NMRA Standard	
Layout Command Control™ (LCC) **Unique Identifiers**	
July 22, 2024	**S-9.7.0.3**

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	Summary of 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 **Long (16-bit) NMRA DCC manufacturer identifiers** table entry to 5.1 Overview section • Removed part of section **5.7 Specifically Assigned by Request** including the table of Unique ID Ranges allocated to named individuals • Added notice to section **5.8 Locomotive Control Systems** to not use • Added to section **5.10 Temporary Assigned by Software at Runtime** • Added section **5.11 Long (16-bit) NMRA DCC Manufacturer Specific**
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" Added to section **5.4 Manufacturer Specific** for manufacturers without a NMRA Assigned DCC Manufacturer ID Corrected comments in **5.7 Specifically Assigned by Request** for 16-bit and 24-bit allocations
July 22, 2024		Updates ranges for train control systems: DC, DCC, TMCC, etc

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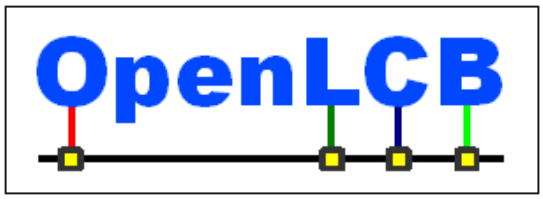

OpenLCB Standard	
Unique Identifiers	
July 22, 2024	Adopted

1 Introduction (Informative)

This standard describes the format and allocation of OpenLCB 48-bit Unique Identifiers. It is not specific to any wire protocol.

2 Intended Use (Informative)

Many OpenLCB protocols rely on each node having a Node ID, and those Node IDs being absolutely unique between nodes. OpenLCB defines 48-bit unique identifiers for this purpose. Unique Identifiers are also used to ensure that Event Identifiers are uniquely specified. This Standard is intended to ensure these Unique Identifiers are available. It applies to all OpenLCB uses of 48-bit Unique Identifiers, including as Node Identifiers.

3 References and Context (Normative)

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

- The OpenLCB 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 OpenLCB Event Identification Standard, which defines the well-known Events Identifiers.

4 Format (Normative)

An OpenLCB Unique Identifier (Unique ID) shall be six bytes of eight bits each.

The order of bytes in an OpenLCB unique 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 6 is considered the least significant byte.

An OpenLCB Unique Identifier shall include one or more 1 bits.

Every OpenLCB node shall have a Unique Identifier to use as a Node Identifier (Node ID).

5 Allocation (Normative)

Unique Identifiers shall be allocated using one of the mechanisms in this section. When additional allocation methods are defined, the Unique Identifiers defined by those additional

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methods shall only provide allocation ranges that do no overlap with existing allocation ranges. Ranges that are not explicitly allocated are reserved for future use unless otherwise noted within this document.

5.1 Overview

Unique Identifiers are allocated in groups starting with the most significant byte as the macro group assignment.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
00	*	*	*	*	*	OpenLCB	Reserved, leading zero indicates uninitialized or non-standard Node ID
01	*	*	*	*	*	OpenLCB	Reserved for well-known global identifiers
02	*	*	*	*	*	OpenLCB	Manufacturer Specific Assignments
03	*	*	*	*	*	OpenLCB	Self-assigning groups space
04	*	*	*	*	*	OpenLCB	Individual Unique Identifiers allocated by automatic requests
05	*	*	*	*	*	OpenLCB	Specifically assigned ranges by request
06	*	*	*	*	*	OpenLCB	Locomotive control systems (deprecated, may be reassigned in the future)
07	*	*	*	*	*	OpenLCB	(tentative) RFID and NFC messages as events
08	*	*	*	*	*	OpenLCB	Temporary individually Unique Identifiers leased by automatic requests
09	*	*	*	*	*	OpenLCB	Long (16-bit) NMRA DCC manufacture identifiers
FF	*	*	*	*	*	OpenLCB	Reserved, indicates an error (example: reset non-volatile memory)

5.2 Reserved Leading Zero

A value of zero in the most significant byte of the Unique Identifier indicates uninitialized or non-standard Node ID.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
00	00	00	00	00	00	OpenLCB	Convenient value for “no valid Node ID assigned”

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5.3 Well-Known Global Identifiers

