

Sony MSC-3000 / MSC-4000

MUSE Decoder User's Guide

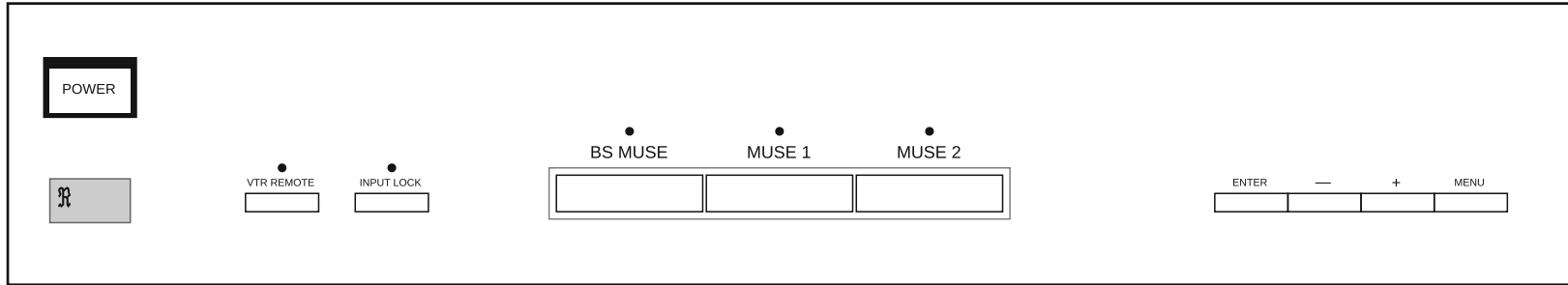
The MSC-3000 and MSC-4000 (the units are functionally although not physically identical) are decoders for the bandwidth-compressed analog High Definition Television transmission format known as MUSE, used for satellite broadcasting in Japan from 1991 to 2007. The same format was used for consumer high-definition videodiscs, under the name *Hi-Vision LD*, and these discs can be played back through the MSC-3000/4000 using the baseband inputs for external MUSE sources.

MUSE stands for multiple sub-Nyquist-sampling encoding, a description of the bandwidth-compression technique employed. In essence, picture elements are deleted in a manner which alternates frame-by-frame and line-by-line, and the result is low-pass filtered. By highly precise sampling of this narrow-band signal, the image can be reconstructed using interpolation and memory circuits. Such a process was first proposed in the early 1950s, but it only became technically feasible with the advance of microelectronics in the 1980s. Separate processing branches are used for moving and stationary image areas, producing an output which is effectively a blend of 1125-line, 15 frame per second, and 562.5-line, 60 fps progressively-scanned pictures. To improve performance during motion of the whole frame, motion vectors are transmitted. Quasi-constant-luminance encoding is used for colour, with differential components transmitted by line-sequential time-division multiplexing. Companded differential PCM digital audio is transmitted by baseband multiplex during the vertical blanking interval.

Notes Descriptions of the functions of the MSC-3000 and MSC-4000 are largely adapted from the Japanese-language owner's manuals, with contributions from other documentation and experiment. Information on the MUSE system is taken from various sources, including *Recommendation ITU-R BO.786*, "MUSE system for HDTV broadcasting-satellite services", and numbers of *NHK Laboratories Note*.
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Summary		
Video		
Lines per Frame	1125 (1032 active)	
Field Rate / Interlace	60.00 Hz / 2:1	
Output Format	Y _P P _R , GBR, GBRHV (switchable)	
Synchronizing Signal	Trilevel, on all components	Trilevel or Separate
Bandwidth (figures in parentheses refer to moving image areas)	20 (12) MHz Y 7 (3.5) MHz P _B , P _R	20 (12) MHz
Output Connectors	RCA × 5, RCA × 3 (1 V p-p, 75Ω)	
Audio		
DANCE Mode	A	B
Channels	4	2
Sampling	32 kHz 15 bits	48 kHz 16 bits
Transmitted Data	8 bits × 8 ranges	11 bits × 6 ranges
Signal-to-Noise Ratio	60 dB	
Channel Separation	60 dB	
Outputs	Analog line-level	RCA × 5 (LCRL _S R _S) 2 places
	Digital	Coaxial : RCA × 2
Input Connectors	MUSE	RCA × 3 (0.8 V p-p 75 Ω)
Dimensions	430 × 92 × 350 mm (W×H×D), 6.7 kg Not including MSC-3000 side panels	
Power consumption	AC 100 V, 50/60 Hz 35 or 40 W, MSC-3000 30 W (5.5 W in standby mode), MSC-4000	

