MIDI Technology Systematic Survey

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Systematized Survey of MIDI and Related Technologies

Hideki Izuchi

ÿSummary

MIDI (Musical Instrument Digital Interface) is a common standard for the digital transfer of electronic musical instrument performance data between devices, established by the Japanese MIDI Standards Council (currently AMEI: Association of Musical Electronics Industry, a general incorporated association) and the international organization MMA (MIDI Manufacturers Association).

At the NAMM Show held in Chicago in June 1981, Roland founder Ikutaro Kakehashi first called for people to consider the possibility of a common interface. Dave Smith (President of Sequential Circuits Inc.) responded to this call and proposed the first proposed standard. The two men were instrumental in establishing MIDI, and in recognition of the contribution the MIDI standard made to the subsequent development of the music industry, they were jointly awarded the Technical Grammy Award at the 55th Grammy Awards in 2013, the 30th anniversary of the establishment of MIDI.

Using MIDI, different electronic musical instruments can now be played simultaneously regardless of manufacturer. It also became possible to connect computers to electronic musical instruments, allowing performance data to be created on a computer and for electronic musical instruments to be automatically played via MIDI. This became known as "Desk Top Music" because music could now be created right on the desk, and it brought about a major change in the music production scene.

In the 1990s, the distribution of MIDI data by amateur musicians flourished through major PC communication hosts. The existence of de facto standard tone arrangements called GS and XG sound sources and a common file format for storing MIDI data called SMF (Standard MIDI File) contributed to the distribution of such MIDI data. With the birth of online karaoke in 1992, MIDI gained a place to play outside the musical instrument industry. Online

karaoke systems using MIDI data were overwhelmingly faster to create and distribute new songs than conventional karaoke systems using disk media, had fewer restrictions on the number of songs stored, and had cheaper running costs, which made a big step forward in lowering the price and popularizing karaoke. In addition, with the launch of i-mode services in February 1999, it became common to download ringtone performance data from content providers' menu sites for a fee, and the content business for mobile phones expanded rapidly. The performance data for the ringtone is actually a Standard MIDI File (SMF), and MIDI data was also used in the world of mobile devices.

MIDI is not limited to performance data information, but can also handle clock information and time code information, which has greatly revolutionized the production process in recording studios. Furthermore, MIDI Machine Control, MIDI Show Control, MIDI Visual Control, etc. were also established, and MIDI began to be used for controlling multi-track recorders, lighting equipment, and video equipment.

In 1999, it became possible to pass MIDI through a USB cable, and in 2015 Bluetooth Low Energy (BLE) was standardized, and since 2016, products that send MIDI wirelessly using Bluetooth have appeared one after another. MIDI is no longer limited to hardware connections using MIDI terminals and MIDI cables, but continues to develop as a protocol for transferring performance data from electronic musical instruments.

ÿAbstract

The Musical Instrument Digital Interface (MIDI) is a common standard for digitally transferring electronic musical instrument performance data between devices, established by the then Japan MIDI Standards Committee (now the Association of Musical Electronics Industry [AMEI]) and the international body, the MIDI Manufacturers Association (MMA).

At the NAMM show held in Chicago in June 1981, Ikutaro Kakehashi, the founder of Roland Corp., was the first to issue a call for a common interface. Dave Smith (President of Sequential Circuits Inc.) responded to this call and provided the first draft for a standard. Both worked to establish MIDI, and the contribution of the MIDI standard to the subsequent development of the music industry was recognized with a joint Technical Grammy Award at the 55th Grammy Awards in 2013, the 30th anniversary of the MIDI.

MIDI made it possible to play different electronic musical instruments together, regardless of manufacturer.
It also became possible to connect computers with electronic musical instruments to create performance data on a computer, then, via MIDI, have the computer play the electronic musical instrument. This made it possible to produce music in its final form at a desk, resulting in the phrase "Desk Top Music," and brought about a sea change in how music is produced.

Further, thanks to the services of a major personal computer telecommunication host, the circulation of MIDI data by amateur musicians flourished in the 1990s. Contributing to this were a couple of de facto standards for assigning instrument sounds, known as GS and XG format sound sources , and also a common MIDI file format, called the Standard MIDI File (SMF), for storing MIDI data.

The birth of "karaoke online" so to speak (with data hosted on remote servers) in 1992 extended MIDI's scope beyond the musical instrument industry. These new karaoke systems used MIDI data, which allowed the vendors to create and distribute new songs with overwhelming speed compared to conventional karaoke systems using disc media. The number of songs available also skyrocketed and running costs lowered, making karaoke more affordable and thus far more widely available. Furthermore, with the launch of i-mode in February 1999, and similar services, it became common to pay for and download ringtone data on a content provider's portal site, leading to rapid expansion of the mobile phone content business. MIDI was also utilized in mobile devices, with the performance data for the ringtone itself being the Standard MIDI file (SMF).

MIDI is not limited to performance data but can handle clock, time code, and other information. This revolutionized the production process in recording studios. In addition, MIDI Machine Control, MIDI Show Control, MIDI Visual Control and other subsets were established as RP (recommended practice) for MIDI.
MIDI thus came to be used for controlling multitrack recording, lighting, and video equipment.

In 1999, it became possible to relay MIDI data through USB cables. In 2015, Bluetooth Low Energy (BLE) was standardized, and products capable of transmitting MIDI wirelessly using Bluetooth have been on the increase since 2016. MIDI is not limited to hardware connections in the form of MIDI cables between
MIDI terminals but continues its development as a protocol for transferring electronic musical instrument performance data.

ÿ Profile

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1977 Graduated from the Department of Electronic Engineering, Faculty of Engineering, Aichi
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1 | Introduction

Since the dawn of history, music has been a powerful medium for human beings to express emotions and create images. Music probably started out as a form of singing or hitting the body or objects, but as people sought greater expressiveness in music, the oldest musical instruments appeared.

Musical scores were created as a means of conveying musical expression as information, and we listen to the sounds that are played based on the scores. It covers a wide range of periods and forms from ancient times to the present. Early musical scores were simple, with the pitch of the notes written next to the lyrics, but as musical instruments were born and evolved, the structure and notation of the scores developed, and eventually the music was written according to the intentions of the composer or conductor. It now has the capacity to convey even the subtlest nuances of information.

In order to transmit musical scores to distant places and to leave them for posterity, a medium (singular: medium, plural: media) is necessary. In ancient times, the recording medium was papyrus or stone tablets, but it eventually changed to paper, and in the 15th century, Gutenberg When letterpress printing became practical, it was the first time that letters were printed by machine. The sheet music appeared as if it was a medium. The music that has become this way is no longer just a one-off performance, It has become something that can be recorded, reproduced, and spread. Music has undergone the greatest transformation in history, changing from something ephemeral to something that can have permanence, and from there it can spread even further. Yes, and the oldest data format for it But it was sheet music.

Music has achieved permanence and diffusion. And this transformation would not have been possible without recording media. Eventually, the times would change and the question of what to record on what recording media and how to record it would change. A natural focus on format and content In the 19th

century, in keeping with the rise of the technologically industrialized society, the phonautograph, gramophone, and even Graham Bell's telephone were invented, which enabled musical performance and the voice itself. Recording, playing, and transmitting directly and in its entirety This is what we now call audio recording technology. In other words, streaming technology was invented. The main focus of the music score was, so to speak, a written text of performance information, but unlike that, These audio technologies are the next generation Due to its unique convenience, it will spread at an accelerating rate. In other words, it is a medium or format different from sheet music. The rise of new technologies using

In the 20th century, audio technology continued to evolve, giving rise to modern speakers that radiate sound into a wide space, and even the radio, the last century's version of wireless streaming technology. Audio technology, which records, plays back, and transmits sound as is, also gave birth to large-scale information media such as mass media, making it possible for the whole world to simultaneously access the same information, and humanity witnessing the dawn of the information society.

The media includes analog records, magnetic tapes, and In line with the dawn of the information society, various formats and media were born according to their uses and advantages and disadvantages, and became widely used in society.

It has come to penetrate into the

However, at this time, musical notation remained a limited tool that only a select few could read, write, and interpret; it was only available to a privileged class of musicians.

there was.

The important thing here is the gramophone, the telephone, or the radio. The difference between the former and the latter is that What is the audio technology that can record, play, and transmit audio directly? Unlike the latter, the score cannot record the entire performance. As mentioned above, the score is a text that writes down the performance information. In other words, the score is a set of instructions that lists a series of instructions (sequences) necessary to reproduce the performance intended by the composer or arranger. Since it is a set of instructions, technology is required to decipher it, and the score spreads, is interpreted, and passed down from generation to generation by repeatedly encrypting and decrypting it using that technology. For this reason, audio technology that captures the entire

sound is clear and easy to understand, and can even capture any sound, not just music, while the score is considered difficult and has only survived in a narrow world.

However, in the second half of the 20th century, the information revolution and IT revolution began. The wave of electronic technology also swept into the field of music. In particular, synthesizers, developed using electronic technology, brought about a revolution that overturned conventional wisdom by generating and playing sounds that do not exist in nature, stimulating the imagination of composers and performers. On the other hand, each synthesizer manufacturer had its own unique specifications and designs.

Therefore, players had to learn how to use various models to obtain the tone they wanted, which was a big burden.
He was my responsibility.

In this environment, engineers who shared the desire to expand the possibilities of musical expression through electronic musical instruments came together and started a groundbreaking movement to create a unified standard. This standard, which handles the types of tones that can be played, as well as the volume and duration of sounds, is like musical score information for electronic musical instruments.
Named MIDI (Musical Instrument Digital Interface), this standard was established in 1983 and is used in Japan.
The engineers from
The birth of MIDI made it possible to play musical instruments from multiple manufacturers in sync, dramatically expanding the expressive power of musicians. In addition, MIDI, which has an extremely small data capacity, has been widely used since then.
The development of computers and communication technology has expanded the scope of work.
It has spread beyond musicians and is now used in our daily lives, including karaoke.
I went.

In other words, music scores, which had previously only been understood by a privileged class of musicians, were now widely accessible to the general public, and even to people who did not know music scores or instruments, like karaoke.
It was MIDI that opened up the world to the point where even children could enjoy it.
In other words, the democratization of musical notation.
The resurgence and explosive evolution of written musical scores and sequences. The true digitization of text. The resulting fluidity and transferability. In other words, MIDI is not an electronic book but an electronic musical score, and it is something that can only be understood by humans.
Unlike e-books, which cannot be read, MIDI is not only readable by humans,
It is a magical electronic score that can be shared between people and instruments, and can be read and understood by instruments.
do.

And this cannot be achieved through audio technology alone.
The development of music that nobody had imagined until then
This will bring about a new dimension of musical activity, on a global network scale.

In this survey, we explained the situation of electronic musical instruments before the birth of MIDI, and then asked Japanese manufacturers' engineers to
This was made possible through the sincere efforts of American engineers.
The story of the birth of MIDI is introduced with materials from that time.
Next, the spread of personal computers and the expansion of the karaoke market
In this article, we will examine how MIDI has been used and how it has played an important role in our daily lives. Finally, we will touch on the current status of development of the next-generation MIDI standard and its specifications, and introduce the further expanding possibilities of MIDI.
sea bream.

2ÿPre-MIDI connection interfaces

This chapter focuses on electronics before MIDI was established in 1983.

This section focuses on the interface between musical instruments.

2.1 Analog connection with CV/GATE

Before MIDI was established, the most commonly used interface for analog synthesizers was an analog connection using CV (Control Voltage) and Gate. With an analog synthesizer, the pitch of the sound is determined by the level of the voltage. This voltage is called CV. Also, whether or not a sound is produced is controlled by a voltage called Gate. Figure 2.1 is a typical analog synthesizer, with the rear panel The CV/Gate input and output terminals shown in Figure 2.2 are It is prepared.

Figure 2.1 Analog synthesizer Roland SH-2

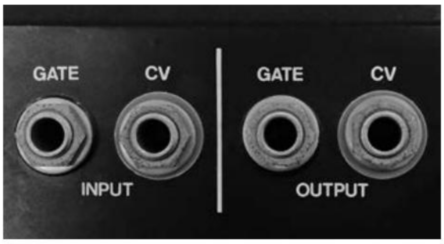


Figure 2.2 Analog synthesizer rear panel

A sequencer is a device that breaks down the performance of an electronic musical instrument into information such as pitch (CV), onset and mute instructions (Gate), and onset timing, stores it, and turns on and off sounds at pre-set timing. CV/Gate is most often used when connecting a synthesizer to a sequencer for automatic performance. There are two types of sequencers: analog sequencers, as shown in Figure 2.3, and digital sequencers, as shown in Figure 2.4.

On an analog sequencer, the volume setting Set the pitch of the sound. With the digital sequencer, Analog sequence

The number of sounds that can be stored in the memory is equal to the number of volumes.

However, digital sequencers can store hundreds of notes.

It was possible to memorize the melody and have it play automatically.

Figure 2.3 Analog sequencer Roland SYSTEM-104

Figure 2.4 Digital sequencer Roland CSQ-100

Just before the birth of MIDI, pitch and timing were expressed numerically.

Edit, control, save and load timings, etc.

A sequencer that can do this was developed by Roland.

The original idea and prototype were created by engineers.

This was originally developed by Ralph Dyck, who had a computer-generated MIDI controller, but Yukio Tamada of Roland made it multi-track (enabling multiple parts to be played simultaneously), and developed the so-called ST/GT method of Step Time (sound length) and Gate Time (note length), and also incorporated the concept of a quarter note resolution (Time Base) to represent the length of a sound. This led to the release of the Micro Composer MC-8 (Fig. 2.5), a full-fledged digital sequencer capable of handling approximately 5,000 sounds/8 tracks. Later, the MC-4 (Fig. 2.6) with 4 tracks was released. This ST/GT system was later adopted by domestic manufacturers. It also had a major influence on the MIDI sequencers of

Figure 2.5 Micro Composer Roland MC-8

Figure 2.6 Roland MC-4 Micro Composer

The large analog synthesizer and master shown in Figure 2.7 The Micro Composer was also used to control multiple analog synthesizer sound sources simultaneously to automatically play chords. Roland's MC-8 could play up to eight notes at the same time, and the MC-4 could play up to four notes at the same time. There was. The CV/Gate interface only had one sound. Each requires one CV/Gate connection, and eight-note chords can be played. To get it out, 16 cable connections were required.

Figure 2.7 System synthesizer Roland SYSTEM-700

2.2 Analog interface: There were two methods

The analog interface with CV/Gate includes: There were two systems, and they were not compatible with each other.

• Oct/V (Octave/Volt) method

This is an interface used in analog synthesizers called system synthesizers, and is This method was adopted by companies such as Samsung, Moog, and Roland. Figure 2.8 This method was named the Oct/V method because the frequency doubles for every 1V increase in CV (control voltage). The gate signal is a positive polarity method (voltage increases while playing) as shown in Figure 2.9. This method allowed for no inconsistencies to occur no matter how the various modules of the system synthesizer were connected, but the Oct/V method Expensive analog circuitry for creating exponential curves Another issue was that it required additional supplies, which led to high costs. Still, the American synthesizer manufacturer ARP, Moog, and Japan's Roland are the three companies that have developed systems. Not only for music synthesizers, but also for small synthesizers However, to maintain compatibility, the Oct/V format is used for all models. formula was adopted.

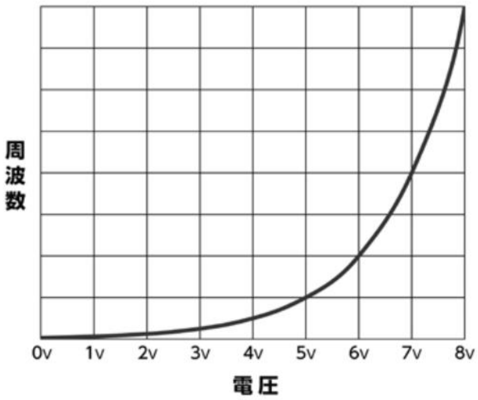


Figure 2.8 Oct/V method graph

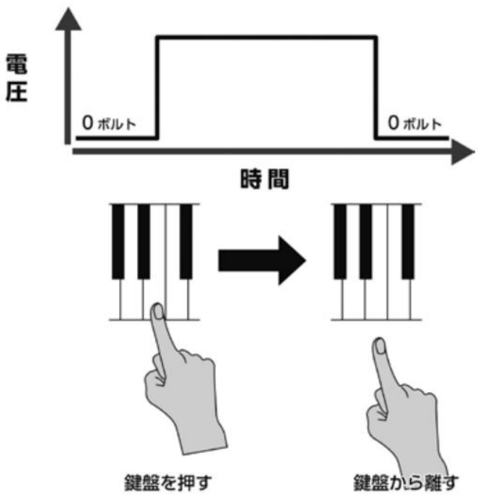


Figure 2.9 Positive polarity voltage operation

• Hz/V (Hertz/Volt) system

The Hz/V (Hertz/Volt) system is used by the Korg and Yamaha synthesizers shown in Figures 2.10 and 2.11.

Figure 2.10 Korg MS-20

Fig. 2.11 Yamaha CS-10

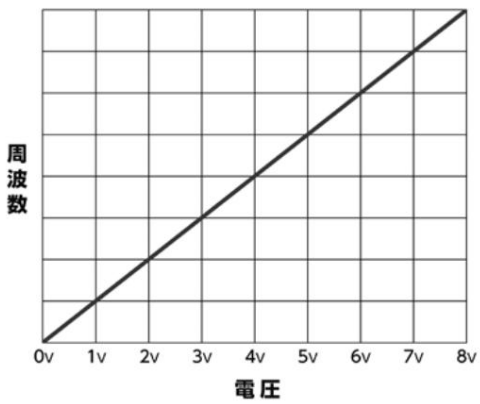


Figure 2.12 Hz/V system graph

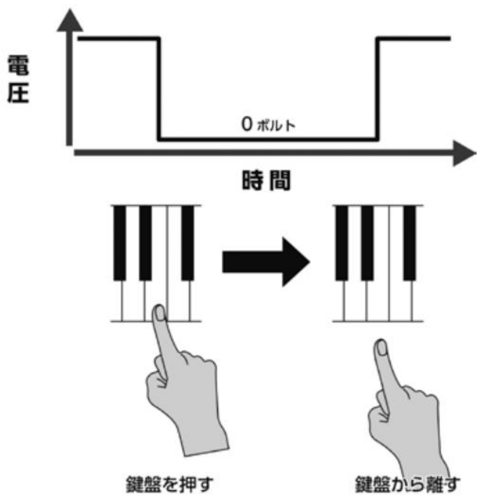


Figure 2.13 Negative polarity voltage operation

This method has a linear relationship between frequency and voltage, as shown in Figure 2.12. Since there is no need to create an exponential curve like the Oct/V method, it has the advantage of keeping costs down and ultimately providing high pitch stability. Neither company made large system synthesizers, so they used the Hz/V method. The gate signal is a negative polarity method (voltage drops while playing) as shown in Figure 2.13.

•Conversion interface KORG MS-02

Korg offers a product that allows you to convert between Oct/V and Hz/V formats. By using this interface, it was possible to connect synthesizers whose specifications differed depending on the manufacturer.
It became possible to use it.

Fig. 2.14 Korg MS-02

2.3 Oberheim Parallel Bus

The Oberheim Parallel Bus is an American Oberheim, a sensor manufacturer
Parallel digital image sensors were introduced in 1980.
The interface is a 37-pin D-SUB connector.
This allows direct memory access (DMA) through the Z-80 processor, and all addresses and data are sent to the Z-80 processor.
Tabas included.

Fig. 2.15 Oberheim OB-X

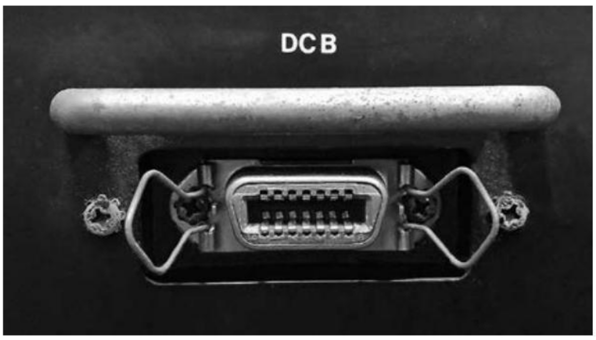
The polyphonic synthesizer OB-X in Fig. 2.15
The later model was connected to the company's polyphonic sequencer DSX with a 37-pin D-SUB cable, making it possible to record polyphonic performances and play them automatically.

The FACE had an extremely fast data transfer speed, which later led to the establishment of MIDI.
During this process, all American synthesizer manufacturers, except for Sequential Circuits, became interested in MIDI.
The reason they did not show this was because they were using parameters with high transfer speeds.
The background of already using the REL interface
There was.

2.4 DCB (Digital Communication Bus)

DCB (Digital Communication Bus) is a serial interface used by Roland before the establishment of MIDI.
The transfer rate is 31.25Kbps.
The transfer rate was the same as that of MIDI. The connector was 14
The Amphenol connector is 1.5mm in diameter.
The pin arrangement is shown below. Input and output are TTL level.

DCB responded to market demand for automatic performance using Roland's polyphonic synthesizer JUPITER-8 (Fig. 2.17), released in 1981, and the Micro Composer MC-4 (see Fig. 2.6), released in the same year.
It is a digital interface designed with the aim of
The first product using DCB was released in April 1982.



1. BUSY
2. DATA
3. CLOCK
RX
4. GND
5. BUSY
6. DATA
7. CLOCK
TX

DATA HANDLING CAPABILITY

MODEL	DATA	TX	RX
JUNO-60	KEY CODE	○	○
OP-8	KEY/PATCH CODE	○	×
JP-8	KEY/PATCH CODE	○	○

DCB Contact Arrangement

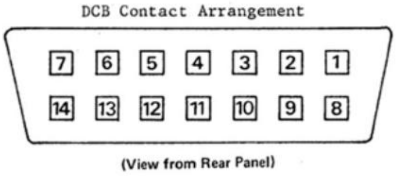


Figure 2.16 DCB terminals and specifications

Fig. 2.17 Roland JUPITER-8

Figure 2.18 Example of connection between Roland OP-8 and OP-8 and MC-4

Optional accessory for adding a DCB connector to the JUPITER-8.
The MC-4 CV/GATE was
The signal was converted to a DCB serial signal by the OP-8 interface (Fig. 2.18) and input to the JUPITER-8 (built-in OC-8), making it possible to play the JUPITER-8 automatically using the MC-4.

In addition, the Roland polyphonic synthesizer JUNO-60 (Fig. 2.19), released in 1982,
DCB terminals were standard equipment from the time of shipment.

Fig. 2.19 Roland JUNO-60

2.5 DIN SYNC

To synchronize the sequencer and rhythm machine
This is a proprietary standard invented by Roland, and was installed in Roland's rhythm machine TR-808 (Fig. 2.20) and sequencers before MIDI was established. The connection terminal uses the same 5-pin DIN connector as MIDI. Pin 1 is assigned to start/stop, and pin 3 is assigned to the clock signal.
The second pin is GND (ground). The clock is 24 clocks per quarter note. As shown in Figure 2.21, it is specified that the clock signal be kept at low level for 5 to 10 milliseconds after the start signal is turned ON.
do.

2.6 The limitations of electronic musical instrument interfaces before the MIDI era

As we have seen in this chapter, before MIDI was born
In this day and age, the interface is still practical.
As a result, electronic musical instruments were no longer standalone.
It was a one-of-a-kind instrument, and in that respect it was not that far removed from existing acoustic instruments.
For example, if you use the CV/Gate method with analog voltage,
A pair of cables is needed to transmit a single note.
By simply playing the chords of C, E, and G, a total of six cases can be played.
Although various synthesizer manufacturers had proposed interfaces using digital signals, each had its own proprietary method, and there was no standardization.

It was only possible to respond to the next generation.
I was waiting for the arrival of a unified interface for
That is why.

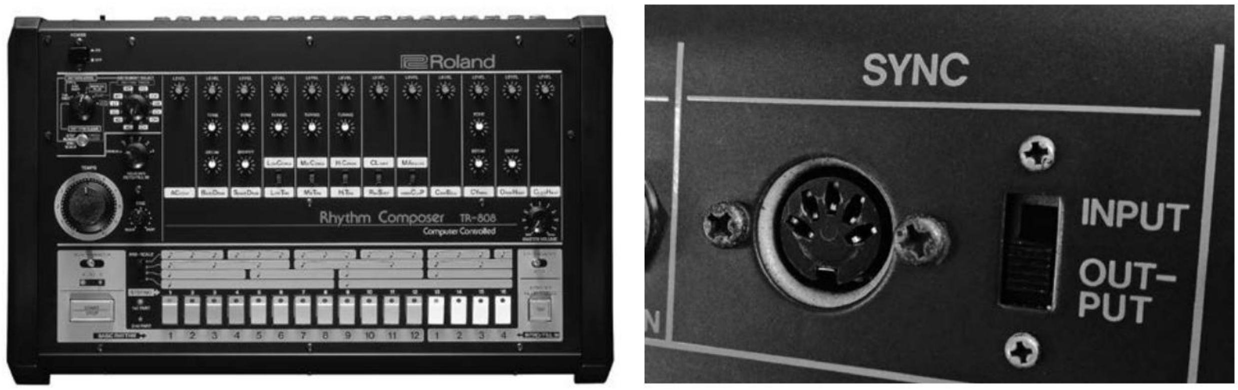


Fig. 2.20 Roland TR-808 and DYN SYNC terminal

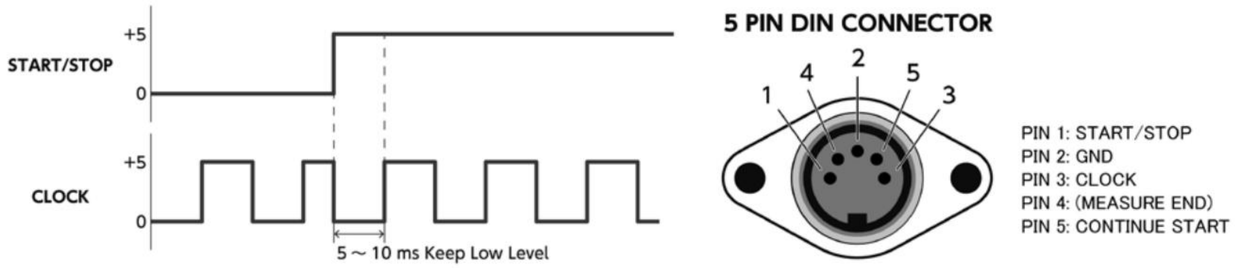


Figure 2.21 DIN SYNC Signals and Pin Arrangement

3 | Towards the establishment of MIDI 1.0

In February 2013, Roland founder Ikutaro Kakehashi Smith (former president of Sequential Circuits) They jointly contributed to the establishment of the MIDI standard, and the MIDI standard The contributions of the MIDI to the development of the music industry after the MIDI MIDI Protocol (M.O.P.) were recognized and the MIDI Protocol was awarded the Technical GRAMMY® Award (see Figures 3.1 and 3.2).

It was our company that first advocated for the need for a "computer interface." At the time, Roland's president was Ikutaro Kakehashi, and in response to the proposal, Dave Smith submitted the first proposed standard.

Le Circuit has been in discussion for about two years. Well, the first MIDI 1.0 specification was published in the summer of 1983. This chapter looks back on how that came about.

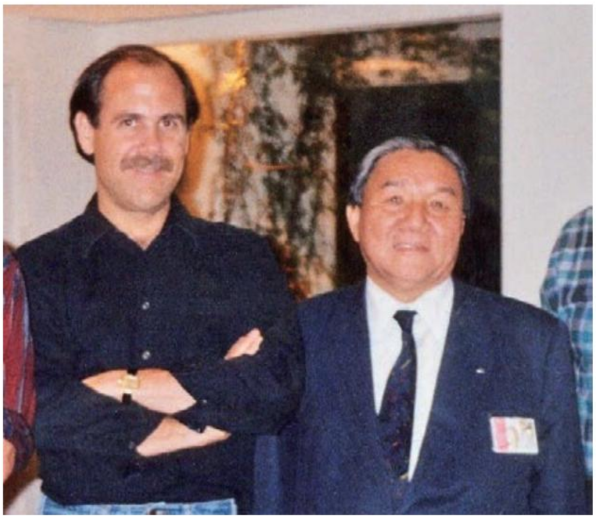


Figure 3.1 Dave Smith (left) and Ikutaro Hashimoto

Figure 3.2 The Grammy Award trophy that they jointly received

3.1 USI (Universal Synthesizer Interface)

In June 1981, the Summer Convention Center was held at McCormick Place in Chicago, the largest convention center in North America. At the NAMM Show (the largest musical instrument trade fair in the United States), Kakehashi met with American synthesizer manufacturer Tom Oberheim, president of the manufacturer I heard about Hashiguchi through Tom Oberheim.