OpenLCB defines specific well-known identification numbers and number ranges for specific uses. The details of these ranges are defined in in either the Event Identifiers Standard or another Standard.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
01	00	00	00	00	00	OpenLCB	Reserved for automatically-routed Event Identifiers. See Event Identifiers Standard.
01	01	00	00	00	00	OpenLCB	Reserved for well-known Event Identifiers. See Event Identifiers Standard.
01	01	01	00	CBUS Node ID		MERG	Reserved for CBUS-defined Event Identifiers (ON state). See Event Identifiers Standard and Technical Note.
01	01	01	01	CBUS Node ID		MERG	Reserved for CBUS-defined Event Identifiers (OFF state). See Event Identifiers Standard Technical Note.
01	01	01	*	CBUS Node ID		MERG	Reserved for CBUS-defined future expansion.
01	63	*	*	*	*	OpenLCB	XpressNet translation
01	81	*	*	*	*	OpenLCB	LocoNet translation
01	EE	*	*	*	*	OpenLCB	DCC Translation

5.4 Manufacturer Specific

Manufacturers shall ensure uniqueness for identifiers they assign. Short (8-bit) NMRA DCC manufacture ID's are assigned out of this pool. Please see section 5.11 for long (16-bit) NMRA DCC manufacture ID's. Some of the DCC manufacture ID's are called out specifically in the table below as an example and to draw attention to their existence, but they are assigned in accordance with their corresponding DCC manufacture ID. This pool may also be used for new, unique, non-DCC manufacture ID based assignments in the future.

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Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
02	01	DCC ID	Self-Assigned			DCC Manufacturer	Manufacturers who have been assigned a short DCC Manufacturer ID code may, but are not required to, use this range. These IDs are defined within the NMRA standard "S-9.2.2 Appendix A, DCC Manufacture ID Codes"
02	01	0D	Self-Assigned			DCC – DIY	Do-It-Yourself (shared unmanaged space, not recommended for individual use)
02	01	12	Self-Assigned			DCC – JMRI	JMRI (for use in software solutions)
02	01	A5	*	CBUS Node ID		DCC – MERG	MERG Node ID translation
02	01	EE	*	*	*	DCC – NMRA	NMRA Reserved (for extended manufacture ID numbers). Not available for use.
02	02	*	*	*	*	Manufacturer	Manufacturers without a DCC Manufacturer ID

5.5 Self-Assigning Groups

These Unique Identifiers are assigned in association with an outside organization's unique identification scheme. The outside organization is responsible for assigning a globally unique identifier that maps into the OpenLCB Unique Identifier space designated in the table below.
50 Future definition of ranges for additional groups will use unique values in Byte 2.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
03	00	Membership Number			*	NMRA	NMRA members may, but are not required to, use their NMRA membership number to self-assign Unique Identifiers. The least significant byte is self-assigned.
03	04	Membership Number			*	MERG	MERG members may, but are not required to, use their MERG membership number to self-assign Unique Identifiers. The least significant byte is self-assigned.
03	08	CBUS Layout ID		CBUS Node ID		MERG	CBUS – for mapping existing modules, using the Layout ID defined by CBUS

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5.6 Assigned by Software at Runtime

A program running in a computer with an IP address must not use that address to directly formulate a unique identifier. The program may use an IP connection to request a unique identifier from openlcb.org, or from another organization that is distributing unique identifiers from a range designated to it.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
04	00	00	Sequentially Assigned Values			OpenLCB	Allocated through OpenLCB.org
04	00	*	Sequentially Assigned Values			OpenLCB	Reserved for OpenLCB.org future expansion

5.7 Specifically Assigned by Request

These ranges are assigned by the OpenLCB group. The OpenLCB group regularly publishes the authoritative list of these assignments. The most up-to-date draft of these assignments are available on the OpenLCB Unique Identifiers website: http://registry.openlcb.org.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
05	01	*	*	*	*	OpenLCB	8-bit assigned ranges. The least significant byte is sequentially assigned.
05	02	*	*	Sequentially Assigned Values		OpenLCB	16-bit assigned ranges. The least significant two bytes are sequentially assigned.
05	03	*	Sequentially Assigned Values			OpenLCB	24-bit assigned ranges. The least significant three bytes are sequentially assigned.

5.8 Locomotive Control Systems

This Unique Identifier range (starting with a most significant byte value of 0x06) is allocated for locomotive control systems. Unique Event Identifiers shall not be defined out of this range.

