

CT-S1-76/CT-S1 MIDI Implementation

CASIO COMPUTER CO., LTD.

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Part I

Overview

1 Product Configuration as a MIDI Device

As a MIDI device, this Instrument consists of the System Section, Sound Generator Section, and Performance Controller Section described below. Each of these sections can send and receive specific MIDI Messages in accordance with its function.

1.1 System Section

The System Section manages the Instrument status and user data.

1.2 Performance Controller Section

The Performance Controller Section performs keyboard play and controller operations, and generates performance messages. Basically, generated performance messages are sent to external destinations while also being transmitted to the Sound Generator Section. The channel number of the sent channel message is in accordance with the Instrument's MIDI setting. For details about the MIDI setting, see the Instrument's User's Guide.

1.3 Sound Generator Section

The Sound Generator Section mainly performs receive of performance information and sound source setting information. It consists of a common part that does not depend on the channel and a musical instrument part that is independent of each channel.

1.3.1 Sound Generator Common Block

The common block consists of system effects, master control, etc. These can be controlled by effect function, general universal system exclusive messages, or the Instrument's system exclusive messages or all. There are two types of system effects on this instrument: system effects applied to keyboard playing parts and system effects applied to other parts.

1.3.2 Instrument Part Block

The instrument part section is divided into A, B, C group for every 16 parts, and it consists of a total of 48 parts. The settings of each part can be changed using channel messages or Instrument's system exclusive messages or all. Of these, only the C group channels can be controlled by external channel messages.

The functions assigned to each part are shown below.

Port	Part number	MIDI Receive Ch	MIDI Transmit ch	Assigned Function	Details
A	01	-	1-16	Upper1	-
A	02	-	1-16	Upper2	-
A	03	-	-	-	-
A	04	-	-	-	-
A	05	-	-	-	-
A	06	-	-	-	-
A	07	-	-	-	-
A	08	-	-	Metronome	-
A	09	-	-	-	-
A	10	-	-	-	-
A	11	-	-	-	-
A	12	-	-	-	-
A	13	-	-	-	-
A	14	-	-	-	-
A	15	-	-	-	-
A	16	-	-	-	-

Port	Part number	MIDI Receive Ch	MIDI Transmit Ch	Assigned Function	Details
B	17	-	-	Recorder	System Track Upper1
B	18	-	-	Recorder	System Track Upper2
B	19	-	-	-	-
B	20	-	-	-	-
B	21	-	-	-	-
B	22	-	-	-	-
B	23	-	-	-	-
B	24	-	-	-	-
B	25	-	-	Notification Tone	-
B	26	-	-	Upper1 Selected Tone	-
B	27	-	-	Upper2 Selected Tone	-
B	28	-	-	-	-
B	29	-	-	-	-
B	30	-	-	-	-
B	31	-	-	-	-
B	32	-	-	-	-

Port	Part number	MIDI Receive Ch	MIDI Transmit Ch	Assigned Function	Details
C	33	1	-	MIDI/Song Play	-
C	34	2	-	MIDI/Song Play	-
C	35	3	-	MIDI/Song Play	-
C	36	4	-	MIDI/Song Play	-
C	37	5	-	MIDI/Song Play	-
C	38	6	-	MIDI/Song Play	-
C	39	7	-	MIDI/Song Play	-
C	40	8	-	MIDI/Song Play	-
C	41	9	-	MIDI/Song Play	-
C	42	10	-	MIDI/Song Play	-
C	43	11	-	MIDI/Song Play	-
C	44	12	-	MIDI/Song Play	-
C	45	13	-	MIDI/Song Play	-
C	46	14	-	MIDI/Song Play	-
C	47	15	-	MIDI/Song Play	-
C	48	16	-	MIDI/Song Play	-

2 About the Timbre Type

Tones that are selected by each Instrument part have an attribute that depends on the sound source operation type. This attribute is called the “Timbre Type”, which is one of the types described below.

