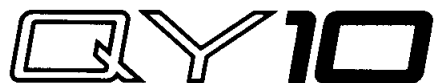


YAMAHA

MUSIC SEQUENCER

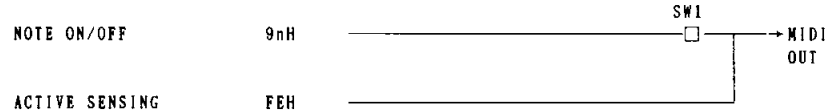


MIDI DATA FORMAT

MIDI SPECIFICATIONS

TONE GENERATOR SECTION

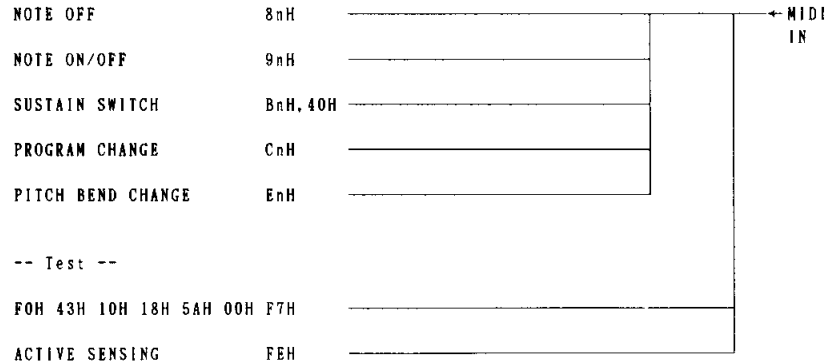
(1) TRANSMIT FLOW



SW1 MIDI Transmit Channel

The MIDI Transmit Channel is fixed at the selected track, and transmits on channels 1-8.

(2) RECEIVE FLOW



(3) TRANSMIT/RECEIVE DATA

(3-1) CHANNEL VOICE MESSAGES

(3-1-1) NOTE OFF

STATUS	1000nnnn	(8nH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
NOTE NUMBER	0kkkkkkk		k = 0 (C-2) ~ 127 (G8)
VELOCITY	0vvvvvvv		v is ignored

Received only.

*In RECORD mode, reception is always Omni On.

(3-1-2) NOTE ON/OFF

STATUS	1001nnnn	(9nH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
NOTE NUMBER	0kkkkkkk		k = 0 (C-2) ~ 127 (G8)
VELOCITY	0vvvvvvv	(v ≠ 0)	NOTE ON
	00000000	(v = 0)	NOTE OFF

*In RECORD mode, reception is always Omni On.

(3-1-3) CONTROL CHANGE

STATUS	1011nnnn	(BnH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
CONTROL NUMBER	0ccccccc		
CONTROL VALUE	0vvvvvvv		

*In RECORD mode, reception is always Omni On.

*No control numbers are transmitted.

*No control numbers are received.

c = 64	SUSTAIN SWITCH
	v = 0 ~ 63 : OFF, 64 ~ 127 : ON

(3-1-4) PROGRAM CHANGE

STATUS	1100nnnn	(CnH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
PROGRAM NUMBER	0ppppppp		p = 0 ~ 31

Only data relating to voices changes is received.

* In RECORD mode, reception is always Omni On.

(Reception)

In PLAY mode when the Voice Channel Number is 0-6 and

in RECORD mode when the Record TRACK is other than "rhythm"

if p = 0-31, change the voice

if p = 32-127, ignore

In PLAY mode when the Voice Channel Number is 7 and

in RECORD mode when the Record TRACK is "rhythm"

if p = 30-31, change the voice

if p = 0-29, 32-127, ignore

(3-1-5) PITCH BEND CHANGE

STATUS	1110nnnn	(EnH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
LSB	0vvvvvvv		PITCH BEND CHANGE LSB
MSB	0vvvvvvv		PITCH BEND CHANGE MSB

7-bit resolution

In RECORD mode, reception is always Omni On.

During reception, only the MSB data is used.

