of horizontal and vertical bars, as well as several brightness levels. Once completed successfully, the display indicates the progress of the POST. See "ELMM faceplate indicators/displays" for a complete listing and description of the controller's status indications and displays.
6	Progress of the POST is shown on the ELMM's faceplate display. If a fault occurs during POST, the test halts and the display shows the test number (T*nnn*) associated with the detected fault. Corrective Action: If a fault occurs and halts the POST, then reset the controller and allow the POST to execute once more. If the fault persists, then replace the failed controller module.
7	If no faults occur, POST continues to execute. Upon completion of POST, the ELMM determines whether to transition to boot mode or application mode. If a valid application image is present in the ELMM, then it is started in application mode, unless the controller has been commanded to shutdown, or is rebooted into the FAIL state. The Status LED indicates the state of the controller's associated hardware.
8	The controller indicates '-bp-' on its display while it waits for a response from the BootP server service. The BootP server supplies the ELMM its IP Address assignment and SNTP Server IP addresses. If no response is received from the BootP server in 2 minutes, the ELMM will timeout. Once the ELMM receives a response from the BootP server, '-TS-' is indicated on the display while it waits for a response from the configured time source. If the configured time source is not available, the controller will attempt to connect with an alternate time source.

Step	Action
9	Action: Verify the correct Device Index is shown on the display (#nnn) and that there are no address errors. Address errors - The ELMM determines if any other module in the FTE network is using the same Device Index. If another module is discovered with the same Device Index, the ELMM will not join the FTE network but instead will enter the "no address" state and wait for a new Device Index to be set. If another node is discovered with the same IP Address, the controller will not join the FTE network but instead will enter the "dup address" state and wait for a new Device Index to be set. Action: If the Device Index is invalid, or any address error is displayed, see Reset Device Index and IP address of a controller on from the *C300 Controller User's Guide* and follow the procedure to reassign the Device Index and IP addresses. Once a valid IP Address is assigned, a redundant ELMM negotiates its redundancy role (primary/secondary) with its partner module. See Stage 10.
10	The ELMM alternately displays its Device Index, redundancy role and execution state on the controller's faceplate display. Redundancy role - '**nrdn**' may appear on the display to indicate that the ELMM's redundancy role has not been determined. For non-redundant controllers, the redundancy role is shown as '**nrdn**.' Secondary controller first displays '**nrdn**' until its redundancy role is determined. Once determined the secondary controller indicates it is an unsynchronized secondary or synchronized secondary. The secondary controller also shows the controller's execution state, which is '**BKUP**.'

The following illustrates the ELMM startup routine and the possible ELMM states when it is in the Boot mode.

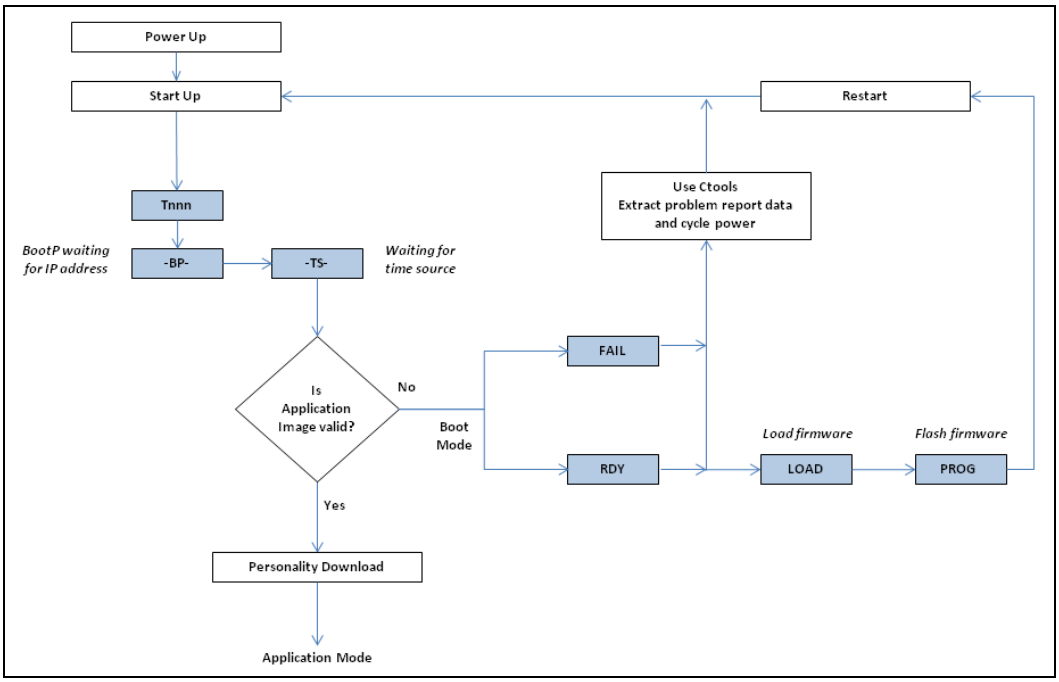


Figure 4-1: ELMM Startup and Boot Mode indications

ELMM states in boot mode

At the conclusion of POST, the ELMM determines whether or not there is a valid Application Image present in the controller and whether it should then transition to executing this Application image (Application mode) or to continue in the Boot mode.

- If the controller remains in the Boot mode, the controller then enters one of the states listed in Controller in Boot mode table and joins the FTE network on which it resides. See Display indications when controller is in boot mode table for a description of the faceplate indications when the controller is operating in the boot mode.

- If the controller transitions to the Application mode, the controller then joins the FTE network and enters one of the operating states described in ELMM in Application mode table.

ELMM State	Description
READY	The controller received a command to remain in the boot mode to allow upgrading ELMM Controller firmware. See the section, Upgrading ELMM Controller firmware in the *C300 Controller User's Guide* for more details.
FAIL	The controller detected a failure during startup. Use the CTools utility to retrieve problem report logs from the controller for failure diagnosis.

ELMM states in application mode

The following table describes the controller states of the ELMM after it transitions to the application mode after the LCN personality download. See Faceplate display information for a description of the faceplate indications when the controller is operating in the application mode.

ELMM State	Description
ALIVE	The controller determined that application image exists and is waiting for personality image to be loaded. You can perform an ELMM controller firmware upgrade from this state, if required, as given in the section, Upgrading ELMM Controller firmware in the *C300 Controller User's Guide*.
IDLE	The ELMM is configured as non-redundant or as redundant and has assumed the primary redundancy role. And… Has retained a valid database from operations prior to startup
OK	The ELMM is configured as non-redundant, or as redundant and has assumed the primary redundancy role, And… Has retained a valid database from previous operations prior to startup
BKUP	The ELMM is configured as redundant and has assumed the secondary redundancy role. The ELMM moves to the BACKUP state.

See the section, Communications and system time faults during startup in the *C300 Controller User's Guide* for details on abnormal startup conditions in the ELMM/C300 controller due to communication and system time faults. Corrective actions are provided to clear these conditions.

ELMM faceplate indicators/displays

The faceplate of the ELMM contains four LEDs and a four-character alphanumeric display as shown in the following figure. The labels on the LEDs are: Power, Status, FTE A and B.

The Status LED uses a 3-color scheme of red, green and orange. Generally, green indicates OK, red indicates power up tests, a fault or failure, and orange indicates backup mode. Blinking LEDs indicate a soft or hard failure and help to point to a problem. Soft failures also are indicated in other displays throughout the system. The four-character display provides additional controller status information, see Faceplate display information. Directly below the display are two LEDs that indicate FTE activity.

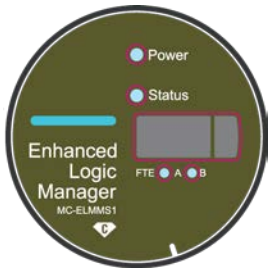


Figure 4-2: ELMM faceplate features

Power and Status LEDs

LED Indication		Status/Description
Power LED		
	GREEN Steady	Indicates the presence of 24Vdc to the controller module.
Status LED		
	GREEN Steady	Non-redundant controller OK Primary controller OK (primary and backup controllers may or may not be synchronized)
	ORANGE Steady	Backup OK (controllers synchronized)
	ORANGE Blink off once per second	Backup OK with Soft Failure (or controllers are not synchronized)
	RED steady	Self test (POST) in progress, or Self test has failed, Fault (hardware or software diagnostic failed), or Hardware Watchdog Timer expired

	RED Blink off once per second	Operating in BOOT mode: Ready state - (RDY on faceplate display) Operating in Boot firmware, IP address assigned, primary address in use. Valid application image loaded.	
		AND faceplate display is blank.	Hardware Watchdog Timer expired.
		AND faceplate display is frozen.	Indicates unrecoverable fault.
		AND display is - frozen or blank	Unknown fault.
	RED Blink off once per 1/4 second (i.e. 1/4 sec ON, 1/4 sec. OFF)	AND faceplate display shows: LOAD or PROG	Indicates: Firmware download in progress.
		AND faceplate display is blank.	Indicates: Hardware Watchdog Timer expired or other major fault.
	OFF (a blank or frozen display)	AND faceplate display is frozen or blank.	Indicates: Fault (Hardware watchdog timeout or hardware failure)

Faceplate display information

The four-character display on the ELMM faceplate shows a variety of information depending upon the controller state and status:

During controller power-up, the display indicates the controller's Power-On Self Test execution and software version.