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Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
06	00	00	00	00	00 - FF	OpenLCB	DC system. Valid byte 6 values are 0 to 255, and correspond with the DC cab ID in a multi-cab block system.
06	01	*	*	*	*	OpenLCB	DCC operated. Undefined values are reserved.
06	01	00	00	00	00 - 7F	OpenLCB	DCC short (7-bit) address. Valid byte 6 values are 0 to 127. 0 is the broadcast address and can be used to control all DCC short and long address locomotives. All other values are reserved.
06	01	00	00	C000 - E7FF		OpenLCB	DCC long (14-bit) address Valid byte 5 and 6 values are 0 to 10239 logically or'd with 0xC000, consistent with DCC conventions. Byte 5 is the most significant byte and byte 6 is the least significant byte. All other values are reserved.
06	02	*	*	*	*	OpenLCB	TMCC.
06	02	00	00	00	01 - 63	OpenLCB	TMCC 2-digit address. Valid byte 6 values are 1 to 99, all other values are reserved. Address 99 is the broadcast address and can be used to control all TMCC 2-digit locomotives.
06	02	00	00	C000 - E70F		OpenLCB	TMCC 4-digit address. Valid byte 5 and 6 values are 0 to 9999 logically or'd with 0xC000. Byte 5 is the most significant byte and byte 6 is the least significant byte. 0xC000 is the broadcast address and can be used to control all TMCC 4-digit locomotives. All other values are reserved.
06	03	00	00	00	01-50	OpenLCB	Märklin/Motorola system. Valid byte 6 values are 1 to 80, all other values are reserved.
06	04	*	*	*	*	OpenLCB	MTH DCS, reserved for future definition, do not use.

5.9 RFID and NFC

The RFID Unique Identifiers space is reserved for further standardization in the future. Do not use this space before contacting the OpenLCB organization first.

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5.10 Temporary Assigned by Software at Runtime

This range has been reserved for specialized software and network services specifically designed to lease a Unique Identifier to nodes upon request. Nodes that come without a Unique Identifier (such as computer programs) may contact an instance of such leasing service to obtain a Unique Identifier. Nodes may use any method outside the OpenLCB network to locate and communicate with a leasing service (for example an Internet connection or a local TCP/IP network). The leases shall be limited in time, and a node shall not use an identifier after the lease time expires. The node may communicate with the leasing service to periodically extend the lease.

Each such service shall operate from a range assigned to the specific instance, and is responsible for ensuring uniqueness among its clients. The owner or maintainer of an OpenLCB Installation is responsible for ensuring that all the leasing services that all the nodes participating in the installation are using, have disjoint ranges. In particular, if the installation operates one or more leasing services, they must be assigned disjoint ranges to hand out identifiers from. Globally available leasing services (such as over the Internet) shall have a unique range assigned to them.

Because Unique Event Identifiers assigned out of this range could be captured and disseminated into use by nodes that could become unaware of a lease expiration and reassignment, Unique Event Identifiers shall not be assigned out of this range.

It is possible that a future OpenLCB protocol may, or may not, define a mechanism to negotiate a Unique Identifier lease over an OpenLCB network. It is important to note that no such protocol is prescribed by this standard.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
08	00	00	Self-Assigned			OpenLCB	Allocated through OpenLCB.org.
08	00	*	Self-Assigned			OpenLCB	Reserved for future OpenLCB.org allocations.
08	01	Long DCC ID		Self-Assigned		DCC Manufacturer	Manufacturers who have been assigned a DCC Manufacturer ID code may, but are not required to, use this range. These IDs are defined within the the NMRA standard “S-9.2.2 Appendix A, DCC Manufacture ID Codes”.
08	01	00	0D	Self-Assigned		DCC - DIY	Do-It-Yourself (shared unmanaged space). Use with Caution.

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5.11 Long (16-bit) NMRA DCC Manufacturer Specific

85 Manufacturers shall ensure uniqueness for identifiers they assign. Long (8-bit) NMRA DCC manufacture ID's are assigned out of this pool. Some of the DCC manufacture ID's are called out specifically in the table below as an example and to draw attention to their existence, but they are assigned in accordance with their corresponding DCC manufacture ID.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
09	Long DCC ID		Self-Assigned			DCC Manufacturer	Manufacturers who have been assigned a DCC Manufacturer ID code may, but are not required to, use this range. These IDs are defined within the NMRA standard "S-9.2.2 Appendix A, DCC Manufacture ID Codes"
09	00	0D	Self-Assigned			DCC – DIY	Do-It-Yourself (shared unmanaged space, not recommended for individual use)
09	00	12	Self-Assigned			DCC – JMRI	JMRI (for use in software solutions)
09	00	A5	*	CBUS Node ID		DCC – MERG	MERG Node ID translation
09	00	EE	*	*	*	DCC – NMRA	NMRA Reserved (for extended manufacture ID numbers). Not available for use.

5.12 Reserved Unique Identifiers

90 All other unique identifiers not specifically discussed in this Standard shall not be used until the Standard is revised to permit their use. Additionally, the following table identifies Unique Identifiers that shall be reserved indefinitely.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Organization	Comment
00	*	*	*	*	*	OpenLCB	Shall not be used at any point.
FF	*	*	*	*	*	OpenLCB	Shall not be used at any point.

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