- LM (Linear Morphing) Piano

This Timbre Type is for Linear Morphing piano tones. The decay rate of the voice being sounded and Damper Resonance effect characteristics are seamlessly altered in accordance with the depressed amount of damper pedal. The method for producing sound in response to the note messages also is different from that of the melody Timbre Type, and operation is optimized for piano.

- Melody

This Timbre Type optimizes for normal melody tones. The damper pedal performs on/off operations.

- Drum

This setting optimizes for drum sounds. The damper pedal does not function. The Hold1, Channel Coarse Tune, and Master Coarse Tune messages are ignored if they are received.

For information about tone selection, see “8 Program Change.”

3 Controlling Send/Receive of MIDI Messages in Each Instrument Part

Send and receive of MIDI messages for each instrument part can be controlled by global Instrument MIDI settings. See the Instrument’s User’s Guide for details.

4 Conditions that Disable Message Send and Receive

No MIDI messages at all can be sent or received while the instrument starts up, shuts down, accesses flash memory, etc.

Part II

Channel Message

5 Note Off

Format

Message Format: 8nH kkH vvH
9nH kkH 00H(receive only)

n: MIDI Channel Number
kk: Key Number
vv: velocity

Transmit Sent when something is played on the keyboard. The key number changes in accordance with on the Transpose function and Octave Shift function.

Receive Receipt stops a note being sounded by a note on message.

6 Note On

Message Format: 9nH kkH vvH

n: MIDI Channel Number
kk: Key Number
vv: Velocity

Transmit Sent when something is played on the keyboard. The key number changes in accordance with on the Transpose function and Octave Shift function.

Receive Receipt sounds a note of the corresponding instrument part.

7 Control Change

Message Format: BnH ccH vvH

n: MIDI Channel Number
cc: Control Number
vv: Value

For details about messages, see each section of this manual that covers them.

7.1 Bank Select (00H,20H)

Message Format: BnH 00H mmH (MSB)
BnH 20H 11H (LSB)

n: MIDI Channel Number
mm: MSB Value(Note1)
11: LSB Value(Transmit:00H, Receive:Ignored)

Note1: For details about the relationship between the MSB value and the tone, see the Tone List that comes with the Instrument's User's Guide.

Transmit Sent when a tone setup number is selected.

Receive Receipt causes a change in the tone bank number stored in Instrument memory, but the tone is not actually changed until a Program Change message is received. For details, see "8 Program Change".

7.2 Modulation wheel or lever (01H)

Message Format: BnH 01H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt adds, to the tone being sounded, modulation of a depth specified by the value. In the case of a tone that already has modulation applied, receipt of this message increases the modulation depth. The modulation effect differs according to the tone being used.

7.3 Portamento time (05H)

Message Format: BnH 05H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the portamento application time.

7.4 Data entry (06H,26H)

Message Format: BnH 06H mmH (MSB)
BnH 26H llH (LSB)

n: MIDI Channel Number
mm: MSB Value
ll: LSB Value

Receive Receipt changes the parameter assigned to RPN.

7.5 Channel Volume (07H)

Message Format: BnH 07H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when part volume is changed.

Receive Receipt changes the part volume.

7.6 Pan (0AH)

Message Format: BnH 0AH vvH

n: MIDI Channel Number
vv: Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “13.4 Pan Setting Value Table” in “IV Setting Values and Send/Receive Values”.

Receive Receipt changes the pan of the corresponding part.

7.7 Expression Controller (0BH)

Message Format: BnH 0BH vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the expression value.

7.8 Damper pedal (sustain) (40H)

Message Format: BnH 40H vvH

n: MIDI Channel Number
vv: Value

Transmit Sent when a pedal that has a sustain function is operated.

Receive Receipt performs an operation equivalent to a sustain pedal operation.

Timbre Type Specific Operation This operation differs in accordance with the Timbre Type (see “2 About the Timbre Type”) setting.