FRONT



PANEL

POWER Switches **standby** and **on** states. Button surround includes a (green) lamp which illuminates when **on**.

R Receiver for the infrared remote control is located here.

VTR REMOTE See *VTR Operation*. Red lamp.

INPUT LOCK Prevents input switching when (amber) lamp is illuminated. Cancels when unit is switched off.

BS MUSE / MUSE 1 / MUSE 2 Each selects the corresponding rear-

panel input — lamp indicates current selection.

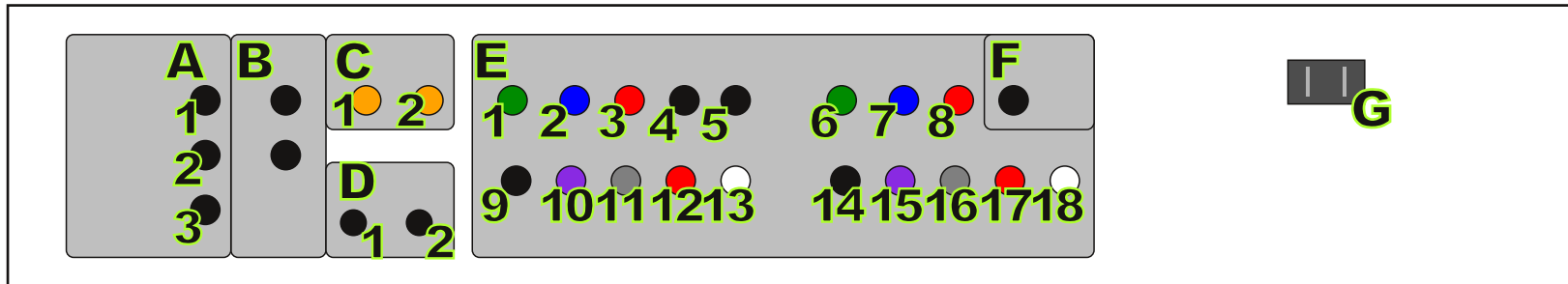
ENTER Confirms selections in the on-screen menu (see *Menu Operations* section).

UP / DOWN ARROWS Select items in the on-screen menu.

MENU Activates the on-screen menu.

When input power is reconnected, settings (including power) resume their states at disconnection, allowing operation with a switched outlet.

REAR



PANEL

Ⓐ MUSE baseband inputs are provided here. ① is designated for use with an external satellite tuner, and may go through somewhat different signal processing than ②③ which are intended for domestic sources such as Hi-Vision LD.

Ⓑ An Automatic Frequency Control keying pulse, for use with an external tuner, is output from both terminals when MUSE decoding is in progress.

Ⓒ Digital outputs for audio, coaxial SPDIF, left and right channels on one, center and surround (when present) on the other. Questions : is there actually a component somewhere which accepts two stereo digital inputs simultaneously, to drive four channels total? When an A-mode signal is being decoded, with 32 kHz sampling rate, is this sampling rate used at the output, or is it resampled to 48 kHz?

Ⓓ These connectors are supplied for linking several Sony components

together. It is also possible to control the unit using a computer. Signals are TTL, conforming to the SIRCS protocol.

