Roland

MIDI MULTI TIMBRAL SOUND MODULE

D-110

OWNER'S MANUAL

Roland Exclusive Messages

1. Data Format for Exclusive Messages

Roland's MIDI implementation uses the following data format for all exclusive messages (type IV):

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
CMD	Command ID
[BODY]	Maindata
F7H	End of exclusive

MIDI status : F0H, F7H

An exclusive message must be flanked by a pair of status codes, starting with a Manufactures-ID immediately after F0H (MIDI version1.0).

Manufactures-ID : 41H

The Manufactures-ID identifies the manufacturer of a MIDI instrument that triggeres an exclusive message. Value 41H represents Roland's Manufactures-ID.

Device-ID : DEV

The Device-ID contains a unique value that identifies the individual device in the multiple implementation of MIDI instruments. It is usually set to 00H - 0FH, a value smaller by one than that of a basic channel, but value 00H - 1FH may be used for a device with multiple basic channels.

Model-ID : MDL

The Model-ID contains a value that uniquely identifies one model from another. Different models, however, may share an identical Model-ID if they handle similar data.

The Model-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Model-IDs, each representing a unique model:

01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H

Command-ID : CMD

The Command-ID indicates the function of an exclusive message. The Command-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Command-IDs, each representing a unique function:

01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H

Main data : BODY

This field contains a message to be exchanged across an interface. The exact data size and contents will vary with the Model-ID and Command-ID.

2. Address-mapped Data Transfer

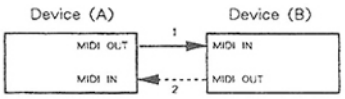
Address mapping is a technique for transferring messages conforming to the data format given in Section 1. It assigns a series of memory-resident records--waveform and tone data, switch status, and parameters, for example--to specific locations in a machine-dependent address space, thereby allowing access to data residing at the address a message specifies.

Address-mapped data transfer is therefore independent of models and data categories. This technique allows use of two different transfer procedures : one-way transfer and handshake transfer.

One-way transfer procedure (See Section3 for details.)

This procedure is suited for the transfer of a small amount of data. It sends out an exclusive message completely independent of a receiving device status.

Connection Diagram

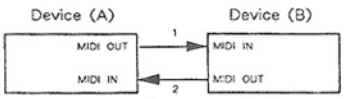


Connectionat point2 is essential for "Request data" procedures. (See Section3.)

Handshake-transfer procedure (See Section4 for details.)

This procedure initiates a predetermined transfer sequence (handshaking) across the interface before data transfer takes place. Handshaking ensures that reliability and transfer speed are high enough to handle a large amount of data.

Connection Diagram



Connectionat points1 and 2 is essential.

Notes on the above two procedures

* There are separate Command-IDs for different transfer procedures.
* DevicesA and B cannot exchange data unless they use the same transfer procedure, share identical Device-ID and Model ID, and are ready for communication.

3. One-way Transfer Procedure

This procedure sends out data all the way until it stops when the messages are so short that answerbacks need not be checked.
For long messages, however, the receiving device must acquire each message in time with the transfer sequence, which inserts intervals of at least 20milliseconds in between.

Types of Messages

Message	Command ID
Request data 1	RQ1 (11H)
Data set 1	DT1 (12H)

Request data # 1 : RQ1 (11H)

This message is sent out when there is a need to acquire data from a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of data required.
On receiving an RQ1 message, the remote device checks its memory for the data address and size that satisfy the request.

If it finds them and is ready for communication, the device will transmit a "Data set 1 (DT1)" message, which contains the requested data. Otherwise, the device will send out nothing.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
11H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ssH	Size MSB
⋮	⋮
	LSB
sum	Check sum
F7H	End of exclusive

*The size of the requested data does not indicate the number of bytes that will make up a DT1 message, but represents the address fields where the requested data resides.
*Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
*The same number of bytes comprises address and size data, which, however, vary with the Model-ID.
*The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

= Data set 1 : DT1 (12H)

This message corresponds to the actual data transfer process. Because every byte in the data is assigned a unique address, a DT1 message can convey the starting address of one or more data as well as a series of data formatted in an address - dependent order.

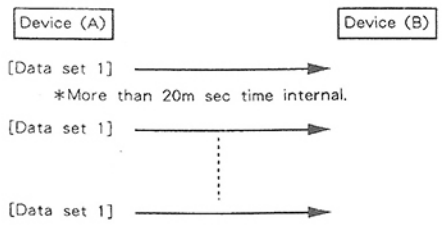
The MIDI standards inhibit non-real time messages from interrupting an exclusive one. This fact is inconvenient for the devices that support a "soft-through" mechanism. To maintain compatibility with such devices, Roland has limited the DT1 to 256 bytes so that an excessively long message is sent out in separate segments.

Byte	Description
F0H	Exclusive
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
12H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ddH	Data
⋮	⋮
sum	Check sum
F7H	End of exclusive

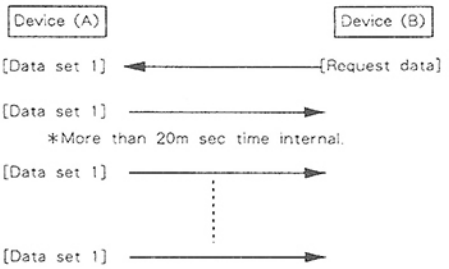
*A DT1 message is capable of providing only the valid data among those specified by an RQ1 message.
*Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
*The number of bytes comprising address data varies from one Model-ID to another.
*The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

= Example of Message Transactions

●Device A sending data to Device B
Transfer of a DT1 message is all that takes place.



●Device B requesting data from Device A
Device B sends an RQ1 message to Device A. Checking the message, Device A sends a DT1 message back to Device B.



4. Handshake- Transfer Procedure

Handshaking is an interactive process where two devices exchange error checking signals before a message transaction takes place, thereby increasing data reliability. Unlike one-way transfer that inserts a pause between message transactions, handshake transfer allows much speedier transactions because data transfer starts once the receiving device returns a ready signal.

When it comes to handling large amounts of data--sampler waveforms and synthesizer tones over the entire range, for example--across a MIDI interface, handshaking transfer is more efficient than one-way transfer.

Types of Messages

Message	Command ID
Want to send data	WSD (40H)
Request data	RQD (41H)
Data set	DAT (42H)
Acknowledge	ACK (43H)
End of data	EOD (45H)
Communication error	ERR (4EH)
Rejection	RJC (4FH)

Want to send data : WSD (40H)

This message is sent out when data must be sent to a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of the data to be sent.