- The controller's operating state the display shows in a rotating display the FTE Device Index, CEE state, and soft failures (such as redundancy, communications, or diagnostic faults).
- The controller's redundancy role and synchronization status.
- Fault codes when the controller ceases normal operation due to a major fault.

The following table includes a listing and descriptions of the various indications of the ELMM display.

ELMM faceplate display	Indicates....	ELMM State shown on Station
Tnnn	POST test number - Transient state.	N/A
-BP-	Controller in BOOTP mode waiting for IP address from BOOTP server - Transient state.	LOADING

-TS-	Controller is attempting connection to configured time source, or time server is not available - Transient state.	LOADING
COMM See Note 1	ELMM not able to communicate with other nodes.	OFFNET
TEST	Factory Test mode - Non product state.	LOADING
FAIL	Failure in Module.	FAILED
RDY	Boot mode with application image	ALIVE
LOAD	Firmware load in progress	LOADING
PROG	Firmware flash in progress	LOADING
IDLE	Application mode with database loaded,	IDLE
OK	Application mode with database loaded, primary controller in RUN state.	OK
BKUP	Application mode with database loaded, secondary.	BACKUP
NRDN	Non-redundant ELMM	OK
SYNC	Application mode with database loaded. Initial sync in progress	SYNC
NOSYNC	Application mode with database loaded:	NOSYNC
Note 1: The ELMM is 'lonely' (cables disconnected or network related problem). Startup halts until controller can obtain an IP address or validate an internally retained IP address.		

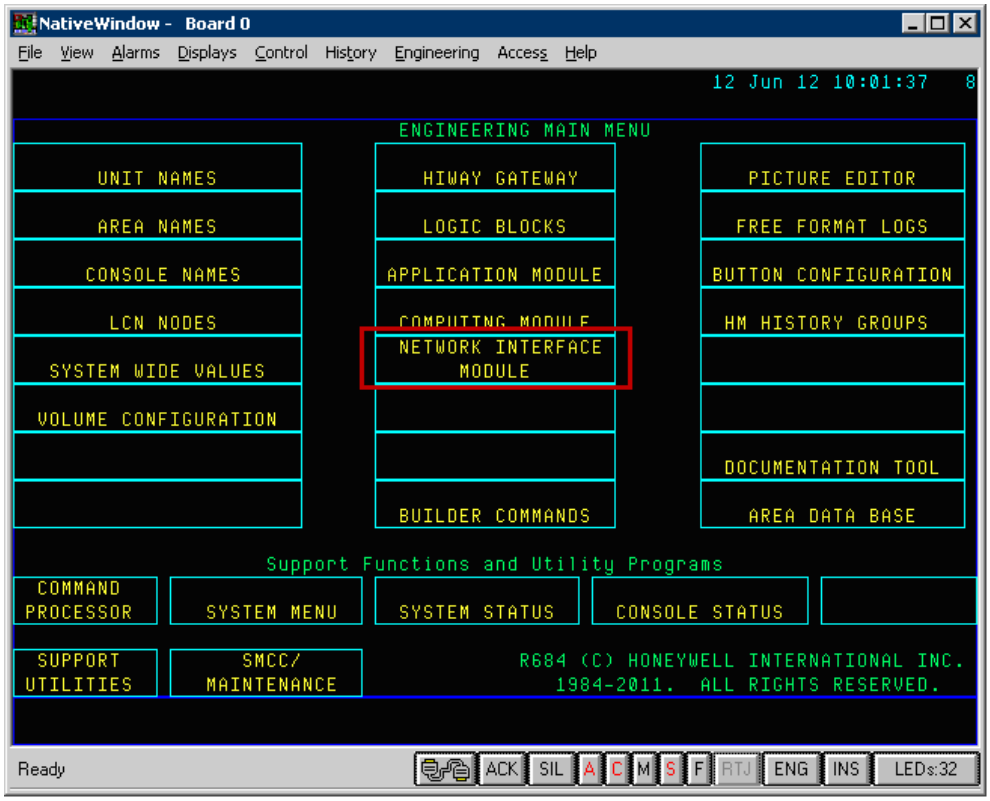
FTE activity LEDs

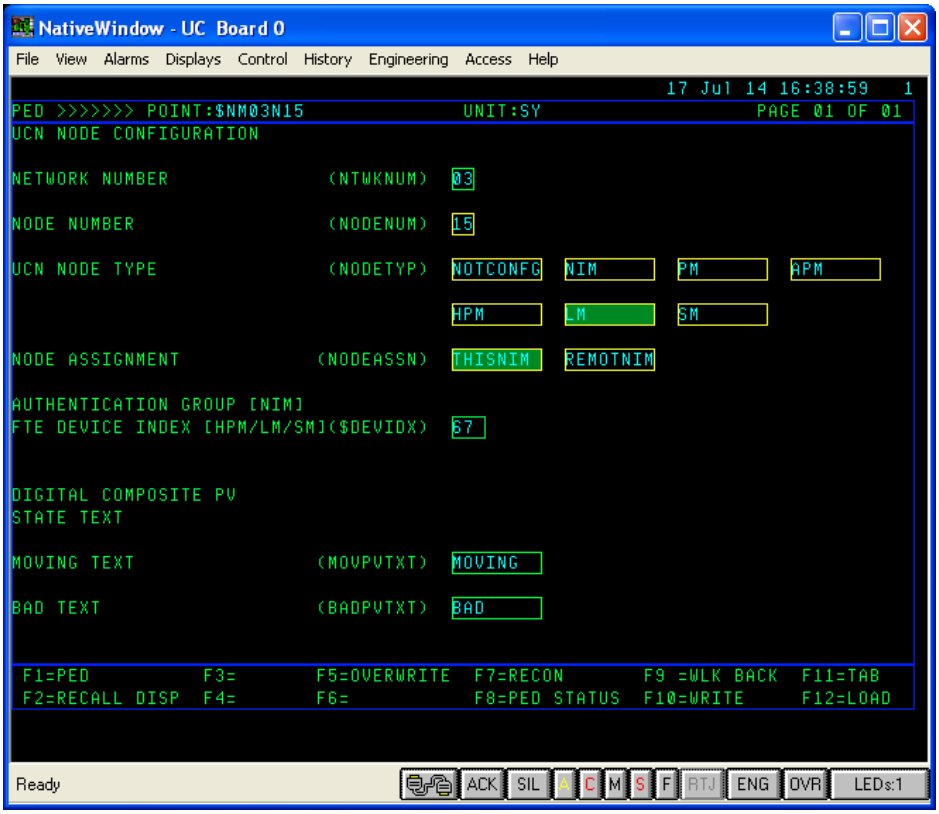
Each FTE port on the ELMM has one status LED. The bi-color FTE A and B LEDs indicate connectivity (link present) and communication activity (transmit and/or receive). The following table describes the indications of the FTE Status LEDs.

FTE A and B LEDs	**Indicates**…
RED	Link integrity check failed - No Ethernet signal detected, or cable is not connected.
OFF	Link integrity is OK - Ethernet signal is present, but no activity on link. Typically, every FTE node should show some activity. If the LED is observed for several seconds, some activity should be seen.
Blinking GREEN	Link integrity signal is present, with activity on link. During normal operation the FTE A and B LEDs should be blinking at a variable rate indicating normal network activity. Moderate to high network traffic conditions may cause the LEDs to appear as steady green.

4.6 ELMM Configuration

Use the following procedure to load the redundant/non-redundant ELMM with LM personality and database.

