Ensoniq Mirage — MASOS_BE MIDI Implementation

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Applies to: MASOS_BE 1.0.0 on the Ensoniq Mirage DSK-1, DSK-8 and DMS-8
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1. Scope

MASOS_BE is a modified build of the Ensoniq MASOS v2 operating system for the Mirage. It adds sysex commands that write single parameters, so that a computer or a hardware controller can edit the Mirage in real time. This document specifies the full MIDI implementation of a Mirage that runs MASOS_BE. It includes the messages that MASOS v2 already supported and the messages that MASOS_BE adds or removes.

Use this document to write an editor, a librarian, a script, or a hardware MIDI controller for the Mirage. You do not need any knowledge of the Mirage internals. Visage is an editor that implements this specification. The MASOS_BE disk image is available from the same page.

1.1 Notation

- Byte values are hexadecimal with a `$` prefix, for example `$0F`. Binary columns show the eight bits of each byte.
- Front-panel parameter numbers are in square brackets, for example `[36]` = Filter Cutoff.
- In a bit field, `N` is the keyboard half. `N` = 0 selects Lower and `N` = 1 selects Upper.
- The *host* is the computer or controller. The *Mirage* is the sampler.
- A *nybble* is four data bits in one MIDI byte. The four high bits of that byte are zero.

2. MIDI Implementation Chart

FUNCTION	TRANSMITTED	RECOGNIZED	REMARKS
Basic channel, default	1	1	Omni on at power-up
Basic channel, changed	1–16	1–16	Parameter [82]
Mode, default	Mode 1	Mode 1	Omni on, Poly
Mode, messages	×	OMNI ON, OMNI OFF, MONO, POLY	Each also acts as All Notes Off
Note number	36–96	36–96	C2 to C7
Velocity, Note On	○ 1–127	○ 1–127	Velocity 0 = Note Off
Velocity, Note Off	×	×	Velocity ignored
After touch, keys	×	×	
After touch, channel	×	×	
Pitch bend	×	○	Needs [84] on. Range set by [22]
Control change 1	×	○	Modulation wheel. Needs [84] on
Control change 64	×	○	Sustain pedal
Control change 123–127	×	○	All Notes Off, Omni Off, Omni On, Mono On, Poly On
Program change	×	×	
System exclusive	○	○	Ensoniq ID `$0F`, product `$01`. See sections 4 to 6
System common	×	×	
System real time	×	×	Clock, Start, Stop and Continue are ignored
Active sensing	×	×	
System reset	×	×	

○ = yes, × = no. The Mirage transmits Note On and Note Off from its own keyboard on the DSK-1 and DSK-8. The DMS-8 has no keyboard.

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3. Channel messages

3.1 Recognized

STATUS	DATA	DESCRIPTION
1000nnnn	0kkkkkkk 0vvvvvvv	Note Off. Key 36..96. Velocity is ignored.
1001nnnn	0kkkkkkk 0vvvvvvv	Note On. Key 36..96, velocity 1..127. Velocity 0 is a Note Off with velocity 64.
1011nnnn	00000001 0vvvvvvv	Modulation wheel, 0..127. Needs [84] on.
1011nnnn	01000000 01111111	Sustain pedal on.
1011nnnn	01000000 00000000	Sustain pedal off.
1011nnnn	01111011 00000000	All Notes Off.
1011nnnn	01111100 00000000	Omni Off. All notes off.
1011nnnn	01111101 00000000	Omni On. All notes off.
1011nnnn	01111110 0xxxxxxx	Mono On. All notes off.
1011nnnn	01111111 00000000	Poly On. All notes off.
1110nnnn	0lllllll 0hhhhhhh	Pitch bend. 64 = center. Needs [84] on.

`nnnn` is the MIDI channel minus one. When Omni [81] is on, the Mirage accepts all channels. When Omni is off, the Mirage accepts only the channel set by [82]. The release of all notes follows the envelope release time. Controllers affect only the notes that MIDI

started.