Dave Smith responded to this proposal, and four months later, on October 15, 1981, at a musical instrument fair in Tokyo, Japan, The first event was attended by four car manufacturers and two American manufacturers. The first proposed standard was presented at the Synthesizer Interface Conference.

Dave Smith's proposed standard USI (Universal Interoperability Indicator) The hardware for the Synthesizer Interface uses 1/4-inch 2-pole phone jacks for both transmission and reception. The two companies are connected with a shielded cable, and the output is an open collector TTL output with a pull-up resistor to +5V It was stipulated that the resistor should be provided on the receiving side (see Figure 3.3).

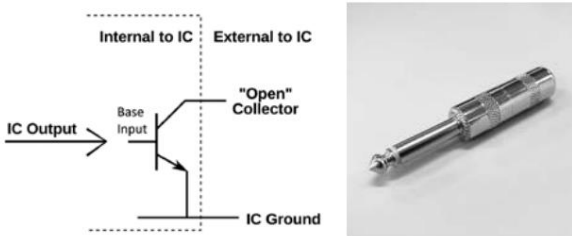


Figure 3.3 Dave Smith's hardware proposal and 1/4-inch 2-pole phone jack

The transfer speed is 19.2kbps, with 8 data bits, plus a start bit, stop bit, and odd parity bit, making 1 byte sent in 11 bits. It takes 0.573 milliseconds to send 1 byte.

The protocol is shown in Figure 3.4. Status Byte The upper two bits have the meanings shown in TABLE 1. is.

For example, when sending keyboard data, the upper two bits are "0, 0" and the bits below are "t, v, c", for a total of three bits, as specified in the table below. The lower three bits "n, n, n" indicate the number of data bytes following the status byte. A maximum of "111" = 7 bytes can be expressed, but the number of data bytes following the status byte is 0.

00001001 nn	Turn on nn
00011010 nn vv	Turn on nn with velocity vv
00101010 nn cc	Turn on nn in channel cc
00111011 nn vv cc	Turn on with velocity in channel
00111011 nn	Turn off nn
00001001 nn vv	Turn off nn with velocity vv
00100010 nn cc	Turn off nn in channel cc
00110011 nn vv cc	Turn off with velocity in channel

※ステータス・バイトは2進数、データ・バイトは16進数で表記

Leftmost digit	Meaning
0	Keyboard data
1	Auxiliary control
2	Bulk transfers
3	Interface protocol, and miscellaneous

TABLE I

GROUP Ø KEYBOARD DATA

FIRST BYTE:

0	0	t	v	c	n	n	n

nnn= # bytes following
c= Ø for key off
1 for key on
v= Ø for velocity data not included
1 for velocity data being sent
t= Ø for no voice assignment

SECOND BYTE:

U/L	n	n	n	n	n	n	n

nnnnnnn= Key number.
U/L= Ø if lower or leftmost part of split keyboard.
1 if upper keyboard or rightmost part of split keyboard.

THIRD & FOURTH BYTES:

v	v	v	v	v	v	v	v

-or-

c	c	c	c	c	c	c	c

v is velocity from 0 to 255
c is channel, or voice assignment, from 0 to 255.

Figure 3.4 Dave Smith's protocol proposal

It is limited to 6 bytes. The difference from the current MIDI is 1) whether the data has velocity or not. You can choose whether to assign channels or not.

ÿ There is a rule called Double length, which allows the 2nd , 3rd , and 4th bytes of data to be stored in double precision. If velocity and channel are not specified, a minimum of 2 bytes per sound can be used, but if velocity and channel are specified in double precision, a maximum of 7 bytes are required.

3.2 Synthesizer Interface Conference

On October 15, 1981, Dave Smith of Sequential Circuits, Inc. proposed USI to the Japanese company.

The four musical instrument manufacturers have been meeting roughly once a month since then.

The contents of the Synthesizer Interface Conference described below are excerpts from the notes and archives of the late Tadao Sakai, who was then the project manager at the Roland Technical Center.

•2nd Synthesizer Interface Conference

(Tokyo, October 24, 1981) Discussion took place regarding Dave Smith's proposal "USI." The following problems were pointed out: 1. 19.2kbps is too slow. 38.4kbps or 31.25kbps Why not consider this?

ÿTTL level open collector output is ground There is a problem with noise due to looping.

3) When using a 1/4-inch 2-pole phone jack with low impedance, there is a problem with reliability. 4) When considering real-time performance, synchronization (sync) in musical progression is required. Isn't a synchronization mechanism necessary?

Fumio Saegusa of Korg, the organizing company for the second conference, faxed the proposal shown in Figure 3.5 to Dave Smith of Sequential Circuits (October 28, 1981).

ÿ19.2kbps seems to be the minimum baud rate for an 8-voice polyphonic synthesizer. If Double If data is handled in double length (double precision), seven bytes are required to send one sound, and it takes up to 27 milliseconds to play eight sounds simultaneously. This makes it impossible to ensure real-time performance. Even without double length (double precision), there is the problem of sound delay. Wouldn't a baud rate of about twice 19.2 kbps be necessary?

ÿ1/4 inch 2-pole phone jacks can cause ground loop noise and poor contact.

3. Sync rhythms, sequencers, and synthesizers Clock, start/stop rules for Rank required

On December 2, 1981, Dave Smith sent the following reply to Fumio Saegusa of Korg: 1) It is rare to use data with double length (double precision), so it is excluded from the specifications.

It takes 14 milliseconds to send eight note numbers.

A clock is generated separately from the serial data transmission line.

TELEX: 232-3258 KORG J
CABLE ADDRESS: DONCARHYTHM TOKYO

KORG
KEIO ELECTRONIC LABORATORY CORPORATION
15-12, Shimotakaido 1-Chome, Suginami-Ku, Tokyo, Japan.

Tokyo October 28, 1981
Ref. No. 2688

Messrs. Sequential Circuits, Inc.
3051 North 1st Street
San Jose, California 95134
U.S.A.

Attn: Mr. Dave Smith, President

Dear Mr. Smith,

We appreciate your valuable proposal.

After reading over your proposal, we, the technical staffs of four companies have held the second meeting on the subject of Universal Synthesizer Interface on October 24, 1981. We all feel the need to develop the Standard Interface which meets the demand of consumers in spite of various technical difficulties, however, we could not suggest any concrete idea to add to or replace your proposal due to limited time, etc.

Followings are our questions and interrogations on your proposal.
1. 19200 baud seems to be minimum rate for present 8 voice Polyphonic Synthesizer. If the double length is used, the transmission time will be over 27msec and it seems that real time playing is impossible. (Because synthesizer itself has the Delay factor, the total DELAY TIME will become a problem if not DOUBLE LENGTH.) At least double speed would be needed considering the style of future synthesizer.

2. When the plural synthesizers or sequencers are used, Interface Bus and Signal Cords make a loop and that may cause the NOISE problem. We are concerned to use 1/4" PHONE JACK considering the possible NOISE from Jack contact.

3. What does it mean "Change note nn to pressure pp" of GROUP 1 Auxiliary control?

4. As the matter of fact, we feel that it is also very important factor of considering standardization of synchro in order to fix the timing for RHYTHM, SEQUENCER, SYNTHE. (Format for CLOCK, START/STOP, DURATION OF NOTE, etc.)

- to continue -

FACTORIES
6-19, Sakurajosui 5-Chome, Setagaya-Ku, Tokyo, Japan.
1825 Kaneko Ohimachi, Ashigarakami-Gun, Kanagawa-Pref., Japan.
1985 Nurumizu Atsugi-Shi, Kanagawa-Pref., Japan.
55 6 100(T)

TELEX: 232-3258 KORG J
CABLE ADDRESS: DONCARHYTHM TOKYO

KORG
KEIO ELECTRONIC LABORATORY CORPORATION
15-12, Shimotakaido 1-Chome, Suginami-Ku, Tokyo, Japan.

- to be continued -
Tokyo
Ref. No. - page 2 -

Please check carefully above several points at your side. We feel that it is needed to make the format compatible with the future Synthe for standardization to avoid possible problems even if we spend a long time for discussion. In our recent meeting, we have spent most time for discussing which information must be forwarded and what is its purpose. In considering the compatibility with the synthesizers of other makers, it is confirmed that the most important point is the transmission of key information.

We appreciate if you would kindly make your comment and transfer the comment by Oberheim for the above matter. And also kindly provide the result of the meeting with other manufacturers in the States.

For your reference, we have sent this message to Mr. Marcus Ryle of Oberheim at the same time. Upon receipt of your letter, we will have the third meeting and we will have the conclusion by four parties.

The attendants of the second meeting were as follows:

From YAMAHA : K. HIRANO, T. NISHIMOTO
From KAWAI : Y. HAYASHI, S. UCHIYAMA
From ROLAND : H. NORIYASU, A. TAKADA, T. KIKUMOTO
From KORG : F. MIEDA, T. ARAI

Many thanks in advance and looking forward to receiving your letter very soon.

Sincerely yours,

Keio Electronic Lab., Corp.
F. Mieda, Managing Director

FM/mh
c.c. Mr. Marcus Ryle, Oberheim

FACTORIES
6-19, Sakurajosui 5-Chome, Setagaya-Ku, Tokyo, Japan.
1825 Kaneko Ohimachi, Ashigarakami-Gun, Kanagawa-Pref., Japan.
1985 Nurumizu Atsugi-Shi, Kanagawa-Pref., Japan.
55 6 100(T)

Figure 3.5 Proposal letter from Korg to Dave Smith

You can increase the baud rate by sending a 1/4 inch 2-pole phone jack. You can also use a slightly more expensive UART (serial communication LSI).

Jack is already using the shielded cable The biggest advantage is that you can use a special cable. It is an alternative to improve poor contact and noise without using a special cable. Please let me know if you have any.

3) Standardization of timing clocks is a good idea, and I think you should be the first to propose it.

•The 3rd Synthesizer Interface Conference
(Tokyo, December 24, 1981)

ÿ In response to Dave Smith's reply, 19.2kbps baud rate is inappropriate (all participants) 38.4kbps is fine. However, considering the CPU clock, 31.25kbps is easy to make. ÿ 1/4 inch 2-pole phone jack is not reliable.

OK, I can't do that, but I don't have an alternative.

3) Each company will think about musical synchronization.

We will come up with ideas at the next meeting.

ÿYamaha will provide a standard interface (draft)

This was suggested.

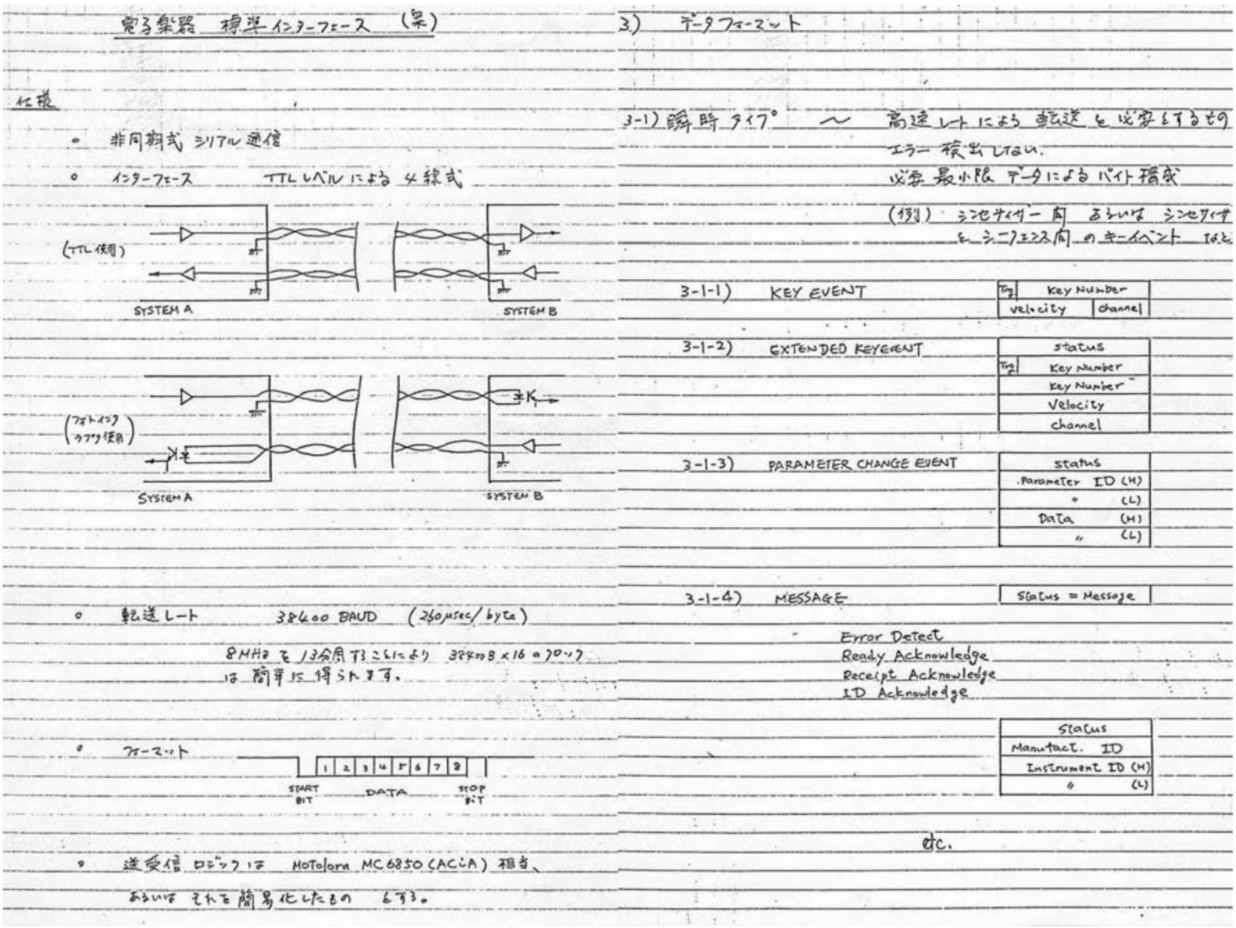
The Yamaha proposal shown in Figure 3.6 was submitted by Katsuhiko Hirano, who was then the head of the LM design department at Nippon Musical Instruments Co., Ltd. The person in charge of creating the proposal was Tetsuo Nishimoto, also from the same department. The idea of using an isolator to separate the ground This was the first time this circuit was submitted. The current loop structure is highly resistant to external noise and It also prevented round loop noise, and became the prototype for MIDI hardware. The transfer rate was proposed to be 38.4 kbps, twice that of "USI". It had a 10-bit structure, with 8 data bits plus a start bit and stop bit.

There is no parity bit. The protocol does not include instantaneous timing. This type is used to transfer key notes, and error detection is not performed with a byte configuration of the minimum necessary data. "KEY EVENT" shown in 3-1-1 in Figure 3.6 allows note ON and OFF with a 2-byte configuration. 1 byte The first MSB 1 bit indicates "NOTE ON" or "NOTE OFF". The first byte represents the key event, and the lower 7 bits are assigned to the keynote information. The upper 5 bits of the second byte specify the velocity (32 levels), and the lower 3 bits specify the sound channel (8 channels). The "EXTENDED KEY EVENT" shown in 3-1-2 has a 5-byte structure, allowing it to store more information.

There are.

* "KEY EVENT" or "EXTENDED KEY EVENT"

The key number in the first byte (MSB 1 bit) is used to distinguish



電子楽器 標準インターフェース (案)

仕様

- 非同期式 シリアル通信
- インターフェース TTLレベルによる4線式

- 転送レート 38400 BAUD (260μsec/byte)

8MHzを13分周することにより 38400B×16のクロックは簡単に得られます。

- フォーマット

- 送受信ロジックは Motorola MC6850 (ACIA) 相当、あるいはそれを簡易化したものとする。

3) データフォーマット

3-1) 瞬時タイプ ～ 高速レートによる転送を必要とするもの
エラー検出しない。
必要最小限データによるバイト構成
(例) シンセサイザー間 あるいは シンセサイザとシーケンサ間のキーイベント など

3-1-1) KEY EVENT

Trg	Key Number
velocity	channel

3-1-2) EXTENDED KEYEVENT

status
Trg Key Number
Key Number
Velocity
channel

3-1-3) PARAMETER CHANGE EVENT

status
Parameter ID (H)
〃 (L)
Data (H)
〃 (L)

3-1-4) MESSAGE

Status = Message

Error Detect
Ready Acknowledge
Receipt Acknowledge
ID Acknowledge

Status
Manufact. ID
Instrument ID (H)
〃 (L)

etc.

Figure 3.6 Proposal submitted by Yamaha

The key number is determined by whether the digits (excluding the 7 bits) are 95 or less or 96 or more (1100000 in binary). If the key number is 95 or less, It is judged as the first byte of "KEY EVENT" and is 96 or more. This is determined to be the first byte (status byte) of an “EXTENDED KEY EVENT”.

•4th Synthesizer Interface Conference

(January 28, 1982, Hamamatsu)

ÿ Roland's proposal will be made during the NAMM show.

The proposal will be submitted to a meeting.

ÿ In the Roland proposal, rhythm synchronization and connection connector

The above will be submitted as part of the overall plan from the Japanese side. 3) The connectors are Canon (XLR) and 5-pin. DIN compatible.

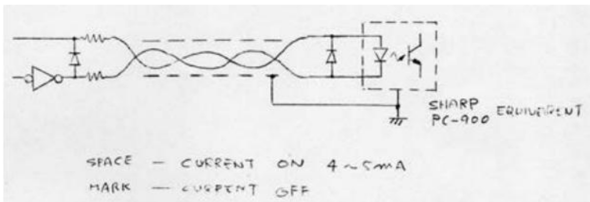
At this meeting, the Roland proposal was presented, which suggested that a 5-pin DIN terminal (Figure 3.7) would be used for the connection terminal in question. However, the 5-pin DIN terminal was the only one in the United States at the time. Since this was not common, and at the strong request of Sequential Circuits, we have also included the use of a 3-pin XLR connector (Figure 3.8).

Figure 3.7 5-pin DIN socket

Figure 3.8 From the left, 3-pin XLR (female) and 3-pin XLR (male) sockets

The hardware follows Yamaha's proposal and uses photocouplers.

The current loop proposal using the 1000V AC current was adopted (see Figure 3.9).



Baud Rate = 31.25kbps

Figure 3.9 Roland's hardware proposal

The protocol proposed by Rowland, shown in Figure 3.10, was

Tadao Kikumoto, who was the general manager of Roland's Osaka Technical Center

1. TIMING INFORMATION

l l l l l m m m

These bytes are sent in synchronous with Tempo Clock and are inserted between any other bytes with the highest priority.

- SUB CODE "Ø" ; Tempo
  The Tempo mark is sent during Play mode.
- SUB CODE "1" ; MEASURE END
  In case of 3/4, 96 clocks/quater note, this Mark is sent every 288 Tempo clocks.
- SUB CODE "2" ; START
  "START" mark resets the Measure Counter and starts the sequence at the 1st measure. Re-start of halted measure is activated by "TEMPO" mark instead of "START" mark.
- SUB CODE "3" ; STOP
  "STOP" mark is sent during the "STOP" or "HALT" mode.
- SUB CODE "4" ; BACKWARD
  This mark backs the current measure to the preceding measure.
- SUB CODE "5" ; FORWARD
  This mark forwards the current measure to the next measure.

  note; Backward and Forward can be effected in either Play or Stop mode. In Play mode, backward and forward is done at the end of the current measure.
- SUB CODE "6" ; SYSTEM RESET
  To initialize all of the system.
- SUB CODE "7" ; UNDEFINED

9. NOTE (CHANNEL INFORMATION 1)

1 0 1 1 1 _ _ _

"CHANNEL" refer to musical instrument. If independent instrument in one unit are assigned to individual Channel No. the data sets(PITCH and VELOCITY) which are sent succesively in the same channel may neglect the channel mark. This DATA BLOCK (chained data sets) is gotten between Channel mark and E.O.B. mark or different Channel Note mark for the other channel Data set.

1 0 1 1 1 0 0 1	NOTE MARK CH #1
0 PITCH 0 VELOCITY	DATA SET
0 PITCH 0 VELOCITY	DATA SET
0 PITCH 0 VELOCITY	DATA SET
1 0 1 1 1 0 1 1	NOTE MARK CH #3
0 PITCH 0 VELOCITY	DATA SET
0 PITCH 0 VELOCITY	DATA SET
1 1 1 1 0 x x x	E.O.B. mark Buss Unoccupied
1 0 1 1 1 0 1 1	
0 PITCH 0 VELOCITY	DATA SET

Note: Gate Off is defined by Zero Velocity.

Figure 3.10: Roland's protocol

Created by. This is the first time I've ever met someone who was talking about synchronization.
It includes information on the status.
The task byte and data byte are arranged in the MSB (Most Significant Bit).
The specification is to divide by 1 bit, and MSB bit=1 is the status
The MSB bit=0 indicates a message byte, and the MSB bit=0
indicates a data byte. Although the data resolution is limited to
7 bits, the protocol specification is simple and easy to understand.
The idea of running status was also
If the same status continues,
The channel is represented by the least significant 3 bits of the status byte, and key information for up to 8 channels can be sent.
In addition, the note OFF status is the same as the note ON status.
This can be substituted with Velocity=0 as is, and after the first note is pronounced, note ON/OFF is achieved with 2 bytes.

- Synthesizer Interface Conference at the NAMM Show (February 7, 1982, USA) Synthesizer Interface Conference was held at a hotel near the NAMM Show venue in Anaheim in February 1982.
The following is a report on the situation at that time.
The conference was hosted by Sequential Circuits, Inc.
Dave Smith recalls:

"At the NAMM show in Anaheim,
invited all synthesizer people to participate.
Most of the people attended the meeting.
Rather than integrating the United States, the majority of
The lack of interest from manufacturers in this field became clear. The reason was
Although the range of applications was wide, a common interface and standard
Some people had no idea the value of dado.
Many people suggested expensive Mbaud parallel interfaces, but it seemed impossible. No one seemed to understand that meetings on these sorts of issues require compromises (and terribly time-consuming feasibility checks). After this frustrating meeting, we met with four Japanese companies (Korg, Kawai, Roland, and Yamaha) who were willing to see this work through. Dealing with the issues that arose from the meetings with the other companies was a bit of a pain.
Putting that aside, we decided to decide on the specifications ourselves.
As a result, other companies lost interest or dropped out.
He was asleep.
*Rittor Music Keyboard Magazine
Quoted from June 1993 issue, p.20

3.3 Until the MIDI 1.0 standard was decided

Synthesizer held during the NAMM show
What became clear at the User Interface Conference was that
American companies other than Sequential Circuits
All sensor manufacturers are using serial interfaces.
The reason for this was that they believed that the bit rates of serial transmission available at the time were too slow to be used for real-time transmission. However, the fact that the Japanese side was limited to one American company was a blessing in disguise in terms of finalizing the specifications. Sequential Circuits was

The Roland proposal, which was presented at a meeting during the NAMM Show, was basically accepted. The regulations were revised for a year until the first public testing of MIDI connections was conducted at the following NAMM Show in 1983. Regarding the details of the ranking, the US side is sequential circuit

The company acted as the liaison office on the Japanese side, while Roland acted as the liaison office on the Japanese side.

3.3.1 MIDI's 16-channel format decided in July 1982

The original USI (later MIDI) specification allowed multiple

The number of channels that can be used was 8.

June 2, 1982 by Sequential Circuits

Below is an excerpt from the proposal sent by the company (see Figure 3.11).

10110nnn	0kkkkkkk 0vvvvvvv	Note on event: nnn= voice number kkkkkkk= key # (see Note 1) vvvvvvv= velocity value
10111nnn	0kkkkkkk 0vvvvvvv	Note off event: as above (see Note 2)

Figure 3.11 Sequential Circuits' proposal

However, in the case of the letter dated July 14, 1982 shown in Figure 3.12,

The memo states that Sequential Circuits requested:

This resulted in the development of monophonic

New channels have been added, with the maximum number of mono channels being

This increased to 16 channels.

Status	Description	
1000mmmm	monophonic channel	key off
1001mmmm		key on, cont, prog
1010mmmm		after touch
1011cccc		control change, prog change
11000nnn	polyphonic channel	key off
''''1nnn		key on, cont, prog
11010nnn		after touch
''''1CCC		control change, prog change

Figure 3.12 Sequential Circuits' proposal for a maximum of 16 monophonic channels

This request was discussed among four Japanese manufacturers, On July 23, 1982, Roland sent the fax shown in Figure 3.13 to Sequential Circuits. The contents of the fax do not distinguish between polyphonic and monophonic synthesizers.

Increase the channel count to 16 channels without

The contents are as follows. Sequential circuits are included in this.

The content was agreed upon and the decision was made to make MIDI 16 channels.

In sequential circuits, the monophonic

There was a plan to develop a multi-timbral (capable of playing multiple tones simultaneously) keyboard with multiple built-in mic (single note) synthesizers.

A monophonic synthesizer that handles only one voice

In this case, the maximum number of channels is 8, so in the future

ROLAND Corporation

7-13 3-chome Shikitajima Suminoe-ku
Osaka 559 Japan

We are sorry to have kept you waiting for long time. So far YAMAHA, KAWAI, KORG and we ROLAND have discussed the USI format for quite a lot of times, and agreed the final Universal Synthesizer Interface protocol (plan). We made some modifications on the old Roland format to meet your requirements and ours, as follows:

1 Channel
Each channel can be either a of monophonic or polyphonic 'instrument'. The system can consist up to 16 channels. (used to be 8.) This method and channel number will allow the system to have powerful capability. Although the channel number in the format is from 0 to 15, it might be advisable to write channel number from 1 to 16 on the panel or manual. For example, if the nnnn in the format is 0101, channel number should be 6.

Figure 3.13 Roland's response agreeing with the specification for 16 polyphonic channels

This request was submitted due to concerns that there would be a shortage of modules.

The four Japanese companies are

Since I had no information about the Chitimbre development plan, I only had my eye on polyphonic synthesizers and thought that eight channels would be enough.

As a result, the decision to make it 16 channels was made.

It can be said that this was a major turning point that greatly expanded the possibilities of MIDI thereafter.

3.3.2 The name MIDI was suggested by Dave Smith

The name of the synthesizer interface is

It was originally called USI (Universal Synthesizer Interface). However, the word "universal" in USI could violate antitrust laws and cause legal problems, so they started looking for another name. Then Dave Smith came up with the name MIDI (Musical Instruments Digital Interface), which was approved by the Japanese side, and MIDI became the official name. Around June 1982

This is what I mean.

3.3.3 Sequential Circuits MIDI Specification Published

by Sequential Circuits, Inc. on November 3, 1982.

The English specification for MIDI, shown in Figure 3.14, was published.

3.3.4 Connection test at the NAMM Show in January 1983.

Sequential Circuit at the NAMM Show

I connected a Prophet-600 from the company to a Roland JUPITER-6 and JX-3P with MIDI cables and succeeded in playing sounds between them (see Figure 3.15).

3.3.5 Establishment of the MIDI Standards Liaison Committee

February 11, 1983 MIDI standard management and ID number

SUMMARY OF STATUS BYTES

Status D7----D0	# of Bytes Following	Description
Channel Information		
1000nnnn	2	Note OFF event
1001nnnn	2	Note ON event (velocity=0: Note OFF)
1010nnnn	2	Polyphonic key pressure/after touch
1011nnnn	2	Control change
1100nnnn	1	Program change
1101nnnn	1	Channel pressure/after touch
1110xxxx		Undefined
System Information		
11110000	*****	System Exclusive Information
11110sss	0 to x	System Common Information
11111ttt	0	System Real Time Information

Figure 3.14 Published by Sequential Circuits
MIDI Specification

Figure 3.15 MIDI connection test at the NAMM show

The MIDI Standard Liaison Committee was established to manage the standards bar, which was later renamed the MIDI Standards Council and is now integrated into AMEI (Association of Musical Electronics Industries).