MSB	
0000000B (00H)	minimum value
0100000B (40H)	center value
0111111B (7FH)	maximum value

(3-2) SYSTEM REAL TIME MESSAGES

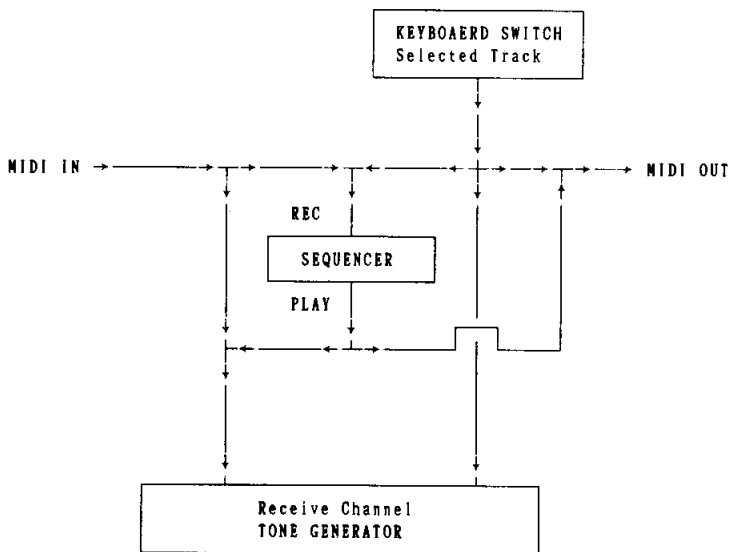
(3-2-1) ACTIVE SENSING

STATUS 11111110 (FEH)

Transmitted approximately every 250 msec.

Once this code is received, sensing will begin. If neither status nor data is received for longer than approximately 350 msec, the MIDI receive buffer will be cleared, and all sounding notes and the sustain switch will be turned off. The value of each control message will be reset to a specific value.

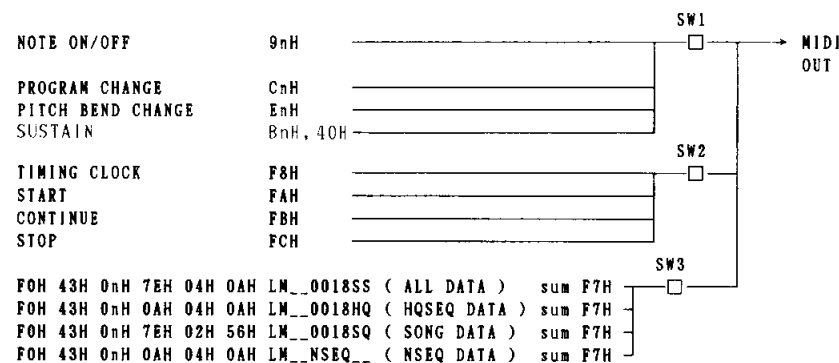
(4) ORGANIZATIONAL DIAGRAM OF THE KEYBOARD SWITCH SECTION, THE SEQUENCER SECTION, AND THE TONE GENERATOR SECTION



Note) *When not in RECORD mode, note-on messages from the keyboard, note-on messages from the sequencer, and note-on messages from MIDI are distinguished. When not in RECORD mode, sustain messages from the sequencer, and sustain messages from MIDI are distinguished. Pitch bend messages from the sequencer and MIDI are not distinguished.

