



MIDI Control Guide



This guide introduces the MIDI messages that can be used on Yamaha digital mixers (such as the M7CL, LS9, PM5D, DM2000, 02R96, DM1000, and 01V96) and describes actual MIDI message application examples along with setup procedures.

This guide uses the M7CL Version 3 digital mixer as an example to describe the features that you can control by sending MIDI messages from an external device to the M7CL through the MIDI port.

Some features that are available on the M7CL are not available on other models. For details on the MIDI features available on each model, see the respective manual.

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Introduction

Simply explained, MIDI stands for Musical Instrument Digital Interface and is a worldwide standard for transferring digital performance data between electronic musical instruments.

* This guide assumes that the reader has a basic knowledge of MIDI, so descriptions of the MIDI standard itself are not provided.

MIDI Program-change, control-change, and parameter-change messages can be used on Yamaha digital mixers to control their scenes and parameters.

Program change

MIDI program change messages can be used to recall scenes and libraries.

You can recall scenes and libraries that have been registered in the mixer's program change message list.

Control change

MIDI control change messages can be used to control a variety of parameters such as fader levels and pan pots.

You can control the parameters that have been registered in the mixer's control change list.

Parameter change

Like the control change messages, MIDI parameter change messages can be used to control parameters such as fader levels and pan pots.

The difference between control change messages and parameter change messages is in their data format. In parameter change messages, hexadecimal data sequences, referred to as system exclusive messages, are transmitted.

This enables the exchange of more detailed information.

This guide will use the M7CL as an example to explain parameter control examples through the use of program-change, control-change, and parameter-change messages.

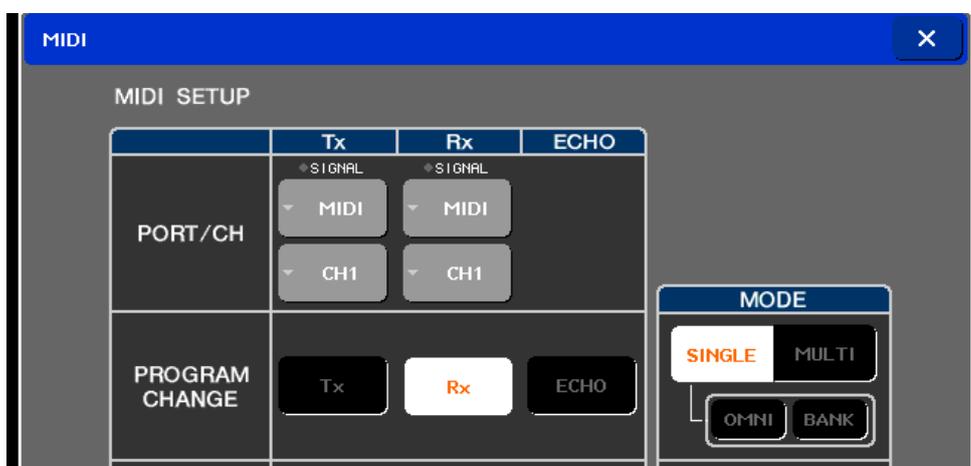
Controlling Scenes and Libraries Using Program Change

This section will give an example of the M7CL configuration and the MIDI messages to send when you want to control the M7CL scene or library from an external device through MIDI program change messages. Regardless of the type of external device that is used, MIDI messages that are sent to the M7CL are the same. Any external device that can send program change messages can control the M7CL.

* The external device can be a dedicated MIDI controller, a DAW, or another digital mixer.

The following section will explain how to send program change messages to the M7CL to control it.

Open the MIDI setup screen, and configure the MIDI channels as shown below.