3.3.6 Publication of the "Japanese version of the MIDI 1.0 specification"

It was published in English on August 25, 1983. The Japanese version of the "MIDI 1.0 SPECIFICATION," "Japanese Version of MIDI 1.0 Specification" (see Figure 3.16), has been published by the MIDI Standards Liaison Committee.

3.4 The birth of the MIDI standard

As mentioned in this chapter, the people involved in the creation of MIDI seriously considered the issue of what it means for musical instruments to communicate with each other, and how it should be.

Figure 3.16 "Japanese version of MIDI 1.0 specification"

The technology, ideas, and problems to be solved at that time We openly bring issues to each other and come up with solutions. There have been no attempts to monopolise these rights, and instead, a mechanism has been created that allows them to be operated while maintaining neutrality.

But it can be used by anyone without exposing your ego. The aim was to create a common standard that would benefit everyone. The multi-timbral sound brought to us by the Shall Circuit The concept was also of great benefit to everyone.

As you can see from this, the true value of the MIDI standard The thing is, it was open. There is no bias towards any one manufacturer or user. It is not convenient. MIDI is not widely available to the public. It was a standard that was established in 1990. And that was rare. Thanks to the foresight of these pioneers, MIDI was born in a miraculous way and at the same time, it was able to become so universal that it could be widely adopted. was born and spread as an open standard, and even Go beyond protocols and advance your electronic instruments faster than ever before. This will result in it becoming a ``system of thought."

The next chapter will provide an overview of the MIDI standard, and from chapter 5 onwards, we will introduce the powerful technology known as MIDI. See how quickly and diversified the musical instruments that were go.

Quoted from Keyboard Magazine published by Rittor Music June 1993 issue P20

4ÿOverview of the MIDI standard

This chapter provides an overview of the MIDI 1.0 standard, which was established in 1983, based on the specifications issued by the Association of Musical Electronics Industry (AMEI). The following is an excerpt from the specifications of the For standard specifications, please refer to the "MIDI 1.0 Standard" published by AMEI.

4.1 MIDI Basics

The Musical Instrument Digital Interface (MIDI) protocol provides a standardized, efficient means for transmitting musical performance information as electronic data. MIDI information is sent as "MIDI messages." It is a music synthesizer, Instructions and ideas on how to play each piece The actual sound can be Must be generated by the receiving synthesizer. For a complete description of the MIDI protocol, see MIDI 1.0 Details. It is contained in.

The MIDI data string consists of 10 bits per byte (1 star). 8 data bits, 1 stop bit MIDI is a one-way asynchronous bit stream of 31.25K bits per second transmitted over a MIDI cable. MIDI instruments usually use the IN, OUT, It has three different MIDI connectors, labeled THRU and THRU. MIDI data streams are typically sent to a MIDI controller, such as a keyboard instrument, or to a MIDI sequencer. Thus, it is produced.

A MIDI controller is a device that is played as a musical instrument and converts what you play into a stream of MIDI data in real time (as you play it). A MIDI sequencer is A device that can record, edit, store, combine, and play MIDI data sequences.

MIDI data from a controller or sequencer The output is sent from the MIDI OUT of the device.

This MIDI data string is usually transmitted to a MIDI sound source or The modules receive the It plays sounds according to MIDI messages received from MIDI IN. Figure 4.1 shows a MIDI keyboard. A simple controller and MIDI sound module This shows a typical MIDI system. Many MIDI keyboard instruments The device is equipped with a keyboard controller in the same unit. It includes both a controller and a MIDI sound module.

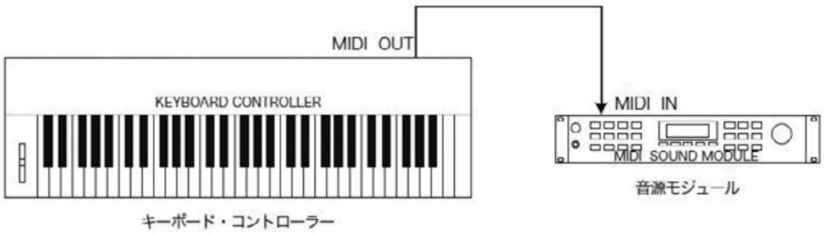


Figure 4.1 A simple MIDI system

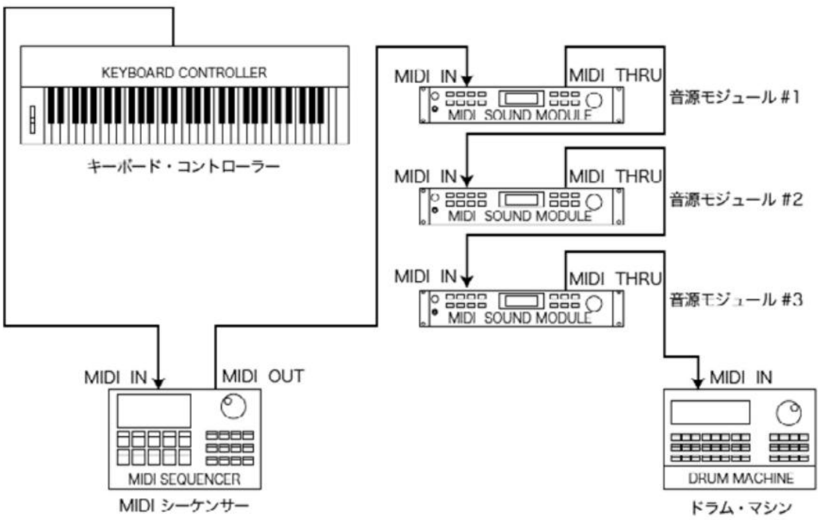


Figure 4.2 An extended MIDI system

Note that in these units,
Keyboards and sound modules may be internally connected and may be connected or disconnected by setting the instrument's "Local Control" function to ON or OFF. The single physical MIDI signal

line is divided into 16 logical channels by the 4-bit channel number contained in many MIDI channel messages. Keyboard instruments can usually be set to transmit on any one of the 16 MIDI channels.

A MIDI sound source (sound module) can be configured to receive on a specific MIDI channel (or channels). For a sound module to play sounds in the system shown in Figure 4.1, it would need to be configured to receive on the channel that the keyboard controller is transmitting on.

Information received at the MIDI IN of a MIDI device is sent out again (repeated) from the MIDI THRU of that device. By connecting the THRU output to the IN of the next device in the chain, you can connect multiple MIDI sound modules together. It is possible to chain the lines together.

Figure 4.2 shows a more complex MIDI system. In this example, a MIDI keyboard controller is used as an input device to a MIDI sequencer, and the sequencer's MIDI OUT port has several A sound module is connected. The composer is There are several pieces, each written for a different instrument. To write a piece of music with different parts Such a system can be used for a wide range of musical compositions: the composer can play each part one by one on the keyboard and record these individual parts into a sequencer. The sequencer then records them into a sound module Play those parts together through the course of the game.

In this case, each part would be played on a different MIDI channel, and the sound modules would be configured to receive on different channels. For example, sound module 1 could receive a piano part on channel 1, and module 2 could receive a piano part on channel 2.
5 The information received is converted to the sound of an acoustic bass.
You can use a MIDI MIDI IN/OUT and configure your drum machine to play the part received on MIDI channel 10.
This can be done.

In this example, we use different sound modules to play each part. However, multi-timbral modules are used. With a sound module, you can play several different parts at the same time. One multi-tone can be played at the same time. The Piano part is channeled on the bar sound module. 1, the bass part on channel 5, and the drums on channel By setting the parts to receive on channel 10, you can play three parts simultaneously.

Figure 4.3 shows a PC-based MIDI system. In this system, the PC transmits MIDI data to an external multi Timbre MIDI Synthesizer Module With a built-in MIDI interface card Multimedia presentation Packages, educational software, games, etc. What application software uses the PC bus? MIDI data is sent through the MIDI IN in parallel format. MIDI interface card. The device converts this information into serial MIDI data, This sound module is It's a timbre, so there's piano, bass, and drums. Performing many different musical parts simultaneously There are also sophisticated MIDI sequencer software packages available for the PC.

This software runs on a PC and can be used with a MIDI keyboard.

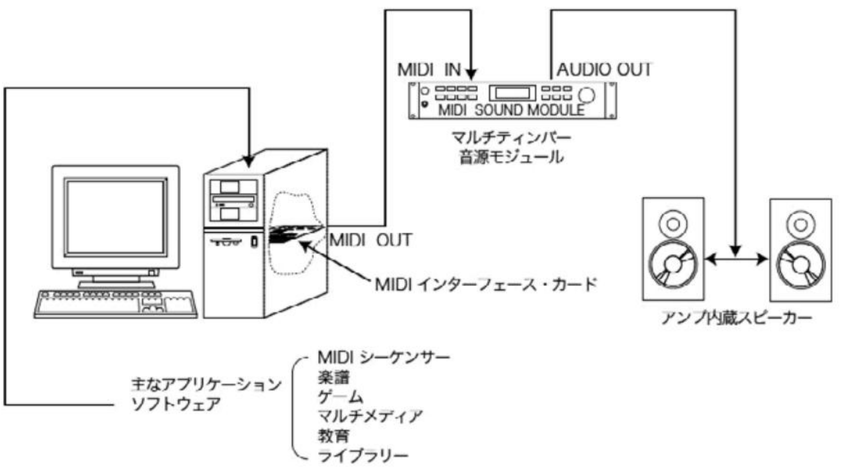


Figure 4.3 PC-based MIDI system

Connect the MIDI controller to a MIDI interface card.
By connecting it to the MIDI IN port of the , you can create music similar to the two examples above.

PC-based MIDI systems can be configured in many different ways. For example, a MIDI interface The MIDI sound module is integrated and added to the PC. In fact, the Multimedia PC (MPC) specification requires that all MPC systems Demanding to have a music synthesizer Today, audio adapter cards (sound cards) usually include a synthesizer along with MIDI interface capabilities. Until recently, most PC sound cards included FM synthesizers of limited capability and subpar sound quality.

These systems require an external wavetable Adding a synthesizer module You will get a higher quality sound. High quality wavetable music synthesizer More advanced sound cards with built-in speakers or daughter cards available as options. In PC applications, With the increasing use of the MIDI protocol, this trend is sure to continue.

4.2 MIDI Messages

MIDI messages are 8-bit status bytes. A MIDI message consists of a sequence of bytes, usually one or two, followed by a data byte. MIDI messages can be broadly categorized as follows: Channel messages and system messages Channel messages are classified as These messages apply to a specific channel and the status byte of these messages contains the channel number. System messages are channel-dependent. In the status byte, No channel information is included.

Channel messages are further Channel Mode Messages and Channel Mode Messages Channels, voice messages, and messages can be categorized into Sage conveys data about the performance of a piece of music, typically It typically makes up the majority of the MIDI data stream. Channel Mode messages affect the way the receiving instrument responds to Channel Voice messages.

4.2.1 Channel Voice Messages

Channel voice messages are used to transmit information about musical performances. The notes are note on, note off, polyphonic Key pressure, channel pressure, Pitch bend change, program change, and control change messages.

•Note On / Note Off / Velocity

In the MIDI system, the start of a note and Releasing that same note is two separate events. On a MIDI keyboard instrument or MIDI keyboard controller, the If you select MIDI OUT, the keyboard will Sends a note-on message.

The keyboard supports 16 logical MIDI channels. It can be set to transmit on any one channel. The status of the Note On message can be The note on status byte is followed by two data bytes specifying the note number (which key was pressed) and the velocity (how hard the key was pressed).

The note number is used to select the note to be played on the receiving synthesizer, and the velocity is It is usually used to control the volume of a note. When the key is released, the keyboard or MIDI The board controller sends a note-off message. The note-off message also contains a data byte indicating the note number and the velocity at the time the key was released. Note-off velocity information is normally ignored.

Aftertouch

Some MIDI keyboard instruments have the ability to sense the amount of pressure applied to a key while it is being held down. This pressure information, commonly called "aftertouch", can be used to control some aspect of the sound produced by the synthesizer, such as vibrato. If a keyboard has pressure sensors on each key, the resulting "polyphonic aftertouch" information can be used to control polyphonic keyplay.

It can be sent as a Rescher message. The message is composed of a note number and a pressure value. It contains two data bytes. On instruments, a single pressure level is used across the entire keyboard.

It is more common to sense level only. This "channel aftertouch" information is sent as a channel pressure message, which requires only one data byte to specify the pressure value.

Pitch Bend Change The Pitch Bend Change message is normally It responds to changes in the pitch bend wheel position. The pitch bend information is sent to the corresponding channel Change the pitch of the sound being played in The pitch bend change message contains two data bytes that specify the pitch bend value. Two bytes are required because they represent the pitch that results from the movement of the pitch bend wheel. Enough to make the change seem continuous, rather than gradual. This is to enable very fine resolution.

•Program Change

Program change messages are The channel that should be used to play the sound. This message is used to specify the type of instrument to be played. This message contains one data bit that specifies the new program number. Only 10 data bytes are required.

•Control Change

Control change messages are sent to the synthesizer. Controlling various functions in the Control Change messages, like other MIDI channel messages, only affect the channel number indicated in the Status Byte.

After the control change status byte The message is followed by a first data byte indicating the "controller number" and a second data byte specifying the "control value". The control number indicates which function of the synthesizer is controlled by the message Specifies whether the defined command should be tracked. For a complete list of controllers, see MIDI 1.0 in detail. It is published.

1. Bank Select Control number 0 (with 32 sending the LSB) is defined as the Bank Select. The Bank Select function is used to expand the number of different instruments that can be addressed. To achieve this, some synthesizers use MIDI programming. Used with gram change messages (The program change message alone can select one of 128 program numbers.) The added sound is sent using control number 0 and control number 32 to specify the new bank, Sending consecutive program change messages This allows for 16,384 possible banks of 128 voices each.

The MIDI standard supports bank select messages. How should the synthesizer banks be mapped? Since the bank select method is not described, By default, there is no standard way to select a particular synthesizer bank. There are no companies like Roland (GS format) or Yamaha (XG format) that guarantee some standardization among their products. Some manufacturers have adopted these practices.

ÿ RPN / NRPN

Control number 6 (Data Entry) can be used in MIDI in conjunction with control numbers 96 (Data Increment), 97 (Data Decrement), 98 (Registered Parameter Number LSB), 99 (Registered Parameter Number MSB), 100 (Non-Registered Parameter Number LSB), and 101 (Non-Registered Parameter Number MSB).

Expand the number of controllers available. First, control numbers 98 and 99, or 100 and 101 is the parameter number to be edited number and then use control numbers 6, 96, or 97 to adjust the data value for that parameter. By selecting the parameter data, the parameter data is transmitted. RPNs and NRPNs are used to store patches and other data. To edit, Typically used to transmit meter data Registered parameters are MIDI The MIDI Manufacturers Association (MMA) and the MIDI Standards Council (JMSC, now AMEI) have agreed to a specific A function is assigned to it. For example, a synthesizer There are registered parameter numbers assigned to control the pitch bend sensitivity of the pedal or the master tuning of the pedal.

are not assigned to a specific device and are used for different functions by different manufacturers. Again, each company, including Roland and Yamaha, adopts their own conventions to ensure some standardization.

4.2.2 Channel Mode Messages

Channel Mode messages (corresponding to MIDI control numbers 120 through 127) are used by the synthesizer to Change how the controller responds to MIDI data.

Control number 121 is used to reset all controllers. Control number 122 is used for local control (keyboard controller functions and synth controller functions on MIDI synthesizers with a keyboard).

The sizer function can be turned off with local control.

(can be separated by

Used to select control numbers 124 to 127.

is used to select OMNI mode on or off, and to select MONO or POLY mode.

When OMNI mode is on, the synthesizer

Responds to incoming MIDI data on all channels.

When OMNI mode is off, the synthesizer

The synthesizer responds to MIDI messages on only one channel. When Poly mode is selected, incoming Note On messages are played polyphonically. This means that if multiple Note On messages are received, a separate voice is assigned to each note (limited by the number of voices available on the synthesizer), resulting in multiple notes being played simultaneously. When Mono mode is selected, only one note per MIDI channel is played.

One voice is assigned to that channel.

This means that only one note can be played at a time.

Many MIDI synthesizers have an omni-on

/ Poly mode operation will be the default (currently Omni Off).

In this mode, the synthesizer will play note messages on all MIDI channels it receives, synthesizing the

The notes sent are played polyphonically.

In MUNI OFF/POLY mode operation, the synthesizer

The user receives only one channel and

Notes received on the panel are played polyphonically. This mode is used when several synthesizers

When connected in a chain using MIDI THRU

In this case, each synthesizer in the tune will be assigned to one part (one channel).

You can set it to play only the part you want to play (MIDI data) and ignore the other parts.

Please note that a MIDI instrument has one MIDI channel, the "basic channel".

Basic channel allocations must be

It may be hard-coded or selectable.

The mode message is sent via the basic channel.

It will only be received on

4.2.3 System Messages

System messages are displayed as System Common Messages.

messages, system real-time messages and system

System Common messages are sent to all receivers in the system. System Real Time messages are sent to synchronize devices that use MIDI Clock.

Used to synchronize the engineers.

Inclusive messages include the manufacturer's ID code.

format specified by its manufacturer

This is used to send any number of bytes of data according to the above.

• System Common Messages

Currently defined system common messages

Includes MTC quarter frame, song select

Song Position Pointer, Tune Re

Quest and the End of Exclusive

(EOX). MTC Quarter Frame Mesh

Sage is a software that allows you to connect MIDI equipment to audio or video equipment.

It is the part of the MIDI Time Code information used to synchronize other equipment, such as a deck.

Song Select messages allow you to select multiple different songs.

The Song Position Pointer is used by MIDI devices such as sequencers and drum machines that store and recall song data. The Song Position Pointer tells a sequencer to start playing at a place other than the beginning of a song.

Used to indicate a song position.

The value of the timer is from the beginning of the song to the point where you want to start.

This is the time in MIDI clocks.

The message is a system real-time message.

This can only be used with devices that recognize MIDI Sync.

This can be done.

Tune request messages are generally

Requires retuning of the oscillator inside the log synthesizer.

This message is generally used when requesting

It's not needed for digital synthesizers.

The EOX message indicates the end of a System Exclusive message, which can contain variable length data.

is used to inform

• System real-time messages

System real-time messages are sent in sequence.

It is used to synchronize all devices in a system that use MIDI Clock, such as keyboards and synthesizers.

Ignore most of the system real-time messages.
To help ensure accurate timing,
System real-time messages are
These 1-byte messages have priority over the System Real-Time Messages and can be placed anywhere in the data stream.
(It may appear between the status byte and the following data byte of a MIDI message.)
System real-time messages include
Clock, Start, Continue, Stop
Active sensing and system reset
There is a set message. Timing Clock
The message sets the tempo of the sequencer's performance.
It is the master clock that controls the timing clock.
The Start, Continue and Stop messages are used to control the playing of the sequencer.

will be done.
The active sensing signal is sent to the MIDI sequence
This occurs when the MIDI cable is disconnected during playback.
This is used to help prevent any "hanging notes" that might occur. Without active sensing, if the cable was removed while playing, any notes sounded by a Note On message would be played back with the corresponding Note Off message.
It keeps ringing forever because no message is sent.
It is possible that this could happen.
The System Reset message, as its name implies, is used to reset and initialize all devices that receive this message.

Messages are generally sent automatically by the sending device.
It is not sent and must be run manually by the user.
Must be.

• System Exclusive Messages

System Exclusive messages are
It is used to send data such as switch parameters and sample data between MIDI devices.
The manufacturer may provide system exclusive data
Manufacturers can define their own format for the purpose of identification. Manufacturers are given their own ID by the JMSC (currently AMEI) or MMA, and the manufacturer ID number is the serial number
As part of a system exclusive message
Currently used. Manufacturer ID followed by any size
The transmitted data is terminated with an EOX message.
The manufacturer may not use System Exclusive
They are required to publish details of their data formats, and other manufacturers are free to use those formats, but are prohibited from modifying them.
and must not be used in any manner inconsistent with the original manufacturer's specifications.
Some System Exclusive ID
numbers are not allowed.
These are reserved for other protocols.
Includes MIDI Show Control and MIDI Machine Control.
control, and sample data transfer between MIDI devices.
The MIDI standard defines a system exclusive data format for transmitting
There is a sample dump standard.

4.2.4 Running Status

MIDI data is transmitted serially, so originally
occurred simultaneously and were sent simultaneously in the MIDI data stream.
The multiple musical events that should be played may not actually be played at exactly the same time.
Each bit is 10 bits, and the transfer rate is 31.25K bits.
This means that the note-on/note-no
It takes about 1 ms to send a power off message.
This is generally a short enough time for multiple events to occur simultaneously. In fact, for someone playing a MIDI keyboard, if you press ten keys simultaneously, it will take about 10 seconds to play those notes.
The time difference between the two should not exceed 10 ms, which is known.
It will not be noticed.
However, the MIDI data sent from the sequencer
A beat can contain many parts. Depending on the beat, there may be many musical events that should occur simultaneously.
There may be a
The delay caused by
The MIDI data sequence being sent may be
To help reduce the amount of data, a technique called "running status" is sometimes used.
be.
Running status is a continuous message
Very often it's the same type of message.
For example, when you play a chord on the keyboard, ten consecutive note-on messages are generated.
A Note Off message is generated, followed by 10 Note Off messages.
Sage will continue. Use running status
If a message is
Same channel and time as the last message sent

Sent only when consecutive
The status byte of the message may be omitted (subsequent messages will only have the data bytes sent).

The effect of the running status is the note off
Instead of a message, a note with a velocity value of 0 is
This is enhanced by sending note-on messages, which will often be successively longer than the original note-on messages. Some MIDI controller changes, or the pitch bend horn of an instrument,
The movement of the Eel is a huge number of MIDI channel voices. Sometimes, a problem may occur and a running message may be generated, and the running status can be of great help in these cases as well.

4.3 Hardware

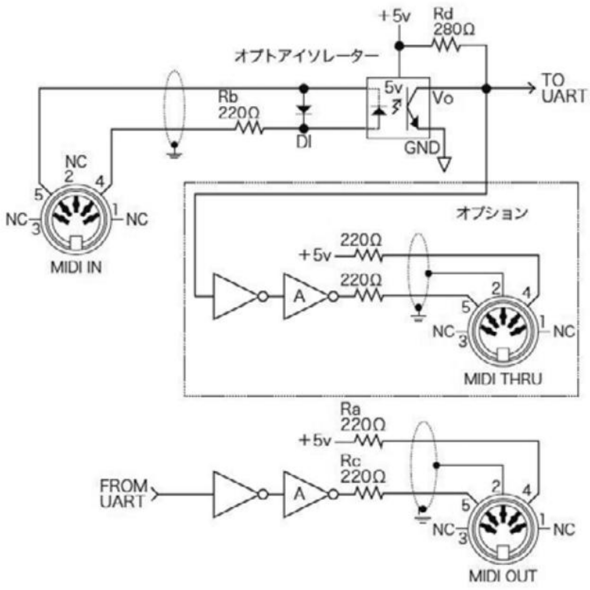
This standard uses an asynchronous serial transfer interface with a transfer speed of 31.25 kbit/sec (± 1%). The transfer consists of eight bits: a start bit, bits 0 to 7, and
A total of 10 data bits, followed by a stop bit.
The transfer is done in bits and takes 320 ÿs to transfer one byte, where the start bit is a logic "0" and the stop bit is a logic "1".

The circuit is a 5mA current loop type.
A logic "0" is a state in which current flows.
A transmitter circuit drives only one receiver circuit.
Avoid loops and the resulting data errors
In order to achieve this, an opto-isolator is used in the receiving circuit to electrically separate the transmitting circuit from the receiving circuit. The receiving circuit must be activated with a current of 5 mA or less, and the rise and fall times must be less than 2 ÿs.

The connector used is a 5-pin DIN (180°). Both transmission and reception must use sockets (female) on the device panel, and must be marked "MIDI OUT" and "MIDI IN" respectively. Pins 1 and 3 must not be used, and must be left open (NC) for both transmission and reception. Pin 2 must be grounded only on the transmission socket. (See Figure 4.4)

The connector to which the MIDI IN jack shell is connected should be grounded to the circuit or chassis ground to avoid ground loops. It is best not to connect it to the ground.

If the MIDI THRU information comes from a MIDI IN signal, the lower part of the signal between the rising and falling points of the square wave is



MIDI 標準ハードウェア (回路図)

＜備考＞
1. ゲート"A"は、集積回路またはトランジスターである。
2. 抵抗は、±5%。また、Rdは使用するオプトアイソレーターに依存する。
3. DIは、ダイオード。

Figure 4.4 MIDI terminal specifications

This signal drop can cause inaccuracies.
These timing errors are due to the response time of the opto-isolator. These timing errors tend to increase in proportion to the number of devices connected between the MIDI THRU and the MIDI IN jack. This is a lack of circuit quality, and no matter how high-performance components you use, there is a limit to the number of devices you can connect in series with the MIDI THRU. This indicates that.

The MIDI cable must be a shielded twisted pair with a maximum length of 15m, with 5-pin DIN plugs (male) on both ends (SWITCH CRAFT 05GM5M, etc., can be used for this standard). The shield must have pin numbers 0 and 1 on both ends. The power supply must be connected to No. 2.

If necessary, an output terminal labeled "MIDI THRU" may be provided. This will output the MIDI IN signal in its original form. In order to connect more than three devices in a long chain using MIDI THRU, a faster opto-isolator should be used to reduce the time difference between the rise and fall of the signal.
Errors need to be prevented.

Reference: Association of Musical Electronics Industry (AMEI): MIDI 1.0 standard

5ÿThe Emergence and Development of MIDI Instruments

MIDI was officially launched on August 25, 1983 with the publication of the Japanese version of MIDI 1.0 specification.
In the 1980s, new electronic instruments appeared one after another.
This was the catalyst that expanded the market for musical instruments at once, and electronic musical instruments became popular worldwide on an unprecedented scale.
MIDI became popular among the general public.
Audio recorders, lighting and video equipment, etc.
It has penetrated into the realm of technology and has created new forms that no one could have imagined.
This has led to him producing music and composing sounds, as well as creating complete live performances.

5.1 Early MIDI Instruments and Confusion

When MIDI was first introduced in 1983, the synthesizer manufacturers who had been instrumental in establishing it immediately announced new MIDI-compatible instruments one after another, expanding their lineups. In just the year 1983, a series of electronic instruments appeared that foreshadowed the trends in instruments to come, making it truly the start of a new era.

Sequential Circuits is an analog synth company.
In 1990, Yamaha released the Prophet-600 (Fig. 5.1) and Prophet-T8 (Fig. 5.2). The former gained popularity as a great machine that achieved cost reduction, while the latter was suitable for a professional synthesizer and featured a velocity control function that changed tone and volume depending on the key touch by using piano-touch keyboard, which was a rare model at the time.

Figure 5.1 Sequential Circuit Prophet-600

Figure 5.2 Sequential Circuit Prophet-T8

Roland released two analog synthesizers in succession: the JUPITER-6 in February (Fig. 5.3) and the JX-3P in April (Fig. 5.4). The former was a sibling model of the legendary JUPITER-8, while the latter was a mid-priced model with digitally controlled pitch.

Of these, the Prophet-600, JUPITER-6, and JX-3P were the three models that were introduced at the NAMM 2007 held in the United States in January 1983.
At the show, it was the first MIDI synthesizer in history.
The devices were connected with MIDI cables, demonstrating that they could communicate with each other regardless of manufacturer.

Figure 5.3 Roland JUPITER-6

Fig. 5.4 Roland JX-3P

In the same year, Yamaha simultaneously announced the DX1, DX7 (Fig. 5.5), and DX9 digital synthesizers with extremely revolutionary specifications.
The innovative sound source and advanced MIDI technology
With its groundbreaking specifications, the Yamaha DX series dominated the synthesizer industry. The DX7 in particular became a globally renowned machine that sold explosively and played a major role in the music scene of the 1980s.
This sparked a synthesizer boom.
The birth of MIDI in 1983 is also remembered as the beginning of the digital synthesizer era.
This is what happened.

