

Advanced MIDI Programming with the MC-303

The MC-303 Groove Box adds a new dimension to any sequencer based system. To access all of the sounds and features in this type of setup, you will need to run the MC-303 in what is referred to as "Sound Module" mode. The purpose of this document is to help you use the MC-303 in Sound Module mode and to explore the effect of certain MIDI messages and how they can impact your music. First, we will show you how to select sounds via MIDI. Then, we will cover editing sounds with controller, RPN, and NRPN messages. Finally, we will examine the construction and use of system exclusive commands.

I. Overview

The MC-303 can be used in one of the following two MIDI modes:

Normal mode

Records Patterns and Songs
 RPS and Arpeggiator
 Real time control via front panel knobs
 Mute parts and Rhythm set sounds in real time
 Not Multi-Timbral via MIDI

Sound Module mode

No Patterns or Songs, sound source only
 Disabled
 Real time control via MIDI only
 Front panel disabled (except volume control)
 16 part Multi-Timbral sound source

In Sound Module mode, you will need to make all changes from your sequencer. You can use Program Changes and Continuous Controller messages to accomplish common functions including Filter Sweeps, Vibrato, etc. System Exclusive messages can be used for more extensive editing.

To enter Sound Module mode:

1. Turn off the MC-303.
2. Hold down [PLAY MODE] and turn on the power.

To return to Normal mode:

1. Turn the power off and back on.

II. Selecting Sounds

The sounds in the MC-303 can be selected via MIDI by using bank select and program change messages. Some computer based sequencers have patch lists or 'templates' available for various products. These 'templates' allow you to select from a list of patch names, and will then send out the appropriate messages for you. You should check with the manufacturer of your particular sequencer to see if they have a MC-303 template available. If not, you must enter the proper bank select and program change messages to choose a sound.

To select a sound in the MC-303 you will need to send three (3) messages from your sequencer (2 Continuous Controller (CC) messages and a Program Change (PC) message). A continuous controller is a message that is defined in the MIDI specification. There are 128 different CCs that perform a number of different functions. Volume (CC7), Panning (CC10), Modulation (CC1), and Hold (CC64) are commonly used controller messages. Controller 0 and 32 are used to select banks of sounds. If you look at the Tone List on pages 85-89 of the Owner's Manual, you will notice that each sound has an associated PC and CC0 value. CC32 will always be set to 0 on the MC-303. You can usually insert these messages in the event list editor of your sequencer to be played back with your song. If you use this method, insert some space between each message (a few clock pulses should be fine). Here are some examples:

To select "101 Bass 1" send:

Message	Value
CC00	64
CC32	00
PC	10

To select "12str.Guitar" send:

Message	Value
CC00	65
CC32	00
PC	58

To select "Sky Vox" send:

Message	Value
CC00	71
CC32	00
PC	35

The rhythm sets in the MC-303 are assigned to MIDI channel 10. There is a list of the rhythm sets on pages 90-93 in your Owner's Manual. You do not need to send a bank message (CC0/32) to select the different sets - only a program change message on MIDI channel 10. For example:

To select "HipHop set" send:

Message	Value
PC	81

To select "House set" send:

Message	Value
PC	41

To select "Techno Set2" send:

Message	Value
PC	57

III. Editing Sounds

In Sound Module mode, the front panel controls on the MC-303 are inactive. To manipulate the sounds, you will need to send continuous controller messages from your sequencer. Let's look at some specific examples of these controllers and what you can do with them. You will normally insert these messages into the event list editor on your sequencer. Please note that you will need to specify the MIDI channel for the part you are going to be editing. Also, make sure that you enter these messages in the order shown. They will not work if your MC-303 receives them in the wrong order.

Mono and Portamento Mono and Portamento are effects that can add a great "Retro" feel to a sound. Mono sounds will only play one note at a time. Portamento is an effect that causes a pitch slide between notes. This works great on synth leads and some bass sounds. Try sending these values from your sequencer:

Controller	Value	
CC126	01	Mono on.
CC65	127	Portamento on, a value of 0 turns it off.
CC5	40	Portamento Time. Higher values create longer slide times.