Ⓔ Two sets of outputs for 1125-line video and multi-channel audio (see table for output assignments). Video is switchable between $YP_B P_R$ and GBR using an on-screen menu, and outputs for horizontal and vertical sync signals are supplied for devices requiring them. Audio on outputs 14-18 is switchable between 2-channel, 4-channel, and 5-channel output mappings using an on-screen menu.

Ⓕ During MUSE decoding, the DANCE data stream is presented here after time-expansion to 1350 kbps. This is required for delivery of data services or use with an outboard pay-TV decoder (not implemented).

Ⓖ A convenience outlet intended for video equipment (do not connect a CRT TV), unswitched, rated 100 W maximum.

Rear Panel Labels

Fields

- A MUSE**
 1 BS MUSE 入力 satellite tuner input
 2 MUSE 入力 1 input 1
 3 MUSE 入力 2 input 2
- B AFC 出力**
- C デジタル音声出力 digital audio output**
 1 CH1, 2
 2 CH3, 4
- D コントロール S Control-S**
 1 入力 input
 2 出力 output
- E デコーダー出力 Decoder Output**
 1-5, 9-13 モニター用 to monitor
 6-8, 14-18 ビデオ用 to video equipment
 1-8 映像 video
 1,6 Y/G
 2,7 P_B/B
 3,8 P_R/R
 4 HD horizontal sync
 5 VD vertical sync
 9-18 音声 audio
 9/10, 14/15 サラウンド surround
 9,14 右 right
 10,15 左 (モノ) left (mono)
 11,16 センタ center
 12,17 右 right
 13,18 左 left
- F ビットストリーム出力 bitstream output**
- G VTR 専用 AC アウトレット AC outlet for VTR use**

Notes

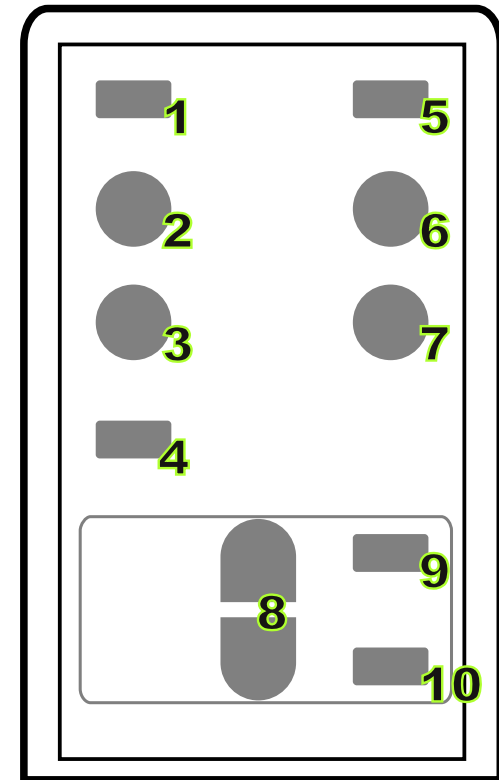
Both items in ④ are 1/8" mini phone jacks, and are absent from some MSC-3000 units (distinguishable by 40 W power consumption rating, and probably by serial numbers beginning in '1'). ⑤ is a Japanese-standard two-prong electrical receptacle, rated 100 W. All other items are RCA connectors, with insulators coloured approximately as illustrated. All connectors are female.

VTR Operation

When front-panel VTR REMOTE is pressed, so that its lamp illuminates, and the unit is then switched to **standby** (the red lamp remaining lit), drawing power from outlet ⑤ will cause the unit to switch **on** after about ten seconds. (If switching occurs while power is being drawn, the unit will return to **on**.) At this time, the input will switch to the value selected under the Recording Mode menu (④ under *Menu Operations*), and INPUT LOCK will be engaged. If Input Lock was already active before switching to **standby**, the input will nevertheless be switched to the preset value for VTR operation.

