AUTOMATION MODERNIZATION PROGRAM

LOS ANGELES CARSON REFINERY

LAR1C AMP BPCS CONFIGURATION PROJECT EQUIPMENT FUNCTIONAL DESIGN SPECIFICATION - #2 DESULF FEED/RECYCLE 0009.087.03

Revisions and Approvals					
Rev	**Date**	**Reason for Issue**	**Originated By:**	**Reviewed By:**	**Approved By:**
1	14-Jul-23	Issued for Design	AP	NF	HR
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B	06-Oct-22	Issued for Approval	NF	RP	HR
A	31-Aug-22	Issued for Review	AP	NF	HR

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Revision History

Rev	Description	Section
A	Issued for Review	All
B	Issued for Approval IFR comments incorporated and document Issued for Approval	1.3, 3.2, 4.1, 5.1, 5.2, 6.2, 6.4, Appendix C, E, F
0	Issued for Design Global comments are incorporated and document Issued for Design	1.1, 2.2, 5.1, Appendix C, E, F
1	Issued for Design Document is updated based on modpack specification document, I/O list Rev. 2 and TPS impact report. HOLD 1 is cleared	6.1, 6.2, Appendix A, C, E, F 5.3

Assumptions

No.	Description	Section
-	-	-

Holds

No.	Description	Section
1	The information needs to be checked and validated in the respective RSP document—**CLEARED** based on the assumption that the EP Contractor will ensure the RSP compliance.	4.2
2	Confirm with LAR the points currently connected to the Environmental Monitoring System. **—CLEARED** based on confirmation from LAR as this activity will be covered as part of cutover planning	5.3

1. General

1.1 Introduction

The Los Angeles Refinery Carson (LARC) facility is completing an Automation Modernization Program (AMP) to replace obsolete automation equipment and to migrate the existing functionality and operability to the Honeywell Experion Process Knowledge System (EPKS) platform.

The LAR1 project scope is to migrate and/or upgrade the existing functionality and operability of identified Basic Process Control System (BPCS) consoles and controllers as well as operator and engineering stations to comply with current industry standards and practices. The migration will be from the existing Honeywell High Performance Process Manager (HPM)[1], Application Module (AM) controllers, Process Manager Input/Output (PMIO) and Basic Controllers to new Honeywell Experion C300 controllers and Series C and Universal Input/Output (UIO) and (UIO-2). The migration of the existing 3rd-party device serial interfaces to the C300 controllers shall be via either Modbus TCP/IP using Peer Communication Data Interfaces (PCDI), Ethernet Interface Module (EIM) or EPKS Server Supervisory Control and Data Acquisition (SCADA) points and Human Machine Interface (HMI) screens migrated using HMI WebBuilder.

1.2 Purpose of this Document

The purpose of the Equipment Functional Design Specification (FDS) is as follows:

- Describe the existing equipment configuration implemented in the BPCS at a functional level, including hardwired and soft I/O, location of the equipment on the Local Control Network (LCN), I/O distribution, assigned console, regulatory control functions, control calculations, operator interfaces, and 3rd party connections.
- Record any deviations from the current design (e.g., value engineering, regulatory compliance).
- Describe the high-level implementation of the migrated complex controls at the system level, the point details are recorded in the software migration specifications.
- Serve as the basis to support the detailed design, implementation, and testing activities.

1.3 Scope

The scope of the Equipment FDS is limited to the specific equipment functions and associated interfaces gathered from the information available in the BPCS backup files and site surveys. Once approved, the document is maintained as a live document throughout the project until the complete handover of the project to LAR.

[1] The scope of the HPM migration is limited to specific functions if it is determined to provide a more robust solution of the other control loops migrating to the C300 controllers.

2. Acronyms and Definitions

2.1 Acronyms

Table 2.1 defines the acronyms used within this document.

