# Introduction

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.

## 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.

## Unserved Use Cases

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.

# Annotations to the Standard

## References

Additional relevant references are found in S-9.1.1.3.

• S-9.1.1.3 21MTC Decoder Interface

## Requirements

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).

## Mechanical Properties

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 up to 3.5 mm in mainboard pin header height, at their discretion, depending on when the decoder under test was originally designed.

## Socket Specifications

### Pin Header Specifications

If a male pin header is provided that is terminated in wires, it is recommended that the wire colors follow the color codes defined in S-9.1.1.

## Electrical Specifications

### Function Output Variations

The 21MTC defines output pins 7, 8, 14, and 15 as Open Collector/Drain switched (heretofore indicated as OC) outputs. Variations exist with output pins 3,4,13, and 17, identified as outputs AUX3 to AUX6. Refer to Chart 1 below. S-9.1.1.3 recommends requires providing outputs higher than AUX2 as logic level outputs. Outputs AUX3 and higher configured as powered outputs should be indicated as such in documentation supplied by the manufacturer.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Pin** | **Output** | **Open Collector** | **Logic Level** | **Notes** |
| 1 | AUX7 |  | ⚫ |  |
| 2 | AUX8 |  | ⚫ |  |
| 3 | AUX6 |  | ⚫ |  |
| 4 | AUX4 |  | ⚫ | Supported as LL on OEM motherboards |
| 5 | AUX9 |  | ⚫ |  |
| 6 | AUX10 |  | ⚫ |  |
| 7 | F0r | ⚫ |  | Standard Reverse Light Output |
| 8 | F0f | ⚫ |  | Standard Forward Light Output |
| 13 | AUX3 |  | ⚫ | Supported as LL on OEM motherboards |
| 14 | AUX2 | ⚫ |  | Supported as OC on OEM motherboards |
| 15 | AUX1 | ⚫ |  | Supported as OC on OEM motherboards |
| 17 | AUX5 |  | ⚫ |  |

Chart 1 – Function Output Variations

# Document History

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| **Date** | **Description** |
| 09/11/2020 | First Revision |
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