The intent is to allow time recording of Hi-Vision broadcasts, but this feature could also be used to automate operation with a videodisc player. Switching off the connected component does not cause the unit to switch to **standby**.

Remote Control Unit RM-J178



- ① **Display** Toggles visibility of on-screen display
- ② **TV/Independent Audio** Selects program or separate audio programs, when present
- ③ **VTR Operation** Locks out RCU and main-unit controls, for use while recording
- ④ **Input Lock** Same as front panel Input Lock
- ⑤ **Power** Same as front-panel Power
- ⑥ **Main/Sub Audio** Selects main or alternate audio programs, when present
- ⑦ **Input Select** Switches between inputs
- ⑧ **Up/Down Arrows** Same as front panel Up/Down Arrows
- ⑨ **Menu** Same as front-panel Menu
- ⑩ **Enter** Same as front-panel Enter

Menu Operation

Ⓐ **Root Menu** This screen appears when Menu is pressed on the front panel or remote control, or received via the Control-S connector. Select a submenu with Up/Down Arrows, then Enter, or send Menu again to exit.

Ⓑ **MUSE Label Menu** The designation which appears in the on-screen display can be changed for each of the inputs. Options are BS MUSE, MUSE 1, MUSE 2, Hi-Vision LD, Hi-Vision VTR. Select an input with Up/Down Arrows, then Enter; switch between selections using Up/Down Arrows, then Enter. Repeat as desired, then exit with Menu. This operation cannot be performed with VTR mode active.

Ⓒ **MUSE Output Menu** Video output format, color saturation, and tint can be adjusted.

Video Output YP_BP_R ↔ RGB 1 (separate sync) ↔ RGB 2 (composite sync)

Saturation Desaturated (薄い) ↔ Standard (標準) ↔ Saturated (濃い)

Tint Red 2 (赤 2) ↔ Red 1 ↔ Standard ↔ Green 1 (緑 1) ↔ Green 2

Select an adjustment with Up/Down Arrows, then Enter; switch between options using Up/Down Arrows, then Enter. Repeat as desired, then exit with Menu.

Ⓓ **Recording Menu** Select source connector and audio options which will be automatically selected when power is switched on by the VTR REMOTE function. The selection of 2/4/5 channels only affects the audio outputs designated for video, rear-panel ④14-18: the 'monitor' audio outputs are always in 5-channel mode. See *Audio Mode* table.

Input Mode BS MUSE ↔ MUSE 1 ↔ MUSE 2

Output Mode 2 CH ↔ 5 CH ↔ 4 CH

TV/Independent TV (テレビ) ↔ Independent (独立)

Dual Audio Main (主) ↔ Sub (副) ↔ Main/Sub ↔ Sub 2 ↔ Sub 3 ↔ Main/Sub 2 ↔ Main/Sub 3

Select an adjustment with Up/Down Arrows, then Enter; switch between options using Up/Down Arrows, then Enter. Repeat as desired, then exit with Menu.

Notes Items in sans-serif type are front-panel or RCU buttons, or the equivalent SIRCS commands. Items in *italic type* are menu selections. Items underlined are menu options.

On-Screen Display

When the RCU Display button is pressed, a simple video overlay shows the label of the currently selected input, and the audio format, until it is dismissed by pressing Display again. This overlay also appears momentarily when performing an action such as changing the input or audio format, and when the signal on the selected changes. For this reason, it may be seen, eg, when skipping chapters on a Hi-Vision LD.