Step	Action
1	Load the odd-numbered ELMM with the LM personality and Checkpoint from the **NET** or **Emulated Drive**. The ELMM status must go to **LOADING**, and then **IDLE** after the load is complete. If this is a redundant ELMM, then this is the new Primary ELMM. Do not load the Secondary ELMM at this time.
2	Verify that the ELMM database is correct.
3	Invoke the **Engineering Main Menu** display by pressing the **<CONTROL>** and **<HELP>** keys on the keyboard.
4	Start the process by selecting the **NETWORK INTERFACE MODULE** target on the **Engineering Main Menu** display. This invokes the **NIM Build Type Select Menu** display. 
5	Select the **UCN NODE CONFIGURATION** target to invoke the **UCN Node Configuration** display.

Step	Action
	
6	Reconstitute the LM by entering the **UCN NETWORK NUMBER**, **NODE NUMBER**, **UCN NODE TYPE**, and pressing the **<CONTROL>** and **<F7>** keys. **Note:** As a better engineering practice, remove all Secondary ELMMs from the network and reconfigure it after Primary ELMMs are running. For removing Secondary ELMMs, use UCN Node configuration, change the BACKUP ELMM to NOT CONF and load by pressing Ctrl + F12.
7	Ensure that the node type is LM and then press enter.
8	Enter the FTE Device Index and press ENTER. Note: • Use the FTE Device Index assigned to this ELMM in the EUCN Configuration Data Checklist. Ensure that there are no errors. **Note:** Refer to the EUCN Configuration Data Checklist file attached to this document. • The FTE Device Index entered must be the same as the FTE Device Index physically set in the rotary switches of the ELMM FTE Interface Module. For the redundant ELMM, the Secondary ELMM FTE Device Index is automatically set to the Primary ELMM Device Index plus one.
9	Press the **<CONTROL>** and **<F12>** keys to load.
10	For the redundant ELMM, repeat steps 6, 7 and 9 for the secondary ELMM to come to the **ALIVE** state.

Step	Action
11	Checkpoint the R6xx ELMM twice to **NET** and once to the Removable media (Emulated Disk).
12	Startup the ELMM using either a Cold or Warm Start, as applicable.
13	If the ELMM is on other Logical UCNs, then repeat steps 3 through 11 for the ELMM on each of the Logical UCNs.
14	Repeat Steps 1 through 12 for any other Primary ELMMs on this EUCN.
15	When all Primary ELMMs on the EUCN have been upgraded, loaded, configured, checkpointed and started, the loading and start up procedure for Primary ELMMs are complete.
16	Shut down both ENIMs on this EUCN.
17	Load both ENIMs to pick up the FTE Device Index configuration for all Primary ELMMs on the EUCN.
18	For redundant ELMMs, perform the following steps for the Secondary ELMMs.
19	Confirm that the Secondary ELMM is in the **ALIVE** state.
20	Load the Secondary ELMM.
21	Confirm that the Secondary ELMM transitions to the **BACKUP** state.
22	Repeat steps 16 through 18 for all secondary ELMMs on this EUCN.
23	All LM to ELMM upgrade activities are complete for this EUCN.
24	You can now modify the ELMM point mix to update the IP parameters for communication with the PLC, as needed. See the Parameter References Dictionary for information about IP parameters.

4.7 Displays

This section describes ELMM specific displays.

4.8 Enhanced Logic Manager Detailed Status Display

This display is called up by selecting the ELMM node and the **DETAIL STATUS** target at the UCN STATUS Display. From here, the various diagnostic displays can be accessed through the **DETAIL STATUS** target on the **lower right side** of the screen.

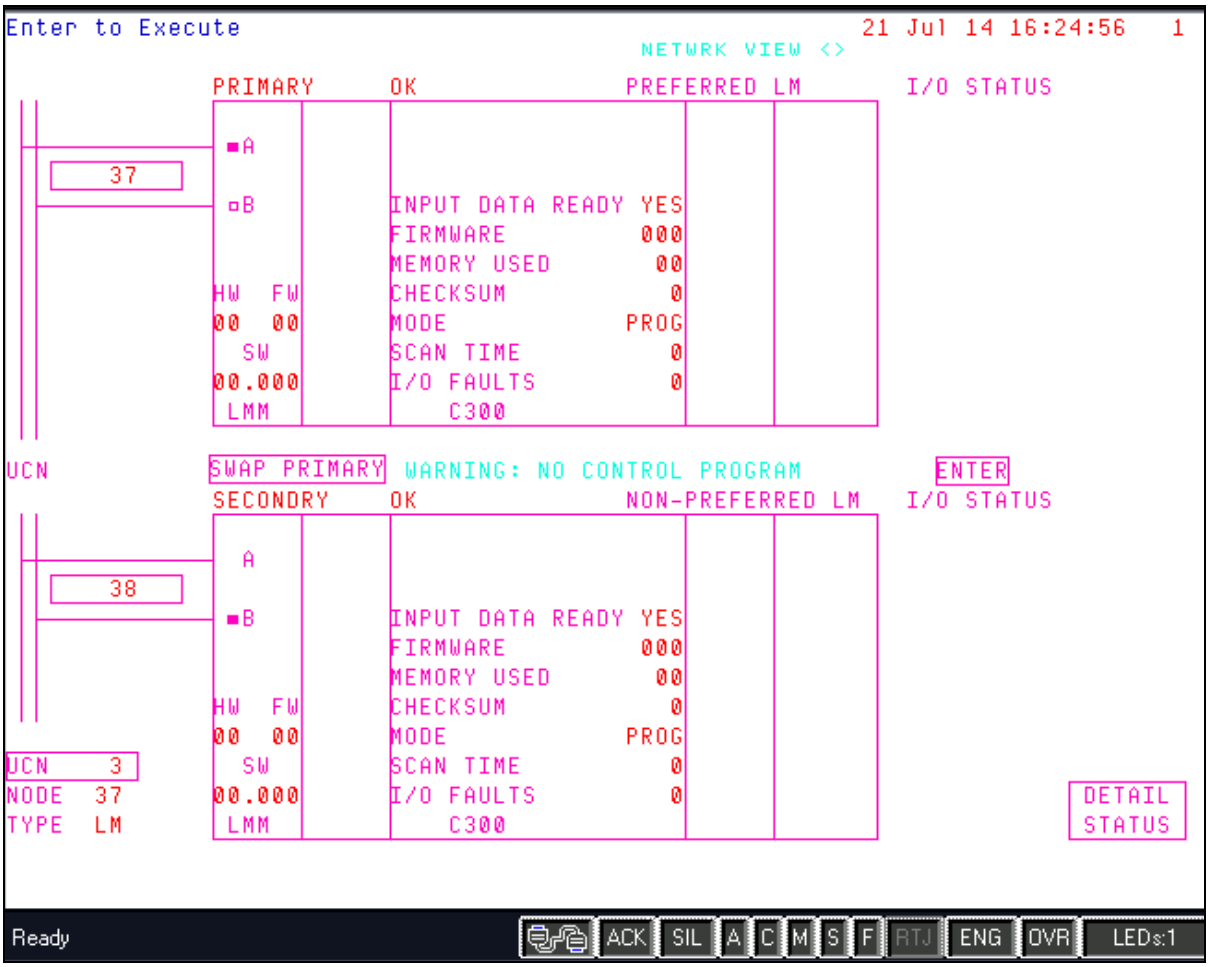


Figure 6-3: Enhanced Logic Manager Detailed Status Display

Targets:

Swap Primary

This target provides the operator with a mechanism for requesting a redundancy switchover. It is functionally equivalent to a target on the UCN Status display. It is visible when NODESTS is not equal to OFFNET for both chassis. An ENTER is exposed to the right of this target that completes the request.

System Parameter: PMMCMD

UCN nn - Displays UCN network number and acts as a target for calling up (returning to) UCN STATUS display.

System Parameter: NTWKNUM

Range: 1 - 20

NN - Identifies node number (1-64) and acts as a target to select the chassis for calling additional detailed status displays.

Detail Status - Acts in conjunction with the NN targets for calling up additional detailed status displays.

Node Status fields:

NODE nn - Node number of the ELMM.

System Parameter: NODENUM

Range: 1 – 64

TYPE tt - UCN Node Type.

System Parameter: NODETYP

Range: NotConfg, LM

(red.status) - Current redundancy status of the ELMM.

System Parameter: PMMOPER

Range: NON-REDUNDANT, PRIMARY, SECONDARY

(node status) - Current node status of the ELMM.

System Parameter: NODESTS

Range: ALIVE, IDLE, OK, PARTFAIL

Enhanced Logic Manager Module (ELMM) fields

A, B LEDs - Indicates the two FTE channels, with the small box used to indicate the active channel.

System Parameter: UCNRECHN

HW - Current version of ELMM hardware. Visible if the ELMM is on-line.

System Parameter: COMHWREV

Color: Cyan

FW - Current version of ELMM firmware. Visible if the ELMM is on-line.

