

<b>NMRA Standard</b>	
<b>Layout Command Control™ (LCC)</b>	
<b>Event Identifiers</b>	
<b>Apr 25, 2021</b>	<b>S-9.7.0.4</b>

## 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: <ul style="list-style-type: none"> <li>• Added "(Normative)" label to <b>4 Format &amp; 5 Allocation</b> section titles</li> <li>• Added Row to <b>5.2 Well-Known Automatically-Routed</b> table</li> <li>• Changes and additions to <b>5.3 Well-Known</b> table</li> </ul>
Apr 25, 2021	<b>July 2, 2021</b>	<p>Changed LCC logo to include the ® symbol</p> <p>Changed "Layout Command Control" to have the ™ symbol</p> <p>Added the NMRA Legal Disclaimer fine-print</p> <p>Changed the OpenLCB license to "Creative Commons Attribution-ShareAlike 4.0 International"</p> <p>In section <b>5.2 Well-Known Automatically-Routed</b> added:</p> <ul style="list-style-type: none"> <li>• <b>Power supply brownout detected below minimum required by node</b></li> <li>• <b>Power supply brownout detected below minimum required by standard</b></li> </ul> <p>In section <b>5.3 Well-Known</b> added:</p> <ul style="list-style-type: none"> <li>• <b>Activate basic DCC accessory decoder address</b></li> <li>• <b>Deactivate basic DCC accessory decoder address</b></li> <li>• <b>Send aspect to extended DCC accessory decoder address</b></li> </ul>

# Important Notices and Disclaimers Concerning NMRA Standards Documents

The Standards (S), Recommended Practices (RP), Technical Note (TN) and Technical Information (TI) documents of the National Model Railroad Association (“NMRA Standards documents”) are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning NMRA Standards Documents.”

## Notice and Disclaimer of Liability Concerning the Use of NMRA Standards Documents

NMRA Standards documents are developed within the Standards and Conformance Department of the NMRA in association with certain Working Groups, members, and representatives of manufacturers and sellers. NMRA develops its standards through a consensus development process, which brings together volunteers representing varied viewpoints and interests to achieve the final product. NMRA Standards documents are developed by volunteers with modeling, railroading, engineering, and industry-based expertise. Volunteers are not necessarily members of NMRA, and participate without compensation from NMRA.

NMRA does not warrant or represent the accuracy or completeness of the material contained in NMRA Standards documents, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard or recommended practice, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, NMRA disclaims any and all conditions relating to results and workmanlike effort. In addition, NMRA does not warrant or represent that the use of the material contained in NMRA Standards documents is free from patent infringement. NMRA Standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of NMRA Standards documents is wholly voluntary. The existence of an NMRA Standard or Recommended Practice does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the NMRA Standards documents. Furthermore, the viewpoint expressed at the time that NMRA approves or issues a Standard or Recommended Practice is subject to change brought about through developments in the state of the art and comments received from users of NMRA Standards documents.

In publishing and making its standards available, NMRA is not suggesting or rendering professional or other services for, or on behalf of, any person or entity, nor is NMRA undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any NMRA Standards document, should rely upon their own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given NMRA Standards documents.

IN NO EVENT SHALL NMRA BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD OR RECOMMENDED PRACTICE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

## Translations

NMRA’s development of NMRA Standards documents involves the review of documents in English only. In the event that an NMRA Standards document is translated, only the English version published by NMRA is the approved NMRA Standards document.

## Official Statements

A statement, written or oral, that is not processed in accordance with NMRA policies for distribution of NMRA communications, or approved by the Board of Directors, an officer or committee chairperson, shall not be considered or inferred to be the official position of NMRA or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of NMRA.

## Comments on Standards

Comments for revision of NMRA Standards documents are welcome from any interested party, regardless of membership. However, **NMRA does not provide interpretations, consulting information, or advice pertaining to NMRA Standards documents.**

Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since NMRA standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, NMRA, its departments, Working Groups or committees cannot provide an instant response to comments, or questions except in those cases where the matter has previously been addressed. For the same reason, NMRA does not respond to interpretation requests. Any person who would like to participate in evaluating comments or in revisions to NMRA Standards documents may request participation in the relevant NMRA working group.

## Laws & Regulations

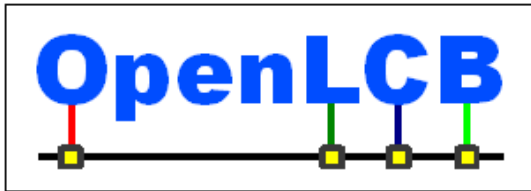
Users of NMRA Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any NMRA Standards document does not constitute compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. NMRA does not, by the publication of NMRA Standards documents, intend to urge action that is not in compliance with applicable laws, and NMRA Standards documents may not be construed as doing so.

## Copyrights

NMRA Standards documents are copyrighted by NMRA under US and international copyright laws. They are made available by NMRA and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of modeling, structural and engineering practices and methods. By making NMRA Standards documents available for use and adoption by public authorities and private users, NMRA does not waive any rights in copyright to the NMRA Standards documents.

## IMPORTANT NOTICE

NMRA Standards documents do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other systems, devices or networks. NMRA Standards documents development activities consider research and information presented to the standards development group in developing any safety recommendations. Other information about safety practices, changes in technology or technology implementation, or impact by peripheral systems also may be pertinent to safety considerations during implementation of the standard. Implementers and users of NMRA Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.



<b>OpenLCB Standard</b>	
<b>Event Identifiers</b>	
<b>Apr 25, 2021</b>	<b>Adopted</b>

## 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)

- 5 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:

- 10
- 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.
  - 15 • The Unique Identifiers Standard which defines the format and allocation of unique 48-bit identifiers.

## 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.

- 20 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.

## 25 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

30

### 5.3 Well-Known

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 Traction Protocol
						03	01	Reserved
						03	02	Reserved
						03	03	This node is a Train
						03	04	This node is a Traction 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	12-bit DCC Basic Accessory Address		Activate basic DCC accessory decoder address. Bytes 7 and 8 are the DCC accessory decoder address (0 – 4087) <sup>1</sup> . 4088 – 4095 are utilized in the DCC standard as broadcast addresses. All other values for bytes 7 and 8 are reserved for future uses.	
						FE		12-bit DCC Basic Accessory Address	Deactivate basic DCC accessory decoder address. Bytes 7 and 8 are the DCC accessory decoder address (0 – 4087) <sup>1</sup> . 4088 – 4095 are utilized in the DCC standard as broadcast addresses. All other values for bytes 7 and 8 are reserved for future uses.

<sup>1</sup>For information on the different methods of how these 2 x 4088 addresses map to the commonly used turnout addresses of 1..2040, 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
					00 - 1F	11-bit DCC Extended Accessory Address		<p>Send aspect to extended DCC accessory decoder address.</p> <p>Byte 6 is the aspect, only values between 0 and 31 are allowed.</p> <p>Bytes 7 and 8 are the DCC accessory decoder address (0 – 2046). 2047 is utilized in the DCC standard as the broadcast addresses. All other values for bytes 7 and 8 are reserved for future uses.</p>

## Table of Contents

1	Introduction (Informative).....	1
2	Intended use (Informative).....	1
3	References and Context (Normative).....	1
4	Format (Normative).....	1
5	Allocation (Normative).....	2
5.1	Node ID Based.....	2
5.2	Well-Known Automatically-Routed.....	3
5.3	Well-Known.....	5