On receiving a WSD message, the remote device checks its memory for the specified data address and size which will satisfy the request. If it finds them and is ready for communication, the device will return an "Acknowledge (ACK)" message.
Otherwise, it will return a "Rejection (RJC)" message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
40H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ssH	Size MSB
⋮	⋮
	LSB
sum	Check sum
F7H	End of exclusive

*The size of the data to be sent does not indicate the number of bytes that make up a "Data set (DAT)" message, but represents the address fields where the data should reside.
*Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
*The same number of bytes comprises address and size data, which, however, vary with the Model-ID.
*The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Request data : RQD (41H)

This message is sent out when there is a need to acquire data from a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of data required.

On receiving an RQD message, the remote device checks its memory for the data address and size which satisfy the request. If it finds them and is ready for communication, the device will transmit a "Data set (DAT)" message, which contains the requested data. Otherwise, it will return a "Rejection (RJC)" message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
41H	Command ID
aaH ⋮	Address MSB ⋮ LSB
ssH ⋮	Size MSB ⋮ LSB
sum	Check sum
F7H	End of exclusive

*The size of the requested data does not indicate the number of bytes, that make up a "Data set (DAT)" message, but represents the address fields where the requested data resides.
*Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
*The same number of bytes comprises address and size data, which, however, vary with the Model-ID.
*The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Data set : DAT (42H)

This message corresponds to the actual data transfer process. Because every byte in the data is assigned a unique address, the message can convey the starting address of one or more data as well as a series of data formatted in an address-dependent order.

Although the MIDI standards inhibit non-real time messages from interrupting an exclusive one, some devices support a "soft-through" mechanism for such interrupts. To maintaincompatibility with such devices, Roland has limited the DAT to 256bytes so that an excessively long message is sent out in separate segments.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
42H	Command ID
aaH ⋮	Address MSB ⋮ LSB
ddH ⋮	Data ⋮
sum	Check sum
F7H	End of exclusive

*A DAT message is capable of providing only the valid data among those specified by an RQD or WSD message.
*Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
*The number of bytes comprising address data varies from one model ID to another.
*The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Acknowledge : ACK (43H)

This message is sent out when no error was detected on reception of a WSD, DAT, "End of data (EOD)", or some other message and a requested setup or action is complete. Unless it receives an ACK message, the device at the other end will not proceed to the next operation.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
43H	Command ID
F7H	End of exclusive

End of data : EOD (45H)

This message is sent out to inform a remote device of the end of a message. Communication, however, will not come to an end unless the remote device returns an ACK message even though an EOD message was transmitted.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
45H	Command ID
F7H	End of exclusive

Communications error : ERR (4EH)

This message warns the remote device of a communications fault encountered during message transmission due, for example, to a checksum error. An ERR message may be replaced with a "Rejection (RJC)" one, which terminates the current message transaction in midstream.

When it receives an ERR message, the sending device may either attempt to send out the last message a second time or terminate communication by sending out an RJC message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
4EH	Command ID
F7H	End of exclusive

Rejection : RJC (4FH)

This message is sent out when there is a need to terminate communication by overriding the current message. An RJC message will be triggered when :

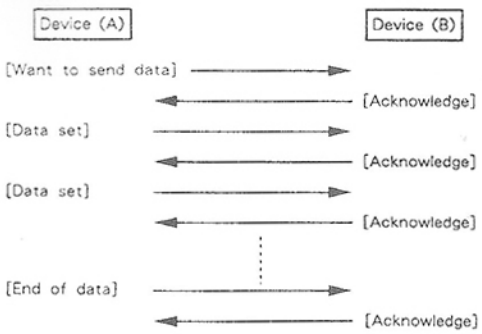
- a WSD or RQD message has specified an illegal data address or size.
- the device is not ready for communication.
- an illegal number of addresses or data has been detected.
- data transfer has been terminated by an operator.
- a communications error has occurred.

An ERR message may be sent out by a device on either side of the interface. Communication must be terminated immediately when either side triggers an ERR message.

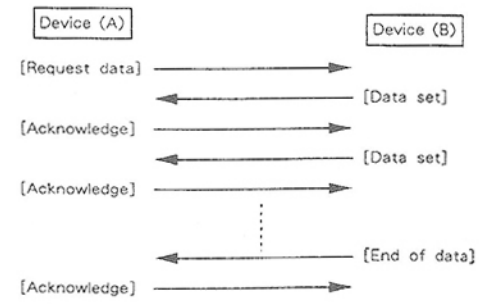
Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
4FH	Command ID
F7H	End of exclusive

Example of Message Transactions

●Data transfer from device (A) to device (B).

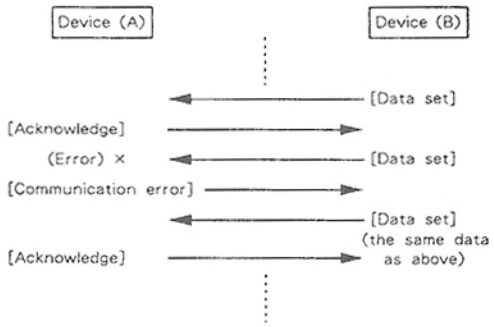


●Device (A) requests and receives data from device (B).

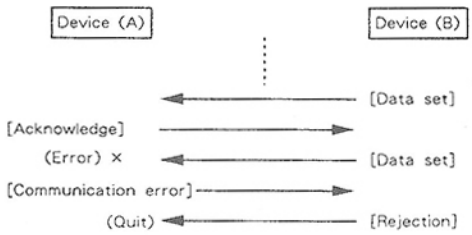


●Error occurs while device (A) is receiving data from device (B).

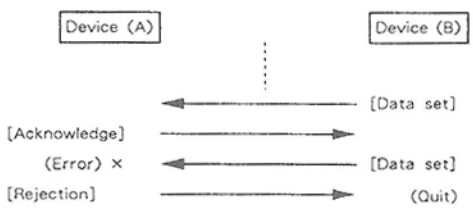
1) Data transfer from device (A) to device (B).



2) Device (B) rejects the data re-transmitted, and quits data transfer.



3) Device (A) immediately quits data transfer.



MODEL D-110

MIDI Implementation

Date : Mar. 1. 1988

Version : 1.00

1. TRAMSMITTED DATA

■ Bypassed Messages

In Overflow assgin mode, retransmits the following MIDI IN messages from MIDI OUT.

- All channel voice messages except Note on.
- Note on message(s) to which D-110 cannot assign voice(s) because the number of received Note on messages exceeds D-110's simultaneusly assignable voices.