Table 2.1. Acronyms

Acronym	Description
AM	Application Module
AMP	Automation Modernization Program
APP	Application Processing Platform
BPCS	Basic Process Control System
CB	Control Box (Basic Controller)
CDA	Control Data Access
DHP	Data Hiway Port
DMC	Dynamic Matrix Control
EIM	Ethernet Interface Module
EPKS	Experion® Process Knowledge System
FDS	Functional Design Specification
HLPIU	High-Level Process Interface Unit
HMI	Human Machine Interface
HPM	High Performance Process Manager
I/O	Input/Output
LAR	Los Angeles Refinery
LARC	Los Angeles Refinery Carson
LCN	Local Control Network
LEPIU	Low-Energy Process Interface Unit
LLPIU	Low Level Process Interface Unit
MPC	Marathon Petroleum Corporation
PCDI	Peer Communication Data Interface
PMIO	Process Manager Input/Output

Acronym	Description
RSP	Refining Standard Practice
SCADA	Supervisory Control and Data Acquisition
TPS	Total Plant Solution
UCN	Universal Control Network
UIO	Universal Input/Output

2.2 Project Definitions

Table 2.2 describes terms used in this document.

Table 2.2. Project Definitions

Definition	Description
3rd-Party Interface	Systems that connect to the BPCS via serial data links or software applications that send and receive data to the BPCS, residing above level 2 in the BPCS architecture.
Automation Contractor	MPC appointed Automation Contractor or their authorized representative(s).
Complex Loop	A loop whose functionality has deviated from the standard configuration template or where control calculations are performed. Else, the loop is considered a “standard” loop.
Demo	Refers to scope to be “demobilized,” i.e., removed from service, all hardware and software and documentation updated accordingly.
LAR Team	Los Angeles Refinery Site and Project Team or their authorized representative(s).
Standard Loop	A loop whose functionality is fully provided by the standard configuration template with no custom configuration. Else, the loop is considered a “complex” loop.

3. References

3.1 MPC and LAR Standards

Table 3.1 records the specifications that shall be referenced in developing this FDS. Any deviations from the specifications are recorded in an addendum to the specification and will be referenced in the table below.

Table 3.1. Codes and Standards

Document Number	Rev	Document Title
AMP Central Global Specifications		
AMP-GBL-PM-SPC-0001	A3	T/A Integration and Cutover Specification
AMP-GBL-PM-SPC-0002	A1	Automation Specification
AMP-GBL-PM-SPC-0004	5	HMI Specification
AMP-GBL-PM-SPC-0009	A3	Third-Party Integration Specification
AMP-GBL-PM-SPC-0012	A0	Experion C300 Configuration Specification
AMP-GBL-PM-SPC-0020	3	Process Automation System Naming Specification
AMP-GBL-PM-SPC-0022	2	Automation System Testing Specification
Refining Standards and Specifications		
RSP-1172-031	5	Minimum Protective Systems for Compressors Application Standard

3.2 Project Reference Drawings, Documents and Software Backups

Table 3.2 records the project documentation referenced in developing this FDS.

Table 3.2. Project Reference Drawings/Documents/Software Backup

Reference Number	Rev	Reference Title
Software Backups		
LCN1 EBs Mar2022	1	AMP LAR1C EB Database (Received from LAR AMP in MAR-2022)
LCN1 EBs May2023	1	AMP LAR1C EB Database (Received from LAR AMP in MAY-2023)

Reference Number	Rev	Reference Title
EP Documentation		
BOD MPLA20002-LAR1-PM-RPT-0002	6	Paton LAR1 Definition BOD 2022-2024 TAR Equipment
PFDs		
B-2202-86727D	10	NO. 2 DESULFURIZER PROCESS FLOW DIAGRAM
P&IDs		
BF-2202-59684-S1	C	2 REFORMER DESULF PROCESS P&ID
BF-2202-37953-S1	C	NO. 2 DESULFURIZER AUXILIARY P&ID
LAR AMP BPCS Documentation		
747002-LAR1C-AUT-IOA-0100	2	LAR1 AMP BPCS Configuration Project I/O List-Carson
747002-LAR1C-AUT-SPC-0102	B	LAR1C AMP BPCS Configuration Project HMI Migration Specification – 2 Reformer
747002-LAR1C-AUT-SPC-0151	A	LAR1C AMP BPCS Configuration Project – Modpack #1 Specification

4. Process System Overview

The Desulfurizer Feed/Recycle Compressor (RW 0009.087.03) system consists of two compressors and is part of the #2 Desulfurization process unit in the Carson Refining. It is controlled from the #2 Reformer Console.