Registered Parameter Numbers (RPN)

CC100 and CC101 define the Registered Parameter Number (RPN) functions, which include pitch-bend sensitivity, fine tuning, and coarse tuning. Use CC6 (data entry) to set the value for the registered parameter you choose.

Pitch-Bend Sensitivity The MC-303 has a default pitch-bend range of a whole-step, but you can set the bend range for an individual Part up to two octaves by inserting these messages into your event list:

Controller	Value	
CC101	00	Selects RPN function.
CC100	00	Selects pitch bend as the parameter you want to adjust.
CC06	XX	Sensitivity in half steps. The range is 0-24.

Fine Tuning With the fine tuning Registered Parameter Number function, the MC-303 can be tuned to match another instrument. You can also use this to detune a part to add some fatness to a particular track. Use the following messages:

Controller	Value	
CC101	00	Selects RPN function.
CC100	01	Selects fine tuning as the parameter you want to adjust.
CC06	XX	Sensitivity in steps of 1.5 cents. The range is 0-127 with 64 being standard A=440hz tuning.

Coarse Tuning The coarse tuning parameter lets you change the pitch of the MC-303 in half-steps over a four-octave range. Since all registered parameter functions affect only the channel on which they are sent, you can transpose just the desired parts. This allows you to transpose a piece while leaving the drum and sound effect parts at their original pitch. Add the following messages to the event list of each track you wish to transpose:

Controller	Value	
CC101	00	Selects RPN function.
CC100	02	Selects coarse tuning as the parameter you want to adjust.
CC06	XX	Sensitivity in half steps. The range is 40-88 with 64 being standard.

Non Registered Parameter Numbers (NRPN)

CC98 and CC99 define the Non Registered Parameter Number (NRPN) functions. NRPNs operate much like RPNs although the parameters they control can be different on each MIDI instrument. As with RPNs, CC6 (data entry) is used to set the value of the parameter you choose.

Synthesis Editing Many MC-303 specific editing parameters are accessible using NRPNs. Eight of these controllers change basic synthesis functions, and five are for editing individual instruments within a Rhythm kit. Listed below are the synth editing NRPNs, their corresponding controller numbers and value ranges. A value of 64 is the default setting. You can raise or lower any of the values ± 50 . Values above 64 will increase the effect, and values below 64 will decrease it. Some sounds may not respond as you might expect because the current value may already be at its maximum. For instance, if a sound's factory default for filter cutoff is already wide open (114), adding 50 to it will have no effect. In this case, lowering the cutoff by 50 should produce a noticeable effect.

TIP The affect of the NRPN functions will be more dramatic if you change the values in real time. You can do this by assigning a slider (on a keyboard or in your sequencer) or a foot controller to transmit CC6. Now when you send the first two CC messages, you can sweep the CC6 value manually. Keep in mind that you can only affect one parameter at a time per MIDI channel.

Description	CC99	CC98	CC6
Vibrato Rate	01	08	14-114
Vibrato Depth	01	09	14-114
Vibrato Delay	01	10	14-114
TVF Cutoff Freq.	01	32	14-114
TVF Resonance	01	33	14-114
TVA & TVF Env. Attack Time	01	99	14-114
TVA & TVF Env. Decay Time	01	100	14-114
TVA & TVF Env. Release Time	01	102	14-114

Here are some examples:

To change the filter cutoff setting of a particular part, use the following messages:

Controller	Value	
CC99	01	Selects NRPN function.
CC98	32	Selects filter cutoff.
CC06	74	Settings of 70-114 will open up the filter for a brighter sound.

To slow the attack time of a particular part, try these settings:

Controller	Value	
CC99	01	Selects NRPN function.
CC98	99	Selects TVF & TVA attack time.
CC06	87	Higher values = slower attack times.