■ Exclusive

Status	
F0H	: System exclusive
F7H	: EOX(End Of Exclusive)

When in Patch Select or Timbre Select mode, a Patch (a set pf parameters costituting a timbre) can be transmitted.
Individual parameter can be sent while editing.
Exclusive message can be used for bulk dumping.
For details, see Sections 4 and 5, and Roland Exclusive Messages.

2. RECOGNIZED RECEIVE DATA (Parts 1-8)

■ Note event

Note off

Status	Second	Third
8nH	kkH	vvH
9nH	kkH	00H

kk = note number 00H - 7FH (0 - 127)
vv = velocity ignored
n = MIDI Channel 0H - FH (1 - 16)

A tone whose envelope mode is "NO SUS" ignores Note off message.

Note on

Status	Second	Third
9nH	kkH	vvH

kk = note number 00H - 7FH (0 - 127)
vv = Velocity 01H - 7FH (1 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Note numbers outside of the range 12-108 are transposed to the nearest octave inside the range.
(When key shift feature of D-110 is engaged, a note is first key shifted; if it still remains or becomes outside of the range, it is transposed by the octave.)

■ Control change

Modulation Depth

Status	Second	Third
BnH	01H	vvH

vv = Modulation depth 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Data Entry

Status	Second	Third
BnH	06H	vvH

vv = Value of a parameter specified by RPC.
(See description in RPC MSB.)
n = MIDI Channel 0H - FH (1 - 16)

Main Volume

Status	Second	Third
BnH	07H	vvH

vv = Volume Value 00H - 7FH (0 - 127)

n = MIDI Channel 0H - FH (1 - 16)

Controls the volume of a Part accessible through the received MIDI channel. The maximum volume is determined by OUTPUT LEVEL set on the D-110 panel and Expression message.

Panpot

Status	Second	Third
BnH	0AH	vvH

vv = Panpot Value 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Orientation of sound is as follows.

0 = LEFT, 63 = CENTER, 127 = RIGHT

Expression

Status	Second	Third
BnH	0BH	vvH

vv = Expression 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Controls the volume of a Part accessible through the received MIDI channel. The maximum volume is determined by OUTPUT LEVEL set on the D-110 panel and Expression message.

Hold-1

Status	Second	Third
BnH	40H	vvH

vv = 00H - 3FH : Off
vv = 40H - 7FH : On
n = MIDI Channel 0H - FH (1 - 16)

RPC LSB

Status	Second	Third
BnH	64H	vvH

vv = The lower byte of a parameter number controlled by RPC.
(Refer to RPC MSB.)
n = MIDI Channel 0H - FH (1 - 16)

RPC MSB

Status	Second	Third
BnH	65H	vvH

vv = The upper byte of a parameter number controlled by RPC.
n = MIDI Channel 0H - FH (1 - 16)

Using MIDI RPC, D-110 parameters can be controlled by Control change message. RPC MSB and LSB specify the parameter to be controlled, while Data entry sets the parameter value.
Effective RPC to D-110 is Bender range.

RPC MSB	RPC LSB	Data Entry	Description
00H	00H	vvH	Bender Range vv= 0 - 24 Unit in semitone, 2 octaves maximum

Reset All Controllers

Status	Second	Third
BnH	79H	00H

Sets each of the following contols as follows.

Controller	setting
Modulation Depth	OFF (0)
Main Volume	MAX (127)
Expression	MAX (127)
Hold1	OFF (0)
Pitch Bender Change	CENTER

■ Program change

Patch / Timbre Change

Status	Second
CnH	ppH

pp = Patch Number 0H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Program change information on the control channel changes patches.
If the card to accommodate program numbers 40H-7FH is not available, D-110 selects an internal patch.

pp	I/C	BANK	NUMBER
00H (00)	I	1	1
:	:	:	:
3FH (63)	I	8	8
40H (64)	C	1	1
:	:	:	:
7FH (127)	C	8	8

Program change information on a channel other than control channel is used to change timbres.
Switching of timbre between internal and card cannot be done through MIDI.

pp	A/B	BANK	NUMBER
00H (00)	A	1	1
:	:	:	:
3FH (63)	A	8	8
40H (64)	B	1	1
:	:	:	:
7FH (127)	B	8	8

■ Pitch Bender change

Pitch Bender

Status	Second	Third
BnH	vvH	vvH

vv vv = Pitch Bender change Value
n = MIDI Channel 0H - FH (1 - 16)

■ Mode message

All notes off

Status	Second	Third
BnH	7BH	00H

n = MIDI Channel 0H - FH (1 - 16)

Turns off all notes that have been turned on by MIDI Note on.

OMNI OFF

Status	Second	Third
BnH	7CH	00H

n = MIDI Channel 0H - FH (1 - 16)

Recognized as only All notes off.
D-110 remains in mode 3 (Omni off, Poly).

OMNI ON

Status	Second	Third
BnH	7DH	00H

n = MIDI Channel 0H - FH (1 - 16)

Recognized as only All notes off.
D-110 remains in mode 3 (Omni off, Poly).

MONO

Status	Second	Third
BnH	7EH	mmH

mm = MONO channel range ignored
n = MIDI Channel 0H - FH (1 - 16)

Recognized as only All notes off.
D-110 remains in mode 3 (Omni off, Poly).

POLY

Status	Second	Third
BnH	7FH	00H

n = MIDI Channel 0H - FH (1 - 16)

Recognized as only All notes off.
D-110 remains in mode 3 (Omni off, Poly).

■ Exclusive

Status	
F0H	: System Exclusive
F7H	: EOX (End of Exclusive)

Using exclusive message, a set of parameters for a patch (timbre) or individual parameters in a patch, timbre or tone can be transferred to D-110.
Exclusive message can also be used for bulk dump/load of internal memory. Refer to Roland Exclusive Messages and Sections 4 and 5.

■ Active Sensing

Status	
FEH	: Active Sensing

Having received this message, D-110 expects to receive information of any status or data every 300ms (max). If D-110 fails to sense message, it assumes that MIDI bus is disconnected for some reason. Then D-110 turns off all notes which have been turned on by MIDI and returns to normal operation (will not check interval of messages).

3. RECOGNIZED RECEIVE DATA (Rhythm part)

Messages on MIDI channels not assigned to rhythm part are ignored.

■ Note event

Note off

Status	Second	Third
8nH	kkH	vvH
9nH	kkH	00H

kk = note number 18H - 6CH (24 - 108)
vv = velocity ignored
n = MIDI Channel 0H - FH (1 - 16)

A tone whose envelope mode is NO SUS ignores this message.