- LM (Linear Morphing) Piano
Continuous control of the following is performed in accordance with the value of the received message.
 - Piano note decay rate
 - Resonance characteristics and decay rate of Damper Resonance effectsee “13.2 Sustain Pedal Setting Value Table” in “IV Setting Values and Send/Receive Values.”
- Melody
Sustain off/on control is performed in accordance with the value of the received message. For information about the relationship between setting values and send/receive values, see the “13.1 Off/On Setting Value Table” in “IV Setting Values and Send/Receive Values”.
- Drum
The received message does not affect sound source operation.

7.9 Portamento On/Off (41H)

Message Format: BnH 41H vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.1 Off/On Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the portamento on/off setting.

7.10 Sostenuto (42H)

Message Format: BnH 42H vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.1 Off/On Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Transmit Sent when a pedal that has a sostenuto function is operated.

Receive Receipt performs an operation equivalent to a sostenuto pedal operation.

7.11 Soft pedal (43H)

Message Format: BnH 43H vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.1 Off/On Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Transmit Sent when a pedal that has a soft function is operated.

Receive Receipt performs an operation equivalent to a soft pedal operation.

7.12 Filter Resonance (47H)

Message Format: BnH 47H vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the filter resonance intensity.

7.13 Release Time (48H)

Message Format: BnH 48H vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Transmit Sent when the sustain function is used.

Receive Receipt makes a relative change in the time it takes for a note to decay to zero after a key is released.

7.14 Attack Time (49H)

Message Format: BnH 49H vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt makes a relative change in the time it takes for a note to rise to its maximum level.

7.15 Filter Cutoff Frequency (4AH)

Message Format: BnH 4AH vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the filter cutoff frequency.

7.16 Vibrato Rate (4CH)

Message Format: BnH 4CH vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the rate of vibrato.

7.17 Vibrato Depth (4DH)

Message Format: BnH 4DH vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the depth of vibrato.

7.18 Vibrato Delay (4EH)

Message Format: BnH 4EH vvH

n: MIDI Channel Number
vv: Value (Note1)

Note1: For information about the relationship between setting values and send/receive values, see the “13.3 -64 - 0 - +63 Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the delay time of vibrato.

7.19 Portamento Control (54H)

Message Format: BnH 54H vvH

n: MIDI Channel Number
vv: Source Key Number

Receive Receipt of this message first stores the Source Note Number for the next note. When the next Note On is received, the portamento effect is applied to the note using this Source Note Number as the pitch start point and the Note On event key number as the end point. If there already is a note being sounded by Source Note Number at this time, the new note on is not performed and the portamento effect is applied to the pitch of the note being sounded. That is to say that legato play is performed.

7.20 Reverb Send Level (5BH)

Message Format: BnH 5BH vvH

n: MIDI Channel Number
vv: Value

Receive Receipt changes the reverb send of the corresponding part.

7.21 RPN (Registered Parameter Number) (64H,65H)

Message Format: BnH 64H 11H (LSB)
BnH 65H mmH (MSB)

n: MIDI Channel Number
11: LSB Value
mm: MSB Value

7.21.1 Pitch Bend Sensitivity

Message Format: BnH 64H 00H
BnH 65H 00H
BnH 06H mmH
BnH 26H 11H

n: MIDI Channel Number
mm: MSB Value(00H - 18H)
11: LSB Value(Receive:Ignored)

Receive Receipt changes Bend Range of the corresponding part.

7.21.2 Channel Fine Tuning

Message Format: BnH 64H 01H
BnH 65H 00H
BnH 06H mmH
BnH 26H 11H

n: MIDI Channel Number
mm: MSB Value
11: LSB Value

Receive Receipt changes the fine tune of the corresponding part.

7.21.3 Channel Coarse Tune

Message Format: BnH 64H 02H
BnH 65H 00H
BnH 06H mmH
BnH 26H 11H

n: MIDI Channel Number
mm: MSB Value(28H - 58H)
11: LSB Value(Receive:Ignored)

Receive Receipt changes the coarse tune of the corresponding part. Does not affect sound source operation when the Timbre Type (see “2 About the Timbre Type”) is Drum.

