Report No. 11594

Interface Control Document for A350 Main Deck Cargo Loading System Controller Area Network

Module:	ICD CAN Module
Configuration Type:	2023-06-21_CAN_ICD_WP3_ENG_RELEASE
Configuration:	Baseline

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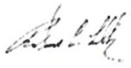
Checked By:		6/21/2023
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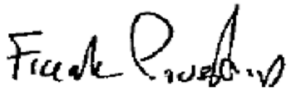
Approved By:		6/21/2023
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Revision Record

Rev. Level	Rev. Date	Prep. By	Check. By	Effected Pages	Change Description
A	03/10/2023	Mahendra Pratap	Srividya Ganesh	All	Initial Revision Implemented PR A350-16 and PR A350-53 Corresponding Doors Baseline is: 2023-03-10_CAN_ICD_WP2_ENG_RELEASE
B	05/09/2023	Mahendra Pratap	Srividya Ganesh	All	Implemented PR A350-34 and A350-100 Corresponding Doors Baseline is: 2023_05_09_CAN_ICD_WP2_ENG_RELEASE
B	05/11/2023	Mahendra Pratap	Srividya Ganesh	All	Implemented PR A350-34 and A350-100 Corresponding Doors Baseline is: 2023_05_11_CAN_ICD_WP2_ENG_RELEASE
B	05/23/2023	Mahendra Pratap	Bhanu Meka	All	Implemented PR A350-100 (CP Fault Message, Configuration Information to LRUs and Configuration Reporting Message Format). Corresponding Doors Baseline is: 2023-05-23_CAN_ICD_WP3_ENG_RELEASE
B	05/30/2023	Mahendra Pratap	Bhanu Meka	All	Implemented PR A350-100 and review remarks closure. Corresponding Doors Baseline is: 2023-05-30_CAN_ICD_WP3_ENG_RELEASE
B	05/31/2023	Mahendra Pratap	Bhanu Meka	All	Implemented PR A350-100 (added CDP Rx Message) and review remarks closure. Corresponding Doors Baseline is: 2023-05-31_CAN_ICD_WP3_ENG_RELEASE
B	06/12/2023	Mahendra Pratap	Bhanu Meka	Section 3.3, 4.1.2 and 4.4	Implemented PR A350-100 (added CDP Rx / Tx Messages, Maintenance Messages and Bus Load Analysis) and review remarks closure. Corresponding Doors Baseline is: 2023-06-12_CAN_ICD_WP3_ENG_RELEASE
B	06/14/2023	Mahendra Pratap	Bhanu Meka	Page 3, 11, 20,	Implemented QA observation as per PR A350-100 Corresponding Doors Baseline is: 2023-06-14_CAN_ICD_WP3_ENG_RELEASE
C	06/21/2023	Mahendra Pratap	Robert Lilly	Page 3, 88, 89, 90, 91	Implemented PR A350-194 (to add section 5 and 6) for CAN Signal Mapping – Spreadsheet added. Corresponding Doors Baseline is: 2023-06-21_CAN_ICD_WP3_ENG_RELEASE

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1 INTRODUCTION

The Airbus A350-1000F Main Deck Cargo Loading System (MDCLS) is comprised of Integrated Modular Avionics (IMA), Common Remote Data Concentrators (CRDC), Power Drive Units (PDU), Control panels (CP) and Cargo Display Panel (CDP). Ancra provides the Power Drive Units, Control panels and Cargo Display Panel to support the Main Deck Cargo Loading system.

A brief organization of this document is as below:

- Section 1: MDCLS overview and scope of this document
- Section 2: Interface overview for CAN communication in MDCLS
- Section 3: Communication Protocol
    - Section 3.1: CAN Message Frame, Message Identification, Function and Node Identification
    - Section 3.2: CRDC requirements.
    - Section 3.3: Bus Load Analysis
- Section 4: Message Signal Definition for each CAN message identifier
    - Section 4.1: Message signal definition for Control Logic, LRUs transmission and reception.
    - Section 4.2: Message signal definition for Data Loading, LRUs transmission and reception.
    - Section 4.3: Message signal definition for Configuration Information / Report Data.
    - Section 4.4: Maintenance message signals for Interactive Tests and in-shop maintenance.

1.1 PURPOSE

The purpose of this document, Interface Control Document (ICD), is to describe the CAN protocol used for communication between CRDC and remote LRU (i.e., PDU, CP and CDP) which is part of the A350-1000F Main Deck Cargo Loading System provided by Ancra.

The Airbus A350-1000F Main Deck Cargo Loading System (MDCLS) includes the CPIOM, Common Remote Data Concentrators (CRDC), Power Drive Units (PDU), Control panels (CP) and Cargo Display Panel (CDP) which are required to translate cargo loading / unloading operator commands into ULD movement and positioning.

This document defines the Controller Area Network (CAN) interface, defines the message structure and protocols that govern the message / data exchange between CRDC and remote LRU (i.e., PDU, CP and CDP).

This document falls at Tier 3 of the requirement hierarchy. Refer to the System Development Plan for information on the requirement development process.

Refer to the below figure for ICD in Requirement Hierarchy:

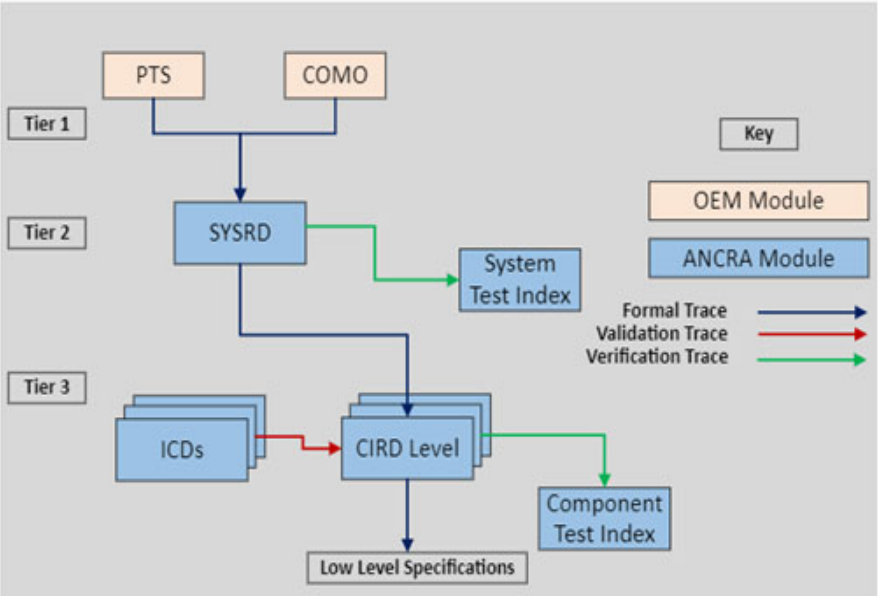

Figure 1 - MDCLS - Requirement Hierarchy

1.2 SCOPE

The Interface Control Document (ICD) provides description of:

- General description of each interface,
- Protocol for exchange, and
- The data exchange format.

1.3 SYSTEM OVERVIEW

The A350-1000F is a freighter aircraft, designed and built by Airbus. The main deck cargo loading system will operate in a class E cargo compartment.

The A350-1000F fuselage frame stations and the position of PDUs, CPs and CDP in the cargo compartment and are as in the below indicative figure. Refer to the Figure-2 for A350F Cargo hold Area and Equipment Positions.

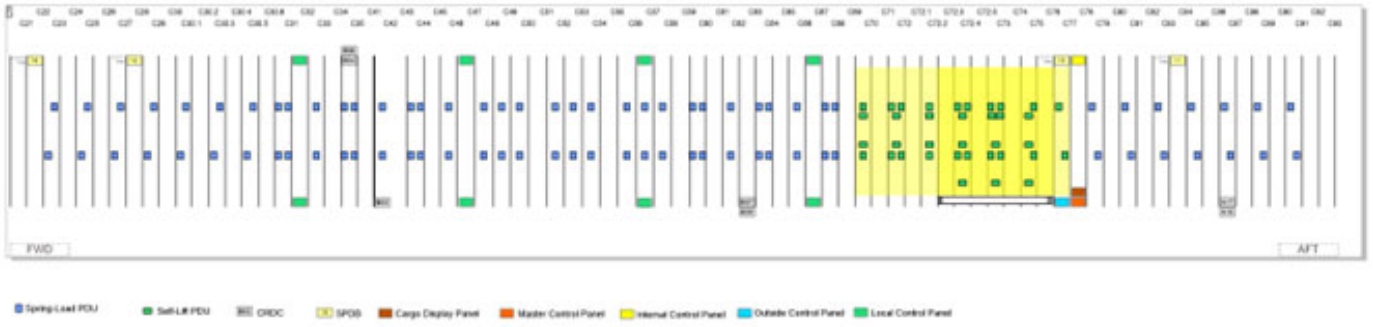

Figure 2 - A350F Cargo Hold Area - Equipment Positions

For the MDCLS three areas will be considered, Door & Extended entrance area, Forward cargo hold area and AFT cargo hold area. Inside the Door & Extended entrance area ULDs will be loaded into (IN) or unloaded out (OUT) of the aircraft. ULDs can be rotated (pallet turning) there. Inside the FWD, AFT cargo hold area, the ULDs will be transported on left hand (LH) side or on right hand (RH) side. Both sides can be operated separately. For ULDs transported in the middle or on both sides, operation can be performed either from left hand or from right hand side. ULDs will be loaded in or unloaded out of the Cargo Compartment via an external Cargo Loader.

MDCLS will move the ULDs in and out of the aircraft with the help of Power Drive Units (PDUs) based on the commands provided by the operator from the Control Panels (CP), the status of the MDCLS and equipment's can be monitored in Cargo Display panel. ULDs will be guided and restraint by mechanical parts. To lock and unlock ULD, latches must be operated manually by the operator. Thus, the MDCLS will be a semi-automatic system.

The below Figure represents the A350-F MDCLS Architecture:

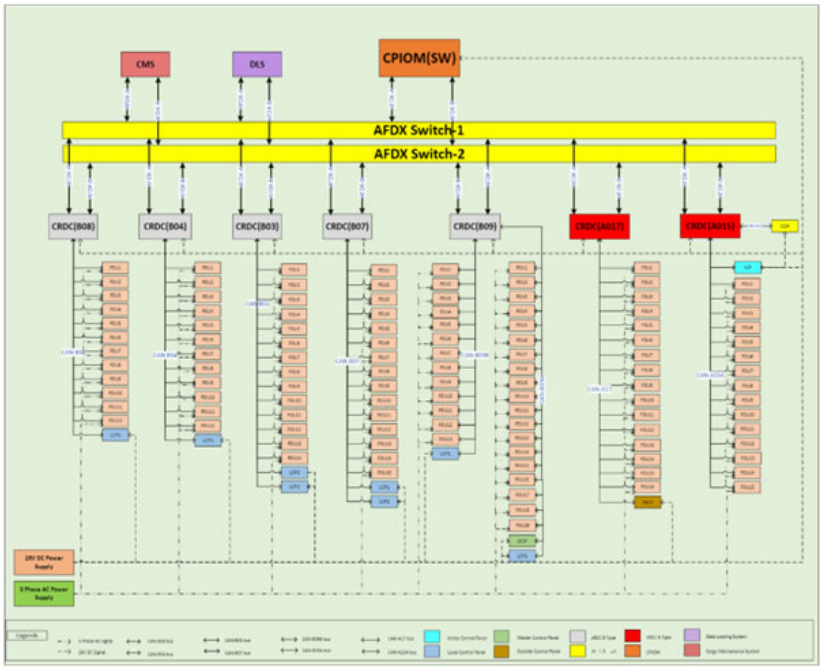

Figure 3 - A350F MDCLS ARCHITECTURE

1.3.1 MDCLS COMPONENTS

The key components of the A350-1000F Main Deck Cargo Loading system include:

S.NO	Equipment/Component	MDCLS	Qty	Supplier
1	CPIOM - MDCLS: Operational Software - MDCLS: S-BITE Software	Internal	 1 1	Ancra
2	Common Remote Data Concentrators	Internal	7	Airbus
3	Control Panels (CPs) • Outside Control Panel - 1 • Master Control Panel - 1 • Inside Control Panel - 1 • Local Control Panel - 6 • Local Control Panel 20FT - 2	Internal	11	Ancra

4	Cargo Display Panel (CDP)	Internal	1	Ancra
5	Power Drive Units (PDUs) • Spring Loaded PDUs – 80 • Self-Lift PDUs – 36	Internal	116	Ancra
6	Secondary Power Distribution Box	Internal	4	Airbus
7	CAN Bus	Internal	9	Airbus
8	AFDX Switch Network	Internal	2	Airbus
9	Data Loading System	External	1	Airbus
10	Central Maintenance System	External	1	Airbus
11	SSPC	Internal	4	Airbus

Table 1 - A350F MDCLS Key components

IMA CPIOM: The Integrated Modular Avionics (IMA) Core Processing and Input / Output Module (CPIOM) is a high-performance computer capable of supporting multiple Hosted Applications (HAs) of differing Design Assurance Levels (DAL) on one computer.

The MDCLS Control Application (CA) and S-BITE Applications will reside on a CPIOM. ANCRA will be supplying these Hosted Applications.

The Primary function of the Control application is ULD type detection function, Speed Control Function, PDU(s) drive logic and PDU scrub protection. The Control application communicates with the CRDCs via AFDX. The CRDCs communicate with the CPs, CDP and PDUs via CAN Bus. The translation of data from AFDX to CAN Bus and vice versa allows the CA to receive operator command from CP and direct the various PDU in the Cargo Compartment for drive.

In addition, Control application includes following functions:

- CPIOM State determination
- Continuous fault and Monitoring
- AFDX message processing
- Indication functions

The S-BITE Application provides Built-in Test (BIT) and monitoring functions for the MDCLS during system operation.

Power Drive Unit: The PDU is responsible for movement of ULD's in the Freighter to facilitate loading and unloading. A series of Power Drive Units are installed on the Freighter to move the ULD's laterally and longitudinally in the main deck cargo hold area of the Freighter as needed for the movement of ULDs.

There are 2 types of PDUs: Spring Loaded and Self-Lift PDU

The primary functionality of PDU is ULD Detection, ULD Movements laterally/longitudinally and Speed control for softer start and stop control of ULDs. PDU operates on 3 Phase AC power supply from ground power unit and communicates with the external devices on CAN bus.

Control Panels (CP): The CP primary function is to perform button/joystick Discrete Signal Processing. The discrete inputs received from joystick/switches are packed and transmitted on CAN bus. The MDCLS contains multiple control panels, the capabilities of control panel near the DOOR are different from control panels placed inside cargo holding area. Control panels are placed at strategic locations for better visibility and access. Below is the list of control panels:

- Outside Control Panel
- Master Control Panel
- Inside Control Panel
- Local Control Panel
- Local Control Panel with 20FT

Cargo Display Panel (CDP): The CDP primary function is to indicate the MDCLS status. The system status is received through the CAN bus and will be displayed on 17-inch Touch screen. In Addition, System status displayed in CDP supports Maintenance Features. The Main page offers visualization of the System and provides critical information about the status of the individual components of the System. The Maintenance Page provides more detailed information about the status of the components of the System and allows the Operator to perform troubleshooting operations.

Common Remote Data Concentrator: The Primary function of CRDCs is translating and routing of AFDX to CAN messages and vice versa for the MDCLS. The translation is for data from the Control and BITE HAs in the CPIOM to the Control Panels, PDU's and the Display Panel / Health Monitoring Display and vice versa. The CRDC's also control the flow of +28Vdc and 115V AC power to the PDU's, Control Panel and Display Panel / Health Monitoring Display.

Secondary Power Distribution Boxes: The SPDBs control the flow of +28 Vdc power to the CP, CDP, and LCP's. The SPDBs also provides 3 phase 115V AC Power to all PDU.

The interfaces used in MDCLS system are as follows:

CAN: The CAN protocol is based on the CAN 2.0B / ARINC 825 standards. Controller Area Network bus or CAN bus is utilized to connect the CRDCs with the various Control Panels (OCP, MCP, ICP and LCPs). CAN Bus is also utilized to connect the CRDCs with the PDUs and CDP.

AFDX: Avionics Full Duplex Switched Ethernet or AFDX is utilized to connect the MDCLS CA hosted in the CPIOM with the CRDCs and SPDBs. AFDX protocol is based on the ARINC 664 / part 7. The redundant design of the AFDX bus structure provides multiple paths for the communication of data to and from the CA

and the CRDCs. It also provides multiple paths for the communication of data to and from the S-BITE and CRDCs and the S-BITE to the Central Maintenance System (CMS).

Figure-4 below presents a simplified architecture of Electrical System for A350F Main Deck Cargo Loading System (MDCLS).

The Main Deck Cargo Loading System (MDCLS) functions; refer to Purchaser Technical Specification (V5024PTSS21002).

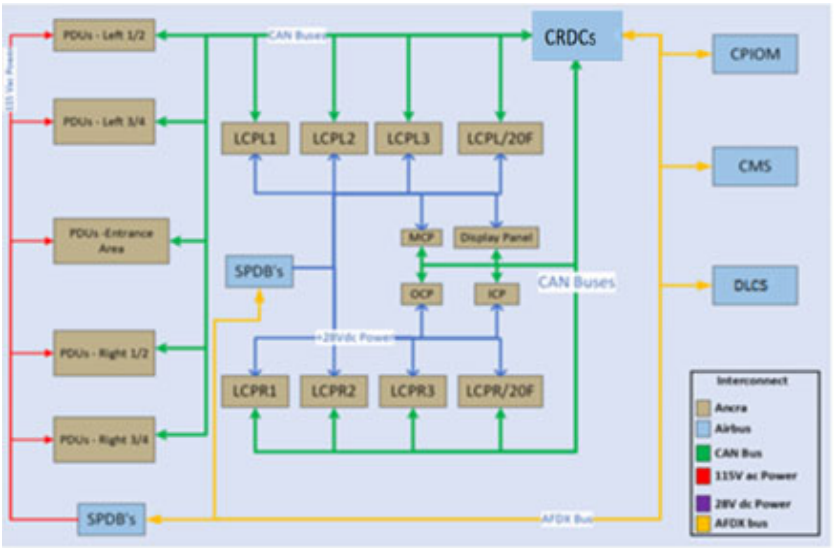

Figure 4 - A350F Main Deck Cargo Loading System Context

1.3.2 DATA LOADING SYSTEM CONTEXT

Figure-5 below presents a simplified architecture of Data Loading System (DLS). Refer to the Detailed Functional Specification (DFS) for CAN Data-loading (V42SP0806471 V2.4).