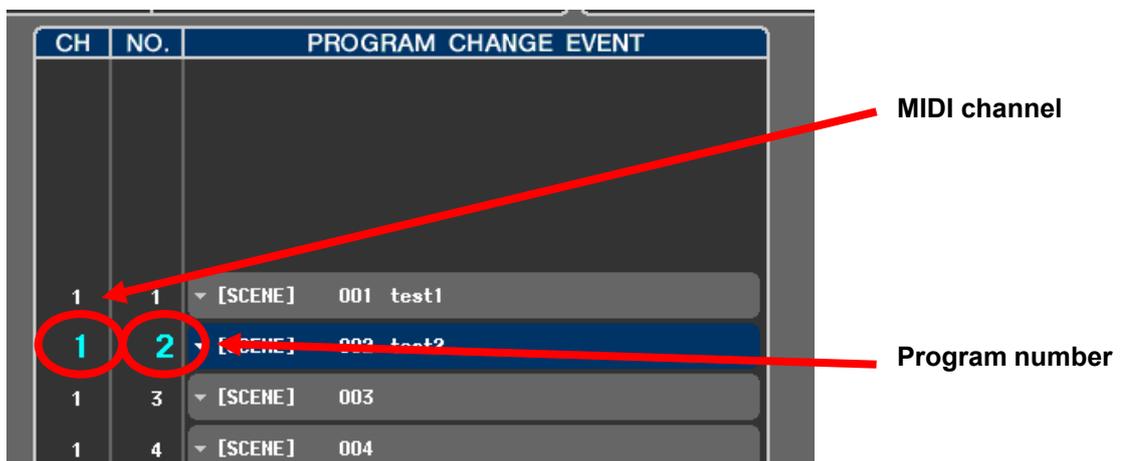
Configure the M7CL so that it can receive MIDI channel 1 signals from the external device through the MIDI port.

You can use a different MIDI channel as long as the channels on the transmitting device and the receiving device are the same.

* In this guide, MIDI PORT/CH is set to 1. Set MODE to SINGLE, as shown in the figure above (see page 7 for details).

To recall scene 001 using a program change message

1. On the M7CL, show the PROGRAM CHANGE page. As shown in the figure, "CH" denotes the MIDI channel number, and "NO." denotes the program number.



2. Check the MIDI channel and the program number that correspond to the program change event that you want to recall.

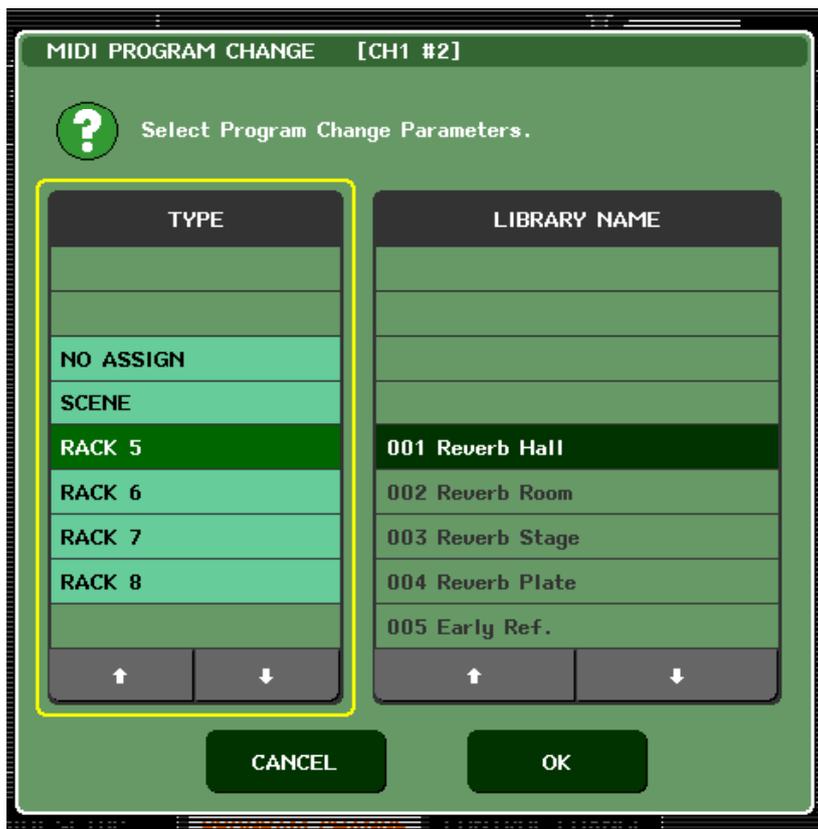
When the M7CL receives a message, the program change event that corresponds to the MIDI channel and program number in the message is executed.

By default, SCENE 001 is assigned to MIDI channel 1, program number 1. If you send a message with program number set to 1 to the M7CL's MIDI channel 1, SCENE 001 will be recalled.

* To recall scenes that are assigned to MIDI channel 2 and later, in the PORT/CH area of the MIDI setup screen, set the Rx MIDI channel to the channel that you want to recall.