The compressor is a steam turbine driven, single stage reciprocating compressor. The compressor has separate cylinders: one for delivering gas as feed to the Reformer and the second for the recycle flow to the Desulfurizer.

4.1 List of Major Equipment

Table 4.1 lists the major equipment for #2 Ref DeSulf Feed/Recycle Compressor.

Table 4.1. List of Major Equipment

Equipment No	Description
RW 3008.271.02	#2 Ref DeSulf Feed/Recycle Compressor Turbine Aux L/O Pump motor
RW 0009.087.03	#2 Ref DeSulf Feed/Recycle Compressor (steam)

4.2 Refining Standard Practice (RSP) Compliance

It is assumed that the EP Contractor will ensure any changes related to the migrated and existing I/O and functions are consistent with RSP-1172-031, Minimum Protective Systems for Compressors Application Standard.

5. Process Control System

5.1 Existing & Migrated Control System Hardware

The controls for the compressor are currently implemented across several nodes connected to redundant Hiway Gateway nodes 43/44, which connect to the Data Hiway 07 on the LCN 1 Carson. Table 5.1 shows how the existing hardware shall be migrated to the new hardware.

Table 5.1. Existing & Migration Control Hardware for RW 0009.087.03

Existing		**Migrated**	
Device	*Ref #*	*Device*	*Ref #*
Redundant Hiway Gateway Data Hiway Basic controllers (2 from 22)	43/44 07 20, 22	Series C IO C300 Controller	REF2-C300-21
Data Hiway - HLPIU (1 from 2)	07 Box 07	Series C IO C300 Controller	REF2-C300-21
AM – LCN 1	25	No Change	-

5.2 Migration Impact on DMC

The Dynamic Matrix Control (DMC) interface shall be reviewed in detail as part of the cutover sequence and a plan developed to minimize the downtime post migration of the equipment. The detailed review of the migrated loops and their connection with the functions in the AM are described in Section 6.2. There are no direct connections with the HPM control logic.

During the detailed loop cutover planning, consideration shall be given to the use of the migrated tags by the DMC application to ensure its operation is not compromised. As part of the initial functional design, AM points have been identified that can be implemented in the C300 controller as part of the LAR1 scope.

The DMC application interface is from a specific thin client screen located to the right of the console. This interface shall be merged into the operator console interface, the scope of which shall be identified and detailed in specific engineering workshops prior to the start of the detailed cutover planning.

5.3 Environmental Monitoring

The existing Environmental Monitoring System shall remain in place, i.e., receiving the necessary signals directly from the field transmitters to the dedicated PLC. No I/O has been identified by the scope of this compressor migration.

6. Detailed Migration Scope Description

6.1 Standard Loops

There are 11 standard loops that are required to be migrated; these loops are either analog or digital input signals used for monitoring and alarming purposes. The signals are listed in Appendix A.

6.2 Complex Loops

The hardware I/O list has been checked and associated logic traced in the AM to confirm the use of the migrated loops. The migrated loops interact with the AM; the summary outcome of the data tracing is described in Table 6.1. The detailed point list for #2 DeSulf Feed/Recycle 0009.087.03 is provided in Appendix C.

Table 6.1. AM Point Summary

Group	No.
Total number of AM points	1251
Points associated with #2 DeSulf Feed/Recycle 0009.087.03	4
- Points source is impacted due to the HG tags migration	2
- Points to migrate to CMs (C300)	1

6.3 3rd-Party System Interfaces

There are no interfaces identified based on the scope recorded in the AMP LAR#1 Definition Basis of Design (MPLA20002-LAR1-AM-RPT-0002).

6.4 HMI Graphics

The graphics associated with #2 DeSulf Feed/Recycle 0009.087.03 are listed in Table 6.2 and are part of the Reformer Console[2]. Any changes to the scope and content of the graphics are described in the relevant HMI Migration Specification.

