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MIDI (musical instrument digital interface) specification 1.0 (Abridged Edition, 2015)

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MIDI (MUSICAL INSTRUMENT DIGITAL INTERFACE) SPECIFICATION 1.0 (Abridged Edition, 2015)

FOREWORD

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International Standard IEC 63035 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

CDV	Report on voting
100/2597/CDV	100/2858/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

IEC 63035 contains the same first 8 pages as in the MIDI 1.0 Detailed Specification (the original core specification text) published by the MIDI Manufacturers Association (MMA). These are included within this standard as Clauses 1 to 4. This specification was submitted to the IEC under the auspices of a special agreement between the IEC and the MMA.

The MMA is a non-profit corporation that serves as a support organization and forum for the advancement and adoption of MIDI technology (along with the Association of Musical Electronics Industry, or AMEI, in Japan).

The MIDI 1.0 technology dates back to 1983 when the protocol and electrical specification comprised 8 pages and the majority of the message identifiers were not yet defined. Over the subsequent years, the MMA and AMEI determined consensus of the worldwide MIDI industry, and defined numerous additional messages (via Confirmation of Approval documents), as well as many Recommended Practices for the use of MIDI technology, all the while maintaining MIDI as "1.0" (meaning that no significant changes were made to the initial specification).

The MMA documentation for MIDI 1.0 now encompasses more than 50 different documents in print or on the World Wide Web. This standard contains the same first 8 pages as in the MMA's MIDI 1.0 Detailed Specification but does not contain all of the subsequent information developed by MMA/AMEI. Rather, this document contains a complete listing (with basic description) of all defined MIDI messages to date, with references to the appropriate MMA documentation. Companies that want to implement MIDI technology are advised to also consult the MMA documentation that is listed in the Biography.

Although the MIDI 1.0 Detailed Specification includes an electrical connection specification ("MIDI-DIN"), other transports (USB, Firewire, etc.) have also been approved by MMA/AMEI for use with MIDI Protocol. For details and documentation of approved physical transports, please contact the MIDI Manufacturers Association.

The term "MIDI" is known all around the world as referring to the technology which is defined in the MMA/AMEI documents, and so should not be used for any other purpose. Companies that implement MIDI technology in their products in compliance with MMA specifications may use the term MIDI to describe their products, but may not use the term to describe any extensions or enhancements that are not defined by MMA/AMEI. Only MMA/AMEI can define the messages, transport payloads, and Recommend Practices which are promoted as "MIDI" so as to prevent any dilution and confusion of the meaning of "MIDI". Implementers of MIDI technology should consult MMA and/or AMEI (depending on the relevant market) for specific trademark usage policies.

MIDI (MUSICAL INSTRUMENT DIGITAL INTERFACE) SPECIFICATION 1.0 (Abridged Edition, 2015)

1 Scope

This International Standard specifies a hardware and software specification which makes it possible to exchange symbolic music and control information between different musical instruments or other devices such as sequencers, computers, lighting controllers, mixers, etc. using MIDI technology (musical instrument digital interface).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60130-9, *Connectors for frequencies below 3 MHz - Part 9: Circular connectors for radio and associated sound equipment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
velocity
parameter which typically changes the intensity and resultant volume of the note that is being played and varies according to the force applied

Note 1 to entry: Velocity is used as Key Velocity as in a piano key.

3.2
aftertouch
parameter that measures the level of intensity applied to a note after it has been played and continues to be depressed

Note 1 to entry: Typically, Aftertouch is useful for adding vibrato or tremolo effects to a sound in much the same way that a violin can add volume or pitch changes to a sustained note using finger vibrato or additional bowing intensity.

3.3
modulation wheel
wheel controller found on synthesizers that players can use to progressively introduce modulation depth to a sound

3.4
pitch wheel
wheel type device, normally found to the left of a synthesizer keyboard, used to manipulate the pitch of a played note or notes

3.5
pitch bend
activity or message, generally initiated by a pitch wheel, that smoothly raises and/or lowers the pitch of note or chord

3.6
oscillator
circuitry or software program that generates the kernel of a synthesizer sound

Note 1 to entry: In the early days, oscillators generated fairly basic sound types (sawtooth, square, pulse etc). In modern synthesizer engines, oscillators can be driven by myriad waveforms and samples.

