NMRA Standard	
Layout Command Control™ (LCC) **Event Identifiers**	
July 22, 2024	**S-9.7.0.4**

Adopted as a NMRA Standard

The OpenLCB Standard document appended to this cover sheet has been formally adopted as a NMRA Standard by the NMRA Board of Directors on the date shown in the *Adopted* column in the *Version History* table below.

Version History

Date	Adopted	Changes
Feb 17, 2015		Initial version submitted for public comment
Feb 6, 2016	Feb 20, 2016	Minor grammatical corrections and readability improvements as well as the following specific changes: • Added "(Normative)" label to **4 Format** & **5 Allocation** section titles • Added Row to **5.2 Well-Known Automatically-Routed** table • Changes and additions to **5.3 Well-Known** table
Apr 25, 2021	**July 2, 2021**	Changed LCC logo to include the ® symbol Changed “Layout Command Control” to have the ™ symbol Added the NMRA Legal Disclaimer fine-print Changed the OpenLCB license to “Creative Commons Attribution-ShareAlike 4.0 International” In section **5.2 Well-Known Automatically-Routed** added: • **Power supply brownout detected below minimum required by node** • **Power supply brownout detected below minimum required by standard** In section **5.3 Well-Known** added: • **Activate basic DCC accessory decoder address** • **Deactivate basic DCC accessory decoder address** • **Send aspect to extended DCC accessory decoder address**
July 22, 2024		Adds Train Search protocol event range

Date	Adopted	Changes
		Adds 11-bit extended DCC accessory address range Reformat some tables

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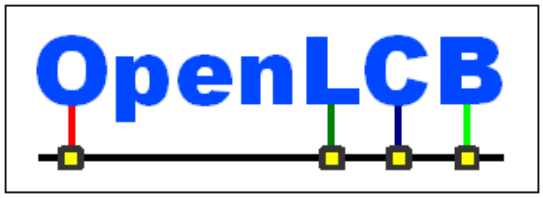

OpenLCB Standard	
Event Identifiers	
July 22, 2024	Adopted

1 Introduction (Informative)

This standard describes the format and allocation of OpenLCB Event Identifiers (Event IDs). It is not specific to any wire protocol.

2 Intended use (Informative)

This standard defines the format and allocation of Event Identifiers. Event Identifiers are typically used with the Event Transport protocol and are globally unique.

3 References and Context (Normative)

This Standard is in the context of the following OpenLCB Standards:

- The CAN Physical Layer Standard, which specifies the physical layer for transporting OpenLCB-CAN frames
- The Message Network Standard, which defines the basic messages and how they interact. Higher-level protocols are based on this message network, but are defined elsewhere.
- The Event Transport Standard, which defines the protocol for transporting events.
- The Unique Identifiers Standard which defines the format and allocation of unique 48-bit identifiers.
- The Train Search Protocol Standard, referenced in the allocations tables.

This Standard is in the context of the following NMRA Standards:

- NMRA S-9.2.1 DCC Extended Packet Formats, which specifies the format of DCC accessory packets.

4 Format (Normative)

An OpenLCB event identifier shall be eight bytes of eight bits each. Except as specifically noted within this document, the upper 6-bytes are represented by a uniquely assigned Node ID.

The order of bytes in an OpenLCB Event Identifier shall be considered significant. The most-significant byte shall be transmitted first during communication operations. The most-significant byte shall be written first (left-most in Western format) in any human-readable representation. Within the tables below, byte 1 is considered the most-significant byte, while byte 8 is considered the least significant byte.

5 Allocation (Normative)

5.1 Node ID Based

Value						Suffix		Description
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**	
6-byte Uniquely Assigned Node ID						*	*	Assigned Node ID event

5.2 Well-Known Automatically-Routed

The following Event Identifiers are automatically routed between OpenLCB segments through gateways.

Value						Suffix		Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
01	00	*	*	*	*	*	*	Well-Known Automatically-Routed Event Identifiers
		00	00	00	00	FF	FF	Emergency off (de-energize)
						FF	FE	Clear emergency off (energize)
						FF	FD	Emergency stop of all operations
						FF	FC	Clear emergency stop of all operations
						FF	F8	Node recorded a new log entry
						FF	F1	Power supply brownout detected below minimum required by node
						FF	F0	Power supply brownout detected below minimum required by standard
						FE	00	Ident button combination pressed
						FD	01	Link error code 1 – the specific meaning is link wire protocol specific
						FD	02	Link error code 2

Value						Suffix		Description
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**	
01	00	*	*	*	*	*	*	Well-Known Automatically-Routed Event Identifiers
						FD	03	Link error code 3
						FD	04	Link error code 4

