



AT-90

MIDI Implementation Guide

Section 1. Receive data

Received data is available only for Accompaniment/SMF Play Voices.

■ Channel Voice Messages

● Note off

Status	2nd byte	3rd byte
8nH	kkH	vvH
9nH	kkH	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)
kk = note number : 00H-7FH (0-127)
vv = note off velocity : 00H-7FH (0-127)

- * For Drum Parts, these messages are received when Rx.NOTE OFF = ON for each Instrument.
- * The velocity values of Note Off messages are ignored.

● Note on

Status	2nd byte	3rd byte
9nH	kkH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
kk = note number : 00H-7FH (0-127)
vv = note on velocity : 01H-7FH (1-127)

- * Not received when Rx.NOTE MESSAGE = OFF. (Initial value is ON)
- * For Drum Parts, not received when Rx.NOTE ON = OFF for each Instrument.

● Polyphonic Key Pressure

Status	2nd byte	3rd byte
AnH	kkH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
kk = note number : 00H-7FH (0-127)
vv = key pressure : 00H-7FH (0-127)

- * Not received when Rx.POLY PRESSURE (PAf) = OFF. (Initial value is ON)
- * The resulting effect is determined by System Exclusive messages. With the initial settings, there will be no effect.

● Control Change

- * When Rx.CONTROL CHANGE = OFF, all control change messages except for Channel Mode messages will be ignored.
- * The value specified by a Control Change message will not be reset even by a Program Change, etc.

○ Bank Select (Controller number 0, 32)

Status	2nd byte	3rd byte
BnH	00H	mmH
BnH	20H	llH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
mm, ll = Bank number : 00H, 00H-7FH, 7FH (bank.1-bank.16384),
Initial Value = 00 00H (bank.1)

- * Not received when Rx.BANK SELECT = OFF. "Rx.BANK SELECT" is set to OFF by "Turn General MIDI System On," and set to ON by "GS RESET" or the arranger playback. (Power-on default value is ON.)
- * Bank number LSB will be handled as 00H regardless of the received value. However, when sending Bank Select messages, you have to send both the MSB (mmH) and LSB (llH, the value should be 00H) together.
- * Bank Select processing will be suspended until a Program Change message is received.

○ Modulation (Controller number 1)

Status	2nd byte	3rd byte
BnH	01H	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
vv = Modulation depth : 00H-7FH (0-127)

- * Not received when Rx.MODULATION = OFF. (Initial value is ON)
- * The resulting effect is determined by System Exclusive messages. With the initial settings, this is Pitch Modulation Depth.

○ Portamento Time (Controller number 5)

Status	2nd byte	3rd byte
BnH	05H	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
vv = Portamento Time : 00H-7FH (0-127), Initial value = 00H (0)

- * This adjusts the rate of pitch change when Portamento is ON or when using the Portamento Control. A value of 0 results in the fastest change.

○ Data Entry (Controller number 6, 38)

Status	2nd byte	3rd byte
BnH	06H	mmH
BnH	26H	llH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
mm, ll = the value of the parameter specified by RPN/NRPN

○ Volume (Controller number 7)

Status	2nd byte	3rd byte
BnH	07H	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
vv = Volume : 00H-7FH (0-127),
Initial Value = 3FH (63) (ch.1, 3-16)
35H (53) (ch.2)

- * Volume messages are used to adjust the volume balance of each Part.
- * Not received when Rx.VOLUME = OFF. (Initial value is ON)

○ Pan (Controller number 10)

Status	2nd byte	3rd byte
BnH	0AH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
vv = pan : 00H-40H-7FH (Left-Center-Right),
Initial Value = 40H (Center)

- * For Rhythm Parts, this is a relative adjustment of each Instrument's pan setting.
- * Not received when Rx.PANPOT = OFF. (Initial value is ON)

○ Expression (Controller number 11)

Status	2nd byte	3rd byte
BnH	0BH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
vv = Expression : 00H-7FH (0-127),
Initial Value = 7FH (127)

- * It can be used independently from Volume messages. Expression messages are used for musical expression within a performance; e.g., expression pedal movements, crescendo and decrescendo.
- * Not received when Rx.EXPRESSION = OFF. (Initial value is ON)

○ Hold 1 (Controller number 64)
Status 2nd byte 3rd byte
BrH 40H vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127) 0-63 = OFF, 64-127 = ON

* Not received when Rx.HOLD1 = OFF. (Initial value is ON)

○ Portamento (Controller number 65)
Status 2nd byte 3rd byte
BrH 41H vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127) 0-63 = OFF, 64-127 = ON

* Not received when Rx.PORTAMENTO = OFF. (Initial value is ON)

○ Sostenuto (Controller number 66)
Status 2nd byte 3rd byte
BrH 42H vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127) 0-63 = OFF, 64-127 = ON

* Not received when Rx.SOSTENUTO = OFF. (Initial value is ON)

○ Soft (Controller number 67)
Status 2nd byte 3rd byte
BrH 43H vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127) 0-63 = OFF, 64-127 = ON

* Not received when Rx.SOFT = OFF. (Initial value is ON)

○ Portamento control (Controller number 84)
Status 2nd byte 3rd byte
BrH 54H kkH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
kk = source note number : 00H-7FH (0-127)

- * A Note-on received immediately after a Portamento Control message will change continuously in pitch, starting from the pitch of the Source Note Number.
- * If a voice is already sounding for a note number identical to the Source Note Number, this voice will continue sounding (i.e., legato) and will, when the next Note-on is received, smoothly change to the pitch of that Note-on.
- * The rate of the pitch change caused by Portamento Control is determined by the Portamento Time value.

Example 1.

On MIDI	Description	Result
90 3C 40	Note on C4	C4 on
80 54 3C	Portamento Control from C4	no change (C4 voice still sounding)
90 40 40	Note on E4	glide from C4 to E4
80 3C 40	Note off C4	no change
80 40 40	Note off E4	E4 off

Example 2.

On MIDI	Description	Result
80 54 3C	Portamento Control from C4	no change
90 40 40	Note on E4	E4 is played with glide from C4 to E4
90 40 40	Note off E4	E4 off

○ Effect 1 (Reverb Send Level) (Controller number 91)
Status 2nd byte 3rd byte
BrH 58H vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127),
Initial Value = 28H (40) (except ch.9)
29H (41) (ch.9)

* This message adjusts the Reverb Send Level of each Part.

○ Effect 3 (Chorus Send Level) (Controller number 93)
Status 2nd byte 3rd byte
BrH 5DH vH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
wv = Control value : 00H-7FH (0-127), Initial Value = 00H (0)

* This message adjusts the Chorus Send Level of each Part.

○ NRPN MSB/LSB (Controller number 98, 99)
Status 2nd byte 3rd byte
BrH 63H mmH
BrH 62H llH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
mm = upper byte of the parameter number specified by NRPN
ll = lower byte of the parameter number specified by NRPN

* NRPN can be received when Rx.NRPN = ON. "Rx.NRPN" is set to OFF by power-on reset or by receiving "Turn General MIDI System On," and it is set to ON by "GS RESET."

* The value set by NRPN will not be reset even if Program Change or Reset All Controllers is received.

****NRPN****

The NRPN (Non Registered Parameter Number) message allows an extended range of control changes to be used.

To use these messages, you must first use NRPN MSB and NRPN LSB messages to specify the parameter to be controlled, and then use Data Entry messages to specify the value of the specified parameter. Once an NRPN parameter has been specified, all Data Entry messages received on that channel will modify the value of that parameter. To prevent accidents, it is recommended that you set RPN Null (RPN Number = 7FH/7FH) when you have finished setting the value of the desired parameter. Refer to Section 4. Supplementary material "Examples of actual MIDI messages" <Example 4> (page 15). On the GS devices, Data entry LSB (llH) of NRPN is ignored, so it is no problem to send Data entry MSB (mmH) only (without Data entry LSB).