You can also edit vibrato settings:

Controller	Value	
CC99	01	Selects NRPN function.
CC98	08	Selects vibrato rate.
CC6	81	Higher values = faster vibrato.
CC99	01	Selects NRPN function.
CC98	09	Selects vibrato depth.
CC6	33	Higher values = more vibrato.
CC99	01	Selects NRPN function.
CC98	10	Selects vibrato delay.
CC6	21	Higher values = more delay time before vibrato starts.

Drum Instrument Editing You can use NRPNs to edit any individual sound in a MC-303 Rhythm kit. Here is a list of the available parameters:

Description	CC99	CC98	CC06
Pitch (Coarse) of Drum Inst.	24	Note #	0-64-127 (-64 - 0 - +63 semitones)
TVA level of Drum Inst.	26	Note #	0-127
Panpot of Drum Inst.	28	Note #	0-64-127 (Left-Center-Right)
Reverb send level of Drum Inst.	29	Note #	0-127
Chorus send level of Drum Inst.	30	Note #	0-127

When editing drum values, you must specify which instrument you want to change. Different values of CC98 are used to choose the note number. Here are some common note numbers:

Note	Note # (CC98 value)	Sound
C2	36	Bass Drum
D2	38	Snare Drum
F#2	42	Hi Hat
C#3	49	Cymbal

Note: The rhythm set list on pages 90-93 of your Owner's Manual has a complete list of all note numbers.

Here are some examples:

Use the following settings to change the pitch of the snare drum assigned to E2:

Controller	Value	
CC99	24	Selects NRPN Rhythm instrument pitch function.
CC98	40	Selects note (E2).
CC06	70	Tunes note. Higher values produce higher pitches.

Use the following settings to change the reverb level on the snare drum assigned to D2:

Controller	Value	
CC99	29	Selects NRPN Rhythm instrument reverb level function.
CC98	38	Selects note (D2).
CC06	83	Sets reverb level. Higher values produce more reverb.

IV. System Exclusive

MIDI system-exclusive (sysex) messages can be used to access any parameter in the MC-303. Sysex messages are created in hexadecimal (hex) notation which is a base 16 numbering system. Hex uses the traditional 0-9 (base 10) and then adds A-F to create its 16 different steps. For instance, a value of 16 appears in hex as 10H (we normally place an H after any number that is in hex to keep things straight - the H is not entered). Here is a conversion chart of decimal and hex values:

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
0	00H	5	05H	10	0AH	15	0FH	20	14H
1	01H	6	06H	11	0BH	16	10H	21	15H
2	02H	7	07H	12	0CH	17	11H	22	16H
3	03H	8	08H	13	0DH	18	12H	23	17H
4	04H	9	09H	14	0EH	19	13H	24	18H

There is a more complete conversion table on page 113 of your MC-303 Owner's Manual.

Sysex messages are divided into three sections: header, body, and end. Here is an example of a system exclusive message:

F0H 41H 10H 00H 03H 12H	00H 40H 01H 30H 06H 09H	F7H
Header	Body	End

The header is six bytes long and is the same for all data commands sent to the MC-303:

F0H	41H	10H	00H	03H	12H
Begin sysex	Roland ID #	Device ID #	MC-303 Model ID #	MC-303 Model ID #	Data set command

The body consists of a four byte address, a data byte, and a special calculation called the checksum. Each parameter in the MC-303 has its own sysex address:

00H	40H	01H	30H	06H	09H
Address	Address	Address	Address	Data	Checksum

The body is followed by the end-of-exclusive byte which is always the same:

F7H
End of exclusive

The Parameter Address Map starting on page 107 in your MC-303 manual is used to find the addresses for this instrument. Let's look at the previous message which will change the current Reverb Macro to delay. Under System Parameters, Reverb Macro is listed next to the address 00H 40H 01H 30H. We enter those numbers as our four byte address after the header information.

F0H 41H 10H 00H 03H 12H	00H 40H 01H 30H
Header	Address for Reverb Macro

For the Reverb Macro parameter, the manual indicates that there are eight choices, of which delay is number 6, so 06H becomes our data byte.

