Ports Table ($40 – $4F)

Port	R/W	Function	Detail
$40	(read_n / write)	ID $08 — MSX2+ FS-A1 Series — Z80B 5.37MHz	ID $D4 — MSX++ Computers and Compatibles — OCM-PLD v2.4 or later
$41	(read_n / write)	BIT 0–7 Smart Command ID (see the list on the right)	CPL or $FF (null)

Port $42 (read / write_n)

BIT	Function	Detail
0	CPU Clock	Virtual DIP-SW1
1	Video Output (MSB)	Virtual DIP-SW2
2	Video Output (LSB)	Virtual DIP-SW3
3	Cartridge Slot-1	Virtual DIP-SW4
4	Cartridge Slot-2 (MSB)	Virtual DIP-SW5
5	Cartridge Slot-2 (LSB)	Virtual DIP-SW6
6	Current Mapper Size	Virtual DIP-SW7
7	Current MegaSD Mode	Virtual DIP-SW8

Port $43 (read / write_n) — Lock Mask of the Toggles

BIT	Function
0	CPU Clock
1	Video Output
2	Audio Mixer & SCRLK
3	Cartridge Slot-1
4	Cartridge Slot-2
5	Hard Reset Key
6	Internal Mapper
7	Internal MegaSD

Port $44 (read / write_n) — Lights I/O + Dynamic ID (d-ID)

(SM-X, SX-2 and SX-E only use Led 8 but this register works the same way)

BIT	Function
0	Led 1 Status
1	Led 2 Status
2	Led 3 Status
3	Led 4 Status
4	Led 5 Status
5	Led 6 Status
6	Led 7 Status
7	Led 8 Status

Port $45

BIT	R/W	Function	Detail
0	(read / write_n)	PSG Volume Level (0 - 7)	BIT 0 (LSB)
1			BIT 1
2			BIT 2 (MSB)
3	(read only)	PSG Mute	Status
4	(read / write_n)	Master Volume Level (0 - 7)	BIT 0 (LSB)
5			BIT 1
6			BIT 2 (MSB)
7	(read only)	Master Mute	Status

Port $46

BIT	R/W	Function	Detail
0	(read / write_n)	OPLL Volume Level (0 - 7)	BIT 0 (LSB)
1			BIT 1
2			BIT 2 (MSB)
3	(read only)	OPLL Mute	Status
4	(read / write_n)	SCC-I Volume Level (0 - 7)	BIT 0 (LSB)
5			BIT 1
6			BIT 2 (MSB)
7	(read only)	SCC-I Mute	Status

Port $47 (read only)

BIT	Function	Detail
0	CPU Custom Speed Level (1 - 7)	BIT 0 (LSB)
1		BIT 1
2		BIT 2 (MSB)
3	Turbo MegaSD (tMSD)	Status
4	Turbo Pana Redirection (tPR)	Status
5	VDP Speed Mode	0=Normal, 1=Fast
6	Mapper Size Req	0=2048 KB, 1=4096 KB
7	MegaSD Mode Req	Status

Port $48 (read only)

BIT	Function	Detail
0	Turbo Pana	Status
1	Current Keyboard Layout	0=JP, 1=Non-JP
2	SCRLK Toggle	Status
3	Lights Mode	0=Auto, 1=ON
4	Red Mode (Led 0)	Status
5	Last Reset Ack	0=Cold Reset ack, 1=Warm Reset ack
6	Reset Required Flag	Status
7	MegaSD Blink	Status

Port $49 (read only)

BIT	Function	Detail
0	Pseudo Stereo	Status
1	External Clock Mode	0=Sync to CPU, 1=3.58MHz
2	Machine Type ID	BIT 0 (LSB)
3	(0=1chipMSX, 1=Zemmix Neo/SX-1 and related,	BIT 1
4	2=SM-X/MC2P, 3=SX-2, 4=SM-X Mini/SM-X HB,	BIT 2
5	5=DE0CV+DE0CM, 6=SX-E/SX-Lite, 7-15=Unknown)	BIT 3 (MSB)
6	NTSC/PAL Type	0=Forced, 1=Auto
7	Forced Video Mode	0=60Hz (NTSC), 1=50Hz (PAL)

Port $4A (read only)

BIT	Function	Detail
0	Right Inverse Audio	Status
1	Pixel Ratio 1:1 for LED Display	BIT 0 (LSB)
2		BIT 1
3		BIT 2 (MSB)
4	Centering YJK Modes/R25 Mask	
5	Assignment of Legacy Output	0=To VGA, 1=To VGA+
6	Internal Slot-1 Linear	Status
7	Internal Slot-2 Linear	Status