[2] The graphics are located in 1 Reformer Console as per the existing hardware at site. There are no EPKS consoles available for 2 Reformer.

Table 6.2. RW 0009.087.03 HMI Summary

Item	Display	Title
Process Graphics		
1	Reformer_2200.htm	2200 Desulf Process Overview
2	Reformer_2201.htm	2201 Desulf Feed System/Eff Exch
3	Reformer_2204.htm	2204 Desulf Strip/Accum/Amine Cont/KO Drum
4	Reformer_2205.htm	2205 #2 Des Feed/Recy Comp - Elec
5	Reformer_2206.htm	2206 #2 Des Feed/Recy Comp - Turb
6	Reformer_2210.htm	2210 #2 Reformer Overview
7	Reformer_2219.htm	2219 #2 Ref - Flash Drum/K.O. Pot
8	Reformer_2240.htm	2240 2 Ref Emergency Screen
Shutdown Graphics		
-	-	-

The scope to migrate the graphics is achieved in two steps; the first step is to complete a one-for-one migration of the existing graphics to the EPKS environment using TPS shapes. This will allow operations to use the EPKS HMI interface and control the unit using the existing controller hardware. The second step is to migrate the EPKS TPS HMI screens loop-by-loop to use the Control Data Access (CDA) EPKS shapes, in line with the cutover plan—i.e., all the graphics affected by the Hiway gateway points migrating to C300.

6.5 #2 DeSulf Feed/Recycle 0009.087.03 Controls Overview

The overview is provided to confirm the scope has not been overlooked as part of the LAR1 migration. All the controls remain in place as currently implemented unless otherwise stated.

The main control schemes are as follows:

Compressor interlock is configured with two signals:

- Low-pressure signal for lube oil (22PA409)
- Manual shutdown command (22HS996)

The Interlock logic is implemented in the field. The common alarm signal 22XA905 is configured with the High alarm priority.

7. Obsolete Control Functionality

7.1 Obsolete Tags

No obsolete tags, as confirmed by the EP Contractor based on the I/O list.

Appendix A. Standard Tag List for Migration

Table A.1. Standard Tag List for Migration

Tag Name	Description
22XA905	DESULF TURBINE TRABON
22PA409	DES COMP TURBINE LUBEOIL
22HS996	TURBN DESULF COMP S/D
22FC125 (Note 1)	REFORMER INCREASING GAS
22FI119 (Note 1)	DESULFURIZER RECYCLE GAS
22FI120 (Note 1)	DESULF STRIP FEED GAS
22HS996B (Note 1)	RW0009 & RW0010 KO DRUM RP3107 LEVEL S/D BYPASS
22LI335 (Note 1)	RW0009 & RW0010 KO DRUM RP3107 LEVEL INDICATION
22UA335 (Note 1)	RW0009 & RW0010 KO DRUM CURRENT SWITCH COMMON TROUBLE
22SC556	RW0009 COMPRESSOR REMOTE SPEED SETPOINT
22UA996	RW0009 COMPRESSOR CONTROL SYSTEM COMMON FAULT ALARM

Notes

1. Tags are common for both to RW 0009.087.03 and RW 0010.087.03

Appendix B. Serial Link Tag List

Not Applicable.

Appendix C. AM Point Analysis for RW 0009.087.03

Table C.1. AM Point Analysis Summary

Point Type	Point (Tag)	PTDESC	CL Block	Migration Status
CUSTOMAM	22XK3701	#2 REFORMER VALVE % OP	STOREOP	LAR confirmed AM tag is not in use.
REGAM	22T4710A	2DES DEWPT CALC PT1		Tag will be deleted, and the functionality will be transferred to original signal in C300
REGAM	22T4710B	2DES DEWPT CALC PT2		Tag will be deleted, and the functionality will be transferred to original signal in C300
REGAM	22TK4710	2DES HTR DEWPOINT		LAR confirmed to Migrate

Appendix D. BPCS and Safety System Interface for Reciprocating Compressors

Not Applicable.