To recall an effect library using a program change message

1. On the PROGRAM CHANGE page, tap the program change event that corresponds to the MIDI channel and program number that you want to set. The following screen will appear, and you will be able to change the program change event assignment.



* In the figure above, the program change event is being assigned to preset "001 Reverb Hall" in RACK 5.

2. When you make the change, the following screen appears. "[RACK 5] 001 Reverb Hall" has been assigned to MIDI channel 1, program number 2.



3. Check the MIDI channel and the program number that correspond to the program change event that you want to recall.

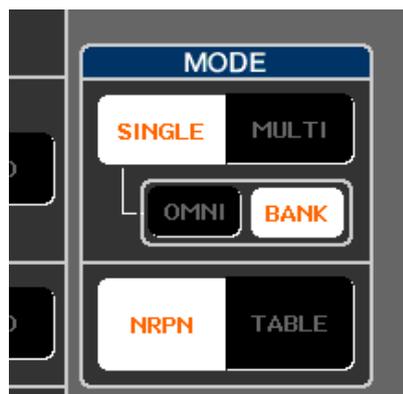
If you send a message with the program number set to 2 to the M7CL's MIDI channel 1, the "Reverb Hall" library will be recalled into RACK 5.

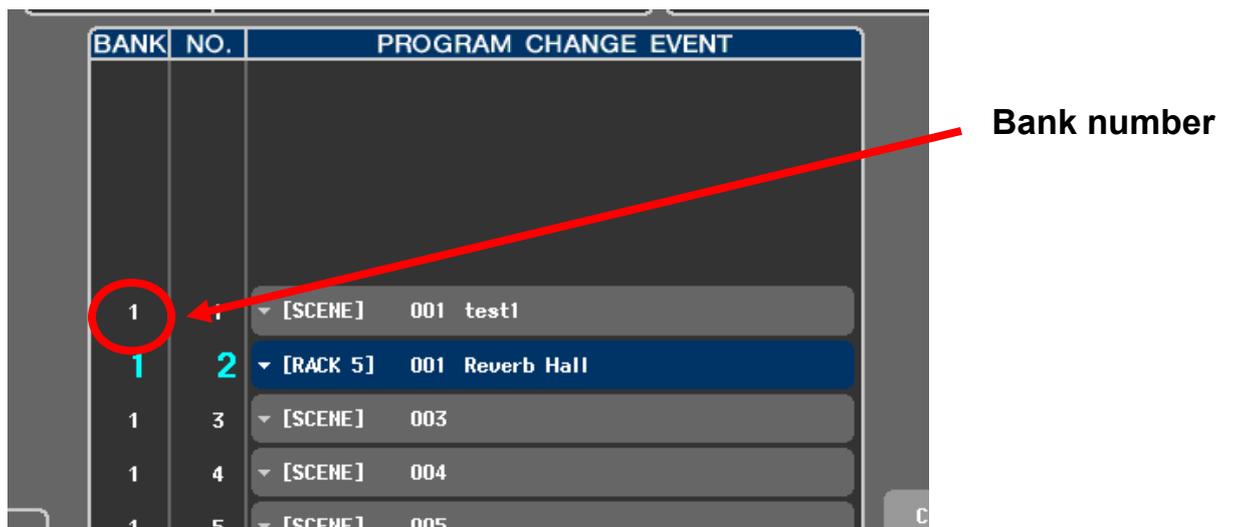
Program Change in Bank Mode

On the PROGRAM CHANGE page, switch the display from the MIDI channel mode to bank (bank number) mode.

In bank mode, you can control over 128 program change events with a single MIDI channel.

As shown in the figure below, tap "BANK" to change the "CH" column to the "BANK" column.





Transmission messages in bank mode

In bank mode, bank numbers are specified using control change numbers in place of MIDI channel numbers. * For an explanation of control change messages, see page 9.

In bank mode, if you want to execute the program change event assigned to the M7CL's bank 1, program number 1, set the following message.

CC0 (bank select MSB): 1
Program change: 1

* CC0 denotes control change number 0. Control change numbers range from 0 to 127.
CC0 is also known as Bank Select MSB.
In some cases, CC32 (Bank Select LSB) is also used to select banks.

* Bank mode can only be used in single mode and is disabled in multi mode.
(For explanations of single and multi modes, see page 9.)