Note on

Status	Second	Third
9nH	kkH	vvH

kk = note number 18H - 6CH (24 - 108)
vv = Velocity 01H - 7FH (1 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Note numbers outside the range 24-108 are ignored.

■ Control change

Modulation Depth

Status	Second	Third
BnH	01H	vvH

vv = Modulation depth 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Data Entry

Status	Second	Third
BnH	06H	vvH

vv = Value of a parameter specified by RPC.
(See description in RPC MSB.)
n = MIDI Channel 0H - FH (1 - 16)

Main Volume

Status	Second	Third
BnH	07H	vvH

vv = Volume Value 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Can contol the volume of the rhythm part.
The maximum volume is determined by OUTPUT LEVEL set on the panel and Expression message.

Expression

Status	Second	Third
BnH	0BH	vvH

vv = Expression 00H - 7FH (0 - 127)
n = MIDI Channel 0H - FH (1 - 16)

Can contol the volume of the rhythm part.
The maximum volume is determined by OUTPUT LEVEL set on the panel and Main volume message.

Hold-1

Status	Second	Third
BnH	40H	vvH

vv = 00H - 3FH : Off
vv = 40H - 7FH : On
n = MIDI Channel 0H - FH (1 - 16)

RPC LSB

Status	Second	Third
BnH	64H	vvH

vv = Lower byte of a parameter number controlled by RPC.
(See description in RPC MSB.)
n = MIDI Channel 0H - FH (1 - 16)

RPC MSB

Status	Second	Third
BnH	65H	vvH

vv = Upper byte of a parameter number controlled by RPC.
n = MIDI Channel 0H - FH (1 - 16)

MSB and LSB RPC together specifies parameter to be controlled while Data entry determines the value.
Effective RPC on D-110 is Bender range.

RPC MSB	RPC LSB	Data Entry	Description
00H	00H	vvH	Bender Range vv= 0 - 24 2 octaves max. in semitone steps

Reset All Controllers

Status	Second	Third
BnH	79H	00H

n = MIDI Channel 0H - FH (1 - 16)

Sets controllers to the value as shown below.

Controller	setting	
Modulation Depth	OFF	(0)
Main Volume	MAX	(127)
Expression	MAX	(127)
Hold1	OFF	(0)
Pitch Bender Change	CENTER	

■ Pitch Bender change

Pitch Bender

Status	Second	Third
BnH	vvH	vvH

vv vv = Pitch Bender change Value
n = MIDI Channel 0H - FH (1 - 16)

■ Exclusive

Status	
F0H	: System Exclusive
F7H	: EOX (End of Exclusive)

Using exclusive message, a set of parameters for a individual parameters in a rhythm part can be transferred to D-110.
Exclusive message can also be used for bulk dump/load of internal memory. Refer to Roland Exclusive Messages and Sections 4 and 5.

4. EXCLUSIVE COMMUNICATION

Parameters for patches, timbres or tones can be transferred to/from D-110 through Exclusive message.
Model-ID# of D-110 is 16H.
In a system where more than one MIDI channel is assigned to D-110, Unit # may be set to the D-110 instead of Device-ID# of a basic channel. The advantage of Unit # is that a specific part is made accessible independent of MIDI channel of that part.
Whether to use MIDI channel or Unit # is depend on parameter adress. D-110 recongnizes MIDI channels 1 thru 16 and Unit # 17 thru 32 as Device-ID #. Note that the actual Device-ID # is the number 1 less MIDI channel number or Unit #.

■ One Way Communication

Request Data 1 RQ1 11H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
11H	Command ID
aaH	Address MSB * 4-1
aaH	Address
aaH	Address LSB
ssH	Size MSB
ssH	Size
ssH	Size LSB
sum	Check sum
F7H	End of exclusive

Data set 1 DT1 12H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
12H	Command ID
aaH	Address MSB * 4-1
aaH	Address
aaH	Address LSB
ddH	Data * 4-2
:	:
sum	Check sum
F7H	End of exclusive

Communication Sequence

A. Starting at transmitting unit

Upon occuring each of the following events, D-110 sends parameters using one way communication.
(Device-ID# is Unit# less 1)

- One way bulk dump is executed in data transfer mode. (Transfers a set of parameters selected.)
- Enter button is pressed in patch select mode. (Transfers parameters in the patch.)
- Enter button is pressed in timbre select mode. (Transfers a parameter set in the timbre.)
- Enter button is pressed while editting. (Transfers a parameter being editted.)

The following is an example of one way communication between two D-110's.

Receiver(D-110)		Transmitter(D110)
	<--------[DT1]	
If the address matches the parameter base address, stores the data into that location.		Transmits this message when one of the above operations is taken place.
(	<--------[DT1]	)
		Will repeat sending Data set until all requested data are received by the receiver.

B. Starting at receiver

D-110 never request data of the other party.
The following sequence applies to the other party that wants to get some parameters from D-110.

Receiver		Transmitter(D-110)
	[RQ1]--------->	
When a programmer or sequencer needs D-110 resident parameter.		When the received Data request contains 1) address that matches a parameter base address and 2) address size is 1 or more, D-110 sends the data in that area.
	<--------[DT1]	
If the address matches the parameter base address, stores the data into that location.		
(	<--------[DT1]	)
(		Will repeat sending Data set)
(		until all requested data are)
(		received by the receiver.)

■ Handshaking Communications

Want to send data WSD 40H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
40H	Command ID
aaH	Address MSB * 4-1
aaH	Address
aaH	Address LSB
ssH	Size MSB
ssH	Size
ssH	Size LSB
sum	Check sum
F7H	End of exclusive

Request data RQD 41H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
41H	Command ID
aaH	Address MSB * 4-1
aaH	Address
aaH	Address LSB
ssH	Size MSB
ssH	Size
ssH	Size LSB
sum	Check sum
F7H	End of exclusive

Data set DAT 42H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
42H	Command ID
aaH	Address MSB * 4-1
aaH	Address
aaH	Address LSB
ddH	Data * 4-2
:	:
sum	Check sum
F7H	End of exclusive

Acknowledge ACK 43H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
43H	Command ID
F7H	End of exclusive

End of data EOD 45H

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
45H	Command ID
F7H	End of exclusive

Communication error ERR 4EH

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
4EH	Command ID
F7H	End of exclusive

Rejection RJC 4FH

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
16H	Model ID
4FH	Command ID
F7H	End of exclusive

Communication Sequence

A. Starting at transmitter

The following an example of handshaking cummunication between two D-110's.

