1 General

1.1 Introduction and Intended Use (Informative)

5 This standard describes the configuration variables for the interface defined in [S-9.4.1] between a main module, hereinafter referred to as Host, and extension modules, hereinafter referred to as SUSI-Modules, installed in the model railway vehicles. These extension modules can be sound modules, extended function outputs or other function modules. The SUSI name is the abbreviation of: "Serial User Standard Interface".

10 ## 1.2 References

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

1.2.1 Normative

15 When using the corresponding interface, the following standards must be complied:

- [S-9.2.1.1]   Advanced Extended Packet Formats
- [TN-9.2.1.1]   NMRA Technical Note, Advanced Extended Packet Formats
- [RCN-218]   DCC-A – Automatic Registration
- [TN-218]   DCC picture and icon numbers for DCC-A

20

1.2.2 Informative

The standards and documents listed here are for information only and are not part of this standard.

- [S-9.2.2]   DCC Configuration Variables
- [RCN-225]   RCN-225 DCC configuration variables
25
- [RCN-226]   RCN-226 DCC special configuration values
- [S-9.4.1]   SUSI bus communication interface
- [RCN-600]   SUSI bus module expansion interface
- [S-9.4.3]   SUSI bus Bidirectional Extension
- [RCN-601]   Bidirectional extension for SUSI bus
30
- [S-9.2.2 App. A]   S-9.2.2 Appendix A Manufacturer ID codes.

35

1.3 Terminology

Term	Definition
HOST	Main module which generate the SUSI Clock
SUSI-Module	Extension module, controlled by the Host
CV	configuration variables
CV Bank	40 module-specific CVs. Range of bank index: 0...255, some banks are reserved. The CVs between CV 900 and CV 1019 can be accessed depending on the Module Number

40 ## 1.4 Requirements

In order to comply with this standard, all configuration variables, CVs for short, may only be used according to the specifications.

2 Configuration variables (CVs)

45

The CVs reserved for SUSI are in the range 897 to 1024 (see [S-9.2.2 / RCN-225]).

A maximum number of three SUSI modules can be connected to a SUSI Host, and to each a valid CV range for the respective module must be assigned before installation. These ranges are CV 900 to 939 for Module 1, CV 940 to 979 for Module 2 and CV 980 to 1019 for Module 3.

50 CVs 897 to 899 and 1020 to 1024 are valid for all Modules regardless of their module number. Reading out these CVs only makes sense with a single module connected and should not be used in normal operation as soon as multiple modules are connected.

CV-Name	CV# Module1	CV# Module2	CV# Module3	Comments
SUSI Module Number		897		Definition *corrected
SUSI CV-Banking		898		Pending, outdated
Manufacturer specific		899		has already been used
Manufacturer identifier	900.0	940.0	980.0	only in bank 0; *corrected
Hardware identifier	900.1	940.1	980.1	only in bank 1; *corrected
Manufacturer identification 2 or alternative manufacturer identification	900.254	940.254	980.254	only in bank 254; reserved for alternative manufacturer identification or extended NMRA manufacturer identification
Version number	901.0	941.0	981.0	only in bank 0; *corrected
Subversion number	901.1	941.1	981.1	only in bank 1; *corrected
SUSI version	901.254	941.254	981.254	only in bank 254; supported SUSI version
Manufacturer specific	903 - 939	942 - 979	982-1019	
Status bits		1020		Bit 0-3 = WAIT, SLOW HOLD & STOP Bits 4-7 reserved.
SUSI CV banking		1021		non-volatile, recommended option
reserved		1022		
reserved		1023		
reserved		1024		

Table 1: List of CVs

55 NOTE: The CVs marked *corrected must – if implemented – fulfill the functions mentioned. The reserved CVs and bits may not be used and must contain a 0.

CV 897, Module Number

The assignment of the 40 Module-specific CVs is defined in CV 897 bits 0 and 1. The value 1 (01b)
60 is written to this CV for Module 1, the value 2 (10b) for Module 2 and the value 3 (11b) for Module 3. Reprogramming the CV 897 only makes sense with a single module connected and should not be done in normal operation as soon as multiple modules are connected.