Figure 5.5 Yamaha DX7

MIDI instruments were not limited to synthesizers. Roland also began offering MIDI instruments for the home.
In May, the first electronic piano compatible with MIDI was released.
The HP-400 (Fig. 5.6) and HP-300 were released in July, followed by the PR-800 home MIDI recorder (Fig. 5.7) in July, and the PB-300 MIDI-compatible auto-accompaniment unit (Fig. 5.8) in August. These showed that MIDI could be widely accepted in ordinary households as one of the functions installed in home-use musical instruments. Thus, MIDI was born.

Figure 5.6 Roland HP-400

Fig. 5.7 Roland PR-800

Fig. 5.8 Roland PB-300

In the year 1983 alone, many MIDI instruments appeared, foreshadowing the diverse evolution of musical instruments that followed.

However, immediately after MIDI was born, although the MIDI standard had been published, it was not fully developed, and there were differences in interpretation among manufacturers and resulting confusion.
In fact, the first MIDI was introduced at the NAMM show in January 1983.
As a communication experiment, sequential circuits
When I connected the Prophet-600 to a Roland JUPITER-6 or JX-3P via MIDI, note information was sent and received correctly, but pitch bend information was not interpreted as octal or hexadecimal.
There was a difference in the interpretation, and it didn't work properly.
Thanks to the practical application of MIDI, electronic musical instruments have begun to evolve at an unprecedented rate, but if we leave things as they are, each manufacturer will continue to develop products based on their own interpretations based on their past experience.
In order to break through this situation, we have unified the interpretation of MIDI and resolved the confusion.
Detailed rules were then decided one after another to make this happen.

For example, control changes were defined in detail to prevent any differences in interpretation. Also, with regard to MIDI synchronization, there was a time lag in the timing when a song started after receiving a START message (FA) or STOP message (FC), but this was also corrected by MIDI.
The problem was solved by providing details in the standard.
In some cases, there was a need to leave a small gap between the signals due to unique exclusive messages corresponding to initial signals, but as this was a matter of the manufacturer's own operation, it was not absorbed by the MIDI standard, but was avoided by actually leaving a gap between the signals.
Active sensors, as part of MIDI
There was even discussion about the usefulness of the technology, but the debate was calmed when Roland's Sakai Tadao explained, "Active sensing is easy to understand if you think of it as being like smoking. Once you start smoking, you have to keep smoking for the rest of your life, but people who don't smoke don't have to smoke."

In addition, sometimes the manufacturer's instructions are misleading. For example, in the explanation of the checksum calculation when sending and receiving a system exclusive message, it was stated that the remainder of dividing the total data by 128 was used, and the checksum was 128 - (negative) remainder. However, with this calculation method, when the remainder is 0, the checksum becomes 128,

Channel Voice Message Note Off
These were largely resolved by quickly revising the explanatory documents, but some of them were
It took time to understand and revise some of the issues.
In such cases, please check with the manufacturer or the program that handles MIDI.

Marketers and users solve the problem independently from their own perspective.

I went.

On the manufacturer side, the MIDI Standards Council has issued the NEC PC-9801, MPU-401 and software-driven MIDI app

A analyzer is provided (see Figure 5.9) and is compatible with standard tools.

This MIDI analyzer can analyze a variety of

The error check function allowed me to easily perform MIDI tests, which helped me understand the situation and correct errors.

The problems were solved.

On the other hand, MIDI programmers and users are the first to

In some cases, they came up with workarounds.

As the level of expertise of programmers increased, workarounds spread as know-how over the early days of computer communication, and information on how to handle MIDI and libraries used by programmers were developed.

By doing this, the problem naturally resolved itself.

Figure 5.9 Provided by the MIDI Standards Council
MIDI Analyzer Instruction Manual (Cover)

Ignoring the confusion that is unique to the early days of MIDI, I focused on the benefits of MIDI to the maximum extent possible and developed this new communication

The benefits of the protocol can be most effectively utilized.

Yamaha used it for marketing purposes.

In 1984, the year after the birth of MIDI, Yamaha was on a roll.

Yamaha developed a diverse lineup of MIDI instruments. Representative products include the fully digital rhythm machines RX11 (Fig. 5.10) and RX15, which used PCM sound sources, and the professional-grade digital sequencer QX1 (Fig. 5.11). Furthermore, the company named the diverse lineup of Yamaha MIDI instruments, including these, by taking the last letter of the model number.

Named the X series, it has a design that exudes a sense of series

Both of them created a unified look for the entire X-series and launched it into the music industry. Yamaha developed its marketing by emphasizing the benefits of MIDI compatibility, that is, by building a system that can be connected in any direction and in any direction, you can create and play music entirely with their own products.

The X-series offers new possibilities that only digital can offer.

It made a strong impression as a lineup of MIDI instruments that boasted superiority and was generous in incorporating cutting-edge technology, and it demonstrated a major presence in the musical instrument industry.

Figure 5.10 Yamaha RX11

Figure 5.11 Yamaha QX1

5.2 Diversification of musical instruments in terms of form and sound source method

Once electronic musical instruments became compatible with MIDI, they began to show new developments that had never been imagined before.

The development that MIDI has made possible is in the form and sound source.

It is a matrix-like evolution based on two coordinate axes,

It allows for a wide variety of sounds on a scale never before seen on any other instrument.

It was transformation.

Below, I will explain along these two axes. First, let's look at the diversification of forms.

5.2.1 Diversification of forms: master keyboards and sound sources Module Since

its creation in the era of Wagner, acoustic instruments have not changed much for about two hundred years.

Conventional electronic musical instruments have been transformed into functional instruments by MIDI.

They are differentiated by function and then reorganized according to purpose.

Here, the first thing to note is that the shape of the instrument has diversified.

Specifically, we will look at the

The synthesizer evolved into a separate keyboard section and a sound module, each of which is an independent MIDI instrument.

This will continue to happen.

First, the keyboard, which is the input interface,
In April 1984, the company launched an 88-key wooden piano-type
In January 1985, Yamaha released the KX88 (Fig. 5.13), which also had an 88-key piano-type keyboard. By making the keyboard section independent, these models no longer had a sound source.

The models are Master Keyboard and Mother Keyboard.
board or MIDI keyboard controller
It was called.

Fig. 5.12 Roland MKB-1000

Fig.5.13 Yamaha KX88

On the other hand, by removing the keyboard, only the sound source part remains.
The master keyboard and the sound module were called MIDI sound modules. The sound module was a specialized instrument dedicated to generating and producing tones. The master keyboard and the sound module are shown in Figure 5.14.
They can be used in combination via MIDI connection.
It was.

Another application is the construction of a system that utilizes the "MIDI THRU" function. Many MIDI sound sources have a "MIDI THRU" function that outputs the input MIDI signal as is.
It is equipped with a "THRU" terminal, which allows
MIDI sound sources can be connected in a chain to create a single MIDI signal.

It became possible to play multiple MIDI sound sources using a single signal. These functions only MIDI can provide made it possible to combine and play multiple synthesizers using just one master keyboard, or to replace only the sound source section while leaving the master keyboard unchanged. This created a beneficial situation for performers in terms of space saving and cost, because sound source modules, which do not have a keyboard, could be sold compactly and inexpensively.

The MIDI sound module was developed by Laurent in September 1984.
Then, Sony released the MIDI sound source MKS-80 (Fig. 5.15).
The MKS-80 is an eight-voice analog polyphonic synth.
The TX816 (Fig. 5.16), another MIDI sound source, was released by Yamaha in December 1984. The TX816 consisted of eight TF1 FM sound source units, equivalent to the DX7, arranged in a rack, and was priced at 890,000 yen.

Fig. 5.15 Roland MKS-80

Fig. 5.16 Yamaha TX816

5.2.2 Diversification of forms: the keytar

The ability to separate the keyboard section from the sound source section has led to the evolution and development of some electronic instruments. One such instrument is the keytar (a portmanteau of keyboard and guitar; it is also called the shoulder keyboard).
The keyboard part is separated and used as the keytar body.
This allows for a smaller, lighter instrument, and as a result, the keys are like those of a guitar.

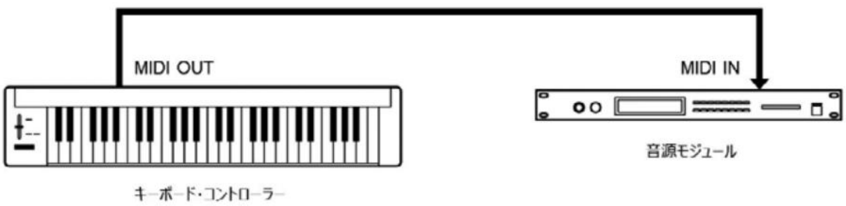


Figure 5.14 Mother keyboard (keyboard controller) and sound module

The play style is that the board part is hung from the shoulder and the sound is generated from the sound source part connected to the main body with a MIDI cable (or wirelessly transferred MIDI signals).

This made the project a reality.

Keyboard instruments that are hung from the shoulder and played were around before the advent of MIDI.

There were other models, but they were too big and heavy.

For these reasons, it was not very practical and was only used by a small number of people.

This made it possible to make the keytar smaller, and as a result, Keyboardists are limited to instrument positions on stage.

without being overlooked, just like a vocalist or guitarist.

This makes it possible for performers to move around on stage and perform.

Yamaha released the KX1 (Fig. 5.17) as a MIDI-compatible keytar in July 1983. It had 44 keys, weighed 6 kg, and was expensive at 200,000 yen, but the KX5, released in May 1984, had almost the same functions but was lighter at 3.7 kg by using 37 small special keys. It also had improved functionality, such as the ability to use two different sound sources by switching MIDI channels, and was priced at 65,000 yen, making it a popular model.

In 1984, Korg released the 41-key model RK-100 (Fig. 5.18) was released, and Roland also released In November, the AXIS-1 (Fig. 5.19) was released, which evolved into today's AX series, with the latest model, the AX-Edge (Fig. 5.20), released in 2018.

5.2.3 Diversification of forms: The rise of standalone MIDI sequencers

A MIDI sequencer is a device that

MIDI is an electronic musical instrument that can store and play back musical performance information. Today, this function has been completely replaced by applications that run on computers, smartphones, tablets, etc., but in the 1980s, it was a standalone sequence.

These standalone sequencers were

By supporting MIDI, it is now possible to handle it much more easily than before.

There is now a lot of information available.

Roland released the MSQ-700 (Fig. 5.21) in March 1984, priced at 158,000 yen.

No data was uploaded, and data was backed up using cassette tapes.

The MSQ-700 was not only compatible with MIDI, but also with the previously used Roland proprietary DCB (Digital Communication Bus), a major feature unique to this transitional period.

Equipped with a 3.5 inch 2DD floppy disk drive

In 1984, Yamaha released the QX1 (see Fig. 5.11), which was equipped with a 3.5-inch 2DD floppy disk drive.

Fig. 5.17 Yamaha KX1

Fig. 5.18 Korg RK-100

Figure 5.19 Roland AXIS-1

Fig. 5.20 Roland AX-Edge

Figure 5.21 Roland MSQ-700

Fig. 5.22 Roland MC-500

The successor model, the QX3 (Fig. 5.23), released in 1987, was a lower-cost model priced at 158,000 yen.

Fig. 5.23 Yamaha QX3

5.2.4 Diversification of forms: standalone MIDI rhythm machines

The 1980s was a time when standalone rhythm machines were popular. Roland released the first MIDI-compatible rhythm machine, the TR-909 (Fig. 5.24), in December 1983, and in 1988 released the R-8 (Fig. 5.25), which used a fully PCM sound source.

As mentioned above, Yamaha has adopted PCM sound sources throughout its

Fig. 5.24 Roland TR-909

Figure 5.25 Roland R-8

In 1984, the company released the RX11 rhythm machine (see Fig. 5.10), which had a revolutionary 100 voices in 1987.

The company has released the RX7 (Figure 5.26) equipped with this system.

Figure 5.26 Yamaha RX7

5.2.5 Evolution and diversification of sound source methods: samplers, etc.

In parallel with the diversification of sound

source formats, the digitalization of synthesizers has progressed, and in particular the digitalization of the sound source section has made it possible to obtain innovative new tones that were previously impossible.

MIDI instruments give MIDI a powerful boost

This will lead to widespread adoption.

Sampling was first put to practical use, and by directly inputting external sounds into the internal memory of the instrument, it became possible to obtain realistic sounds that had never been possible before. This gave rise to a series of new types of instruments known as samplers.

When musical instruments were born, only analog synthesizers existed.

This brought a breath of fresh air to the electronic musical instrument industry, which had not seen a breakthrough before. As a result, samplers began to be used in professional recording studios right before the birth of MIDI, and sampled sounds were first used in rhythm machines.

A PCM sound source with the colors burned into a waveform ROM was adopted.

That's what happened.

Later, in 1985, the American manufacturer Ensoniq began selling the Mirage (Fig. 5.27) in Japan. At the time, a single sampler in the industry was costing over 2 million yen, but this model attracted a lot of attention with its price of less than 400,000 yen (less than US$1,700 in North America), and literally became the center of attention.

Equipped with MIDI, it was a pioneer of the digital age.

Also in 1985, Akai released the S612 (Fig. 5.28), and in 1986 the S900 (Fig. 5.29).

The latter is especially popular due to its overwhelming cost performance.

It became the de facto standard in the sampler industry.

As mentioned above, 1983 was the same year that MIDI was born.

In May of the same year, the revolutionary Yamaha DX7 (see Figure 5.5) was released.

Figure 5.27 Ensonic Mirage

Figure 5.28 Akai S612

Figure 5.29 Akai S900

It was released for 248,000 yen and was featured in FM synthesis, with its innovative tones, became a big hit as a new generation synthesis method. The following year, Casio released the CZ-101 (Fig. 5.30) for 89,000 yen. It had a mini keyboard, a unique triple power supply system that could be powered by batteries or a car power source, and a compact body with FM.
It is packed with digital PD sound sources, and then
The OZ series became a worthy rival to the Yamaha X series.

With the appearance of the two major digital synthesizer lineups, the Yamaha DX and the Casio CZ, the market seemed to be dominated by digital equipment, but in February 1984, the same year as the CZ-101, Roland released the low-priced analog synthesizer JUNO-106 (Fig. 5.31).

Figure 5.30 Casio CZ-101

Figure 5.31 Roland JUNO-106

With its unique sounds and MIDI compatibility, and its low price of 138,000 yen, it has greatly increased sales.
I was doing it.

Then, four years after the DX7, in March 1987, Roland's first digital synthesizer was released.
The D-50 (Fig. 5.32) was equipped with a newly developed LA sound source. By layering sampled waveforms and analog synthesizer-like sounds produced by digital calculations, it produced a completely new sound that had never been heard before, which caused a big stir. As a result, the D-50 spread like wildfire, and every new
Many of the songs used the D-50 sound.

The following year, in 1988, Korg's digital synthesizer M1 (Fig. 5.33) was equipped with an AI sound source, boasting unparalleled realism among consumer devices, and it also produced a wide range of colorful PCM sound source Music Works.
As a promotion, it will sell in unprecedented quantities.
Arrived.

Fig. 5.32 Roland D-50

Figure 5.33 Korg M1

In the 1980s, many other manufacturers besides those mentioned above
Then, MIDI instruments using various sound source methods were born.
These various new synthesizers and samples
All of these games sold explosively, with many of them selling over 100,000 units individually or across the entire series.
He made a significant contribution to the popularization and development of MIDI.

5.2.6 Customizing the playing environment with a variety of MIDI instruments

With the advent of MIDI, musical instruments began to be differentiated according to function, and many MIDI instruments with their own unique sound source methods appeared.
You can now freely combine and use them according to your preferences and needs.

With the release of a wide range of products, including sequencers, standalone rhythm machines, and even MIDI-compatible effects, you can choose from a wide variety of options and combine them together. At the same time, various sound source methods were released one after another. When it comes to leasing, each manufacturer strives to differentiate themselves As a result, each sound source method has a strong individuality in the tone. Therefore, if you know which sound source system is used, you can imagine what kind of sound will be produced. You can also choose your favorite sound source format here. It is now possible to do this.

Sequencers and rhythm machines also use MIDI. Thanks to this compatibility, not only can performance information be sent and received, Synchronization between MIDI instruments became important. The MIDI standard already had start/stop and clock information defined from the beginning, so The need for MIDI instruments to synchronize with this has gradually increased. For example, by supporting MIDI clock, you can apply a vibrato with a period that corresponds to the tempo of the music, or a dotted eighth note delay that is synchronized with the tempo. Such is the case.

This allows you to create a network that combines various MIDI instruments. Twerk is a popular This led to further evolution of the instrument.

5.3 Further evolution: the rise of multitimbral

The next step in the evolution of MIDI instruments was the introduction of multi-timbral functionality. As explained in Chapter 4, multi-timbral functionality allows multiple sounds to be played simultaneously from a single MIDI sound source, and each sound can be played individually. Synthesizers, samplers, etc. can be connected to MIDI sequences. When used in conjunction with the MIDI controller, you can recreate an entire band performance on a single synthesizer, or a large symphony. Reproduce an orchestra performance with a single sampler I was able to do that.

As musical instruments have evolved, MIDI and multi-timbres The bar played a crucial role.

First of all, multitimbral is what made MIDI so unique. Harimoto took the technology to a whole new level and popularized it. This led to the MIDI standard being a mere remote Beyond operational network realization and communication protocols, Let the Zar soar into a new musical world like never before. This became the driving force behind the move.

And without MIDI, the development of multitimbral instruments would have been much slower. Thanks to As explained in Chapter 3, it was the American manufacturer Sequential Circuits that proposed incorporating this specification into MIDI. The Shall Circuit is the first multi-timbral He had a vision of developing a type of synthesizer, but he struggled to sneak this idea into the MIDI standard unobtrusively and without it being stolen by other companies.

Then, with multitimbrality as the new axis, musical instruments will evolve to the next stage. In other words, after the differentiation according to function that had progressed up until then, musical instruments will be reorganized and integrated into various new forms, and will meet the needs of the next generation. New instruments were born one after another to meet these needs.

5.4 Emergence of a new instrument through reorganization: a new form of integrated sound source sequencer

In the 1980s, a single MIDI-compatible keyboard, Source module, sequencer, rhythm machine, effect As a result of the release of many new games, The age has come when people can create and play music by using MIDI. MIDI has been extremely useful as a common language that connects musical instruments released by various manufacturers both in Japan and overseas. did.

As more people began to use MIDI instruments to create music, the image of the sequencer, which had previously been that of a specialized device, began to change to something more musical and easy to use. And it needs to be easy to use even for beginners. That's when the sound source with built-in sound was born. This new type of sequencer is a built-in source. The key to realizing MIDI instruments was a multitimbral sound source, and these integrated sound source sequencers led to a dramatic increase in the number of MIDI users.

First came functionally factorized instruments. Of these, the keyboard, sound source, sequencer, and depending on the model It also integrates rhythm machines and effects into one device. It was an all-in-one synthesizer.

In 1984, the year after MIDI was born, Circuits is the first MIDI compatible multi-tone The bar-type synthesizer SIX-TRAK (Fig. 5.34) was released. This model is a 49-key, 6-voice polyphonic 6-part MIDI instrument. Multitimbral analog synthesizer,

A combination of 6 tracks and 800 sounds sequencer
The memory capacity of 800 notes was not enough for serious music production, but the company was able to
I ran a sequencer on the computer and then
We also propose a music production system that drives TRAK.
So, the problem is solved.

Fig. 5.34 Sequential circuit SIX-TRAK

In 1986, Ensoni, also a US manufacturer,
The K is an all-in-one digital synthesizer.
The ESQ-1 was released. This was a keyboard-type synthesizer that used a 61-key, 8-voice polyphonic, 8-part, multitimbral PCM sound source driven by a built-in 8-track sequencer with 24,000 sounds.
This model has a built-in sequencer with a note capacity of
This was an exceptionally large number at the time, and it allowed the artist to create music on his own without the need for an external computer.
This is in fact the industry's first all-in-one synthesizer.
It is no exaggeration to say that.

In 1988, Korg released the aforementioned M1 (see Figure 5.33).

It is a PCM synthesizer with 8 tracks and a maximum of 7,700 sounds, and also has two built-in digital multi-effects.

It was an ambitious work. When the company launched the M1,
The realism and high quality of the sounds produced by the ai sound source, and the inclusion of powerful effects, all in one unit, made the M1 a success. However, the reason it was successful was not only the clarity of being able to create sounds and write songs in a self-contained environment, but also the fact that the M1 was an "all-in-one synthesizer."
Instead of calling it a "music workstation,"
Calling it the "Sonic" would have given a strong impression that a new generation of instrument had been born. This marketing success
As a result, the M1 surpassed previous sales figures for synthesizers.
This set a new record by drastically breaking the previous record, and the term "workstation synthesizer" became firmly established as an instrument for music production.

Various types of workstations are available from the car.
This will be manifested.

In this way, by integrating the sound source and the sequencer, it became possible to play the instrument by itself as long as the performance data was preprogrammed.
In the 2000s, technological innovation led to miniaturized workpieces.
This made it possible to create a portable music station that could be carried anywhere, regardless of location. The QY10 (Fig. 5.35), released by Yamaha in 1990, became a hit product that made the most of the benefits of this "integration" and "compactness."

there were.

The QY10 was a small, 8-track machine with 30 tones and one drum kit built in, in a compact size the size of a VHS video cassette, which was revolutionary for its time.
Equipped with buttons that can also be used as a mini keyboard.
Its easy-to-use design, such as the use of
This, combined with the fact that I had no experience with sequencers or electronic instruments,
It was also popular among vocalists and guitarists who had never used the MIDI controller before as a composition and practice tool.

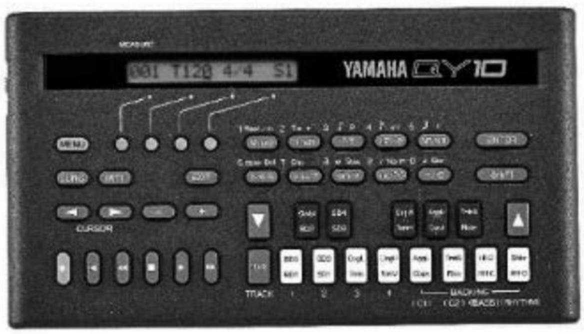


Fig.5.35 Yamaha QY10

Then in 1996, Roland asked me to
Specializing in the techno/house music that was gaining popularity
The MC-303 (Fig. 5.36) was released, featuring the latest sound source.

Fig. 5.36 Roland MC-303

Includes a wide variety of unique bass sounds and rhythm patterns He became a driving force behind the global popularity of dance music, which shifted the focus of music from melody to rhythm (groove).

As various tone generator-integrated sequencers were born, a new category of electronic musical instrument called the arranger keyboard, which applied workstation technology, appeared overseas. Workstation synthesizers focused on music production, allowing for full-scale sound creation and the programming of a wide range of performance data.

On the other hand, the arranger keyboard is a live performance It was a musical instrument specialized for performance, and had a full range of automatic accompaniment functions and various functions to support performance in real time. For example, by connecting a microphone, you could record vocals while playing the instrument. Mix it with the accompaniment and output it from the speaker. Add echo to Rika's voice and even pitch shift The pitch is then recorded as MIDI sequence data. By controlling the keyboard with the MIDI controller, it is even possible to add choral parts in real time while playing.

They are performed in places such as restaurants and hotel lobbies, and are also performed by amateurs. Even if a band doesn't have a drummer or bassist, It was used for live performances at night or for solo singing and playing, and many users were born, mainly in Europe and the United States, and there were also professionals who made a living from playing it.

In 1988, he was appointed arranger by Roland. The E-20 board (Fig. 5.37) was released overseas first, and because it used the LA sound source that had first appeared in the D-50 released the previous year, it quickly became a popular model. Arranger keyboards then flourished as a large market overseas, and Yamaha has been selling powerful flagship models with extremely rich expressive power since 2002 as the Tyros series (Fig. 5.38).

This category has given birth to arranger keyboards that have evolved in a unique way, not only in Europe and America, but also in the Middle East. These are called Oriental keyboards, and a representative model is the KORG 2017 model. The Pa700 Oriental (Fig. 5.39) and other models are available. All of these models are equipped with accompaniment data that is specific to the cultures of various parts of the Middle East, and a tuning function that allows the tuning of each key individually and precisely to be adjusted to suit the scales of various ethnic music.

Arranger keys specific to these regions The movement to develop, manufacture and sell boards continued after that. It has expanded to include models for Latin American and Latin music, as well as China and India. Models for emerging markets such as the 1960s and 1970s, as well as MIDI music data focusing on folk music in specific markets such as Southeast Asia and popular music in those regions, were created and distributed, and the market is still expanding today. There is.

Figure 5.37 Roland E-20

Fig. 5.38 Yamaha Tyros

Figure 5.39 Korg Pa700 Oriental

There are also attempts to cross genres rather than specializing in a particular region. In 2003, Roland released a keyboard called the DisCover 5 (Fig. 5.40) to meet the needs of the cover band culture that had spread widely and deeply across Europe. This model could easily and semi-automatically convert SMF data (described below) into a genre so that you could play your favorite songs in your favorite genre, for example converting a hard rock song into techno.

Figure 5.40 Roland DisCover 5

Machine Translated by Google

5.5 The evolution and change of music brought about by early MIDI

As we have seen, musical instruments have made great strides since the birth of MIDI. For now, let us take a look back at the impact and significance that MIDI has had on musical instruments and the music industry up to this point.

The birth of MIDI has brought about three major changes and evolutions in music.

"Liberation of the creative profession," and "Increase in the number of music producers."

5.5.1 Non-real-time nature of music production

The act of creating music used to be a real-time art based on live performance.

Playing on a sequencer or rhythm machine without performing live

The realization of a technique called "programming," which involves storing performance information, has made it possible to program performance information for multiple parts, play it back, and then examine phrases and tempos based on that, creating a non-realistic approach

MIDI brought about the idea of composing in time.

5.5.2 Freedom from having to learn how to read and write music and how to play it

At the same time, it also means that music, which was previously limited to those who could read and write music or who had acquired the skills to play an instrument, can now be composed and performed by anyone, regardless of their knowledge of music or the skills to play it.

Liszt also plays the rhythm part in the background.

It became possible for a single person to play a full band ensemble.

That was no longer necessarily necessary.

5.5.3 Increase in the number of

music producers If this situation occurs, it will be inevitable that people will start to think, "This rhythm is cool," or "This phrase feels good."

These sensory elements are then transformed into concrete rhythms and phrases.

It is possible to convert directly.

With MIDI, all you need is a good musical sense.

This has become an age where anyone can make music, and it has been a major factor in expanding the number of people around the world who want to present music as a form of self-expression. These trends have made even greater advances with the combination of MIDI and computers.

I ended up losing my job.

5.6 Beyond Instruments: The Emergence of a New MIDI World

As MIDI spread and penetrated deeper into the music market,

Things other than musical instruments are now also MIDI compatible.

First, standalone effects became MIDI-compatible, allowing previously unthinkable remote control and automation of parameters. Lexicon's standalone reverb PCM70, released in 1985, could be controlled from an external MIDI keyboard.

MIDI messages such as velocity and aftertouch

Real-time adjustment of reverb time etc. according to the

It was possible to do so.

The next step was the mixer. In 1987, Yamaha released the DMP7 (Fig. 5.41), an 8-channel professional digital mixer with MIDI programmability.

Switch scene memories by receiving a change

This allowed the mix balance to be changed at any time.

This idea quickly spread,

Various mixers and audio recorders

Scene memory allows you to adjust the mix balance

You can memorize the scene and switch between them via MIDI.

I can do it now.

Fig. 5.41 Yamaha DMP7

In January 1996, Roland released the VS-880 V-Studio digital studio workstation (Fig. 5.42).

Rack audio recorder at its core, 8 channels

Panel mixer, built-in effector option,

After mastering, the CD is burned to an external CD drive.