ハイビジョン LD
3-1 ステレオ

▶ MUSE ラベル
MUSE 出力設定
録音設定

a

△▽ 設定 (決定) 実行 (メニュー) 終了

MUSE ラベル

b

▶ BS MUSE BS MUSE
MUSE 1 ハイビジョン LD
MUSE 2 ハイビジョン VTR
メニューに戻る

△▽ 設定 (決定) 実行 (メニュー) 終了

MUSE 出力設定

c

▶ 映像出力 YP_BP_R
色の濃さ 標準
色あい 標準
メニューに戻る

△▽ 設定 (決定) 実行 (メニュー) 終了

録音設定

d

▶ 入力モード BS MUSE
出力モード 2CH
テレビ / 独立 テレビ
二重音声 主
メニューに戻る

△▽ 設定 (決定) 実行 (メニュー) 終了

Audio Formats

Depending on program content, and (for the VTR audio output) the selections made in the *Recording* menu, various audio channel output arrangements can be selected using the RCU TV/Independent Audio and Main/Sub Audio buttons. These are of little practical interest, as the only audio formats known to exist on disc (of 28 total defined in the MUSE standard) are A-Mode 3-1 Stereo and B-Mode Stereo. Output assignments in 4-channel Mode also apply to the digital outputs, and digital channel numbers are shown along with channel labels.

The OSD column shows what will appear when the on-screen display is activated. The Japanese text is given as it occurs : 主 Main, 副 Sub, 独立 Independent, ステレオ Stereo

Audio Channel Mode		OSD	2-channel Mode		4-channel Mode				5-channel Mode					
A-Mode	TV Audio	Indep.		L	R	L / 1	C / 3	R / 2	S / 4	L	C	R	L _S	R _S
	3-1 Stereo	—	3-1 ステレオ	L'	R'	L	C	R	S	L	C	R	S	S
	2-2 Stereo	—	2-2 ステレオ	L'	R'	L	L _S	R	R _S	L	—	R	L _S	R _S
	3ch Stereo	—	3CH ステレオ	L'	R'	L	C	R	—	L	C	R	—	—
	3ch Stereo + Mono	—	3CH ステレオ	L'	R'	L	C	R	Sub	L	C	R	—	—
			A 副	Sub	Sub					Sub	—	—		
	Stereo	—	A ステレオ	L	R	L	—	R	—	L	—	R	—	—
	Stereo×2	—	主ステレオ	Main L	Main R	Main L	Sub L	Main R	Sub R	Main L	—	Main R	—	—
			副ステレオ	Sub L	Sub R					Sub L	—	Sub R	—	—
	Stereo + Mono	—	A ステレオ	Main L	Main R	Main L	Sub	Main R	—	Main L	—	Main R	—	—
			A 副 1	Sub	Sub					Sub	—	Sub	—	—
	Stereo + Mono×2	—	A ステレオ	Main L	Main R	Main L	Sub 1	Main R	Sub 2	Main L	—	Main R	—	—
			A 副 1	Sub 1	Sub 1					Sub 1	—	Sub 1	—	—
			A 副 2	Sub 2	Sub 2					Sub 2	—	Sub 2	—	—
	Stereo	Stereo	A ステレオ	TV L	TV R	TV L	Ind L	TV R	Ind R	TV L	—	TV R	—	—
			独立ステレオ	Ind L	Ind R					Ind L	—	Ind R	—	—
Stereo	Mono	A ステレオ	TV L	TV R	TV L	Ind	TV R	—	TV L	—	TV R	—	—	
		独立	Ind	Ind					Ind	—	Ind	—	—	
Stereo	Mono×2	A ステレオ	TV L	TV R	TV L	Ind Main	TV R	Ind Sub	TV L	—	TV R	—	—	
		独立主	Ind Main	Ind Main					Ind Main	—	Ind Main	—	—	
		独立副	Ind Sub	Ind Sub					Ind Sub	—	Ind Sub	—	—	
		独立主 / 副	Ind Main	Ind Sub					Ind Main	—	Ind Sub	—	—	

Key C Center, L Left, L_S Left Surround, L' Left Downmix, R Right, R_S Right Surround, R' Right Downmix, S (Mono) Surround

