

MIDI Implementation

Model CDX-1 Version 1.01, Apl. 16 2001

1. RECOGNIZED RECEIVE DATA

■ Channel Voice Message

● Note On/Off

Receive the note number which is designated with "RxNote", in the MIDI channel number which is designated with "Pads Rx Ch." in the UTILITY "MIDI."

Status	Second	Third
9nH	mmH	llH

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)
 mm = Note No.: 00H-7FH (0-127)
 ll = Velocity: 01H-7FH (1-127) / 00H = NOTE OFF

● Program Change

Works as bank switch when MIDI channel number is set for playing the sample.

Status	Second
CnH	ppH

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)
 pp = Program No.: 00H-3FH (0-63)

■ Channel Mode Message

● All Sound Off (Controller Number 120)

Mutes all sounding notes, in the MIDI channel number which is designated with "Pads Rx Ch." in the UTILITY "MIDI."

Status	Second	Third
BnH	78H	00H

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)

● All Note Off (Controller Number 123)

Mutes all sounding notes, in the MIDI channel number which is designated with "Pads Rx Ch." in the UTILITY "MIDI."

Status	Second	Third
BnH	7BH	00H

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)

● System Exclusive Message

Status	Data Bytes	Status
F0H	iiH, ddH, ..., eeH	F7H

Byte	Description
F0H	Status of System Exclusive Message
iiH	Manufacturer ID 41H RolandsManufacturerID'
	7EH Universal Non Realtime Message
	7FH Universal Realtime Message
ddH	Data: 00H-7FH (0-127)
eeH	Data
F7H	EOX (End of System Exclusive Message)

● Universal System Exclusive Message

○ INQUIRY MESSAGE

◇ Identity Request

Status	Data Bytes	Status
F0H	7EH, Dev, 06H, 01H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7EH	Universal System Exclusive Message Non Realtime Header
Dev	Device ID (10H or 7FH)
06H	General Information (sub-ID #1)
01H	Identify Request (sub-ID #2)
F7H	EOX (End of System Exclusive Message)

The message is used to request the particular of the CDX-1.

If CDX-1 received the message and the device ID of the message is same as 10H or 7FH, the CDX-1 transmits the prescribed Identity Replay message.

○ MIDI Machine Control Commands

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, aaH, ..., bb	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
aaH	Command
bbH	Command
F7H	EOX (End of System Exclusive Message)

* See "2. MIDI Machine Control" section.

2. MIDI Machine Control

■ MIDI Machine Control Details

● STOP (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 01H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
01H	STOP (MCS)
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 stops immediately.

● PLAY (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 02H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
02H	PLAY (MCS)
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 goes into the playback condition.

● DEFERRED PLAY (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 03H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
03H	DEFERRED PLAY (MCS)
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 goes into the playback condition after the locate operation.

● FAST FORWARD (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 03H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
03H	DEFERRED PLAY (MCS)
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 goes into the fast forward condition.

MIDI Implementation

● REWIND (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 05H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
05H	REWIND (MCS)
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 goes into the rewind condition.

● RECORD STROBE

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 06H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
06H	RECORD STROBE
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 goes into the following condition.

1. The CDX-1 is in the playback condition.
Start Recording the tracks that status are the record standby mode.
2. The CDX-1 is in the stop condition.
Start Playing back, and Start Recording the track that status are record standby mode.

● RECORD EXIT

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 07H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
07H	RECORD EXIT
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 exits from the record condition.

● LOCATE (MCP)

○ Format 2-LOCATE [TARGET]

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 44H, 06H, 01H, hrH, mnH, scH, frH, ffH	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID (10H or 7FH)
06H	MMC Command Message
44H	LOCATE (MCP)
06H	Number of Bytes
01H	"TARGET" sub command
hrH, mnH, scH, frH, ffH	Standard Time with Sub Frame
F7H	EOX (End of System Exclusive Message)

If the device ID on the message was as same as that of the receiving 10H or 7FH, the CDX-1 locates the specified time location received from the command.

3. TRANSMITTED DATA

■ Channel Voice Message

● Note On/Off

Transmit the number/velocity which is designated, in the MIDI channel number "1" - "16" which is designated with "Rhythm Ch." in the UTILITY "MIDI."

The MIDI Channel number specified in "Pads Tx Ch." in the UTILITY "MIDI" and the Note number specified in "RxNote(Pad1)" are output.

In this case, Velocity is fixed at 100.

Status	Second	Third
9nH	mmH	lIH

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)

mm = Note No.: 00H-7FH (0-127)

lI = Velocity: 01H-7FH (1-127) / 00H = NOTE OFF

● Program Change

Works as bank switch, in the MIDI channel number which is designated with "Pads Rx Ch." in the UTILITY "MIDI."