System Parameter: COMFWREV

Color: Cyan

SW - Current version of ELMM software. Visible if the ELMM is on-line.

System Parameter: CONVERS, COMREV

Color: Cyan (Dot and Strings)

Processor fields

For ELMM, you can monitor the displays from the Experion Station. For information about monitoring the displays, see the *Operator's Guide* in the Experion documentation set.

4.9 I/O System Status Display and Hardware Status Display

You can monitor the displays related to I/O status and hardware status from the Experion station. For more information about the displays, refer to "Operator's Guide" in Experion documentation or Experion Station help.

4.10 Enhanced Logic Manager Revisions and Personality Display

This display is called up from the **VERS/REVIS** target of the Enhanced LM Detailed Status Displays.

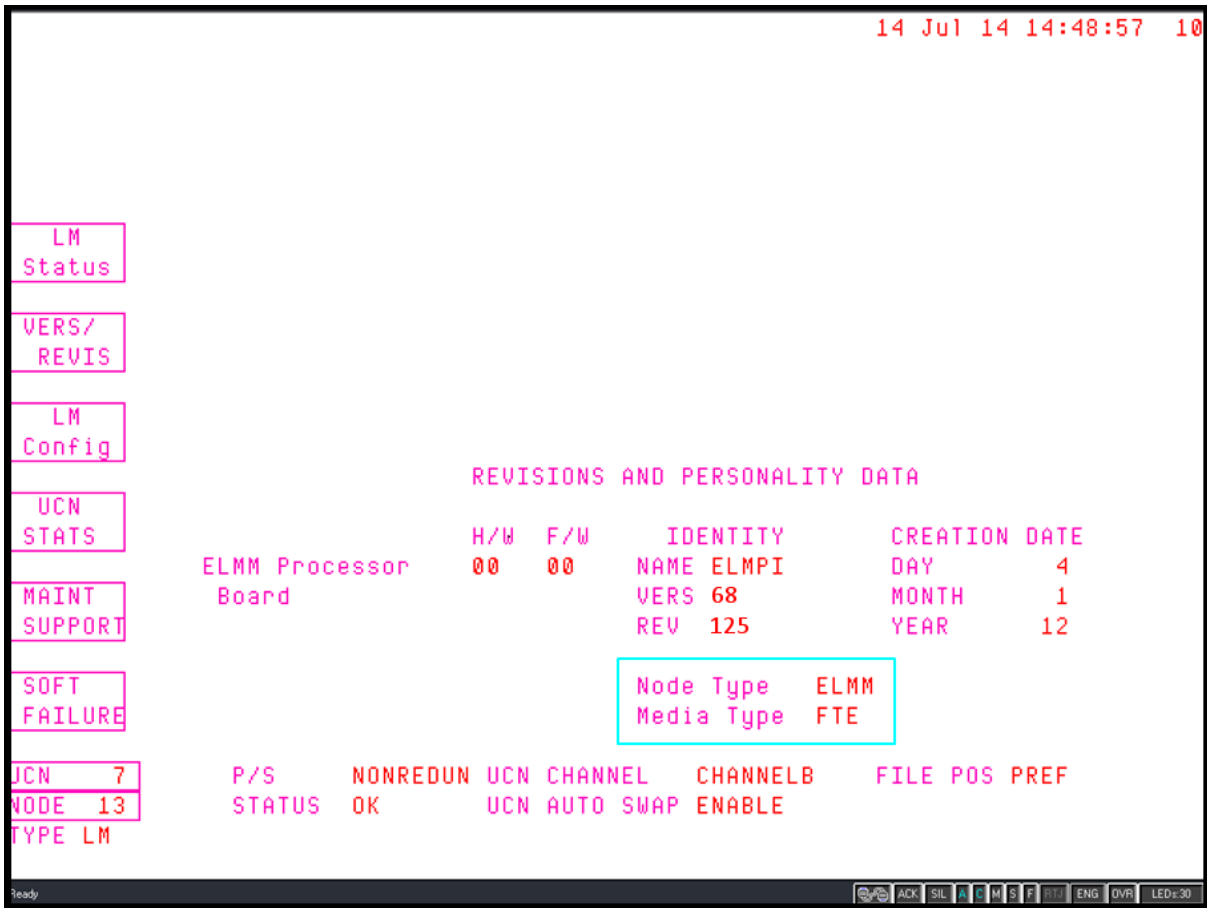


Figure 6-4: Enhanced Logic Manager Revisions and Personality Data Display

The targets along the left side and the textual status information along the bottom are standard for all ELM Detailed Status Displays.

The display presents identification information for the ELMM hardware, firmware, and Personality.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAIN SUPPORT, SOFT FAILURE, UCN xxx -

Fields:

H/W - LMM Processor Board hardware version.

F/W - LMM Processor Board firmware version.

NAME - Personality name (always ELMPI).

VERS - Personality version.

REV - Personality revision.

DAY - Personality creation day.

MONTH - Personality creation month.

YEAR - Personality creation year.

NODE: ELMM

MEDIA TYPE: FTE

4.11 Enhanced Logic Manager Configuration Display

This display is called up from the **LM Config** target of ELM Detailed Status Display.

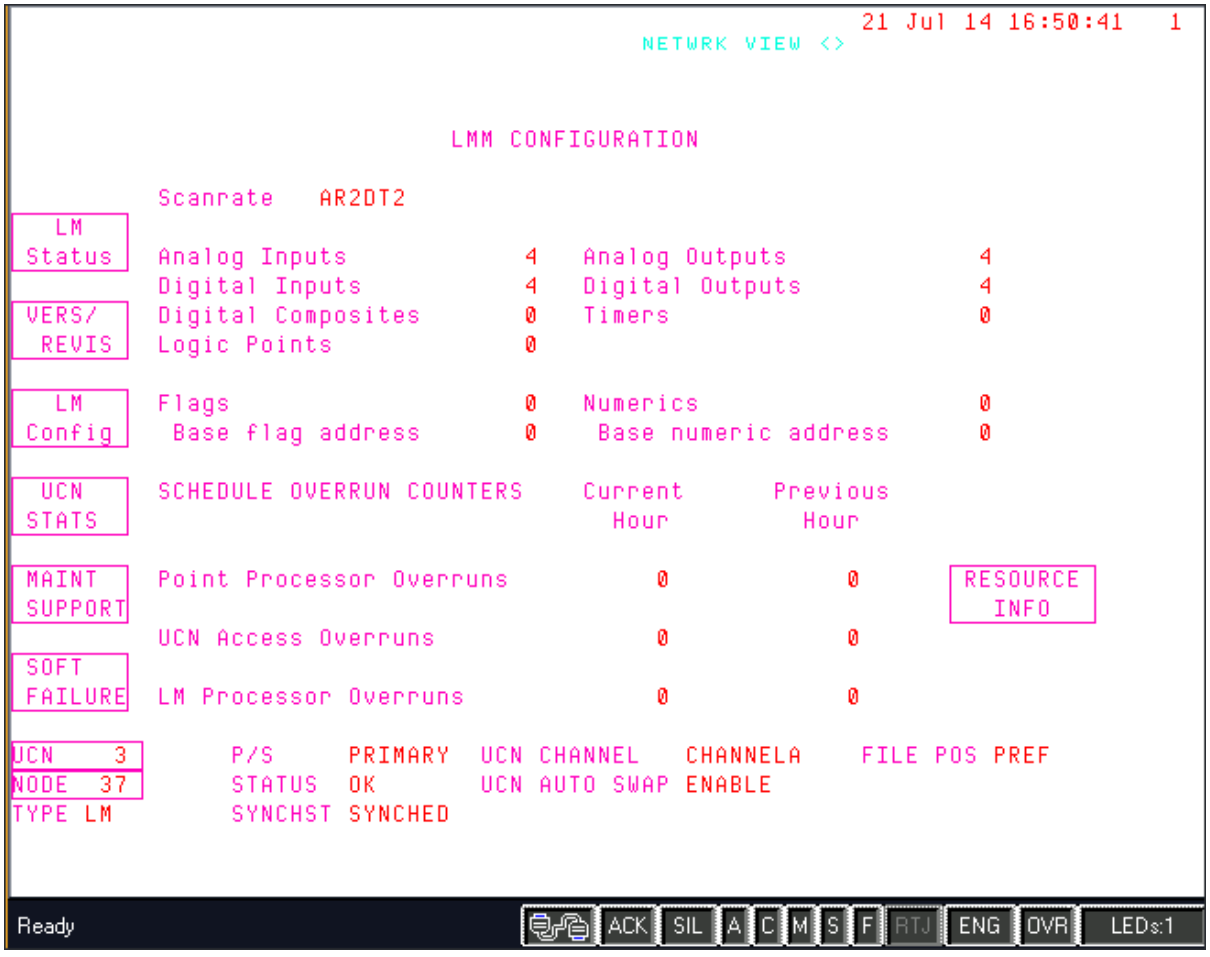


Figure 6-5: Enhanced Logic Manager Configuration Display

The targets along the left side and the textual status information along the bottom are standard for all Enhanced LM Detailed Status Displays.