Other Modes

Single mode

For each MIDI channel, program change messages are assigned program numbers 1 to 128 (0 to 127). In single mode, the M7CL sends and receives only the program change messages that are assigned to the MIDI channel that is selected in the PORT/CH area of the MIDI setup screen.

Multi mode

In multi mode, the M7CL sends and receives program change messages of all MIDI channels, regardless of the setting in the PORT/CH area of the MIDI setup screen.

Omni mode

Omni mode is used in conjunction with single mode. When enabled, the M7CL sends program change messages from a single channel and receives messages of all MIDI channels (multi mode is used only for receiving messages).

* Omni mode is invalid in multi mode. The MIDI channel for sending messages is determined by the setting on the MIDI setup screen.

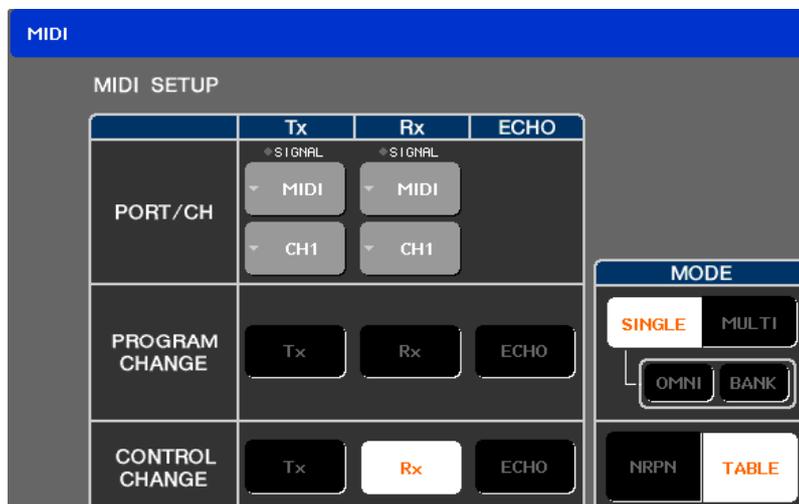
Controlling Fader Levels and Pan Pots Using Control Change (TABLE)

This section will give an example of the M7CL configuration and the MIDI messages to send when you want to control the M7CL parameters such as faders and pan pots from an external device through MIDI control change messages.

* The external device can be a dedicated MIDI controller, a DAW, or another digital mixer.

Regardless of the type of external device that is used, MIDI messages that are sent to the M7CL are the same. Any external device that can send control change messages can control the M7CL. The following section will explain how to send control change messages to the M7CL to control its input channel 1 fader level and pan value.

1. Open the M7CL MIDI setup screen, and configure the MIDI channel settings as shown below.

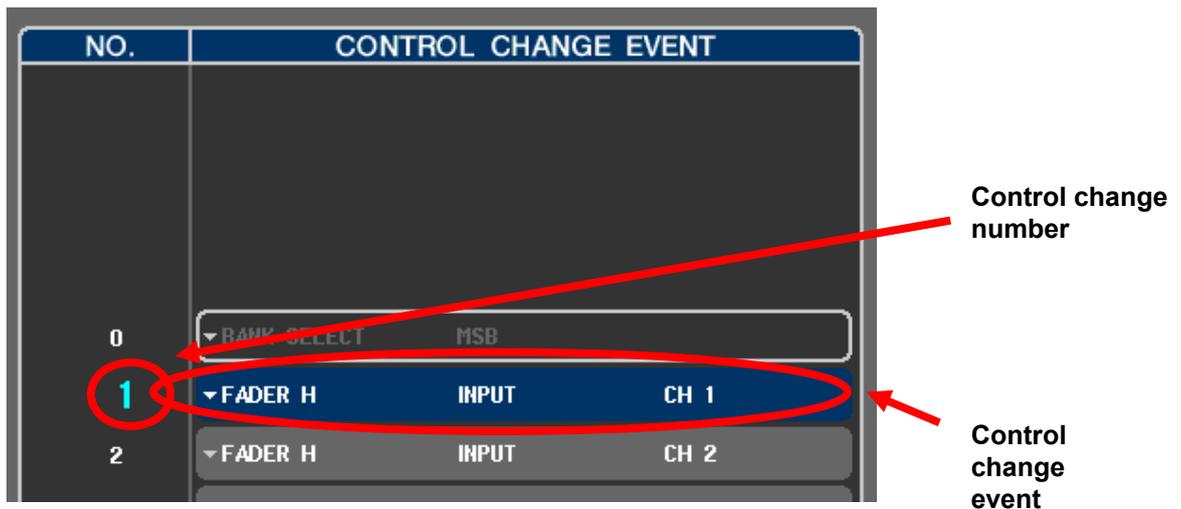


2. Configure the settings so that MIDI channel 1 signals can be received from the external device through the M7CL MIDI port. You can use a different MIDI channel as long as the channels on the transmitting device and the receiving device are the same.

