# General

## Introduction and Intended Use (Informative)

This Standard defines a multi-pole interface for locomotives and cars. It is suitable for non-sound decoders in most scales. These interface connectors are not recommended for new designs. An extensive population exist in older equipment. The Small (6 pin) connector provides connections for power pickup from two rails, motor control and two lighting outputs (usually forward and rear headlights). The Medium (8 pin) interface provides one additional output that can be used for additional lighting or other accessories so long as the current capacity is not exceeded.

When an extended service interface socket (or plug) is built-into a locomotive or car by a manufacturer, the manufacturer shall document very clearly which connection is wired to which built-in equipment. The extended service socket (or plug) should be made in such a way that it is possible to insert a basic service plug (or socket) only in those socket holes (plug pins) corresponding to the basic service socket (plug).

Two interface designs (Small and Medium) are specified for different size and power applications. Their mechanical characteristics are specified in Table 2.1, while the assignment of their connections is given in Table 3.1. Figures 3.1 and 3.2 illustrate the Medium interface socket and the Small interface socket, and the numbering of the connections on each.

## References

This standard should be interpreted in the context of the following NMRA Standards, Technical Notes, and Technical Information.

### Normative

* S-9.1.1 DCC Interfaces, which specifies general DCC interface requirements

### Informative

* TN-9.1.1 DCC Interfaces, which provides commentary on general DCC interface requirements
* TI-9.1.1 Sources for Connectors for DCC, which provides a list of manufacturer part numbers for DCC interface connectors

## Terminology

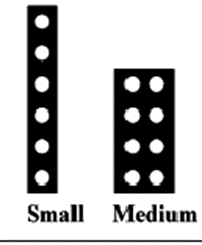
|  |  |
| --- | --- |
| **Term** | **Definition** |
| Vehicle | Mobile model railroad device. This includes locomotives and other rolling stock. |
| Decoder | DCC receiver for controlling vehicle animation. |

## Requirements

To meet this Standard all mechanical and electrical values mentioned must be met and respected, unless otherwise noted. It is not necessary to implement all connections of the interface. The pins with unimplemented features must remain unconnected. This applies to vehicles as well as for other devices that use this interface.

# Mechanical Properties

|  | **Small** | **Medium** |
| --- | --- | --- |
| Connections (layout) | 6 (1x6) | 8 (2x4) |
| Part in Locomotive/car | female | female |
| Pitch | 0.050″ | 0.100″ |
| Pin Section | circular(1) | circular(1) |
| Pin Length  Tolerance | 0.118″  0.001″ | 0.155″  0.010″ |
| Pin Diameter  Tolerance | 0.017″  0.002″ | 0.022″  0.002″ |
| Current Rating | 0.50A | 1.50A |
| Peak Current Rating | 0.75A | 3.00A |
| Suitable for Scales | N or larger | HO or larger |



(1) Pins with a square or rectangular section are an acceptable alternative provided they offer similar power rating and physical contact quality as pins with a circular section.

Locomotives or cars that have a built-in interface (socket or plug) shall be identified as having one of the specified designs by using the appropriate pictogram as shown in Figure 2.1. The same pictograms shall be used to identify the interface plug or socket design that is on the controller. These pictograms shall be clearly visible on the locomotive, car or controller packaging.

For Medium Interface designs, a minimum distance of 0.180″ (is required for decoder clearance above the socket.

# Electrical Properties

## Pin Assignment

**Table 3.1: Interface Six Pin Socket Table 3.2: Interface Eight Pin Socket**

| **Pin** | **Small** | **Color** |
| --- | --- | --- |
| **1** | Motor (+) | Orange |
| **2** | Motor (-) | Gray |
| **3** | Right Rail | Red |
| **4** | Left Rail | Black |
| **5** | Front Headlight | White |
| **6** | Rear Headlight | Yellow |

| **Pin** | **Medium** | **Color** |
| --- | --- | --- |
| **1** | Motor (+) | Orange |
| **2** | Rear Headlight | Yellow |
| **3** | (1) | Green |
| **4** | Left Rail | Black |
| **5** | Motor (-) | Gray |
| **6** | Front Headlight | White |
| **7** | Common (V+) | Blue |
| **8** | Right Rail | Red |

1. This connection on the socket (in the locomotive) may be left unconnected or may be connected to an accessory. If connected to an accessory, the accessory must be protected by a diode, if it is polarity sensitive, to avoid any damage in case the plug is inserted the wrong way into the socket. On the plug, this connection may be left unconnected or may be connected to connection 7 or may be connected to a decoder’s function output. In all cases, the use of this connection must be documented by the manufacturer.

For the Small and Medium designs, connection pin 1 shall be identified clearly on both parts of the interface. In Figures 3.1 and 3.2 a small triangle is used to identify pin 1, but other symbols may be used. It is recommended that these connections be identified either with their number or their corresponding wire color.

|  |  |
| --- | --- |
| Figure 3.1: Top View Medium Interface | Figure 3.2 Top View Small Interface |

|  |
| --- |
| **Note: There must be no electrical connection on the locomotive side of the interface between either of the motor leads and either of the track leads or vehicle frame. In addition, a direct connection must not be made between pins 3 and 7 on the locomotive side of the interface for the medium plug. Either type of connection can lead to decoder damage.** |

## Color Code of Wiring

Wiring of this interface must conform to the color code for wiring in S-9.1.1.

# Document History

|  |  |
| --- | --- |
| **Date** | **Description** |
| Sept 2020 | Six & Eight pin decoder interface connectors split out from S-9.1.1 as a separate Standard. Recommended neither be used in new designs. Changed to new template. Corrected various errors. |
|  |  |
|  |  |
|  |  |

**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.