Bits 2 to 7 in CV 897 are reserved. If both bits 0 and 1 are set to zero, the Module should evaluate this as 1.

65 Alternatively, it is permissible to specify the range by the manufacturer or to make the selection using hardware, e.g. using a mechanical switch or jumper.

CV 898, SUSI CV Banking (volatile, obsolete version)

With the CV 898 "SUSI CV Banking," the number of CVs per module can be expanded. This allows
70 256 * 40 = 10,240 CVs to be implemented within the 40 module-specific CVs in a module. Only the module-specific CVs in the range 900 to 1019 are switched via banking. CV 898 can be written during operation.

Since CV 898 is shared by/accessible to all SUSI modules, reading it is not useful if more than one SUSI module is connected to the Host. It is recommended to reset CV 898 to 0 at the end of all CV
75 manipulations outside of bank 0. CV 898 is volatile and resets to 0 after each programming command for CV manipulation with 3 bytes.

Therefore, if a CV outside of bank 0 is to be manipulated, a "Write CV Manipulation Byte (0x7F)" command must be prefixed to CV 898 with the bank number before every programming command. When reading the CV value bit by bit, this write command must be sent multiple times.

80 This CV is not recommended for new implementations. Hosts that use CV 898 for compatibility with existing products are compliant with the standard. For new implementations, CV 1021 is recommended.

CV 899, Manufacturer-specific (obsolete)

85 Since CV 899 is shared by/accessible to all SUSI modules, reading it is not useful if more than one SUSI module is connected.

This CV is not recommended for new implementations.

CV 900 / 940 / 980, Manufacturer and hardware identifier

90   Bank 0 (see CV 1021) contains the manufacturer identification as assigned by the NMRA and documented in [S-9.2.2 Appendix A]. If the manufacturer does not have an NMRA manufacturer ID, this CV should be set to 13. If an alternative manufacturer identification is defined and stored in the corresponding CV, this CV must be set to 0. CV 900.0 / 940.0 / 980.0 can only be read. A write operation to CV 900.0 / 940.0 / 980.0 is used to reset the module as described in [S-9.2.2 / RCN-226]
95   in Section 2 for CV 8 of a DCC decoder.

Bank 1 (see CV 1021) contains the manufacturer-dependent hardware identifier. CV 900.1 / 940.1 / 980.1 may only be used for this and can only be read. It is freely defined by the manufacturer.

Bank 254 of CV 900 / 940 / 980 is reserved. If necessary, an identifier can be set here for manufacturers who do not have an NMRA manufacturer identifier because they do not support DCC.
100 Or the above 4 bits of an extended 12-bit NMRA manufacturer identification are stored here. If the value of this CV is 0, the NMRA manufacturer identification is in bank 0. If the value of this CV is between 1 and 15 inclusive, banks 0 and 254 contain the 12 bits of the extended NMRA manufacturer identification. If the value is 16 or greater, it is an alternative manufacturer identifier.

105 ### CV 901 / 941 / 981, Version and sub-version number and SUSI version identifier

The version number in bank 0 and the subversion number in bank 1 (see CV 1021) are manufacturer dependent, but CVs 900.0 / 940.0 / 980.0 and 900.1 / 940.1 / 980.1 may only be used for this purpose. These CVs are read-only.

Bank 254 contains the supported SUSI version. The value is interpreted as a decimal value with one
110 decimal place, i.e., the maximum value of 255 corresponds to version 25.5. A decoder that meets this standard from July 27, 2015, corresponds to version 1.0, which is stored as value 10.

CV 1020, Status byte

CV1020 is a status byte and is used, for example, for a WAIT function. This CV applies to all Modules
115 and is not switched via CV 1021.