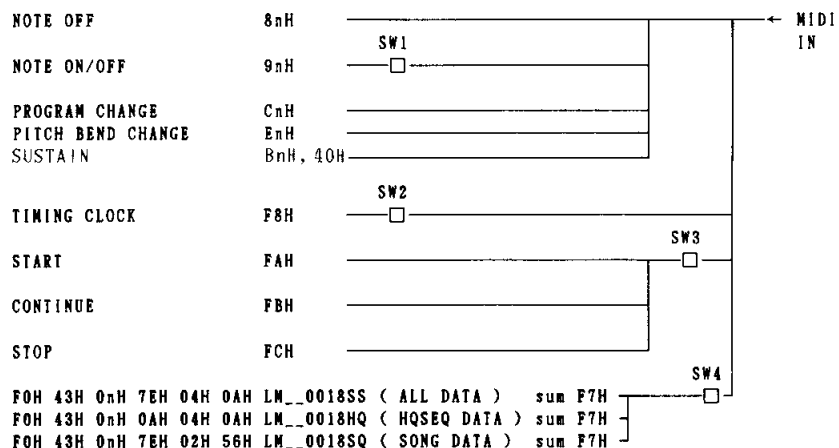
SEQUENCER SECTION

(1) TRANSMIT FLOW



- SW1 MIDI Transmit Channel
The transmit channel is fixed for each track (1-8).
- SW2 MIDI Control
Transmission can be turned on/off.
- SW3 System Exclusive Message Transmit Channel
System Exclusive message transmission can be turned on/off, and the device number can be specified.

(2) RECEIVE FLOW



SW1 Velocity Filter

Velocity step recording and editing input can be turned on/off.

SW2 Clock Condition Select

You can select whether to use the internal clock or clock messages from MIDI as the timing source.

SW3 MIDI Control

Reception can be turned on/off.

SW4 System Exclusive Message Receive Channel

System Exclusive message reception can be turned on/off, and the device number can be specified.

(3) TRANSMIT/RECEIVE DATA

(3-1) CHANNEL VOICE MESSAGE

Transmitted only during play and overdub. The transmission channel is fixed for each track, as 0-7.

Received only during record. All channels are always received.

(3-1-1) NOTE OFF

STATUS	1000nnnn	(8nH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
NOTE NUMBER	0kkkkkkk		k = 0 (C-2) ~ 127(G8)
VELOCITY	0vvvvvvv		v is ignored

Received only. Converted into 9nH 00H for transmission.

* In RECORD mode, reception is always Omni On.

(3-1-2) NOTE ON/OFF

STATUS	1001nnnn	(9nH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
NOTE NUMBER	0kkkkkkk		k = 0 (C-2) ~ 127(G8)
VELOCITY	0vvvvvvv	(v ≠ 0)	NOTE ON
	00000000	(v = 0)	NOTE OFF

Reception of velocity during step recording and editing input can be turned on/off.

* In RECORD mode, reception is always Omni On.

(3-1-3) PROGRAM CHANGE

STATUS	1100nnnn	(CnH)	n = 0 ~ 7 VOICE CHANNEL NUMBER
PROGRAM NUMBER	0ppppppp		p = 0 ~ 127

* In RECORD mode, reception is always Omni On.

(3-2) CHANNEL MODE MESSAGE

Neither transmitted nor received.

(3-3) SYSTEM COMMON MESSAGE

Neither transmitted nor received.

(3-4) SYSTEM REAL TIME MESSAGE

(3-4-1) TIMING CLOCK

STATUS	11111000	(F8H)
--------	----------	-------

You can select whether to use the internal clock or clock messages from MIDI as the timing source. Transmission can be turned on/off, and reception can be turned on/off.

(3-4-2) START

STATUS 11111010 (FAH)

Transmission/reception can be turned on/off.

(3-4-3) CONTINUE

STATUS 11111011 (FBH)

Transmission/reception can be turned on/off.

(3-4-4) STOP

STATUS 11111100 (FCH)

Transmission/reception can be turned on/off.

(3-5) SYSTEM EXCLUSIVE MESSAGE

Not received, except for in PLAY mode and PATTERN mode initial displays.

In DEMO mode, Exclusive messages are not received.