This model packed an entire recording studio, including a burning function, into an attaché case-sized unit.

You can also build a system that synchronizes with external devices via MIDI.

This series is named after V-Studio.

In addition, it provides the best environment for home recording.

He became a rising star in the recording industry.

Fig. 5.42 Roland VS-880

Figure 5.43 Roland VM-7000 series

In September 1999, Roland released the VM-7000 V-Mixer. The series (Fig. 5.43) was released. It adopted a separate concept in which audio was processed by rack-mounted input/ output modules and mixing was performed on a dedicated console installed in a separate location. This allowed the audio to be digitized over the shortest possible distance to avoid noise. This allows the recording studio to record live From mixers to PA on concert stages Not only the audio equipment, but the entire mixing environment is now digitalized and can be controlled via MIDI.

Furthermore, MIDI is not only used for music, but also for lighting and video equipment. It spread all over the world. As for lighting, It gave way to standards such as DMX to accommodate larger settings such as stadiums, but the time-honored MIDI is still used in various cases, such as for switching between scenes, and in 1991 a standard called MIDI Show Control was established that also included stage equipment such as smoke.

As an example of control over video equipment, Examples include V-LINK and MIDI Visual Control. V-LINK is a system that Roland developed to link MIDI instruments with video equipment. This is a MIDI function designed to control Based on this, MIDI Visual Control was standardized to increase versatility and make it available to all manufacturers. It is.

V-LINK was first adopted in October 2002. The Roland MC-909 (Fig. 5.44) was released in 1999. This was a further expansion of the integrated sound source sequencer. It is a desktop workstation with a master Not only can you compose and perform music, including chords, The V-LINK function allows you to connect to the company's video equipment via MIDI. This makes it possible to control video clips and add video effects in real time while playing the MC-909, enabling comprehensive direction in live performances.

It became.

Fig. 5.44 Roland MC-909

In June 2005, the company released the CG-8 (Fig. 5.45), the first mass-produced MIDI-compatible video synthesizer in history, under its Edirol brand. Not only can you generate video with By capturing the images and mapping them onto various virtual objects, it is possible to generate and even change video in real time. It is also possible to freely "play" videos live by controlling the device itself or an external MIDI instrument. It happened.

Figure 5.45 Roland CG-8

The advent of these diverse categories of MIDI equipment has enabled recording studios to automate many tasks and has made MIDI even more widely available on the concert stage.

The total production of sound, lighting, and video is done by MIDI.

He began to become weak.

5.7 DTM and Online Karaoke: A new dimension in music created by MIDI and multitimbres

The most unusual thing that MIDI has done is to create DTM and

When musical instruments became multi-timbral and were linked to the networks that digital communication allows, a whole new dimension of market was created. The biggest difference from the conventional musical instrument market is that people who do not play musical instruments can now compose music.

The ability to actively and proactively participate in musical performances.

People who were not musicians can now become players, composers, and performers, and even take the lead role in all of this. We will look at this movement in more detail in the following chapters.

6 | Personal Computers and MIDI

Since the invention of the computer, performance has improved and the In the 1970s, the personal computer Computers appeared, and individuals began to own computers. The age had come when people could easily enjoy electronic musical instruments. Thanks to the efforts of engineers, electronic musical instruments were also becoming relatively easy to enjoy. The establishment of MIDI in this era made it possible for musical instruments and personal computers to communicate through this common standard. This encounter was a turning point for the unique music culture in Japan in particular. This is how the system is formed.

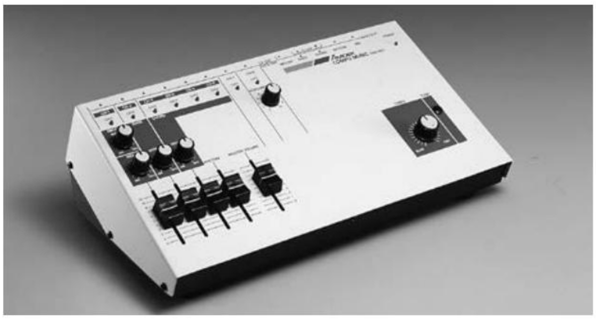


Figure 6.1 Roland CMU-800

6.1 Computer Music before MIDI

Personal computers (PCs) are registered From the very beginning, various ideas were incorporated into the It also had a function to play back the sound, but the computers at the time The sounds that could be pronounced were limited to relatively simple sounds. In the community of hack users, Texas Instruments, used in game consoles of the time Install a sound chip such as the SN76477 from the company or the AY-3-8910 from General Instruments in your computer to produce sound. There were some strong players, but for many users, it was a little difficult. Still, there were users who dreamed of playing music on a computer, and recording methods such as MML (Music Macro Language) were proposed, making it possible to play the same music on different computers.

In those days, Roland released the CompuMusic CMU-800 (Fig. 6.1) under the AMDEK brand. The CMU-800 was a product that combined a main unit with a built-in tone generator and an interface provided by each computer manufacturer.

Sequencer based on the Roland MC-8/MC-4 The software was sold separately. The main unit had melodies. 1 note, 1 bass note, 4 chords plus rhythm Bass, snare, low tom, high tom, cymbals, Seven notes: open hi-hat, closed hi-hat It was equipped with a number of features, which made it completely different from the simple sounds that computers could produce up until then. In addition, the software editor allowed users to create, save, load, and play their own music. The music stored on the computer can be read and played on other computers. This made it possible to exchange music data with friends.

6.1.1 Supporting sequence software for CMU-800 Two ideas

Supports sequence editor software for CMU-800 The solution was to combine two main ideas. It is the ST/GT method for note input and the The ST/GT method stands for Step Time/Gate Time, and as mentioned in Chapter 2, this determines the timing at which a note will sound and how long it will sound.

It is a numerical representation of the MIDI signal, and was used mainly by Loran before MIDI. It has been used by

On the other hand, the Rhythm Pattern Editor was developed in MIDI Rhythm Maps and Pattern Editing First, the CMU-800 was Since it can handle rhythm, I decided to use this editor software. There was one feature in the CD. It was called Track 0. It was what you might call a matrix pattern editor. There is also a Track 9 that determines the order in which the patterns are played. A similar concept was beginning to be implemented in hardware rhythm editors, but it was made easier to use on the large screen of a personal computer. This was the first time it had been implemented.

Also, when MIDI was being formulated, the concepts of multi-part and multi-timbral were not yet clearly defined, much less was it thought possible to handle rhythm instruments. How to control and produce sounds with many instruments such as rhythm instruments on 16 channels was thought to be a long way off, when the instruments were just about to be able to communicate with each other, and MIDI was not trusted during its formulation, as it was thought to have many technical challenges. For these reasons, the standard The use of OMNI mode was considered and proposed. However, Tadao Kikumoto of Roland wrote the note number How to assign a rhythm instrument to a

He invented a MIDI map (see Figure 6.2) and demonstrated that rhythms could be handled using MIDI on the rhythm machine TR-909. This method of generating rhythmic sounds is still used today. The practicality and effectiveness of these concepts are being evaluated in the market. It will be obvious.

The sequence editor software With the arrival of Idea and multi-timbral sound sources, and with the advent of MIDI, the era in which not only humans but also computers could communicate with musical instruments had arrived.

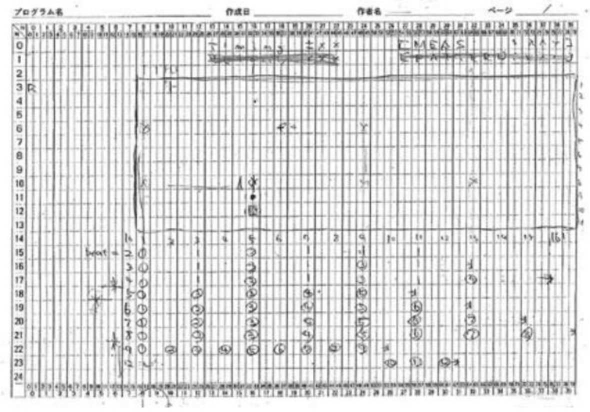


Figure 6.2 Proposal for a rhythm editor at that time

6.2 After the advent of MIDI (the dawn of time)

In the 1980s, as MIDI was being formulated and standardized, various companies began to develop products that controlled sound sources via MIDI. The idea was born and development proceeded. The first company to use MIDI to control musical instruments was the American company Sequential Circuits. At the NAMM Show in February, the company and Roland announced We connected the Prophet-600 to the JUPITER-6 and JX-3P and conducted the first ever MIDI connection demo. was developing a MIDI interface for Commodore computers, which were very popular overseas, and at the same NAMM venue,

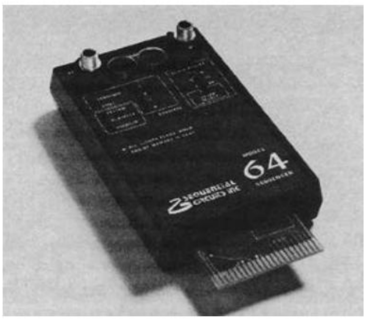


Figure 6.3 Sequential Circuit Model 64

(Later, he introduced the Model 64 (Fig. 6.3), the first MIDI interface in history.) and released).

Starting with this, sequential circuits In , products were launched in rapid succession. The first multi-timbral synthesizer The lineup was based on SIX-TRAK (see Figure 5.34). However, at the time, they were still too busy explaining how to connect and play multiple instruments with MIDI, so they were unable to promote computer music. The sales floor was also equipped with computers at the time. It was not able to penetrate the market and there was no interest in music stores. It was a difficult situation.

Meanwhile, Yamaha released the famous DX7 (see Fig. 5.5). They also developed and released the TX816 (see Fig. 5.16), a multi-part sound source that connected multiple DX7s. Roland released the The origin of the so-called multitimbral all-in-one In 1990, the company released the MKS-7, a multi-timbral synthesizer with a 3-channel synthesizer (Fig. 6.4). This multi-part/ multi-timbral concept played a major role in computer music culture, and these Japanese-made synthesizers gained the support of a small number of passionate fans, eventually giving rise to the huge popularity of DTM (Desk Top Music).

Figure 6.4 Roland MKS-7

6.3 MIDI and DTM (Desk Top Music)

DTM (Desk Top Music) is music played by connecting a computer and electronic instruments via MIDI or other means. It is a general term for the act of creating music, and is a Japanese-English word created from the word "DTP" (Desk Top Publishing). In contrast to real-time performance of musical instruments, DTP refers to the act of inputting each sound numerically into a computer, as if writing a musical score. This style is called non-real-time music. Later it came to be called "uchikomi". 1984 The sequence editor for the CMU-800 mentioned above is included. For NEC PC-8001/8801, software compatible with MIDI

The software MCP-PC8 was released by Roland.
In 1985, Roland released the MCE-PC88 editor software for the MKS-7, the origin of multi-timbral sound sources. This software allowed users to create and edit MKS-7 sounds, and save them along with their musi
You can save information such as the tone along with this song.
This combination of the two became the seeds of the later DTM culture.
And Yamaha and Roland started to offer
Compactly packaged products are developed and released
It was done.

The name DTM originated from "Desk Top Music System," which was first used in April 1988 when Roland released "Music-kun" (Fig. 6.5), a package of equipment and software required for creating music on a computer.
PC interface MPU-PC98 and sound source module Joule MT-32 and Starter Software
(later called sequence software "Ballade"), and included everything you needed except for a computer (PC-98). People who wanted to start DTM could go to music stores or computer specialty stores.
You need to buy the equipment you need at different stores.
The all-in-one-package concept is
It greatly lowered the barrier to entry into computer music.

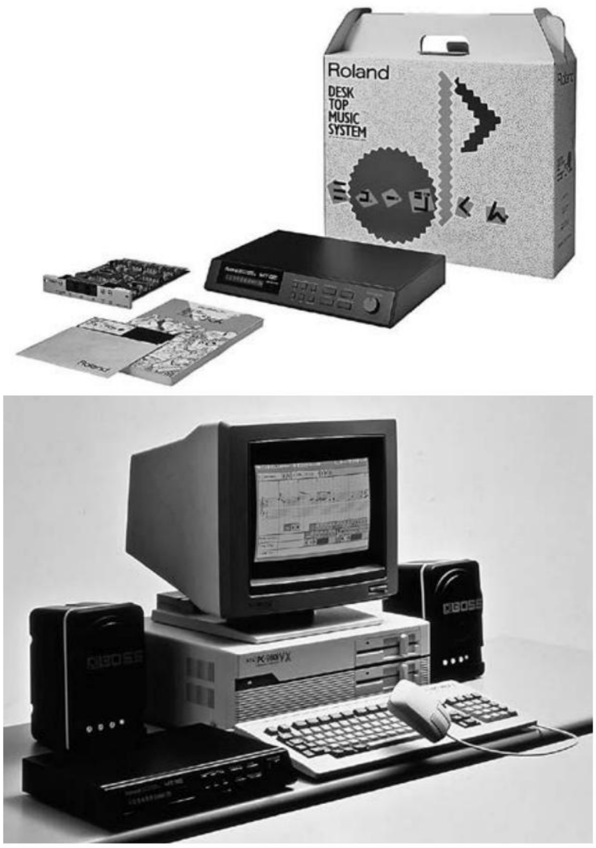


Figure 6.5 Roland "Music-kun" package and system setup

In addition, musical instrument manufacturers are releasing a variety of products for DTM, making the enjoyment of making music accessible to the general public.
These so-called DTM

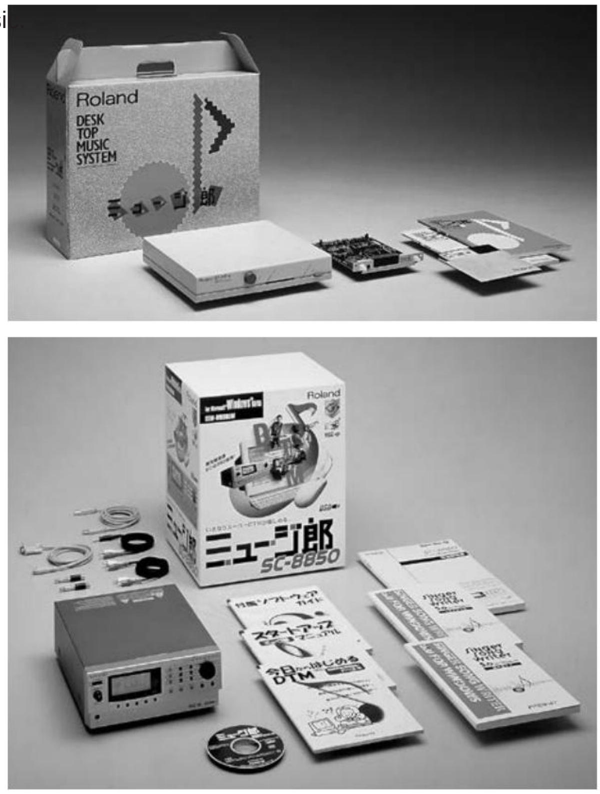


Figure 6.6 Roland's "Musician" (Top: First-generation "Musician", Bottom: "Musician SC-8850")

Figure 6.7 Yamaha's "HELLO! MUSIC!" (top: "HELLO! MUSIC! 90", bottom: "HELLO! MUSIC! 2000 AUDIO")

The packaged product is Roland's "Music-kun"
The first was the release of "Musiciro" (Fig. 6.6) in 1989. This series became a popular package series that continued for over 10 years until "Musiciro Net Studio" was released in 2002.

Yamaha released "HELLO! MUSIC!" (Fig. 6.7) in 1992. In 1996, the company released its own music software for Windows. In 2000, they released "HELLO! MUSIC! 2000," which was released as a package of "XGworks," a new software, and "HELLO! MUSIC! 90," which included the DTM sound source MU90.
The series continued until "AUDIO".

From here on, we will look in more detail at the history of each of the individual components that make up the DTM package.

MIDI sound sources, MIDI interfaces, etc.

6.4 MIDI and Sequencing Software

When MIDI was standardized, Roland
The interface required to connect the
NEC PC-8001/8801 compatible with data cards/units
The company released the MCP-PC8 software for PC.
This is compatible with the Roland MKS-7 (see Figure 6.4), which was developed and released as a sound source to be used in conjunction with a personal computer.
Developed and released MCE-PC88.
The MKS-7's tone generator allowed users to create and edit MKS-7 sounds, which could then be saved and used with music.
The idea of saving sounds together with music was
This became the seed of the DTM culture (see Figure 6.8).

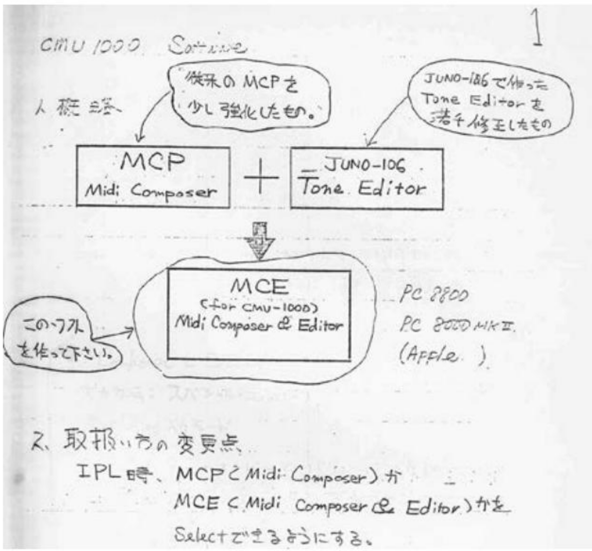


Figure 6.8: Proposal for integrating the sequence editor and tone editor on the MCE-PC88 (created by the author)

After this, Ko, who was a freelance programmer at the time,
The MIDI Recomposer series developed by Matsumi was released by Kamon Music and became a domestic sequence
It became the de facto standard for business software.
Taking over the ST/GT style culture, NEC PC8001/8801 series
Starting with the RCP-PC8 for Leeds,
The software RCP-PC98 for the NEC PC-9801 series, which was a terminal personal computer, was released.
A coined word consisting of code and compose.
Previously, music data could only be entered numerically, but now it is possible to enter MIDI data.
It was also suitable for recording from
Sophisticated numeric entry/editing and MIDI exclusive
Since it can handle MIDI messages,
The messages were manipulated as if they were machine language, and the power of the sound source was maximized.
The features of the Composa series are the MKS-7, DX7, MT-
Dedicated for sound sources such as 32, D-50, CM-64, SC-55
Built-in controller that can be saved with your music
The Recomposer series is a series of software that allows you to create a miniature world of sound sources and music.
With the expansion of sources and improvements to functions,
Versions compatible with Windows 3.1 and Windows 95/98 were also released.

In this era when MIDI was established, many sequences
A new software called Reclier was released by Kamiya Studio. It plays back the data you have entered in the music notation.
Music Pro series by Musical Plan
In addition, Dynaware's Ballade and Internet
Companies competed to develop new products, such as Sony's Singer Song Writer series.

6.5 MIDI and computer communication

When MIDI sequence software data became exchangeable, people began copying their own compositions and those of famous musicians over domestic computer networks such as PC-VAN and Nifty-Serve, which used the general telephone lines of the time.
The song data is uploaded and people who listen to it can post their impressions.
(At the time, there were no terms of use for PC communication services regarding the distribution of MIDI data that was copied from music, so the exchange of music data was provisionally permitted.) At the time, the communication speed of PC communication was 1200bps or 2400bps, which meant that at most 100-200 bytes could be sent and received per second.
Although it was only a recording of the sound,
However, the MIDI data recorded from the performance is far superior.

This allowed the file size to be reduced considerably, and songs could be downloaded to the computer and listened to in a short time.

Also, to discern the intentions of the music data creator

It was important to create the same equipment environment for both the two teams.

As users sought the same sound sources and sequence software as their favorite music creators, the de facto standard equipment spread among the user community. In this way, the de facto standardization of DTM equipment has led to the development of a unique Japanese DTM culture in which users create and play music in the same environment.

The birth of this technology was the seed for future online karaoke and other such services.

In other words, users who had created MIDI data and honed their skills would become the ones producing the music data for tens of thousands of songs when online karaoke was launched.

6.6 Evolution of sound modules and format history

With the birth of MIDI, the transition from synthesizers to keyboards

As mentioned in the previous chapter, the MIDI section and the sound source section can now be separated.

However, the sound source module that was born from this trend

It was not only used in conjunction with electronic instruments such as MIDI keyboards, but also in conjunction with computers, creating new possibilities.

Let's take a closer look at the format.

6.6.1 Pioneering DTM sound modules

In 1985, Roland released the MKS-7 sound module (see Figure 6.4).

This was a MIDI sound module that combined the sound source part of the analog synthesizer JUNO-106 with a simplified version of the sound source part of the rhythm machine TR-707.

It was possible to play multiple parts and rhythm parts.

What made it unique was that it was compatible with both the traditional style of playing in combination with a MIDI keyboard or a standalone sequencer, and the new style of using it in combination with a PC to create music.

It was a sound module that could be considered a pioneer of the

However, because it was still designed based on musical instruments, the price was high at 169,000 yen. The

following year, in 1986, Yamaha released the FM sound module FB-01 (Fig. 6.9), which was primarily intended for use with personal computers. It had 240 built-in tones, and eight parts could be played using Yamaha's own sequence software, YRM-31. In addition to these functions,

It's easy to use on a desktop computer

It is half the size of a conventional sound module.

Designed to be rack-sized, and priced at a significantly low price of 49,800 yen, this unit set the tone for future DTM sound sources.

Fig. 6.9 Yamaha FB-01

6.6.2 Sound modules in the early days of DTM

In 1987, Roland released the best-selling single "Shin

A sound source model that uses the sound source system of the Cessizer D-50

In 1999, the Joule MT-32 (Fig. 6.10) was released. It attracted attention for its compact size, high performance, and the affordable price of 69,000 yen.

It also had the function of accurately recording and playing back performances.

Recliner who can play instruments, and ensemble

There is also software to control the MT-32, such as Steps, which lets you play and Shuffle, which automatically generates sheet music.

Because of the richness of the sound, I decided to use the MT-32 as my first DTM sound.

Many people have praised it as a "source."

Figure 6.10 Roland MT-32

Thus, the DTM system evolved greatly in just a few years, but what propelled it into the “DTM culture” originating in Japan was the previously mentioned Rolland package product “Musi-kun” (released in 1988), which was based around the MT-32. The following year, in 1989, a higher-end version called “Musi-ro” was released, which came with the new DTM sound source CM-64 (Fig. 6.11), and became a popular series product that continued for about 10 years.

Ta.

Fig. 6.11 Roland CM-64

6.6.3 The result of competition between Roland and Yamaha

DTM Market Expansion (GS vs. XG)

The DTM culture born from MIDI has

It has matured further with the development of

There was a competition between Roland and Yamaha.

6.6.4 Roland's proprietary MIDI format "GS sound source" In May 1991, Roland

released the SC-55 (Fig. 6.12) as a DTM sound source.

What was revolutionary was the company's proprietary MIDI format.

The main feature of the GS sound source was that it was based on the GS format, which emphasized upward compatibility.

Fig. 6.12 Roland SC-55

Fig. 6.13 Roland SC-88

Fig. 6.14 Roland SC-8850

Fig. 6.15 Roland SC-88Pro

This means that if you create song data on GS sound source A that says "play C with a piano tone," then even if you play the same data on a different GS sound source B, "C will always be played with a piano tone" (for details, see "Chapter 7, Unifying Tones and SMF (Standard MIDI Files)").

This means that song data created with the SC-55 can be

The higher-end models sold at the time, such as the SC-88 (released in 1994, Fig. 6.13) and the SC-8850 (released in 1999, Fig. 6.14), were used to play the discs.

Even if you play a part, the ensemble will be played with the same parts.

Therefore, even if you buy a new DTM sound source, the song data will be

Not only can users share song data, but

Even if you exchange ideas, the music will basically be played back exactly as you intended.

This has greatly increased the versatility of song data.

As the company was one of the first to propose its own GS sound source, it became the de facto standard for MIDI sound sources, and the SC-88Pro (Fig. 6.15), released in 1996, became the leading MIDI sound source due to its high functionality and high quality.

It has become a noun.

6.6.5 Yamaha's "XG Sound Source" fights back with new features

In 1991, the international standard for MIDI sound sources, the "GM format," was created, based on a portion of the GS sound source standard.

In the same year, Yamaha released the TG100, a GM-compatible DTM sound source.

(Fig. 6.16), but at the same time they developed their own extended MIDI format to be compatible with GM, and announced it as the "XG format" in 1994. The first XG sound source was the MU80 (Fig. 6.17), and the following year in 1995

In 2013, the company released a lower-end model, the MU50.

The MU80 had the same basic specifications as the SC-88, which was Roland's top DTM sound source at the time, but taking advantage of its late start, it greatly surpassed the SC-88 in terms of the variety of tones and, in particular, the richness of its effects.

The Roland GS had the upper hand.

This was a major breakthrough for DTM sound sources.

The sound can be expanded by adding boards to the main body.

Fig. 6.16 Yamaha TG100

Fig. 6.17 Yamaha MU80

With this new idea in mind, the company released its second-generation XG sound source, the MU100 (Fig. 6.18), and in 1998 it released its flagship model, the MU128 (Fig. 6.19), as its final form.

Fig. 6.18 Yamaha MU100

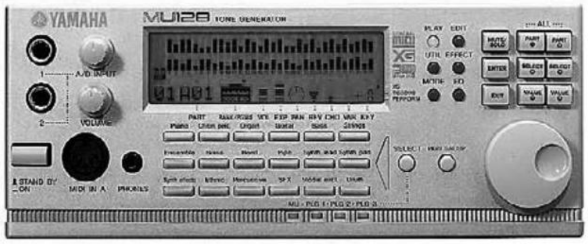


Fig. 6.19 Yamaha MU128

6.6.6 Establishment and evolution of General MIDI (GM)

In 1991, General MIDI was established as a recommended application example (RP-003) with an emphasis on compatibility of MIDI data and with the intention of application in the fields of music, consumer electronics, and entertainment.
Although it does not support a minimum of 24 voices,
The standard required the simultaneous production of 16 melody notes and 8 rhythm notes, and defined a minimum of 128 preset sounds, called the GM Sound Set, 47 rhythm instruments, the arrangement of those sounds, and the corresponding control change numbers and functions. In response to this, Kawai released the GM-compatible sound module GMega (Fig. 6.20) in 1992, and Korg released the AG-10 (Fig. 6.21) in 1993. The GMega had 32 parts, a maximum polyphony of 28 notes, and was priced at 69,000 yen, while the AG-10 had 16 parts, a maximum polyphony of 32 notes, and was priced at 49,000 yen.

Figure 6.20 Kawaii GMega

Figure 6.21 Korg AG-10

However, GM sound sources are becoming more and more diverse and complex. There was a limit to how much the GM format could be reproduced. Some functions were not clearly defined in the standard, and these caused compatibility problems. Against this background, GM was expanded to become GM Level 2, which was issued in 1999 as a recommended application example (RP-024) by the GM Level 2 Working Group of the MIDI Standards Committee of the Association of Musical Electronics Businesses. With a minimum sound set of at least 32 simultaneous voices, a minimum of 256 preset tones, and 9 types of drum set, compatibility in terms of playing music was reviewed in detail, and each function was clearly classified as [Required], [Recommended], [Optional], or [Prohibited].

6.6.7 Progressive resolution of the "GS vs. XG" competition.

With Roland improving quality and unique ideas
The competition in the DTM sound source market with Yamaha, which was introducing new functions, became even more intense from the mid-1990s onwards, with the format of "GS vs. XG".

This is a major factor in revitalizing the DTM culture and expanding it.
Then in 2001, Roland released
The DTM sound source SD-90 supports not only GS and GM, but also Yamaha
Through cooperation with Sony, the two companies have come to a compromise, including the inclusion of a function that allows playback of music data in XG format.
At the same time, the PC and internet environment
As the DTM environment has evolved significantly,
It was time to move on to the next generation.

6.7 Computer and MIDI interface

When connecting a computer to MIDI, a MIDI interface is required. When MIDI was established in 1983, MIDI interfaces were quickly released by companies such as Yamaha and Roland.