Appendix E. Existing Control System Schematic for RW 0009.087.03

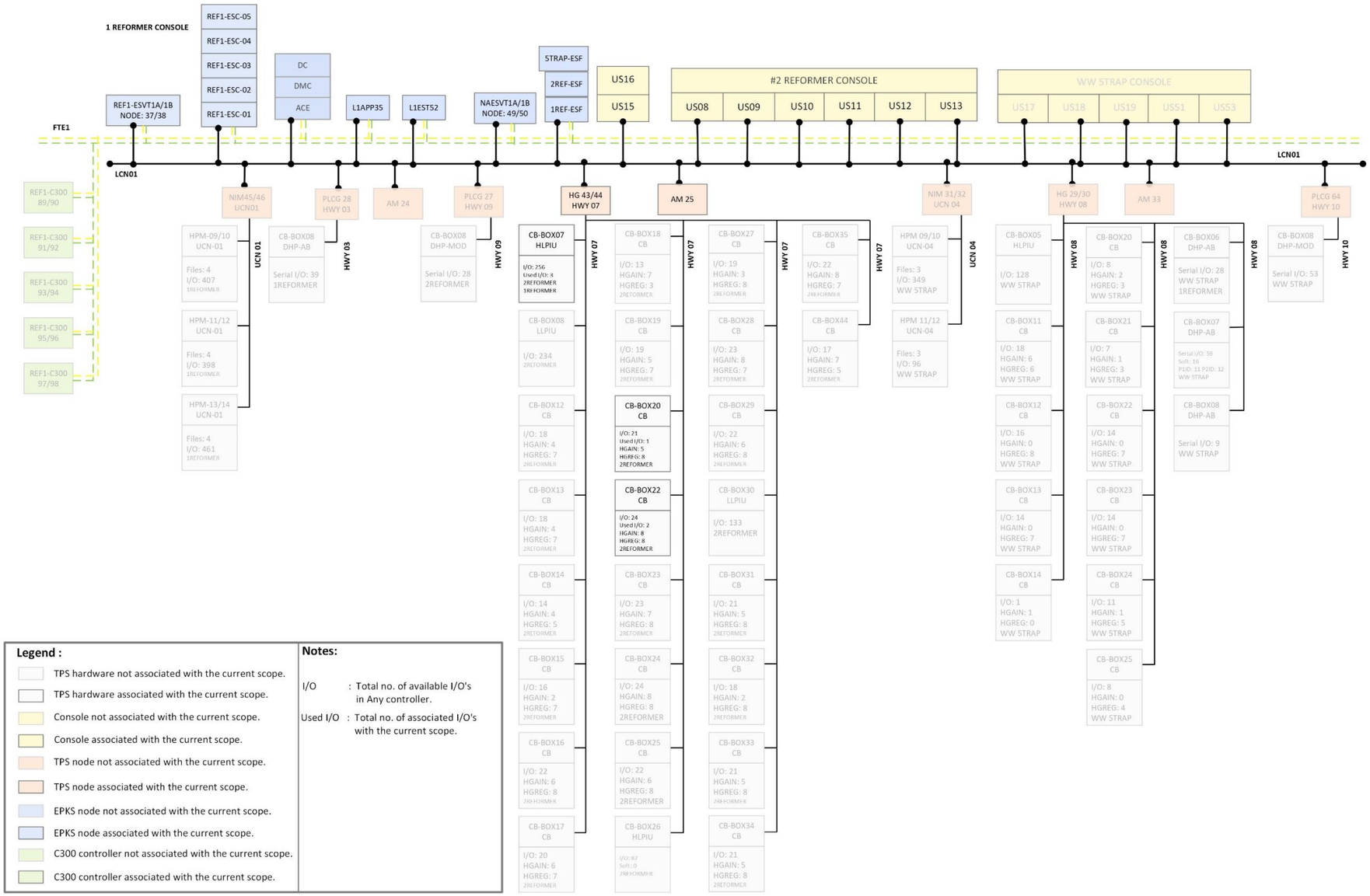

Figure E.1. Existing Control System Schematic for RW 0009.087.03