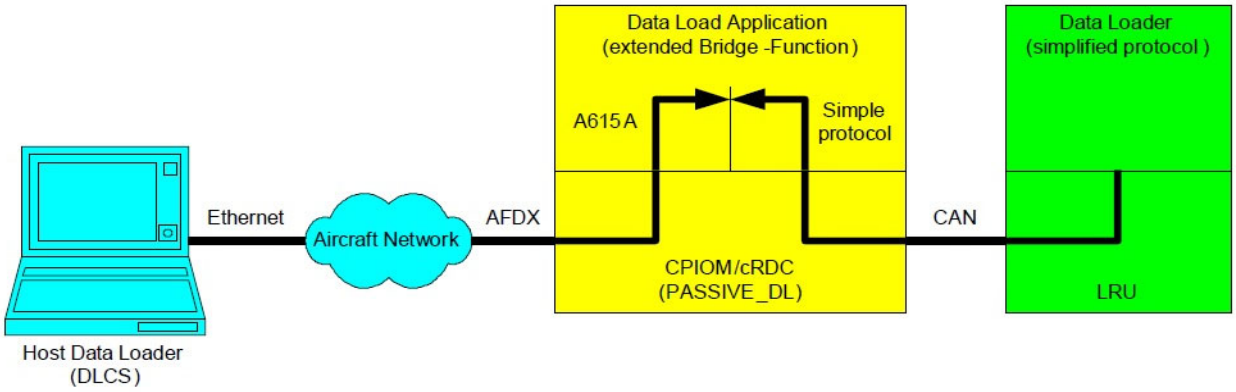

Figure 5 - Data Loading System Context

1.4 OPERATIONAL CONTEXT

The Main Deck Cargo Loading System (MDCLS) is the controlling unit for all cargo loading functions.

The communication interface between each LRUs is illustrated below; it also describes the communication protocol followed between each interface:

- All data flow and communication between MDCLS CA, S-BITE application, Data Loading Configuration System (DLCS) and Common Remote Data Concentrator (CRDC) is over AFDX.

- All data flow and communication between Power Drive Unit (PDU), Control Panel (CP), Cargo Display Panel (CDP) and Common Remote Data Concentrator (CRDC) is over Controlled Area Network (CAN) adhering to ARINC 825 (A825-4) specifications and CAN DFS Message Format Technical Report (V42RP0904936 v1.0).

The Main Deck Cargo Loading System (MDCLS) technical specification and operational / functional requirements are described in Purchaser Technical Specification (PTS) – 'V5024PTSS21002 V2' and System Requirement Document (SysRD) – 'Rpt 11632'.

For CAN Data-loading Detailed Functional Specification (CAN-DL DFS) refer to the V42SP0806471 v2.4

1.5 ABBREVIATIONS AND GLOSSARY

A825-4	General Standardization of CAN BUS Protocol for Airborne Use
A/C	Aircraft
ABD	Airbus Directives and Procedures
AC	Alternating Current
ACK	Acknowledgement
AFDX	Avionics Full Duplex Switched Ethernet
AFT	Rear
ARINC	Aeronautical Radio Incorporated

BCD	Binary Coded Decimal
BIT	Built-in Test
BITE	Built-in Test Equipment
CA	Control Application
CAN	Controller Area Network
CAN-DL	CAN Data Loading
CDP	Cargo Display Panel
CIRD	Configuration Item Requirement Document
CLS	Cargo Loading System
COMO	Coordination Memo
CP	Control Panel
CMS	Centralized Maintenance System
CPIOM	Core Processing and I/O Module
CRC	Cyclic Redundancy Check
CRDC	Common Remote Data Concentrator
DAL	Design Assurance Level
DC	Direct Current
DFS	Detailed Functional Specification
DLA	Data Load Application
DLC	Data Length Code
DLCS	Data Load Configuration System
DLS	Data Loading System

DOC	Data Object Code
EOF	End Of Frame
FDF	Flexible Data rate Format Identifier
FID	Function code Identifier
FIN	Function Identifier
FSB	Functional Status Bit
FT	Functional Test
FWD	Forward
HA	Hosted Application
HDL	Host Data Loader
IBIT	Interactive Built-In Test
ICD	Interface Control Document
ICP	Inside Control Panel
ID	Identifier
IMA	Integrated Modular Avionics
IN	Loading Into
I/O	Input / Output
LAT	Lateral
LCC	Logical Communication Channel
LCP	Local Control Panel
LH	Left Hand Side
LLC	Limited Liability Company

LONG	Longitudinal
LRU	Line Replaceable Unit
LSB	Least Significant Bit
MCP	Master Control Panel
MD	Main Deck
MDCC	Main Deck Cargo Compartment
MDCD/DOOR	Main Deck Cargo DOOR
MDCLS	Main Deck Cargo Loading System
MSB	Most Significant Bit
NCD	No Computed Data
NO	Normal Operation
NVM	Non-Volatile Memory
OCP	Outside Control Panel
OUT	Unloading Out
PDU	Power Drive Unit
PN	Part Number
PTS	Purchaser Technical Specification
PVT	Private
RCI	Redundancy Channel Identifier
RH	Right Hand Side
RSD	Reserved Bit
RTR	Remote Request Frame

Rx	Reception
SBIT	System Build in Test
S-BITE	System Built in Test Equipment
SELF-L	Self-Lifting
SPDB	Secondary Power Distribution Box
SPR-L	Spring-Loaded
SOF	Start Of Frame
SSPC	Solid State Power Controller
SysRD	System Requirement Document
Tx	Transmission
UDC	User Defined Channel
ULD	Unit Load Device

Table 2 - Abbreviations and Glossary

1.6 REFERENCES

File / Document / Version	Description
A825-4	General Standardization of CAN Bus Protocol for Airborne Use
PTS_ATA_50-24_MDCLS_V5024PTSS21002 _Issue_2.0_signed	PTS Main Deck Cargo Loading System (MDCLS)
PD1000006713 ISSUE 000_15 SECTION 01	A350 XWB CRDC User Guide Section 1 - Introduction
PD1000006713 ISSUE 000_15 SECTION 02	A350 XWB CRDC User Guide Section 2 - Overview
PD1000006713 ISSUE 000_15 SECTION 04	A350 XWB CRDC User Guide Section 4 - Input-

	Output Resources
PD1000006713 ISSUE 000_15 SECTION 12	A350 XWB CRDC User Guide Section 12 - Usage Domain
V4230RQ0702729_2.0	CAN Detailed Functional Specification
V42RP0904936_V1.0	CAN DFS message format
A350F-MDCLS-0014	Power architecture
A350F-MDCLS-0021	Concept of Operation
A350F-MDCLS-0026 Rev 4	Aircraft Connector for PDU and Control Panel
A350F-MDCLS-0029	CAN-Bus architecture
V5024D22020176_v2.0	A350F Layout_PWR_BUS_v2.0ANCRA
V42SP0806471_v2.4	Detailed Functional Specification CAN Data-loading
V5024SP2202946_v1.0	A350F MDCLS BITE Specification issue 1
A350F-MDCLS-OperationalConcept_V5024RP2221448_v2DRAFT2	Operational concepts
Rpt 11632.docx	A350-1000F MDCLS System Requirements Document

Table 3 - Referenced Documents

2 OVERVIEW

2.1 INTERFACE OVERVIEW

The interface between MDCLS Control Application (hosted on CPIOM), CRDC, PDU, CP and CDP are as below:

- Data flow and communication between CRDC and CPIOM is over AFDX
- Data flow between CRDC to / from PDU, CRDC to / from CP and CRDC to / from CDP are over CAN Bus.

The interface between DLCS and CRDC/CPIOM are over AFDX; whereas, between CRDC and LRUs (PDU, CP and CDP) are on CAN extended frame data format, as per specification of A825-4. The interfaces and context of DLCS is illustrated in Figure-5 above.

Note that this document provides details of the data exchange format, protocol for exchange, and general description of each message between CRDCs and LRUs (PDU, CP and CDP).

The CAN communication interface between MDCLS components is described in Figure-4 above.

2.2 INTERFACE DEFINITION

Table-4 below provide the description of the required datalink using CAN 2.0 B as per A825-4 specification, for communication between CRDCs and LRUs (CPs, PDUs and CDP).

The CAN Data Transfer / Exchanges of information between LRUs are defined in section 3.1.7 and section 4 of this document.

Interface Type	From	To	Description of Interface
Data Link	cRDC	PDU	CAN 2.0 B as per A825-4 specification
	PDU	cRDC	CAN 2.0 B as per A825-4 specification
	cRDC	CP	CAN 2.0 B as per A825-4 specification
	CP	cRDC	CAN 2.0 B as per A825-4 specification
	cRDC	CDP	CAN 2.0 B as per A825-4 specification
	CDP	cRDC	CAN 2.0 B as per A825-4 specification

Table 4 - Interface Definition

3 COMMUNICATION PROTOCOL

3.1 CONTROLLER AREA NETWORK

The Controller Area Network (CAN) is a serial data transmission based on broadcast communication. The data source is assigned a unique identifier, represented as extended data frame format (with 29-bit identifier), and ARINC 825-4 specifies how to encode the identifier. Also, there is information to describe the payload data formatting for each message.

With this aim, to specify the format of CAN messages that CRDCs exchanges with LRUs (CPs, PDUs and CDP), that further converted to / from AFDX message frame(s) from MDCLS CA, S-BITE application and DLCS / Data Load Application (DLA). This data exchange is ensured through a gateway as CRDC.

A single communication channel is established for each LRU (CP, PDU and CDP), using a CAN Bus, for exchange of data with the connected CRDC on the Bus. And each LRU is connected to / controlled by one CRDC only.

Note that a CAN Bus connects a set of LRUs to the CRDC, consisting of a set of CPs, PDUs and / or CDP. For details of CAN Buses and Nodes on each bus; refer to the section 3.1.5.

3.1.1 CAN DATA FRAME

The MDCLS CA, S-BITE application and DLA uses CAN extended data frame format (29 bits), as represented by Figure-6 below:

The network data structures, the Arbitration Field, contain the necessary data used by network protocols to identify the information. This structure is compliant with ARINC 825-4.

The Data Field (payload) in CAN message frame can hold a maximum of 8 bytes data, which can be a variable field sizing 0 to 8 data bytes. However, for MDCLS CA, S-BITE application and DLA, each CAN message uses all 8 bytes of payload, i.e., it uses fixed length of 8 bytes data as payload in a CAN message frame.

The bits description for the CAN message, extended frame data format is as below, for further detail refer section 4.2.1.1 of A825-4 specification:

- The CAN message Frame starts with Start of Frame (SOF) bit, which is always dominant (set to 0), for hard synchronization of all nodes.
- The SOF bit is followed by the Arbitration Field reflecting content and priority of the message. The 29-bit identifier is part of the Arbitration Field.

- The next field is the Control Field which specifies mainly the number of bytes of data contained in the message payload. In the 6-bit Control Field, of which only the lower 4 bits are used to define the number of bytes of data contained in the message payload. For MDCLS, it is always of fixed length of 8 bytes. Whereas the FDF (FD Format Identifier) and r0 (Reserved) is always dominant (set to 0).
- The Data Field maximum size is 8 bytes and contains the application data to be transmitted. The CAN message uses a fixed length message frame with 8 bytes of payload data. Note that the Data Field included message signals for various communication as defined in section 4 (Message Signal Definition).
- The Cyclic Redundancy Check (CRC) Field is used to detect possible transmission errors. The 15-bit CRC Sequence Field is CRC generator polynomial (X^15 + X^14 + X^10 + X^8 + X^7 + X^4 + X^3 + X^0). It uses SOF, Arbitration Field, Control Field, and Data Field (where present). The CRC Sequence is completed by the recessive (set to 1) CRC Delimiter bit.
- With the Acknowledgement (ACK Slot) Field the transmitting node sends out a recessive bit. The ACK Delimiter is always recessive (set to 1).
- Any node that received an error free frame acknowledges the correct reception of the frame by sending back a dominant bit (set to 0) in ACK Slot.
- The EOF marks the end of the CAN message Frame, by 7 consecutive recessive (set to 1) bits.
- Between two frames there must be a recessive 3-bit Intermission field.

CAN Extended Frame Data Format (Size in Bits)

SOF	Arbitration Field					Control Field			DATA Field	CRC		ACK		EOF	Intermission
1	32					6			0 .. 8 Data Bytes	16		2		7	3
SOF	Base Identifier	SRR	IDE	Identifier Extension	RTR	FDF	r0	DLC	Payload	CRC Sequence Field	CRC Delimiter	ACK Slot	ACK Delimiter	End of Frame	Intermission
1	11	1	1	18	1	1	1	4	0..64	15	1	1	1	7	3

Figure 6 - CAN Extended Data Frame Format

3.1.2 ARBITRATION / IDENTIFIER DEFINITION

The A825-4 specification-based CAN 2.0B extended data frame format uses a 29-bit message identifier for communication. Hence, CAN messages frames uses a 29-bits arbitration field, as described in Figure - 7 below. The sections below describe the representation of all 32 bits allocated to arbitration field from CAN extended data frame format for each message between CRDCs and LRUs.

The bits description for the arbitration field is as below, for more detail refer to the section 4.2.1.1.1 of A825-4 specification:

- The Logical Communication Channel (LCC), 3 bits (26..28), identifies the channel and message priority.

- The Function Code Identifier (Source FID), 7 bits (19..25), specifies the system and/or subsystem the message originates from (system message source) and is specified through system design. It reflects the importance of the system with respect to the aircraft.

- The Functional Status Bit (FSB) or Reserved Bit (RSD), 1 bit (18), is used to communicate the validity of the data contained in the payload. The FSB is computed based on number of bytes used in payload data (which is always 8 bytes this system) and nature of function, as below: - FSB set to 0 for Normal Operation (NO), when DLC is greater than 0.

  - FSB set to 1 for Functional Test (FT), when DLC is greater than 0.
  - FSB set to 0 for No Computed Data (NCD), when DLC is equal to 0.
  - FSB set to 1 for Failure / Warning (FW), when DLC is equal to 0.

- The Local (LCL), 1 bit (17) is set to a one (1) for messages that are designated only for the network the transmitting node resides in. Gateways do not transfer these messages to other network segments.

- The Private (PVT), 1 bit (16), identifies messages that have no meaning to the nodes other than those nodes specifically programmed to use them. For one-to-one communication, the PVT bit is set to 0; whereas for broadcast messages it is set to 1.

- The Identifier Mapping, 14 bits (2..15), allows specification of different data objects per function.

- The Redundancy Channel Identifier (RCI) allows the users to identify redundant messages and is optional. Up to four redundant channels (0, 1, 2, and 3 corresponding to the redundant channels A, B, C, and D) are supported. Note that redundancy is not used in this application. The bit 0, which is for RTR (Remote Request Frame) and remains dominant, i.e., not used.

Arbitration / Identifier Definition																															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Unused			LCC			Source FID							FSB / RSD	LCL	PVT	DOC														RCI	
						Pre Assigned by System										ID Mapping														Optional	

Figure 7 - Arbitration Field Definition

3.1.2.1 LOGICAL COMMUNICATION CHANNEL

This system uses channel number 5 (or b101), User Defined Channel (UDC), for Logical Communication Channels (LCCs).

The LCC is coded into the upper three bits of the arbitration / identifier fields (bits 26..28).

3.1.2.2 SOURCE FID

The Function Code Identifier (Source FID), 7 bits (19..25), specifies the system and / or subsystem the message originates (message source) from and is specified through system design. It reflects the importance of the system with respect to the aircraft. Refer to the A825-4 specification, section 5.3.2.1.

For the Data-Load specific messages, Function Code Identifier (Source FID) is set as 'Reserved for System Integrator', and has a system assigned decimal value of 42 (or b0101010).

The CA and S-BITE related messages, it implements Function Code Identifier (Source FID) as 'Cargo and Accessory Compartment' and is system assigned as decimal value 103 (or b1100111).

3.1.2.3 REDUNDANCY CHANNEL IDENTIFIER

In any case, the value of the 'Redundancy Channel Identifier' (bits 0-1 in the CAN identifier) is set to '00'.

3.1.3 IDENTIFIER MAPPING

The following sections define the identifier mapping, for messages related to MDCLS CA, S-BITE application and DLA, for arbitration purposes.

This section also describes the mechanism for nodes identification, function identification and subblock frame identification, where necessary.

With reference to the arbitration field, the Data Object Code (DOC), bits 15..2, is used for Identifier Mapping.

3.1.3.1 ID MAPPING – MDCLS CA AND S-BITE

The CAN message for MDCLS-CA and S-BITE communication implements the identifier mapping as described in Figure – 8 below.

Figure - 8 describes the identifier mapping mechanism for nodes identifier, function identifier and reserves bits for future use, where necessary.

With reference to the arbitration field (refer section 3.1.2), the Data Object Code (DOC) is used for Identifier Mapping.

The sub-sections below detail the mechanism for nodes, node type and function identification.

- The Function Identifier, 6 bits (10..15), identifies the message name / function to perform.
- For the Node Identifier, 8 bits (2..9) are allocated, bits 2..6 (5-bits) allows a unique identification of nodes (5 bits) on a CAN Bus. Bit 7, 8 and 9 (3 bits) remains unused for all communication except redirected messages to the CDP. Note that for CDP redirected messages, the system uses translated node identifier of 8-bits (using bits 2..9) to hold the value as described in section 3.1.5.1.

Note that bit 2..6 (5 bits) are used for node identification, which is mapped to hardware address pin to configure the LRU on a specific location. The system uses ODD PARITY based on 5 pin address definition, for parity pin and common ground pin is always set for all LRUs.

ID Mapping - MDCLS CA and S-BITE													
15	14	13	12	11	10	9	8	7	6	5	4	3	2
Function Identifier						Unused			Node Identifier				

Figure 8 - Identifier Mapping - MDCLS and S-BITE

3.1.3.2 ID MAPPING - DLA

The CAN message for DLA implements the identifier mapping for arbitration purposes as described in Figure - 9 below.

Figure - 9 describes the identifier mapping mechanism for nodes identifier, function identifier and reserves bits for future use, where necessary.

With reference to arbitration field (refer section3.1.2), the Data Object Code (DOC) is used for Identifier Mapping.

The sub-sections below detail the mechanism for nodes, node type and function identification.

- The Function Identifier, 2 bits (7..8), identifies the message name / function to perform.
- The Node Identifier, 5 bits (10..14) allows unique identification of nodes (in 5 bits) and bit 15 is reserved for future use.
- The Alt. Bit (bit 9) is only set for Upload Data Message, to identify alternate data block.
- The Sub-block Frame identifier, 4 bits (5..2) is only set for Upload Data Message, identifies message frame in a data block.
- Note that bit 10..14 (5 bits) are used for node identification, which is mapped to hardware address pin to configure the LRU on a specific location. The system uses ODD PARITY based on 5 pin address definition, for parity pin and common ground pin is always set for all LRUs.
- Note that Alt. Bit (bit 9) is only set for Upload Data Message.