3.2 Transmitted

STATUS	DATA	DESCRIPTION
`1001nnnn`	`0kkkkkkk 0vvvvvvv`	Note On from the Mirage keyboard.
`1000nnnn`	`0kkkkkkk 01000000`	Note Off from the Mirage keyboard.

The Mirage transmits on the channel set by [82]. It uses running status.

3.3 MIDI Echo

When MIDI Echo [83] is on, the Mirage copies every received byte to MIDI Out without change. This includes system exclusive and real-time bytes. While MIDI Echo is on, the Mirage does not transmit its own sysex messages. **Set [83] to off when you use a host editor.** MASOS_BE disks ship with [83] off.

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4. System Exclusive format

4.1 Frame

Every Mirage sysex message has this form:

BINARY	HEX	DESCRIPTION
`11110000`	`F0`	System Exclusive
`00001111`	`0F`	Ensoniq code
`00000001`	`01`	Mirage code
`000Ncccc`		Command code. Some commands carry `N` in bit 4.
...		Command data
`11110111`	`F7`	End of Exclusive

There is no device ID. Every Mirage on the cable responds to every message.

4.2 Data encoding

The Mirage sends and receives eight-bit values as two nybbles, **low nybble first**. Each nybble is one MIDI data byte with the four high bits zero. For example, the value `$A7` travels as `07 0A`. This rule applies to parameter values, to program and configuration tables, and to sample data.

4.3 Checksum

Only Wavesample Dump Data (`$06`) has a checksum. The checksum is the sum of every nybble after the command byte, page-count nybbles included, modulo 128. The Mirage stores the data of a message with an incorrect checksum. It then transmits Nak instead of Ack.

4.4 Message handling

The Mirage processes each sysex byte when it arrives. A message must be complete. If a message stops early, the Mirage waits for the missing bytes. The next status byte, for example the `$F0` of the next message, resets the parser.

Some commands make the Mirage do work for 2 to 3 ms before it can accept the next byte. The Mirage then loses bytes that arrive during that time, without an error. Section 8 gives the timing rules that prevent this.

4.5 Command summary

CODE	MESSAGE	DIRECTION	MASOS V2	MASOS_BE 1.0.0
$00	Configuration Dump Request	to Mirage	○	○
$01	Front Panel Command	to Mirage	○	○
$02	Configuration Dump Data	both	○	○
$03	Program Dump Request	to Mirage	○	○
$04	Wavesample Dump Request	to Mirage	○	○
$05	Program Dump Data	both	○	○
$06	Wavesample Dump Data	both	○	○
$07	Program Status	from Mirage	○	○
$08	Wavesample Status	from Mirage	○	○
$09	Acknowledge	from Mirage	○	○
$0A	Not Acknowledged	from Mirage	○	○
$0B	Wavesample Dump Absolute Request	to Mirage	○	removed
$0C	Wavesample Dump Absolute Data	to Mirage	○	replaced by Rotate Wavesample
$0D	Program Parameter Message	from Mirage	○	○ and **also received**
$0E	Wavesample Parameter Message	from Mirage	○	○ and **also received**
$0F	Perform Wavesample Manipulation Function	to Mirage	○	removed

5. Receive data (host to Mirage)

5.1 Front Panel Command

This message presses up to five front-panel keys, in order, as if the user pressed them.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000001	01	Front panel command
0kkkkkkk		Key code (Table 7.1). One to five bytes.
01111111	7F	End of command marker
11110111	F7	End of Exclusive

The key sequence must be a complete front-panel operation. It must end with ENTER if the operation needs ENTER. These sequences work:

OPERATION	KEYS	MESSAGE
Select program 3 in the current half	PROG, 3	F0 0F 01 01 00 03 7F F7
Select Lower wavesample 5	Select Lower WS, 5	F0 0F 01 01 15 05 7F F7
Select Upper wavesample 1	Select Upper WS, 1	F0 0F 01 01 14 01 7F F7
Show parameter 36	PARAM, 3, 6	F0 0F 01 01 0C 03 06 7F F7

A wavesample selection with key `$14` or `$15` also moves the Mirage to that half. No key sequence changes the half alone. Two PROG presses without a digit change the half as a side effect. Do not send two PROG codes in one message unless you want that. When [91] is on, the Mirage confirms each selection with a Program Status or a Wavesample Status message (section 6).