* In this guide, MIDI PORT/CH is set to 1. Configure the settings in the MODE area as shown on the right of the figure above.

To control the input channel 1 fader level using control change messages

1. On the M7CL, show the control change list screen. In the figure, the number on the left is the control change number, and the corresponding control change event is shown on the right.



When a control change message that corresponds to a control change event in the list is received through the Rx MIDI channel, the control change event is executed.

2. Check the control change number that corresponds to the control change event that you want to recall. The input channel 1 fader is assigned to number 1 and 33.



FADER H and FADER L

On Yamaha digital mixers, each fader level is controlled through two fader events.

Because control message values can only range from 0 to 127 (1 to 128), a single event can only control a fader in up to 128 steps.

To control each fader level in more detail, two events are used to increase the fader control resolution.

FADER H and FADER L

When two control change messages are used, because each message is 7 bits (128 values), 14 bits of values (16,384 values) can be expressed. If these values are mapped evenly to the fader resolution (1024 levels), we see that Values expressed using 14 bits = fader levels [0-1023] * 16.

Of the 14 bits available, the upper 7 bits are assigned to FADER H, and the lower 7 bits are assigned to FADER L.

For the mapping table based on this calculation, see the separate file "control_change_fader_assignment.pdf."

* The value assignments are the same as those for the corresponding parameter change message.

Note) For details on how to convert parameter values to control change data, see the equation on the "MIDI Data Format" page towards the back of the manual.

3. Examples of control change messages for changing the channel 1 fader position are shown below.

Example 1: Change the fader value to -71.80 dB

CC1 (control change number 1) value: 8
CC33 (control change number 33) value: 0
Send the message using the values above.

Example 2: Change the fader value to 0 dB

CC1 (control change number 1) value: 102
CC33 (control change number 33) value: 112
Send the message using the values above.

To control the input channel 1 pan pot using control change messages

1. On the M7CL, show the control change list screen.
2. Check the control change number that corresponds to the control change event that you want to recall.
Input channel 1 pan pot is assigned to number 89.

NO.	CONTROL CHANGE EVENT		
84	▾ CH ON	INPUT	CH21
85	▾ CH ON	INPUT	CH22
86	▾ CH ON	INPUT	CH23
87	▾ CH ON	INPUT	CH24
88	▾ DCA	FADER H	DCA 8
89	▾ PAN/BALANCE	INPUT	CH 1
90	▾ PAN/BALANCE	INPUT	CH 2

3. Examples of control change messages for changing the channel 1 pan position are shown below.

Example 1: Change the pan value to L63

Send a message with CC89 (control change number 89) set to 0.

Example 2: Change the pan value to R63

Send a message with CC89 (control change number 89) set to 127.

Example 3: Change the pan value to C (center)

Send a message with CC89 (control change number 89) set to 63.

Note) For details on how to convert parameter values to control change data, see the equation on the "MIDI Data Format" page towards the back of the manual.

TABLE and NRPN Methods

Using the TABLE (control changes)

This method uses typical control changes to control specified control change events. You can freely assign control change events to control numbers.