7.21.4 RPN Null

Message Format: BnH 64H 7FH
BnH 65H 7FH

n: MIDI Channel Number

Receive Receipt de-selects RPN.

7.22 All Sound Off (78H)

Message Format: BnH 78H 00H

n: MIDI Channel Number

Receive Receipt stops all voices that are sounding.

7.23 Reset All Controllers (79H)

Message Format: BnH 79H 00H

n: MIDI Channel Number

Receive Receipt initializes each performance controller.

7.24 All Notes Off (7BH)

Message Format: BnH 7BH 00H

n: MIDI Channel Number

Receive Receipt releases (key release) all voices that are sounding.

7.25 Omni Mode Off (All Notes Off) (7CH)

Message Format: BnH 7CH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received.

7.26 Omni Mode On (All Notes Off) (7DH)

Message Format: BnH 7DH 00H

n: MIDI Channel Number

Note: This Instrument always operates in Omni Mode Off.

Receive Receipt performs the same operation as when All Notes Off is received.

7.27 Mono Mode On (Poly Mode Off) (All Notes Off) (7EH)

Message Format: BnH 7EH 00H

n: MIDI Channel Number

Note: This Instrument always operates in Poly Mode On.

Receive Receipt performs the same operation as when All Notes Off is received.

7.28 Poly Mode On (Mono Mode Off) (All Notes Off) (7FH)

Message Format: BnH 7FH 00H

n: MIDI Channel Number

Receive Receipt performs the same operation as when All Notes Off is received.

8 Program Change

Message Format: CnH ppH

n: MIDI Channel Number

pp: Program Number (Note1)

Note1: For details about the relationship between the program number and the tone, see the Tone List that comes with the Instrument's User's Guide.

Transmit Sent when a tone number is selected. Also, sent when the Program number send function is used.

Receive Receipt changes the tone of the corresponding part. The selected tone is determined by the program value of this message and the Bank Select message value received prior to this message. Also note that receipt of this message also may change the Timbre Type that corresponds to the selected tone. For more information, see "2 About the Timbre Type" below.

9 Channel Pressure (Aftertouch)

Message Format: DnH vvH

n: MIDI Channel Number

vv: Value

Receive Receipt adds, to the tone being sounded, modulation of a depth specified by the value. In the case of a tone that already has modulation applied, receipt of this message increases the modulation depth. The modulation effect differs according to the tone being used.

10 Pitch Bend Change

Message Format: EnH llH mmH

n: MIDI Channel Number
ll: Value LSB
mm: Value MSB

Receive Receipt changes the pitch of the currently sounding note. The range of the pitch change depends on the Pitch Bend Sensitivity value setting in RPN. For information about the Pitch Bend Sensitivity, see the “7.21.1 Pitch Bend Sensitivity” of this document.

Part III

System Message

11 Active Sensing

Message Format: FEH

Receive Once this message is received, the Active Sensing mode is entered. If no MIDI message is received for a specified amount of time, voices being sounded by this Instrument's sound source are released, the controller is reset, and the Active Sensing mode is exited.

12 System Exclusive Message

Message Format: FOH iiH...F7H

ii: ID Number

The Instrument sends and receives standard universal system exclusive messages, and system exclusive messages that have Instrument-specific formats (CASIO General System Exclusive).

ID Number The ID numbers handed by this Instrument are shown below.

ID Number	ID Name
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44H	Casio Computer Co. Ltd
7EH	Non Real Time System Exclusive Message
7FH	Real Time System Exclusive Message

12.1 Universal Real Time System Exclusive Message

Message Format: FOH 7FH 7FH...F7H

12.1.1 Master Volume

Message Format: FOH 7FH 7FH 04H 01H 11H mmH F7H

11: LSB Value(Receive:Ignored)

mm: MSB Value

Receive Receipt changes the master volume.

12.1.2 Master Fine Tuning

Message Format: FOH 7FH 7FH 04H 03H 11H mmH F7H

11: LSB Value(Note1)

mm: MSB Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see "13.5 Fine Tuning Setting Value Table" in "IV Setting Values and Send/Receive Values" of this document.