5.2 Program Dump Request

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
000N0011	03 / 13	Program dump request. N = 0: Lower, N = 1: Upper.
11110111	F7	End of Exclusive

The Mirage replies with Program Dump Data (section 6.7) for that half. This needs [91] on.

5.3 Configuration Dump Request

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000000	00	Configuration dump request
11110111	F7	End of Exclusive

The Mirage replies with Configuration Dump Data (section 6.8). This needs [91] on.

5.4 Wavesample Dump Request

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000100	04	Wavesample dump request
11110111	F7	End of Exclusive

The Mirage replies with Wavesample Dump Data (section 6.9) for the **selected** wavesample in the **current** half. The message has no address. Select the wavesample first with a Front Panel Command. This needs [91] on. Set the loop [65] to off before the request. When the loop is on, the dumped data includes 16 stop bytes at the loop end.

5.5 Program Dump Data

This message loads one full half: eight wavesample control blocks, the segment lists and four program parameter blocks.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
000N0101	05 / 15	Program dump data. N = 0: Lower, N = 1: Upper.
0000llll 0000hhhh		625 bytes (Table 7.2) as 1250 nybbles, low nybble first
11110111	F7	End of Exclusive

There is no checksum. The Mirage writes the data directly into the sound memory of that half and does not mute the audio. Send this message while no notes play. The Mirage sends no reply.

5.6 Wavesample Dump Data

This message loads sample data into the **selected** wavesample of the **current** half.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000110	06	Wavesample dump data
0000cccc		Page count, low nybble
0000cccc		Page count, high nybble
0000llll 0000hhhh		Sample data, two nybbles per byte, low nybble first
0kkkkkkk		Checksum (section 4.3)
11110111	F7	End of Exclusive

- A page is 256 bytes. The data must cover the pages from Sample Start [60] to Sample End [61] of the selected wavesample, both included. Send exactly `(end − start + 1) × 256` bytes. With fewer bytes, the parser waits. With more bytes, the data runs into the next wavesample.
- Sample bytes are 8-bit offset binary. `$80` is zero. The value `$00` is the oscillator stop marker. Change each `$00` to `$01` before you send.
- The message is `8 + 512 × pages` bytes on the wire. 32 KB of audio takes about 21 s. 64 KB takes about 41 s.
- The Mirage writes the data while it arrives and does not mute the audio. Do not play notes during the transfer.
- The Mirage replies with Acknowledge when the checksum is correct and with Not Acknowledged when it is not. It keeps the data in both cases.

5.7 Configuration Dump Data

This message writes the full configuration block.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000010	02	Configuration dump data
0000llll 0000hhhh		29 bytes (Table 7.5) as 58 nybbles, low nybble first
11110111	F7	End of Exclusive

There is no checksum. The Mirage copies the bytes into its configuration block without validation. MIDI channel and Omni changes apply immediately. The baud-rate switch [92] does not apply until a user edits it on the front panel. The Mirage sends no reply.

5.8 Program Parameter Write — added in MASOS_BE

This message writes one byte of a program parameter block.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001101	0D	Program parameter write
000N00PP		N = 0: Lower, N = 1: Upper. PP = program number 0..3 (see note).
0ooooooo		Byte offset in the program parameter block, 0..35 (Table 7.3)
0000vvvv		Value, low nybble
0000vvvv		Value, high nybble
11110111	F7	End of Exclusive

- **The parameter field is a byte offset, not a front-panel parameter number.** Table 7.3 lists both. Section 6.1 explains the difference from the transmitted message.
- **Target program:** the Mirage writes to the *selected* program of the given half. It reads `PP` and ignores it. To write to a specific program, select it first with a Front Panel Command. Then wait for the Program Status message that confirms the selection.