3.7
pan
parameter that specifies the location of a sound within the stereo field

4 General

4.1 Hardware

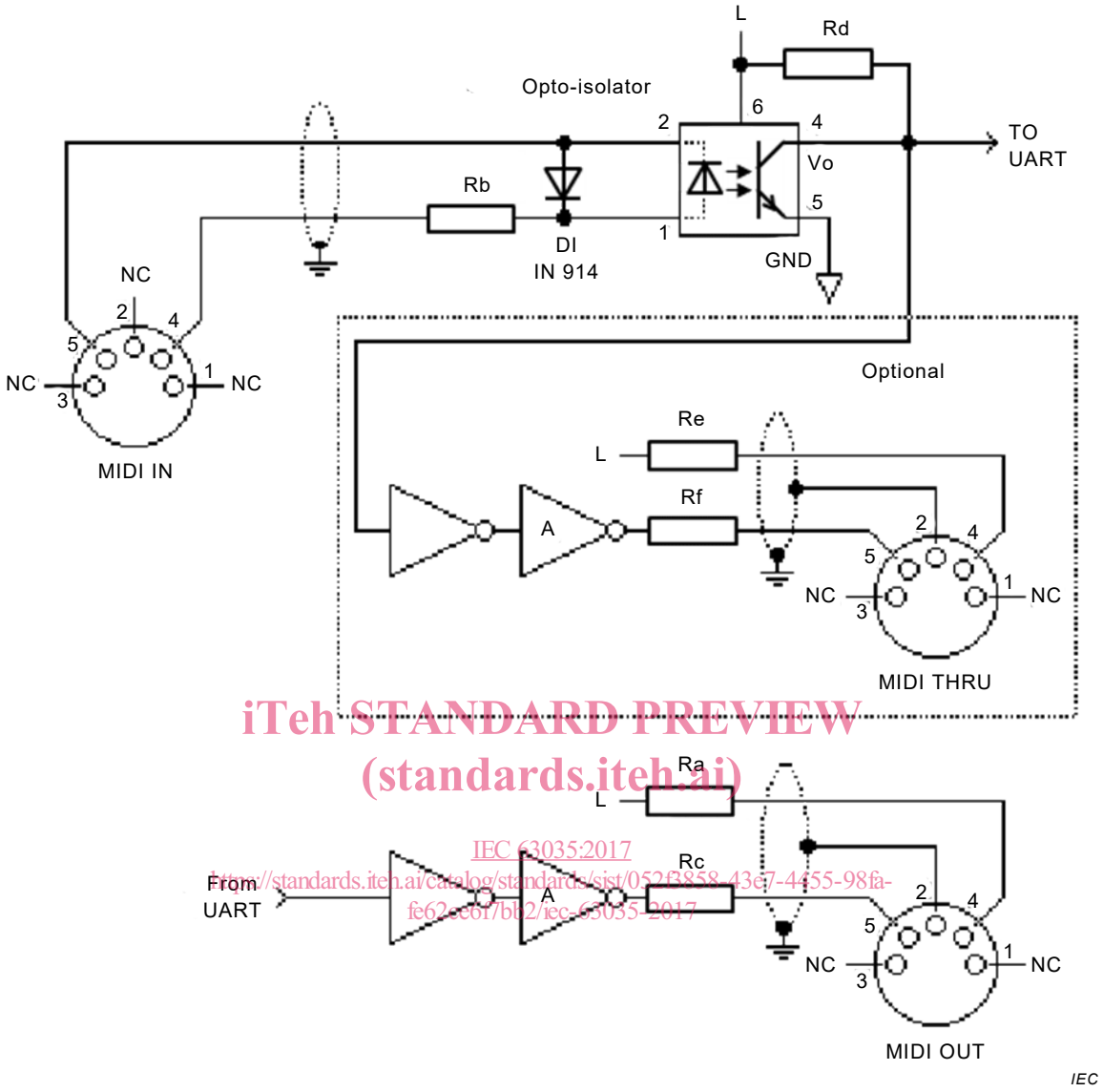
The hardware MIDI interface operates at 31,25 × (1 ± 1 %) kBd asynchronous, with a start bit, 8 data bits (D0 to D7), and a stop bit. This makes a total of 10 bits for a period of 320 μs per serial byte. The start bit is a logical 0 (current on) and the stop bit is a logical 1 (current off). Bytes are sent LSB first.

Circuit: (See Figure 1). 5 mA current loop type. Logical 0 is current ON. One output shall drive one and only one input. To avoid ground loops, and subsequent data errors, the transmitter circuitry and receiver circuitry are internally separated by an opto-isolator (a light emitting diode and a photo sensor which share a single, sealed package). The receiver shall require less than 5 mA to turn on. Rise and fall times should be less than 2 μs.

Connectors: DIN 5 pin (180°) female panel mount receptacle which is specified in IEC 60130-9 as type designation IEC-04. The connectors shall be labelled "MIDI IN" and "MIDI OUT". Note that pins 1 and 3 are not used, and should be left unconnected in the receiver and transmitter. Pin 2 of the MIDI In connector should also be left unconnected.