Receiver(D-110)		Transmitter(D-110)
	<--------[WSD]	
		Executing handshaking type bulk dump in the data transfer mode causes D-110 to send this message and enter into the following handshaking communication.
(	[RJC]-------->	)
(Will send Rejection when receiving (the request while it is reproducing (any sound.		Stops communication upon receiving this message.)
	[ACK]-------->	
If not reproducing any sound, sends this message and waits transmission of data.		Upon receiving this message, sends the next data.

<-------[DAT]

If the address matches the parameter base address, stores the data into that location; then sends Acknowledge.

[ACK]------->

<-------[DAT]
[ACK]------->

[ERR]------->)
(Should failure in data reception (occur(e.g. disagreement of checksum), (sends this message. (When receiving this message, sends the previous data again.)

<---------[DAT]

:
:

<--------[EOD]

Upon receipt of this message, sends acknowledge and ceases current handshaking communication.

Sends this message at the end of the data.

[ACK]-------->

Upon receiving this message in reply to End of data, ends current communication.

B. Starting at receiver

D-110 will never require any data of the other party. The following sequence can apply to the outside world where a unit wants to get D-110 resident parameters.

Receiver	Transmitter (D-110)
	[RQD]--------->
Outside unit such as a computer can obtain D-110 parameters by following the steps below, starting with transmission of Data request.	
<---------[RJC]) (Ends current communication upon (receipt of this message. (	Will send this message when Data request comes while it is reproducing sound.)
<---------[DAT]	When the Data request comes during no-sound period and contains address listed in the Parameter base address table followed by 1 or more address size, D-110 will send the data stored in that address area and subsequent.
If the address matches the parameter base address, stores the data into that location; then sends Acknowledge	
[ACK]--------->	
	Sends the next data in reply to Acknowlege.
<---------[DAT]	
[ACK]-------->	
[ERR]-------->) (Should failure in data reception (occur(e.g. disagreement of checksum), (sends this message. (	When receiving this message, sends the previous data again.)
<---------[DAT]	
:	
:	
<---------[EOD]	
Sends Aknowledge in response to Data end and terminates handshaking communication.	Sends this data when completing required data transfer.
[ACK]--------->	
	When this message comes as an answer to the Data end, terminates communication.

*4-1 Address and Address size must cover the memory location where data exist.

*4-2 When comming data are for partial reserve of the system parameter, D-110 will make these reserves effective only after receiving all the data.

5. PARAMETER ADDRESS MAP

Addresses are represented in 7-bit hexadecimal.

Address	MSB		LSB
Binary	0aaa aaaa	0bbb bbbb	0ccc cccc
7-bit Hexadecimal	AA	BB	CC

The actual address of a parameteris a sum of the start address of each block and one or more offset address.

Parameter marked by	Actual address
*5-1	Start address plus two offset addresses (in tables *5-1 and *5-1-1)
*5-2	Start address plus one offset address (in table *5-2)
*5-3	Start address plus two offset addresses (in tables *5-1 and *5-1-2)
*5-4 - *5-8	Start address plus one offset address (in table *5-4 - *5-8)

■ Parameter Base Address

Temporary area (Accessed through each basic channel)

Start address	Description	
02 00 00	Tone Temporary Area (synth part)	*5-1

Whole part (Accessible on UNIT#)

Start address	Description		
03 00 00	Timbre Temporary Area	(part 1)	*5-2
03 00 10	Timbre Temporary Area	(part 2)	
:	:		
03 00 60	Timbre Temporary Area	(part 7)	
03 00 70	Timbre Temporary Area	(part 8)	
03 01 00	Timbre Temporary Area	(rhythm part)	
03 01 10	Rhythm Setup Temporary Area		*5-3
04 00 00	Tone Temporary Area	(part 1)	*5-1
04 01 76	Tone Temporary Area	(part 2)	
:	:		
04 0B 44	Tone Temporary Area	(part 7)	
04 0D 3A	Tone Temporary Area	(part 8)	
05 00 00	Timbre Memory #1		*5-4
05 00 08	Timbre Memory #2		
:	:		
05 07 70	Timbre Memory #127		
05 07 78	Timbre Memory #128		
06 00 00	Patch Memory #1		*5-5
06 01 00	Patch Memory #2		
:	:		
06 3E 00	Patch Memory #63		
06 3F 00	Patch Memory #64		
08 00 00	Tone Memory #1		*5-1
08 02 00	Tone Memory #2		
:	:		
08 7C 00	Tone Memory #63		
08 7E 00	Tone Memory #64		
10 00 00	System Area		*5-6
20 00 00	Display		*5-7
40 00 00	Write Request		*5-8

Notes :

*5-1 Tone temporary area / Tone memory

Offset address	Description		
00 00 00	Common parameter		*5-1-1
00 00 0E	Partial parameter (for Partial# 1)		*5-1-2
00 00 48	Partial parameter (for Partial# 2)		
00 01 02	Partial parameter (for Partial# 3)		
00 01 3C	Partial parameter (for Partial# 4)		

*5-1-1 Common parameter

Offset address		Description	
00	0aaa aaaa	TONE NAME 1	32 - 127 (ASCII)
:	:	:	
09	0aaa aaaa	TONE NAME 10	
0A	0000 aaaa	Structure of Partial# 1 & 2	0 - 12 (1 - 13)
0B	0000 aaaa	Structure of Partial# 3 & 4	0 - 12 (1 - 13)
0C	0000 aaaa	PARTIAL MUTE	0 - 15 (0000 - 1111)
0D	0000 000a	ENV MODE	0 - 1 (Normal,No sustain)
Total size		00 00 0E	

*5-1-2 Partial parameter

Offset address		Description	
00 00	0aaa aaaa	WG PITCH COARSE	0 - 96 (C1,C#1, - C9)
00 01	0aaa aaaa	WG PITCH FINE	0 - 100 (-50 - +50)
00 02	0000 aaaa	WG PITCH KEYFOLLOW	0 - 16 (-1,-1/2,-1/4,0, 1/8,1/4,3/8,1/2, 5/8,3/4,7/8,1, 5/4,3/2,2,s1,s2)
00 03	0000 000a	WG PITCH BENDER SW	0 - 1 (OFF, ON)
00 04	0000 000a	WG WAVEFORM/PCM BANK	0 - 3 (SQU/1, SAW/1, SQU/2, SAW/2)
00 05	0aaa aaaa	WG PCM WAVE #	0 - 127 (1 - 128)
00 06	0aaa aaaa	WG PULSE WIDTH	0 - 100
00 07	0000 aaaa	WG PW VELO SENS	0 - 14 (-7 - +7)
00 08	0000 aaaa	P-ENV DEPTH	0 - 10
00 09	0aaa aaaa	P-ENV VELO SENS	0 - 100
00 0A	0000 0aaa	P-ENV TIME KEYF	0 - 4
00 0B	0aaa aaaa	P-ENV TIME 1	0 - 100
00 0C	0aaa aaaa	P-ENV TIME 2	0 - 100
00 0D	0aaa aaaa	P-ENV TIME 3	0 - 100
00 0E	0aaa aaaa	P-ENV TIME 4	0 - 100
00 0F	0aaa aaaa	P-ENV LEVEL 0	0 - 100 (-50 - +50)
00 10	0aaa aaaa	P-ENV LEVEL 1	0 - 100 (-50 - +50)
00 11	0aaa aaaa	P-ENV LEVEL 2	0 - 100 (-50 - +50)
00 12	0xxx xxxx	P-ENV SUSTAIN LEVEL	50 (always 0)
00 13	0aaa aaaa	END LEVEL	0 - 100 (-50 - +50)