- The new value applies to the next note. After a write to offset 10 (Initial Wavesample [27]), the Mirage also rebuilds its key map. The new routing applies to the next note.
- The front-panel display does not update after a write. The display shows the old value until the user presses PARAM or VALUE.
- The Mirage sends no reply.

Example: set Filter Cutoff [36] (offset 6) to 73 (`$49`) in the selected Lower program:

```
F0 0F 01 0D 00 06 09 04 F7
```

5.9 Wavesample Parameter Write — added in MASOS_BE

This message writes one byte of a wavesample control block.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001110	0E	Wavesample parameter write
000N0SSS		N = 0: Lower, N = 1: Upper. SSS = wavesample number 0..7.
0ooooooo		Byte offset in the wavesample control block, 8..19 (Table 7.4)
0000vvvv		Value, low nybble
0000vvvv		Value, high nybble
11110111	F7	End of Exclusive

- The Mirage writes to the wavesample given by `SSS` , whatever the front panel has selected.
- For offsets 8 and 15..19 (Loop Switch, Sample Start, Sample End, Loop Start, Loop End, Loop End Fine), the Mirage runs the same checks as a front-panel edit. It keeps Start below End for the sample and for the loop. A write to Sample Start or Sample End resets the loop pointers to the new end. The Mirage then recalculates its internal sample pointers and updates the notes that play that wavesample. A held note can click once.

- The Mirage writes offsets 9..14 (Coarse Tune, Fine Tune, Amplitude, Filter Frequency, Maximum Filter, Top Key) directly. After a write to offset 14 (Top Key [72]), the Mirage also rebuilds its key map.
- Do not write offsets 0..7 or 20..23. They hold internal pointers and flags.
- To set a full sample and loop range, send one message at a time in this order: [60], [61], [62], [63], [64], then [65].
- The Mirage sends no reply.

Example: set the loop on for Upper wavesample 3 (`SSS` = 2):

```
F0 0F 01 0E 12 08 01 00 F7
```

5.10 Rotate Wavesample — added in MASOS_BE

This message moves the sample data of one wavesample by one byte, left or right, across the full sample range. Use it to align a single-cycle loop so that the loop point does not click.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001100	0C	Rotate wavesample
000N0SSS		N = 0: Lower, N = 1: Upper. SSS = wavesample number 0..7.
0000000D		D = 0: rotate left. D = 1: rotate right. One byte, not a nybble pair.
11110111	F7	End of Exclusive

- The Mirage mutes the audio during the rotation and then restores it. Held notes stop.
- The front-panel wavesample selection moves to the rotated wavesample.
- A 32 KB wavesample takes up to 200 ms. Do not send another sysex message before that time.
- The Mirage sends no reply. The host must apply the same rotation to its own copy of the sample.

5.11 Commands removed in MASOS_BE

MASOS_BE ignores Wavesample Dump Absolute Request (`$0B`) and Perform Wavesample Manipulation Function (`$0F`). It does not reply to them. The sample functions Copy, Scale, Add, Invert, Reverse, Replicate and Rotate still work from the front panel.

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6. Transmit data (Mirage to host)

The Mirage transmits the messages in this section only when External Computer Port Enable [91] is on. MASOS_BE disks ship with [91] on.

6.1 Program Parameter Message

The Mirage sends this message when a user changes a program parameter on the front panel.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001101	0D	Program parameter message
000N00PP		N = 0: Lower, N = 1: Upper. PP = program number 0..3.
0ppppppp		**Parameter number**, for example 36 ($24)
0000vvvv		Value, low nybble
0000vvvv		Value, high nybble
11110111	F7	End of Exclusive

The transmitted message carries the front-panel parameter number. The received message (section 5.8) carries the byte offset. The Mirage uses a byte offset on receive because that write path is safe during playback. A host must translate between the two with Table 7.3.

Program parameters have the numbers 27..59. The Mirage also uses this message for configuration parameters (21..25 and 73..99). This behavior is not confirmed on hardware for configuration parameters.