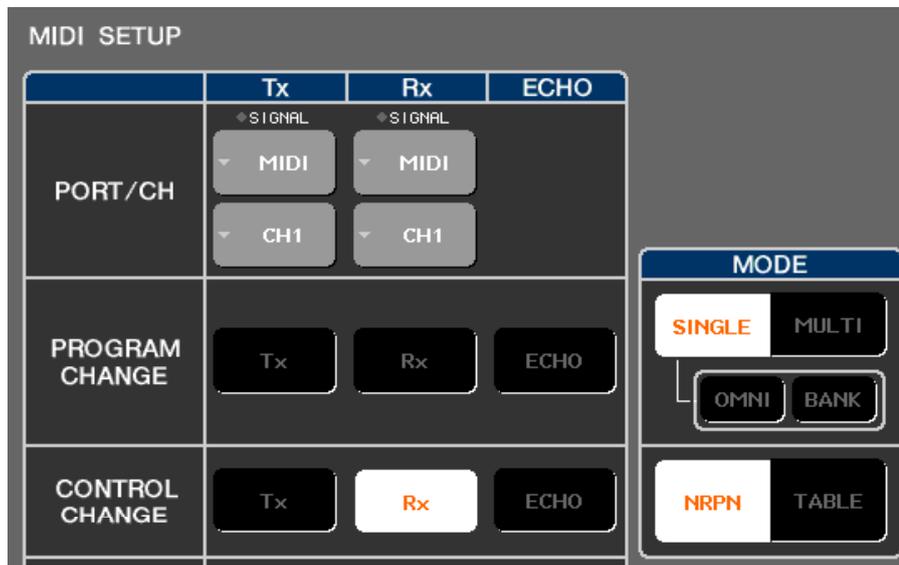
Using NRPN (Non Registered Parameter Number)

This method uses a special type of control change messages called NRPN to control specified control change events.

With NRPN, control change messages with control numbers 99 and 98 are sent to specify the MSB and LSB of a parameter number. Then, a control change message with control number 6 (or 6 and 38) is sent to change the parameter value. Control change events are pre-assigned to parameter numbers and cannot be changed.

Controlling Fader Levels and Pan Pots Using NRPN

1. Open the M7CL MIDI setup screen, and configure the MIDI channels as shown below.



Configure the M7CL so that it can receive MIDI channel 1 signals from the external device through the MIDI port.

You can use a different MIDI channel as long as the channels on the transmitting device and the receiving device are the same.

When using NRPN to control program change events, you cannot use the control change list. Use the predefined NRPN parameter assignments.

* In this guide, MIDI PORT/CH is set to 1.

To control the input channel 1 and 48 fader levels using NRPN

Example: Change the fader value to -71.80 dB

1. See the NRPN parameter assignments on page 274 in the "M7CL V3 Owner's Manual."

Parameter		From (HEX)	To (HEX)
FADER	INPUT	0000	0037
	MIX, MATRIX, STEREO LR	0060	007D
INPUT to Mix9-16,	MIX9 SEND	007E	00B5
	MIX10 SEND	00DE	0115
	MIX11 SEND	013E	0175
	MIX12 SEND	019E	01D5
	MIX13 SEND	01FE	0235
	MIX14 SEND	025E	0295

HEX denotes hexadecimal numbers. See the FADER INPUT line.
 From (HEX) 0000 represents the parameter's first number.
 To (HEX) represents the parameter's last number.
 Because the M7CL has 48 mono input channels and 8 channels of stereo inputs, 0000 is channel 1, and 0037 is ST INPUT 4R.

2. If we convert these numbers to decimal notation and assign them to CC99 (NRPN: MSB) and CC98 (NRPN: LSB), we obtain the following values.

ch1	ch48
CC99 (MSB): 0	CC99 (MSB): 0
CC98 (LSB): 0	CC98 (LSB): 47

CC98 represents the least significant byte. For fader inputs, the numbers range from 0 to 47.

CC99 represents the most significant byte. For models that have more than 127 input channels, CC99 can take on values greater than zero.

3. Next, enter the data section. The data section is assigned to CC6 and CC38. How to specify this section is the same as how FADER H and FADER L are specified during TABLE control.

CC6 value: 8
 CC38 value: 0

The data to send is shown below.

To set the channel 1 fader to -71.80 dB

CC99 (MSB): 0	CC6: 8
CC98 (LSB): 0	CC38: 0

To set the channel 48 fader to -71.80 dB

CC99 (MSB): 0	CC6: 8
CC98 (LSB): 47	CC38: 0

To control the input channel 1 and 48 pan pots using NRPN

Example 2: Change the pan value to L23

1. See the NRPN parameter assignments on page 274 in the "M7CL V3 Owner's Manual."

	GAIN	1F9A	2017
	KNEE/WIDTH	2018	2095
PAN/BALANCE	INPUT	2096	20CD
INPUT to Mix9/10–15/16, Matrix1/2, 3/4 PAN	MIX9–10	20F6	212D
	MIX11–12	2156	218D
	MIX13–14	21B6	21ED
	MIX15–16	2216	224D
	INPUT TO MATRIX1, 2	2276	22AD
	INPUT TO MATRIX3, 4	22D6	230D
	MIX1-16, STEREO LR to MATRIX PAN	MATRIX1, 2	2336
MATRIX3, 4		234C	2361
MATRIX5, 6		2362	2377

See the PAN/BALANCE INPUT line. 2096 represents channel 1. As this number increases, the channel number increases.