On the AT-90, NRPN can be used to modify the following parameters.

NRPN	Data entry	Description
MSB LSB	MSB	
01H 08H	mmH	Vibrato rate (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 09H	mmH	Vibrato depth (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 0AH	mmH	Vibrato delay (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 20H	mmH	TVF cutoff frequency (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)

NRPN	Data entry		Description
	MSB	LSB	
01H 21H	mmH		TVF resonance (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 63H	mmH		TVF&TVA Env. Attack time (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 64H	mmH		TVF&TVA Env. Decay time (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
01H 66H	mmH		TVF&TVA Env. Release time (relative change on specified channel) mm: 0EH-40H-72H (-50 - 0 - +50)
18H rrH	mmH		Pitch coarse of drum instrument (relative change on specified drum instrument) rr: key number of drum instrument mm: 00H-40H-7FH (-64 - 0 - +63 semitone)
1AH rrH	mmH		TVA level of drum instrument (absolute change on specified drum instrument) rr: key number of drum instrument mm: 00H-7FH (zero-maximum)
1CH rrH	mmH		Panpot of drum instrument (absolute change on specified drum instrument) rr: key number of drum instrument mm: 00H, 01H-40H-7FH (Random, Left-Center-Right)
1DH rrH	mmH		Reverb send level of drum instrument (absolute change on specified drum instrument) rr: key number of drum instrument mm: 00H-7FH (zero-maximum)
1EH rrH	mmH		Chorus send level of drum instrument (absolute change on specified drum instrument) rr: key number of drum instrument mm: 00H-7FH (zero-maximum)

* Parameters marked "relative change" will change relative to the preset value.

* Parameters marked "absolute change" will be set to the absolute value of the parameter, regardless of the preset value.

○ RPN MSB/LSB (Controller number 100, 101)

Status	2nd byte	3rd byte
BrH	65H	mmH
BrH	64H	lH

n = MIDI channel number : 0H-FH (ch.1-ch.16)

mm = upper byte of parameter number specified by RPN

lH = lower byte of parameter number specified by RPN

* Not received when Rx.RPN = OFF. (Initial value is 0H)

* The value specified by RPN will not be reset even by messages such as Program Change or Reset All Controller.

RPN

The RPN (Registered Parameter Number) messages are expanded control changes, and each function of an RPN is described by the MIDI Standard.

To use these messages, you must first use RPN MSB and RPN LSB messages to specify the parameter to be controlled, and then use Data Entry messages to specify the value of the specified parameter. Once an RPN parameter has been specified, all Data Entry messages received on that channel will modify the value of that parameter. To prevent accidents, it is recommended that you set RPN Null (RPN Number = 7FH/7FH) when you have finished setting the value of the desired parameter. Refer to Section 4. "Examples of actual

MIDI messages" <Example 4> (page 15).

On the AT-90, RPN can be used to modify the following parameters.

RPN	Data entry		Explanation
	MSB	LSB	
00H 00H	mmH	---	Pitch Bend Sensitivity mm: 00H-18H (0-24 semitones) Initial Value = 02H (2 semitones) lH: ignored (processed as 00H) specify up to 2 octaves in semitone steps
00H 01H	mmH	lH	Master Fine Tuning mm, lH: 00 00H - 40 00H - 7F 7FH (-100 - 0 - +99.99 cents) Initial Value = 40 00H (± 0 cent)
00H 02H	mmH	---	Master Coarse Tuning mm: 28H-40H-58H (-24 - 0 - +24 semitones) Initial Value = 40H (± 0 semitone) lH: ignored (processed as 00H)
7FH 7FH	---	---	RPN null Set condition where RPN and NRPN are unspecified. The data entry messages after set RPN null will be ignored. (No Data entry messages are required after RPN null). Settings already made will not change. mm, lH: ignored

● Program Change

Status	2nd byte
CnH	ppH

n = MIDI channel number : 0H-FH (ch.1-ch.16)

pp = Program number : 00H-7FH (prog.1-prog.128)

* Not received when Rx.PROGRAM CHANGE = OFF. (Initial value is 0H)

* After a Program Change message is received, the sound will change beginning with the next Note-on. Voices already sounding when the Program Change message was received will not be affected.

* For Drum Parts, Program Change messages will not be received on bank numbers 129-16384 (the value of Control Number 0 is other than 0 (00H)).

● Channel Pressure

Status	2nd byte
DnH	wH

n = MIDI channel number : 0H-FH (ch.1-ch.16)

w = Channel Pressure : 00H-7FH (0-127)

* Not received when Rx.CH PRESSURE (Caf) = OFF. (Initial value is 0H)

* The resulting effect is determined by System Exclusive messages. With the initial settings there will be no effect.

● Pitch Bend Change

Status	2nd byte	3rd byte
ErH	lH	mmH

n = MIDI channel number : 0H-FH (ch.1-ch.16)

mm, lH = Pitch Bend value : 00 00H - 40 00H - 7F 7FH (-8192 - 0 - +8191)

* Not received when Rx.PITCH BEND = OFF. (Initial value is 0H)

* The resulting effect is determined by System Exclusive messages. With the initial settings the effect is Pitch Bend.

■ Channel Mode Messages

● All Sounds Off (Controller number 120)

Status	2nd byte	3rd byte
BnH	78H	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* When this message is received, all currently-sounding notes on the corresponding channel will be turned off immediately.

● Reset All Controllers (Controller number 121)

Status	2nd byte	3rd byte
BnH	79H	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* When this message is received, the following controllers will be set to their reset values.

Controller	Reset value
Pitch Bend Change	±0 (center)
Polyphonic Key Pressure	0 (off)
Channel Pressure	0 (off)
Modulation	0 (off)
Expression	127 (max)
Hold 1	0 (off)
Portamento	0 (off)
Sostenuto	0 (off)
Soft	0 (off)
FFN	unset; previously set data will not change
NAPN	unset; previously set data will not change

● All Notes Off (Controller number 123)

Status	2nd byte	3rd byte
BnH	7EH	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* When All Notes Off is received, all notes on the corresponding channel will be turned off. However if Hold 1 or Sostenuto is ON, the sound will be continued until these are turned off.

● OMNI OFF (Controller number 124)

Status	2nd byte	3rd byte
BnH	7CH	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* The same processing will be carried out as when All Notes Off is received.

● OMNI ON (Controller number 125)

Status	2nd byte	3rd byte
BnH	7DH	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* OMNI ON is only recognized as "All notes off"; the Mode doesn't change (OMNI OFF remains).

● MONO (Controller number 126)

Status	2nd byte	3rd byte
BnH	7EH	mmH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
mm = mono number : 00H-10H (0-16)

* The same processing will be carried out as when All Sounds Off and All Notes Off is received, and the corresponding channel will be set to Mode 4 (M = 1) regardless of the value of "mono number."

● POLY (Controller number 127)

Status	2nd byte	3rd byte
BnH	7FH	00H

n = MIDI channel number : 0H-FH (ch.1-ch.16)

* The same processing will be carried out as when All Sounds Off and All Notes Off is received, and the corresponding channel will be set to Mode 3.

■ System Realtime Message

● Active Sensing

Status
FBH

* When Active Sensing is received, the unit will begin monitoring the intervals of all further messages. While monitoring, if the interval between messages exceeds 420 ms, the same processing will be carried out as when All Sounds Off, All Notes Off and Reset All Controllers are received, and message interval monitoring will be halted.