6.2 Wavesample Parameter Message

The Mirage sends this message when a user changes a wavesample parameter on the front panel.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001110	0E	Wavesample parameter message
000N0SSS		N = 0: Lower, N = 1: Upper. SSS = wavesample number 0..7.
0ppppppp		**Parameter number**, 60..72
0000vvvv		Value, low nybble
0000vvvv		Value, high nybble
11110111	F7	End of Exclusive

The Mirage sends these messages only for edits made on the front panel. It does not send them for the parameter writes of the host.

6.3 Program Status

The Mirage sends this message when the program selection changes.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00000111	07	Program status
000N00PP		N = 0: Lower, N = 1: Upper. PP = program number 0..3.
11110111	F7	End of Exclusive

The Mirage sends this message on every program selection, also when the number does not change. It also sends it at the end of a front-panel Save. A wavesample selection on the front panel sends a Program Status message with the *wavesample* number in the `PP` field, together with the correct Wavesample Status message. Ignore Program Status messages with a `PP` value above 3.

6.4 Wavesample Status

The Mirage sends this message when the wavesample selection changes.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001000	08	Wavesample status
000N0SSS		N = 0: Lower, N = 1: Upper. SSS = wavesample number 0..7.
11110111	F7	End of Exclusive

6.5 Acknowledge

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001001	09	Wavesample dump received without error
11110111	F7	End of Exclusive

6.6 Not Acknowledged

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
00001010	0A	Wavesample dump received with error
11110111	F7	End of Exclusive

6.7 Program Dump Data

The Mirage sends this message in reply to a Program Dump Request.

BINARY	HEX	DESCRIPTION
11110000	F0	System Exclusive
00001111	0F	Ensoniq code
00000001	01	Mirage code
000N0101	05 / 15	Program dump data. N = 0: Lower, N = 1: Upper.
0000llll 0000hhhh		625 bytes (Table 7.2) as 1250 nybbles, low nybble first
11110111	F7	End of Exclusive

The Mirage sends the Upper dump with the command byte `$15`. Read the half from bit 4 and then clear that bit. The message is 1255 bytes, about 0.4 s. There is no checksum.

6.8 Configuration Dump Data

The Mirage sends this message in reply to a Configuration Dump Request. The format is the same as in section 5.7.

6.9 Wavesample Dump Data

The Mirage sends this message in reply to a Wavesample Dump Request. The format is the same as in section 5.6. A full wavesample of 256 pages overflows the page count to 0. Compute the length from the data that arrives, not from the page count.

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7. Tables

7.1 Keypad codes

CODE	KEY	CODE	KEY
$00	0 / PROG	$0C	PARAM
$01..$09	1..9	$0D	VALUE
$0A	ENTER / START	$0E	UP arrow
$0B	CANCEL / STOP	$0F	DOWN arrow
$10	LOAD UPPER	$14	REC SEQ (MASOS: Select Upper Wavesample)
$11	LOAD LOWER	$15	PLAY SEQ (MASOS: Select Lower Wavesample)
$12	SAMPLE UPPER	$16	LOAD SEQ (MASOS: Load Wavesample, not confirmed)
$13	SAMPLE LOWER	$17	SAVE SEQ

The codes are those of the original Mirage panel. MASOS gives the four sequencer keys new functions.

7.2 Program Dump format (625 bytes)

OFFSET	LENGTH	CONTENT
0	1	Sound revision level
1	8 × 24	Wavesample Control Blocks 1..8 (Table 7.4)
193	9 × 32	Segment lists (internal data, do not change)
481	4 × 36	Program Parameter Blocks 1..4 (Table 7.3)

7.3 Program Parameter Block (36 bytes)

The offset is the value for Program Parameter Write (section 5.8). The parameter number is the value in the Program Parameter Message (section 6.1).