ID Mapping - DLA													
15	14	13	12	11	10	9	8	7	6	5	4	3	2
Unused	Node Identifier					Alt. Bit	Function ID		Unused	Sub-block Frame Id			

Figure 9 - Identifier Mapping - DLA

3.1.4 FUNCTION IDENTIFIER

The arbitration field in the CAN message frame Function Identifier (Function ID) that identifies the messages name (including command, responses and redirected) and from the message priority.

Table - 4 describes Function Identifier using 6 bits of identifier mapping (bits 15..10), for CAN messages used for MDCLS CA and S-BITE. And Table - 5 describes Function Identifier using 2 bits (bits 8..7) for DLA communication.

Function Identifier Mapping – MDCLS and S-BITE							
Bits (ID Mapping)						Decimal Value	Description
15	14	13	12	11	10		
0	0	0	0	0	0	0	Reserved / Unused
0	0	0	0	0	1	1	Reserved / Unused
0	0	0	1	0	0	4	PANEL_OPER_CMD
0	0	1	0	0	0	8	STATUS_MSG_1
0	0	1	0	0	1	9	STATUS_MSG_2
0	0	1	0	1	0	10	STATUS_MSG_3
0	0	1	1	0	0	12	PREPARE
0	1	0	0	0	0	16	MOVE
0	1	0	1	0	0	20	RETRACT
0	1	1	0	0	0	24	PANEL_STATUS_CMD
1	0	0	1	0	0	36	CARGO_ZONE_ENABLED
1	0	0	1	0	1	37	CDP_STATUS_DATA
1	0	1	0	0	1	41	LRU_FIN
1	0	1	0	1	0	42	DATE_TIME
1	0	1	0	1	1	43	ARN_MSN

1	0	1	1	0	0	44	AIRPORT_CODE
1	0	1	1	0	1	45	CONFIGURATION_DATA
1	1	0	0	1	1	51	READOUT_CMD
1	1	0	1	0	0	52	READOUT_RESPONSE
1	1	0	1	0	1	53	IBIT_CMD
1	1	0	1	1	0	54	IBIT_RESPONSE

Table 5 - Function Identifier - MDCLS CA and S-BITE

Function ID Mapping - DLA		
Function Name	**Function ID Bits**	
	8	**7**
UPLOAD_RESPONSE	0	0
UPLOAD_REQUEST	0	1
WACK	1	0
UPLOAD_DATA	1	1

Table 6 - Function Identifier - DLA

3.1.5 LRU / NODE IDENTIFIER

The node identifier is allotted to each LRU connected to a specific CAN bus uniquely. Each Node (LRU) is configured to a fixed location (with odd parity and 5 pin address configuration) in the cargo hold area (refer to the Figure-2 above for ‘Cargo Hold Area - Equipment Positions’.

The CAN Bus and connected CRDC mapping is illustrated by Figure-3 above with ‘MDCLS Architecture’.

The Node Identifier for each LRU is articulated in the Table-7 below along with its CAN Bus connectivity. The table below also provides the following details:

- The node identifier uses 5 bits (bit 2..6 for MDCLS CA and S-BITE, bit 10..14 for DLS) for unique identification of LRUs on each CAN Bus.
- Table - 7 articulates node identification and its bit mapping, for each connected LRU to a CAN Bus and CRDC.

- On every CAN bus node 0 is unused to distinguish from default value, node 1 to 31 is used for LRU identification, excluding 15, 23, 27, 29, 30 and 31, as with parity bit setting it violates the rule of pin configuration, i.e., minimum 2 pins and maximum 4 pins (including parity and common ground) to be used for address configuration of an LRU. Hence, in 5 pin address configuration, node 0, 15, 23, 27, 29, 30 and 31 remains unused (refer to the COMO A350F-MDCLS-0026-ANC).
- The Control Panels are installed as unique nodes, irrespective of the CAN bus it is connected to, as they are location specific. Hence, Unique Node Id is allotted to each CP, irrespective of CAN Bus it is connected to.
- CDP is allotted Node Id 12 on CAN Bus A15A.
- PDUs are allotted Node Id between 1 to 31, depending on available node id (excluding node id allotted to CPs) on a specific Can Bus. Note that the node identifier and parity bit (5 address programming pin and 1 parity programming pin) does not set more than 3 pins, that makes Node Id 15, 23, 27, 29, 30 and 31 not usable (refer to the description above).
- A CAN bus is identified by CRDC to which it is connected. Where more than one CAN bus is connected to a CRDC, the CAN bus is identified with postfix A or B. Refer to the COMO A350F-MDCLS-0026-ANC for LRU and CRDC connectivity to a CAN Bus, where more than one CAN Bus is used.

NODE IDENTIFIER: CAN BUS, CRDC AND LRU ID MAPPING

CAN BUS	CRDC	LRU ID	LRU Type	NODE ID (5 Bits) Decimal Value	ADDRESS PIN CONFIGURATION					
					PARITY	ADD SEL 5	ADD SEL 4	ADD SEL 3	ADD SEL 2	ADD SEL 1
						Node ID Bit Mapping				
						6	5	4	3	2
B03	CRDC-B03	LCP2 LH	CP	6	1	0	0	1	1	0
B03	CRDC-B03	LCP4 LH	CP	10	1	0	1	0	1	0
B03	CRDC-B03	PDUL13	PDU	1	0	0	0	0	0	1
B03	CRDC-B03	PDUL15	PDU	2	0	0	0	0	1	0
B03	CRDC-B03	PDUL17	PDU	3	1	0	0	0	1	1

B03	CRDC-B03	PDUL19	PDU	4	0	0	0	1	0	0
B03	CRDC-B03	PDUL21	PDU	5	1	0	0	1	0	1
B03	CRDC-B03	PDUL23	PDU	7	0	0	0	1	1	1
B03	CRDC-B03	PDUL25	PDU	8	0	0	1	0	0	0
B03	CRDC-B03	PDUL27	PDU	9	1	0	1	0	0	1
B03	CRDC-B03	PDUL29	PDU	11	0	0	1	0	1	1
B03	CRDC-B03	PDUL31	PDU	12	1	0	1	1	0	0
B03	CRDC-B03	PDUL33	PDU	13	0	0	1	1	0	1
B03	CRDC-B03	PDUL35	PDU	14	0	0	1	1	1	0
B03	CRDC-B03	PDUL37	PDU	16	0	1	0	0	0	0
B03	CRDC-B03	PDUTL02	PDU	17	1	1	0	0	0	1
B04	CRDC-B04	LCP1 RH	CP	5	1	0	0	1	0	1
B04	CRDC-B04	PDUL01	PDU	1	0	0	0	0	0	1
B04	CRDC-B04	PDUL03	PDU	2	0	0	0	0	1	0
B04	CRDC-B04	PDUL05	PDU	3	1	0	0	0	1	1
B04	CRDC-B04	PDUL07	PDU	4	0	0	0	1	0	0
B04	CRDC-B04	PDUL09	PDU	6	1	0	0	1	1	0
B04	CRDC-B04	PDUL11	PDU	7	0	0	0	1	1	1
B04	CRDC-B04	PDUR01	PDU	8	0	0	1	0	0	0
B04	CRDC-B04	PDUR03	PDU	9	1	0	1	0	0	1
B04	CRDC-B04	PDUR05	PDU	10	1	0	1	0	1	0
B04	CRDC-B04	PDUR07	PDU	11	0	0	1	0	1	1

B04	CRDC-B04	PDUR09	PDU	12	1	0	1	1	0	0
B04	CRDC-B04	PDUR11	PDU	13	0	0	1	1	0	1
B07	CRDC-B07	LCP2 RH	CP	7	0	0	0	1	1	1
B07	CRDC-B07	LCP4 RH	CP	11	0	0	1	0	1	1
B07	CRDC-B07	PDUR13	PDU	1	0	0	0	0	0	1
B07	CRDC-B07	PDUR15	PDU	2	0	0	0	0	1	0
B07	CRDC-B07	PDUR17	PDU	3	1	0	0	0	1	1
B07	CRDC-B07	PDUR19	PDU	4	0	0	0	1	0	0
B07	CRDC-B07	PDUR21	PDU	5	1	0	0	1	0	1
B07	CRDC-B07	PDUR23	PDU	6	1	0	0	1	1	0
B07	CRDC-B07	PDUR25	PDU	8	0	0	1	0	0	0
B07	CRDC-B07	PDUR27	PDU	9	1	0	1	0	0	1
B07	CRDC-B07	PDUR29	PDU	10	1	0	1	0	1	0
B07	CRDC-B07	PDUR31	PDU	12	1	0	1	1	0	0
B07	CRDC-B07	PDUR33	PDU	13	0	0	1	1	0	1
B07	CRDC-B07	PDUR36	PDU	14	0	0	1	1	1	0
B07	CRDC-B07	PDUR40	PDU	16	0	1	0	0	0	0
B07	CRDC-B07	PDUTR02	PDU	17	1	1	0	0	0	1
B07	CRDC-B07	PDUTR05	PDU	18	1	1	0	0	1	0
B08	CRDC-B08	LCP1 LH	CP	4	0	0	0	1	0	0
B08	CRDC-B08	PDUL02	PDU	1	0	0	0	0	0	1
B08	CRDC-B08	PDUL04	PDU	2	0	0	0	0	1	0

B08	CRDC-B08	PDUL06	PDU	3	1	0	0	0	1	1
B08	CRDC-B08	PDUL08	PDU	5	0	0	0	1	0	0
B08	CRDC-B08	PDUL10	PDU	6	1	0	0	1	1	0
B08	CRDC-B08	PDUL12	PDU	7	0	0	0	1	1	1
B08	CRDC-B08	PDUR02	PDU	8	0	0	1	0	0	0
B08	CRDC-B08	PDUR04	PDU	9	1	0	1	0	0	1
B08	CRDC-B08	PDUR06	PDU	10	1	0	1	0	1	0
B08	CRDC-B08	PDUR08	PDU	11	0	0	1	0	1	1
B08	CRDC-B08	PDUR10	PDU	12	1	0	1	1	0	0
B08	CRDC-B08	PDUR12	PDU	13	0	0	1	1	0	1
B09A	CRDC-B09	OCP	CP	3	1	0	0	0	1	1
B09A	CRDC-B09	LCP3 LH	CP	8	0	0	1	0	0	0
B09A	CRDC-B09	PDUL14	PDU	1	0	0	0	0	0	1
B09A	CRDC-B09	PDUL16	PDU	2	0	0	0	0	1	0
B09A	CRDC-B09	PDUL18	PDU	4	0	0	0	1	0	0
B09A	CRDC-B09	PDUL20	PDU	5	1	0	0	1	0	1
B09A	CRDC-B09	PDUL22	PDU	6	1	0	0	1	1	0
B09A	CRDC-B09	PDUL24	PDU	7	0	0	0	1	1	1
B09A	CRDC-B09	PDUL26	PDU	9	1	0	1	0	0	1
B09A	CRDC-B09	PDUL28	PDU	10	1	0	1	0	1	0
B09A	CRDC-B09	PDUL30	PDU	11	0	0	1	0	1	1
B09A	CRDC-B09	PDUL32	PDU	12	1	0	1	1	0	0

B09A	CRDC-B09	PDUL34	PDU	13	0	0	1	1	0	1
B09A	CRDC-B09	PDUL36	PDU	14	0	0	1	1	1	0
B09A	CRDC-B09	PDUL39	PDU	16	0	1	0	0	0	0
B09A	CRDC-B09	PDUL41	PDU	17	1	1	0	0	0	1
B09A	CRDC-B09	PDUTL01	PDU	18	1	1	0	0	1	0
B09A	CRDC-B09	PDUTL03	PDU	19	0	1	0	0	1	1
B09A	CRDC-B09	PDUTL05	PDU	20	1	1	0	1	0	0
B09A	CRDC-B09	PDUTL08	PDU	21	0	1	0	1	0	1
B09A	CRDC-B09	PDUTL10	PDU	22	0	1	0	1	1	0
B09B	CRDC-B09	LCP3 RH	CP	9	1	0	1	0	0	1
B09B	CRDC-B09	PDUR14	PDU	1	0	0	0	0	0	1
B09B	CRDC-B09	PDUR16	PDU	2	0	0	0	0	1	0
B09B	CRDC-B09	PDUR18	PDU	3	1	0	0	0	1	1
B09B	CRDC-B09	PDUR20	PDU	4	0	0	0	1	0	0
B09B	CRDC-B09	PDUR22	PDU	5	1	0	0	1	0	1
B09B	CRDC-B09	PDUR24	PDU	6	1	0	0	1	1	0
B09B	CRDC-B09	PDUR26	PDU	7	0	0	0	1	1	1
B09B	CRDC-B09	PDUR28	PDU	8	0	0	1	0	0	0
B09B	CRDC-B09	PDUR30	PDU	10	1	0	1	0	1	0
B09B	CRDC-B09	PDUR32	PDU	11	0	0	1	0	1	1
B09B	CRDC-B09	PDUR34	PDU	12	1	0	1	1	0	0
B09B	CRDC-B09	PDUR38	PDU	13	0	0	1	1	0	1

B09B	CRDC-B09	PDUTR01	PDU	14	0	0	1	1	1	0
A15A	CRDC-A15	CDP	DP	12	1	0	1	1	0	0
A15B	CRDC-A15	ICP	CP	2	0	0	0	0	1	0
A15B	CRDC-A15	PDUL43	PDU	1	0	0	0	0	0	1
A15B	CRDC-A15	PDUL45	PDU	3	1	0	0	0	1	1
A15B	CRDC-A15	PDUL47	PDU	4	0	0	0	1	0	0
A15B	CRDC-A15	PDUL49	PDU	5	1	0	0	1	0	1
A15B	CRDC-A15	PDUR35	PDU	6	1	0	0	1	1	0
A15B	CRDC-A15	PDUR37	PDU	7	0	0	0	1	1	1
A15B	CRDC-A15	PDUR39	PDU	8	0	0	1	0	0	0
A15B	CRDC-A15	PDUR41	PDU	9	1	0	1	0	0	1
A15B	CRDC-A15	PDUR43	PDU	10	1	0	1	0	1	0
A15B	CRDC-A15	PDUR45	PDU	11	0	0	1	0	1	1
A15B	CRDC-A15	PDUR47	PDU	12	1	0	1	1	0	0
A15B	CRDC-A15	PDUR49	PDU	13	0	0	1	1	0	1
A15B	CRDC-A15	PDUTR03	PDU	14	0	0	1	1	1	0
A15B	CRDC-A15	PDUTR04	PDU	16	0	1	0	0	0	0
A15B	CRDC-A15	PDUTR06	PDU	17	1	1	0	0	0	1
A17	CRDC-A17	MCP	CP	1	0	0	0	0	0	1
A17	CRDC-A17	PDUL38	PDU	2	0	0	0	0	1	0
A17	CRDC-A17	PDUL40	PDU	3	1	0	0	0	1	1
A17	CRDC-A17	PDUL42	PDU	4	0	0	0	1	0	0

A17	CRDC-A17	PDUL44	PDU	5	1	0	0	1	0	1
A17	CRDC-A17	PDUL46	PDU	6	1	0	0	1	1	0
A17	CRDC-A17	PDUL48	PDU	7	0	0	0	1	1	1
A17	CRDC-A17	PDUL50	PDU	8	0	0	1	0	0	0
A17	CRDC-A17	PDUTL04	PDU	9	1	0	1	0	0	1
A17	CRDC-A17	PDUTL07	PDU	10	1	0	1	0	1	0
A17	CRDC-A17	PDUTL09	PDU	11	0	0	1	0	1	1
A17	CRDC-A17	PDUR42	PDU	12	1	0	1	1	0	0
A17	CRDC-A17	PDUR44	PDU	13	0	0	1	1	0	1
A17	CRDC-A17	PDUR46	PDU	14	0	0	1	1	1	0
A17	CRDC-A17	PDUR48	PDU	16	0	1	0	0	0	0
A17	CRDC-A17	PDUR50	PDU	17	1	1	0	0	0	1
A17	CRDC-A17	PDUTR07	PDU	18	1	1	0	0	1	0

Table 7 - Node Identifier: CAN Bus, CRDC AND LRU ID Mapping

3.1.5.1 TRANSLATED NODE IDENTIFIER

The CRDC A15A is to translate all the AFDX input and output messages (all redirect messages) to CAN output message using Translated Node Identifier as specified in Table – 8.

Note that translated node ID is applicable for redirected messages from all CRDCs to CDP via CRDC A15A only; hence, it is only applicable for MDCLS control application.