■ System Exclusive Message

Status	Data byte	Status
FOH	iiH, ddH,eeH	F7H

FOH : System Exclusive Message status
ii = ID number : an ID number (manufacturer ID) to indicate the manufacturer whose Exclusive message this is. Roland's manufacturer ID is 41H.
ID numbers 7EH and 7FH are extensions of the MIDI standard; Universal Non-realtime Messages (7EH) and Universal Realtime Messages (7FH).
dd,....ee = data: 00H-7FH (0-127)
F7H : EOX (End Of Exclusive)

The System Exclusive Messages received by the AT-90 are; messages related to mode settings, Universal Realtime System Exclusive messages, and Data Set (DT1).

● System exclusive messages related to mode settings

These messages are used to initialize a device to GS or General MIDI mode. When creating performance data, a "Turn General MIDI System On" message should be inserted at the beginning of a General MIDI score, and a "GS Reset" message at the beginning of a GS music data. Each song should contain only one mode message as appropriate for the type of data. (Do not insert two or more mode setting messages in a single song.)
"Turn General MIDI System On" use Universal Non-realtime Message format.
"GS Reset" use Roland system exclusive format "Data Set 1 (DT1)".

○ Turn General MIDI System On

This is a command message that resets the internal settings of the unit to the General MIDI initial state (General MIDI System-Level 1). After receiving this message, AT-90 will automatically be set to the proper condition for correctly playing a General MIDI score.

Status	Data byte	Status
FOH	7EH, 7FH, 09H, 01H	F7H

Byte	Explanation
FOH	Exclusive status
7EH	ID number (Universal Non-realtime Message)
7FH	Device ID (Broadcast)
09H	Sub ID#1 (General MIDI Message)
01H	Sub ID#2 (General MIDI On)
F7H	EOX (End Of Exclusive)

- * When this message is received, Rx.BANK SELECT will be OFF and Rx.NRPN will be OFF.
- * There must be an interval of at least 50 ms between this message and the next message.

○ GS reset

GS Reset is a command message that resets the internal settings of a device to the GS initial state. This message will appear at the beginning of GS music data, and a GS device that receives this message will automatically be set to the proper state to correctly playback GS music data.

Status	Data byte	Status
FOH	41H, 10H, 42H, 12H, 40H, 00H, 7FH, 00H, 41H	F7H

Byte	Explanation
FOH	Exclusive status
41H	ID number (Roland)
10H	Device ID
42H	Model ID (GS)
12H	Command ID (DT1)
40H	Address MSB
00H	Address
7FH	Address LSB
00H	Data (GS reset)
41H	Checksum
F7H	EOX (End Of Exclusive)

- * When this message is received, Rx.NRPN will be ON.
- * There must be an interval of at least 50 ms between this message and the next.

● Universal Realtime System Exclusive Messages

○ Master volume

Status	Data byte	Status
FOH	7FH, 7FH, 04H, 01H, 11H, mmH	F7H

Byte	Explanation
FOH	Exclusive status
7FH	ID number (universal realtime message)
7FH	Device ID (Broadcast)
04H	Sub ID#1 (Device Control messages)
01H	Sub ID#2 (Master Volume)
11H	Master volume lower byte
mmH	Master volume upper byte
F7H	EOX (End Of Exclusive)

- * The lower byte (11H) of Master Volume will be handled as 00H.

● Data transmission

AT-90 can receive the various parameters using System Exclusive messages. The exclusive message of GS format data has a model ID of 42H and a device ID of 10H (17), and it is common to all the GS devices.

○ Data set 1 (DT1)

This is the message that actually performs data transmission, and is used when you wish to transmit the data.

Status	Data byte	Status
FOH	41H, 10H, 42H, 12H, aaH, bbH, ccH, ddH, ... eeH, sum	F7H

Byte	Explanation
FOH	Exclusive status
41H	ID number (Roland)
10H	Device ID
42H	Model ID (GS)
12H	Command ID (DT1)
aaH	Address MSB : upper byte of the starting address of the transmitted data
bbH	Address : middle byte of the starting address of the transmitted data
ccH	Address LSB : lower byte of the starting address of the transmitted data
ddH	Data : the actual data to be transmitted. Multiple bytes of data are transmitted starting from the address.
:	:
eeH	Data
sum	Checksum
F7H	EOX (End Of Exclusive)

- * The amount of data that can be transmitted at one time depends on the type of data, and data can be received only from the specified starting address and size. Refer to the Address and Size given in Section 3 (page 7 - 13).
- * Data larger than 128 bytes must be divided into packets of 128 bytes or less. If "Data Set 1" is transmitted successively, there must be an interval of at least 40 ms between packets.
- * Regarding the checksum please refer to section 4 (page 15).

Section 2. Transmit data

Arranger and composer data can not be transmitted.

■ Channel Voice Message

● Note off

○ Upper Keyboard

Status	2nd byte	3rd byte
BnH	kkH	40H

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = CH (ch.13)
kk = note number : 30H-67H (48-103)

* Note off message is sent out with the velocity of 40H.

○ Lower Keyboard

Status	2nd byte	3rd byte
BnH	kkH	40H

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = BH (ch.12)
kk = note number : 1CH-67H (28-103)

* Note off message is sent out with the velocity of 40H.

○ Bass Keyboard

Status	2nd byte	3rd byte
BnH	kkH	40H

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = DH (ch.14)
kk = note number : 24H-3CH (36-60)

* Note off message is sent out with the velocity of 40H.

● Note on

○ Upper Keyboard

Status	2nd byte	3rd byte
9nH	kkH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = CH (ch.13)
kk = note number : 30H-67H (48-103)
vv = Velocity : 01H-7FH (1-127)

○ Lower Keyboard

Status	2nd byte	3rd byte
9nH	kkH	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = BH (ch.12)
kk = note number : 1CH-67H (28-103)
vv = Velocity : 01H-7FH (1-127)

○ Bass Keyboard

Status	2nd byte	3rd byte
9nH	kkH	64H

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = DH (ch.14)
kk = note number : 24H-3CH (36-60)

* Note on message is sent out with the velocity of 64H.

● Control change

○ Hold1 (Controller number 64)

Status	2nd byte	3rd byte
BnH	40H	vvH

n = MIDI channel number : 0H-FH (ch.1-ch.16)
Initial Value = BH (ch.12)
vv = Control Value : 00H/7FH (0/127)
0=OFF, 127=ON

■ System Realtime Message

● Active sensing

Status
FEH

* This will be transmitted constantly at intervals of approximately 250 ms.

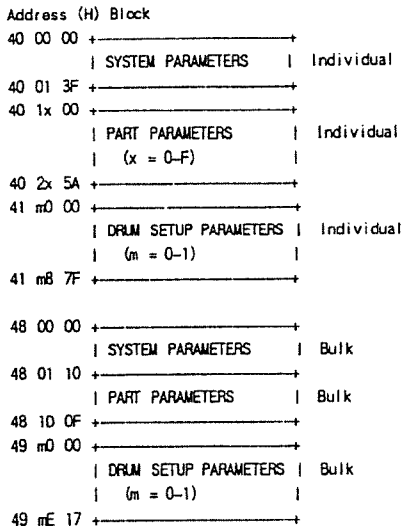
Section 3. Parameter Address Map (Model ID = 42H)

This map indicates address, size, Data (range), Parameter, Description, and Default Value of parameters which can be transferred using "Data set 1 (DT1)."

All the numbers of address, size, Data, and Default Value are indicated in 7-bit Hexadecimal-form.