The display summarizes the ELMM's Point Mix and the data access overrun statistics.

Targets:

LM Status, VERS/REVIS, E LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxx -

Fields:

Scanrate - ELMM Point Processor scan rate AR represents analog point scans, with the number following being 1 or 2 (once or twice per second). DT represents digital, timer, and logic point scans, with only the value of 2 available for ELM.

System parameter: SCANRATE

Range: AR1DT2, AR2DT2

Analog Inputs - Number of AI points available.

System Parameter: NAISLOT

Range: 0-127/254

Analog Outputs - Number of AO points available.

System parameter: NAOSLOT

Range: 0-482/965

Digital Inputs - Number of DI points available.

System parameter: NDISLOT

Range: 0-1866

Digital Outputs - Number of DO points available.

System parameter: NDOSLOT

Range: 0-4000

Digital Composites - Number of DC points available.

System parameter: NDCSLOT

Range: 0-304

Timers - Number of Timer points available.

System parameter: NTIMER

Range: 0-700

Logic Points - Number of Logic points available.

System parameter: NLOGSLOT

Range: 0-14

Flags - Number of Flag points available.

System parameter: NFLAG

Range: 0-1024

Base Flag address - Starting address (least significant) of the block of flags.

System parameter: FLLSBA

Range: -1 (not configured), 0-4095

Numerics - Number of Numeric points available.

System parameter: NNUMERICS

Range: 0-1024

Base numeric address - Starting address (least significant) of the block of numerics.

System parameter: NNLSBA

Range: -1 (not configured), 4096 to 8191

Point Processor Overruns - Number of times ELMM was unable to complete a full scan of its points within the allotted 1/2 or 1 second. Such overruns are usually caused by a burst of activity (e.g., alarms or parameter requests) and should only be a cause for concern if they occur frequently. If this number accumulates steadily, it usually means the ELMM is receiving an excessive amount of parameter requests.

System parameter: CRPPXORN, LSPPXORN

UCN Access Overrun - Number of times ELMM was unable to collect UCN data in time to start its next scan. This involves Logic Point inputs connected to points on other UCN nodes. Such overruns are usually caused by a burst of activity (e.g., alarms or parameter requests) and should only be a cause for concern if they occur frequently. Excessive loading at the ELMM or at one or more remote nodes could cause frequent overruns, a situation which should be corrected.

System parameter: CRUCNORN, LSUCNORN

LM Processor Overruns - Number of times ELMM was unable to collect fresh Logic Controller (C300) data in time to start its next scan. Such overruns are usually caused by a burst of activity (e.g., alarms or parameter requests) and should only be a cause for concern if they occur frequently. Excessive logic controller (C300) scan times (approaching ELMM scan time) could cause such overruns.

4.12 Enhanced Logic Manager UCN Stats Display

This display is called up from the **UCN STATS** target of any ELM Detailed Status Display. The display may also be called up from the **UCN STATS** display, Page 2, by selecting the **STATISTICS PAGE ONE** target.

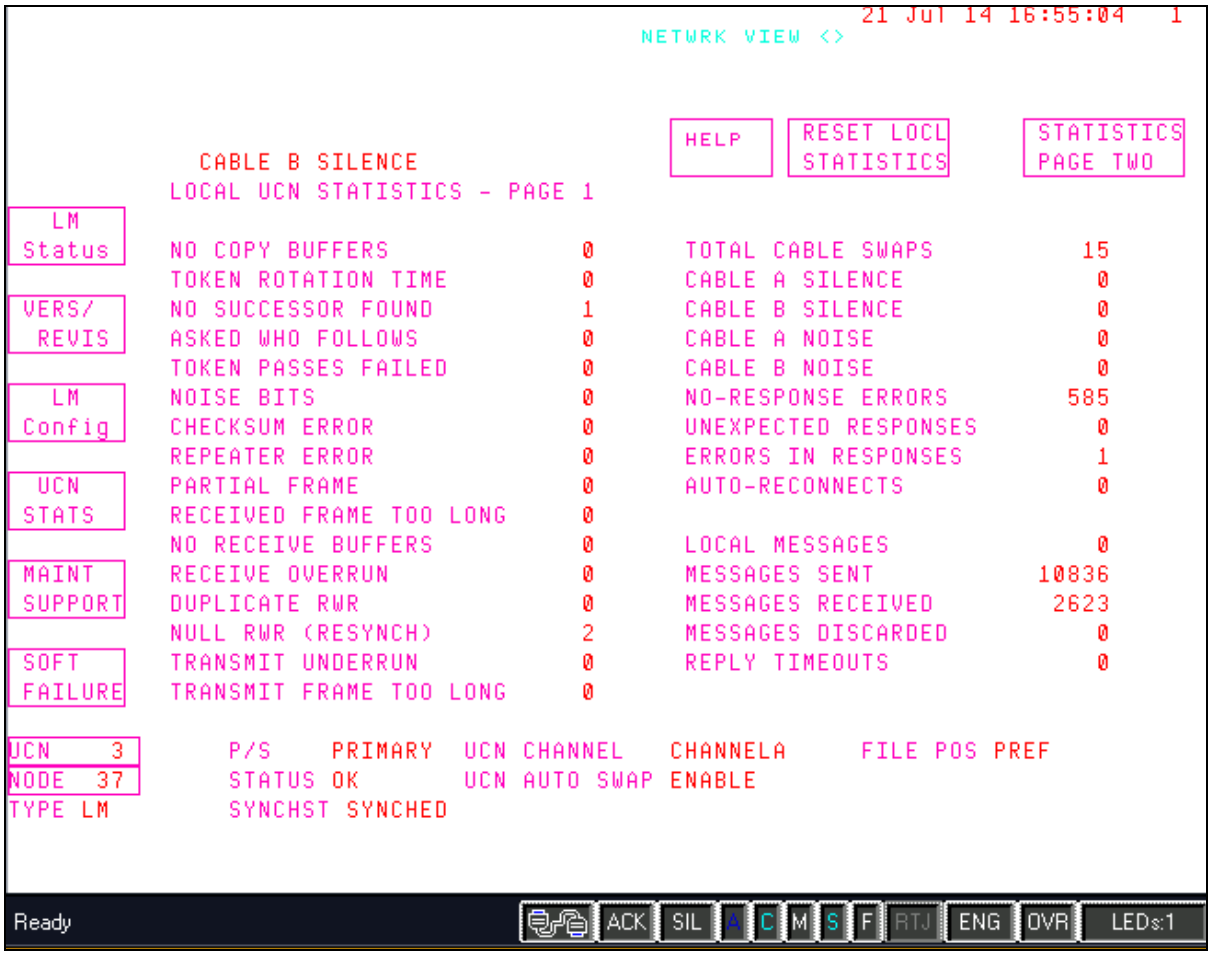


Figure 6-6: Enhanced Logic Manager UCN STATS Display (Page 1)

The targets along the left side and the textual status information along the bottom are standard for all ELM Detailed Status Displays.

The display, in conjunction with PAGE 2, summarizes the ELMM's UCN Error statistics.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxxx

Page 2 is selected by touching the **STATISTICS PAGE TWO** target.

This display is called up from the **UCN STATUS** target of any ELM Detailed Status Display, followed by the selection of the **STATISTICS PAGE TWO** target.