HW Node ID (5-Bits) Vs LRU Node ID (8-Bits) Mapping							
LRU AT LH				**LRU AT RH**			
LRU ID				**LRU ID**			

	CAN Bus	HW Node-ID 5-bits	Translated Node ID (8 - Bits)		CAN Bus	HW Node-ID 5-bits	Translated Node ID (8 - Bits)
PDUL01	B04	1	1	PDUR01	B04	8	129
PDUL02	B08	1	2	PDUR02	B08	8	130
PDUL03	B04	2	3	PDUR03	B04	9	131
PDUL04	B08	2	4	PDUR04	B08	9	132
PDUL05	B04	3	5	PDUR05	B04	10	133
PDUL06	B08	3	6	PDUR06	B08	10	134
PDUL07	B04	4	7	PDUR07	B04	11	135
PDUL08	B08	5	8	PDUR08	B08	11	136
PDUL09	B04	6	9	PDUR09	B04	12	137
PDUL10	B08	6	10	PDUR10	B08	12	138
PDUL11	B04	7	11	PDUR11	B04	13	139
PDUL12	B08	7	12	PDUR12	B08	13	140
PDUL13	B03	1	13	PDUR13	B07	1	141
PDUL14	B09A	1	14	PDUR14	B09B	1	142
PDUL15	B03	2	15	PDUR15	B07	2	143
PDUL16	B09A	2	16	PDUR16	B09B	2	144
PDUL17	B03	3	17	PDUR17	B07	3	145
PDUL18	B09A	4	18	PDUR18	B09B	3	146
PDUL19	B03	4	19	PDUR19	B07	4	147
PDUL20	B09A	5	20	PDUR20	B09B	4	148
PDUL21	B03	5	21	PDUR21	B07	5	149
PDUL22	B09A	6	22	PDUR22	B09B	5	150

PDUL23	B03	7	23	PDUR23	B07	6	151
PDUL24	B09A	7	24	PDUR24	B09B	6	152
PDUL25	B03	8	25	PDUR25	B07	8	153
PDUL26	B09A	9	26	PDUR26	B09B	7	154
PDUL27	B03	9	27	PDUR27	B07	9	155
PDUL28	B09A	10	28	PDUR28	B09B	8	156
PDUL29	B03	11	29	PDUR29	B07	10	157
PDUL30	B09A	11	30	PDUR30	B09B	10	158
PDUL31	B03	12	31	PDUR31	B07	12	159
PDUL32	B09A	12	32	PDUR32	B09B	11	160
PDUL33	B03	13	33	PDUR33	B07	13	161
PDUL34	B09A	13	34	PDUR34	B09B	12	162
PDUL35	B03	14	35	PDUR35	A15B	6	163
PDUL36	B09A	14	36	PDUR36	B07	14	164
PDUL37	B03	16	37	PDUR37	A15B	7	165
PDUL38	A17	2	38	PDUR38	B09B	13	166
PDUL39	B09A	16	39	PDUR39	A15B	8	167
PDUL40	A17	3	40	PDUR40	B07	16	168
PDUL41	B09A	17	41	PDUR41	A15B	9	169
PDUL42	A17	4	42	PDUR42	A17	12	170
PDUL43	A15B	1	43	PDUR43	A15B	10	171
PDUL44	A17	5	44	PDUR44	A17	13	172
PDUL45	A15B	3	45	PDUR45	A15B	11	173
PDUL46	A17	6	46	PDUR46	A17	14	174
PDUL47	A15B	4	47	PDUR47	A15B	12	175

PDUL48	A17	7	48	PDUR48	A17	16	176
PDUL49	A15B	5	49	PDUR49	A15B	13	177
PDUL50	A17	8	50	PDUR50	A17	17	178
PDUTL01	B09A	18	51	PDUTR01	B09B	14	179
PDUTL02	B03	17	52	PDUTR02	B07	17	180
PDUTL03	B09A	19	53	PDUTR03	A15B	14	181
PDUTL04	A17	9	54	PDUTR04	A15B	16	182
PDUTL05	B09A	20	55	PDUTR05	B07	18	183
PDUTL07	A17	10	56	PDUTR06	A15B	17	184
PDUTL08	B09A	21	57	PDUTR07	A17	18	185
PDUTL09	A17	11	58				
PDUTL10	B09A	22	59				
MCP	A17	1	60	ICP	A15B	2	188
OCP	B09A	3	61	LCP1 RH	B04	5	189
LCP1 LH	B08	4	62	LCP2 RH	B07	7	190
LCP2 LH	B03	6	63	LCP3 RH	B09B	9	191
LCP3 LH	B09A	8	64	LCP4 RH	B07	11	192
LCP4 LH	B03	10	65				

Table 8 - Translated Node Identifier and CAN Bus Mapping

3.1.5.2 ALLOWABLE NUMBER OF NODES

The information below provides a comparison between maximum number of nodes on a CAN bus with given transmission rate (with reference to A825-4, section 7.3.5.1.1) and LRU connectivity per bus for MDCLS, is as below:

CAN BUS	Bus Speed (in kbps)	Max Possible Nodes of Bus	Nodes Connected on the Bus for A350 MDCLS

B03	250	40	14 PDU + 2 CP + 1 CRDC
B04	250	40	12 PDU + 1 CP + 1 CRDC
B07	250	40	15 PDU + 2 CP + 1 CRDC
B08	250	40	12 PDU + 1 CP + 1 CRDC
B09A	250	40	19 PDU + 2 CP + 1 CRDC
B09B	250	40	13 PDU + 1 CP + 1 CRDC
A15A	1000	30	1 CDP + 1 CRDC
A15B	250	40	15 PDU + 1 CP + 1 CRDC
A17	250	40	16 PDU + 1 CP + 1 CRDC

Table 9 - Maximum Nodes Allowed on a CAN Bus

3.1.6 DATA / PAYLOAD STRUCTURE

In purview of this document, all CAN messages transmit a fixed length of 8 bytes of payload data in one message frame. Where a data set longer than 8 bytes is to be transmitted; it is transmitted as separate message frame consisting of 8 bytes of payload data.

The CAN data payload packs the message signals in bits arrangements (BIG ENDIAN) as described in figure below.

Where consecutive bytes are used to represent a binary number, the lower byte number carries the most significant value.

Where a numeric quantity is represented in binary, the left most bit is the high order or most significant bit (MSB), and the right most bit, the least significant bit (LSB).

Figure - 10 describes the progression of transmission with bit and byte representation.

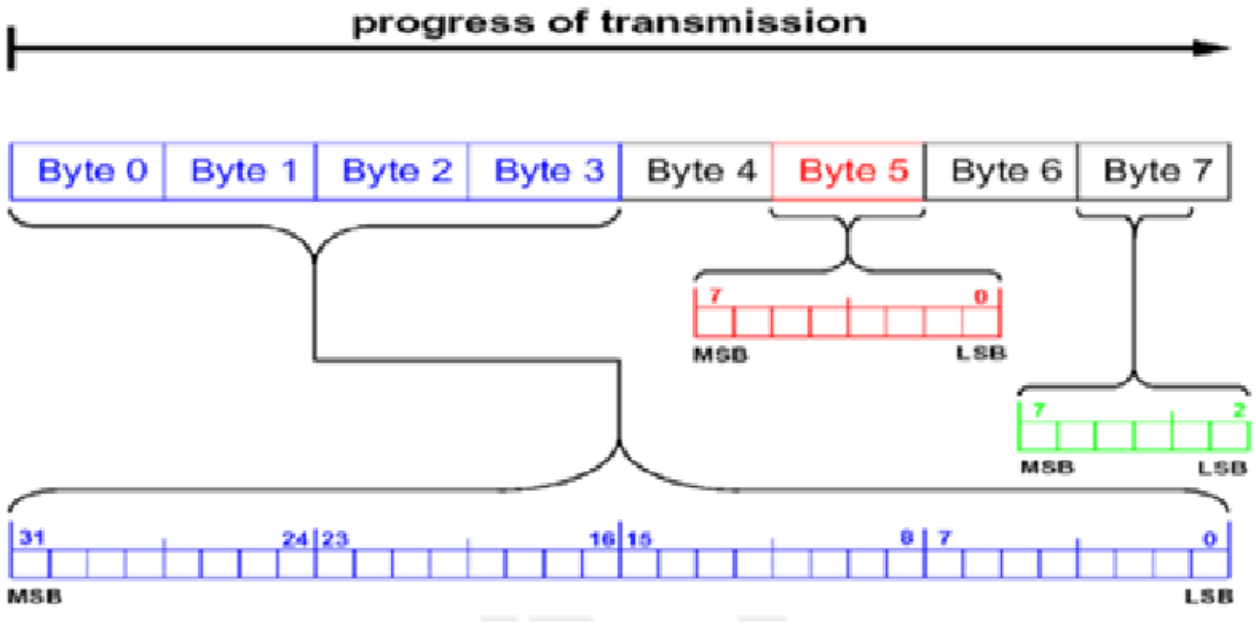

Figure 10 - Bit and Byte Representation

3.1.6.1 DATA ALIGNMENT / ENCODING

The data is to be aligned on their natural boundary. Following rules are applied for message packing:

- All unused bits are encoded with 0 s.
- A Boolean value to be encoded on one bit taken among the 8 of a byte. The value FALSE being 0 (zero) and the value TRUE being 1 (one).
- Boolean to be placed in the word from most to least significant bits.
- A byte allows the encoding of 8 Boolean data. If 9 are needed, a second byte word to be used, and so on. The rest of the byte not used is counted as spare and should be encoded with 0 (zero) value.
- The Minimum to encode an integer should be one byte (8 bits).
- The Maximum to encode an integer should be four bytes (32 bits).
- An integer encoded on BCD should be encoded on half of a byte (4 bits). Thus, two (2) BCD can be placed in a byte.
- A BCD should encode only decimal figures from 0 to 9 (value across 10 to 15 is prohibited).
- A byte (8 bits) should be aligned on any byte of payload (8 bytes max. by payload)
- A sixteen bits word (16 bits) should be aligned on any multiple of two bytes.
- A sixteen bits word (16 bits) should not be aligned across the third and the fourth byte of the payload.

- A thirty-two bits word (32 bits) should be aligned on a multiple of 4 bytes.
- A thirty-two bits word (32 bits) should not be aligned across the third and the fourth byte of the payload.
- Note that to describe8-bit, 16-bit and 32-bit decimal values unsigned integer is used. For 8-bit unsigned integer is identified as UINT_8 and 16-bit unsigned integer is identified as UINT_16.
- Where a data type is identified as UINT_8 and signal are allotted number of bits 8 or less than 8, it holds a 'minimum value of 0' to 'maximum value of 2^alloted number of bits -1'.
- Where a data type is identified as UINT_16 and signal are allotted number of bits 16 or less than 16, it holds a 'minimum value of 0' to 'maximum value of 2^alloted number of bits -1'.

Table - 10 describes the data encoding used.

Parameter Type	Signal Type	Number of Bits	Number of Bytes
Boolean	Boolean	1	1 (on 1 byte 8 Boolean data can be encoding)
Integer	BN2 (signed)	8, 16, 32	Up to 4 bytes
	BCD	4	1 (on 1 byte 2 BCD data can be encoding)

Table 10 - Data Encoding

3.1.7 DATA TRANSFER / MESSAGE EXCHANGE

This section describes the CAN Data Transfer / Exchanges of information between LRU and CRDC. Each message exchange (message frame) adheres to the payload/signal description, as in section 4.

For each applicable function (message exchange) between a LRU and CRDC is described in section 4, with byte/bits position for a signal. Where, bits that are not specified in the message payload are packed with 0 (zero).

Note that each message frame consists of a fixed length of 8 byte as payload data.

3.1.7.1 MDCLS CONTROL MESSAGES

This section identifies the messages (transmitted or received by an LRU) for MDCLS control application.

3.1.7.1.1 CP Tx MESSAGES

Each CP transmits PANEL_OPER_CMD message to the connected CRDC. Note that each CP transmits its operator command in a single message frame.

The transmitting CP always includes its node identifier in the arbitration field to identify the message source.

I.e., the ID mapping in the arbitration field for the Panel Operator Command message consists transmitting CP as node identifier.

3.1.7.1.2 CP Rx MESSAGES

Each CP receives PANEL_STATUS_CMD message from the connected CRDC. Note that each CP receives its status command in a single message frame.

The transmitting CRDC always includes the CP node identifier in the arbitration field to identify the message destination. I.e., the ID mapping in the arbitration field for the Panel Status Command message consists of receiving CP as node identifier.

3.1.7.1.3 PDU Tx MESSAGES

Each PDU transmits STATUS_MSG_1, STATUS_MSG_2 and STATUS_MSG_3 to the connected CRDC. Note that each PDU transmits its status in three message frames.

For each Status message, the Node Id (in the arbitration field) is the address of PDU from where message is originating (source address).

3.1.7.1.4 PDU Rx MESSAGES

Each PDU receives the PREPARE, MOVE and RETRACT function command from the connected CRDC. Note that each PDU receives three types of command message, and each command is received in a single message frame.

For each PREPARE command, the Node Id (in the arbitration field) is the address of receiving PDU (destination address). Whereas, for MOVE and RETRACT command the message is broadcasted, hence, the node identifier in the arbitration field is set with zero.

3.1.7.1.5 CDP Tx MESSAGES

The CDP transmits its health status and fault data (CDP Status Data) to CRDC-A15A. Note that CDP Status Data is transmitted in a single message frame.

While transmitting the message, the CDP uses its Node Identifier in the message arbitration field indicating the source of message origin.

3.1.7.1.6 CDP Rx MESSAGES

The CDP receives Cargo Zone Information from CA via CRDC A15A. For Cargo Zone Information, the Node Id (in the arbitration field) is the address of CDP (destination address).

The CDP also receives all PDU and CP message (Tx and Rx messages) redirected from all CRDCs. Note that redirected message transmitted by each CRDC to CDP through an IMA virtual link.

The redirected messages to CRDC-A15 always includes the LRU node identifier for each message in the arbitration field to identify the message source uniquely. To identify the source LRUs uniquely, the 8-bit translated node identifier are used. I.e., the Node Identifier in the arbitration field, for the redirected Panel Operator Command, Panel Status Command, Prepare, Move, Retract, and PDU Status Messages consists translated LRU ID, as per the Table-8.

3.1.7.2 DLA MESSAGES

This section identifies the messages (transmitted or received by an LRU) for DLS application.

3.1.7.2.1 LRU Tx MESSAGE

Each LRU in Data load Mode (DL_MODE) transmits its status (UPLOAD_RESPONSE Message) to the CRDC via connected CAN bus.

The LRU in DL_MODE transmits the LRU Response Message to the connected CRDC via CAN bus, indicating the status of the received upload data.

The transmitting LRU always includes its node identifier in the arbitration field to identify the message source. I.e., the ID mapping in the arbitration field for the LRU in message consists transmitting LRU ID as node identifier.

3.1.7.2.2 LRU Rx MESSAGE

This section defines the message signal and payload data for the READOUT_RESPONSE.

3.1.7.3 SBITE MESSAGES

Each LRU transmissions (Tx messages from CP, CDP and PDU) to CA via CRDCs are also transmitted to SBITE application via AFDX virtual link.

Hence, there is no separate message from LRUs to SBITE application. Also, there is no communication from SBITE application to MDCLS LRUs over CAN Bus.

3.2 MESSAGE CONVERSION AT CRDC AND TX REQUIREMENTS

This section describes CAN message conversion to ADFX message frame conversion and their transmission through virtual links.

ID:ICD-CAN-28773

CRDCs B03, B04, B07, B08, B09, A15, and A17 should translate the all-input CAN Message (including CAN-LRU's Node identifier as per Table - 7) to the AFDX Message and transmit it to the MDCLS-CA.

ID:ICD-CAN-21783

CRDCs B03, B04, B07, B08, B09, A15, and A17 should translate the all-input CAN Message (including CAN-LRU's Node identifier as per Table - 7) to the AFDX Message and transmit it to the S-BITE.

ID:ICD-CAN-72488

CRDCs B03, B04, B07, B08, B09, A15, and A17 should translate the AFDX Message to CAN Output Message including the CAN-LRU's Node identifier (destination address) as per Table – 7 and transmit on CAN Bus to which the LRU is connected.

ID:ICD-CAN-21781

CRDC B03, B04, B07, B08, B09 and A17 should transmit (redirect) all AFDX input and output messages to CRDC A15.

ID:ICD-CAN-72490

CRDC A15A should translate all the AFDX input and output messages (including redirect messages) to CAN output messages using Translated Node Identifier as specified in Table - 8 (for Translated Node ID, refer section 3.1.5.1).

ID:ICD-CAN-83450

CRDCs B03, B04, B07, B08, B09A, B09B, A15A, A15B and A17 should translate the CAN Messages using CAN-LRU Node Identifier added with fifteen for PDUs (PDU Node Identifier + 15) while configuration data reporting for DLCS. This enables the DLCS operator to allocate the same SW FIN and field loadable SW Part Number to a selected block of PDUs (up to 10 PDUs) in common, irrespective of CAN Bus connectivity.

3.3 BUS LOAD ANALYSIS

This table below describes the CAN Bus Load Analysis.

Attributes Considered for Bus Load Analysis	CAN Bus								
	B03	B04	B07	B08	B09A	B09B	A15A	A15B	A17
Number of PDUs	14	12	15	12	19	13	0	15	16
Number of CPs	2	1	2	1	2	1	0	1	1

CDP	0	0	0	0	0	0	1	0	0
Total number of LRU	16	13	17	13	21	14	1	16	17
Periodic PDU Tx msg.	3	3	3	3	3	3	0	3	3
Event Trig. PDU Tx msg.	1	1	1	1	1	1	0	1	1
PDU Rx message	2	2	2	2	2	2	0	2	2
Periodic CP Tx msg.	1	1	1	1	1	1	0	1	1
Event Trig. CP Tx msg.	1	1	1	1	1	1	0	1	1
CP Rx message	1	1	1	1	1	1	0	1	1
Periodic CDP Tx message	0	0	0	0	0	0	1	0	0
CDP Rx Message	0	0	0	0	0	0	1	0	0
CDP Rx (Redirected Msg.)	0	0	0	0	0	0	602	0	0
Total Messages / bus / cycle	90	75	96	75	120	81	604	93	99
Bus Speed (in kbps)	250	250	250	250	250	250	1000	250	250
Time taken (in ms) / message	0.632	0.632	0.632	0.632	0.632	0.632	0.158	0.632	0.632
Bus Load %	**22.75%**	**18.96%**	**24.27%**	**18.96%**	**30.34%**	**20.48%**	**38.17%**	**23.51%**	**25.03%**

Table 11 - CAN Bus Load Analysis

Factors considered in the above bus load analysis:

- Each PDU transmits 3 messages periodically (Status Message 1, 2 and 3).
- Each PDU transmits 1 event triggered message (Status Message 1), in 250 milliseconds.
- Each CP transmits 1 message periodically (Panel Operator Command)
- Each CP transmits 1 event triggered message (Panel Operator Command), in 250 milliseconds.
- Each PDU receives 2 messages (Prepare and Move, or Prepare and Retract), in 250 milliseconds.
- Each CP receives 1 message (Panel Status Command), in 250 milliseconds.
- The CDP transmits 1 message (Health Status and Fault Data), in 250 milliseconds.
- The CDP receives 1 message (Cargo Zone Information from CA), in 250 milliseconds.
- The CDP receives 602 redirected message frames (5 messages for each PDU and 2 messages for each CP), in every 250 milliseconds.

- All CAN Bus speed is 250 kbps, except A15A (to CDP). The CAN bus connecting CDP operates at 1000 kbps.
- The message length of each CAN message frame is considered as 158 bits, with reference to table 5-22 of A825-4.

4 MESSAGE SIGNAL DEFINITION

The following sections describe the CAN Data Transfer / Exchanges of information between LRU and CRDC. The payload data in each message exchange for applicable function are described in this section.

The message payload in each message has a fixed length of 8 bytes (64 bits). The bits that are not specified in the message payload are to be packed with 0 (zero).

4.1 CONTROL LOGIC MESSAGES

This section describes the payload data for CAN message Transfer / Exchanges of information between LRU and CRDC, for control logic and fault data transmission.

4.1.1 CONTROL PANEL MESSAGES

This section describes the payload data for a CAN message Transfer / Exchanges of information (signals) between CP and CRDC.