- Bit 0 "WAIT" is set while - e.g. in the event of a sound - the decoder should not let the traction motor start running. Classic application: allows a diesel engine rev up acoustically before it starts moving. To do this, the Host checks bit 0 of this CV for 1. While a Module responds with an Acknowledge, the system waits.
120 - Bit 1 "SLOW" is set when the locomotive is allowed to drive very slowly at " crawl speed ". Classic application: a crane, a work platform or similar, is currently outside the perimeter of the vehicle (e.g. NEM 301). In this case, the vehicle can still drive slowly, just like in reality. However, if the user switches off the control of the platform (and thus switches to the control of the traction motor) while it has not yet been brought to a safe driving state, the vehicle is
125 prevented from driving off quickly and thereby causing an accident.

- Bit 2 "HOLD" is while the speed must be maintained. Classic application: the sound for the gearshift of a mechanical transmission is played.
- Bit 3 "STOP" is set to stop the motor(s) while driving. It has priority over bits 0...2. The SUSI Module can stop the drive in any operating state. Possible applications are stopping sections on push-pull trains with control cars in front, Point-based train control (PZB) in front of signals, limited European Train Control System (ETCS) and control using IR transmitters in the track bed.

CV 1021, SUSI CV banking

With the CV 1021 "SUSI CV-Banking" the number of usable CVs per Module can be expanded. This means that 256 * 40 = 10240 CV can be implemented in a Module within the 40 Module-specific CVs. Only the Module-specific CVs in the range 900 to 1019 are switched via banking. CV 1021 can be written during operation.

Since CV 1021 is shared by all Module modules, reading it out does not make sense if more than one Module is connected. It is recommended to reset CV1021 to 0 at the end of all CV manipulations outside bank 0. CV1021 is non-volatile and does not reset to 0 even if the power is interrupted.

In banks 0 and 1, the CVs 900 / 940 / 980 and 901 / 941 / 981 have a fixed meaning. Any manufacturer-dependent data can be stored in the other CVs of these banks. From bank 2 up to and including bank 247, any manufacturer-dependent data can be stored. Banks 248 to 254 are reserved by the RailCommunity, bank 255 can be freely used again for compatibility with existing modules.

In order to clearly reference the CVs that can be reached via banking, the bank number is appended to the CV number with a dot as a separation, as already explained above.

Bank 254 is reserved for standardized applications with read-only values. Values that have not yet been defined or implemented cannot be read, i.e. a read command never receives an acknowledge. This allows you to clearly distinguish a non-supported CV from any value.

Currently only the SUSI version described above has been defined in this bank. The CV for the alternative manufacturer ID is currently reserved.

Banks 248 to 253 are reserved for the configuration data

3 Banks of configuration data for RCN-218

For the automatic registration of a decoder to the command station according to [S-9.2.1.1 / RCN-218], the decoder also needs the information about the functions that are implemented in the connected SUSI Modules. This data is stored in special banks and is retrieved by the decoder via CV bank reading according to [S-9.4.3 / RCN-601] Section 3.1.

Bank 253 contains the functional information as stored in Data Space 2 of the decoder from byte 11. In order to be able to easily link the data of the SUSI modules with that of the decoder, only the information for F0 is stored in bits 6 and 7 in the first byte (CV 900/940/980) and then in the second byte those for the functions F1 to F4, and so on. Two bits are reserved for each function:

00 = Function is not available.

01 = Function is available and can be used by switching (e.g. light).

10 = Function is present and can be used momentarily.

Banks 252 to 248 contain a static assignment/mapping of function numbers to function icons for the implemented functions, as stored in Data Space 4 of the decoder from byte 2 onwards. One byte is stored for the function number, followed by one or two bytes for the icon index. The actual space required depends on the number of functions supported and whether the icon indices require one or two bytes. Two-byte icon indices of up to 66 functions can be stored in the 5 reserved banks. The exact encoding rule is specified in [TN-9.2.1.1 / TN-218].

180 # 4 Document History

Date	Description
2025.07.01	First Draft
2026.01.29	Reordered the "Document History" and "Table of Contents" chapters, checked/corrected decimal separator

5 Table of Contents

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 document.

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.