* The number is in hexadecimal notation.

2. If we convert these numbers to decimal notation and assign them to CC99 (NRPN: MSB) and CC98 (NRPN: LSB), we obtain the following values.

Channel 1: 2096 (hexadecimal) -> 8342 (decimal)

Channel 48: 20CD (hexadecimal) -> 8397 (decimal)

In this case, because the number is greater than 127, CC99 (MSB) takes on a value greater than zero.

To calculate the numbers to assign to the MSB and LSB, use the following equation.

MSB = data value/128; discard the remainder

LSB = the remainder

Substituting the numbers above, we obtain

Channel 1: $8342/128 = 65$ remainder 22

Channel 48: $8397/128 = 65$ remainder 43

So the MSB and LSB of channels 1 and 48 are as follows:

ch1

CC99 (MSB): 65

CC98 (LSB): 22

ch48

CC99 (MSB): 65

CC98 (LSB): 43

3. Next, enter the data section. The data section is assigned to CC6 and CC38. If the data value is in the range of 0 to 127, only specify CC6. There is no need to specify CC38.

CC6 value: 41

CC38 value: 0 (do not use)

The data to send is shown below.

To set the channel 1 pan pot to L23

CC99 (MSB): 65

CC98 (LSB): 22

CC6: 41

CC38: 0 (do not use)

To set the channel 48 pan pot to L23

CC99 (MSB): 65

CC98 (LSB): 43

CC6: 41

CC38: 0 (do not use)

Note) For details on how to convert parameter values to control change data, see the equation on the "MIDI Data Format" page towards the back of the manual.

* You can determine control change messages through calculations as explained above. For some parameters, you can also determine control change messages by moving the M7CL controls and monitoring the control change messages that the M7CL transmits.

Controlling Fader Levels and Pan Pots Using Parameter Change

This section will give an example of the M7CL configuration and the MIDI messages to send when you want to control the M7CL faders or pan pots from an external device through MIDI parameter change messages.

* The external device can be a dedicated MIDI controller, a DAW, or another digital mixer. Regardless of the type of external device that is used, MIDI messages that are sent to the M7CL are the same. Any external device that can send control change messages can control the M7CL.

The following section will explain how to send parameter change messages to the M7CL V3 to control its input channel 1 fader level and pan pot.

1. Open the M7CL MIDI setup screen, and configure the MIDI channel settings as shown below.



Configure the M7CL so that it can receive MIDI channel 1 signals from the external device through the MIDI port.

To control the input channel 1 fader level using parameter change messages

To control events using parameter change messages, MIDI messages called system exclusive messages need to be used.

System exclusive messages are used to send electronic instrument parameters and manufacture-specific data. These messages can be used to set the sound source master volume and sound effect parameters (such as reverb parameters). System exclusive messages are not channel messages, so they do not have MIDI channels. Instead, these messages have manufacturer IDs, which enable instrument manufacturers to freely design their own messages.

Details of system exclusive messages

This section will explain exclusive messages using actual messages as examples. The following message is used to set the input channel 1 fader to $-\infty$.

[F0 43 10 3E 11 01 00 32 00 00 00 00 00 00 00 00 F7]

Explanation of each byte is given below.

Byte 1: F0

The first byte is called the exclusive status; it represents the beginning of an exclusive message. This byte exists at the beginning of all exclusive messages.

An exclusive message is bound by "F0" and "F7," which is the last byte.

Byte 18: F7

This byte is called the End of Exclusive; it represents the end of an exclusive message.

This byte exists at the end of all exclusive messages.

* The End of Exclusive is not always at byte 18. Its position varies depending on the amount of data that follows byte 6.

Simply remember that this byte always exists at the end of each message.

Byte 2: 43

This is the manufacturer ID. Yamaha's manufacturer ID is 43. Yamaha products use this ID for identification.