6.7.1 Yamaha Music Production Computers

Yamaha develops and sells computers for music production, and in 1983, when MIDI was first introduced, they released the MSX computer.
The CX5 (Fig. 6.22) and the SMD-01 (Fig.

On June 23, SFG-01, which had a built-in FM sound source, was released. By inserting this into the back slot of the CX5 and using the dedicated sequence software on the CX5, music could be produced.

Figure 6.22 Yamaha MSX PC CX5

Fig. 6.23 Yamaha MIDI unit SMD-01

In 1989, the company also launched the notebook computer model C1. It was actually a PC-AT compatible machine, but when it was turned on, it started up a sequencer, making it a MIDI-only machine with two MIDI INs and eight MIDI OUTs, and was packed with features such as about 400 tracks and recording functions. On the other hand, MIDI terminals were also used overseas. A computer equipped with a child for music production was announced, MIDI was gaining attention.

6.7.2 MIDI input has become the de facto standard Terface MPU-401 Series

In November 1983, Roland released the MPU-401 (Figs. 6.24 to 6.27), a MIDI interface for personal computers. Because a personal computer and MIDI cannot be physically connected directly, an interface for signal conversion was necessary, but the processing power of personal computers at the time made it difficult to handle even MIDI's 31.25 kbps. It is easy to imagine that there will be some missed shots and jitter. So Roland built a MIDI processor inside the Built-in microcomputer for intelligent operation In order to make it compatible with the NEC PC-8001, PC-8801, PC-9801, IBM-PC, Apple II, Fujitsu FM-7, and Sharp X1 (CZ-800 series), the main unit was the same for each model, but a separate interface board was provided for each model.

Figure 6.24 Roland MPU-401

Figure 6.25 Interface for PC8001 and PC8801

Figure 6.26 IBM-PC Interface

Figure 6.27 APPLE-II interface

The interface board was connected with a 25-pin D-SUB cable. The MPU-401's specifications, including its circuit diagram and instructions for use, were also widely released. As a result, the development and sale of music software by third parties was stimulated, and it became the de facto standard for MIDI interfaces for personal computers. Compatible interfaces such as Misuzu Ellie's EMU-98 and Kawai's MSB-98 also appeared for the NEC PC98.

Roland also announced that it would begin sales of PC-For the 9801, the main unit and interface board are integrated MPU-PC98, which was designed to reduce costs, and its successor This was followed by the development and sale of the MPU-PC98 II (Fig. 6.28), and then, to accommodate the age of Microsoft Windows, the company developed and sold the SuperMPU, which was equipped with an intelligent mode.

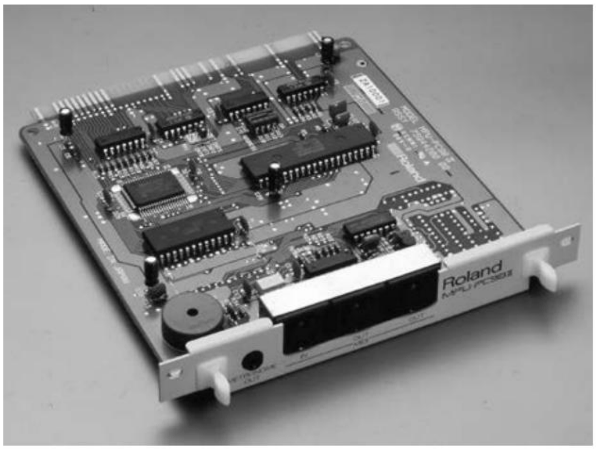


Fig. 6.28 MPU-PC98 II

6.7.3 Sound cards

The Sound Blaster (compatible) sound system was installed as standard on many DOS/V-based personal computers in the 1990s. The board has a 15-pin D-SUB game port. It was equipped as standard (Fig. 6.29), and could be used as a MIDI interface by connecting it with a MIDI cable for game ports (Fig. 6.30). Hardware and device drivers are provided by Roland MPU-401 MIDI interface in UART mode It is based on many operating systems for Windows and MS-DOS.

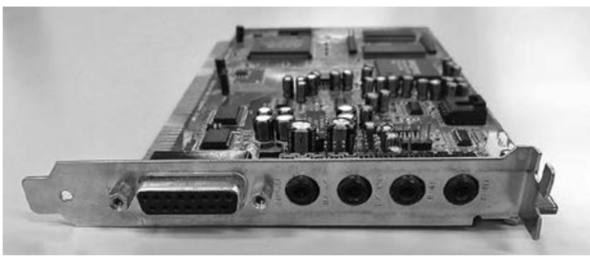


Figure 6.29 Sound Blaster compatible sound card

Figure 6.30: Gameport MIDI cable

Supported applications for MPU-401. The device driver for 401 was available up until the Windows XP era. Currently, the main methods for connecting a PC to MIDI are A USB-MIDI interface is used.

6.7.4 Direct connection to a computer In

order to connect a computer to MIDI, an interface such as the MPU-401 was required, but As capabilities improve with Moore's Law, information is lost If you no longer have to worry about jitter or other issues, you can use the MPU-401 to handle more internal sequence tracks and respond faster. Time becomes an issue.

To handle more than 1000 tracks, UART Many sequence software programs use this mode. At that time, personal computers had RS-232C terminals. Also, by adjusting the division ratio, it was possible to set it to around 31.25kbps. After that, a current of 5mA was obtained using a photocoupler based on the MIDI recommended circuit diagram. This idea is commonly known as RS-MIDI. This was good news for users of personal computers that were not compatible with Rolland's MPU series, such as the Sharp X68000.

In addition, circuit diagrams created by users are also made public, and people who want to build their own circuits can use them. The PC-98 supports MIMPI and other There was a player. Come on Music has The MA-01, an interface compatible with RS-MIDI, has been released for the Composer series.

After this, in 1991 Yamaha released the TG100 (Figure 6.16) has a serial port in addition to the MIDI connectors. This was different from the hardware specified by MIDI, but it mostly followed the MIDI protocol, and was a breakthrough in that it eliminated the need for a MIDI interface, which had been essential for sending MIDI signals between a computer and a DTM sound source until then. This eliminated the psychological feeling of beginner users that "DTM is difficult."

This greatly reduced my concerns, and now it was possible to directly and easily connect a computer to a MIDI sound source.

Yamaha has released TG100 and later, and Roland has released 1993 Serial port for SC-55mkII and later DTM sound sources (Fig. 6.31), and then a USB cable is It has evolved into USB-MIDI, which allows connection via USB. (For details, see Chapter 10, Expanding the Use of MIDI.)

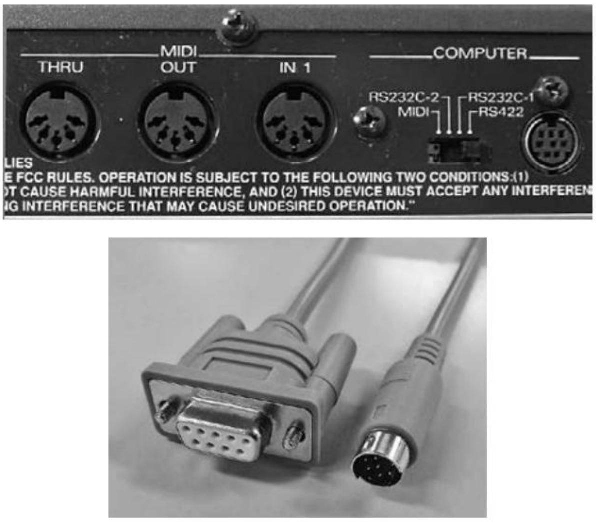


Figure 6.31: Serial port on the DTM sound source and the connecting serial cable

6.7.5 Software Instruments

In the mid-1990s, the processing speed of personal computers, especially the central processing units called CPUs, improved. Intel, a CPU manufacturer, established a laboratory called Intel Architecture Labs within the company to study how the excess processing power resulting from the evolution of CPUs and semiconductors could be best used by the general public.

The idea was conceived of a modem for personal computer communication, for example. Software modems that eliminate the need for FAX, etc. Later, USB was also produced in this lab.

Among these was the idea of software sound sources that could produce not only PCM sound but also synthesized sounds. From around this time, free software and software sound sources began to be provided by several manufacturers, and the Apple Macintosh and Micro It has also been installed in Windows by Soft Inc. I went.

6.8 Summary

This chapter will discuss the use of computers for sound and music production, MIDI interfaces, and computer The sound source and sound source format connected to the computer He explained and considered the state of DTM packages and computer

communications. At that time, with the times, composing and creating music using MIDI sound sources and sequencers was gradually spreading, and musicians who used DTM and professional equipment to create music began to appear. For composers and arrangers, the advantage of using MIDI and DTM was that they could work at home right up to the deadline. Also, MIDI sound sources and MIDI sequence data used in the song Some musicians even took it directly to the studio to record.

This coincides with the transition from digital to digital, and also marks a turning point in history. For the first time, it became possible to send and receive music data over a communication line, and these changes brought with them a mixture of feelings of crisis and anticipation. It was also a situation where

In the midst of this, especially in domestic multi-party The emergence of multi-timbral and multi-timbral sound sources, and the use of sequencers on computers The sound engineer and the sound editor became one and eventually The DTM package will be released and everyone will be able to use it. However, as people became able to easily enjoy music, and it became easy to exchange songs via computer networking, and people could also receive feedback, this motivated people to practice and develop their skills. This spiral may have been created because Japan has a unique mentality compared to other countries in the world. When the culture that developed in this way crossed paths with a different market, it blossomed into a flower. This was the so-called online karaoke. We will discuss this in Chapter 8.

7 | Standardization of Tones and SMF (Standard MIDI File)

The sound maps of 1980s DTM (Desk Top Music) sound sources differed depending on the manufacturer and model of the MIDI sound source. Basically, it was not compatible with other products. For example, the first program change, which is the information for switching tones, will be a piano tone in the MIDI sound source of company A. However, in the case of Company B's products, violins are assigned. If the MIDI The song data you create may not be reproduced in a different MIDI sound source. There was a problem that the music would be played with an unintended tone. Also, the data format for the MIDI sound source differed from company to company. Standardization of MIDI sound source specifications and music data file Standardization of the format was essential. Around 1989 The company includes an American music publisher, a music data production company, and A request from a media company to standardize the sounds of MIDI sound sources The Warner Bros. Newspaper also received comments from the press at the time. There were plans to release a CD player with MIDI output, named CD-MIDI, which was jointly developed by Sony Digital (now WarnerMedia) and Nippon Victor (now JVC Kenwood), and there was a strong desire for a MIDI sound source with unified tone specifications to be released. This was because the MIDI output of CD-MIDI could be used to easily add electronic musical instrument performance to the CD performance (see Figure 7.1). CD-MIDI was not a commercial success, but This was one of the catalysts for the standardization of MIDI sound source specifications.

7.1 Establishment of General MIDI (GM)

In this context, Standard MIDI File 1.0 was developed in 1991 as a standard for recording musical performance data. It has been accepted as the base file format for In the same year, GM System Level 1 was released as a common sound source specification. Both were approved as American MMA. (MIDI Manufacturers Association) and the then MIDI Standards Council (now AMEI), It was approved as a recommended practice for MIDI rather than the MIDI standard itself, and was named MIDI 1.0. It is listed in the specifications.

7.1.1 The appearance of General MIDI (GM) sound sources

In 1991, when GM System Level 1 was approved, GM-compatible sound sources appeared: Roland's SC-55 (see Figure 6.12) and Yamaha's TG100 (see Figure 6.16). Roland's SC-55 had 16 parts, a maximum polyphony of 24 voices, and was released at a price of 69,000 yen, while Yamaha's TG100 had 16 parts, a maximum polyphony of 28 voices, and was released at a price of 45,000 yen. Since then, GM sound source models have been used not only for DTM but also for home music. Digital piano for garden and overseas arranger keyboard A flood of new models were released, including the It will be possible.

CD-MIDI

CD-MIDIは，ワーナー・ニューメディア社と日本ビクターとの共同開発によるもので，CDのサブ・コードを使ったアプリケーションのひとつである。CDには，通常の音楽情報が入るエリアとは別にサブ・コードのエリアが用意されているが，ほとんど使われていない。このサブ・コード・エリアにMIDI信号を入れようというものである。サブ・コードを使ったアプリケーションとしては，他に映像信号を入れるCDグラフィックスなどがある。

これは，CDのオーディオ・データには影響せず，普通のCDにおまけのようなニュアンスでMIDIの演奏情報が入れられる。これをMIDIのデコーダを持ったCDプレイヤーで再生すると，オーディオ出力と共にMIDI情報も出力される。MIDI信号を使って，楽譜や歌詞の出力，カラオケのサブ・メロディをMIDI出力するなど，さまざまな応用が考えられる。

CD-MIDIは，一般のMIDIシーケンサーのようにデータを本体メモリーにロードして演奏するのとは違って，CDのオーディオ同様にMIDIデータをリアルタイムに近い形で読み出し，再生する。したがって，MIDIの演奏時間もオーディオの再生時間と同じである。

CDへの記録方法は，EIAJ（日本電子機械工業会）のレッド・ブックに定義され，CDのアプリケーションの中でモード3，アイテム0がMIDIモードとして標準化された。なお，レッド・ブックの定義はあくまでもMIDIをCDディスクに記録するためのフォーマットで，MIDI規格ではない。

Figure 7.1 Explanation of CD-MIDI
Quoted from "MIDI Handbook '93" in the December 1993 issue of Keyboard Magazine, published by Rittor Music.

7.1.2 Requirements for GM sound source

The sound source method is not specified, but it is based on the MIDI 1.0 standard.

The document states the following as "essential requirements for GM sound sources":

It is described.

Number of voices: A minimum of 24 voices, fully dynamically allocated for both melody and rhythm sounds, must be available simultaneously.

is dynamically allocated for the melody.

8 voices available for voice + rhythm sounds.

ÿSupported MIDI channels:

- All 16 MIDI channels

-Voices playable on each channel (polyphonic)

The number is variable

- Each channel can play a different instrument sound (tone).

The rhythm sounds arranged on the keyboard are always on channel 10.

ÿInstruments:

- A minimum of 128 presets (MIDI program numbers) for musical instruments that follow the GM sound set (Figure 7.2) - A minimum of 47 preset rhythm sounds (tones) that follow the GM percussion map (Figure 7.3) For other detailed specifications, please refer to the MIDI 1.0 specification.

Please note that the GM sound source requires the GM System Level 1 logo.

It is recommended that the mark (Figure 7.4) be attached to the product.

(MIDI プログラム番号1～128：チャンネル 10 を除く全 MIDI チャンネル)

プログラム番号　楽器	プログラム番号　楽器	プログラム番号　楽器	プログラム番号　楽器
1. アコースティック・グランド・ピアノ	33. アコースティック・ベース	65. ソプラノ・サックス	97. FX1(雨)
2. ブライト・アコースティック・ピアノ	34. エレクトリック・ベース(フィンガー)	66. アルト・サックス	98. FX2(サウンドトラック)
3. エレクトリック・グランド・ピアノ	35. エレクトリック・ベース(ピック)	67. テナー・サックス	99. FX3(クリスタル)
4. ホンキー・トンク・ピアノ	36. フレットレス・ベース	68. バリトン・サックス	100. FX4(アトモスフィア)
5. エレクトリック・ピアノ1	37. スラップ・ベース1	69. オーボエ	101. FX5(ブライトネス)
6. エレクトリック・ピアノ2	38. スラップ・ベース2	70. イングリッシュ・ホルン	102. FX6(ゴブリン)
7. ハープシコード	39. シンセ・ベース1	71. バスーン	103. FX7(エコー)
8. クラビ	40. シンセ・ベース2	72. クラリネット	104. FX8(SF)
9. チェレスタ	41. バイオリン	73. ピッコロ	105. シタール
10. グロッケン	42. ビオラ	74. フルート	106. バンジョー
11. ミュージック・ボックス(オルゴール)	43. チェロ	75. リコーダー	107. 三味線
12. ビブラフォン	44. コントラバス	76. パン・フルート	108. 琴
13. マリンバ	45. トレモロ・ストリングス	77. ボトル・ブロウ	109. カリンバ
14. シロフォン	56. ピチカート・ストリングス	78. 尺八	110. バグ・パイプ
15. チューブラ・ベル	57. オーケストラ・ハープ	79. ホイッスル(口笛)	111. フィドル
16. ダルシマー	58. ティンパニー	80. オカリナ	112. シャナイ
17. ドローバー・オルガン	59. ストリング・アンサンブル1	81. リード1(矩形波)	113. ティンカ・ベル
18. パーカッシブ・オルガン	50. ストリング・アンサンブル2	82. リード2(鋸歯状波)	114. アゴゴ
19. ロック・オルガン	51. シンセ・ストリングス1	83. リード3(calliope 蒸気オルガン)	115. スティール・ドラム
20. チャーチ・オルガン	52. シンセ・ストリングス2	84. リード4(chiff)	116. ウッド・ブロック
21. リード・オルガン	53. ボイス(アー)	85. リード5(charang)	117. 太鼓
22. アコーディオン	54. ボイス(ウー)	86. リード6(ボイス)	118. メロディック・タム
23. ハーモニカ	55. シンセ・ボイス	87. リード7(5度)	119. シンセ・ドラム
24. タンゴ・アコーディオン	56. オーケストラ・ヒット	88. リード8(ベース+リード)	120. リバース・シンバル
25. アコースティック・ギター(ナイロン)	57. トランペット	89. パッド1(ニュー・エイジ)	121. ギター・フレット・ノイズ
26. アコースティック・ギター(スティール)	58. トロンボーン	90. パッド2(ウォーム)	122. ブレス・ノイズ
27. エレクトリック・ギター(ジャズ)	59. チューバ	91. パッド3(ポリシンセ)	123. 海辺
28. エレクトリック・ギター(クリーン)	60. ミュート・トランペット	92. パッド4(クワイア)	124. 鳥のさえずり
29. エレクトリック・ギター(ミュート)	61. フレンチ・ホルン	93. パッド5(bowed)	125. 電話のベル
30. オーバードライブ・ギター	62. ブラス・セクション	94. パッド6(メタリック)	26. ヘリコプター
31. ディストーション・ギター	63. シンセ・ブラス1	95. パッド7(halo)	127. 拍手喝采
32. ギター・ハーモニクス	64. シンセ・ブラス2	96. パッド8(スウィープ)	128. ガン・ショット

Figure 7.2 GM Sound Set

(チャンネル 10)

MIDI キー	ドラム・サウンド	MIDI キー	ドラム・サウンド	MIDI キー	ドラム・サウンド
35	アコースティック・バス・ドラム	51	ライド・シンバル1	67	ハイ・アゴゴ
36	バス・ドラム1	52	チャイニーズ・シンバル	68	ロー・アゴゴ
37	サイド・スティック	53	ライド・ベル	69	カバサ
38	アコースティック・スネア	54	タンバリン	70	マラカス
39	ハンド・クラップ	55	スプラッシュ・シンバル	71	ショート・ホイッスル
40	エレクトリック・スネア	56	カウベル	72	ロング・ホイッスル
41	ロー・フロア・タム	57	クラッシュ・シンバル2	73	ショート・ギロ
42	クローズド・ハイハット	58	ビブラスラップ	74	ロング・ギロ
43	ハイ・フロア・タム	59	ライド・シンバル2	75	クラベス
44	ペダル・ハイハット	60	ハイ・ボンゴ	76	ハイ・ウッド・ブロック
45	ロー・タム	61	ロー・ボンゴ	77	ロー・ウッド・ブロック
46	オープン・ハイハット	62	ミュート・ハイ・コンガ	78	ミュート・クイーカ
47	ロー・ミッド・タム	63	オープン・ハイ・コンガ	79	オープン・クイーカ
48	ハイ・ミッド・タム	64	ロー・コンガ	80	ミュート・トライアングル
49	クラッシュ・シンバル1	65	ハイ・ティンバレス	81	オープン・トライアングル
50	ハイ・タム	66	ロー・ティンバレス		

Figure 7.3 GM Percussion Map

*The above percussion sounds are all assigned to the corresponding MIDI keys (keyboard) on the 10 channels.

Figure 7.4 GM System Level 1 logo

7.2 GS and XG Sound Sources

GM system as a common specification sound source beyond the manufacturer System Level 1 played a major role, but in reality Roland's proprietary GS sound source was originally used for MIDI sounds. It had become the de facto standard for The reason is that the first GS sound source released by Roland, the SC-55 (see Figure 6.12), included the specifications of GM System Level 1 and allowed the specification of additional sounds as variations. What I was able to do was to switch between multiple drum sets. The main features of the MIDI controller were the ability to add expression to sounds using NRPNs (Non-Registered Parameter Numbers), and the ability to modify each sound individually using system exclusive messages.

In 1994, Yamaha introduced its proprietary XG sound source format. The MU80 (see Figure 6.17) was released with the XG sound source. It included the specifications of GM System Level 1 and differentiated itself by offering unique expansion sounds, expansion drum sets, detailed effect settings, etc. Sales of XG sound sources also increased. It has become a de facto standard alongside the GS sound source. In the world of DTM, there is a standard sound source called GM. However, the GS and XG sound sources coexisted. And so it went.

7.3 SMF (Standard MIDI File)

SMF (Standard MIDI File) is a file format that stores MIDI performance information. SMF was developed by Opcord at the time as the basic file format for recording MIDI performance data. A file proposed by Dave Oppenheim that is written in bytes and can be played on a computer. The contents are usually explained in two-digit hexadecimal notation. Common. Music sequencers and dedicated Can be created, edited and played using MIDI applications. The SMF filename extension is case sensitive. ".MID" is used without distinction.

7.3.1 Background of the Establishment of SMF

Before SMF was established, MIDI-based automatic performance data was generated in a format that differed from manufacturer to manufacturer, and the data was not compatible. Data can be used interchangeably between different models and software This has been strongly supported by data producers and electronic musical instrument users. Compatible file formats There was a strong demand for its establishment.

7.3.2 SMF Music Data

In 1991, Standard MIDI File 1.0 was released. This was approved as a recommended application example for MIDI devices, and coupled with the spread of GM sound sources, the de facto standard Roland GS sound sources, and Yamaha XG sound sources, music data in Standard MIDI files was stored on 3.5-inch floppy disks, as shown in Figure 7.5, in CD cases. It was sold as performance data for electronic musical instruments. 720k bytes or 1.44M bytes. Unlike CDs that directly record the sound itself, it is easy to add or remove musical instruments for each part and change the tempo and key. Not only is it used for listening, but it is also used for educational purposes, and especially overseas, it is used for playing and singing covers of oldies and famous songs. It was also widely used as data for It has become difficult to obtain storage media itself, and sales have switched to download sales via the Internet.

Figure 7.5 SMF music data from the 1990s

7.3.3 Data structure of SMF SMF

is structured into chunks as shown in Figure 7.6. It consists of a data block. The chunk that contains the data is called the header chunk, and the following chunk is called the A chunk that contains performance data is called a track chunk. SMF files are classified into three formats based on the difference in chunk structure. A format that consists of only one rack chunk 0, a header chunk and multiple track chunks Format 1 and Format 2 are currently the most popular formats. Since it is rarely used, we will not go into detail here. Format 0 is a format suitable for playback only devices, and there is no need to mix data or order with other tracks. You can play a song by simply sending data in order from the beginning of the track. On the other hand, format 1 can It plays songs by sending data while mixing the

However, the data is separated into tracks,
The Rody part is a melody track, and the chord part is
are managed separately, like the chord track.
Edit the melody, chords, etc., and edit the parts you need.
It has the advantage that it is easy to edit only the "to" part.

As shown in Figure 7.7, the header chunk consists of a total of 14 bytes, which include the four-character ASCII code "MThd" (4D 54 68 64) that indicates that it is a header chunk, the data length (00 00 00 06), the file format (00 00) (if the format type is 0), the number of tracks (00 01) (if there is one track), and the time unit (00 60) (time base = resolution per quarter note, e.g. 60 in hexadecimal = 96 in decimal).

If you use multiple tracks,
Specify "00 01" in the mat field, which means 1, and
Enter the number of tracks to be used in the Number of Tracks field.

*The time unit can be specified based on the time code by setting the MSB of the upper byte to 1, but a resolution of one quarter note is generally used.

The actual performance data is stored in the track chunk as shown in Figure 7.8. The track chunk contains an identifier "MTrk" (4D 54 72 6B) that indicates that it is a track chunk, the data length (the data length of the data section in this track = the number of data pieces in hexadecimal), and the data (variable length).

The data recorded in a track chunk consists of the following three types:
There are various types.

ÿ MIDI event (MIDI normal performance information with time information)
(with additional information)
Delta Time + Channel Voice Message

ÿ Exclusive Event (Exclusive
(When sending a message)
Delta Time + F0 + Data Length + Exclusive
Message +F7 (usually used)
Delta Time + F7 + Data Length + Exclusive
Message

ÿ Meta events (data other than normal MIDI performance information)
(This is provided to handle
Delta Time + FF~
The most frequently used meta event is Ten
It is a tune with a melody of Po. It can also include key and beat, but it is mainly used for
display purposes (see Figure 7.9).

Delta time is a time expressed as a variable length numeric representation.
This is information that indicates the time since the previous event.
The delta time value is specified in the header chunk.
For example, if the resolution per quarter note is 96, then a
delta time of 96 corresponds to an interval of a quarter note.
Also, if there is an event with the same timing as the previous
event, then a delta time of 0 corresponds to the interval of a quarter note.
Variable length numeric representation uses 7 bits per byte.
where bit 7 is used as a flag.
The flag in bit 7 indicates that a data byte follows.
The first byte is set to 1, and the last data byte is set to 0. For example,
hexadecimal numbers 00 to 7F are stored in the variable length numeric table.

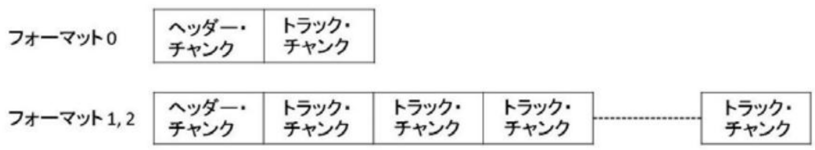


Figure 7.6 SMF format

M	T	h	d	実データの大きさ(現状6)				フォーマット		トラック数		時間単位	
4D	54	68	64	00	00	00	06	00	00	00	01	00	60

Figure 7.7 Example of a header chunk (all values in hexadecimal)

M	T	r	k	実データの大きさ			
4D	54	72	6B	**	**	**	**

+ データ

Figure 7.8 Track chunk example (all values in hex)

ステータス	種類	データ長	データ	機能	用途
FF	00	02	ssss	シーケンス番号	演奏情報の前に置いてシーケンス番号を指定する。
FF	01	バイト長	text	テキスト	内容もテキスト長も任意で置きたいメモ情報をストアできる。アスキー文字を使用する。
FF	02	バイト長	text	著作権表示	アスキー文字で著作権情報を表示。
FF	03	バイト長	text	シーケンス名／トラック名	フォーマット0のトラック中、あるいはフォーマット1の第1トラック中の場合、シーケンスの名前を表す。それ以外の場合はトラックの名前を表す。
FF	04	バイト長	text	楽器名	そのトラックで使用される楽器名やMIDIチャンネルを記述できる。
FF	05	バイト長	text	歌詞	歌われる歌詞を記述する。各音節が別々の歌詞イベントとして記述される。
FF	06	バイト長	text	マーカー	リハーサル・マークやセッション・ネームをストアできる。
FF	07	バイト長	text	キューポイント	フィルムやビデオ、ステージで発生するキューポイントのメモ書きをストアする。
FF	2F	00	-	エンド・オブ・トラック	トラックの終わりには、必ずこのイベントを置かなければならない。
FF	51	03	tttttt	セット・テンポ	このイベントはテンポ・チェンジを表す。4分音符あたりのマイクロ秒で表す。
FF	58	04	nn dd cc bb	拍子記号	nnとddはそのまま拍子記号を表す。ただし分母は２のマイナスの累乗で表現する。2=4分音符、3=8分音符、4=16分音符となる。ccはメトロノーム1拍あたりのクロック数（通常24で0x18)またbbはMIDIの4分音符中の32分音符の数で通常bb=8となる。
FF	59	02	sf mi	調号	sfがプラスならばシャープの数、マイナスならフラットの数。sfが0の場合はハ長調（イ短調）を表す。mi=0なら長調、mi=1なら短調を表す。
FF	7F	バイト長	data	シーケンサー固有メタイベント	特定のメーカーのシーケンサーのためのもので、最初のデータはメーカーのIDである。

Figure 7.9 Meta event types

表現する値(16進)	可変長表現(16進)		可変長表現(2進)	
00000000		00		00000000
0000007F		7F		01111111
00000080	81	00	10000001	00000000
00003FFF	FF	7F	11111111	01111111

Figure 7.10 Example of variable-length numeric representation

90 3C 40 ドの音を鳴らす
(90) 3C 00 ドの音を止める
(90) 3E 40 レの音を鳴らす
(90) 3E 00 レの音を止める
(90) 40 40 ミの音を鳴らす
(90) 40 00 ミの音を止める
(90) 41 40 ファの音を鳴らす
(90) 41 00 ファの音を止める
※(90)はランニング・ステータスを使ってもよい

Figure 7.11 MIDI data corresponding to a musical score

Currently, numbers are expressed as 00 to 7F, but if 80 is expressed as a variable-length number, it becomes 81 00. This is because the variable-length number representation handles numbers in 7 bits, so after 7F, another data byte is used instead of 80. Since the data byte follows next, bit 7 of the first byte becomes 1, so it is expressed as 81, and the next byte is expressed as 00. Note that the delta time in the variable-length numeric representation of SMF is The maximum length is 4 bytes (see Figure 7.10).