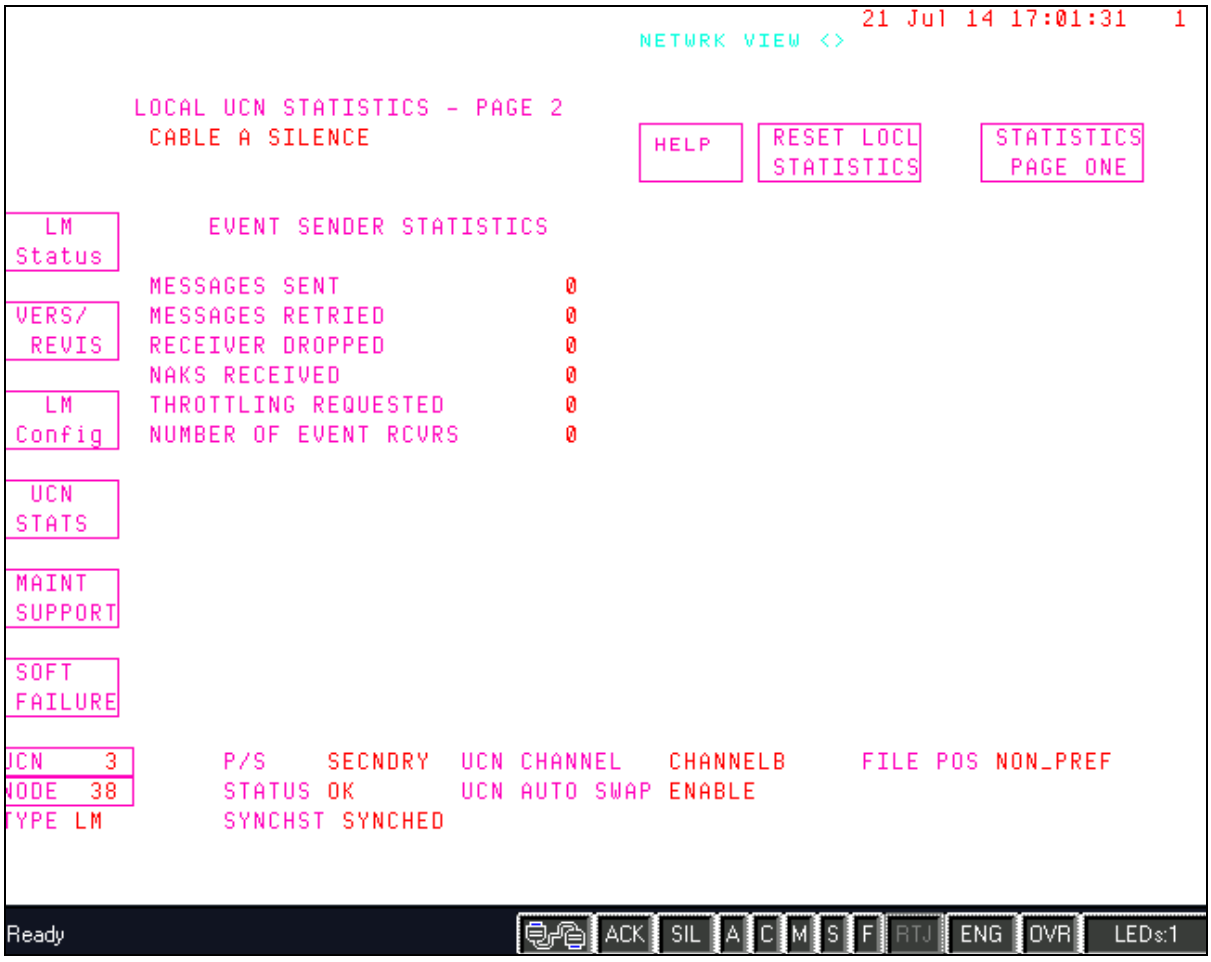


Figure 6-7: Enhanced Logic Manager UCN Status Display (Page 2)

The targets along the left side and the textual status information along the bottom are standard for all ELM Detailed Status Displays.

The display, in conjunction with PAGE 1, summarizes the ELMM's UCN error statistics.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxx

Descriptions of the ELM Local UCN Statistics Display's statistics are found in Table 6.4 and Table 6.5.

Table 6-1: Local UCN Statistics Descriptions

Statistic	Description
No Copy Buffers	The number of times no buffers on the LCN side of PNI/EPNI for copying received messages (NIM only) were available. The count is normally zero. Increasing counts indicate extreme NIM congestion. The LLC increments the count. The situation can lead to a "No Receive Buffers" count.
Token Rotation Time	NIM only. Sampled, the averaged token rotation time in 0.1 millisecond units. This is not an absolute measurement, and only roughly correlates to the Concord Token Scope. A 2-node UCN with no traffic will be in the 0.1 millisecond range, while a moderately-loaded 64-node UCN will be in the 4-6 millisecond range. OFFNET nodes and heavy traffic will increase the observed token rotation time. The nominal token rotation time for the system should be recorded when there are no errors and the load is moderate. Deviations from the count noted in a smoothly operating system should be investigated. An abnormally slow token rotation time may be caused by a level of trunk noise not quite high enough to cause a cable swap.
No Successor Found	The ring collapsed, and token-passing was lost. The count is incremented once in most nodes for a ring collapse. It is preceded by an "Asked Who Follows" count in the node that had the token. The count is incremented by the TBC.
Asked Who Follows	The number of times the successor node dropped out of the ring, temporarily or permanently (shutdown, failure, failover). It does not change in a system that is running normally. The count is incremented by the TBC.
Token Passes Failed	The number of times a token pass to successor node was retried. The count is normally zero. This does not change in a smoothly operating system. The cause can show up as noise, checksum error, or frame fragment count in the successor node. The count is incremented by the TBC.
Noise Bits	Noise periods or bursts are detected by the TBC. This may be caused by physical network problems. It can occur without the loss of any messages. A count of zero is expected, but low counts are acceptable. A burst of noise, frame fragment counts over 25, three successive 300 millisecond periods of noise counts of 3, and/or partial frames of 2, will cause noise to be reported, the "Cable A/B Noise" count to be incremented, and the cable to be swapped. These low thresholds are empirically derived from introducing various types of trunk faults.
Checksum Error	The number of times message corruption was detected by the TBC. The theoretical bit error rate for errors not detected by the modem and noted as noise or frame fragments is 1 x 10E-9. This works out to approximately three checksum errors per hour, per network. The observed rate is much less, and because messages are tokens, real messages are seldom lost. If frequent checksum errors occur, there may be a physical network or modem problem. If the predecessor to a node with checksum errors indicates a corresponding increase in the "Token Pass Failed" count, the problem is likely to be in the node with the checksum errors.
Repeater Error	The number of times the TBC detected that the error bit in the message end delimiter was set, indicating that a repeater received a message with a bad checksum, then retransmitted it. Because the UCN does not use repeaters, this means corruption in the end delimiter of the message. A count of zero is expected, but occasional counts

Statistic	Description
	are acceptable.
Partial Frame	The number of times message corruption was detected by the TBC. This may be caused by physical network problems. It can occur without loss of messages. See the "Noise" description.
Received Frame Too Long	The number of times the received message exceeded the 8 Kbyte IEEE 802.4 limit. Note that UCN messages are limited to 1 Kbyte in length. A count of zero is expected. The count is incremented by the TBC.
No Receive Buffers	The number of times no buffers were available for the TBC to store received messages. Zero is the expected count, but an occasional count under continuous, very heavy demand is acceptable. The count is incremented by the TBC.
Receive Overrun	The number of times there was insufficient local processor DMA bandwidth for the TBC to copy a received message into memory. A count of zero is expected. The count is incremented by the LLC based on the transmit status.
Duplicate RWR	The number of times a duplicate Type 3 message was received. This could be caused by the TBC retrying a message because an ACK was lost. A count of zero is expected, but a small number is acceptable. A count here can sometimes be explained by an increase in one of the other error statistics. The count is incremented by the LLC based on the transmit status.
Null RWR (Resynch)	The number of times the Null RWR messages were used by other nodes to resynchronize with this node upon startup or after an error. A node that leaves and reenters a running UCN will probably show and cause some counts. The count is incremented by the LLC based on the transmit status.
Transmit Underrun	The number of times there was insufficient local processor DMA bandwidth for the TBC to transmit a message. A count of zero is expected. The count is incremented by the LLC based on the transmit status.
Transmit Frame Too Long	The number of times there was a discrepancy between the frame length and the sum of the data block lengths given to the TBC. A count of zero is expected. The count is incremented by the LLC based on the transmit status.
Total Cable Swaps	A count of the operator, periodic, or fault-induced cable swaps. The periodic swap is every 15 minutes.
Cable A Silence	The number of times Cable A was found silent. A count of zero is expected. Normally, a silent cable is a broken or disconnected drop cable, or a bad tap. Certain types of trunk cable problems, such as a short in the middle of a trunk cable segment, can also cause silence to be reported, perhaps by multiple nodes.
Cable B Silence	The number of times Cable B was found silent. A count of zero is expected.
Cable A Noise	The number of times Cable A was found noisy. A count of zero is expected.
Cable B Noise	The number of times Cable B was found noisy. A count of zero is expected.
No Response Errors	The number of times one or more nodes did not respond to RDR messages. One or more nodes can be OFFNET or can be temporarily overloaded. The count is normally zero, but will increase when access to an OFFNET node is attempted. The count is