Status	Second
CnH	ppH

n = MIDI Channel No.: 00H-0FH (ch.1-ch.16)

pp = Program No.: 00H-3FH (0-63)

■ System Common Messages

● MIDI Time Code Quarter Frame Messages

MIDI Time Code Quarter Frame Messages can be transmitted while the CDX-1 is running (Playing or Recording) if the SONG parameter "Sync Out" is "MTC."

Status	Second
FIH	mmH (= 0nnndddd)

nnn = Message type: 0 = Frame count LS nibble
1 = Frame count MS nibble
2 = Seconds count LS nibble
3 = Seconds count MS nibble
4 = Minutes count LS nibble
5 = Minutes count MS nibble
6 = Hours count LS nibble
7 = Hours count MS nibble

dddd = 4 bit nibble data: 0H-FH (0-15)

If the upper and lower 4 bits of the count are combined, these bit fields are assigned as follows.

Frame Count	xxx	xxxxxyyy	Reserved (000)
	yyyyy		Frame No. (0-29)
Seconds Count	xx	xyyyyyy	Reserved (00)
	yyyyyy		Seconds Count (0-59)
Minutes Count	xx	xyyyyyy	Reserved (00)
	yyyyyy		Minutes Count (0-59)
Hours Count	x	xyzzzzz	Reserved (0)
	yy		Time Code type
			0 = 24 Frames/Sec
			1 = 25 Frames/Sec
			2 = 30 Frames/Sec (Drop Frame)
			3 = 30 Frames/Sec (Non Drop Frame)
	zzzzz		Hours Count (0-23)

■ System Exclusive Message

Status	Data Bytes	Status
F0H	iiH, ddH, ..., eeH	F7H

Byte	Description
F0H	Status of System Exclusive Message
iiH	Manufacturer ID 41H RolandsManufacturerID' 7EH Universal Non Realtime Message 7FH Universal Realtime Message
ddH	Data: 00H-7FH (0-127)
eeH	Data
F7H	EOX (End of System Exclusive Message)

● Universal System Exclusive Message

○ INQUIRY MESSAGE

◇ Identity Reply

Status	Data Bytes	Status
F0H	7EH, Dev, 06H, 02H, 41H, 3BH, 01H, 00H, 00H, ssH, ssH, ssH, ssH	F7H

Byte	Description
F0H	Status of System Exclusive Message
7EH	Universal System Exclusive Message Non Realtime Header
Dev	Device ID
06H	General Information (sub-ID #1)
02H	Identify Reply (sub-ID #2)
41H	Manufacturer ID (Roland)
3BH, 01H	Device Family Code (CDX-1)
00H, 00H	Device Family No.
ssH, ssH, ssH, ssH	Software Revision Level
F7H	EOX (End of System Exclusive Message)

The CDX-1 transmits as the device ID 10H.

○ MIDI Time Code

Status	Data Bytes	Status
F0H	7FH, Dev, 01H, 01H, hr, mn, sc, fr	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
01H	MIDI Time Code (sub-ID #1)
01H	Full Message (sub-ID #2)
hr	type/hours (0yyzzzzz) yy Time code type 0 = 24 frame/sec 1 = 25 frame/sec 2 = 30 frame/sec (Drop frame) 3 = 30 frame/sec (Non-drop frame) zzzz Hours (0-23)
mn	Minutes (0-59)
sc	Seconds (0-59)
fr	Frames (0-29)
F7H	EOX (End of Exclusive)

If the time locate is operated effectively, the CDX-1 transmits as the device ID 7FH.

○ MIDI Machine Control Commands

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, aaH, ..., bb	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
aaH	Command
bbH	Command
F7H	EOX (End of System Exclusive Message)

* See "4. MIDI Machine Control" section.

4. MIDI Machine Control

■ MIDI Machine Control Details

● STOP (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 01H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
01H	STOP (MCS)
F7H	EOX (End of System Exclusive Message)

If the transport switch [STOP] was pressed, the CDX-1 transmits as the device ID 7FH.

● DEFERRED PLAY (MCS)

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 03H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
03H	DEFERRED PLAY (MCS)
F7H	EOX (End of System Exclusive Message)

If the transport switch [PLAY] was pressed, the CDX-1 transmits as the device ID 7FH.

● RECORD STROBE

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 06H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
06H	RECORD STROBE
F7H	EOX (End of System Exclusive Message)

If the transport switch [REC] was pressed out of the recording condition, the CDX-1 transmits as the device ID 7FH.

● RECORD EXIT

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 07H	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
07H	RECORD EXIT
F7H	EOX (End of System Exclusive Message)

If the transport switch [REC] was pressed while recording, the CDX-1 transmits as the device ID 7FH.