4.1.1.1 CONTROL PANEL Tx MESSAGES

This section describes the payload data for a CAN message transmitted by CP. Note that each CP transmits periodically (every 250 milliseconds) when powered. And on an active CP, where the operator controlling the ULD movement, the CP transmits for change in state / selection on switch panel (i.e., event triggered).

Each CP transmits one message for transmission of command and fault data packaged together, identified as PANEL_OPER_CMD.

4.1.1.1.1 PANEL OPERATOR COMMAND

This section describes the payload data for PANEL_OPER_CMD (operator command from a control panel) transmitted by CP.

The values for each signal are set as per 'signal description' based on selections on respective CPs; default value for each signal is 0.

Note that fault data transmission is part of this message payload.

4.1.1.1.1.1 MCP AND ICP PANEL OPERATOR COMMAND

This section describes the payload data for PANEL_OPER_CMD (operator command from Master Control Panel, Inside Control Panel, their Fault Data, and overall health status) transmitted by MCP or ICP.

Note: The MCP and ICP transmit PANEL_OPER_CMD to the CRDC which is connected on same CAN

Bus as a node. For CAN Bus mapping to CRDC and MCP/ICP, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_Power_On_Off	Power On/Off; Set (1) when button pressed (ON)	MCP, ICP	Connected CRDC	0	7	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop	PDU Stop; Set (1) when button pressed	MCP, ICP	Connected CRDC	0	6	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Left	Side Select - Left; Set (1) when LEFT side selected, otherwise (0)	MCP, ICP	Connected CRDC	0	5	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Right	Side Select - Right; Set (1) when RIGHT side selected, otherwise (0)	MCP, ICP	Connected CRDC	0	4	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_AFT	Zone Select - AFT; Set (1) when AFT zone selected, otherwise (0)	MCP, ICP	Connected CRDC	0	3	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_FWD	Zone Select - FWD; Set (1) when FWD zone selected, otherwise (0)	MCP, ICP	Connected CRDC	0	2	**Boolean**	250 ms and Event Triggered
PB_LCP_LH2_1_Enable	LCP LH2/1 Enable; Set (1) when LCP 1 and 2 on LH is selected, otherwise (0)	MCP, ICP	Connected CRDC	0	1	**Boolean**	250 ms and Event Triggered
PB_LCP_LH4_3_Enable	LCP LH4/3 Enable; Set (1) when LCP 3 and 4 on LH is selected, otherwise (0)	MCP, ICP	Connected CRDC	0	0	**Boolean**	250 ms and Event Triggered
PB_LCP_RH2_1_Enable	LCP RH2/1 Enable; Set (1) when LCP 1 and 2 on RH is selected, otherwise (0)	MCP, ICP	Connected CRDC	1	7	**Boolean**	250 ms and Event Triggered
PB_LCP_RH4_3_Enable	LCP RH4/3 Enable; Set (1) when LCP 3 and 4 on RH is selected, otherwise (0)	MCP, ICP	Connected CRDC	1	6	**Boolean**	250 ms and Event Triggered
PB_Dual_Operator	20FT DUAL OPERATOR; Set (1) when button pressed, otherwise (0)	MCP, ICP	Connected CRDC	1	5	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_20FT	20FT; Set (1) when button pressed, otherwise (0)	MCP, ICP	Connected CRDC	1	4	**Boolean**	250 ms and Event Triggered
Joystick_AFT	Joystick - AFT; Set (1) when joystick moved to AFT, otherwise (0)	MCP, ICP	Connected CRDC	1	3	**Boolean**	250 ms and Event Triggered
Joystick_FWD	Joystick - FWD; Set (1) when joystick moved to FWD, otherwise (0)	MCP, ICP	Connected CRDC	1	2	**Boolean**	250 ms and Event Triggered
Joystick_IN	Joystick - IN; Set (1) when joystick moved to IN, otherwise (0)	MCP, ICP	Connected CRDC	1	1	**Boolean**	250 ms and Event Triggered
Joystick_OUT	Joystick - OUT; Set (1) when joystick moved to OUT, otherwise (0)	MCP, ICP	Connected CRDC	1	0	**Boolean**	250 ms and Event Triggered
Joystick_NEUTRAL	Joystick - NEUTRAL; Set (1) when joystick is on default position, otherwise (0)	MCP, ICP	Connected CRDC	2	7	**Boolean**	250 ms and Event Triggered
TGLS_20FT_OUT	TGL 20FT - OUT; Set (1) when toggle switch is moved to OUT, otherwise (0)	MCP, ICP	Connected CRDC	2	6	**Boolean**	250 ms and Event Triggered
TGLS_20FT_IN	TGL 20FT - IN; Set (1) when toggle switch is moved to IN, otherwise (0)	MCP, ICP	Connected CRDC	2	5	**Boolean**	250 ms and Event Triggered
PB_Spin	Spin; Set (1) when button pressed, otherwise (0)	MCP, ICP	Connected CRDC	2	4	**Boolean**	250 ms and Event Triggered
Spare_1	Unused / Reserved, Set (0)	MCP, ICP	Connected CRDC	2	3	**Boolean**	250 ms and Event Triggered
Spare_2	Unused / Reserved, Set (0)	MCP, ICP	Connected CRDC	2	2	**Boolean**	250 ms and Event Triggered
Spare_3	Unused / Reserved, Set (0)	MCP, ICP	Connected CRDC	2	1	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Spare_4	Unused / Reserved, Set (0)	MCP, ICP	Connected CRDC	2	0	**Boolean**	250 ms and Event Triggered
Switch_Fault_Status	No fault set to 0, otherwise set to 1.	MCP, ICP	Connected CRDC	3	7	**Boolean**	250 ms and Event Triggered
PB_Power_On_Off_ Fault	Power On/Off button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	6	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop_Fault	PDU Stop button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	5	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Left _Fault	Left side select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	4	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Rig ht_Fault	Right side select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	3	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_AF T_Fault	AFT zone select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	2	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_FW D_Fault	FWD zone select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	1	**Boolean**	250 ms and Event Triggered
PB_LCP_LH2_1_En able_Fault	LCP-LH 2-1 enable button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	3	0	**Boolean**	250 ms and Event Triggered
PB_LCP_LH4_3_En able_Fault	LCP-LH 4-3 enable button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	7	**Boolean**	250 ms and Event Triggered
PB_LCP_RH2_1_En able_Fault	LCP-RH 2-1 enable button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	6	**Boolean**	250 ms and Event Triggered
PB_LCP_RH4_3_En able_Fault	LCP-RH 4-3 enable button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	5	**Boolean**	250 ms and Event Triggered
PB_Dual_Operator_F ault	20FT DUAL OPERATOR enable select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	4	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_20FT_Fault	20FT button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	3	**Boolean**	250 ms and Event Triggered
Joystick_Fault	Joystick healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	2	**Boolean**	250 ms and Event Triggered
TGLS_20FT_Fault	20 FT toggle switch healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	1	**Boolean**	250 ms and Event Triggered
PB_Spin_Fault	Spin select button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	4	0	**Boolean**	250 ms and Event Triggered
PB_Lamp_Test_Fault	Lamp Test push button healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	5	7	**Boolean**	250 ms and Event Triggered
LED_System_Active_Fault	System active indicator LED healthy (0), otherwise faulty (1)	MCP, ICP	Connected CRDC	5	6	**Boolean**	250 ms and Event Triggered
Mux_Current_Voltage	Default (0), Current (1), Voltage (2)	MCP, ICP	Connected CRDC	5	5..4	**UINT_8**	250 ms and Event Triggered
Panel_Status	Default (0), Off State (1), Init State (2), DL State (3), OP State (4), Fail State (5)	MCP, ICP	Connected CRDC	5	3..0	**UINT_8**	250 ms and Event Triggered
Measured_Current_Voltage	Measured Current / Voltage value, Default (0)	MCP, ICP	Connected CRDC	6..7	15..0	**UINT_16**	250 ms and Event Triggered

Table 12 - MCP AND ICP PANEL OPERATOR COMMAND

4.1.1.1.1.2 OCP PANEL OPERATOR COMMAND

This section describes the payload data for PANEL_OPER_CMD (operator command from Outside Control Panel, Fault Data, and overall health status) transmitted by OCP.

Note: The OCP transmits PANEL_OPER_CMD to the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and OCP, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_Power_On_Off	Power On / Off; Set (1) when button pressed (ON), otherwise (0)	OCP	CRDC-B09A	0	7	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop	PDU Stop; Set (1) when button pressed, otherwise (0)	OCP	CRDC-B09A	0	6	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Left	Side Select - Left; Set (1) when LEFT side selected, otherwise (0)	OCP	CRDC-B09A	0	5	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Right	Side Select - Right; Set (1) when RIGHT side selected, otherwise (0)	OCP	CRDC-B09A	0	4	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_AFT	Zone Select - AFT; Set (1) when AFT zone selected, otherwise (0)	OCP	CRDC-B09A	0	3	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_FWD	Zone Select - FWD; Set (1) when FWD zone selected, otherwise (0)	OCP	CRDC-B09A	0	2	**Boolean**	250 ms and Event Triggered
TGLS_20FT_ IN	20FT TGL - IN; Set (1) when toggle switch is moved to IN, otherwise (0)	OCP	CRDC-B09A	0	1	**Boolean**	250 ms and Event Triggered
TGLS_20FT_OUT	20FT TGL - OUT; Set (1) when toggle switch is moved to OUT, otherwise (0)	OCP	CRDC-B09A	0	0	**Boolean**	250 ms and Event Triggered
PB_Dual_Operator	20FT DUAL OPERATOR; Set (1) when button pressed, otherwise (0)	OCP	CRDC-B09A	1	7	**Boolean**	250 ms and Event Triggered
PB_20FT	20FT; Set (1) when button pressed, otherwise (0)	OCP	CRDC-B09A	1	6	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
TGLS_IN_OUT_IN	IN_OUT TGL -IN; Set (1) when toggle switch is moved to IN, otherwise (0)	OCP	CRDC-B09A	1	5	**Boolean**	250 ms and Event Triggered
TGLS_IN_OUT_OUT	IN_OUT TGL - OUT; Set (1) when toggle switch is moved to OUT, otherwise (0)	OCP	CRDC-B09A	1	4	**Boolean**	250 ms and Event Triggered
TGLS_L_R_FWD	L_R_TGL - FWD; Set (1) when toggle switch is moved to FWD, otherwise (0)	OCP	CRDC-B09A	1	3	**Boolean**	250 ms and Event Triggered
TGLS_L_R_AFT	L_R_TGL - AFT; Set (1) when toggle switch is moved to AFT, otherwise (0)	OCP	CRDC-B09A	1	2	**Boolean**	250 ms and Event Triggered
Switch_Fault_Status	No fault set to 0, otherwise set to 1.	OCP	CRDC-B09A	1	1	**Boolean**	250 ms and Event Triggered
PB_Power_On_Off_Fault	Power On/Off button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	1	0	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop_Fault	PDU Stop button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	7	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Left_Fault	Left side select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	6	**Boolean**	250 ms and Event Triggered
PB_Side_Select_Right_Fault	Right side select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	5	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_AFT_Fault	AFT zone select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	4	**Boolean**	250 ms and Event Triggered
PB_Zone_Select_FWD_Fault	FWD zone select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	3	**Boolean**	250 ms and Event Triggered
TGLS_20FT_Fault	20 FT toggle switch healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	2	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_Dual_Operator_Fault	20FT DUAL OPERATOR enable select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	1	**Boolean**	250 ms and Event Triggered
PB_20FT_Fault	20FT select button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	2	0	**Boolean**	250 ms and Event Triggered
TGLS_IN_OUT_Fault	IN-OUT toggle switch healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	3	7	**Boolean**	250 ms and Event Triggered
TGLS_L_R_Fault	Left-Right toggle healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	3	6	**Boolean**	250 ms and Event Triggered
PB_Lamp_Test_Fault	Lamp Test push button healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	3	5	**Boolean**	250 ms and Event Triggered
LED_System_Active_Fault	System active indicator LED healthy (0), otherwise faulty (1)	OCP	CRDC-B09A	3	4	**Boolean**	250 ms and Event Triggered
Panel_Status	Default (0), Off State (1), Init State (2), DL State (3), OP State (4), Fail State (5)	OCP	CRDC-B09A	3	3..0	**UINT_8**	250 ms and Event Triggered
Mux_Current_Voltage	Default (0), Current (1), Voltage (2)	OCP	CRDC-B09A	4	7..6	**UINT_8**	250 ms and Event Triggered
Spare_1	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	5	**Boolean**	250 ms and Event Triggered
Spare_2	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	4	**Boolean**	250 ms and Event Triggered
Spare_3	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	3	**Boolean**	250 ms and Event Triggered
Spare_4	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	2	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Spare_5	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	1	**Boolean**	250 ms and Event Triggered
Spare_6	Unused / Reserved, Set (0)	OCP	CRDC-B09A	4	0	**Boolean**	250 ms and Event Triggered
Measured_Current_Voltage	Measured Current / Voltage value, Default (0)	OCP	CRDC-B09A	5..6	15..0	**UINT_16**	250 ms and Event Triggered

Table 13 - OCP PANEL OPERATOR COMMAND

4.1.1.1.1.3 LCP PANEL OPERATOR COMMAND

This section describes the payload data for PANEL_OPER_CMD (operator command from Local Control Panels, their Fault Data and overall health status) transmitted by LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH and LCP3RH.

Note: Each LCP transmits PANEL_OPER_CMD to the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and LCP1LH / LCP2LH / LCP3LH / LCP1RH / LCP2RH / LCP3RH, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_PDU_Stop	PDU Stop; Set (1) when button pressed, otherwise (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	7	**Boolean**	250 ms and Event Triggered
TGLS_Drive_FWD	Drive TGL - FWD; Set (1) when toggle switch is moved to FWD, otherwise (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	6	**Boolean**	250 ms and Event Triggered
TGLS_Drive_AFT	Drive TGL - AFT; Set (1) when toggle switch is moved	LCP1LH, LCP2LH, LCP3LH, LCP1RH,	Connected CRDC	0	5	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
	to AFT, otherwise (0)	LCP2RH, LCP3RH					
PB_Dual_Lane	Dual Lane: Set (1) when both lane is selected, otherwise (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	4	**Boolean**	250 ms and Event Triggered
PB_Unlock_Next	Unlock Next; set (1) when button pressed	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	3	**Boolean**	250 ms and Event Triggered
Switch_Fault_Status	No fault set to 0, otherwise set to 1.	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	2	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop_Fault	PDU Stop button healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH LCP2RH, LCP3RH	Connected CRDC	0	1	**Boolean**	250 ms and Event Triggered
TGLS_Drive_Fault	Drive toggle switch healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	0	0	**Boolean**	250 ms and Event Triggered
PB_Dual_Lane_Fault	Dual lane selection button healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH LCP2RH, LCP3RH	Connected CRDC	1	7	**Boolean**	250 ms and Event Triggered
PB_Unlock_Next_Fault	Unlock next selection button healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	1	6	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_Lamp_Test_Fault	Lamp Test push button healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	1	5	**Boolean**	250 ms and Event Triggered
LED_Panel_Enabled_Fault	Panel enabled indicator LED healthy (0), otherwise faulty (1)	LCP1LH, LCP2LH, LCP3LH, LCP1RH LCP2RH, LCP3RH	Connected CRDC	1	4	**Boolean**	250 ms and Event Triggered
Panel_Status	Default (0), Off State (1), Init State (2), DL State (3), OP State (4), Fail State (5)	LCP1LH, LCP2LH, LCP3LH, LCP1RH LCP2RH, LCP3RH	Connected CRDC	1	3..0	**UINT_8**	250 ms and Event Triggered
Mux_Current_Voltage	Default (0), Current (1), Voltage (2)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	2	7..6	**UINT_8**	250 ms and Event Triggered
Spare_1	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH LCP2RH, LCP3RH	Connected CRDC	2	5	**Boolean**	250 ms and Event Triggered
Spare_2	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	2	4	**Boolean**	250 ms and Event Triggered
Spare_3	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	2	3	**Boolean**	250 ms and Event Triggered
Spare_4	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH,	Connected CRDC	2	2	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
		LCP2RH, LCP3RH					
Spare_5	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	2	1	**Boolean**	250 ms and Event Triggered
Spare_6	Unused / Reserved, Set (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	2	0	**Boolean**	250 ms and Event Triggered
Measured_Current_Voltage	Measured Voltage value, Default (0)	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	Connected CRDC	3..4	15..0	**UINT_16**	250 ms and Event Triggered

Table 14 - LCP PANEL OPERATOR COMMAND

4.1.1.1.1.4 LCP20FT PANEL OPERATOR COMMAND

This section describes the payload data for PANEL_OPER_CMD (operator command from 20FT Local Control Panels, their Fault Data and overall health status) transmitted by LCP4LH and LCP4RH.