Statistic	Description
	incremented by the LLC based on the transmit status. The count is not incremented if the TBC is successful on its automatic retry.
Unexpected Responses	The number of times MAC control was not correct for an RWR response message (such as the wrong node number in a response). This indicates network contention or corruption within a node. A count of zero is expected. It also indicates the number of times SAPs were not as expected. The count is incremented by the LLC based on the transmit status and/or message header contents.
Errors In Responses	The number of times the LLC part of an RWR response was incorrect. This can indicate corruption in a node, or network contention. A count of zero is expected. The count is incremented by the LLC based on the transmit status and/or message size, or header contents.
Auto-Reconnects	The number of times this node attempted to reconnect to the UCN after a serious UCN communication fault.
Local Messages	The number of messages between tasks in this node. The count is always incrementing in a NIM, zero in a LM.
Messages Sent	The number of messages sent from this node. The count does not include automatic TBC retries or driver retries.
Messages Received	The number of messages received by this node.
Messages Discarded	The number of messages discarded by this node. Normally zero, but may occasionally count occurrences of: A reply received after the reply timeout period expired; 1. A duplicate reply message caused by retry because the immediate ACK of a reply message was not received by the node sending the reply message 2. A bad protocol version 1. A message for an inactive function 2. A message from a non configured node (NIM only)
Reply Timeouts	The number of times a reply was not received during the user-specified timeout interval. If a Type 3 request, the request was received and ACK'd, but the reply was not received. It may be caused by receive buffer overload in the local node, or the remote node failed after the ACK but before sending the reply.

Table 6-2: Event Sender Statistics Descriptions

Statistic	Description
Messages Sent	The number of messages sent, not including retries. When an idle or running event sender has no new events to send, it resends the last message every 10 seconds so that the NIM can watchdog event delivery.
Messages Retried	The number of messages retried caused by no response, lost ACK, or NAK. The count is normally zero unless event overload has occurred. The count normally correlates with the

	"NAKs Received" count in the event senders.
Receiver Dropped	The number of times any event receiver failed to respond to a message after retries, and thus was removed from the retry list. Retries are no longer performed to nonresponding event receivers. The count is normally zero in NIMs. A single count in each event sender can accompany a NIM failure (primary and secondary).
NAKs Received	The number of times a message was temporarily not accepted by an event receiver. Retries are performed after a delay. The count is normally zero, except under heavy event traffic.
Throttling Requested	The number of times this node was requested to delay before sending another message. A count of zero is normal, except under heavy event traffic. The count corresponds to the "At Node Throttle Threshold" statistic in the event senders.
Number Of Event Rcvrs	The number of event receivers that are currently acknowledging events from this event sender. In LMs this count is normally the number of primary NIMs.

4.13 Maintenance Support Displays Communications Error Block Display for Enhanced Logic Manager

This display is called up from the **MAINT SUPPORT** target of any ELM Detailed Status Display, or by selecting the **COMMUNCTN ERROR BLK** target within the **NODE STS INFO** display.

Figure 6-8: Enhanced Logic Manager Communications Error Block Display

The targets along the left side and the textual status information along the bottom are standard for all ELM Detailed Status Displays.

The display presents the content of an error buffer within the LMM. This display is normally used to assist product support personnel during fault situations. Please contact TAC for more details.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxx

COMMUNCTN ERROR BLK - target for this display.

NODE STS INFO - target for NODE STATUS (NIM version) display.

Node Status Information Display

This display is called up from within the **MAINT SUPPORT** target of any ELM Detailed Status Display, by selecting the **NODE STST INFO** target within that display.

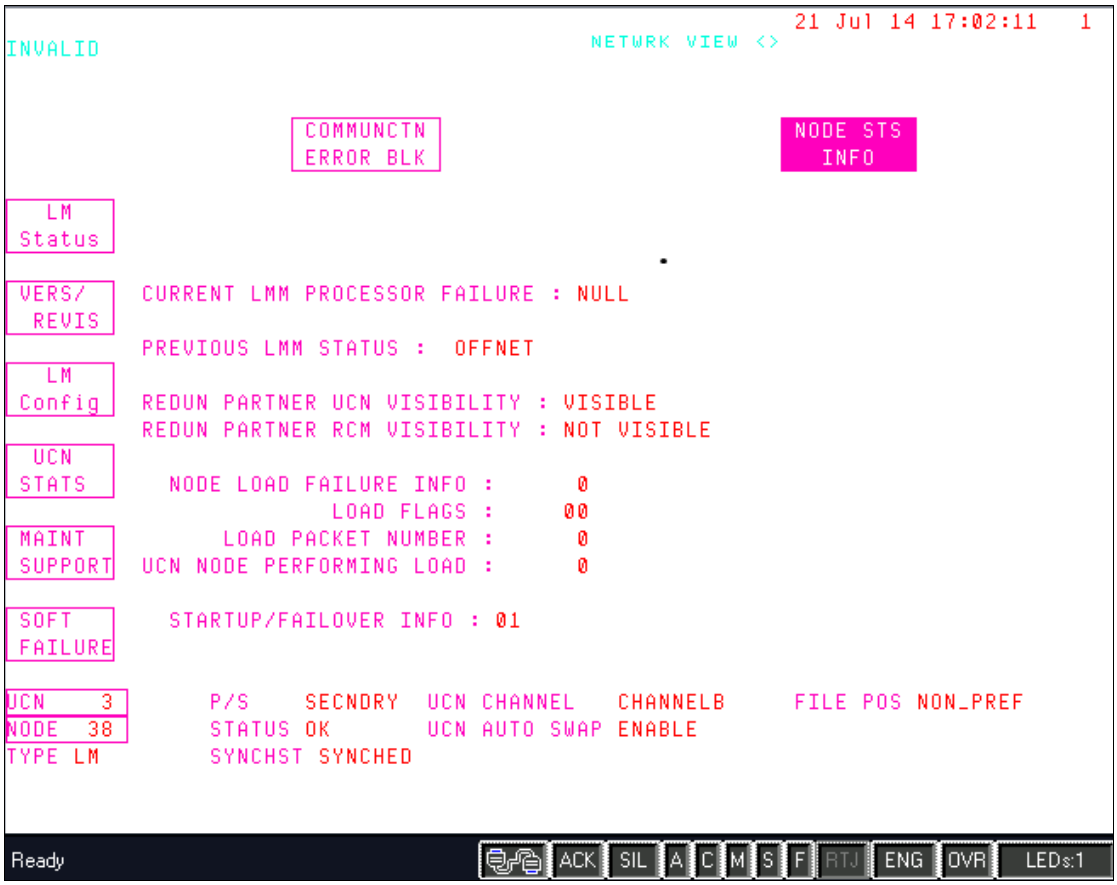


Figure 6-9: Enhanced Logic Maganer Node Status Information Display

The target along the left side and the textual status information along the bottom are standard for all E LM Detailed Status Displays.

The display presents additional failure information and a few statistics related to Personality download. Although pertaining to the ELMM, the data resides in the ENIM.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxx -

COMMUNCTN ERROR BLK - target for COMM ERROR BLOCK display.

NOTE STS NODE - target for this display.

Fields:

CURRENT LMM PROCESSOR FAILURE - Per ENIM, current ELMM status.

System parameter: NODESTS

Range: CONFGMIS, FAIL, NOTSYNC, OK, PARTFAIL, OFFNET

5. ELMM Troubleshooting

5.1 Hardware Diagnostics

Start-up Self-Test

A power on self test (POST) is performed when the ELMM is powered on. See Power on ELMM and ensure the sequence of steps is correctly performed.

5.2 Troubleshooting scenarios

The following are the troubleshooting scenarios for ELMM.

Scenario	Description	Cause	Solution
IP conflict	Two nodes with same Device Index (IP address).	Device Index is not unique in two nodes	Ensure Device Index is unique in each node.
CF9 firmware revision	CF9 firmware version is not up-to-date.	CF9 firmware version is below FF.	Upgrade CF9 firmware version to FF or above.
PCDI Communication failure	ELMM and C300 fail to communicate, which will indicate as socket error or protocol errors in ELMM node.	Many causes that are scrutinized within the corrective action.	If socket error or protocol errors appear, then go to Control Builder to see the failed PCDI channels and then correct the error.
Not Synchronized	The primary and/or secondary Control Processor Module (CPM) generates the Not Synchronized Diagnostic Alarm notification either upon redundancy startup (i.e. detection of Redundancy Module (RM)) or detection of loss-of-synchronization. The primary and secondary CPM generates the Not Synchronized return-to-normal notification once synchronization is achieved.	Many causes that are scrutinized within the corrective action	Ensure redundancy cable is present and attached to both the primary and secondary RM

Soft Failure Display for Enhanced Logic Manager

This display is called up from the **SOFT FAILURE** target of any ELM Detailed Status Display.