7.3.4 Examples of SMFs

The MIDI data shown in Figure 7.11 is stored in SMF format 0. A concrete example of this is shown in Figure 7.12. The time base (resolution per quarter note) is 96. All subsequent values are in hexadecimal notation.

最初にヘッダー・チャンク

	4D 54 68 64	MThd
	00 00 00 06	データ長
	00 00	フォーマット0
	00 01	トラック数=1
	00 60	4分音符あたりの分解能(10進数で96)

次にトラック・チャンク

	4D 54 72 6B	MTrk
	00 00 00 24	データ長（10進数で36）

デルタ・タイム	イベント	コメント
00	FF 51 03 07 A1 20	テンポ（メタ・イベントで表記※）
00	90 3C 40	ドの音を鳴らす
60	3C 00	ドの音を止める
00	3E 40	レの音を鳴らす
60	3C 00	レの音を止める
00	3E 40	ミの音を鳴らす
60	3C 00	ミの音を止める
00	3E 40	ファの音を鳴らす
60	41 00	ファの音を止める
00	FF 2F 00	エンド オブ トラック

※ テンポ=120の場合、4分音符は500,000μ秒。16進数に直すと07A120μ秒となる。

Figure 7.12 Example of MIDI data in SMF format 0

7.4 What GM and SMF have brought

GM is the standard format for MIDI sound sources, The format of the MIDI sequence data side has been unified. Thanks to these two systems working together, high compatibility was guaranteed, and electronic musical instruments were able to create new forms. The stage has arrived.

It's a workstation synthesizer, It's not just the birth of DTM. For example, Thanks to the widespread use of data for automatic playing and automatic accompaniment in digital pianos, it is now possible to take piano lessons on one's own. In other words, even if you don't have a piano teacher, the digital piano can play back model performances and record and automatically evaluate the user's performance. Or it can play a luxurious orchestral performance. While reproducing it with the piano with the built-in GM sound source, I played the piano concerto at home, and it was a great performance. It is now possible to listen carefully to the piece while practicing it on the Dophon.

Overseas, arranger keyboards have evolved to a more advanced stage, and to drive their automatic accompaniment functions, Therefore, a huge amount of SMF data was initially stored in 3.5-inch It was first sold on floppy disks, and then later on was sold as a download over communication lines. Moreover, in Europe and the US, the lack of compatibility of GM System Level 1 was not acceptable, and data conforming to GS and XG was being sold. Because of its popularity, compatibility with GM systems has been expanded. I'm happy that it's the first GM compatible system in System Level 2. Furthermore, SMF vocal troupe Data pre-loaded into the rack could be used to activate the keyboard's built-in pitch shifter, adding stunning harmonies to the song.

In the next chapter, we will look at the GM and MIDI data that can be used to create Introducing new markets that have emerged.

8ÿThe spread of online karaoke

Online karaoke, which appeared in 1992, is a new business that uses MIDI data.
Laser disc type color, which was mainstream in the 1980s,
This resulted in a complete replacement of orchestra equipment.

8.1 The origins of online karaoke

Brother Industries, Ltd., the parent company of Xing Corporation, one of the two largest manufacturers of online karaoke today, launched a new business suited to the new media era in 1986 called TAKERU, an electronic distribution system for PC software (Figure 8.1).

Figure 8.1 Software vendor TAKERU (Brother Museum)

The following is an excerpt from the "Communications Society Magazine No. 27 Winter 2013" published by the Institute of Electronics, Information and Communication Engineers.
It is useful.

"Takeru is a system that connects a host computer installed in Nagoya, where Brother Industries' headquarters is located, to terminals installed in computer shops, home appliance retailers, etc. nationwide via a communication network, downloads game software and other content, and automatically writes it to a floppy disk (FD). (Omitted) Takeru's original content includes various data other than game software. For example, there was a collection of sample letters, seasonal New Year's card data, and a MIDI (Musical Instrument Digital Interface) data collection for music enthusiasts.
MIDI is characterized by its small data capacity, which made it easy to handle even on the slow and expensive communication networks of the time. Taking a major step away from the extremely niche business of selling MIDI data collections to PC users, Takeru continued to explore the possibility of a business distributing music (MIDI data was not made public), and eventually came up with the idea of an online karaoke business. The market size of PC games handled by Takeru Business was 20 billion yen, while the market size of commercial karaoke was about 450 billion yen, and the market
The scale is about 20 times. Around 1990, Brother Industries
We were searching for a business idea on the scale of 10 billion yen that would be suitable for the multimedia age. The karaoke market seemed very attractive as a new business candidate combining multimedia and communication networks.

8.2 The introduction of the multi-timbral sound source SC-55

Around 1990, when Brother Industries first began considering online karaoke as a new business, the only multi-timbral MIDI sound source was Roland's MT-32 (see Figure 6.10). However, the MT-32's PCM sounds (sampled sounds) were limited to a few hundred milliseconds of attack, making it particularly poor at producing vivid piano sounds. In 1991, Roland released the SC-55 (see Figure 6.12), a multi-timbral sound source that used PCM sounds (sampled sounds) entirely.

Sound source based on SC-55 with the sounds required for online karaoke
By adding new colors, this sound source board (Fig. 8.2) is now
It was decided that they would be supplied to radio makers.

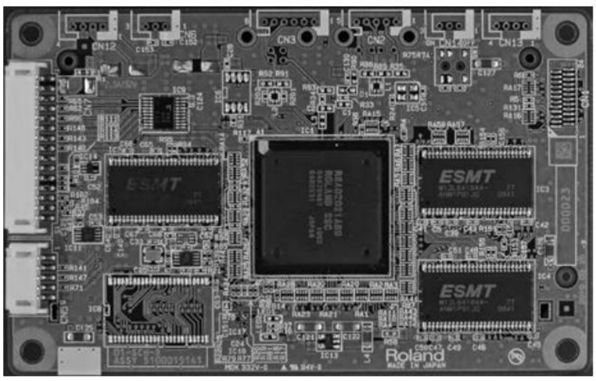


Figure 8.2 Karaoke sound source board

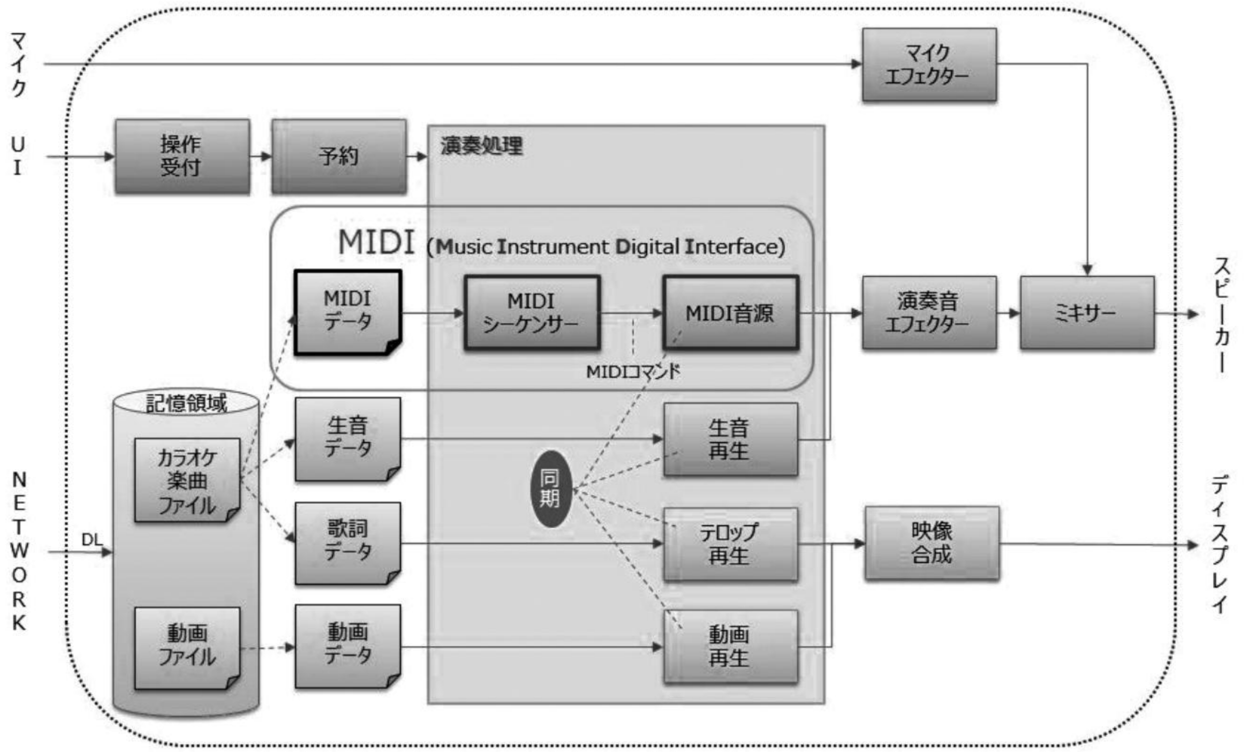


Figure 8.3 Block diagram of online karaoke (provided by Brother Industries, Ltd.)

8.3 MIDI-enabled online karaoke

The heart of online karaoke is the MIDI sound source. The data to play the source is SMF (Standard MIDI File) Figure 8.3 shows the sequence data for communication. Block diagram of Oke. Sequence data is built-in. The sequencer plays the MIDI sound. The audio data is mainly used to play backing choruses, and the lyrics data passes through a caption playback block and is superimposed on the background video image and shown on an external display.

Fig. 8.4 JOYSOUND JS-1

8.4 1992 was the first year of online karaoke

The world's first online karaoke was released by a game company The manufacturer is Taito. It was released in August 1992. The first model was the X-2000. However, Taito's online karaoke business was slower than Xing in building its communications network, and was eventually transferred to Xing when Taito withdrew from the karaoke business in July 2006.

October 1992, two months after the debut of Taito X-2000 In April, the "JOYSOUND JS-1" (Fig. 8.4) was released by Xing (a group company of Brother Industries, Ltd.).

8.5 Laser Karaoke with a Limited Number of Songs

In the 1980s, it had an overwhelming dominance in the karaoke world. The first machine to be introduced was laser karaoke, but the number of songs that could be stored was physically limited. Figure 8.5 shows a machine that holds 144 laser discs. It is an autochanger system that can store large The system took up as much space as a refrigerator. The maximum number of songs that could be stored was about 4,000.

In addition, the process of recording the performance in the studio and creating background footage on location or on a studio set can take anywhere from one to two weeks from the release of a new song to the provision of karaoke.

It took two months to complete.

In the stem, both the karaoke performance and the background images are laser.

The quality of the karaoke was not comparable.

However, for the young generation, who are the main customers of karaoke boxes,

How quickly you can sing new songs at karaoke is important.

That was an important point.

Figure 8.5 Pioneer Laser Karaoke Auto Change
Jar system (Laser disc stored in the lower center)

8.6 Daiichi Kosho enters the online karaoke market

In 1994, a year and a half after the release of JOYSOUND's JS-1,

In April, Daiichi Kosho, a major karaoke company, entered the online karaoke market.

The model name was DAM-6400 (Fig. 8.6). The MIDI sound source was

The communication karaoke device itself uses Yamaha's MIDI sound source.

These were also supplied by Yamaha on an OEM basis.

Figure 8.6 Daiichi Kosho DAM-6400

With the entry of Daiichi Kosho into the online karaoke market in 1995,

The market share of online karaoke is surpassing that of laser karaoke.

(See Figure 8.7.) Then the laser

Laoke rapidly lost its market share and in March 2007, the market declined.

became the world's only disc press manufacturer.

Memory Tech discontinued its production line.

The history of Za Karaoke has come to an end.

8.7 Current online karaoke

As mentioned in Chapter 6, the online karaoke service was launched.

In order to create the new version, tens of thousands of MIDI sequence files were created at once.

Data has been provided. There are already a huge number of DTMs

Users competed with each other through computer communication, and MIDI

I was honing my ability to create sequence data.

This is also very useful for creating data for online karaoke.

This will contribute to the launch of the new karaoke market.

Moreover, online karaoke is a new technology that uses physical data.

Without using any data media,

	year	87 88 89 90 91 92 93 94 95 96 97 98 99												
	LD manual 33.2 44.4 46.7 46.5 49.3 47.7 41.3 38.1 17.9 14.8 11.5 8 LD auto CD VHD Online karaoke Others Bar													6.3
	Karaoke	5.9 9.6 12.1 14.9 17.4 20 20.4 20.7 11.5 6.3 6.4 4.7 4.2												
Market share by type (%)		9.7 18.7 17.3 21 22.1 21.3 24.5 22.5 25.5 21.6 16.4 13.1 10.3												
	room	30.7 18.7 20.1 15.7 10.2 9.4 7.7 4.5 2.3 1.3 0.8 0.8 0.5												
	Number of units							1.3 5.9 37.2 41.8 52.2 62.7 68.9						
	in	20.5 8.6 3.8 1.9				1.0	1.6 4.8 8.3 5.8 14.2 12.8 10.7 11.9							
								28.0 28.0 26.0				32.0		27.0
units)	operation (10,000							11.0 13.9 15.0 3.4				16.0		14.8
	Other							8.9 7.0 42.4 50.8				13.0		10.6
	Total							48.0				61.0		52.4

87-94: Pioneer Corporation, Public Relations Department, Karaoke White Paper, Type share is only for bars

95-99: Japan Karaoke Business Association. The share by type is only for dealer-managed units, which account for more than 80% of the number of units in operation.

Figure 8.7 Trends in market share by type of commercial karaoke (cited from a systematic survey on the development and practical application of laser discs)

By making full use of the clock, small MIDI data can be transmitted in a short time. Because there are no physical constraints, data for newly released songs can be supplied quickly,

Not only can you store a huge amount of song data,

You can change the number and key to your liking, or give it a score.

Such features were not available with previous karaoke systems.

There were many benefits.

Initially, online karaoke had 3,000 songs built in, but now it has grown to 270,000 songs. And about 1,000 new songs are added every month.

According to statistics for 2017,

The shipment value of the equipment was approximately 60.8 billion yen, and the end user's

The domestic market size is just under 600 billion yen. Japan is the only country where online karaoke has been successful, but the most successful MIDI-related product is

It is no exaggeration to say that MIDI

It is also the most unique market that has been born.

Not only could even non-players enjoy the pleasure of music, but it also marked a time in the network age when MIDI data could be distributed to every corner of the country as naturally as water or electricity.

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2) Sumitaka Matsumura: "Development of LD (Laser Disc System) Systematic survey of practical applications National Museum of Nature and Science Technology Systematization Survey Report Vol.21 March 2014

3) Japan Karaoke Association: KE White Paper 2018

9ÿExpanding Use of MIDI

9.1 USB-MIDI

MIDI was introduced in 1983, and while the protocol has been utilized, the hardware configuration has expanded over time. In the 1990s, when DTM (Desk Top Music) was booming, sound sources included computers with MIDI terminals.
A model with a serial terminal for pewter is now available
This allows direct connection to a computer's serial terminal without a MIDI interface. Although direct connection to a computer's serial terminal differs from the hardware specified at the time of the establishment of MIDI 1.0, the information flow is
was the MIDI protocol itself.

In the world of DTM, as computers have evolved, so have their connection formats. First, "IEEE 1394," established in 1995, was led by Apple Computer, and standardized in collaboration with Sony, TI, IBM, and others. In November 2000, Japan's AMEI and America's MMA established RP-027, "MIDI Media Adaptation Layer for IEEE-1394," as a recommended application example for streaming MIDI over "IEEE 1394."

At the same time, the USB (Universal Serial Bus) standard was being established and discussions were underway in the Device Working Group of the USB Implementers Forum on how to stream MIDI.

9.1.1 USB-MIDI device classes

As the name Universal Serial Bus indicates, USB is a bus standard for connecting various peripheral devices to a host device. The first standard, USB 1.0, was
It was introduced in 1996. Today's personal computers
It is the most popular general-purpose interface standard for computer peripherals. It was developed by Compaq, Digital Equipment Corporation (DEC), IBM, Intel, Microsoft, NEC Corporation (NEC), Nortel, and others with the aim of replacing the conventional RS-232C serial port, parallel port, and PS/2 connector.

It was jointly developed by seven companies in the U.S., Europe, and Asia-Pacific, and was launched in 1994.

It became popular after being officially supported in Windows 98.

In USB, peripherals are grouped according to their functions. A set of specifications called device classes has been defined. A unified control interface is provided for devices created according to each class specification (or subclass specification depending on the class specification), and the class
Devices that comply with the specification are called class drivers. Since all devices in the same class can be operated using common device driver software, there is no need to create separate driver software for each product. USB-MIDI is defined as one of the following three subclasses of the audio class:

ÿAudio Control Interface Sub
AC: Audio Control interface subclass ÿ Audio Streaming Interface Subclass
AS (AudioStreaming interface subclass)
ÿMIDI Streaming Interface Subclass
(MS: MIDIStreaming interface subclass)

9.1.2 USB-MIDI transfer speed

Up until USB 1.1 (released in September 1998), the following speeds were the maximum:
It was big.

- Low-Speed (Ls USB): Transfer speed 1.5 Mbps. Peripherals that do not require high-speed communication, such as keyboards and mice. Used for vessels
- Full-Speed (Fs USB): Transfer speed 12 Mbps. For devices that require high communication speed, such as digital scanners and printers. Used for peripheral devices

USB 2.0, which offers a significant improvement in data transfer speed, was released in April 2000. was newly established.

- High-Speed (Hs USB): Transfer speed 480Mbps. It can handle large amounts of data and storage at practical speeds (see Figure 9.1).

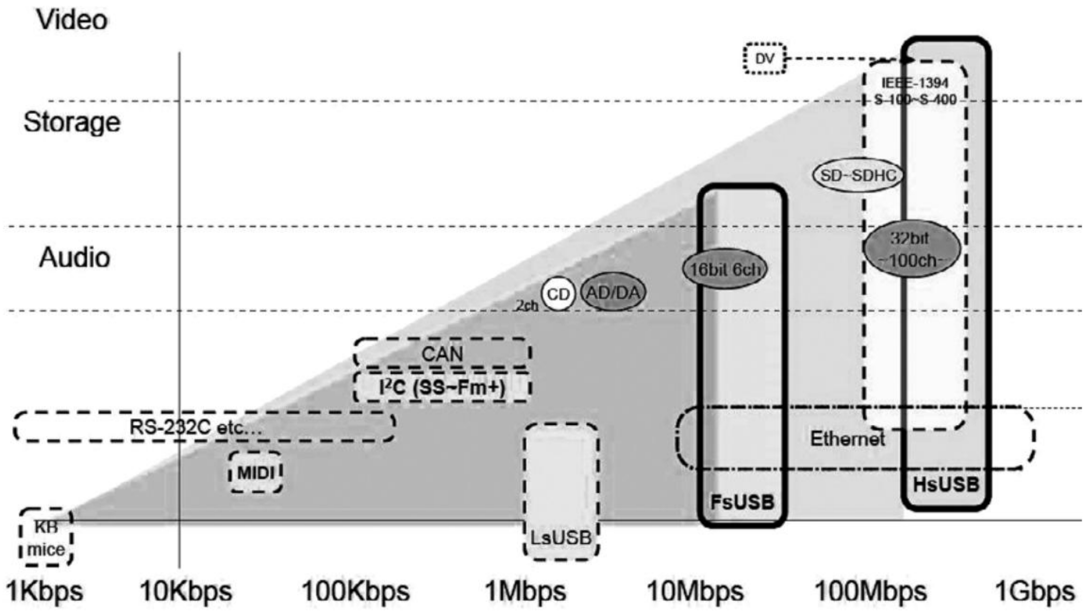


Figure 9.1 Comparison of transfer speeds

9.1.3 USB-MIDI data structure

The format of MIDI data transmitted over USB is a 4-byte (32-bit) fixed-length “USB-MIDI event” as shown in Figure 9.2.

The data is then packed into a single "transmit packet" and forwarded.

The variable length MIDI message "System Export" Other 1 to 3 bytes except for "inclusive message" Fixed-length MIDI messages are stored as complete messages without any status bytes omitted. It is stored in bytes 1 to 3 of the packet. The first byte (byte 0) of a MIDI event packet indicates the nature of the MIDI message contained in the packet. The upper four bits are the cable number (CN: Cable Number), which indicates the MIDI cable number. Thanks to this "cable number", USB-MIDI can assign individual MIDI messages to up to 16 MIDI connectors. MIDI signals can be output to the MIDI terminal. If there is only one, all packets forwarded will CN=0.

* The running status defined in MIDI 1.0 is not used.

Also, a note-off message is sent at velocity = 0.

There is no substitute for sage. Note off is

Always use the status of the note-off message.

The lower 4 bits of byte 0 are the code index. The CIN is a Code Index Number (CIN) that indicates the type of MIDI message stored in bytes 1 and after. 9.3 summarizes the classification. CIN=0x00ÿ 0x01 is currently undefined and unused. CIN=0x08ÿ 0x0E is status byte 0x8n "Notes OFF" The "Channel Message" consisting of a sequence of 2 to 3 bytes is stored in bytes 1 to 3 of the packet. The value of CIN is

This is the value of the upper 4 bits of the status byte.

The CIN value corresponding to the "System Message" in the status byte 0xFn is 0x0F. For "single byte" status byte 0xF8 to 0xFF are reserved exclusively for "system real-time messages" (see Figure 9.4).

Other "System Common Messages" and "System For "System Exclusive Messages" CIN=0x02 to 0x07 are assigned. Status byte 0xF8 to 0xFF "System real-time message" A "message" is a 1-byte message that is the signature of other messages. It can be inserted anywhere in the can, even in the middle.

Byte 0		Byte 1	Byte 2	Byte 3
Cable Number	Code Index Number	MIDI_0	MIDI_1	MIDI_2

Figure 9.2 32-bit USB-MIDI event packet (taken from Universal Serial Bus Device Class Definition for MIDI Devices)

CIN	MIDI_x Size	Description
0x0	1, 2 or 3	Miscellaneous function codes. Reserved for future extensions.
0x1	1, 2 or 3	Cable events. Reserved for future expansion.
0x2	2	Two-byte System Common messages like MTC, SongSelect, etc.
0x3	3	Three-byte System Common messages like SPP, etc.
0x4	3	SysEx starts or continues
0x5	1	Single-byte System Common Message or SysEx ends with following single byte.
0x6	2	SysEx ends with following two bytes.
0x7	3	SysEx ends with following three bytes.
0x8	3	Note-off
0x9	3	Note-on
0xA	3	Poly-KeyPress
0xB	3	Control Change
0xC	2	Program Change
0xD	2	Channel Pressure
0xE	3	PitchBend Change
0xF	1	Single Byte

Figure 9.3 Code Index Number Classification

Description	MIDI_ver. 1.0	Event Packet
Note-on message on virtual cable 1 (CN=0x1; CIN=0x9)	9n kk vv	19 9n kk vv
Control change message on cable 10 (CN=0xA; CIN=0xB)	Bn pp vv	AB Bn pp vv
Real-time message F8 on cable 3 (CN=0x3; CIN=0xF)	F8 xx xx	3F F8 xx xx

Figure 9.4 Example of a USB-MIDI event packet

9.1.4 USB-MIDI interfaces

In 1998, Roland released the world's first USB-MIDI interface, the UA-100 (Fig. 9.5).
Since USB-MIDI is defined as the USB audio class, it can also handle audio.

Fig. 9.5 Roland UA-100

In 2000, Roland released the USB-MIDI interface UM-1 (Fig. 9.6). This was a UA-100 that removed the audio section and sent and received only MIDI.
We have achieved low prices.

Figure 9.6 Roland UM-1

9.2 BLE-MIDI

BLE-MIDI is officially called "MIDI over Bluetooth Low
The name of the company is "Energy" and was established in the United States on September 15, 2015.
MMA (MIDI Manufacturers Association) and Japan
It was officially approved by AMEI (Association of Musical Electronics Industries) and was published as MIDI Standard Recommended Application Example (RP-052) on November 1 of the same year.
It has been published as such.

9.2.1 What is BLE-MIDI?

When the Bluetooth standard version 4.0 was announced in December 2009, it was a revamp of the existing Bluetooth Basic Rate/
Significant power savings compared to Enhanced Data Rate
BLE (Bluetooth Low Energy) has been added. Originally, it was designed to communicate data with sensors installed in home appliances, and was intended for use in weight scales, blood pressure monitors, thermometers, refrigerators, etc.
The rate is 1Mbit/s. BLE-MIDI is a MIDI protocol.
The call is sent with a timestamp (time information) via BLE (Bluetooth
It is a standard for transmitting and receiving data over Wireless Low Energy (WLE).

9.2.2 Background of the establishment of BLE-MIDI

The background to the establishment of BLE-MIDI is Apple's extremely large
Apple already supported BLE in iOS 8, developed in 2014, and all iPhones from the iPhone 4S onwards and all iPads from the third generation onwards are compatible with BLE.

The original proposal for BLE-MIDI was submitted by Apple Inc., and The BLE-MIDI specification is based on Core MIDI (the MIDI function in Apple's Mac OS X and iOS).
It is based on the Android version.
Since Android 6.0, BLE-MIDI has been supported at the same time that MIDI has been supported in the OS. However, care must be taken when using BLE-MIDI as it is highly device-dependent.

9.2.3 BLE-MIDI devices

Even before the BLE-MIDI standard was officially decided, development of MIDI devices using BLE was already underway. A US venture company called Miselu developed a BLE device the size of which was adjusted to match the iPad at the time, as shown in Figure 9.7.
The mini keyboard C.24 was released in December 2014.
In November 2014, Quicco Sound released the mi.1 (Fig. 9.8), an adapter that connects a MIDI IN terminal to a MIDI OUT terminal and enables connection to BLE.

Figure 9.7 Miselu C.24

Figure 9.8 Quicco Sound mi.1

In February 2016, Yamaha released the MD-BT01 (Fig. 9.9), which has the same functions as the Quicco Sound mi.1.
Both the mi.1 and the MD-BT01 have a MIDI OUT current loop.
It is used as a power supply source.
Then, MIDI signals are transmitted between USB-MIDI and BLE-MIDI.
The company also released a product called UD-BT01 (Fig. 9.10) that supports this function.
It is being used.

Around the same time, Korg released the BLE-MIDI

The mini keyboard microKEY AIR is now on sale.
As shown in Figure 9.12, the company has commercialized a number of software sound sources for iOS.
The main feature is that it can be used as a wireless keyboard.
be.