Note: Each LCP20FT transmits PANEL_OPER_CMD to the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and LCP4LH / LCP4RH, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_PDU_Stop	PDU Stop; Set (1) when button pressed	LCP4LH, LCP4RH	Connected CRDC	0	7	**Boolean**	250 ms and Event Triggered
TGLS_Drive_FWD	Drive_TGL - FWD; Set (1) when toggle switch is moved to FWD	LCP4LH, LCP4RH	Connected CRDC	0	6	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
TGLS_Drive_AFT	Drive_TGL - AFT; Set (1) when toggle switch is moved to AFT	LCP4LH, LCP4RH	Connected CRDC	0	5	**Boolean**	250 ms and Event Triggered
TGLS_L_R_LEFT	L_R_TGL - LEFT; Set (1) when toggle switch is moved to LEFT	LCP4LH, LCP4RH	Connected CRDC	0	4	**Boolean**	250 ms and Event Triggered
TGLS_L_R_RIGHT	L_R_TGL - RIGHT; Set (1) when toggle switch is moved to RIGHT	LCP4LH, LCP4RH	Connected CRDC	0	3	**Boolean**	250 ms and Event Triggered
TGLS_20FT_IN	20FT_TGL - IN; Set (1) when toggle switch is moved to IN	LCP4LH, LCP4RH	Connected CRDC	0	2	**Boolean**	250 ms and Event Triggered
TGLS_20FT_OUT	20FT_TGL - OUT; Set (1) when toggle switch is moved to OUT	LCP4LH, LCP4RH	Connected CRDC	0	1	**Boolean**	250 ms and Event Triggered
PB_Dual_Lane	Dual Lane: Set (1) when both lane is selected	LCP4LH, LCP4RH	Connected CRDC	0	0	**Boolean**	250 ms and Event Triggered
PB_Unlock_Next	Unlock Next; set (1) when button pressed	LCP4LH, LCP4RH	Connected CRDC	1	7	**Boolean**	250 ms and Event Triggered
Switch_Fault_Status	No fault set to 0, otherwise set to 1.	LCP4LH, LCP4RH	Connected CRDC	1	6	**Boolean**	250 ms and Event Triggered
PB_PDU_Stop_Fault	PDU Stop button healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	1	5	**Boolean**	250 ms and Event Triggered
TGLS_Drive_Fault	Drive toggle switch healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	1	4	**Boolean**	250 ms and Event Triggered
TGLS_L_R_Fault	Left-Right toggle switch healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	1	3	**Boolean**	250 ms and Event Triggered
TGLS_20FT_Fault	20FT In-Out healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	1	2	**Boolean**	250 ms and Event Triggered
PB_Dual_Lane_Fault	Fault not present (0), Fault present (1)	LCP4LH, LCP4RH	Connected CRDC	1	1	**Boolean**	250 ms and Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PB_Unlock_Next_Fault	Fault not present (0), Fault present (1)	LCP4LH, LCP4RH	Connected CRDC	1	0	**Boolean**	250 ms and Event Triggered
PB_Lamp_Test_Fault	Lamp Test push button healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	2	7	**Boolean**	250 ms and Event Triggered
LED_Panel_Enabled_Fault	Panel enabled indicator LED healthy (0), otherwise faulty (1)	LCP4LH, LCP4RH	Connected CRDC	2	6	**Boolean**	250 ms and Event Triggered
Mux_Current_Voltage	Default (0), Current (1), Voltage (2)	LCP4LH, LCP4RH	Connected CRDC	2	5..4	**UINT_8**	250 ms and Event Triggered
Panel_Status	Default (0), Off State (1), Init State (2), DL State (3), OP State (4), Fail State (5)	LCP4LH, LCP4RH	Connected CRDC	2	3..0	**UINT_8**	250 ms and Event Triggered
Measured_Current_Voltage	Measured Voltage value, Default (0)	LCP4LH, LCP4RH	Connected CRDC	3..4	15..0	**UINT_16**	250 ms and Event Triggered

Table 15 - LCP20FT PANEL OPERATOR COMMAND

4.1.1.2 CONTROL PANEL Rx MESSAGES

This section describes the payload data for a CAN message received by CP (from CRDC).

The CP receive messages are event triggered. The messages transmitted by CPIOM-CA are translated by CRDC and transmitted to CP as and when available.

4.1.1.2.1 PANEL STATUS COMMAND

This section describes the payload data (signals) for PANEL_STATUS_CMD (panel status command to a control panel) transmitted by CRDC, i.e., received by a CP.

The value for each signal is set by CPIOM, transmitted to CPs for LED control. The values for each signal are set as per 'signal description'; default value for each signal is 0.

4.1.1.2.1.1 MCP AND ICP PANEL STATUS COMMAND

This section describes the payload data for PANEL_STATUS_CMD received by MCP and ICP.

Note: The MCP and ICP receive PANEL_STATUS_CMD from the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and MCP/ICP, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
LED_System_Active	System Active; Set (1) when system is active	CRDC	MCP, ICP	0	7	**Boolean**
PB_On_Off_LED	On/Off; Set (1) when MCP is ON	CRDC	MCP, ICP	0	6	**Boolean**
PB_Zone_Select_AFT_LED	Zone Selected - AFT; Set (1) when AFT zone selected	CRDC	MCP, ICP	0	5	**Boolean**
PB_Zone_Select_FWD_LED	Zone Selected - FWD; Set (1) when FWD zone selected	CRDC	MCP, ICP	0	4	**Boolean**
PB_Side_Select_Left_LED	Side Selected - Left; Set (1) when LEFT side selected	CRDC	MCP, ICP	0	3	**Boolean**
PB_Side_Select_Right_LED	Side Selected - Right; Set (1) when RIGHT side selected	CRDC	MCP, ICP	0	2	**Boolean**
PB_Dual_Operator_LED	20FT DUAL OPERATOR - Enabled; Set (1) when 20 FT 2 MAN enabled	CRDC	MCP, ICP	0	1	**Boolean**
PB_20FT_LED	20FT - Enabled; Set (1) when 20 FT enabled	CRDC	MCP, ICP	0	0	**Boolean**
PB_LCP_LH2_1_Enable_LED	LCP LH2/1 Active; Set (1) when LCP LH2 LCP LH2/1 is active	CRDC	MCP, ICP	1	7	**Boolean**
PB_LCP_LH4_3_Enable_LED	LCP LH4/3 Active; Set (1) when LCP LH4 LCP LH4/3 is active	CRDC	MCP, ICP	1	6	**Boolean**
PB_LCP_RH2_1_Enable_LED	LCP RH2/1 Active; Set (1) when LCP RH2 LCP RH2/1 is active	CRDC	MCP, ICP	1	5	**Boolean**
PB_LCP_RH4_3_Enable_LED	LCP RH4/3 Active; Set (1) when LCP RH4 LCP RH4/3 is active	CRDC	MCP, ICP	1	4	**Boolean**
PB_Spin_LED	MCP Spin Selected; Set (1) when spin button selected on MCP	CRDC	MCP, ICP	1	3	**Boolean**
Spare_1	Unused / Reserved, Set (0)	CRDC	MCP, ICP	1	2	**Boolean**
Spare_2	Unused / Reserved, Set (0)	CRDC	MCP, ICP	1	1	**Boolean**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Spare_3	Unused / Reserved, Set (0)	CRDC	MCP, ICP	1	0	**Boolean**

Table 16 - MCP AND ICP PANEL STATUS COMMAND

4.1.1.2.1.2 OCP PANEL STATUS COMMAND

This section describes the payload data for PANEL_STATUS_CMD received by OCP.

Note: The OCP receives PANEL_STATUS_CMD from the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and OCP, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
LED_System_Active	System Active; Set (1) when system is active	CRDC-B09A	OCP	0	7	**Boolean**
PB_On_Off_LED	On/Off; Set (1) when OCP is ON	CRDC-B09A	OCP	0	6	**Boolean**
PB_Side_Select_Left_LED	Side Selected - Left; Set (1) when LEFT side selected	CRDC-B09A	OCP	0	5	**Boolean**
PB_Side_Select_Right_LED	Side Selected - Right; Set (1) when RIGHT side selected	CRDC-B09A	OCP	0	4	**Boolean**
PB_Zone_Select_AFT_LED	Zone Selected - AFT; Set (1) when AFT zone selected	CRDC-B09A	OCP	0	3	**Boolean**
PB_Zone_Select_FWD_LED	Zone Selected - FWD; Set (1) when FWD zone selected	CRDC-B09A	OCP	0	2	**Boolean**
PB_Dual_Operator_LED	20FT DUAL OPERATOR - Enabled; Set (1) when 20 FT 2 MAN enabled	CRDC-B09A	OCP	0	1	**Boolean**
PB_20FT_LED	20FT - Enabled; Set (1) when 20 FT enabled	CRDC-B09A	OCP	0	0	**Boolean**

Table 17 - OCP PANEL STATUS COMMAND

4.1.1.2.1.3 LCP PANEL STATUS COMMAND

This section describes the payload data for PANEL_STATUS_CMD received by LCP.

Note: Each LCP receives PANEL_STATUS_CMD from the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and LCP1LH / LCP2LH / LCP3LH / LCP1RH / LCP2RH / LCP3RH, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
LED_Panel_Enabled	Panel Enabled; Set (1) when LCP1LH is enabled	Connected CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	7	**Boolean**
PB_Dual_Lane	Dual Lane: Set (1) when both row/lane is enabled	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	6	**Boolean**
PB_Unlock_Next	Unlock Next; Set (1) when S/w unlocks next ULD	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	5	**Boolean**
Spare_1	Unused / Reserved, Set (0)	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	4	**Boolean**
Spare_2	Unused / Reserved, Set (0)	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	3	**Boolean**
Spare_3	Unused / Reserved, Set (0)	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	2	**Boolean**
Spare_4	Unused / Reserved, Set (0)	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH,	0	1	**Boolean**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
			LCP2RH, LCP3RH			
Spare_5	Unused / Reserved, Set (0)	CRDC	LCP1LH, LCP2LH, LCP3LH, LCP1RH, LCP2RH, LCP3RH	0	0	**Boolean**

Table 18 - LCP PANEL STATUS COMMAND

4.1.1.2.1.4 LCP20FT PANEL STATUS COMMAND

This section describes the payload data for PANEL_STATUS_CMD received by LCP20FT.

Note: Each LCP20FT receives PANEL_STATUS_CMD from the CRDC which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and LCP1LH / LCP2LH / LCP3LH / LCP1RH / LCP2RH / LCP3RH, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
LED_Panel_Enabled	Panel Enabled: Set (1) when LCP1LH is enabled	CRDC	LCP4LH, LCP4RH	0	7	**Boolean**
PB_Dual_Lane	Dual Lane: Set (1) when both row/lane is enabled	CRDC	LCP4LH, LCP4RH	0	6	**Boolean**
PB_Unlock_Next	Unlock Next: Set (1) when S/w unlocks next ULD	CRDC	LCP4LH, LCP4RH	0	5	**Boolean**
Spare_1	Unused / Reserved, Set (0)	CRDC	LCP4LH, LCP4RH	0	4	**Boolean**
Spare_2	Unused / Reserved, Set (0)	CRDC	LCP4LH, LCP4RH	0	3	**Boolean**
Spare_3	Unused / Reserved, Set (0)	CRDC	LCP4LH, LCP4RH	0	2	**Boolean**
Spare_4	Unused / Reserved, Set (0)	CRDC	LCP4LH, LCP4RH	0	1	**Boolean**
Spare_5	Unused / Reserved, Set (0)	CRDC	LCP4LH, LCP4RH	0	0	**Boolean**

Table 19 - LCP20FT PANEL STATUS COMMAND

4.1.2 CARGO DISPLAY PANEL MESSAGES

4.1.2.1 CARGO DISPLAY PANEL (CDP) Tx MESSAGE

This section describes the payload data for a CAN message transmitted by Cargo Display Panel (to CRDC A15A)

4.1.2.1.1 CDP STATUS DATA

This section describes the payload data for CDP_STATUS_DATA (failure and status data transmitted by CDP) as part of continuous monitoring and used during initiated built-in test.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Measured_Current	Measured Current, Default (0)	CDP	CRDC-A15A	0..1	15..0	**UINT_16**	250 ms
Measured_Voltage	Measured Voltage, Default (0)	CDP	CRDC-A15A	2..3	15..0	**UINT_16**	250 ms
CDP_Health_Status	Set Healthy (0), Faulty (1)	CDP	CRDC-A15A	4	7	**Boolean**	250 ms
CAN_Address_Pin_Parity_Fault	Set to 1 when parity pin fault detected, otherwise 0	CDP	CRDC-A15A	4	6	**Boolean**	250 ms
Program_Integrity_Check_Fault	Set to 1 when program integrity check (CRC) failed, otherwise 0	CDP	CRDC-A15A	4	5	**Boolean**	250 ms
Fault_1	Reserved for fault 1	CDP	CRDC-A15A	4	4	**Boolean**	250 ms
Fault_2	Reserved for fault 2	CDP	CRDC-A15A	4	3	**Boolean**	250 ms
Fault_3	Reserved for fault 3	CDP	CRDC-A15A	4	2	**Boolean**	250 ms
Fault_4	Reserved for fault 4	CDP	CRDC-A15A	4	1	**Boolean**	250 ms
Fault_5	Reserved for fault 5	CDP	CRDC-A15A	4	0	**Boolean**	250 ms
Fault_6	Reserved for fault 6	CDP	CRDC-A15A	5	7..0	**UINT_8**	250 ms

Table 20 - CDP STATUS DATA

4.1.2.2 CARGO DISPLAY PANEL (CDP) Rx MESSAGES

This section describes the payload data for a CAN message received by Cargo Display Panel (from CRDC A15A) for Cargo Zone Information.

The Cargo Display Panel (CDP) receives all exchanged messages between a LRU (PDU / CP) and their connected CRDCs. The respective CRDCs redirect all messages to CDP via CRDC to which it is connected.

The CDP receive messages are event triggered. The messages transmitted by CPIOM-CA are translated by CRDC and transmitted to CDP as and when available.

4.1.2.2.1 CARGO ZONE ENABLED

This section describes the payload data (signals) for CARGO_ZONE_ENABLED (Cargo Zone Enabled Information to the CDP) computed by CPIOM and transmitted to CDP via CRDC-A15 over CAN Bus A15A.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Access_Zone_1_Enabled	Set when Zone 1 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	7	**Boolean**
Access_Zone_2_Enabled	Set when Zone 2 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	6	**Boolean**
Access_Zone_3_Enabled	Set when Zone 3 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	5	**Boolean**
Access_Zone_4_Enabled	Set when Zone 4 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	4	**Boolean**
Access_Zone_5_Enabled	Set when Zone 5 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	3	**Boolean**
Access_Zone_6_Enabled	Set when Zone 6 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	2	**Boolean**
Access_Zone_7_Enabled	Set when Zone 7 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	1	**Boolean**
Access_Zone_8_Enabled	Set when Zone 8 enabled (1), otherwise (0)	CRDC-A15A	CDP	0	0	**Boolean**
Access_Zone_9_Enabled	Set when Zone 9 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	7	**Boolean**
Access_Zone_10_Enabled	Set when Zone 10 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	6	**Boolean**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Access_Zone_11_Enabled	Set when Zone 11 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	5	**Boolean**
Access_Zone_12_Enabled	Set when Zone 12 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	4	**Boolean**
Access_Zone_13_Enabled	Set when Zone 13 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	3	**Boolean**
Access_Zone_14_Enabled	Set when Zone 14 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	2	**Boolean**
Access_Zone_15_Enabled	Set when Zone 15 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	1	**Boolean**
Access_Zone_16_Enabled	Set when Zone 16 enabled (1), otherwise (0)	CRDC-A15A	CDP	1	0	**Boolean**
Access_Zone_17_Enabled	Set when Zone 17 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	7	**Boolean**
Access_Zone_18_Enabled	Set when Zone 18 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	6	**Boolean**
Access_Zone_19_Enabled	Set when Zone 19 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	5	**Boolean**
Access_Zone_20_Enabled	Set when Zone 20 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	4	**Boolean**
Access_Zone_21_Enabled	Set when Zone 21 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	3	**Boolean**
Access_Zone_22_Enabled	Set when Zone 22 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	2	**Boolean**
Access_Zone_23_Enabled	Set when Zone 23 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	1	**Boolean**
Access_Zone_24_Enabled	Set when Zone 24 enabled (1), otherwise (0)	CRDC-A15A	CDP	2	0	**Boolean**
Access_Zone_25_Enabled	Set when Zone 25 enabled (1), otherwise (0)	CRDC-A15A	CDP	3	7	**Boolean**
Access_Zone_26_Enabled	Set when Zone 26 enabled (1), otherwise (0)	CRDC-A15A	CDP	3	6	**Boolean**
Access_Zone_27_Enabled	Set when Zone 27 enabled (1), otherwise (0)	CRDC-A15A	CDP	3	5	**Boolean**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Access_Zone_28_Enabled	Set when Zone 28 enabled (1), otherwise (0)	CRDC-A15A	CDP	3	4	**Boolean**
Access_Zone_29_Enabled	Set when Zone 29 enabled (1), otherwise (0)	CRDC-A15A	CDP	3	3	**Boolean**
Spare_1	Unused / Reserved, Set (0)	CRDC-A15A	CDP	3	2	**Boolean**
Spare_2	Unused / Reserved, Set (0)	CRDC-A15A	CDP	3	1	**Boolean**
Spare_3	Unused / Reserved, Set (0)	CRDC-A15A	CDP	3	0	**Boolean**

Table 21 - CARGO ZONE ENABLED

4.1.3 PDU MESSAGES

This section describes the payload data for a CAN message Transfer / Exchanges of information (signals) between PDUs and CRDCs via CAN bus through which the respective PDU and CRDC are connected.

Note: A PDU receives command messages from a CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

4.1.3.1 PDU Rx MESSAGES

This section describes the payload data for a CAN message received by PDU.

The PDU receive messages are event triggered. The messages transmitted by CPIOM-CA are translated by CRDC and transmitted to PDU as and when available.

4.1.3.1.1 PREPARE COMMAND

This section describes the payload data (signals) for prepare command (PREPARE) to PDUs.

Note: A PDU receives PREPARE command from the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Command_Identification_Code	Command Identification Code: 0x11 (Enable for Move),	All CRDC	Connected PDU	0	7..0	**UINT_8**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
	0x22 (Disable for Move) 0x33 (Enable for Retract), 0x66 (Disable for Retract)					
Direction_Velocity	Direction - FWD (0x5, bit 4 and 6 is set), AFT (0xA, bit 5 and 7); Speed - Set Full Speed 0x1, bit 0 set), Speed (0x2, bit 1 is set), Half Speed (0x4, bit 2 is set), Speed (0x8, bit 3 is set) and 0x00 when unused.	All CRDC	Connected PDU	1	7..0	**UINT_8**
Group_Identifier	Group Identifier: As set by CPIOM (group of PDUs to perform same temporary function), Set to 0xFF when unused.	All CRDC	Connected PDU	2	7..0	**UINT_8**
Expiry_Time	Expiry Time: As set by CPIOM (0x01 is for 50ms, 0x02 is for 100ms...0x00 is forever). Set to 0xFF when unused.	All CRDC	Connected PDU	3	7..0	**UINT_8**

Table 22 - PREPARE COMMAND

4.1.3.1.2 MOVE COMMAND

This section describes the payload data (signals) for move command messages (MOVE) to PDUs.

Note: A PDU receives MOVE command from the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Command_Identification_Code	Command Identification Code: 0x44 for Move (start) 0x88 for Move (stop)	All CRDC	Connected PDU	0	7..0	**UINT_8**
Direction_Velocity	Direction - FWD (0x5, bit 4 and 6 is set), AFT (0xA, bit 5 and 7); Speed - Set Full Speed 0x1, bit 0 set), Speed (0x2, bit 1 is set), Half Speed (0x4, bit 2 is set), Speed (0x8, bit 3 is set) and 0x00 when unused.	All CRDC	Connected PDU	1	7..0	**UINT_8**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Group_Identifier	Group Identifier: As set by CPIOM (group of PDUs to perform same temporary function), Set to 0xFF when unused.	All CRDC	Connected PDU	2	7..0	**UINT_8**
Expiry_Time	Expiry Time: As set by CPIOM (0x01 is for 50ms, 0x02 is for 100ms...0x00 is forever). Set to 0xFF when unused.	All CRDC	Connected PDU	3	7..0	**UINT_8**

Table 23 - MOVE COMMAND

4.1.3.1.3 RETRACT COMMAND

This section describes the payload data (signals) for retract command messages (RETRACT) to PDUs.