F0H 41H 10H 00H 03H 12H	00H 40H 01H 30H	06H
Header	Address for Reverb Macro	Data

Next, we need to compute a checksum for this message. The checksum is used to protect your MC-303 from receiving corrupted data by ensuring that the address and data bytes follow a precise mathematical formula. Here's a simple translation of the checksum formula:

$$80H - (\text{sum of address bytes} + \text{sum of data bytes}) = \text{Checksum}$$

So for our example:

$$80H - (00H + 40H + 01H + 30H + 06H) = \text{Checksum}$$

$$80H - 77H = \text{Checksum}$$

$$09H = \text{Checksum}$$

F0H 41H 10H 00H 03H 12H	00H 40H 01H 30H	06H	09H
Header	Address for Reverb Macro	Data	Checksum

The checksum is followed by the end-of-exclusive byte F7. Our entire message would be:

F0H 41H 10H 00H 03H 12H	00H 40H 01H 30H	06H	09H	F7H
Header	Address for Reverb Macro	Data	Checksum	End

When computing the checksum, the sum of the address and data bytes may be greater than 80H. In this case the result will be a negative checksum. When this happens, subtract 80H from the address and data sum as often as necessary until the sum is less than 80H, so that the subtraction that computes the checksum yields a positive result. For instance:

80H - (80H + 40H + 01H + 40H + 06H) = Checksum
 80H - 107H = Checksum (negative, so subtract 80H)
 80H - (107H - 80H=87H) = Checksum (still negative, so subtract 80H again)
 80H - (87H - 80H=07H) = Checksum (positive)
 79H = Checksum

If you're new to hex, you may be confused to see an equation like 80H - 07H = 79H. You may find it easier to convert all the values to decimal, perform the subtraction, and then convert back. In this case, 128 (=80H) minus 7 (=07H) equals 121 (=79H). If you have a PC, you can use the calculator that comes with Windows to perform these calculations in hex or decimal. Also, you can use the conversion chart on page 113 of your Owner's Manual.

For the MC-303, there is a slight variation on this message format when we want to affect parameters for a single part in Sound Module mode. Look at the Part Parameter addresses (Starting on pg. 108) in the Owner's Manual. You will notice that many addresses here have an "x" in the third address byte. In hex, the 16 Parts of the MC-303 are numbered starting with 8. For part 1, x=8, for part 2, x=A, etc. For part 10, x=9, after which part 11 is numbered 2, and so on. For this example, let's say we want to change part 1 from MIDI channel 1 to channel 16. First, we use the same six byte header, followed by the appropriate address as shown in the Patch Parameter list. Notice we have set x=8 (part 1) in our third byte of the address. The data byte is set to MIDI channel 16 (0FH).

F0H 41H 10H 00H 03H 12H	00H 40H 18*H 02H	07H
Header	Address (* sets to part 1)	Data

Our checksum for this message would be:

80H - (00H + 40H + 18H + 02H + 07H) = Checksum
 80H - 61H = Checksum
 1FH = Checksum

Yielding:

F0H 41H 10H 00H 03H 12H	00H 40H 18H 02H	07H	1FH	F7H
Header	Address	Data	Checksum	End

Here are a few more examples:

Use the following message to set part 12 to random panning:

F0H 41H 10H 00H 03H 12H	00H 40H 13H 1CH	00H	11H	F7H
Header	Address	Data	Checksum	End

Use the following message to set the LFO waveform to Square for part 8:

F0H 41H 10H 00H 03H 12H	00H 40H 10H 39H	03H	74H	F7H
Header	Address	Data	Checksum	End

Use the following message to set the Chorus Macro to Flanger:

F0H 41H 10H 00H 03H 12H	00H 40H 01H 38H	05H	02H	F7H
Header	Address	Data	Checksum	End

Give these examples a try. You can create a sequence that will automatically call up your sounds on all 16 MIDI channels. You can edit sounds to fit into your performance needs. You can re-create all of the functions of the front panel "Realtime Modify" section on the MC-303. You can even use system exclusive commands to make the MC-303 do things it normally won't do from the front panel! With a little practice you too can become an official "Groove Box Master."