Transmit Sent when the tuning setting is changed.

Receive Receipt changes the tuning setting.

12.1.3 Master Coarse Tuning

Message Format: FOH 7FH 7FH 04H 04H 11H mmH F7H

11: LSB Value(Transmit:00H,Receive:Ignored)
mm: MSB Value(28H - 58H)

Receive Receipt changes the master coarse tuning parameter.

12.1.4 Reverb Type

Message Format: FOH 7FH 7FH 04H 05H 01H 01H 01H 01H 01H 00H vvH F7H

vv: Value(Note1)

Note1: For information about the relationship between setting values and send/receive values, see “13.6 Reverb Type Setting Value Table” in “IV Setting Values and Send/Receive Values” of this document.

Receive Receipt changes the reverb type.

12.1.5 Reverb Time

Message Format: FOH 7FH 7FH 04H 05H 01H 01H 01H 01H 01H 01H vvH F7H

vv: Value

Receive Receipt changes the reverb time.

12.2 Universal Non Real Time System Exclusive Message

Message Format: FOH 7EH 7FH...F7H

12.2.1 GM System On

Message Format: FOH 7EH 7FH 09H 01H F7H

Receive Receipt changes the sound source to the GM default state.

12.2.2 GM System Off

Message Format: FOH 7EH 7FH 09H 02H F7H

Receive Receipt changes the sound source setting to the Instrument presetting.

12.2.3 GM2 System On

Message Format: FOH 7EH 7FH 09H 03H F7H

Receive Though the Instrument does not support GM2, receipt of the GM2 System On message has the same result as receipt of the GM System On message.

12.3 CASIO General System Exclusive

Message Format: FOH 44H 7EH 7FH iiH ccH ssH ggH ppH ddH ... F7H

ii: Device ID (7FH)
cc: Category ID
ss: Sub Category ID
gg: Group ID (00H)
pp: Parameter ID
dd ...: Data

This message can be used to perform sound source parameter operations.

12.3.1 Reverb Type

Message Format: FOH 44H 7EH 7FH 7FH 04H 00H 00H 00H ccH ttH F7H

cc: Channel(Note1)
tt: Type(Note2)

Note1: For information about the relationship between setting values and send/receive values, see "MIDI Receive Ch" in "1.3.2 Instrument Part Block" of this document.

Note2: For information about the relationship between setting values and send/receive values, see "13.7 Reverb Type (CASIO General System Exclusive) Setting Value Table" in "IV Setting Values and Send/Receive Values" of this document.

Transmit Sent when the reverb type is changed.

Receive Receipt changes the reverb type.

Part IV

Setting Values and Send/ Receive Values

13 Setting Value Tables

13.1 Off/On Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H - 3FH	Off
7FH	40H - 7FH	On

13.2 Sustain Pedal Setting Value Table

Transmit Value	Receive Value	Parameter
-	00H	Off
:	:	(continuous)
-	7FH	Full

13.3 -64 - 0 - +63 Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H	-64
:	:	:
40H	40H	0
:	:	:
7FH	7FH	+63

13.4 Pan Setting Value Table

Transmit Value	Receive Value	Parameter
-	00H	Left
:	:	:
-	40H	Center
:	:	:
-	7FH	Right