■ Address Block map

An outlined address map of the Exclusive Communication is as follows:



There are two ways in which GS data is transmitted: Individual Parameter Transmission in which individual parameters are transmitted one by one, and Bulk Dump Transmission in which a large amount of data is transmitted at once.

■ Individual Parameters

Individual Parameter Transmission transmits data (or requests data) for one parameter as one exclusive message (one packet of "F0 F7"). In Individual Parameter Transmission, you must use the Address and Size listed in the following "Parameter Address Map." Addresses marked at "m" cannot be used as starting addresses.

● System Parameters

Parameters related to the system of the device are called System Parameters.

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)	Description
40 00 00	00 00 04	0018-07E8	MASTER TUNE	-100.0 - +100.0 [cent]	00 04 00 00	0 [cent]
40 00 01 [‡]			Use nibblized data.			
40 00 02 [‡]						
40 00 03 [‡]						
40 00 04	00 00 01	00-7F	MASTER VOLUME	0-127	7F	127
			(= F0 7F 7F 04 01 00 vv F7)			
40 00 05	00 00 01	28-58	MASTER KEY-SHIFT	-24 - +24 [semitones]	40	0 [semitones]
40 00 06	00 00 01	01-7F	MASTER PAN	-63 (LEFT) - +63 (RIGHT)	40	0 (CENTER)
40 00 7F	00 00 01	00	MODE SET	00 = GS Reset		
			(Rx. only)			

* Refer to "System exclusive messages related to Mode settings" (page 5).

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)	Description
40 01 10	00 00 10	00-1C	VOICE RESERVE	Part 10 (Drum Part)	02	2
40 01 11				Part 1	06	6
40 01 12				Part 2	02	2
40 01 13				Part 3	02	2
40 01 14				Part 4	02	2
40 01 15				Part 5	02	2
40 01 16				Part 6	02	2
40 01 17				Part 7	02	2
40 01 18				Part 8	02	2
40 01 19				Part 9 (Drum Part)	02	2
40 01 1A				Part 11	00	0
40 01 1F				:		
40 01 1F				Part 16	00	0

* The sum total of voices in the voice reserve function must be equal to or less than the number of the maximum polyphony. The maximum polyphony of the AT-90 from MIDI IN is 28. For compatibility with other GS models, it is recommended that the maximum polyphony be equal or less than 24.

40 01 30	00 00 01	00-07	REVERB MACRO	00: Room 1 01: Room 2 02: Room 3 03: Hall 1 04: Hall 2 05: Plate 06: Delay 07: Panning Delay	04	Hall 2
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40 01 31	00 00 01	00-07	REVERB CHARACTER	0-7	04	4
40 01 32	00 00 01	00-07	REVERB PRE-LPF	0-7	00	0
40 01 33	00 00 01	00-7F	REVERB LEVEL	0-127	2B	43
40 01 34	00 00 01	00-7F	REVERB TIME	0-127	40	64
40 01 35	00 00 01	00-7F	REVERB DELAY FEEDBACK	0-127	00	0
40 01 36	00 00 01	00-7F	REVERB SEND LEVEL TO CHORUS	0-127	00	0

* REVERB MACRO is a macro parameter that allows global setting of reverb parameters. When you select the reverb type with REVERB MACRO, each reverb parameter will be set to the most suitable value.

* REVERB CHARACTER is a parameter that changes the reverb algorithm. The value of REVERB CHARACTER corresponds to the REVERB MACRO of the same number.

40 01 38	00 00 01	00-07	CHORUS MACRO	00: Chorus 1 01: Chorus 2 02: Chorus 3 03: Chorus 4 04: Feedback Chorus 05: Flanger 06: Short Delay 07: Short Delay (FB)	02	Chorus 3
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40 01 39	00 00 01	00-07	CHORUS PRE-LPF	0-7	00	0
40 01 3A	00 00 01	00-7F	CHORUS LEVEL	0-127	40	64
40 01 3B	00 00 01	00-7F	CHORUS FEEDBACK	0-127	08	8
40 01 3C	00 00 01	00-7F	CHORUS DELAY	0-127	50	80
40 01 3D	00 00 01	00-7F	CHORUS RATE	0-127	03	3
40 01 3E	00 00 01	00-7F	CHORUS DEPTH	0-127	13	19
40 01 3F	00 00 01	00-7F	CHORUS SEND LEVEL TO REVERB	0-127	00	0

* CHORUS MACRO is a macro parameter that allows global setting of chorus parameters. When you use CHORUS MACRO to select the chorus type, each chorus parameter will be set to the most suitable value.

● Part Parameters

AT-90 has 16 parts. Parameters that can be set individually for each Part are called Part parameters.

If you use exclusive messages to set Part parameters, specify the address by Block number rather than Part Number (normally the same number as the MIDI channel). The Block number can be specified as one of 16 blocks, from 0 (H) to F (H).

The relation between Part number and Block number is as follows.

x...BLOCK NUMBER (0-F),	Part 1 (MIDI ch = 1)	x = 1
	Part 2 (MIDI ch = 2)	x = 2
	:	:
	Part 9 (MIDI ch = 9)	x = 9
	Part10 (MIDI ch = 10)	x = 0
	Part11 (MIDI ch = 11)	x = A
	Part12 (MIDI ch = 12)	x = B
	:	:
	Part16 (MIDI ch = 16)	x = F