The grounding shield connector on the MIDI jacks should not be connected to any circuit or chassis ground.

When MIDI Thru information is obtained from a MIDI In signal, transmission may occasionally be performed incorrectly due to signal degradation (caused by the response time of the opto-isolator) between the rising and falling edges of the square wave. These timing errors will tend to add up in the "wrong direction" as more devices are chained between MIDI Thru and MIDI In jacks. The result is that, regardless of circuit quality, there is a limit to the number of devices which can be chained (series-connected) in this fashion.



Key

Components		**Supplies**
Ra, Rb, Rc, Re, Rf	resistor R = 220 Ω	L +5 V
Rd	resistor R = 280 Ω	

NOTE 1 Opto-isolator shown is Sharp PC-900. (HP 6N138 or other opto-isolator can be used with appropriate changes.)

NOTE 2 Gates "A" are IC or transistor.

NOTE 3 Resistors are 5 %.

Figure 1 – MIDI standard hardware

Cables shall have a maximum length of 15 m, and shall be terminated on each end by a corresponding 5-pin DIN male plug which is specified in IEC 60130-9 as type designation IEC-03. The cable shall be shielded twisted pair, with the shield connected to pin 2 at both ends.

A MIDI Thru output may be provided if needed, which provides a direct copy of data coming in MIDI In. For long chain lengths (more than three instruments), higher-speed opto-isolators should help to avoid additive rise/fall time errors which affect pulse width duty cycle.

4.2 Data format

MIDI communication is achieved through multi-byte "messages" consisting of one Status byte followed by one or two Data bytes. Real-Time and Exclusive messages are an exception.

A MIDI-equipped instrument typically contains a receiver and a transmitter. Some instruments may contain only a receiver or only a transmitter. A receiver accepts messages in MIDI format and executes MIDI commands. It consists of an opto-isolator, Universal Asynchronous Receiver/Transmitter (UART), and any other hardware needed to perform the intended functions. A transmitter originates messages in MIDI format, and transmits them by way of a UART and line driver.

MIDI makes it possible for a user of MIDI-compatible equipment to expand the number of instruments in a music system and to change system configurations to meet changing requirements.

MIDI messages are sent over any of 16 channels which are used for a variety of performance information. There are five major types of MIDI messages: Channel Voice, Channel Mode, System Common, System Real-Time and System Exclusive.

A MIDI event is transmitted as a "message" and consists of one or more bytes. Figure 2 to Figure 5 show the structure and classification of MIDI data.

Figure 2 – Types of MIDI bytes

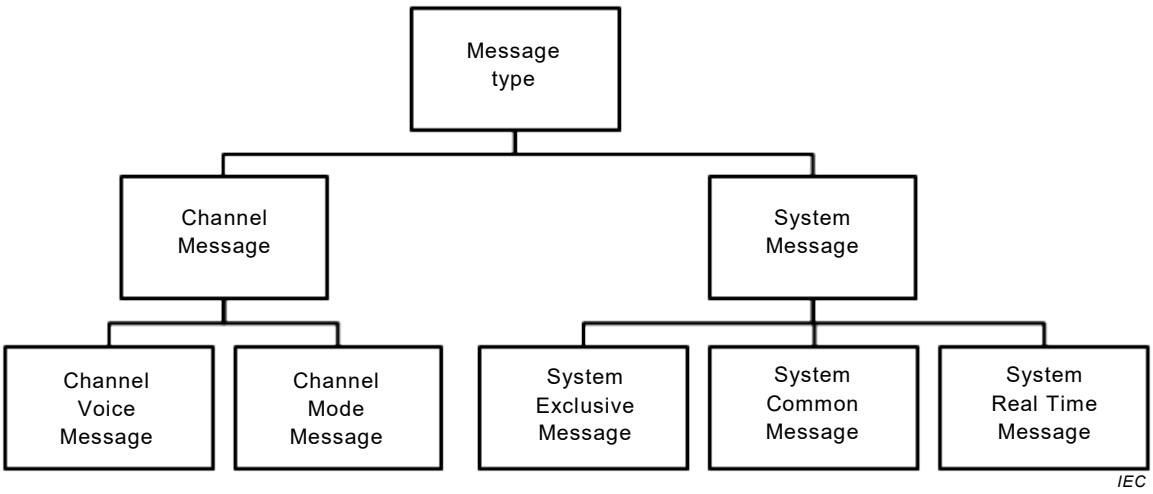


Figure 3 – Types of MIDI messages