Byte 3: 10

This is the device ID. Ordinarily Yamaha digital mixers are assigned 10 for the device ID. This byte is sometimes used to specify the MIDI channel. In this situation, the value range from 0 to F (channel 1 to 16). On some instruments, the device ID can be changed so that multiple instruments of the same type can be controlled on a single MIDI network. This feature is not available on Yamaha digital mixers. The device ID is fixed at 10.

Byte 4: 3E

This is the group ID. The value 3E represents the Yamaha digital mixer group.

Byte 5: 11

This is the model ID. The value 11 represents the Yamaha M7CL model.

* On the DM2000, 02R96, DM1000, and 01V96, in addition to the values that specify each model, the value 7F is used as a common ID. The common ID can be used to specify control parameters that are common to all these models. (For details, see the section on MIDI data format in the respective manual.)

Byte 6 and subsequent bytes

These bytes contain the parameter data. Enter information such as the target channel, the function, and the value you want to set the function to in order to complete the message.

* For details on byte 6 and the subsequent bytes, visit the Yamaha Pro Audio Website (<http://www.yamahaproaudio.com/global/en/>), and see the M7CL MIDI protocol guide.

The following section will explain how to actually control an input channel fader.

Example 1: Set the input channel 24 fader to 0 dB

1. Visit the Yamaha Pro Audio Website

(<http://www.yamahaproaudio.com/global/en/>), and see the M7CL MIDI protocol guide.

Open the Excel file, click the Parameter Change List sheet, and find the kInputFader item. The exclusive message to control the input channel fader is shown in the figure below.

[F0 43 10 3E 11 01 00 32 00 00 cc cc dd dd dd dd dd F7]

Comment	Parameter Change Format																
CH TABLE #01																	
PRM TABLE #03	F0	43	10	3E	11	01	00	32	00	00	cc	cc	dd	dd	dd	dd	F7
CH TABLE #01																	

The value in the Max Ch column includes stereo input channels.
 The Index Min and Max values represent the range of values that the fader value can be set to.
 cc represents the channel.
 dd represents the data.

2. Substitute the appropriate values into cc.

You already know the values for up to the 10th byte of the exclusive message, so enter them.

[F0 43 10 3E 11 01 00 32 00 00]

Enter the channel number in bytes 11 and 12.

* Convert 24 into hexadecimal notation. 00 = CH1, 01 = CH2, ...17 = CH24

[F0 43 10 3E 11 01 00 32 00 00 00 17]

* Byte 11 is 00 because the channel number is small, and there is no need to use the MSB.

3. Substitute the appropriate values into dd.

Enter the data value in bytes 13 to 17.

Enter the value MSB first (byte 17 first).

The value for 0 dB is 823. * Refer to PRM TABLE #03 in the PRM TABLE sheet of the M7CL MIDI protocol guide.

Byte 17 can be used to specify values up to 127. Values greater than 127 are carried over to byte 16. For example, the values 127 and 128 are expressed using bytes 16 and 17 as shown below.

127: [00 7F] 128: [01 00]

Likewise, enter 823 in bytes 16 and 17, and enter zero in bytes 13 to 15, which will not be used. Finally, enter the last byte F7.

The complete message used to set the input channel 24 fader to 0 dB is shown below.

[F0 43 10 3E 11 01 00 32 00 00 00 17 00 00 00 06 37 F7]

To specify smaller negative numbers, decrease the LSB value. See the following examples as reference.

PAN C: [00 00 00 00 00]
PAN L1: [0F 7F 7F 7F 7F]
PAN R1: [00 00 00 00 01]
PAN L63: [0F 7F 7F 7F 41]
PAN R63: [00 00 00 00 3F]

Because we are setting the pan pot to L50 in this example, set the bytes as follows:

PAN L50: [0F 7F 7F 7F 4E]

The complete message used to set the input channel 48 pan pot to L50 is shown below.

[F0 43 10 3E 11 01 00 31 00 01 00 2F 0F 7F 7F 7F 4E F7]

* Note that [0F 7F 7F 7F 7F] in the data section does not necessarily represent -1 in all cases. For input pan, [0F 7F 7F 7F 7F] is defined to be -1, but for Input EQ input attenuator, [00 00 00 00 00] and [0F 7F 7F 7F 7F] are defined to be zero.

Refer to the Parameter Change List sheet to control other parameters.

* You can determine parameter change messages through calculations as explained above. For some parameters, you can also determine parameter change messages by moving the M7CL controls and monitoring the parameter change messages that the M7CL transmits.