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)	Description
40 1x 00	00 00 02	00-7F	TONE NUMBER	CC#00 VALUE 0-127	00	0
40 1x 01	00 00 01	00-7F		P.C. VALUE 1-128	00	1
40 1x 02	00 00 01	00-10	Rx. CHANNEL	1-16, OFF	Same as the Part Number	
40 1x 03	00 00 01	00-01	Rx. PITCH BEND	OFF/ON	01	ON
40 1x 04	00 00 01	00-01	Rx. CH PRESSURE (Caf)	OFF/ON	01	ON
40 1x 05	00 00 01	00-01	Rx. PROGRAM CHANGE	OFF/ON	01	ON
40 1x 06	00 00 01	00-01	Rx. CONTROL CHANGE	OFF/ON	01	ON
40 1x 07	00 00 01	00-01	Rx. POLY PRESSURE (Paf)	OFF/ON	01	ON
40 1x 08	00 00 01	00-01	Rx. NOTE MESSAGE	OFF/ON	01	ON
40 1x 09	00 00 01	00-01	Rx. RPN	OFF/ON	01	ON
40 1x 0A	00 00 01	00-01	Rx. NRPN	OFF/ON	00 (01*)	OFF (0N*)
* Rx. NRPN is set to OFF by power-on, by receiving "Turn General MIDI System On" or by the arranger playback, and it will be set ON when "GS RESET" is received.						
40 1x 0B	00 00 01	00-01	Rx. MODULATION	OFF/ON	01	ON
40 1x 0C	00 00 01	00-01	Rx. VOLUME	OFF/ON	01	ON
40 1x 0D	00 00 01	00-01	Rx. PANPOT	OFF/ON	01	ON
40 1x 0E	00 00 01	00-01	Rx. EXPRESSION	OFF/ON	01	ON
40 1x 0F	00 00 01	00-01	Rx. HOLD1	OFF/ON	01	ON
40 1x 10	00 00 01	00-01	Rx. PORTAMENTO	OFF/ON	01	ON
40 1x 11	00 00 01	00-01	Rx. SOSTENUTO	OFF/ON	01	ON
40 1x 12	00 00 01	00-01	Rx. SOFT	OFF/ON	01	ON
40 1x 13	00 00 01	00-01	MONO/POLY MODE	Mono/Poly	01	Poly
(= CC# 126 01 / CC# 127 00)						
40 1x 14	00 00 01	00-02	ASSIGN MODE	0 = SINGLE 1 = LIMITED-MULTI 2 = FULL-MULTI	00 at x = 0 01 at x ≠ 0	SINGLE at x = 0 LIMITED-MULTI at x ≠ 0
* ASSIGN MODE is the parameter that determines how voice assignment will be handled when sounds overlap on identical note numbers in the same channel (i.e., repeatedly struck notes). This is initialized to a mode suitable for each Part, so for general purposes there is no need to change this.						
40 1x 15	00 00 01	00-02	USE FOR RHYTHM PART	0 = OFF 1 = MAP1 2 = MAP2	00 at x ≠ 0, x ≠ 9 01 at x = 0 02 at x = 9	OFF at x ≠ 0, x ≠ 9 MAP1 at x = 0 MAP2 at x = 9
* This parameter sets the Drum Map of the Part used as the Drum Part. AT-90 can simultaneously (in different Parts) use up to two Drum Maps (MAP1, MAP2). With the initial settings, Part10 (MIDI CH = 10, x = 0) is set to MAP1 (1), Part9 (MIDI CH = 9, x = 9) is set to MAP2 (2), and other Parts are set to normal instrumental Parts (OFF (0)).						
40 1x 16	00 00 01	28-58	PITCH KEY SHIFT	-24 - +24 [semitones]	40	0 [semitones]
40 1x 17	00 00 02	08-F8	PITCH OFFSET FINE	-12.0 - +12.0 [Hz]	08 00	0 [Hz]
40 1x 18				Use nibblized data.		
* PITCH OFFSET FINE allows you to alter, by a specified frequency amount, the pitch at which notes will sound. This parameter differs from the conventional Fine Tuning (RPN #1) parameter in that the amount of frequency alteration (in Hertz) will be identical no matter which note is played. When a multiple number of Parts, each of which has been given a different setting for PITCH OFFSET FINE, are sounded by means of an identical note number, you can obtain a Celeste effect.						
40 1x 19	00 00 01	00-7F	PART LEVEL	0-127	64	100
(= CC# 7)						
40 1x 1A	00 00 01	00-7F	VELOCITY SENSE DEPTH	0-127	40	64
40 1x 1B	00 00 01	00-7F	VELOCITY SENSE OFFSET	0-127	40	64
40 1x 1C	00 00 01	00-7F	PART PANPOT	-64 (RANDOM), -63 (LEFT) → +63 (RIGHT)	40	0 (CENTER)
(= CC# 10, except RANDOM)						
40 1x 1D	00 00 01	00-7F	KEY RANGE LOW	(C-1)-(G9)	00	C-1
40 1x 1E	00 00 01	00-7F	KEY RANGE HIGH	(C-1)-(G9)	7F	G 9
40 1x 1F	00 00 01	00-5F	CC1 CONTROLLER NUMBER	0-95	10	16
40 1x 20	00 00 01	00-5F	CC2 CONTROLLER NUMBER	0-95	11	17
40 1x 21	00 00 01	00-7F	CHORUS SEND LEVEL	0-127	00	0
(= CC# 93)						
40 1x 22	00 00 01	00-7F	REVERB SEND LEVEL	0-127	28 at x ≠ 9 29 at x = 9	40 at x ≠ 9 41 at x = 9
(= CC# 91)						
40 1x 23	00 00 01	00-01	Rx. BANK SELECT	OFF/ON	01 (00*)	ON (OFF*)
* Rx. BANK SELECT is set to ON by power-on or by receiving "GS RESET," and will be set OFF when "Turn General MIDI System On" is received.						

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)	Description
40 1x 30	00 00 01	0E-72	TONE MODIFY 1 Vibrato rate (= NRP# 8)	-50 - +50	40	0
40 1x 31	00 00 01	0E-72	TONE MODIFY 2 Vibrato depth (= NRP# 9)	-50 - +50	40	0
40 1x 32	00 00 01	0E-72	TONE MODIFY 3 TVF cutoff frequency (= NRP# 32)	-50 - +50	40	0
40 1x 33	00 00 01	0E-72	TONE MODIFY 4 TVF resonance (= NRP# 33)	-50 - +50	40	0
40 1x 34	00 00 01	0E-72	TONE MODIFY 5 TVF&TVA Env. attack (= NRP# 99)	-50 - +50	40	0
40 1x 35	00 00 01	0E-72	TONE MODIFY 6 TVF&TVA Env. decay (= NRP# 100)	-50 - +50	40	0
40 1x 36	00 00 01	0E-72	TONE MODIFY 7 TVF&TVA Env. release (= NRP# 102)	-50 - +50	40	0
40 1x 37	00 00 01	0E-72	TONE MODIFY 8 Vibrato delay (= NRP# 10)	-50 - +50	40	0
40 1x 40	00 00 0C	00-7F	SCALE TUNING C	-64 - +63 [cent]	40	0 [cent]
40 1x 41#		00-7F	SCALE TUNING C#	-64 - +63 [cent]	40	0 [cent]
40 1x 42#		00-7F	SCALE TUNING D	-64 - +63 [cent]	40	0 [cent]
40 1x 43#		00-7F	SCALE TUNING D#	-64 - +63 [cent]	40	0 [cent]
40 1x 44#		00-7F	SCALE TUNING E	-64 - +63 [cent]	40	0 [cent]
40 1x 45#		00-7F	SCALE TUNING F	-64 - +63 [cent]	40	0 [cent]
40 1x 46#		00-7F	SCALE TUNING F#	-64 - +63 [cent]	40	0 [cent]
40 1x 47#		00-7F	SCALE TUNING G	-64 - +63 [cent]	40	0 [cent]
40 1x 48#		00-7F	SCALE TUNING G#	-64 - +63 [cent]	40	0 [cent]
40 1x 49#		00-7F	SCALE TUNING A	-64 - +63 [cent]	40	0 [cent]
40 1x 4A#		00-7F	SCALE TUNING A#	-64 - +63 [cent]	40	0 [cent]
40 1x 4B#		00-7F	SCALE TUNING B	-64 - +63 [cent]	40	0 [cent]

* SCALE TUNING is a function that allows fine adjustment to the pitch of each note in the octave. The pitch of each identically-named note in all octaves will change simultaneously. A setting of ± 0 cent (40H) is equal temperament. Refer to section 4. Supplementary material, "The Scale Tune Feature".