Figure 9.9 Yamaha MD-BT01

Fig. 9.10 Yamaha UD-BT01


Figure 9.11 Korg microKEY AIR

Figure 9.12 Korg Mobile Sound Module


Fig. 9.13 Roland LX-17

Figure 9.14 Roland Piano Partner 2

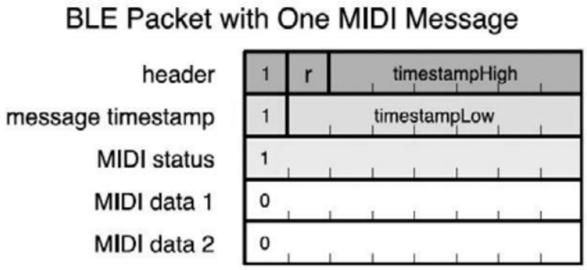
Roland's home piano LX-17 (Fig. 9.13), released in September 2015, is compatible with BLE-MIDI. By linking with the iOS/Android application Piano Partner 2 (Fig. 9.14), the sheet music of songs stored in the piano itself can be displayed on the tablet screen, and rhythmic accompaniment can be automatically added to piano performances, and the rhythm function, ear training and music reading can be done in a game-like manner.
can.

9.2.4 Protocols used in BLE-MIDI

BLE-MIDI uses packet-based
The protocol has a packet transmission interval of 15 ms.
The size of one packet is usually 20
The conventional MIDI transmission timing is real-time.
However, since BLE-MIDI is a standard protocol, packets are transferred in batches at intervals of up to 15 milliseconds, the concept of timestamps is introduced to correct the exact timing of sound generation. A timestamp is a 13-bit time in 1 millisecond increments, with a maximum of 8,191 milliseconds. This time is issued on the sending side in a monotonically increasing format.

A BLE packet consists of the header bytes as shown in Figure 9.15. and the timestamp byte contains 2 bytes of MIDI data. The timestamp consists of the lowest 6 bits of the header (timestampHigh) and the lowest 7 bits of the timestamp (timestampLow). The important point is that the timestamp byte must always precede the MIDI status byte, as shown in Figure 9.16.

This is something that must not be done.



* r is a reserved bit, usually 0.

Figure 9.15 BLE-MIDI packet example 1

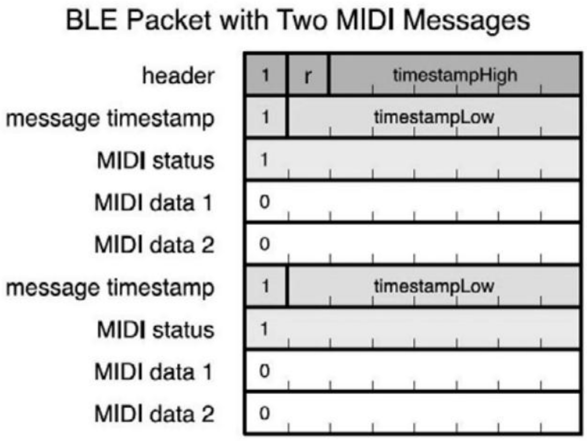


Figure 9.16 BLE-MIDI Message Example 2

Uses the running status like traditional MIDI. However, some care must be taken when using BLE-MIDI. Also, system common messages and system real-time messages and system events Exclusive messages require special treatment. Yes. Please refer to the specifications for details.

9.2.5 Future and challenges of BLE-MIDI

Wireless connections are extremely convenient for using MIDI on mobile devices, and this is expected to grow significantly in the future. For editing and remote control of electronic musical instruments using mobile devices However, it is very effective in real-time. The MIDI transmission is packetized at up to 15 ms. It is necessary to take into consideration the above points.

BLE-MIDI is data with time stamps Therefore, if a system that takes timestamps into account is constructed on the receiving side, it will be possible to manage the sound timing with an accuracy of 1 millisecond. It is extremely important to operate it in a way that suits its intended purpose.

9.3 MIDI-CI (MIDI Capability Inquiry)

9.3.1 Background

More than 30 years have passed since the establishment of the MIDI 1.0 standard, and during this time, the content of the standard has been expanded through more than 60 Confirmation of Approval for the MIDI Standard and Recommended Practices. It also includes a MIDI message library. The path has also changed from asynchronous serial communication to so-called RS-MIDI, USB, IEEE 1394, Bluetooth and other It has evolved while using the latest interface of Ta.

In contrast to the old MIDI cable, which was a one-way communication where messages were sent continuously, USB and Bluetooth have mechanisms in place that allow the receiver to wait before sending (flow control) according to its own circumstances, and to resend if confirmation of receipt is not received, allowing for synchronization between sending and receiving. He said.

The number of products equipped with MIDI has also diversified, with keyboards and sound sources being added. From the keyboard to the drums/percussion, Without guitar synthesizers, wind instruments, or sound sources, Even new controller keyboards appeared, and the variety of them increased. The software allows you to record MIDI It is now possible to use the MIDI controller, and it even has a sound source function.

MIDI devices have become more diverse and feature-rich. The structure in which devices connected via MIDI send messages one-way without each device knowing about the other has not changed since the establishment of the MIDI 1.0 standard. This has maintained compatibility for over 30 years, but Responding to new demands for MIDI-based systems It is also true that this was not the case.

For example, a computer that does not have a keyboard Let's say you connect a sound module product via USB. The DAW software on your computer can use a numerical value called a program change to switch the sounds assigned to the sound module, but it doesn't know the names of the sounds that the sound module has, so it can't display them. Conversely, the DAW doesn't know that this product doesn't have a keyboard, so it can't display the names of the sounds.

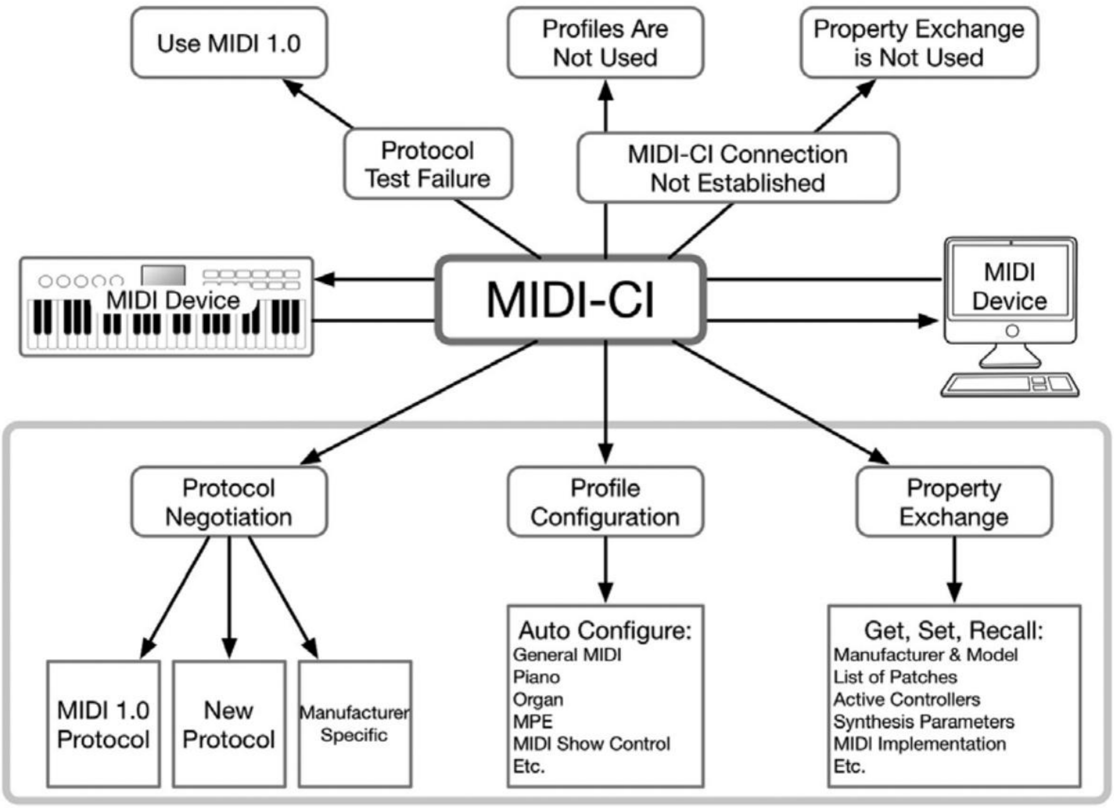


Figure 9.17: MIDI-CI standard concept diagram (quoted from the MIDI-CI standard)

I don't know about this, so I'm not using it as a MIDI input device.
In this way, the device information of the connected device is insufficient, and the appropriate communication
It is difficult to communicate with other devices.
I can't see the MIDI implementation in
Then connect the keyboard controller to the sound source product and
When you want to play a loop, you may want to check whether the other device supports harmonic control of the sound.
or Rotary Speaker Effect On/Off
In order to solve these problems, MIDI-CI was established, and Protocol Negotiation, Profile Configuration, and Property Exchange were defined.

9.3.2 Proposal for the MIDI-CI standard

With the widespread use of modern interfaces such as USB, bidirectional communication can be easily achieved. The MIDI-CI (MIDI Capability Inquiry) standard was proposed with the aim of enabling MIDI devices to exchange information and data with each other and optimizing the functionality and operability of the system.

Based on the current MIDI 1.0, negotiation
The definition of the ensemble allows for more advanced inter-instrument coordination.
In addition, future protocol expansion and integration with devices other than musical instruments are also possible.
We are also considering collaboration (media mix).

As shown in the MIDI-CI standard conceptual diagram in Figure 9.17,
Information shared between devices through negotiation and
Protocol Negotiation, Profile Configuration,
Three new Property Exchanges are defined.
Protocol Negotiation is a protocol negotiation technique that allows a protocol different from that described in the MIDI 1.0 specification to be used with a Profile.
Configuration describes the predefined specifications the instrument has (such as GM System Level 2 or Organ), and
Property Exchange gets or sets device-specific information such as a tone list or a control list.
It is called the three P's, which come from the initials of these three words.

9.3.3 The birth of the MIDI-CI standard

Yamaha Corporation has been selling the Future MIDI
The Japanese government had been advocating the evolution of MIDI, and in November 2016, the Association of Musical Electronics Industry (AMEI) officially proposed to consider Future MIDI at its technical research committee. The MIDI Standards Committee decided to accept the proposal, and in December, the Future MIDI Expansion with Capability Inquiry Working Group (FME-CI WG) was established. The working group included Yamaha Corporation, Roland Corporation, Korg Inc., and Chroma.

Rimson Technology Co., Ltd., Kawai Musical Instruments Co., Ltd., and Zoom Corporation are registered members, but the substance of the discussion is Yamaha, Roland, Korg, Crimson
The project was led by four technology companies.

At the MIDI Manufacturers Association (MMA) Annual General Meeting (AGM) held at the NAMM Show in January 2017, AMEI introduced the contents of FME-CI and the establishment of a working group as a proposal, and encouraged the MMA to begin discussions toward standardization. In response, the matter was discussed as Agenda #216 at the MMA Technical Standards Board (TSB), and a specialized working group, CIWG, was established. The standard was structured to respect compatibility with existing MIDI and to adopt a gradualist approach that would realize the new standard step by step.

Therefore, we decided to adopt a more flexible approach.
The new functions are only activated when the devices and PCs that use them negotiate with each other (CI), and if they match, the communication remains at MIDI 1.0.

Versal System Exclusive Messages
They exchange information with each other using this format.

The activities of the FME-CI WG in 2017 are as follows:
The MIDI-CI protocol will be defined within the MIDI 1.0 standard, and a draft standard will be compiled. The standard will be approved at the MMA annual meeting during the Winter NAMM Show in 2018. As an appeal to the electronic musical instrument industry,
We decided to demonstrate on the spot how to obtain and operate Profile Configuration and Property Exchange.

During 2017, discussions were held in parallel in the FME-WG of AMEI and the CIWG of MMA, but as a new initiative
Both parties can exchange opinions and share materials on the same BBS.
The two parties exchanged opinions at regular intervals. Compared to the past, when they exchanged opinions via email, the speed of exchange of opinions has increased dramatically. The draft of the specification was completed on October 30, 2017, and was approved by AMEI and sent to MMA.
The details of the text will be revised and the standard will be published by January 2018.
The format was also improved.

Every year, a meeting between AMEI and key MMA members is held on the day before the MMA Annual General Meeting. At the 2018 meeting, AMEI Chairman Yutaka Hasegawa (Yamaha at the time) explained the significance of the MIDI-CI standard,
Both AMEI and MMA were able to reach a consensus.

At the 2018 MMA Annual General Meeting, a vote on the MIDI-CI standardization took place in the morning session and was approved without any problems. Together with the MIDI Polyphonic Expression (MPE) standard, which was approved at the same time, this impressed upon the industry the continuing evolution of MIDI (see Figure 9.18).

In the afternoon presentation, Mizumoto Koichi (then of Roland) of the FME-CI WG explained the background and overview of the standard's proposal, followed by Kakishita Masahiro (then of Yamaha), chairman of the AMEI Technology Research Committee, who described his vision of the future of MIDI, one that would link with technologies in other fields.

First, we demoed Property Exchange. The demo software was plugged into Cubase (music production software) and was connected to a USB MIDI connected Yamaha, Roland, and Korg synths
The instrument obtains a list of tones and then actually calls up a tone from the list (see Figure 9.19).
The strike was captured in about 2 seconds, which made an impact.
In addition, you can plug in the state of the tone changed by the knobs on the actual instrument.
Import it into Cubase via the input, then quit it.
At the same time, turn the power back on and initialize the actual device.

Figure 9.18 2018 MMA Annual General Meeting

Machine Translated by Google

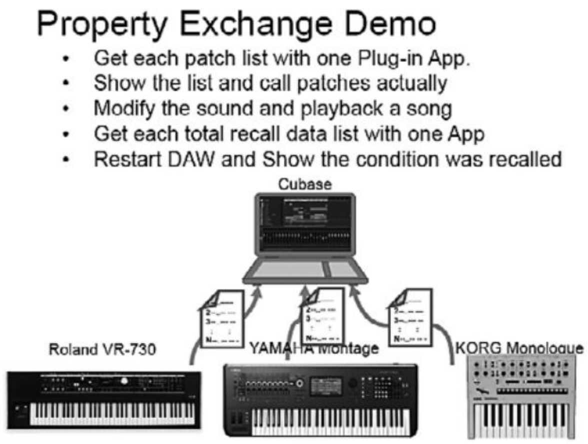


Figure 9.19: Getting a list of tones using MIDI-CI

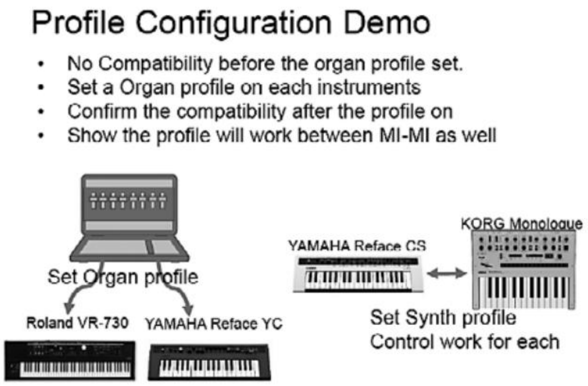


Figure 9.20: Interconnecting products from different manufacturers using MIDI-CI profiles

If you restart the program, the state just before the program was shut down can be reproduced.

This was possible with software synths, but with hardware In the past, it was necessary to make full use of each company's own proprietary protocol.

I did.

Next, we demonstrated the Profile Configuration. We prepared Yamaha and Roland organ keyboards,

However, after you turn on the Organ Profile, they will operate with common controls, and you will be able to use the controls of one to control the organ tone of the other.

In addition, Korg and Yamaha synthesizers

Connect the synth directly, and then turn on the synth Profile. This shows that it is possible to control the tone of the instruments (see Figure 9.20).

The idea of maintaining and connecting them must have seemed fresh.

The

possibilities of MIDI beyond the field of electronic musical instruments include:

Controlling the synthesizer provided by Yamaha

A video showing how the drone's flight is controlled was shown.

By "playing" knobs and keys, you can control the direction and altitude of the drone.

Being able to control the

Figure 9.21 Speech by then AMEI Chairman Hasegawa

Finally, the demonstration ended with a speech by AMEI Chairman Hasegawa (Fig. 9.21) on the possibilities of Future MIDI Expansion.

This case study was also significant in terms of promoting cooperation among manufacturers, and we look forward to seeing AMEI continue to play an active role in achieving common industry goals.

References and Citations

1) USB Implementers Forum: “Universal Serial Bus Device Class Definition for MIDI Devices”

2) The MIDI Manufacturers Association: “Specification for MIDI over Bluetooth Low Energy version 1.0” 3) The MIDI Manufacturers

Association: “MIDI Capability Inquiry Document version 1.0”

10ÿConclusion

This survey focuses on the MIDI 1.0 standard, its creation, We have examined the history of the technology and how it has become so widespread.

It all started with the idea of instruments talking to each other. MIDI. The conversation goes beyond the framework of musical instruments and is For example, commercial equipment that was previously out of the loop has now joined the conversation, Eve concert PA and recording studio It has become possible to operate and automate various things. Or, in a karaoke booth far away, it has made a citizen who has never played an instrument into an instant star. Nowadays, GM sound sources are even included in mobile terminals, and ringtones are actually SMF data.

MIDI song data was distributed via the Internet. With the spread of Bluetooth, wireless MIDI keyboards are now available for sale, and it is now commonplace to wirelessly control music apps on smartphones and tablets with MIDI. In this way, MIDI has greatly expanded its scope of discussion, but even so, in the 35 years since its establishment,

and MIDI version remained at 1.0.

In December 2018, the Japan Music Electronics Business Association (AMEI) and the MIDI Manufacturers Association (MMA) is the next generation of MIDI that includes a new protocol that provides extensibility to the conventional MIDI standard. To advance the development and standardization of "MIDI 2.0" Electronic musical instrument manufacturers and software vendors from Japan, the United States, and other countries are participating in the development of this new standard.

MIDI 2.0 was first developed through negotiation between MIDI devices. This allows for compatibility with existing MIDI 1.0 devices. It is a standard that will greatly improve performance expressiveness and data reproducibility over the current MIDI 1.0, with features such as expanded resolution, note control, and time stamps.

Also, at the NAMM Show in January 2019, MIDI-CI The public exam was held using the Control the drone by manipulating the parameters of the sensor. There were also some innovative experiments on display, such as rolling the robot. In addition, applications to mobility and home appliances are also being considered, and MIDI is expected to become even more integral to our lives. It is expected that...

Thus, even though more than 35 years have passed since its establishment, The pioneers who created MIDI, which plays an important role I would like to express my respect for the insight and efforts of MIDI is updated to keep up with the times This allows for more attractive music and content than ever before. We hope that this will create new ideas and enrich our lives. It never stops.

Acknowledgements

This report, "MIDI Technology Systemization Survey," was compiled. In doing so, many organizations, companies, and individuals have We would like to express our deepest gratitude to the following people for their guidance and instruction. We would also like to express our sincere gratitude to the following people for providing us with particularly valuable materials and information:

Association of Musical Electronics Industry (AMEI)
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ATV Corporation
Pioneer Corporation
Daiichi Kosho Co., Ltd.
Brother Industries, Ltd. Xing
Co., Ltd. Idea Sound Co.,
Ltd.
Sea Music Co., Ltd.
QUICCO SOUND Inc. inMusic Japan
Inc. Music Trade Inc. Rittor
Music Inc.

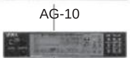
Roland Corporation
Mr. Dave Smith
Mr. Marcus Ryle Mr.
Hiroshi
Takayama Formerly with Yamaha Corporation
Mr. Tetsuo Nishimoto Formerly with Roland Corporation
Mr. Tadao Kikumoto Mr. Toshiaki Yamabata (in no particular order)

*The author of this book, Hideki Ido, passed away before completing the work. This book was compiled based on the manuscripts and materials left behind by Ido. If you find any errors or omissions in the contents of this book, please contact the National Museum of Nature and Science, Industrial Technology History Information Center.

MIDI Technology Tree

		1960	1970	1980	The Birth of MIDI
M I D I Technique Technique of strange Transition		Different methods CV/GATE interfaces are mixed on the market		1980: Oberheim's "Oberheim Parallel Bus" is introduced •1980 Roland Introducing "DYN SYNC" •1981 Ikutaro Hashimoto proposes standardization of a common interface •1981 The 1st Synthesizer Interface Conference was held. •1982 Roland Introducing "DCB"	•1983 MIDI connection test was successful at the NAMM Show in the US •1983 MIDI Liaison Council (later MIDI Standards Council (name changed to MIDI Standards Council) established  MIDI connection test •1983 MIDI 1.0 specification published •1986 Multitimbral The emergence of DTM sound sources •1988 Launch of packaged products for PC music production
M I D I Seki Ream Product of strange Transition	synthesizer/ sampler		•1973 Appearance of Japanese synthesizers (Roland SH-1000, Korg miniKORG700) •1976 Roland SYSTEM-700 released •1977 Yamaha CS-10 released •1978 Korg MS-20 released • 1979 Korg MS-02 released	•1981 Roland JUPITER-8 released •1982 Roland JUNO-60 released	•1983 Sequential Circuit Prophet-600 released  Prophet-600 •1983 Roland JUPITER-6, JX-3P launched  JUPITER-6 •1983 Yamaha DX7 released  DX7 •1984 Casio CZ-101 released  CZ-101 •1985 Akai S612 launched  D-50 •1986 Akai S900 released •1987 Roland D-50 released  M1 •1988 Korg M1 released
	sequencer		•1977 Roland MC-8 released	•1981 Roland MC-4 released	•1984 Yamaha QX1 released •1984 Roland MSQ-700 released  QX1 •1986 Roland MC-500 released •1987 Yamaha QX3 released
	Rhythm Machine			•1980 Roland TR-808 released	•1983 Roland TR-909 released •1984 Yamaha RX11 released •1987 Yamaha RX7 released •1988 Roland R-8 released  TR-909  RX11
	DTM/ Sound Module			 CX5  MPU-401	•1983 Yamaha CX5 released •1983 Roland MPU-401 released •1984 Roland MCP-PC8 released  FB-01 •1985 Come on Music RCP-PC88, RCP-PC98 released •1986 Yamaha FB-01 released  MT-32 •1987 Roland MT-32 released •1988 Roland Music-kun released  Musician •1989 Roland Musico launched
	karaoke				

*For MIDI-related products, products from domestic manufacturers are mainly listed.

1990	2000	2010
•1991 Standard MIDI files are standardized. •1991 GM System Level 1 is standardized •1992 The appearance of MIDI communication karaoke •1996 The Association of Musical Electronics Industry (AMEI) was established. •1998 USB-MIDI interface appears •1999 GM System Level 2 is standardized •1999 MIDI is certified as a JIS standard. (JIS X 6054-1 and 2)	•2000 MIDI Media Adaptation Layer (IEEE 1394 compatible) is standardized •2001 XMF (eXtensible Music Format) is standardized •2001 GM Light and Mobile Applications Guidelines for	•2013 Ikutaro Hashimoto and Dave Smith won the Grammy Award "Technical Grammy Award" •2015 BLE-MIDI (MIDI over Bluetooth Low Energy is standardized •2017 MIDI is certified as an IEC international standard. (IEC63035:2017 ED1) •2018 MIDI-CI (MIDI Inter-Device Negotiation) standardized •2019 Announcement of development and standardization of MIDI 2.0
	•2002 Yamaha Tyros released  Tyros •2003 Roland DisCover 5 released  DisCover 5	•2014 Miselu C.24 released  C.24 •2014 Quicco Sound mi.1 released  mi.1 •2017 Korg Pa700 Oriental released  Pa700 Oriental
•1990 Yamaha QY10 released  QY10 •1996 Roland MC-303 released  MC-303	•2002 Roland MC-909 released  MC-909	
•1991 Roland SC-55 released •1991 Yamaha TG100 released •1991 Internet Singer Song Writer released •1992 Yamaha HELLO!MUSIC! released •1992 Kawai GMega released •1993 Korg AG-10 released •1997 Yamaha MU100 released •1998 Roland UA-100 released  GMega  AG-10  MU100  SC-55  HELLO!MUSIC!  UA-100  TG100	•2000 Roland UM-1 released  UM-1	
•1992 Taito X-2000 released •1992 Xing JOYSOUND JS-1 released •1994 Daiichi Kosho DAM-6400 launched  JS-1  DAM-6400		

Release	products		Japan	Keytar
1983	DX7		Japan	Synthesizer
	KX1			
	CX5		Japan	Music Production
	SMD-01			MIDI Interface
	JUPITER-6			
	JX-3P			synthesizer
	TR-909			Rhythm Machine
	MPU-401			MIDI Interface
	HP-400			Digital
	PR-800			MIDI Recorder
	PB-300			Auto-accompaniment
	Prophet-600			synthesizer
	Prophet-T8			synthesizer
1984	TX816			Sound Module
	KX5			Keytar
	QX1		[illegible]	sequencer
	RX11			Rhythm Machine
	JUNO-106			synthesizer
	MKB-1000			Keyboard Controller
	MKS-80			Sound Module
	AXIS-1			Keytar
	MSQ-700			sequencer
	RK-100			Keytar
	CZ-101			synthesizer
	SRX AK			synthesizer
1985	KX88			Keyboard Controller
	MKS-7			Sound Module
	S612			sampler
	Mirage			Keyboard Sampler
1986	FB-01			Sound Module
	MC-500			sequencer
	S900			sampler
	ESQ-1			synthesizer
1987	QX3			sequencer
	RX7			Rhythm Machine
	DMP7			Digital Mixer
	D-50			synthesizer
	[illegible]			Sound Module

1988			[illegible]	[illegible] Machine
				[illegible] Voltage
				synthesizer
	[illegible]			synthesizer
1989				[illegible] Interface
				[illegible] Module
				[illegible] Voltage
1990				[illegible] Sequencer
1991				[illegible] Module
				[illegible] Module
1992				[illegible] Voltage
		Kawai		[illegible] Module
				[illegible] Karaoke
				[illegible] Karaoke
1993				[illegible] Module
1994				[illegible] Module
				[illegible] Module
				[illegible] Karaoke
1995				[illegible] Module
1996	[illegible] SOUND			[illegible] Voltage
				[illegible] Sequencer
				[illegible] Module
1997			[illegible] Interface	[illegible] Module
1998				[illegible] Module
1999			[illegible]	[illegible] Module
				[illegible] Voltage
				[illegible] Digital
2000				[illegible] Voltage
				[illegible] Interface
2002				synthesizer
				[illegible] Sequencer
[illegible]				synthesizer
				[illegible] Synthesizer
2014		[illegible]		
		[illegible]		[illegible]
[illegible]			[illegible]	[illegible] Digital
				[illegible]
				synthesizer
				Keytar

[illegible]

number	name	[illegible]	Manufacturer	location		[illegible]
1	[illegible]ification	1983	[illegible]da, [illegible]	[illegible]	[illegible]o, 2-16-9	[illegible]ers. [illegible]
	[illegible]esizer DX7	1983	[illegible]	[illegible]ion	[illegible]	[illegible]zer [illegible]r
	[illegible]puter CX5	1983	[illegible]	[illegible]ation	[illegible]	[illegible]y, [illegible]n,
	synthesizer JUPITER-6	1983	[illegible]ation	[illegible]u	[illegible]u	[illegible]ial [illegible]ons
	synthesizer JX-3P	1983	[illegible]ation	[illegible]u [illegible]m	[illegible]u	
	[illegible] TR-909	1983	[illegible]ation	[illegible]u	[illegible]u	[illegible]or, [illegible]ed is.
	[illegible]face MPU-401	1983	[illegible]ation	[illegible]u	[illegible]u	[illegible]on
	[illegible]uencer QX1	1984	[illegible]	[illegible]ion	[illegible]	[illegible]ers
	[illegible]esizer D-50	1987	[illegible]ation	[illegible]u	[illegible]u	[illegible]
10	[illegible]p	1988-2002	[illegible]ation	[illegible]u	[illegible]u	[illegible]aking Added.
11	[illegible]station M1	1988	KORG	[illegible]uarters	[illegible]chi,	[illegible]r [illegible]on [illegible]y.
12	[illegible]encer QY10	1990	[illegible]ation	[illegible]ion	[illegible]	[illegible]d
13	[illegible]ke [illegible]SOUND	1992	[illegible]	[illegible]	[illegible]o	[illegible]d. [illegible]