● LOCATE (MCP)

○ Format 2-LOCATE [TARGET]

Status	Data Bytes	Status
F0H	7FH, Dev, 06H, 44H, 06H, 01H, hrH, mnH, scH, frH, ffH	F7H

Byte	Description
F0H	Status of System Exclusive Message
7FH	Universal System Exclusive Message Realtime Header
Dev	Device ID
06H	MMC Command Message
44H	LOCATE (MCP)
06H	Number of Bytes
01H	"TARGET" sub command
hrH, mnH, scH, frH, ffH	Standard Time with Sub Frame
F7H	EOX (End of System Exclusive Message)

If the time locate is operated effectively, the CDX-1 transmits as the device ID 7FH.

MIDI Implementation

5. Appendices

● Decimal and Hexadecimal table

(Hexadecimal number is shown with H.)

In MIDI documentation, data values and addresses/sizes of system exclusive messages etc. are expressed as hexadecimal values for each 7 bits.

The following table shows how these correspond to decimal numbers.

dec	hex	dec	hex	dec	hex	dec	hex
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

* Decimal values such as MIDI channel, bank select, and program change are listed as one (1) greater than the values given in the above table.

* A 7-bit byte can express data in the range of 128 steps. For data where greater precision is required, we must use two or more bytes. For example, two hexadecimal numbers aa bbH expressing two 7-bit bytes would indicate a value of $aa \times 128 + bb$.

* In the case of values which have a \pm sign, 00H = -64, 40H = ± 0 , and 7FH = +63, so that the decimal expression would be 64 less than the value given in the above chart. In the case of two types, 00 00H = -8192, 40 00H = ± 0 , and 7F 7FH = +8191.

* Data marked "nibbled" is expressed in hexadecimal in 4-bit units. A value expressed as a 2-byte nibble 0a 0bH has the value of $a \times 16 + b$.

<Ex.1> What is 5AH in decimal system?
5AH = 90 according to the above table.

<Ex.2> What in decimal system is 12034H in hexadecimal of every 7 bit?
12H = 18, 34H = 52 according to the above table. So $18 \times 128 + 52 = 2356$.

<Ex.3> What in decimal system is 0A 03 09 0D in nibble system?
0AH = 10, 03H = 3, 09H = 9, 0DH = 13 according to the table.
So $((10 \times 16 + 3) \times 16 + 9) \times 16 + 13 = 41885$.

<Ex. 4> What in nibble system is 1258 in decimal system?

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16)1258
  78 ... 10
  4 ... 14
  0 ... 4
  
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0 = 00H, 4 = 04H, 14 = 0EH, 10 = 0AH According to the table.
So it is 00 04 0E 0AH.

MIDI Machine Control (MMC) Command

● Commands Recognized

Command	Action
01H STOP	STOP
02H PLAY	PLAY
03H DEFERRED PLAY	PLAY
04H FAST FORWARD	FF
05H REWIND	REW
06H RECORD STROBE	REC/PUNCH IN
07H RECORD EXIT	PUNCH OUT
44H 01H LOCATE TARGET	LOCATE

● Commands Transmitted

Command	Action
01H STOP	STOP
03H DEFERRED PLAY	PLAY
06H RECORD STROBE	REC/PUNCH IN
07H RECORD EXIT	PUNCH OUT
44H 01H LOCATE TARGET	LOCATE

MIDI Implementation

MULTITRACK CD RECORDER / AUDIO SAMPLE WORKSTATION

Date : Apl. 16, 2001

Model CDX-1

MIDI Implementation Chart

Version : 1.01

Function...	Transmitted	Recognized	Remarks
Basic Channel Default Changed	1-16 1-16	1-16 1-16	
Mode Default Messages Altered	Mode 3 X *****	Mode 3 X X	
Note Number: True Voice	O 0-127 *****	O 0-127 0-127	
Velocity Note On Note Off	O 1-127 X9n, v = 0	X X	
After Touch Key's Channel's	X X	X X	
Pitch Bend	X	X	
Control Change	X	X	
Program Change :True Number	O *****	O 0-63	Pad Bank1-64
System Exclusive	O	O	
System Common : Quarter Frame : Song Position : Song Select : Tune Request	O X X X *1	X X X X	
System Real Time : Clock : Commands	X X	X X	
Aux Messages : All Sound Off : Reset All Controllers : Local On/Off : All Notes Off : Active Sensing : System Reset	X X X X X X	O X X O X X	
Notes	* 1 SyncOut=MTC Only		

Mode 1 : OMNI ON, POLY
Mode 3 : OMNI OFF, POLY

Mode 2 : OMNI ON, MONO
Mode 4 : OMNI OFF, MONO

O : Yes
X : No