Port $4B — IN A,($44) : if A=$00   d-ID $00   (read only)   [Dynamic Port 4B]

BIT	Function	Detail	Note
0	VGA Scanlines Level (Status*25%)	BIT 0 (LSB)	only for SM-X / SX-2 / SX-E
1		BIT 1 (MSB)	only for SM-X / SX-2 / SX-E
2	Internal PSG2	Status	only for SM-X / SX-2 / SX-E
3	SDRAM Size	BIT 0 (LSB)	
4	(0=8 MB, 1=16 MB, 2=32 MB, 3=Over 32 MB)	BIT 1 (MSB)	
5	OCM-BIOS Reloading Req	Status	
6	Extra-Mapper 4096 KB Req	Status	
7	Slot-0 Mode Req	0=Primary, 1=Expanded	

Port $4B — IN A,($44) : if A=$01   d-ID $01   (read only)   [Dynamic Port 4B]

BIT	Function	Detail
0	Extended MegaROM Reading	Status
1	Auxiliary SDRAM Size	BIT 0 (LSB)
2	(0=64 MB, 1=128 MB, 2=192 MB, 3=256 MB,	BIT 1
3	4=384 MB, 5=512 MB, 6=768 MB, 7=1024 MB)	BIT 2 (MSB)
4		BIT 0 (LSB)
5	Vertical Offset (Status+12)	BIT 1
6		BIT 2
7		BIT 3 (MSB)

Port $4B — IN A,($44) : if A=$02   d-ID $02   (read only)   [Dynamic Port 4B]

BIT	Function	Detail
0	Sprite Limit	0=4/8 (standard), 1=8/8 (enhanced)
1	Safe Mode	Status
2	C-BIOS Mode	Status
3	Extra-Mapper 4096 KB Ack	Status
4	Current Slot-0 Mode	0=Primary, 1=Expanded
5		BIT 0 (LSB)
6	Free	BIT 1
7		BIT 2 (MSB)

Port $4C (read only)

BIT	Function	Detail
0	CPU Clock	Hard DIP-SW1
1	Video Output (MSB)	Hard DIP-SW2
2	Video Output (LSB)	Hard DIP-SW3
3	Cartridge Slot-1	Hard DIP-SW4
4	Cartridge Slot-2 (MSB)	Hard DIP-SW5
5	Cartridge Slot-2 (LSB)	Hard DIP-SW6
6	Internal Mapper	Hard DIP-SW7
7	Internal MegaSD	Hard DIP-SW8

Port $4D (read / write_n)

BIT	Function	Detail
0	64 KB VRAM Slot ID (Page 0)	BIT 0 (LSB)
1		BIT 1
2		BIT 2
3		BIT 3 (MSB)
4	64 KB VRAM Slot ID (Page 1)	BIT 0 (LSB)
5		BIT 1
6		BIT 2
7		BIT 3 (MSB)

Port $4E (read only)

BIT	Function	Detail
0	OCM-PLD main version X.Y.(z)	BIT 0 (LSB)
1		BIT 1
2		BIT 2
3	(range 0.0.z - 25.5.z)	BIT 3
4		BIT 4
5		BIT 5
6		BIT 6
7	ID	BIT 7 (MSB)

Port $4F (read only)

BIT	Function	Detail
0	I/O Revision ID (0 - 31)	BIT 0 (LSB)
1		BIT 1
2		BIT 2
3		BIT 3
4		BIT 4 (MSB)
5	OCM-PLD sub version (x.y).Z	BIT 0 (LSB)
6	(range x.y.0 - x.y.3)	BIT 1 (MSB)
7	Default Keyboard Layout	Status