5.3 Well-Known

35 The following Event Identifiers are not automatically routed.

Value						Suffix		Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
01	01	*	*	*	*	*	*	Well-Known Event Identifiers
		00	00	00	00	02	01	Duplicate Node ID Detected
						03	*	Reserved for Train Control Protocol
						03	01	Reserved
						03	02	Reserved
						03	03	This node is a Train
						03	04	This node is a Train Control Proxy
						06	*	Reserved for Firmware Upgrade Protocol
						06	01	Firmware Corrupted
						06	02	Firmware Upgrade Request by Hardware Switch
				01	00	*		Default Fast Clock

Value						Suffix		Description
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**	
01	01	*	*	*	*	*	*	Well-Known Event Identifiers
		00	00	01	01	*		Default Real-Time Clock
					02	*		Alternate Clock 1
					03	*		Alternate Clock 2
		01	00	CBUS Node ID		CBUS Event ID		Subset of the assigned Node ID space for CBUS mapped nodes. Node ID is 00.00 for short events. This range is an ON request.
		01	01	CBUS Node ID		CBUS Event ID		Subset of the assigned Node ID space for CBUS mapped nodes. Node ID is 00.00 for short events. This range is an OFF request.
		02	00	00	FF	11-bit DCC Basic Accessory Address ($A_{10}..A_0$) + Pair bit (R)		Activate basic DCC accessory decoder address. Bytes 7 and 8 contain the DCC accessory decoder address (0 – 4095) in the form of byte 7 = $0000A_{10}A_9A_8A_7$ and byte 8 = $A_6A_5A_4A_3A_2A_1A_0R$[1]. All other values for bytes 7 and 8 are reserved for future uses.

[1]For information on the different methods of how these 2 x 4095 addresses map to the commonly used turnout addresses of 1..2048, please see the OpenLCB Event Identifiers Technical Note.

Value						Suffix		Description
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**	
01	01	*	*	*	*	*	*	Well-Known Event Identifiers
					FE	11-bit DCC Basic Accessory Address ($A_{10}..A_0$) + Pair bit (R)		Deactivate basic DCC accessory decoder address. Bytes 7 and 8 contain the DCC accessory decoder address (0 – 4095) in the form of byte 7 = $0000A_{10}A_9A_8A_7$ and byte 8 = $A_6A_5A_4A_3A_2A_1A_0R$[1]. All other values for bytes 7 and 8 are reserved for future uses.
					FD	11-bit DCC Accessory Address ($A_{10}..A_0$) + Pair bit (R)		DCC turnout feedback active/on/high. Bytes 7 and 8 contain the DCC accessory decoder address (0 – 4095) in the form of byte 7 = $0000A_{10}A_9A_8A_7$ and byte 8 = $A_6A_5A_4A_3A_2A_1A_0R$[1]. All other values for bytes 7 and 8 are reserved for future uses.
					FC	11-bit DCC Accessory Address ($A_{10}..A_0$) + Pair bit (R)		DCC turnout feedback inactive/off/low. Bytes 7 and 8 contain the DCC accessory decoder address (0 – 4095) in the form of byte 7 = $0000A_{10}A_9A_8A_7$ and byte 8 = $A_6A_5A_4A_3A_2A_1A_0R$[1]. All other values for bytes 7 and 8 are reserved for future uses.
					FB	12-bit DCC Sensor Address		DCC system sensor feedback active/on/high. Bytes 7 and 8 contain the sensor address (0 – 4095). All other values for bytes 7 and 8 are reserved for future uses.

Value						Suffix		Description
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**	
01	01	*	*	*	*	*	*	Well-Known Event Identifiers
					FA	12-bit DCC Sensor Address		DCC system sensor feedback inactive/off/low. Bytes 7 and 8 contain the DCC sensor address (0 – 4095). All other values for bytes 7 and 8 are reserved for future uses.
				01	00.00 – 07.FF 11-bit DCC Extended Accessory Address		00 - FF	Send command to extended DCC accessory decoder address. Please refer to NMRA S-9.2.1 for the definitions of byte 8, which corresponds to the 3rd byte of a DCC extended accessory decoder packet. Bytes 6 and 7 are the DCC accessory decoder address in the form of byte 6 = 00000A10A9A8 and byte 7 = A7A6A5A4A3A2A1A0. Valid values are from 0 to 2047. By convention, user address 1 corresponds to binary adress 4 in bytes 6 and 7. User addresses 2045 to 2048 may wrap around to binary adresses 0 to 3. All other values for bytes 6 and 7 are reserved for future uses.

5.4 Well-Known Other

The following Event Identifiers are not automatically routed.

Value								Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
0x09	0x00	0x99	0xFF	*	*	*	*	Train Search Protocol. See the OpenLCB Train Search Protocol Standard.

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