Appendix F. Migrated Control System Schematic for RW 0009.087.03

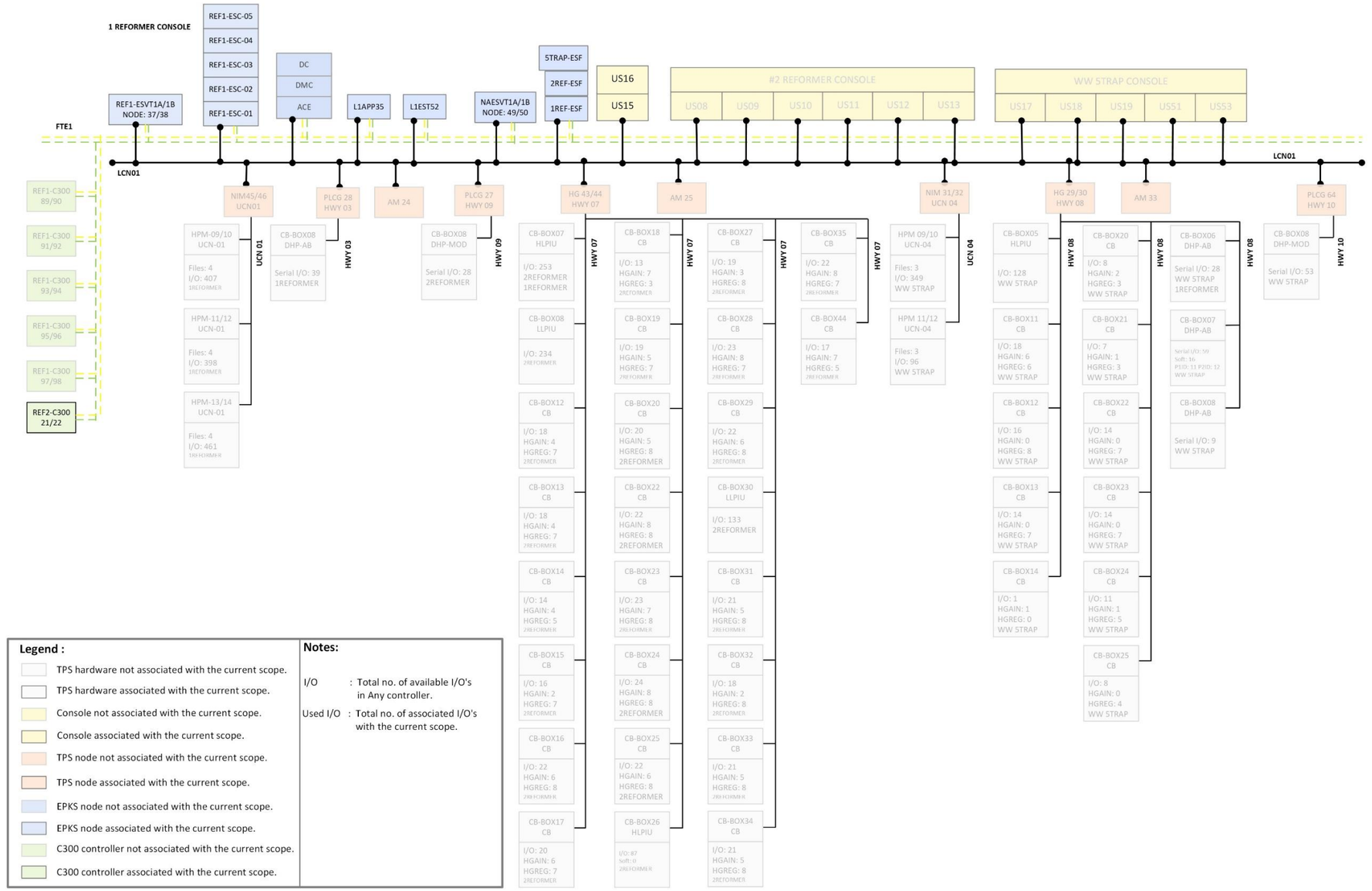

Figure F.1. Migrated Control System Schematic for RW 0009.087.03