Note: A PDU receives RETRACT command from the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Command_Identification_Code	Command Identification Code: 0xCC for Retract (start) 0x99 for Retract (stop)	All CRDC	Connected PDU	0	7..0	**UINT_8**
Direction_Velocity	Direction and Velocity: 0xFF (unused)	All CRDC	Connected PDU	1	7..0	**UINT_8**
Group_Identifier	Group Identifier: As set by CPIOM (group of PDUs to perform same temporary function)	All CRDC	Connected PDU	2	7..0	**UINT_8**
Expiry_Time	Expiry Time: As set by CPIOM (0x01 is for 50ms, 0x02 is for 100ms...0x00 is forever). Set to 0xFF when unused.	All CRDC	Connected PDU	3	7..0	**UINT_8**

Table 24 - RETRACT COMMAND

4.1.3.2 PDU Tx MESSAGES

This section describes the payload data for a CAN message (signals) transmitted by each PDU to CRDC via CAN bus through which the respective PDU and CRDC are connected.

Note: A PDU transmits to a CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

4.1.3.2.1 PDU STATUS MESSAGES

This section describes the payload data (signals) for status messages, transmitted periodically and/or event triggered, by each PDU.

Note that PDUs transmit status messages periodically (every 250 milliseconds) in three message frames. However, with change in 'Cover Status', PDU also transmit STATUS_MSG_1 with change in cover status (event triggered)

4.1.3.2.1.1 STATUS MESSAGE 1

This section defines the payload data / signals for STATUS_MSG_1 that is transmitted by each PDU periodically. Also, when there is change in cover status, the STATUS_MSG_1 is transmitted (event triggered).

Note: A PDU transmits STATUS_MSG_1 to the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PDU_Type	Set as Default (0), Spring Loaded (1), Self-Lift (3)	All PDU	Connected CRDC	0	7..6	**UINT_8**	250 ms & Event Triggered
PDU_Health_Status	Default (0), Overall Healthy (No critical Faults) (1), Not Healthy (Any of critical Faults) (3)	All PDU	Connected CRDC	0	5..4	**UINT_8**	250 ms & Event Triggered
PDU_Cover_Status	Default (0), Not Covered (1), Covered (3)	All PDU	Connected CRDC	0	3..2	**UINT_8**	250 ms & Event Triggered
PDU_Roller_Position	Default (0), HOME (1), PARTIAL LIFT (2), FULLY LIFT (3)	All PDU	Connected CRDC	0	1..0	**UINT_8**	250 ms & Event Triggered
PDU_Mode	Set as OFF Mode (0), INIT_MODE (1), OP_MODE (2), DL_MODE (3), BIT_MODE (4)	All PDU	Connected CRDC	1	7..4	**UINT_8**	250 ms & Event Triggered
PDU_State	PDU_ST_POWERUP (1), PDU_ST_STANDBY (2), PDU_ST_LIFT_HOLD (3), PDU_ST_LIFT_DRIVE (4), PDU_ST_LIFT_BRAKE (5), PDU_ST_RETRACT_HOLD (6) PDU_ST_FAULTY (7), PDU_ST_REGENERATIVE (8)	All PDU	Connected CRDC	1	3..0	**UINT_8**	250 ms & Event Triggered
Drive_Motor_Mode	DMM_STNDBY (0), DMM_MOTOR (1), DMM_HOLD.	All PDU	Connected CRDC	2	7..6	**UINT_8**	250 ms & Event Triggered
Lift_Motor_Mode	LMM_IDLE (1), LMM_MOVE (2)	All PDU	Connected CRDC	2	5..4	**UINT_8**	250 ms & Event Triggered
Drive_Motor_State	DM_ST_POWER_UP (0), DM_ST_SC (1), DM_ST_FIX_POS (2), DM_ST_IDLE (3), DM_ST_CHARGE (4), DM_ST_SPEED (5)	All PDU	Connected CRDC	2	3..0	**UINT_8**	250 ms & Event Triggered

Lift_Motor_Control_Seq_State	LM_CTLSEQ_ST_POWERUP (0), LM_CTLSEQ_ST_GOHOME (1), LM_CTLSEQ_ST_RETRACTED (2), LM_CTLSEQ_ST_RAISE_FAST (3), LM_CTLSEQ_ST_RAISE_SLOW (4), LM_CTLSEQ_ST_AWAIT_CONTAINER (5), LM_CTLSEQ_ST_HOLD_UP_LOW_FORCE (6), LM_CTLSEQ_ST_RETRACTING_FAST (7), LM_CTLSEQ_ST_HOLD_UP_HI_FORCE (8), LM_CTLSEQ_ST_HOLD_UP_MED_FORCE (9), LM_CTLSEQ_ST_RETRACTING_SLOW (10), LM_CTLSEQ_ST_BW_DRV_CTRL (11), LM_CTLSEQ_ST_BW_DRV_DONE (12), LM_CTLSEQ_ST_FLT_STATE (13)	All PDU	Connected CRDC	3	7..4	**UINT_8**	250 ms & Event Triggered
Lift_Motor_State	LM_ST_IDLE (0), LM_ST_CHARGE (1), LM_ST_MOVING (3)	All PDU	Connected CRDC	3	3..2	**UINT_8**	250 ms & Event Triggered
Active_Drive_Command_Direction	Default (0), DIR A (1), DIR B (3)	All PDU	Connected CRDC	3	1..0	**UINT_8**	250 ms & Event Triggered
Hold_Status	Automatic hold active (0), Release active (1)	All PDU	Connected CRDC	4	7	**Boolean**	250 ms & Event Triggered
HVDC_Over_Voltage_Fault	Set to 1 when over voltage detected, otherwise 0	All PDU	Connected CRDC	4	6	**Boolean**	250 ms & Event Triggered
HVDC_Under_Voltage_Fault	Set to 1 when under voltage detected, otherwise 0	All PDU	Connected CRDC	4	5	**Boolean**	250 ms & Event Triggered
IGBT_Protection_Trip	Set to 1 when hardware fault detected, otherwise 0	All PDU	Connected CRDC	4	4	**Boolean**	250 ms & Event Triggered
Board_Over_Temperature_Fault	Set to 1 when over temperature detected, otherwise 0	All PDU	Connected CRDC	4	3	**Boolean**	250 ms & Event Triggered

115VAC_Phase_Fault	Set to 1 when phase fault detected, otherwise 0	All PDU	Connected CRDC	4	2	**Boolean**	250 ms & Event Triggered
Drive_Motor_Hall_Sensor_State_Error	Set to 1 when error, otherwise 0	All PDU	Connected CRDC	4	1	**Boolean**	250 ms & Event Triggered
Lift_Motor_Hall_Sensor_State_Error	Set to 1 when error, otherwise 0	All PDU	Connected CRDC	4	0	**Boolean**	250 ms & Event Triggered
Drive_Motor_State_Machine_Error	Set to 1 when error, otherwise 0	All PDU	Connected CRDC	5	7	**Boolean**	250 ms & Event Triggered
Lift_Motor_State_Machine_Error	Set to 1 when error, otherwise 0	All PDU	Connected CRDC	5	6	**Boolean**	250 ms & Event Triggered
Lift_Mechanism_Fault	Set to 1 when lift mechanism / retract fault detected, otherwise 0	All PDU	Connected CRDC	5	5	**Boolean**	250 ms & Event Triggered
CAN_Address_Pin_Parity_Fault	Set to 1 when parity pin fault detected, otherwise 0	All PDU	Connected CRDC	5	4	**Boolean**	250 ms & Event Triggered
Program_Integrity_Check_Fault	Set to 1 when program integrity check (CRC) failed, otherwise 0	All PDU	Connected CRDC	5	3	**Boolean**	250 ms & Event Triggered
RAM_Fault	Set to 1 when RAM check failed, otherwise 0	All PDU	Connected CRDC	5	2	**Boolean**	250 ms & Event Triggered
NVM_Fault	Set to 1 when NVM check failed, otherwise 0	All PDU	Connected CRDC	5	1	**Boolean**	250 ms & Event Triggered
HVDC_Over_Current_Fault	Set to 1 when over current detected, otherwise 0	All PDU	Connected CRDC	5	0	**Boolean**	250 ms & Event Triggered
ATRU_Right_Coil_Over_Temperature_Fault	Set to 1 when over temperature detected, otherwise 0	All PDU	Connected CRDC	6	7	**Boolean**	250 ms & Event Triggered
ATRU_Left_Coil_Over_Temperature_Fault	Set to 1 when over temperature detected, otherwise 0	All PDU	Connected CRDC	6	6	**Boolean**	250 ms & Event Triggered
Drive_Motor_Over_Temperature_Fault	Set to 1 when over temperature detected, otherwise 0	All PDU	Connected CRDC	6	5	**Boolean**	250 ms & Event Triggered

IGBT_Onchip_Over_Temperature_Fault	Set to 1 when over temperature detected, otherwise 0	All PDU	Connected CRDC	6	4	**Boolean**	250 ms & Event Triggered
DM_Current_Fault_Monitoring_Status	Set to 1 when current fault monitored, otherwise 0	All PDU	Connected CRDC	6	3	**Boolean**	250 ms & Event Triggered
LM_Current_Fault_Monitoring_Status	Set to 1 when current fault monitored, otherwise 0	All PDU	Connected CRDC	6	2	**Boolean**	250 ms & Event Triggered
Spare_1	Unused / Reserved, Set (0)	All PDU	Connected CRDC	6	1	**Boolean**	250 ms & Event Triggered
Spare_2	Unused / Reserved, Set (0)	All PDU	Connected CRDC	6	0	**Boolean**	250 ms & Event Triggered
Spare_3	Unused / Reserved, Set (0)	All PDU	Connected CRDC	7	7..0	**UINT_8**	250 ms & Event Triggered

Table 25 - STATUS MESSAGE 1

4.1.3.2.1.2 STATUS MESSAGE 2

This section defines the payload data / signals for STATUS_MSG_2 that is transmitted by each PDU periodically (every 250 millisecond).

Note: A PDU transmits STATUS_MSG_2 to the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Current_Mux	HVDC (1), DM (2), LM (3)	All PDU	Connected CRDC	0	7..6	**UINT_8**	250 ms
Voltage_Mux	HVDC (1), Phase-A (2), Phase-B (3), Phase-C (4)	All PDU	Connected CRDC	0	5..4	**UINT_8**	250 ms
Temperature_Mux	ATRU_COIL_R (1), ATRU_COIL_L (2), DM_TEMP (3), DM_IPM_TEMP (4), HEAT_SINK (5)	All PDU	Connected CRDC	0	3..0	**UINT_8**	250 ms

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Measured_Current	Measured current value	All PDU	Connected CRDC	1..2	15..0	**UINT_16**	250 ms
Spare_1	Unused / Reserved, Set (0)	All PDU	Connected CRDC	3	7..0	**UINT_8**	250 ms
Measured_Voltage	Measured voltage value	All PDU	Connected CRDC	4..5	15..0	**UINT_16**	250 ms
Measured_Temperature	Measured temperature (+/-)	All PDU	Connected CRDC	6..7	15..0	**INT_16**	250 ms

Table 26 - STATUS MESSAGE 2

4.1.3.2.1.3 STATUS MESSAGE 3

This section defines the payload data / signals for STATUS_MSG_3 that is transmitted by each PDU periodically (every 250 millisecond).

Note: A PDU transmits STATUS_MSG_3 to the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
PDU_Roller_Speed	Measured Roller Speed	All PDU	Connected CRDC	0..1	15..0	**UINT_16**	250 ms
PDU_LM_Speed	Lift Motor Speed	All PDU	Connected CRDC	2..3	15..0	**UINT_16**	250 ms
PDU_LM_Hall_Count	Lift Motor Hall Count	All PDU	Connected CRDC	4..5	15..0	**UINT_16**	250 ms
Spare_1	Unused / Reserved, Set (0)	All PDU	Connected CRDC	6..7	15..0	**UINT_16**	250 ms

Table 27 - STATUS MESSAGE 3

4.2 DATA LOADER MESSAGES

The following sections define the message payload data for data loading functions. Refer to the CAN-DL

DFS (V42SP0806471 V2.4) for the data loading functionality and message format for transmitting and receiving messages to / from LRU during data load operation.

4.2.1 LRU Rx MESSAGE

This section defines message signal for the Upload Request, Upload Data and WACK messages to the LRU identified for data loading.

Note: A CP, PDU or CDP receives the UPLOAD_REQUEST, UPLOAD_DATA and WACK Message from the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

4.2.1.1 UPLOAD REQUEST MESSAGE

This section defines Upload Request message signals in the message payload received by each LRU. The SW FIN is of 8-character length, refer to the requirement DFS-IMA-CANDL-465 from CAN DL DFS (V42SP0806471 V2.4).

When a CP, PDU or CP receives Upload Request Message with SW_FIN in its payload, the LRU is expected to go to DL_MODE.

After transmitting the last data block, DLA sends Upload Request message with 0x0F in its payload to seek COMPLETE as response from the LRU.

At end of data loading process, DLA sends Upload Request message with 0xFF in its payload.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
SW_FIN_CHAR_1	SW FIN First Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	0	7..0	**UINT_8**
SW_FIN_CHAR_2	SW FIN Second Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	1	7..0	**UINT_8**
SW_FIN_CHAR_3	SW FIN Third Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	2	7..0	**UINT_8**
SW_FIN_CHAR_4	SW FIN Fourth Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	3	7..0	**UINT_8**
SW_FIN_CHAR_5	SW FIN Fifth Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	4	7..0	**UINT_8**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
SW_FIN_CHAR_6	SW FIN Sixth Character SW-FIN / 0xFF / 0x0F	All CRDCs	Connected CP, PDU, CDP	5	7..0	**UINT_8**
SW_FIN_CHAR_7	SW FIN Seventh Character SW-FIN / 0xFF / 0x0F, Set 0x00 when unused	All CRDCs	Connected CP, PDU, CDP	6	7..0	**UINT_8**
SW_FIN_CHAR_8	SW FIN Eighth Character SW-FIN / 0xFF / 0x0F, Set 0x00 when unused	All CRDCs	Connected CP, PDU, CDP	7	7..0	**UINT_8**

Table 28 - UPLOAD REQUEST MESSAGE

4.2.1.2 UPLOAD DATA MESSAGE

The CRDC transmits the Upload Data Message to the LRU identified for data load in a subblock of 12 message frame each. Note that each message frame transmits 8 bytes of payload data, as described below.

Each LRU in Data load Mode (DL_MODE) receives UPLOAD_DATA message from the CRDC via connected CAN bus. For functional details, refer to the requirement id DFS-IMA-CANDL-471, DFS-IMA-CANDL-472 and DFS-IMA-CANDL-473 in the section 4.2.2.9 of CAN-DL DFS (V42SP0806471 v2.4).

The Upload Data message has the following signals in the message payload.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Byte_1	Byte 1; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	0	7..0	**OPAQUE**
Byte_2	Byte 2; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	1	7..0	**OPAQUE**
Byte_3	Byte 3; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	2	7..0	**OPAQUE**
Byte_4	Byte 4; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	3	7..0	**OPAQUE**
Byte_5	Byte 5; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	4	7..0	**OPAQUE**
Byte_6	Byte 6; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	5	7..0	**OPAQUE**

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Byte_7	Byte 7; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	6	7..0	**OPAQUE**
Byte_8	Byte 8; Upload data as sent by DLA	All CRDCs	Connected CP, PDU, CDP	7	7..0	**OPAQUE**

Table 29 - UPLOAD DATA MESSAGE

4.2.1.3 WACK MESSAGE

The WACK message has the following signals in the message payload for each type of LRUs.

Each LRU in Data load Mode (DL_MODE) receives a WACK message from the CRDC via connected CAN bus. For functional details, refer to the requirement id DFS-IMA-CANDL-475, DFS-IMA-CANDL-476, DFS-IMA-CANDL-477 and DFS-IMA-CANDL-478in the section 4.2.2.910 CAN-DL DFS (V42SP0806471 v2.4).

If STATUS signal in upload response message is WAIT from one or more LRU, then WAIT_VALUE signal in WACK message is set with highest wait value received (i.e., between 2 and 255 seconds); and transmitted in following 5 seconds. Refer to the requirement id DFS-IMA-CANDL-477 and DFS-IMA-CANDL-511 in the CAN DL DFS (V42SP0806471 v2.4).

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
WAIT_VALUE	Wait Value as set by DLA	All CRDCs	Connected CP, PDU, CDP	0	7..0	**UINT_8**
RESERVED_1	Reserved 1; 0x00	All CRDCs	Connected CP, PDU, CDP	1	7..0	**UINT_8**
RESERVED_2	Reserved 2; 0x00	All CRDCs	Connected CP, PDU, CDP	2	7..0	**UINT_8**
RESERVED_3	Reserved 3; 0x00	All CRDCs	Connected CP, PDU, CDP	3	7..0	**UINT_8**
SYSTEM_APPLICATION_USE	System Application Use; Free for system use	All CRDCs	Connected CP, PDU, CDP	4..7	31..0	**OPAQUE**

Table 30 - WACK MESSAGE

4.2.2 LRU Tx MESSAGE

Each LRU in Data load Mode (DL_MODE) transmits its status (UPLOAD_RESPONSE Message) to the

CRDC via connected CAN bus. For functional details, refer to the requirement id DFS-IMA-CANDL-253 in the CAN-DL DFS (V42SP0806471 v2.4).

A LRU transmits its response within 5 seconds after reception of upload data or upload request from DLA, and the LRU_RESPONSE is to be received at DLA within 10 seconds after transmission of a data block. Refer to the requirement in DFS-IMA-CANDL-267 and DFS-IMA-CANDL-336 in the CAN-DL DFS (V42SP0806471 v2.4).

Note: A CP, PDU or CDP transmits the LRU_RESPONSE Message to the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

4.2.2.1 UPLOAD RESPONSE MESSAGE

The UPLOAD_RESPONSE message has the following signals in the message payload.

The Upload Response message with ACK, NAK, WAIT and Complete code, is expected to be compliant with the following scheme.

The STATUS signal value is one of the following:

- 0x15 = NAK
- 0x06 = ACK
- 0x57 = Wait
- 0x43 = Complete

If STATUS is NAK, ERROR_CODE is set as below:

- Set to 2 when Timeout Error, i.e., bit 1 is set.
- Set to 4 when Incompatible SW Version Load, i.e., bit 2 is set.
- Set to 8 when CAN Receiver Data Error, i.e., bit 3 is set.
- Set to 16 when Load Data Timeout, i.e., bit 4 is set.
- Set to 32 when Load Interlocks Failed, i.e., bit 5 is set.
- Set to 64 when CRC fails after programmed into Flash, i.e., bit 6 is set.