(3-5-1) BULK DUMP

(i) ALL DATA, SONG DATA

```

STATUS 11110000 (FOH)
IDENTIFICATION 01000011 (43H)
SUB STATUS 0000nnnn (0nH) n = DEVICE NUMBER
FORMAT NUMBER 01111110 (7EH)
BYTE COUNT(MSB) 0bbbbbbb
BYTE COUNT(LSB) 0bbbbbbb
CLASSIFICATION 01001100 (4CH) ASCII'L
NAME 01001101 (4DH) ASCII'M
00100000 (20H) ASCII'_'
00100000 (20H) ASCII'_'
DATA FORMAT 00110000 (30H) ASCII'0'
NAME 00110000 (30H) ASCII'0'
00110001 (31H) ASCII'1'
00110000 (38H) ASCII'8'
0nnnnnnn ASCII
0nnnnnnn ASCII
DATA 0ddddd
|
0ddddd
CHECK SUM 0eeeeeee 2's complement of 7 bits sum of all
data bytes
BOX 11110111 (F7H)

```

Type	b	m	Refer to
ALL DATA	04H 0AH	SS	
SONG DATA	02H 56H	SQ	table 2

(ii) QYSEQ DATA

```

STATUS          11110000      (F0H)
IDENTIFICATION  01000011      (43H)
SUB STATUS      0000nnnn      (0nH)  n = DEVICE NUMBER
FORMAT NUMBER   00001010      (0AH)
BYTE COUNT(MSB) 0bbbbbbb
BYTE COUNT(LSB) 0bbbbbbb
CLASSIFICATION  01001100      (4CH)  ASCII'L
NAME            01001101      (4DH)  ASCII'M
                00100000      (20H)  ASCII'_
                00100000      (20H)  ASCII'_
DATA FORMAT     00110000      (30H)  ASCII'0
NAME            00110000      (30H)  ASCII'0
                00110001      (31H)  ASCII'1
                00111000      (38H)  ASCII'8
                0mmmmmm      ASCII
                0mmmmmm      ASCII
DATA            0ddddddd
                0ddddddd
CHECK SUM       0eeeeeee      2's complement of 7 bits sum of all
EOX             11110111      (F7H)  data bytes
    
```

Type	b	m	Refer to
HQSEQ DATA	04H 0AH	HQ	

(iii) NSEQ DATA

```

STATUS          11110000      (F0H)
IDENTIFICATION  01000011      (43H)
SUB STATUS      0000nnnn      (0nH)  n = DEVICE NUMBER
FORMAT NUMBER   00001010      (0AH)
BYTE COUNT(MSB) 00000100      (04H)
BYTE COUNT(LSB) 00001010      (0AH)
CLASSIFICATION  01001100      (4CH)  ASCII'L
NAME            01001101      (4DH)  ASCII'M
                00100000      (20H)  ASCII'_
                00100000      (20H)  ASCII'_
DATA FORMAT     01001110      (4EH)  ASCII'N
NAME            01010011      (53H)  ASCII'S
                01000101      (45H)  ASCII'E
                01010001      (51H)  ASCII'Q
                00100000      (20H)  ASCII'_
                00100000      (20H)  ASCII'_
DATA            0ddddddd
                0ddddddd
CHECK SUM       0eeeeeee      2's complement of 7 bits sum of all
EOX             11110111      (F7H)  data bytes
    
```

Type		Refer to
NSEQ DATA	NSEQ_ _	table 3

The three types of bulk data indicated in (i) and (ii) can be transmitted and received, and the bulk data data indicated in (iii) can be received. The device number can be specified in UTILITY mode.

Reception is possible only while in song play or pattern play modes when the sequencer isn't running.

When SONG DATA or QYSEQ DATA is received, the received data will be loaded into the song only if the currently selected song is empty. When ALL DATA is received, all data will be erased, and the received data will be loaded.

Transmission is done when the UTILITY operation Bulk Transmit is executed.

When you select "song out", specify the song number, and execute Bulk Dump, the following data will be transmitted consecutively.

1. SONG DATA
2. QYSEQ DATA

If the specified song is empty, transmission will not occur.

The format of the ALL DATA that is transmitted when you select "all out" and execute Bulk Dump is as follows.

1. SONG 1:SONG DATA
8. SONG 8 SONG DATA
9. SETUP DATA (Table 1)
10. SONG 1:QYSEQ DATA
17. SONG 8 QYSEQ DATA

Even if a song is empty, the song data will be transmitted.

