



NMRA Technical Note	
PluX Decoder Interface	
May 10, 2021	TN 9.1.1.4

# 1 General

Decoder interface standards exist in order to aid in installation of decoders into vehicle system boards. Installation can be performed by the vehicle manufacturer or separately by the individual modeler.

## 5 2 Served Use Cases

The intent is that any decoder which conforms to the standard, from any manufacturer, will operate with any vehicle system board which conforms to the standard, from any manufacturer. Operate is further defined as not to cause any permanent damage of the decoder or vehicle system board.

### 2.1 Unserved Use Cases, References

10 It is not the purpose of the standard to ensure that every decoder and vehicle system board implements all of the possible features defined by the standard. Operation is limited to the features supported by the decoder and/or vehicle system board, as documented by the respective manufacturers.

## 3 Annotations to the Standard

### 15 3.1 References

Additional relevant references are found in

- S-9.1.1.4 PluX Decoder Interface
- RCN-122 Decoder Interface PluX, with which this standard is intended to be in harmony.
- 20 • NEM 658 Electrical Interface PluX, with which this standard is intended to be in harmony.

### 3.2 Requirements

25 It is important to note that a product is not required to implement all connections of the interface. A manufacturer may choose to omit certain features, for example the number of function outputs. It is incumbent on the manufacturer to document for users the supported features of their product(s).

### 3.3 Mechanical Properties and Dimensions.

30 The mechanical properties are provided in general terms so as not to codify into the standard any limit to alternative sources. Proper connector sources will result in the proper seating of the decoder on the locomotive mainboard so that the decoder's socket mounts flush with the mainboard pin header. TI-9.1.1 contains a list of manufacturer and part numbers for connector sources that have been tested for conformance to the standard.

The NMRA Conformance and Inspection committee may allow exemptions from the 3.0mm pin header height, at their discretion, depending on when the decoder under test was originally designed.

- 35 In the NEM-658 Standard PluX22 decoders have a maximum length of 35 mm. RCN-122 and NMRA S 9.1.1.4 have reduced this to 30mm to harmonize with RCN-121 and S 9.1.1.3 respectively. In the interests of compatibility with existing decoders, the installation space in the vehicle should, if possible, comply with the dimensions specified in NEM 658 to allow a maximum decoder length of 35mm.
- 40 A PluX16-S for sound decoders is defined in NEM 658. However, since its dimensions almost correspond to those of the PluX22, no need for this size was seen in RCN-122 and it is also not adopted for S 9.1.1.4. There are, however, sound decoders with a width and height of the normal PluX16 and a length corresponding to NEM 658. In the interests of compatibility with existing decoders, vehicle manufactures may want to pay attention to the PluX16-S dimensions in NEM-
- 45 658. At least the greater length of the decoder should be taken into account.

### 3.4 Electrical Properties

- It is strongly recommended that the effective impedance of the speaker(s), as observed by the decoder, is  $4\Omega$  -  $8\Omega$ . The effective impedance required by the decoder must be documented by the decoder manufacturer. Impedance of factory installed speakers must be documented by the vehicle
- 50 manufacturer.

Date	Description
March 22 2021	First Revision

# 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.