A-Mode	Mono	—	A	TV	TV	TV	—	—	—	TV	—	TV	—	—
	Mono	Stereo	A 主 独立ステレオ	TV Ind L	TV Ind R	TV	Ind L	—	Ind R	TV	—	TV	—	—
	Mono	Mono	A 独立	TV Ind	TV Ind	TV	Ind	—	—	TV L Ind	—	TV R Ind	—	—
	Mono	Mono×2	A 独立主 独立副 独立主 / 副	TV Ind Main Ind Sub Ind Main	TV Ind Main Ind Sub Ind Sub	TV L	Ind Main	—	Ind Sub	TV Ind Main Ind Sub Ind Main	—	TV Ind Main Ind Sub Ind Sub	—	—
	Mono×2	—	A 主 A 副 A 主 / 副	Main Sub Main	Main Sub Sub	Main	—	Sub	—	Main Sub Main	—	Main Sub Sub	—	—
	Mono ×2	Stereo	A 主 A 副 A 主 / 副 独立ステレオ	TV Main TV Sub TV Main	TV Main TV Sub TV Sub	TV Main	Ind L	TV Sub	Ind R	TV Main TV Sub TV Main Ind L	—	TV Main TV Sub TV Sub Ind R	—	—
	Mono ×2	Mono	A 主 A 副 A 主 / 副 独立	TV Main TV Sub TV Main	TV Main TV Sub TV Sub	TV Main	Ind	TV Sub	—	TV Main TV Sub TV Main Ind	—	TV Main TV Sub TV Sub Ind	—	—
	Mono ×2	Mono×2	A 主 A 副 A 主 / 副 独立主 独立副 独立主 / 副	TV Main TV Sub TV Main	TV Main TV Sub TV Sub	TV Main	Ind Main	TV Sub	Ind Sub	TV Main TV Sub TV Main Ind Main Ind Sub Ind Main	—	TV Main TV Sub TV Sub Ind Main Ind Sub Ind Sub	—	—
	Mono ×3	—	A 主 A 副 1 A 副 2 A 主 / 副 1 A 主 / 副 2	Main Sub 1 Sub 2 Main	Main Sub 1 Sub 2 Sub 1	Main	Sub 2	Sub 1	—	Main Sub 1 Sub 2 Main Main	—	Main Sub 1 Sub 2 Sub 1 Sub 2	—	—

A-Mode	Mono×4	—	A 主	Main	Main	Main	Sub 2	Sub 1	Sub 3	Main	—	Main	—	—
			A 副 1	Sub 1	Sub 1					Sub 1	—	—	—	
			A 副 2	Sub 2	Sub 2					Sub 2	—	—	—	
			A 副 3	Sub 3	Sub 3					Sub 3	—	—	—	
			A 主 / 副 1	Main	Sub 1					Main	—	Sub 1	—	—
			A 主 / 副 2	Main	Sub 2					Main	—	Sub 2	—	—
			A 主 / 副 3	Main	Sub 3					Main	—	Sub 3	—	—
	—	Stereo	独立ステレオ	Ind L	Ind R	—	Ind L	—	Ind R	Ind L	—	Ind R	—	—
	—	Mono	独立	Ind	Ind	—	Ind	—	—	Ind	—	Ind	—	—
	—	Mono×2	独立主	Ind Main	Ind Main	—	Ind Main	—	Ind Sub	Ind Main	—	Ind Main	—	—
			独立副	Ind Sub	Ind Sub					Ind Sub	—	Ind Sub	—	—
			独立主 / 副	Ind Main	Ind Sub					Ind Main	—	Ind Sub	—	—

B-Mode	TV Audio													
	Stereo	B ステレオ	L	R	L	—	R	—	L	—	R	—	—	
	Mono	B	TV	TV	TV	—	—	—	TV	—	TV	—	—	
	Mono×2	B 主	Main	Main	Main	—	Sub	—	Main	—	Main	—	—	
		B 副	Sub	Sub					Sub	—	Sub	—	—	
B 主 / 副		Main	Sub	Main					—	Sub	—	—		