QYSEQ Track data begins with F0H mnH.

(m = song number, n = track number)

If all songs & patterns are empty no data will be transmitted.

If bulk dumps are transmitted successively, an interval of longer than 100 msec will be inserted between each bulk dump transmission.

If the length of the data portion of ALL DATA or NSEQ DATA exceeds 512 bytes, it will be divided into 512 byte blocks and a byte count and header will be added to the beginning of each block, a check sum will be added to the end, and an interval of longer than 100 msec will be inserted between each block.

When bulk dumps are received successively, an interval of longer than 100 msec must be inserted between each bulk dump.

(3-5-2) DUMP REQUEST

Not received.

(TABLE 1) SEQUENCER SETUP DATA

No.	function	value	note
0	Click Condition	0-3	0:off, 1:rec, 2:play/rec, 3:always
1	Clock Condition	0-1	0:internal, 1:MIDI
2	reserved		
3	Song Rec Type	0-3	0:step, 1:overdub, 2:replace, 3:auto
4	Pattern Rec Type	0-1	0:step, 1:overdub
5	MIDI Control	0-1	0:off, 1:on
6	Transpose	0-24	
7	Song Rec channel	0-8	
8	Pattern Rec channel	0-3	
9	Current Track	0-7	
10	Pattern Number	0-99	
11	Pattern Sequence	size & value is not fixed	
12	reserved	00	

(TABLE 2) SEQUENSER SONG DATA

```

=====
No.      function                value      note
=====
0        song tempo
-----
1        track 1 voice number         0-31
2        track 2 voice number         0-31
3        track 3 voice number         0-31
4        track 4 voice number         0-31
5        chord 1 track voice number  0-31
6        chord 2 track voice number  0-31
7        bass track voice number     0-31
8        rhythm track voice number   30-31
-----
9        track 1 pb range            0-12
10       track 2 pb range            0-12
11       track 3 pb range            0-12
12       track 4 pb range            0-12
13       chord 1 track pb range     0-12
14       chord 2 track pb range     0-12
15       bass track pb range        0-12
-----
16       track 1 volume              0-99
17       track 2 volume              0-99
18       track 3 volume              0-99
19       track 4 volume              0-99
20       chord 1 track volume       0-99
21       chord 2 track volume       0-99
22       bass track volume          0-99
23       rhythm track volume        0-99
-----
24       track 1 pan                 0-2
25       track 2 pan                 0-2
26       track 3 pan                 0-2
27       track 4 pan                 0-2
28       track 5 pan                 0-2
29       track 6 pan                 0-2
30       track 7 pan                 0-2
31       track 8 pan                 0-2
-----
32-330  measure map (299 byte)       1-122
=====

```

(TABLE 3) NSEQ DATA FORMAT

One song of NSEQ data consists of one or more tracks, and each track begins with FOH OnH (n = track number), and ends with F2H. Empty tracks will not be transmitted. The time/event/control data explained below in "Remarks" is inserted between the FOH OnH and F2H.

```

hex      description
-----
F0       top of track #1
00
--
--       time/event/control data
F2       end of record

--
--       track #2 ~ #7 data

F0       top of track #8
07
--
--       time/event/control data
F2       end of record
-----

```

(REMARKS) NSEQ time/event/control data DATA FORMAT
(binary notation)

```

short time      0ttttttt          (384th note length/bit)
long time.     0ttttttt 0ttttttt  (MS byte - LS byte order)

short note     10dddddd 0kkkkkkk 0vvvvvvv
long note      11dddddd 0ddddddd 0kkkkkkk 0vvvvvvv
short note     10dddddd 1kkkkkkk          (When velocity = 40H)
long note      110dddddd 0ddddddd 1kkkkkkk  (When velocity = 40H)

ddd = duration          (96th note/bit)
kkk = MIDI note number
vvv = MIDI velocity

measure mark    11110101          (bar line)
no operation    11111000          (does nothing)