Figure 6-1: SOFT FAILURE Display for Enhanced Logic Manager

The targets along the left side and the textual status information along the bottom are standard for all ELM Detailed Status Displays.

The display lists all SoftFails supported by the ELM, and highlights all which are currently active.

Targets:

LM Status, VERS/REVIS, LM Config, UCN STATS, MAINT SUPPORT, SOFT FAILURE, UCN xxx

Refer to the following table for an explanation of two new soft failure codes as part of Enhanced Logic Manager.

Table 6-1: Enhanced Logic Manager Soft Failure Codes

FAILURE CODE	DESCRIPTION	CORRECTIVE ACTION
52	**Socket Errors**. PCDI block communication fails between ELMM and C300.	Verify communication b/w ELMM and C300. Verify CEE is in RUN state.
63	**Protocol** Errors.Format of PCDI communication messages is incorrect. For example: PCDI address is incorrect.	Verify PCDI block configuration for address and commands.

5.3 ELMM Diagnostics

This section describes the Enhanced Logic Manager's self-diagnostics and error reporting.

Checking faceplate display and LEDs

Check the ELMM Controller's 4-character display and ELMM/IOTA LED indications and compare results with data in the "Processor fields''. For more information about "Processor fields", see Enhanced Logic Manager Detailed Status Display.

Fault classifications	Controller display	LEDs
Hard/Severe Failures	**FAIL** alternating with a four-digit error code 03A7 –Hardware failure Any other four digit code= possible software fault A blank display indicates a Watchdog Timer timeout	Status LED = RED
Installation-Startup Failures	**Tnnn** indicating the test number that the controller was performing when a fault was detected. **-bp-** BootP service not available **-TS-** Time source not available.	Status LED = solid RED
Hardware Watchdog Timer Expired	**Blank**	Status LED= RED blinking off every \ second. FTE LEDs = RED
Communications Failure	**COMM** indicating no communications with other nodes.	FTE LEDs = RED

5.4 Using CTools to capture diagnostic data

You can use the CTools utility to capture diagnostic data used to examine the operating conditions within the controller. This data also can be analyzed to determine the cause of an error or fault. The following data can be captured using CTools:

- Trace Log
- Registers
- SSP
- Call Stack
- Instructions

You can also use the CTool utility to capture crash block or user log diagnostic data associated with a given Series C device as well as view history log data. Remember the following while using the CTool utility.

- You must run one instance of CTools on either the primary or backup Experion server.

- The first time you launch the CTools utility, it may take up to 40 seconds before the Series C devices on the network appear in the module listing table.
- CTools detects when modules are added or removed as well as when I/O Link cables are added or removed, which affect the presence of I/O Modules.
- You can click the Save User Log button on the Diagnostic Capture dialog to save a user readable file listing firmware download data to a directory location of your choice.
- You can click the Save Data button on the Diagnostic Capture dialog to save a crash information file to a directory location of your choice that can be transferred to Honeywell TAC for fault analysis.

Prerequisites

- You have installed the Experion R410.1/R430.1 software, configured the base IP address as well as addresses for time servers through the System Preferences selection in the Control Builder's Tools menu, and set the Device Index number for each of ELMM and FIM4 through the Binary Coded Decimal switches on its input/output termination assembly (IOTA).

To capture diagnostic data using CTools

To capture the diagnostic data using CTools, refer to *"C200/C200E Troubleshooting and Maintenance Guide"* in Experion documentation.

5.5 FTESTS Cable Error scenarios for Enhanced Logic Manager

The following sections show how the FTE cable faults are reported on the $FTESTS displays:

ATTENTION

The term "$FTESTS displays" include both $FTESTS1 and $FTESTS2 displays.

- $FTESTS1 display shows the FTE status of the UCN nodes assigned to the selected ENIM, and is filtered by the UCN Node Number, which has a range of 01-64.
- $FTESTS2 display shows the status of all the FTE devices in the FTE community and is filtered by the FTE Device Index, which has a range of 01-509.

Table 2 EHPM Cable Faults

Error scenario	$FTESTS displays (this ELMM)	$FTESTS displays (all other EUCN nodes)
No FTE cable problems		
If FTE cable A on an ELMM node has a problem		
If FTE cable B on an ELMM node has a problem		

If both FTE cable A and FTE cable B on an ELMM node have a problem		

Table 3 ELMM Cable Faults

Error scenario	$FTESTS displays (this ELMM)	$FTESTS displays (all other EUCN nodes)
If FTE cable A on an ELMM has a problem		
If FTE cable B on an ELMM has a problem		
If both FTE cable A and FTE cable B on an ELMM have a problem	Single ELMM:  Redundant ELMM: 	 

ATTENTION

If you come across an LCN system alarm that can be traced to a UCN cable failure (indicated by the word “FAIL” next to the text UCN CABLE STATUS on the UCN Status Display) and the ELMM's A/B cables are backlit/red.

To resolve this, perform the following procedure:

1. Go to the $FTESTS2 display and then check the FTE composite status.
2. If the composite status for cables is **not** OK, then scroll through all the 8 pages of $FTESTS2 display to determine the node that is causing cable problems and then resolve.

Note: Select the RESET STATS target to reset either disjoined or force-failed nodes before the FTE composite status can be resolved.

LCN system alarm can also be caused by a switch uplink failure (for example, CF9), check your upper-level network topology to confirm this.

5.6 Known Issues

A few known issues with workarounds where available are presented in this section.

Issue	Description	Workaround
LADDER SAVE and LADDER LOAD options are displayed on the UCN Status display for LOAD/SAVE RESTORE option while performing Checkpoint Restore of ELMM.	LADDER SAVE and LADDER LOAD options are displayed even though they are not applicable for ELMM. During the Checkpoint Restore operation, these targets are disabled.	There is no known workaround
Non-redundant ELMM shows PARTFAIL since the firmware cannot determine whether the ELMM configured is redundant or non-redundant.	The Non-redundant ELMM shows PARTFAIL status, since currently there is no way the firmware can determine whether the ELMM configured is redundant or non-redundant. The PARTFAIL status on the non-redundant node can be ignored. No functional impact.	There is no known workaround
A system error is reported on the SEJ whenever an ELMM node comes up	**A system error is reported on the SEJ whenever an ELMM node comes up. This is due to the mismatch in the event packet format between the NIM and ELMM. No functional impact**	There is no known workaround
NIM fails to recognize the secondary ELMM module during the double FTE cable fault scenario.	**NIM fails to recognize the secondary ELMM module during the double FTE cable fault scenario**	Reboot the Secondary ELMM

Issue	Description	Workaround
Non-redundant ELMM is displayed as primary on the UCN Status Display which causes several no-response errors	The Non-redundant ELMM is displayed as primary instead of non-redundant on the UCN Status Display and hence it attempts to communicate with the secondary ELMM which does not exist. This results in several no-response errors	There is no known workaround
A loss of control and/or loss of view may occur on running EUCN nodes if the Device Index ($DEVIDX) of an existing node is used while loading the EUCN node specific configuration to a newly configured EUCN node.	For example, on a running ELMM (for example, EUCN=04, ELMM=07, $DEVIDX=33), if the user reconstitutes the UCN configuration on the ELMM, and changes the ELMM node number (for example, 07), but retains the same $DEVIDX value (for example, 33) on the same UCN number (for example, 04), and then loads this configuration, this may result in a loss of control and/or loss of view for all the EUCN nodes. While reconfiguring an EUCN node, if there is a change in the Device Index of a running EUCN node, DEB throws a warning indicating that a loss of control and/or loss of view may occur on an EUCN node. Use caution while reconfiguring an EUCN node	If you have need assistance to perform this procedure, contact Honeywell TAC. Use caution when making ONLINE changes to the Device Index ($DEVIDX) value on a running EUCN system. This may result in loss of control and/or loss of view for the EUCN nodes if the same Device Index and the EUCN node numbers are used that exist on a pre-existing EUCN (only the EUCN node number is different). If this accidentally occurs, to recover: • Reload the original EUCN's UCN Device Specific configuration. • Configure a unique Device Index for the new EUCN node. • Re-flash the firmware on the EPNI2 board and then reboot ENIM. A unique Device Index is required for each and every node in the FTE Community. If you attempt to configure a duplicate Device Index, then the last one loaded replaces the original.

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