If STATUS is ACK, ERROR_CODE is set to 0 (i.e., Not Used).

If STATUS is WAIT, ERROR_CODE is set with value between 2 and 255 (in seconds).

If STATUS is COMPLETE, ERROR_CODE is set to 0 (i.e., Not Used).

Byte 2 and 3 (RESERVED_1 and RESERVED_2 respectively) are reserved for future use.

Byte 4..7 is Free for System application Use.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
STATUS	Status: NAK(0x15), ACK (0x06), WAIT (0x57), COMPLETE(0x43)	CP, PDU, CDP	Connected CRDC	0	7..0	**UINT_8**	Within 10 second after reception
ERROR_CODE	Error Code for NAK: Timeout (2), Incompatible SW Ver (4), CAN Data Error (8), Load Data Timeout (16), Load Interlock Fail (32), CRC Fail (64); Error Code for ACK and COMPLETE=0 (not used) and it is 2..255 (in seconds) for WAIT.	CP, PDU, CDP	Connected CRDC	1	7..0	**UINT_8**	Within 10 second after reception
RESERVED_1	Reserved 1; 0x00	CP, PDU, CDP	Connected CRDC	2	7..0	**UINT_8**	Within 10 second after reception
RESERVED_2	Reserved 2; 0x00	CP, PDU, CDP	Connected CRDC	3	7..0	**UINT_8**	Within 10 second after reception
SYSTEM_APPLICATION_USE	System Application Use; Free for system use	CP, PDU, CDP	Connected CRDC	4..7	31..0	**OPAQUE**	Within 10 second after reception

Table 31 - UPLOAD RESPONSE MESSAGE - ICD-CAN-71246

4.3 CONFIGURATION INFORMATION / REPORT DATA

4.3.1 LRU Rx MESSAGES

Each LRU receives FIN, DATE, TIME, ARN and Airport / City code data at power up from the CPIOM via its connected CRDC. LRU memorizes this information and uses it for fault data record in the NVM.

The LRU message reception is triggered, it depends on transmission from CPIOM Control Application.

Note: A CP, PDU or CDP receives FIN, DATE, TIME, and Airport information from the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

4.3.1.1 LRU FIN

This section described payload data of LRU_FIN message transmitted by CRDCs to LRUs (CPs, PDUs and CDP).

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
FIN_CH_1	Char 1 of FIN	All CRDC	Connected CP, PDU, CDP	1	7..0	**UINT_8**
FIN_CH_2	Char 2 of FIN	All CRDC	Connected CP, PDU, CDP	1	7..0	**UINT_8**
FIN_CH_3	Char 3 of FIN	All CRDC	Connected CP, PDU, CDP	2	7..0	**UINT_8**
FIN_CH_4	Char 4 of FIN	All CRDC	Connected CP, PDU, CDP	3	7..0	**UINT_8**
FIN_CH_5	Char 5 of FIN	All CRDC	Connected CP, PDU, CDP	4	7..0	**UINT_8**
FIN_CH_6	Char 6 of FIN	All CRDC	Connected CP, PDU, CDP	5	7..0	**UINT_8**
FIN_CH_7	Char 7 of FIN, Set to 0x00 when unused	All CRDC	Connected CP, PDU, CDP	6	7..0	**UINT_8**
FIN_CH_8	Char 8 of FIN, Set to 0x00 when unused	All CRDC	Connected CP, PDU, CDP	7	7..0	**UINT_8**

Table 32 - LRU FIN

4.3.1.2 DATE AND TIME

This section described payload data of DATE_TIME message transmitted by CRDCs to LRUs (CPs, PDUs and CDP).

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Date_Time	UTC Format (YYYY-MM-DD hh:mm:ss[.nnn])	All CRDC	Controlled CP, PDU, CDP	0..7	64..0	OPAQUE

Table 33 – DATE AND TIME

4.3.1.3 ARN_MSN

This section described payload data of ARN_MSN message (Aircraft Registration / Manufacturer Serial Number) transmitted by CRDCs to LRUs (CPs, PDUs and CDP).

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
ARN_CH_2	Char 2 of ARN	All CRDC	Connected CP, PDU, CDP	1	7..0	**UINT_8**
ARN_CH_3	Char 3 of ARN	All CRDC	Connected CP, PDU, CDP	2	7..0	**UINT_8**
ARN_CH_4	Char 4 of ARN	All CRDC	Connected CP, PDU, CDP	3	7..0	**UINT_8**
ARN_CH_5	Char 5 of ARN	All CRDC	Connected CP, PDU, CDP	4	7..0	**UINT_8**
ARN_CH_6	Char 6 of ARN	All CRDC	Connected CP, PDU, CDP	5	7..0	**UINT_8**
Spare_1	Reserved for future use	All CRDC	Connected CP, PDU, CDP	6	7..0	**UINT_8**
Spare_2	Reserved for future use	All CRDC	Connected CP, PDU, CDP	7	7..0	**UINT_8**

Table 34 – ARN_MSN

4.3.1.4 AIRPORT / CITY CODE

This section described payload data of AIRPORT_CODE message (Airport City Code) transmitted by CRDCs to LRUs (CPs, PDUs and CDP).

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
AIRPORT_CODE_CH_1	Char 1 of Airport Code	All CRDC	Connected CP, PDU, CDP	0	7..0	**UINT_8**
AIRPORT_CODE_CH_2	Char 2 of Airport Code	All CRDC	Connected CP, PDU, CDP	1	7..0	**UINT_8**
AIRPORT_CODE_CH_3	Char 3 of Airport Code	All CRDC	Connected CP, PDU, CDP	2	7..0	**UINT_8**
Spare_1	Reserved for future use	All CRDC	Connected CP, PDU, CDP	3	7..0	**UINT_8**
Spare_2	Reserved for future use	All CRDC	Connected CP, PDU, CDP	4	7..0	**UINT_8**

Signal	Signal Description	Produce r	Consumer	Byt e	Bit Position	Signal Type
Spare_3	Reserved for future use	All CRDC	Connected CP, PDU, CDP	5	7..0	**UINT_8**
Spare_4	Reserved for future use	All CRDC	Connected CP, PDU, CDP	6	7..0	**UINT_8**
Spare_5	Reserved for future use	All CRDC	Connected CP, PDU, CDP	7	7..0	**UINT_8**

Table 35 - AIRPORT / CITY CODE

4.3.2 LRU Tx MESSAGES

4.3.2.1 CONFIGURATION REPORT DATA

This section describes the payload data (signals) for configuration report data (CONFIGURATION_DATA) message transmitted by each LRU to CRDC. This message includes software part number (SW_PN), hardware part number (HW_PN), hardware serial number (HW_SLN), software FIN (SW_FIN) and hardware FIN (HW_FIN).

Note: A CP, PDU or CDP transmits CONFIGURATION_DATA (Data for Configuration Reporting) to the CRDC, which is connected on same CAN Bus as a node. For CAN Bus mapping to CRDC and PDU, refer to the section 3.1.5 of this document.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Config_Info_Type	SW_PN (1), HW_PN (2), HW_SLN (3), SW_FIN (4), HW_FIN (5)	CP, PDU, CDP	Connected CRDC	0	7..5	**UINT_8**	Event Triggered
Frame_Id	Default (0), Frame_1 (1), Frame_2 (2), Frame_3 (3)	CP, PDU, CDP	Connected CRDC	0	4..3	**UINT_8**	Event Triggered
Num_of_Character	Number of characters transmitted in the frame.	CP, PDU, CDP	Connected CRDC	0	2..0	**UINT_8**	Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Frame_CH_1	First, Eighth or Fifteenth character	CP, PDU, CDP	Connected CRDC	1	7..0	**UINT_8**	Event Triggered
Frame_CH_2	Second or Nineth character	CP, PDU, CDP	Connected CRDC	2	7..0	**UINT_8**	Event Triggered
Frame_CH_3	Third or Tenth character	CP, PDU, CDP	Connected CRDC	3	7..0	**UINT_8**	Event Triggered
Frame_CH_4	Fourth or Eleventh character	CP, PDU, CDP	Connected CRDC	4	7..0	**UINT_8**	Event Triggered
Frame_CH_5	Fifth or Twelfth character	CP, PDU, CDP	Connected CRDC	5	7..0	**UINT_8**	Event Triggered
Frame_CH_6	Sixth or Thirteenth character	CP, PDU, CDP	Connected CRDC	6	7..0	**UINT_8**	Event Triggered
Frame_CH_7	Seventh or Fourteenth character	CP, PDU, CDP	Connected CRDC	7	7..0	**UINT_8**	Event Triggered

Table 36 - CONFIGURATION REPORT DATA

4.4 MAINTENANCE MESSAGES

For maintenance purposes, each LRU records the faults observed during power-up test and continuous monitoring during operation.

Each LRU records its internal faults to NVM of the equipment, which is used during shop maintenance. And reports its external faults to S-BITE for its recording into the CMS. The list of faults monitored during various stages is described in BITE specification (refer to the V5024SP2202946) along with reporting / recoding formats.

4.4.1 FAULT DATA TO S-BITE

Each LRU transmits its internally monitored fault to S-BITE application (via CRDC).

The monitored fault on CP is transmitted to S-BITE as part of message PANEL_OPER_CMD. Refer to section 4.1.1.1.1 (Panel Operator Command) transmitted by each CP.

The monitored fault on PDU is transmitted to S-BITE as part of message STATUS_MSG_1. Refer to section 4.1.3.2.1.1 (Status Message 1) transmitted by each PDU.

The monitored fault on CDP is transmitted to S-BITE as part of message CDP_STATUS_DATA. Refer to section 4.1.2.1.1 (CDP Status and Fault Data) transmitted by each PDU.

4.4.2 INTERACTIVE TEST

During maintenance, based on faults recorded into the CMS, the operator initiates interactive test as per BITE specification (V5024SP2202946). The interactive test command is sent to LRU via CRDC and LRU responds with the test result data.

The interactive BIT command (IBIT_CMD message) is sent to a LRU and corresponding response from LRU is observed on IBIT response (IBIT_RESPONSE message).

The following sections describe the payload of IBIT_CMD and IBIT_RESPONSE messages.

4.4.2.1 INTERACTIVE BIT COMMAND (IBIT_CMD)

This section defines the message signal and payload data for the IBIT_CMD.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Command_Identification_Code	0x01 - 0xFF, as requested by Read out tool	All CRDC	Connected CP, PDU, CDP	0	7..0	**UINT_8**

Table 37 - INTERACTIVE BIT COMMAND (IBIT_CMD)

4.4.2.2 INTERACTIVE BIT RESPONSE (IBIT_RESPONSE)

This section defines the message signal and payload data for the IBIT_RESPONSE.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Command_Identification_Code	0x01 - 0xFF, identifies response to command	CP, PDU, CDP	Connected CRDC	0	7..0	**UINT_8**	Event Triggered
Number_of_Frames	0x1 - 0xF, as set by LRU	CP, PDU, CDP	Connected CRDC	1	7..4	**UINT_8**	Event Triggered
Current_Frame	0x1 - 0xF, as set by LRU	CP, PDU, CDP	Connected CRDC	1	3..0	**UINT_8**	Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Data	As set by Read out tool	CP, PDU, CDP	Connected CRDC	2..7	47..0	**OPAQUE**	Event Triggered

Table 38 - INTERACTIVE BIT RESPONSE (IBIT_RESPONSE)

4.4.3 SHOP MAINTENANCE / DEBUG MESSAGE

During maintenance and/or development, based on faults recorded into the NVM, the operator extracts fault records and debugs the erroneous scenario using an external tool, say Read-out-Tool. For the test purpose, the controlling unit can take the role of an external Read-Out-Tool, then the test-setup switches to a transmitting object and Read-Out-Tool switches to the receiving object.

The following sections describe the payload of READOUT_CMD and READOUT_RESPONSE messages.

4.4.3.1 READOUT COMMAND (READOUT_CMD)

This section defines the message signal and payload data for the READOUT_CMD.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type
Command_Identification_Code	0x01 - 0xFF, as requested by Read out tool	Readout Tool, CRDC	CP, PDU, CDP	0	7..0	**UINT_8**
Data	As set by Read out tool	Readout Tool, CRDC	CP, PDU, CDP	1..7	55..0	**OPAQUE**

Table 39 - READOUT COMMAND (READOUT_CMD)

4.4.3.2 READOUT RESPONSE (READOUT_RESPONSE)

This section defines the message signal and payload data for the READOUT_RESPONSE.

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Command_Identification_Code	0x01 - 0xFF, identifies response to command	CP, PDU, CDP	Readout Tool, CRDC	0	7..0	**UINT_8**	Event Triggered

Signal	Signal Description	Producer	Consumer	Byte	Bit Position	Signal Type	Tx Update Rate
Number_of_Frames	0x1 - 0xF, as set by LRU	CP, PDU, CDP	Readout Tool, CRDC	1	7..4	**UINT_8**	Event Triggered
Current_Frame	0x1 - 0xF, as set by LRU	CP, PDU, CDP	Readout Tool, CRDC	1	3..0	**UINT_8**	Event Triggered
Data	As set by Read out tool	CP, PDU, CDP	Readout Tool, CRDC	2..7	47..0	**OPAQUE**	Event Triggered

Table 40 - READOUT RESPONSE (READOUT_RESPONSE)

5 CAN SIGNAL MAPPING (EXCEL FORMAT)

This attached “CAN_ICD_Signal_Mapping.xlsx” defines the following in excel format, which is defined in this document:

- Node Identifiers for LRUs, and its mapping to CAN Bus / CRDC.
- Message / Function Identifiers for CAN communication between LRUs and CRDC.
- Message signals, its packaging pattern as payload to the CAN message frame.

CAN_ICD_Signal_Mapping.xlsx

6 CAN MESSAGE SIGNAL MAPPING MODIFICATIONS

The changes on CAN signal Mapping for each revision are summarized in table below.

Report Revision	Changes
A	Initial Revision, • Node identification based on 6 pins for address configuration. • Message / Function Identifier as below: o PANEL_CMD o STATUS_MSG_1 o STATUS_MSG_2 o PREPARE o MOVE o RETRACT o PANEL_STATUS o CARGO_ZONE o PANEL_CMD_REDIRECT o STATUS_MSG_1_REDIRECT o STATUS_MSG_2_REDIRECT o PREPARE_REDIRECT o MOVE_REDIRECT o RETRACT_REDIRECT o PANEL_STATUS_REDIRECT • Message signals as per the attached excel worksheet "CAN_ICD_WP2_ENG_RELEASE_Rev_A.xlsx".  CAN_ICD_WP2_ENG_ RELEASE_Rev_A.xlsx
B	The 'Rev B' is created to include the following changes, • Node identification based on 5 pins for address configuration per Airbus directive, which makes nodes 15, 23, 27, 29, 30 and 31 not usable. For details of node identification, refer to the section 3.1.5 of this document. o Unique node identifier (1 to 12) for Control Panels, irrespective of CAN Bus it is connected. The buttons and Joystick Orientations are different on Control Panels, and it makes it location specific. o Control Application determines and commands the PDU as appropriate for its location. PDUs are allowed to use the address 1 to 12 if the same address is not allocated to the CP on the same CAN Bus. o This is because there are up to 19 PDU on a CAN Bus and only 25 usable addresses are available. o Therefore, 12 addresses cannot be reserved only for CP-CDP. • The following Message / Function Identifier name are modified / renamed for better readability: o PANEL_CMD is renamed as PANEL_OPER_CMD, for operator's command from a Control Panel. o PANEL_STATUS is renamed as PANEL_STATUS_CMD, for Control Application command to Control Panels for LED control and system active status. • Additional status message from PDU (STATUS_MESSAGE_3) is created to accommodate faults and other monitored data transmission to Control Application (CPIOM), as required by PTS (V5024PTSS21002 V2.0).

- The following Message / Function Identifier are included for configuration reporting, CDP communication to/from CRDC/CPIOM, Interactive Tests and for Debug purposes.
  - CARGO_ZONE_ENABLED, for Cargo Zone information to CDP.
  - CDP_STATUS_DATA, for CDP faults and status data from CDP.
  - LRU_FIN, to all LRUs for memorization in the NVM.
  - DATE_TIME, to all LRUs for memorization in the NVM.
  - ARN_MSN, to all LRUs for memorization in the NVM.
  - AIRPORT_CODE, to all LRUs for memorization in the NVM.
  - CONFIGURATION_DATA, for configuration reporting by each LRU.
  - READOUT_CMD, for Debug purpose, command to LRUs.
  - READOUT_RESPONSE, for Debug purpose, responses from LRUs.
  - IBIT_CMD, for interactive test command from Control Application.
  - IBIT_RESPONSE, for interactive test responses from LRUs.
- The following Messages / Function Identifier are included for data loading to LRUs:
  - UPLOAD_RESPONSE, for acknowledgement from LRUs.
  - UPLOAD_REQUEST, for request to LRUs to enter data loading mode.
  - WACK, for wait message to LRUs from DLA.
  - UPLOAD_DATA, for transmission of load files to LRUs.
- The following Message / Function Identifiers, for ‘redirect message’ are deleted, as this is handled entirely by Virtual Link at the CRDC/AFDX level.
  - PANEL_CMD_REDIRECT
  - STATUS_MSG_1_REDIRECT
  - STATUS_MSG_2_REDIRECT
  - PREPARE_REDIRECT
  - MOVE_REDIRECT
  - RETRACT_REDIRECT
  - PANEL_STATUS_REDIRECT
- Message signal for the following Message / Function Identifier are added (new Messages:
  - CARGO_ZONE_ENABLED
  - CDP_STATUS_DATA
  - LRU_FIN
  - DATE_TIME
  - ARN_MSN
  - AIRPORT_CODE
  - CONFIGURATION_DATA
  - READOUT_CMD
  - READOUT_RESPONSE
  - IBIT_CMD
  - IBIT_RESPONSE
  - UPLOAD_RESPONSE
  - UPLOAD_REQUEST
  - WACK
  - UPLOAD_DATA
- Message signal for the following Message / Function Identifier are added / reorganized, to accommodate faults, status and optimize message frames:
  - STATUS_MSG_1
  - STATUS_MSG_2
  - STATUS_MSG_3
  - PANEL_OPER_CMD
  - PANEL_STATUS_CMD

	Refer comparison report attached below for details.  CAN_Signal_Mappi ng_RevA_RevB_Com
C	No change in CAN Signal Mapping. The word document has been updated to include Section 5 and Section 6.