OFFSET	PARAM	NAME	RANGE	NOTE
0	[29]	Mono Mode	0..1	
1	[31]	LFO Frequency	0..99	
2	[32]	LFO Depth	0..99	
3	[33]	Oscillator Detune	0..99	
4	[34]	Oscillator Mix	0..252	126 = equal
5	[35]	Osc Mix Velocity Sensitivity	0..124	
6	[36]	Filter Cutoff	0..198	
7	[37]	Filter Resonance	0..160	
8	[38]	Filter Keyboard Tracking	0..4	
9	—	spare		write 0
10	[27]	Initial Wavesample	0..7	key map rebuilt after write
11	[28]	Mix Mode	0..1	
12	[40]	Filter Envelope Attack	0..31	
13	[41]	Filter Envelope Peak	0..31	
14	[42]	Filter Envelope Decay	0..31	
15	[43]	Filter Envelope Sustain	0..31	
16	[44]	Filter Envelope Release	0..31	
17	[45]	Filter Attack × Velocity	0..124	
18	[46]	Filter Peak × Velocity	0..124	
19	[47]	Filter Decay × Keyboard	0..124	
20	[48]	Filter Sustain × Velocity	0..124	
21	[49]	Filter Release × Velocity	0..124	
22	[50]	Amplitude Envelope Attack	0..31	
23	[51]	Amplitude Envelope Peak	0..31	
24	[52]	Amplitude Envelope Decay	0..31	

OFFSET	PARAM	NAME	RANGE	NOTE
25	[53]	Amplitude Envelope Sustain	0..31	
26	[54]	Amplitude Envelope Release	0..31	
27	[55]	Amp Attack × Velocity	0..124	
28	[56]	Amp Peak × Velocity	0..124	
29	[57]	Amp Decay × Keyboard	0..124	
30	[58]	Amp Sustain × Velocity	0..124	
31	[59]	Amp Release × Velocity	0..124	
32..35	—	spare		write 0

Envelope stages are rates, not times. Each step is about 1.5 times the previous step. Value 0 is the fastest. The time of a stage is the level distance divided by the rate.

7.4 Wavesample Control Block (24 bytes)

The offset is the value for Wavesample Parameter Write (section 5.9). The parameter number is the value in the Wavesample Parameter Message (section 6.2).

OFFSET	PARAM	NAME	RANGE	WRITE
0..7	—	Internal sample and loop pointers		**do not write**
8	[65]	Loop Switch	0..1	checked
9	[67]	Coarse Tune	0..7	direct
10	[68]	Fine Tune	0..255	direct, 1/256 octave per step
11	[69]	Relative Amplitude	0..63	direct
12	[70]	Relative Filter Frequency	0..198	direct
13	[71]	Maximum Filter Frequency	0..198	direct
14	[72]	Top Key	0..60	direct, then key map rebuild. 0 = C2
15	[60]	Sample Start (page)	$00..$FE	checked, 2..3 ms
16	[61]	Sample End (page)	$01..$FF	checked, 2..3 ms
17	[62]	Loop Start (page)	$00..$FE	checked
18	[63]	Loop End (page)	$01..$FF	checked
19	[64]	Loop End Fine	$00..$FF	checked
20	—	Free-run flag		do not write
21..23	—	spare		do not write

"Checked" means that the Mirage validates the value and recalculates its internal pointers, as it does for a front-panel edit. "Direct" means that the Mirage stores the value without checks.

7.5 Configuration block (29 bytes)

Configuration Dump Data (sections 5.7 and 6.8) carries this block. Byte 0 must be zero.