00 14	0aaa aaaa	P-LFO RATE	0 - 100
00 15	0aaa aaaa	P-LFO DEPTH	0 - 100
00 16	0aaa aaaa	P-LFO MOD SENS	0 - 100
00 17	0aaa aaaa	TVF CUTOFF FREQ	0 - 100
00 18	000a aaaa	TVF RESONANCE	0 - 30
00 19	0000 aaaa	TVF KEYFOLLOW	0 - 14 (-1,-1/2,-1/4,0, 1/8,1/4,3/8,1/2, 5/8,3/4,7/8,1, 5/4,3/2,2)
00 1A	0aaa aaaa	TVF BIAS POINT/DIR	0 - 127 (<1A - <7C >1A - >7C)
00 1B	0000 aaaa	TVF BIAS LEVEL	0 - 14 (-7 - +7)
00 1C	0aaa aaaa	TVF ENV DEPTH	0 - 100
00 1D	0aaa aaaa	TVF ENV VELO SENS	0 - 100
00 1E	0000 0aaa	TVF ENV DEPTH KEYF	0 - 4
00 1F	0000 0aaa	TVF ENV TIME KEYF	0 - 4
00 20	0aaa aaaa	TVF ENV TIME 1	0 - 100
00 21	0aaa aaaa	TVF ENV TIME 2	0 - 100
00 22	0aaa aaaa	TVF ENV TIME 3	0 - 100
00 23	0aaa aaaa	TVF ENV TIME 4	0 - 100
00 24	0aaa aaaa	TVF ENV TIME 5	0 - 100
00 25	0aaa aaaa	TVF ENV LEVEL 1	0 - 100
00 26	0aaa aaaa	TVF ENV LEVEL 2	0 - 100
00 27	0aaa aaaa	TVF ENV LEVEL 3	0 - 100
00 28	0aaa aaaa	TVF ENV SUSTAIN LEVEL	0 - 100
00 29	0aaa aaaa	TVA LEVEL	0 - 100
00 2A	0aaa aaaa	TVA VELO SENS	0 - 100
00 2B	0aaa aaaa	TVA BIAS POINT 1	0 - 127 (<1A - <7C >1A - >7C)
00 2C	0000 aaaa	TVA BIAS LEVEL 1	0 - 12 (-12 - 0)
00 2D	0aaa aaaa	TVA BIAS POINT 2	0 - 127 (<1A - <7C >1A - >7C)
00 2E	0000 aaaa	TVA BIAS LEVEL 2	0 - 12 (-12 - 0)
00 2F	0000 0aaa	TVA ENV TIME KEYF	0 - 4
00 30	0000 0aaa	TVA ENV TIME V_FOLLOW	0 - 4
00 31	0aaa aaaa	TVA ENV TIME 1	0 - 100
00 32	0aaa aaaa	TVA ENV TIME 2	0 - 100
00 33	0aaa aaaa	TVA ENV TIME 3	0 - 100
00 34	0aaa aaaa	TVA ENV TIME 4	0 - 100
00 35	0aaa aaaa	TVA ENV TIME 5	0 - 100
00 36	0aaa aaaa	TVA ENV LEVEL 1	0 - 100
00 37	0aaa aaaa	TVA ENV LEVEL 2	0 - 100
00 38	0aaa aaaa	TVA ENV LEVEL 3	0 - 100
00 39	0aaa aaaa	TVA ENV SUSTAIN LEVEL	0 - 100
Total size		00 00 3A	

Example of RQ1 and DT1 application --- 1

Assuming that D-110 sets Unit # to 17, obtain Part 2 tone data from the temporary area by sending the following messages.

F0 41 10 16 11 04 01 76 00 01 76 0E F7

*5-2 Timbre temporary area

Offset address		Description	
00 00	0000 0aaa	TONE GROUP	0 - 3 (a, b, i/c, r)
00 01	00aa aaaa	TONE NUMBER	0 - 63 (1 - 64)
00 02	00aa aaaa	KEY SHIFT	0 - 48 (-24 - +24)
00 03	0aaa aaaa	FINE TUNE	0 - 100 (-50 - +50)
00 04	000a aaaa	BENDER RANGE	0 - 24
00 05	0000 00aa	ASSIGN MODE	0 - 3 (POLY 1,POLY 2, POLY 3,POLY 4)
00 06	0000 0aaa	OUTPUT ASSIGN	0 - 7 (MIX,MIX,MULTI 1 2,3,4,5,6)
00 07	0xxx xxxx	dummy	
00 08	0aaa aaaa	OUTPUT LEVEL	0 - 100
00 09	0000 aaaa	PANPOT	0 - 14 (L - R)
00 0A	0aaa aaaa	KEY RANGE LOWER	0 - 127
00 0B	0aaa aaaa	KEY RANGE UPPER	0 - 127
00 0C	0xxx xxxx	dummy	
:	:	:	
00 0F	0xxx xxxx	dummy	
Total size		00 00 10	

*5-3 Rhythm part setup area

Offset address	Description	
00 00 00	Rhythm Setup (for Key# 24)	*5-3-1
00 00 04	Rhythm Setup (for Key# 25)	
00 00 08	Rhythm Setup (for Key# 26)	
00 00 0C	Rhythm Setup (for Key# 27)	
00 00 10	Rhythm Setup (for Key# 28)	
:	:	
:	:	
:	:	
00 02 4C	Rhythm Setup (for Key# 107)	
00 02 50	Rhythm Setup (for Key# 108)	

*5-3-1 Rhythm setup (for each Key #)