```

(For the following, the format is the same as MIDI except for the MS byte.)

```

poly a. touch   11111010 0kkkkkkk 0vvvvvvv
control change  11111011 0ccccccc 0vvvvvvv
program change  11111100 0ppppppp
channel a. touch 11111101 0vvvvvvv
pitch bend     11111110 0vvvvvvv 0vvvvvvv

```


Function ...	Transmitted	Recognized	Remarks
Basic Default	: 1 - 8	: 1 - 8	*1 : memorized
Channel Changed	: 1 - 8 *2	: x	
Mode Default	: 3	: 1, 3	: memorized
Mode Messages	: x	: x	
Mode Altered	: *****	: x	
Note Number : True voice	: 0 - 127 *****	: 0 - 127	
Velocity Note ON	: o 9nH, v=1-127	: o v=1-127	
Velocity Note OFF	: x 9nH, v=0	: x	
After Key's	: x	: x	
Touch Ch's	: x	: x	
Pitch Bender	: x	: o 0-12 semi	: 7 bit resolution
Control Change	: 0-63 : x 64 : x 65-120 : x	: x : o : x	: Sustain

Prog Change : True #	: x *****	: o 0 - 31	: *3
System Exclusive	: x	: x	
System : Song Pos	: x	: x	
System : Song Sel	: x	: x	
Common : Tune	: x	: x	
System : Clock	: o *4	: o *5	
Real Time : Commands	: o *4	: o *4	
Aux : Local ON/OFF	: x	: x	
Aux : All Notes OFF	: x	: x	
Mes- : Active Sense	: o	: o	
sages:Reset	: x	: x	

Notes: *1 = if REC mode, receive all channels.
 *2 = selected by current track.
 *3 = 0-29:voice1-30, 30:rhythm, 31:voice off
 *4 = if MIDI control switch is on.
 *5 = receive in MIDI sync mode.

Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO o : Yes
 Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO x : No

Function ...	Transmitted	Recognized	Remarks
:Basic Default	: 1 - 8	: 1 - 16	: memorized
:Channel Changed	: x	: x	:
:Mode Default	: x	: x	:
:Mode Messages	: x	: x	:
:Mode Altered	: *****	: x	:
:Note Number : True voice	: 0 - 127 : *****	: 0 - 127	:
:Velocity Note ON	: o 9nH,v=1-127	: o v=1-127 *1	:
:Velocity Note OFF	: x 9nH,v=0	: x	:
:After Key's	: x	: x	:
:Touch Ch's	: x	: x	:
:Pitch Bender	: o	: o 0-12 semi	: 7 bit resolution:
:Control Change	: 0-63 : x : 64 : o : 65-120 : x	: x : o : x	: Sustain
:Prog Change : True #	: o 0 - 127 : *****	: o 0 - 127	:
:System Exclusive	: o *2	: o *2	: song data etc.
:System : Song Pos	: x	: x	:
:System : Song Sel	: x	: x	:
:Common : Tune	: x	: x	:
:System :Clock	: o *3	: o *4	:
:Real Time :Commands	: o *3	: o *3	:
:Aux :Local ON/OFF	: x	: x	:
:Aux :All Notes OFF	: x	: x	:
:Mes- :Active Sense	: o	: x	:
:sages:Reset	: x	: x	:
:Notes: *1 = receive if velocity parameter is 'kb' in step REC mode.			
: if parameter is not 'kb',velocity is fixed to 1 - 127.			
: *2 = transmit/receive if device No. is not off.			
: *3 = if MIDI control switch is on.			
: *4 = receive clock at MIDI sync mode.			
Mode 1 : OMNI ON, POLY	Mode 2 : OMNI ON, MONO	o : Yes	
Mode 3 : OMNI OFF, POLY	Mode 4 : OMNI OFF, MONO	x : No	

YAMAHA

YAMAHA CORPORATION
P.O.Box 1, Hamamatsu, Japan

R3  Printed in Japan