BYTE	PARAM	NAME	RANGE	MASOS_BE DEFAULT
0	—	dummy	0	0
1	[21]	Master Tune	0..99	50 = A440
2	[22]	Pitch Bend Range	0..34	2
3	[23]	Velocity Sensitivity	0..63	30
4	[24]	Upper/Lower Balance	0..126, even	64
5	[25]	Program Link	0..1	0
6	[73]	Sample Time	20..99	34
7	[74]	Input Filter Frequency	0..198, even	160
8	[75]	Mic/Line	0..1	0
9	[76]	Sampling Threshold	0..126, even	48
10	[77]	Multisample	0..1	0
11	[81]	MIDI Omni	0..1	1
12	[82]	MIDI Channel	0..15	0 = channel 1
13	[83]	MIDI Echo	0..1	0
14	[84]	MIDI Controller Enable	0..1	1
15	[85]	Source Start, high byte	0..255	0
16	[86]	Source Start, low byte	0..255	0
17	[87]	Source End, high byte	0..255	255
18	[88]	Source End, low byte	0..255	239
19	[89]	Destination, high byte	0..255	0
20	[90]	Destination, low byte	0..255	1
21	[94]	Destination Bank	0..1	0
22	[95]	Scale Start Factor	0..255	0
23	[96]	Scale End Factor	0..255	255
24	[91]	External Computer Port Enable	0..1	1

BYTE	PARAM	NAME	RANGE	MASOS_BE DEFAULT
25	[92]	Baud Rate Switch	0..1	0
26	[93]	Cartridge Filter	0..25	0
27	[97]	Software version		
28	—	spare		0

[91] must be 1. The Mirage transmits sysex only when it is on. It does not affect receive.

[92] must be 0. When a user sets it to 1 on the front panel, the Mirage changes its serial clock to about 4800 baud. The Mirage then ignores MIDI until the next boot.

---

8. Host requirements

1. **Keep at least 8 ms between sysex messages.** A write to Sample Start or Sample End occupies the Mirage for 2 to 3 ms. During that time the Mirage loses incoming bytes without an error. Channel messages are not affected.
2. **Combine fast parameter movements.** Send the latest value every 20 to 30 ms and the final value on release.
3. **Wait for Rotate Wavesample to complete** before you send another message.
4. **The host drives the selection.** No message asks the Mirage what it has selected. Select with a Front Panel Command and wait for the status reply. Listen to status messages at all times, because the user can change the selection on the front panel.
5. **Do not play notes during a wavesample transfer** in either direction.
6. **Keep [83] off and [91] on.** A host can request the configuration, set those two bytes, and send the block back.
7. **Do not expect a display update** after a parameter write.

9. Changes from MASOS v2

AREA	MASOS V2	MASOS_BE 1.0.0
Program Parameter Message $0D	transmit only	also received as a parameter write (section 5.8)
Wavesample Parameter Message $0E	transmit only	also received as a parameter write (section 5.9)
Command $0C	Wavesample Dump Absolute Data	Rotate Wavesample (section 5.10)
Command $0B	Wavesample Dump Absolute Request	removed
Command $0F	Perform Wavesample Manipulation Function	removed
Sample End after a front-panel or sysex change	playback continued past the new end	corrected
Held notes after a loop change	not updated	updated
[91] on a new disk	off	on
[83] on a new disk	on	off

All other messages are unchanged.

10. Example session

A host connects to a Mirage that runs MASOS_BE. The host sends the messages 8 ms apart.

```
host:   F0 0F 01 00 F7                    Configuration Dump Request
mirage: F0 0F 01 02 <58 nybbles> F7        Configuration Dump Data
host:   F0 0F 01 03 F7                    Program Dump Request, Lower
mirage: F0 0F 01 05 <1250 nybbles> F7      Program Dump Data, Lower
host:   F0 0F 01 13 F7                    Program Dump Request, Upper
mirage: F0 0F 01 15 <1250 nybbles> F7      Program Dump Data, Upper ($15)
host:   F0 0F 01 01 15 01 7F F7           Select Lower wavesample 1
mirage: F0 0F 01 08 00 F7                 Wavesample Status: Lower, WS 0
mirage: F0 0F 01 07 00 F7                 Program Status (section 6.3)
host:   F0 0F 01 0D 00 06 09 04 F7        Write Lower Cutoff = 73
host:   F0 0F 01 0E 00 0E 0F 01 F7        Write Lower WS 1 Top Key = 31
user turns Resonance on the front panel:
mirage: F0 0F 01 0D 00 25 0A 02 F7        Parameter Message: [37] = 42
```