40 2x 00	00 00 01	28-58	MOD PITCH CONTROL	-24 - +24 [semitone]	40	0 [semitones]
40 2x 01	00 00 01	00-7F	MOD TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 02	00 00 01	00-7F	MOD AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 03	00 00 01	00-7F	MOD LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 04	00 00 01	00-7F	MOD LF01 PITCH DEPTH	0-600 [cent]	0A	47 [cent]
40 2x 05	00 00 01	00-7F	MOD LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 06	00 00 01	00-7F	MOD LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 07	00 00 01	00-7F	MOD LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 08	00 00 01	00-7F	MOD LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 09	00 00 01	00-7F	MOD LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 0A	00 00 01	00-7F	MOD LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 10	00 00 01	40-58	BEND PITCH CONTROL	0-24 [semitone]	42	2 [semitones]
40 2x 11	00 00 01	00-7F	BEND TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 12	00 00 01	00-7F	BEND AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 13	00 00 01	00-7F	BEND LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 14	00 00 01	00-7F	BEND LF01 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 15	00 00 01	00-7F	BEND LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 16	00 00 01	00-7F	BEND LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 17	00 00 01	00-7F	BEND LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 18	00 00 01	00-7F	BEND LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 19	00 00 01	00-7F	BEND LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 1A	00 00 01	00-7F	BEND LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 20	00 00 01	28-58	CAF PITCH CONTROL	-24 - +24 [semitone]	40	0 [semitones]
40 2x 21	00 00 01	00-7F	CAF TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 22	00 00 01	00-7F	CAF AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 23	00 00 01	00-7F	CAF LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 24	00 00 01	00-7F	CAF LF01 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 25	00 00 01	00-7F	CAF LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 26	00 00 01	00-7F	CAF LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 27	00 00 01	00-7F	CAF LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 28	00 00 01	00-7F	CAF LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 29	00 00 01	00-7F	CAF LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 2A	00 00 01	00-7F	CAF LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]

Address (H)	Size (H)	Data (H)	Parameter	Description	Default Value (H)	Description
40 2x 30	00 00 01	28-58	PAf PITCH CONTROL	-24 - +24 [semitone]	40	0 [semitones]
40 2x 31	00 00 01	00-7F	PAf TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 32	00 00 01	00-7F	PAf AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 33	00 00 01	00-7F	PAf LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 34	00 00 01	00-7F	PAf LF01 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 35	00 00 01	00-7F	PAf LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 36	00 00 01	00-7F	PAf LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 37	00 00 01	00-7F	PAf LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 38	00 00 01	00-7F	PAf LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 39	00 00 01	00-7F	PAf LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 3A	00 00 01	00-7F	PAf LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 40	00 00 01	28-58	CC1 PITCH CONTROL	-24 - +24 [semitone]	40	0 [semitones]
40 2x 41	00 00 01	00-7F	CC1 TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 42	00 00 01	00-7F	CC1 AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 43	00 00 01	00-7F	CC1 LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 44	00 00 01	00-7F	CC1 LF01 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 45	00 00 01	00-7F	CC1 LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 46	00 00 01	00-7F	CC1 LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 47	00 00 01	00-7F	CC1 LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 48	00 00 01	00-7F	CC1 LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 49	00 00 01	00-7F	CC1 LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 4A	00 00 01	00-7F	CC1 LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 50	00 00 01	28-58	CC2 PITCH CONTROL	-24 - +24 [semitone]	40	0 [semitones]
40 2x 51	00 00 01	00-7F	CC2 TVF CUTOFF CONTROL	-9600 - +9600 [cent]	40	0 [cent]
40 2x 52	00 00 01	00-7F	CC2 AMPLITUDE CONTROL	-100.0 - +100.0 [%]	40	0 [%]
40 2x 53	00 00 01	00-7F	CC2 LF01 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 54	00 00 01	00-7F	CC2 LF01 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 55	00 00 01	00-7F	CC2 LF01 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 56	00 00 01	00-7F	CC2 LF01 TVA DEPTH	0-100.0 [%]	00	0 [%]
40 2x 57	00 00 01	00-7F	CC2 LF02 RATE CONTROL	-10.0 - +10.0 [Hz]	40	0 [Hz]
40 2x 58	00 00 01	00-7F	CC2 LF02 PITCH DEPTH	0-600 [cent]	00	0 [cent]
40 2x 59	00 00 01	00-7F	CC2 LF02 TVF DEPTH	0-2400 [cent]	00	0 [cent]
40 2x 5A	00 00 01	00-7F	CC2 LF02 TVA DEPTH	0-100.0 [%]	00	0 [%]

● Drum Setup Parameters

* m: Map number (0 = MAP1, 1 = MAP2)

* rr: drum part note number (00H-7FH)

Address (H)	Size (H)	Data (H)	Parameter	Description
41 m1 rr	00 00 01	00-7F	PLAY NOTE NUMBER	Pitch coarse
41 m2 rr	00 00 01	00-7F	LEVEL (= NRP# 26)	TVA level
41 m3 rr	00 00 01	00-7F	ASSIGN GROUP NUMBER	Non, 1-127
41 m4 rr	00 00 01	00-7F	PANPOT (= NRP# 28, except RANDOM)	-64 (RANDOM), -63 (LEFT) - +63 (RIGHT)
41 m5 rr	00 00 01	00-7F	REVERB SEND LEVEL (= NRP# 29)	0.0-1.0 Multiplicand of the part reverb depth
41 m6 rr	00 00 01	00-7F	CHORUS SEND LEVEL (= NRP# 30)	0.0-1.0 Multiplicand of the part chorus depth
41 m7 rr	00 00 01	00-01	Rx. NOTE OFF	OFF/ON
41 m8 rr	00 00 01	00-01	Rx. NOTE ON	OFF/ON

* When the Drum Set is changed, DRUM SETUP PARAMETER values will all be initialized.

■ Bulk Dump

Bulk Dump allows you to transmit a large amount of data at once.

Addresses marked at "#" cannot be used as starting addresses.

Bulk Dump data which include large amount of data (more than 128 bytes) will sent out in separate packets at an interval of about 40 ms. In this case, the subsequent packets may contain the address marked "#."

To send several packets of large DT1 messages at a time, insert intervals of at least 40 ms. in between those packets.

● System and Part Parameters

Address (H)	Size (H)	Description	Number of packets
48 00 00	00 1D 10	ALL (All of the System parameters and Part parameters can be sent sequentially.)	
	#		30 packets
48 1D 0F#			
48 00 00	00 00 10		
	#	SYSTEM 1	1 packet
48 00 0F#			
48 00 10	00 01 00		
	#	SYSTEM 2	1 packet
48 01 0F#			
48 01 10	00 01 60		
	#	BLOCK 0	2 packets
48 02 6F#			
48 02 70	00 01 60		
	#	BLOCK 1	2 packets
48 04 4F#			
48 04 50	00 01 60		
	#	BLOCK 2	2 packets
48 06 2F#			
48 06 30	00 01 60		
	#	BLOCK 3	2 packets
48 08 0F#			
48 08 10	00 01 60		
	#	BLOCK 4	2 packets
48 09 6F#			
48 09 70	00 01 60		
	#	BLOCK 5	2 packets
48 0B 4F#			
48 0B 50	00 01 60		
	#	BLOCK 6	2 packets
48 0D 2F#			
48 0D 30	00 01 60		
	#	BLOCK 7	2 packets
48 0F 0F#			
48 0F 10	00 01 60		
	#	BLOCK 8	2 packets
48 10 6F#			
48 10 70	00 01 60		
	#	BLOCK 9	2 packets
48 12 4F#			
48 12 50	00 01 60		
	#	BLOCK A	2 packets
48 14 2F#			

48 14 30	00 01 60		
	#	BLOCK B	2 packets
48 16 0F#			
48 16 10	00 01 60		
	#	BLOCK C	2 packets
48 17 6F#			
48 17 70	00 01 60		
	#	BLOCK D	2 packets
48 19 4F#			
48 19 50	00 01 60		
	#	BLOCK E	2 packets
48 1B 2F#			
48 1B 30	00 01 60		
	#	BLOCK F	2 packets
48 1D 0F#			

● DRUM SETUP PARAMETERS

m: map number (0 = MAP1, 1 = MAP2)

Address (H)	Size (H)	Description	Number of packets
49 m0 00	00 02 00		
		PLAY NOTE NUMBER	2 packets
49 m1 7F			
49 m2 00	00 02 00		
		LEVEL	2 packets
49 m3 7F			
49 m4 00	00 02 00		
		ASSIGN GROUP NUMBER	2 packets
49 m5 7F			
49 m6 00	00 02 00		
		PANPOT	2 packets
49 m7 7F			
49 m8 00	00 02 00		
		REVERB SEND LEVEL	2 packets
49 m9 7F			
49 mA 00	00 02 00		
		CHORUS SEND LEVEL	2 packets
49 mB 7F			
49 mC 00	00 02 00		
		Rx. NOTE ON/OFF	2 packets
49 MD 7F			
49 ME 00	00 00 18		
		DRUM MAP NAME	1 packet
49 ME 17			

Section 4. Supplementary material

● Decimal and Hexadecimal table

In MIDI documentation, data values and addresses/sizes of 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 bytes, 00 00H = -8192, 40 00H = ± 0 , and 7F 7FH = +8191. For example if aa bbH were expressed as decimal, this would be $aa \text{ bbH} - 40 \text{ 00H} = aa \times 128 + bb - 64 \times 128$.
- * 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 $a \times 16 + b$.