13.5 Fine Tuning Setting Value Table

Transmit Value	Receive Value	Parameter
(LSB, MSB)		
(43H, 00H)	(00H, 00H) - (5FH, 00H)	415.5 Hz
(65H, 00H)	(60H, 00H) - (7FH, 00H)	415.6 Hz
(07H, 01H)	(00H, 01H) - (1FH, 01H)	415.7 Hz
(29H, 01H)	(20H, 01H) - (3FH, 01H)	415.8 Hz
:	:	:
(40H, 3FH)	(30H, 3FH) - (4FH, 3FH)	439.8 Hz
(60H, 3FH)	(50H, 3FH) - (6FH, 3FH)	439.9 Hz
(00H, 40H)	(70H, 3FH) - (1FH, 40H)	440.0 Hz
(20H, 40H)	(20H, 40H) - (3FH, 40H)	440.1 Hz
(40H, 40H)	(40H, 40H) - (5FH, 40H)	440.2 Hz
:	:	:
(54H, 7EH)	(50H, 7EH) - (6FH, 7EH)	465.6 Hz
(73H, 7EH)	(70H, 7EH) - (0FH, 7FH)	465.7 Hz
(11H, 7FH)	(10H, 7FH) - (2FH, 7FH)	465.8 Hz
(30H, 7FH)	(30H, 7FH) - (7FH, 7FH)	465.9 Hz

13.6 Reverb Type Setting Value Table

Transmit Value	Receive Value	Parameter
-	00H	Small Room
-	01H	Medium Room
-	02H	Large Room
-	03H	Medium Hall
-	04H	Large Hall
-	08H	Plate

13.7 Reverb Type (CASIO General System Exclusive) Setting Value Table

Transmit Value	Receive Value	Parameter
00H	00H	Room1
01H	01H	Room2
02H	02H	Room3
03H	03H	Hall1
04H	04H	Hall2
05H	05H	Plate1
06H	06H	Delay
07H	07H	Pan Delay
08H	08H	Plate2
0AH	0AH	Large Room1
0BH	0BH	Large Room2
0CH	0CH	Stadium1
0DH	0DH	Stadium2
0EH	0EH	Long Delay1
0FH	0FH	Long Delay2
10H	10H	Room4
11H	11H	Room5
16H	16H	Church
17H	17H	Hall3
18H	18H	Hall4
19H	19H	Hall5
1AH	1AH	Hall6
1EH	1EH	Cathedral
1FH	1FH	Stadium3
20H	20H	Off
2DH	2DH	Tone

Part V

MIDI Implementation Notation

14 Value Notation

14.1 Hexadecimal Notation

MIDI implementation sometimes requires that data be expressed in hexadecimal format. Hexadecimal values are indicated by the letter “H” after the value. The hexadecimal equivalents of decimal values 10 through 15 are expressed as the letters A through F.

The table below shows the hexadecimal equivalents for decimal values 0 through 127, which are often used in MIDI messages.

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
0	00H	32	20H	64	40H	96	60H
1	01H	33	21H	65	41H	97	61H
2	02H	34	22H	66	42H	98	62H
3	03H	35	23H	67	43H	99	63H
4	04H	36	24H	68	44H	100	64H
5	05H	37	25H	69	45H	101	65H
6	06H	38	26H	70	46H	102	66H
7	07H	39	27H	71	47H	103	67H
8	08H	40	28H	72	48H	104	68H
9	09H	41	29H	73	49H	105	69H
10	0AH	42	2AH	74	4AH	106	6AH
11	0BH	43	2BH	75	4BH	107	6BH
12	0CH	44	2CH	76	4CH	108	6CH
13	0DH	45	2DH	77	4DH	109	6DH
14	0EH	46	2EH	78	4EH	110	6EH
15	0FH	47	2FH	79	4FH	111	6FH
16	10H	48	30H	80	50H	112	70H
17	11H	49	31H	81	51H	113	71H
18	12H	50	32H	82	52H	114	72H
19	13H	51	33H	83	53H	115	73H
20	14H	52	34H	84	54H	116	74H
21	15H	53	35H	85	55H	117	75H
22	16H	54	36H	86	56H	118	76H
23	17H	55	37H	87	57H	119	77H
24	18H	56	38H	88	58H	120	78H
25	19H	57	39H	89	59H	121	79H
26	1AH	58	3AH	90	5AH	122	7AH
27	1BH	59	3BH	91	5BH	123	7BH
28	1CH	60	3CH	92	5CH	124	7CH
29	1DH	61	3DH	93	5DH	125	7DH
30	1EH	62	3EH	94	5EH	126	7EH
31	1FH	63	3FH	95	5FH	127	7FH

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