Offset address		Description	
00 00	0aaa aaaa	TONE	0 - 127 (i01-i64,r01-r64)
00 01	0aaa aaaa	OUTPUT LEVEL	0 - 100
00 02	0000 aaaa	PANPOT	0 - 14 (L - R)
00 03	0000 000a	REVERB SWITCH	0 - 1 (OFF, ON)
Total size		00 00 04	

*5-4 Timbre memory

Offset address		Description	
00 00	0000 0aaa	TONE GROUP	0 - 3 (a, b, i/c, r)
00 01	00aa aaaa	TONE NUMBER	0 - 63
00 02	00aa aaaa	KEY SHIFT	0 - 48 (-24 - +24)
00 03	0aaa aaaa	FINE TUNE	0 - 100 (-50 - +50)
00 04	000a aaaa	BENDER RANGE	0 - 24
00 05	0000 00aa	ASSIGN MODE	0 - 3 (POLY 1,POLY 2, POLY 3,POLY 4)
00 06	0000 0aaa	OUTPUT ASSIGN	0 - 7 (MIX,MIX,MULTI 1 2,3,4,5,6)
00 07	0xxx xxxx	dummy	
Total size		00 00 08	

*5-5 Patch memory

The total number of Partial reserves for 9 parts must be 32 or less.
All Partial reserves must be sent as a package of 9 parts.

Offset address		Description	
00	0aaa aaaa	PATCH NAME 1	32 - 127 (ASCII)
:	:	:	
09	0aaa aaaa	PATCH NAME 1	
00 0A	0000 00aa	REVERB MODE	0 - 8 (Room1/2, Hall1/2, Plate, Tap delay 1/2/3, OFF)
00 0B	0000 0aaa	REVERB TIME	0 - 7 (1 - 8)
00 0C	0000 0aaa	REVERB LEVEL	0 - 7
00 0D	00aa aaaa	PARTIAL RESERVE (Part 1)	0 - 32
00 0E	00aa aaaa	PARTIAL RESERVE (Part 2)	0 - 32
00 0F	00aa aaaa	PARTIAL RESERVE (Part 3)	0 - 32
00 10	00aa aaaa	PARTIAL RESERVE (Part 4)	0 - 32
00 11	00aa aaaa	PARTIAL RESERVE (Part 5)	0 - 32
00 12	00aa aaaa	PARTIAL RESERVE (Part 6)	0 - 32
00 13	00aa aaaa	PARTIAL RESERVE (Part 7)	0 - 32
00 14	00aa aaaa	PARTIAL RESERVE (Part 8)	0 - 32
00 15	00aa aaaa	PARTIAL RESERVE (Part R)	0 - 32
00 16	000a aaaa	MIDI CHANNEL(Part 1)	0 - 16 (1 - 16,OFF)
00 17	000a aaaa	MIDI CHANNEL(Part 2)	0 - 16
00 18	000a aaaa	MIDI CHANNEL(Part 3)	0 - 16
00 19	000a aaaa	MIDI CHANNEL(Part 4)	0 - 16
00 1A	000a aaaa	MIDI CHANNEL(Part 5)	0 - 16
00 1B	000a aaaa	MIDI CHANNEL(Part 6)	0 - 16
00 1C	000a aaaa	MIDI CHANNEL(Part 7)	0 - 16
00 1D	000a aaaa	MIDI CHANNEL(Part 8)	0 - 16
00 1E	000a aaaa	MIDI CHANNEL(Part R)	0 - 16
00 1F		PATCH PARAMETERS(Part 1)	*5-5-1
00 2B		PATCH PARAMETERS(Part 2)	
00 37		PATCH PARAMETERS(Part 3)	
00 43		PATCH PARAMETERS(Part 4)	
00 4F		PATCH PARAMETERS(Part 5)	
00 5B		PATCH PARAMETERS(Part 6)	
00 67		PATCH PARAMETERS(Part 7)	
00 73		PATCH PARAMETERS(Part 8)	
00 7F	0aaa aaaa	OUTPUT LEVEL(Rhythm Part)	0 - 100
Total size		00 01 00	

*5-5-1 Patch parameters (for each part)

Offset address		Description	
00 00	0000 00aa	TONE GROUP	0 - 4
00 01	00aa aaaa	TONE NUMBER	0 - 63
00 02	00aa aaaa	KEY SHIFT	0 - 48 (-24 - +24)
00 03	0aaa aaaa	FINE TUNE	0 - 100 (-50 - +50)
00 04	000a aaaa	BENDER RANGE	0 - 24
00 05	0000 00aa	ASSIGN MODE	0 - 3
00 06	0aaa aaaa	OUTPUT ASSIGN	0 - 7
00 07	0xxx xxxx	dummy	
00 08	0aaa aaaa	OUTPUT LEVEL	0 - 100
00 09	0000 aaaa	PANPOT	0 - 14 (L-R)
00 0A	0aaa aaaa	KEY RANGE LOWER	0 - 127
00 0B	0aaa aaaa	KEY RANGE UPPER	0 - 127
Total size		00 00 0C	

*5-6 System area

The total number of Partial reserves for 9 parts must be 32 or less.
All Partial reserves must be sent as a package of 9 parts.

Offset address		Description	
00 00	0aaa aaaa	MASTER TUNE	0 - 127 (432.1Hz - 457.6Hz)
00 01	0000 00aa	REVERB MODE	0 - 8 (Room1/2, Hall1/2, Plate, Tap delay 1/2/3, OFF)
00 02	0000 0aaa	REVERB TIME	0 - 7 (1 - 8)
00 03	0000 0aaa	REVERB LEVEL	0 - 7
00 04	00aa aaaa	PARTIAL RESERVE (Part 1)	0 - 32
00 05	00aa aaaa	PARTIAL RESERVE (Part 2)	0 - 32
00 06	00aa aaaa	PARTIAL RESERVE (Part 3)	0 - 32
00 07	00aa aaaa	PARTIAL RESERVE (Part 4)	0 - 32
00 08	00aa aaaa	PARTIAL RESERVE (Part 5)	0 - 32
00 09	00aa aaaa	PARTIAL RESERVE (Part 6)	0 - 32
00 0A	00aa aaaa	PARTIAL RESERVE (Part 7)	0 - 32
00 0B	00aa aaaa	PARTIAL RESERVE (Part 8)	0 - 32
00 0C	00aa aaaa	PARTIAL RESERVE (Part R)	0 - 32

