



OpenLCB Standard	
OpenLCB-CAN Message Network	
May 20, 2012	Preliminary

1 Introduction (Informative)

OpenLCB is based on a global exchange of individual messages. This specification describes how messages and/or parts of messages are transported across CAN segments as CAN frames.

2 Intended Use (Informative)

- 5 For moving messages on CAN... (includes aspects of moving on and off CAN to other forms)

3 References and Context (Normative)

This specification is in the context of the following OpenLCB-CAN Specifications:

- The OpenLCB Frame Transfer Specification, which specifies ...
- The OpenLCB Node Identifier Specification, which specifies ...

- 10 “CAN” refers to the electrical and protocol specifications as defined in ISO 11898-1:2003 and ISO 11898-2:2003 and their successors.

External certification of parts shall be accepted for conformance to these standards. Conformance with a later version of a standard shall be accepted as conformance with the referenced versions.

- 15 For more information on format and presentation, see:
- OpenLCB Common Information Technical Note

4 States

The message network layer in an OpenLCB-CAN node has two states:

- Uninitialized
- 20 • Initialized

Nodes shall start in the Uninitialized state.

A node in the Uninitialized state may transmit an Initialization Complete message. A node in the Uninitialized state shall not transmit any other message type.

A node in the Initialized state may transmit any message type.

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5 Message Format (Normative)

OpenLCB-CAN messages are sent in single CAN frames using the transfer mechanism and format described in the “OpenLCB-CAN Frame Transfer Standard”. This defines a 15 bit variable field in the frame, the format and contents of which is defined in this section. There are two formats, indicated by the most significant bit of the variable field.

(refer back to the general standard, where most of the content is)

(Needs to discuss structure of CAN MTI, so that equipment can count on the long-term-stable parts of that)

(The following bits about addressing are somewhat overlapping with the frame-level, which is where addressed vs non-addressed is structured for CAN)

5.1 Global (non-addressed) messages

Global messages do not carry a destination Node ID alias, and therefore are directed at all nodes receiving the particular message.

5.2 Addressed messages

Addressed messages carry the Node ID alias of their destination as the low 12 bits of the variable field.

6 Messages (Normative)

6.1.1 Initialization Complete

Indicates that the node initialization is complete, and once the message is delivered, reachable on the network.

Message Type Indicator: 0x

Destination address present: No

Simple subset:

Priority group:

Content: Node ID of the sending node

CAN frame format:

6.1.2 Verify Node ID

Message Type Indicator: 0x

Destination address present: Both yes and no

55 Simple subset:
 Priority group:
 Content:
 CAN frame format:

6.1.3 Verified Node ID

60 Message Type Indicator: 0x
 Destination address present: No (space reasons originally, but these no longer apply?)
 Simple subset:
 Priority group:
 Content: NID of the sending node – this is sent in full 48 bit format in all wire protocols, even if
 65 an alternate form or alias is available elsewhere in the message
 CAN frame format:

6.1.4 Optional Interaction Rejected

 Message Type Indicator: 0x
 Destination address present: Yes
 70 Simple subset:
 Priority group:
 Content:

- Mandatory most recent MTI (2 bytes)
- Mandatory error code (TBD)
- Optional data content (TBD)

 75 CAN frame format:

6.1.5 Terminate Due to Error

 Message Type Indicator: 0x
 Destination address present: Yes
 80 Simple subset:
 Priority group:
 Content:

- Mandatory most recent MTI (2 bytes)

- Mandatory error code (TBD)
- Optional data content (TBD)

CAN frame format:

7 Interactions (Normative)

All nodes shall take part in all standard interactions defined in this section.

7.1 Node Initialization

- 90 Newly functional nodes, once their start-up is complete and they are fully operational, including having the frame transfer layer in “Permitted state”, shall send an "Initialization Complete" message and enter Initialized state.

7.2 Duplicate Node ID Detection

- 95 OpenLCB nodes must have unique node IDs. To detect this across the entire connected OpenLCB, all OpenLCB nodes must indicate an error if they detect an incoming message with a Source Node ID equal to their own. If possible, they should indicate it at the board itself using a light or similar. If possible, they should emit a PCER message with the “Duplicate Source ID detected” global event, which will carry the duplicate event ID in the Source Node ID field.

- 100 After sending the “Duplicate Source ID detected” global event, the node shall not transmit any further messages until reset because this message will be received at the other duplicate-ID node(s), resulting in additional “Duplicate Source ID detected” global events and causing a possible message loop.

7.3 Node ID Discovery

Upon receipt of a Verify Node ID Number message addressed to it, or an unaddressed Verify Node ID Number message, a node must reply with an unaddressed Verified Node ID Number message.

105 7.4 Error Handling

There are multiple mandatory error-handling scenarios defined.

(Need to explain “optional” here)

7.4.1 Reject Addressed Optional Interaction

- Node A receives an addressed message from Node B that carries Node A's NID.
- 110 • The MTI indicates the start of an optional interaction.
- If Node A does not want to take part in the optional interaction, it shall send an Optional Interaction Rejected message addressed to Node B with the original MTI in the message content.

- 115 The message content also contains an optional reason code and an optional data value. The use of these fields is to be defined.

7.4.2 Reject Unaddressed Optional Interaction

- Node A receives an unaddressed message from Node B.
- The MTI indicates the start of an optional interaction.

120 If Node A does not want to take part in the optional interaction, it silently drops the message without reply.

7.4.3 Reject Addressed Standard Interaction Due to Error

- Node A is taking part in an addressed interaction with Node B. Either node may be able to send the next message.
- Some error condition prevents Node A from continuing the interaction.
- 125 • To terminate the interaction, Node A sends a Terminate Due to Error message to Node B. It then resets it's state so as to no longer be taking part in the addressed interaction.

The message content contains the most recent MTI received in this interaction, a mandatory reason code and an optional data value. The use of these fields is to be defined.

Nodes must handle messages of this type that arrive without MTIs and error code information.

130 Needs definition of a permanent vs temporary bit in the error code information (consider choosing bits in a similar way to the datagram definitions)

7.4.4 Delays and Timeouts

Nodes shall send messages required by OpenLCB protocols within 750 msec unless otherwise indicated in the documentation for the specific protocol interaction.

135 Nodes may, but are not required to, use a timeout mechanism to protect against messages lost due to malfunctions. Such a timeout shall not be shorter than 3 seconds.

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