<Example 1> What is the decimal expression of 5AH ?
From the preceding table, 5AH = 90

<Example 2> What is the decimal expression of the value 12 34H given as hexadecimal for each 7 bits?
From the preceding table, since 12H = 18 and 34H = 52
 $18 \times 128 + 52 = 2356$

<Example 3> What is the decimal expression of the nibbled value 0A 03 09 0D ?
From the preceding table, since 0AH = 10, 03H = 3, 09H = 9, 0DH = 13
 $((10 \times 16 + 3) \times 16 + 9) \times 16 + 13 = 41885$

<Example 4> What is the nibbled expression of the decimal value 1258?

```

16) 1258
   78 ... 10
   4 ... 14
   0 ... 4

```

Since from the preceding table, 0 = 00H, 4 = 04H, 14 = 0EH, 10 = 0AH, the answer is 00 04 0E 0AH.

● Examples of actual MIDI messages

<Example 1> 92 3E 5F

9n is the Note-on status, and n is the MIDI channel number. Since 2H = 2, 3EH = 62, and 5FH = 95, this is a Note-on message with MIDI CH = 3, note number 62 (note name is D4), and velocity 95.

<Example 2> CE 49

CnH is the Program Change status, and n is the MIDI channel number. Since EH = 14 and 49H = 73, this is a Program Change message with MIDI CH = 15, program number 74 (Flute in GS).

<Example 3> EA 00 28

EnH is the Pitch Bend Change status, and n is the MIDI channel number. The 2nd byte (00H = 0) is the LSB and the 3rd byte (28H = 40) is the MSB, but Pitch Bend Value is a signed number in which 40 00H (= 64 x 128 + 0 = 8192) is 0, so this Pitch Bend Value is 28 00H - 40 00H = 40 x 128 + 0 - (64 x 128 + 0) = 5120 - 8192 = -3072

If the Pitch Bend Sensitivity is set to 2 semitones, -8192 (00 00H) will cause the pitch to change -200 cents, so in this case -200 x (-3072) / (-8192) = -75 cents of Pitch Bend is being applied to MIDI channel 11.

<Example 4> B3 64 00 65 00 06 0C 26 00 64 7F 65 7F

BnH is the Control Change status, and n is the MIDI channel number. For Control Changes, the 2nd byte is the control number, and the 3rd byte is the value. In a case in which two or more messages consecutive messages have the same status, MIDI has a provision called "running status" which allows the status byte of the second and following messages to be omitted. Thus, the above messages have the following meaning.

B3	64 00	MIDI ch.4, lower byte of RPN parameter number	: 00H
(B3)	65 00	(MIDI ch.4) upper byte of RPN parameter number	: 00H
(B3)	06 0C	(MIDI ch.4) upper byte of parameter value	: 0CH
(B3)	26 00	(MIDI ch.4) lower byte of parameter value	: 00H
(B3)	64 7F	(MIDI ch.4) lower byte of RPN parameter number	: 7FH
(B3)	65 7F	(MIDI ch.4) upper byte of RPN parameter number	: 7FH

In other words, the above messages specify a value of 0C 00H for RPN parameter number 00 00H on MIDI channel 4, and then set the RPN parameter number to 7F 7FH.

RPN parameter number 00 00H is Pitch Bend Sensitivity, and the MSB of the value indicates semitone units, so a value of 0CH = 12 sets the maximum pitch bend range to ±12 semitones (1 octave). (On GS sound sources the LSB of Pitch Bend Sensitivity is ignored, but the LSB should be transmitted anyway (with a value of 0) so that operation will be correct on any device.)

Once the parameter number has been specified for RPN or NRPN, all Data Entry messages transmitted on that same channel will be valid, so after the desired value has been transmitted, it is a good idea to set the parameter number to 7F 7FH to prevent accidents. This is the reason for the (B3) 64 7F (B3) 65 7F at the end.

It is not desirable for performance data (such as Standard MIDI File data) to contain many events with running status as given in <Example 4>. This is because if playback is halted during the song and then rewound or fast-forwarded, the sequencer may not be able to transmit the correct status, and the sound source will then misinterpret the data. Take care to give each event its own status.

It is also necessary that the RPN or NRPN parameter number setting and the value setting be done in the proper order. On some sequencers, events occurring in the same (or consecutive) clock may be transmitted in an order different than the order in which they were received. For this reason it is a good idea to slightly skew the time of each event (about 1 tick for TPQN = 96, and about 5 ticks for TPQN = 480).

* TPQN: Ticks Per Quarter Note

● Example of an Exclusive message and calculating a Checksum

Roland Exclusive messages (DT1) are transmitted with a checksum at the end (before F7) to make sure that the message was correctly received. The value of the checksum is determined by the address and data (or size) of the transmitted exclusive message.

◇ How to calculate the checksum (hexadecimal numbers are indicated by 'H')

The checksum is a value derived by adding the address, size and checksum itself and inverting the lower 7 bits.

Here's an example of how the checksum is calculated. We will assume that in the exclusive message we are transmitting, the address is aa bb cCH and the data or size is dd ee ffH.

```
aa + bb + cc + dd + ee + ff = sum
sum / 128 = quotient ... remainder
128 - remainder = checksum
```

<Example> Setting REVERB MACRO to ROOM 3

According to the "Parameter Address Map," the REVERB MACRO Address is 40 01 30H, and ROOM 3 is a value of 02H. Thus,

```

FO  41  10  42  12  40 01 30  02  ??  F7
(1) (2) (3) (4) (5) address data checksum (6)

```

(1) Exclusive Status (2) ID (Roland) (3) Device ID (17)
(4) Model ID (GS) (5) Command ID (DT1) (6) End of Exclusive

Next we calculate the checksum.

$40H + 01H + 30H + 02H = 64 + 1 + 48 + 2 = 115$ (sum)
 115 (sum) / $128 = 0$ (quotient) ... 115 (remainder)
checksum = $128 - 115$ (remainder) = $13 = 00H$

This means that FO 41 10 42 12 40 01 30 02 00 F7 is the message we transmit.