00 0D	000a aaaa	MIDI CHANNEL(Part 1)	0 - 16 (1 - 16,OFF)
00 0E	000a aaaa	MIDI CHANNEL(Part 2)	0 - 16 (1 - 16,OFF)
00 0F	000a aaaa	MIDI CHANNEL(Part 3)	0 - 16 (1 - 16,OFF)
00 10	000a aaaa	MIDI CHANNEL(Part 4)	0 - 16 (1 - 16,OFF)
00 11	000a aaaa	MIDI CHANNEL(Part 5)	0 - 16 (1 - 16,OFF)
00 12	000a aaaa	MIDI CHANNEL(Part 6)	0 - 16 (1 - 16,OFF)
00 13	000a aaaa	MIDI CHANNEL(Part 7)	0 - 16 (1 - 16,OFF)
00 14	000a aaaa	MIDI CHANNEL(Part 8)	0 - 16 (1 - 16,OFF)
00 15	000a aaaa	MIDI CHANNEL(Part R)	0 - 16 (1 - 16,OFF)
00 16	0xxx xxxx	dummy	
00 17 : 00 20	0aaa aaaa : 0aaa aaaa	PATCH NAME 1 : PATCH NAME 10	32 - 127 (ASCII)
Total size		00	

Example of RQ1 and DT1 application --- 2

Assuming that D-110 sets Unit # to 17, set Partial reserve of each part as follows by sending the byte string listed below.
Part 1 ..... 8 Parts 3 thru 8 0
Part 2 ..... 10 Rhythm part 8

F0 41 10 16 12 10 00 04 08 0A 00 00 00 00 00 00 08 66 F7

#5-7 Display
D-110 deciphers incoming data and sends them to the LCD as a string of ASCII code characters. (In play mode)
Fiddling D-110 panel switches or sending Display reset address data to D-110 returns the display to the normal reading.
No display data in this area can be brought outside world by the use of RQ1 and RQD.

Offset address		Description	
00 00 : 00 1F	0aaa aaaa	DISPLAYED LETTER	32 - 127 (ASCII)
01 00	0xxx xxxx	DISPLAY RESET	
Total size		00 00 21	

#5-8 Write request
This message simulates write switch on D-110, that is, D-110 writes data of each part in the temorary area into internal memory or memory card.(Memory must be specified by two bytes addresses.) D-110 will inform back of the writing result.
No data in the temorary area can be brought outside world through MIDI exclusive message such as RQ1 and RQD.

Offset address		Description	
00 00	00aa aaaa	Tone Write (part 1)	0 - 63 (01 - 64)
00 01	0000 000a		0, 1 (Internal,Card)
00 02 : 00 0E	00aa aaaa : 00aa aaaa	Tone Write (part 2) : Tone Write	
00 03 : 00 0F	0000 000a : 0000 000a	(part 8)	
01 00	0aaa aaaa	Timbre Write (part 1)	0 - 127 (A11 - B88)
01 01	0000 000a		0, 1 (Internal,Card)
01 02 : 01 0E	0aaa aaaa : 0aaa aaaa	Timbre Write (part 2) : Timbre Write	
01 03 : 01 0F	0000 000a : 0000 000a	(part 8)	
02 00	00aa aaaa	Patch Write	0 - 63 (11 - 88)
02 01	0000 000a		0, 1 (Internal,Card)
10 00	0000 00aa	Result	0 - 3 0 = Function Completed 1 = Card Not Ready 2 = Write Protected 3 = Incorrect Mode

Example of RQ1 and DT1 application --- 3

Assuming that D-110 sets Unit # to 17, direct D-110 to write data of Part 3 in the temorary area into I-B24 by sending the byte string listed below.

F0 41 10 16 12 40 01 04 4B 00 70 F7

Address Map

Address	Block	Sub Block	Reference
02 00 00	Tone Temp. (Basic Ch)	Common	5-1-1
		Partial 1	5-1-2
		Partial 2	
		Partial 3	
		Partial 4	
03 00 00	Timbre Temp. (Unit#)	Part 1	5-2
		Part 2	
		:	
		Part 8	
		Part R	
03 01 10	Rhythm Setup Temp(Unit#)	Note# 24	5-3
		Note# 25	
		:	
		Note# 107	
		Note# 108	
04 00 00	Tone Temp. (Unit#)	Part 1	5-1
		Part 2	
		:	
		Part 7	
		Part 8	
05 00 00	Timbre Memory	I-A11 (# 1)	5-4
		I-A12 (# 2)	
		:	
		I-B87 (#127)	
		I-B88 (#128)	
06 00 00	Patch Memory	I-A11 (# 1)	5-5
		I-A12 (# 2)	
		:	
		I-B87 (#127)	
		I-B88 (#128)	
08 00 00	Tone Memory	i-01	5-1
		i-02	
		:	
		i-63	
		i-64	
10 00 00	System A		5-6
20 00 00	Display		5-7
40 00 00	Write Req		5-8

A:¥WORK>/

MULTI TIMBRAL LINEAR SYNTHESIZER MODULE
MODEL D-110

MIDI Implementation Chart

Date : Mar. 1. 1988
Version : 1.00

Function...		Transmitted	Recognized	Remarks
Basic Channel	Default	1-16	1-16	memorized
	Changed	1-16	1-16	
Mode	Default	×	3	
	Messages	×	×	
	Altered	*********		
Note Number		×	0-127	
	True Voice	*********	12-108	
Velocity	Note ON	×	○ v=1-127	
	Note OFF	×	×	
After Touch	Key's	×	×	
	Ch's	×	×	
Pitch Bender		×	○	
Control Change	1	×	○	Modulation
	2-5	×	×	
	6	×	**	Data Entry
	7	×	○	Volume
	6-9	×	×	
	10	×	○	Pan
	11	×	○	Expression
	12-63	×	×	
	64	×	○	Hold1
	65-99	×	×	
	100, 101	×	** (0)	RPC LSB, MSB
	102-120	×	×	
	121	×	○	Reset all Controllers
Prog Change		×	○ 0-127	
	True #	*********	0-127	
System Exclusive		*	*	
System Common	Song Pos	×	×	
	Song Sel	×	×	
	Tune	×	×	
System Real Time	Clock	×	×	
	Commands	×	×	
Aux Message	Local ON/OFF	×	×	
	All Notes OFF	×	○ (123-127)	
	Active Sense	×	○	
	Reset	×	×	

Notes

* Can be set to ○ or × by manual operation.
** RPC=Registered Parameter Control Number
RPC #0 : Pitch Bend Sensitivity
The value of parameter is to be determined by entering data.

Mode 1 : OMNI ON, POLY
Mode 2 : OMNI ON, MONO
Mode 3 : OMNI OFF, POLY
Mode 4 : OMNI OFF, MONO

○ : Yes
× : No