THE COMPLETE SCI MIDI
First Edition

Contents

PRELIMINARY

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MIDI HISTORY
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Introduction

The Musical Instrument Digital Interface (MIDI) is a specification which enables manufacturers to design equipment that is basically compatible. This is most beneficial for the owner, whose equipment is thereby protected from obsolesence. As MIDI-compatible equipment is introduced, one will be able to freely choose keyboards, sequencers, and rhythm units from a variety of manufacturers with confidence that they will work together as one programmable system through which complete pieces can be composed and realized.

The problem of instrument compatibility is not new. It can be probably said of any two keyboards, that someone has desired if not actually tried to interconnect them. Keyboard couplers were developed for both pipe organs and harpsichords. In the heyday of electric organ technology this interest occasionally led to the installation of thick cables for wiring keyboards in parallel. The first synthesizers were easier to interface, because of the nature of modular equipment. However modules from different manufacturers might have incompatible control voltage, trigger, gate, and output levels or polarities. These differences have been promulgated in scores of synthesizer, keyboard, and effect devices, ultimately giving rise to an entire industry devoted to modifications and interfacing. And though they provide the best opportunity for interface so far, even microcomputer-based synthesizer equipment has been developed along independent, incompatible lines.

Like many other defacto "standards," the MIDI has arisen primarily from the activities of those concerned that the incompatibility of current equipment discourages wider availability of the kinds of complex systems which can be envisioned utilizing even current technology. (The S-100 microcomputer buss evolved for similar reasons.) It is more than anything else the advent of the home computer which has forced music manufacturers to finally address the issue of compatibility. For the musician, the keyboard interface to the computer terminal offers the possibility of multi-track sequencing and editing, score display and printing. In this light the usefulness and need for a standard computer keyboard interface is obvious. Only with some such standard can these musical tools be developed.

The following explains how the MIDI specification resulted from this industry-wide consensus. The MIDI specification neither possesses nor claims any authority over equipment design. Rather, it is merely an informal agreement on some simple interface circuitry and the "grammar" of a non-proprietary language which can carry meaningful information between instruments. The incorporation or support of the MIDI facility in a product remains entirely a decision for each manufacturer.

The SCI Digital Interface

SCI first became interested in microcomputer interfacing in conjunction with the design of the Prophet-10 polyphonic synthesizer and its internal polyphonic sequencer. The Prophet and its sequencer each were based on Z-80 microcomputers. To record, as notes were played, every few milliseconds (at a rate set by the sequencer clock), the Prophet would send its complete keyboard "status" to the sequencer. The sequencer had to figure out which notes were going on and off, and record these events in reference to the clock count. On playback, the sequencer computer also sent the complete keyboard status every clock pulse, with events as counted out by the clock. The Prophet would play these notes just as if they came from its own keyboard. Later, this sequencer was made available as an accessory for the Prophet-5. The Prophet-5 Remote Keyboard was also developed which used this interface. SCI published the data protocol upon which this interface was based, in the hopes that the programming public would be encouraged to develop their own interfaces for the Prophet-5.

This did not occur, apparently because in being conceived for a specific application, the interface was very fast but too clumsy for general-purpose use. It was criticized as requiring too much programming "overhead," in the constant transmission of meaningless keyboard information. As a result of this experience, SCI resolved to pursue a more streamlined interface that would be easier for programmers to work with.

The Universal Synthesizer Interface

In the meantime, occasional discussions between the presidents of Sequential Circuits (SCI), Oberheim Electronics, and Roland (Dave Smith, Tom Oberheim and Ikutaroo Kakehashi) also revealed a shared interest in the interface problem and development of an interface widely acceptable to the industry.

Smith then outlined a specification for a "Universal Synthesizer Interface" (USI). It was developed with the assistance of SCI's Chet Wood and presented at the Fall, 1981 convention of the Audio Engineering Society (AES).

The USI differed markedly from the earlier SCI Digital interface in that rather than being polled at the sequencer clock rate, information was only sent when an event actually occured--for example, a note going on or off. The USI was proposed to be serial, operating at 19.2 kBaud, with TTL levels, and connected through phone jacks.

After incorporating changes in response to comments from AES, Smith sent a questionnaire to all manufacturers and industry consultants he could find, asking for their suggestions and any special requirements. There was a strong response to this initiative; some saying, for example, that it would not be possible to do it serially, that a parallel interface was necessary. Others thought the proposed serial speed too fast for operation with home computers. Many other issues were raised.

All respondents were invited to a conference in coincidence with the January, 1982 Western National Association of Music Merchants (NAMM) convention in Anaheim. This meeting was attended by representatives from SCI, Roland, Oberheim, CBS/Rhodes, Yamaha, E-mu, Unicord (Korg), Music Technology Inc., Kawai, Octave Plateau, Passport Designs, and Syntauri. Other manufacturers seemed to be maintaining a "wait-and-see" policy.

At this meeting the chief changes which occured to the USI were to add optoisolation to prevent audio ground loops, and to increase the speed to 31.25 kBaud.

The Japanese Interface Proposal

Following the USI discussion at Anaheim, an alternative specification was presented by some of the Japanese companies which had grown out of their own research. Whereas the USI was basically content to specify note on/off codes, this new proposal went on to define many more complex operations. It also offered a different data structure, with status and data bytes being flagged by bit 7 (1=status, 0=data). This greatly simplified the protocol by eliminating all the checks which were otherwise needed to distinguish the data category. With the most significant bit now defined as a "flag," data is thereby limited to 7 bits, but this is sufficient for most synth data, and when not, can simply be sent as multiple 4-bit nibbles.

The MIDI

After the Anaheim meeting, Smith and Wood integrated the USI and Japanese proposals, forming the first MIDI specification. This was sent to all of the meeting participants but, curiously, provoked no further comment from this continent. The final document was therefore arrived at after several exchanges betwen SCI and Roland, which is serving as liason with Yamaha, Korg, and Kawai.

The development of MIDI was first made public by Robert Moog, in his October, 1982 column in KEYBOARD magazine.

In December of 1983, SCI began shipping the Prophet-600, the first commerically available instrument to include the MIDI.