● GS Tone Mapping

PC	CC00	Instrument	No. of voices	Remark	PC	CC00	Instrument	No. of voices	Remark
<u>Piano</u>					<u>Organ</u>				
001	000	Piano 1	1		017	000	Organ 1	1	
	008	Piano 1w	2			008	Detuned Or.1	2	
	016	Piano 1d	1			016	60's Organ 1	1	
002	000	Piano 2	1			032	Organ 4	2	
	008	Piano 2w	2		018	000	Organ 2	1	
003	000	Piano 3	1			008	Detuned Or.2	2	
	008	Piano 3w	2			032	Organ 5	2	
004	000	Honky-tonk	2		019	000	Organ 3	2	
	008	Honky-tonk w	2		020	000	Church Org.1	1	
005	000	E.Piano 1	1			008	Church Org.2	2	
	008	Detuned EP 1	2			016	Church Org.3	2	
	016	E.Piano 1v	2		021	000	Reed Organ	1	
	024	60's E.Piano	1		022	000	Accordion Fr	2	
006	000	E.Piano 2	1			008	Accordion It	2	
	008	Detuned EP 2	2		023	000	Harmonica	1	
	016	E.Piano 2v	2		024	000	Bandoneon	2	
007	000	Harpsichord	1		<u>Guitar</u>				
	008	Coupled Hps.	2		025	000	Nylon-str.Gt	1	
	016	Harpsi.w	2			008	Ukulele	1	
	024	Harpsi.o	2			016	Nylon Gt.o	2	
008	000	Clav.	1			032	Nylon Gt.2	1	
<u>Chromatic percussion</u>					026	000	Steel-str.Gt	1	
009	000	Celesta	1			008	12-str.Gt	2	
010	000	Glockenspiel	1			016	Mandolin	1	
011	000	Music Box	1		027	000	Jazz Gt.	1	
012	000	Vibraphone	1			008	Hawaiian Gt.	1	
	008	Vib.w	2		028	000	Clean Gt.	1	
013	000	Marimba	1			008	Chorus Gt.	2	
	008	Marimba w	2		029	000	Muted Gt.	1	
014	000	Xylophone	1			008	Funk Gt.	1	
015	000	Tubular-bell	1			016	Funk Gt.2	1	
	008	Church Bell	1		030	000	Overdrive Gt	1	
	009	Carillon	1		031	000	DistortionGt	1	
016	000	Santur	1			008	Feedback Gt.	2	
					032	000	Gt.Harmonix	1	
						008	Gt.Feedback	1	

PC	CC00	Instrument	No. of voices	Remark	PC	CC00	Instrument	No. of voices	Remark
<u>Bass</u>					<u>Reed</u>				
033	000	Acoustic Bs.	1		065	000	Soprano Sax	1	
034	000	Fingered Bs.	1		066	000	Alto Sax	1	
035	000	Picked Bs.	1		067	000	Tenor Sax	1	
036	000	Fretless Bs.	1		068	000	Baritone Sax	1	
037	000	Slap Bass 1	1		069	000	Oboe	1	
038	000	Slap Bass 2	1		070	000	English Horn	1	
039	000	Synth Bass 1	1		071	000	Bassoon	1	
	001	Synth Bass101	1		072	000	Clarinet	1	
	008	Synth Bass 3	1		<u>Pipe</u>				
040	000	Synth Bass 2	2		073	000	Piccolo	1	
	008	Synth Bass 4	2		074	000	Flute	1	
	016	Rubber Bass	2		075	000	Recorder	1	
<u>Strings / orchestra</u>					076	000	Pan Flute	1	
041	000	Violin	1		077	000	Bottle Blow	2	
	008	Slow Violin	1		078	000	Shakuhachi	2	
042	000	Viola	1		079	000	Whistle	1	
043	000	Cello	1		080	000	Ocarina	1	
044	000	Contrabass	1		<u>Synth lead</u>				
045	000	Tremolo Str	1		081	000	Square Wave	2	
046	000	PizzicatoStr	1			001	Square	1	
047	000	Harp	1			008	Sine Wave	1	
048	000	Timpani	1		082	000	Saw Wave	2	
<u>Ensemble</u>						001	Saw	1	
049	000	Strings	1			008	Doctor Solo	2	
	008	Orchestra	2		083	000	Syn.Calliope	2	
050	000	Slow Strings	1		084	000	Chiffer Lead	2	
051	000	Syn.Strings1	1		085	000	Charang	2	
	008	Syn.Strings3	2		086	000	Solo Vox	2	
052	000	Syn.Strings2	2		087	000	5th Saw	2	
053	000	Choir Aahs	1		088	000	Bass & Lead	2	
	032	Choir Aahs 2	1		<u>Synth pad, etc.</u>				
054	000	Voice Oohs	1		089	000	Fantasia	2	
055	000	SynVox	1		090	000	Warm Pad	1	
056	000	Orchestrahit	2		091	000	Polysynth	2	
<u>Brass</u>					092	000	Space Voice	1	
057	000	Trumpet	1		093	000	Bowed Glass	2	
058	000	Trombone	1		094	000	Metal Pad	2	
	001	Trombone 2	2		095	000	Halo Pad	2	
059	000	Tuba	1		096	000	Sweep Pad	1	
060	000	MutedTrumpet	1		<u>Synth SFX</u>				
061	000	French Horns	2		097	000	Ice Rain	2	
	001	French Horn2	2		098	000	Soundtrack	2	
062	000	Brass 1	1		099	000	Crystal	2	
	008	Brass 2	2			001	Syn Mallet	1	
063	000	Synth Brass1	2		100	000	Atmosphere	2	
	008	Synth Brass3	2		101	000	Brightness	2	
	016	AnalogBrass1	2		102	000	Goblin	2	
064	000	Synth Brass2	2		103	000	Echo Drops	1	
	008	Synth Brass4	1			001	Echo Bell	2	
	016	AnalogBrass2	2			002	Echo Pan	2	
					104	000	Star Theme	2	

PC	CC00	Instrument	No. of voices	Remark	PC	CC00	Instrument	No. of voices	Remark
<u>Ethnic, etc.</u>					<u>SFX</u>				
105	000	Sitar	1		121	000	Gt.FretNoise	1	
	001	Sitar 2	2			001	Gt.Cut Noise	1	**
106	000	Banjo	1			002	String Slap	1	**
107	000	Shamisen	1		122	000	Breath Noise	1	
108	000	Koto	1			001	Fl.Key Click	1	**
	008	Taisho Koto	2		123	000	Seashore	1	**
109	000	Kalimba	1			001	Rain	1	**
110	000	Bagpipe	1			002	Thunder	1	**
111	000	Fiddle	1			003	Wind	1	**
112	000	Shanai	1			004	Stream	2	**
<u>Percussive</u>						005	Bubble	2	**
					124	000	Bird	2	**
113	000	Tinkle Bell	1			001	Dog	1	**
114	000	Agogo	1			002	Horse-Gallop	1	**
115	000	Steel Drums	1			003	Bird 2	1	**
116	000	Woodblock	1	**	125	000	Telephone 1	1	**
	008	Castanets	1	**		001	Telephone 2	1	**
117	000	Taiko	1	**		002	DoorCreaking	1	**
	008	Concert BD	1	**		003	Door	1	**
118	000	Melo. Tom 1	1	**		004	Scratch	1	**
	008	Melo. Tom 2	1	**		005	Windchime	2	**
119	000	Synth Drum	1	**	126	000	Helicopter	1	**
	008	808 Tom	1	**		001	Car-Engine	1	**
	009	Elec Perc	1	**		002	Car-Stop	1	**
120	000	Reverse Cym.	1	**		003	Car-Pass	1	**
						004	Car-Crash	2	**
						005	Siren	1	**
						006	Train	1	**
						007	Jetplane	2	**
						008	Starship	2	**
						009	Burst Noise	2	**
					127	000	Applause	2	**
						001	Laughing	1	**
						002	Screaming	1	**
						003	Punch	1	**
						004	Heart Beat	1	**
						005	Footsteps	1	**
					128	000	Gun Shot	1	**
						001	Machine Gun	1	**
						002	Lasergun	1	**
						003	Explosion	2	**

Remark **: a percussive sound which cannot be played melodically. Use near C4 (note number 60).

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