SMART COMMANDS TABLE

Cmd	(dec)	Description	Note
$00	(000)	Null Command $00 (reserved)	
$01	(001)	Set Turbo Pana Redirection OFF (default)	
$02	(002)	Set Turbo Pana Redirection ON	
$03	(003)	Set Standard Speed 3.58MHz	
$04	(004)	Set Custom Speed 4.10MHz	
$05	(005)	Set Custom Speed 4.48MHz	
$06	(006)	Set Custom Speed 4.90MHz	
$07	(007)	Set Custom Speed 5.39MHz	
$08	(008)	Set Custom Speed 6.10MHz	
$09	(009)	Set Custom Speed 6.96MHz	
$0A	(010)	Set Custom Speed 8.06MHz (aka "Turbo 10MHz") (default)	
$0B	(011)	Set Turbo MegaSD OFF	
$0C	(012)	Set Turbo MegaSD ON (default)	
$0D	(013)	Set External Slot-1 + External Slot-2	
$0E	(014)	Set Internal SCC-I Slot-1 + External Slot-2	
$0F	(015)	Set External Slot-1 + Internal SCC-I Slot-2	
$10	(016)	Set Internal SCC-I Slot-1 + Internal SCC-I Slot-2	
$11	(017)	Set External Slot-1 + Internal ASCII-8K Slot-2	
$12	(018)	Set Internal ASCII-8K Slot-1 + Internal ASCII-8K Slot-2	
$13	(019)	Set External Slot-1 + Internal ASCII-16K Slot-2	
$14	(020)	Set Internal ASCII-16K Slot-1 + Internal ASCII-16K Slot-2	
$15	(021)	Set Japanese Keyboard Layout	
$16	(022)	Set Non-Japanese Keyboard Layout	
$17	(023)	Set Display Mode 15KHz Composite/S-Video	
$18	(024)	Set Display Mode 15KHz RGB w/ Audio Out	
$19	(025)	Set Display Mode 31KHz VGA for LED TV or LED Display	also HDMI AV on SM-X
$1A	(026)	Set Display Mode 31KHz VGA+ for CRT Monitor (legacy output)	also HDMI AV on SM-X
$1B	(027)	Set VDP Speed Normal Mode (default)	
$1C	(028)	Set VDP Speed Fast Mode (V9958)	
$1D	(029)	Reserve MegaSD OFF (warm reset to go)	
$1E	(030)	Reserve MegaSD ON (warm reset to go)	
$1F	(031)	Set MegaSD Blink OFF	
$20	(032)	Set MegaSD Blink ON (default)	
$21	(033)	Set Lights Mode OFF w/ Auto LEDs Control (default)	
$22	(034)	Set Lights Mode ON + Red Led OFF	
$23	(035)	Set Lights Mode ON + Red Led ON	
$24	(036)	Internal Audio Preset #1 "Mute Sound"	
$25	(037)	Internal Audio Preset #2 "Middle Sound"	
$26	(038)	Internal Audio Preset #3 "High Sound" (default)	
$27	(039)	Set CMT OFF (default) (disabled w/ MSXtR BIOS)	n/a on SM-X / SX-2 / SX-E
$28	(040)	Set CMT ON (needs a cassette recorder) (disabled w/ MSXtR BIOS)	n/a on SM-X / SX-2 / SX-E
$29	(041)	Lock Turbo Toggles	
$2A	(042)	Unlock Turbo Toggles	
$2B	(043)	Lock Display Toggles	
$2C	(044)	Unlock Display Toggles	
$2D	(045)	Lock Audio Mixer & SCRLK Toggles	
$2E	(046)	Unlock Audio Mixer & SCRLK Toggles	
$2F	(047)	Lock Slot-1 Toggles	
$30	(048)	Unlock Slot-1 Toggles	
$31	(049)	Lock Slot-2 Toggles	
$32	(050)	Unlock Slot-2 Toggles	
$33	(051)	Lock Slot-1 & Slot-2 Toggles	
$34	(052)	Unlock Slot-1 & Slot-2 Toggles	
$35	(053)	Lock Hard Reset Key	
$36	(054)	Unlock Hard Reset Key	
$37	(055)	Lock Mapper Toggle	
$38	(056)	Unlock Mapper Toggle	
$39	(057)	Lock MegaSD Toggle	
$3A	(058)	Unlock MegaSD Toggle	
$3B	(059)	Lock All Toggles	
$3C	(060)	Unlock All Toggles (default)	
$3D	(061)	Set Pseudo-Stereo OFF (default)	
$3E	(062)	Set Pseudo-Stereo ON (needs an external sound cartridge)	
$3F	(063)	Sync External Bus Clock to CPU Speed (default)	
$40	(064)	Set External Bus Clock 3.58MHz	
$41	(065)	Set Turbo Pana 5.37MHz	
$42	(066)	Set Right Inverse Audio OFF (default)	
$43	(067)	Set Right Inverse Audio ON	
$44	(068)	Internal Audio Preset #4 "Emphasis PSG Sound"	
$45	(069)	Internal Audio Preset #5 "Emphasis SCC-I Sound"	
$46	(070)	Internal Audio Preset #6 "Emphasis OPLL Sound"	
$47	(071)	Vertical Offset 16 (useful for Ark-A-Noah)	
$48	(072)	Vertical Offset 17	
$49	(073)	Vertical Offset 18	
$4A	(074)	Vertical Offset 19 (default)	
$4B	(075)	Vertical Offset 20	
$4C	(076)	Vertical Offset 21	
$4D	(077)	Vertical Offset 22	
$4E	(078)	Vertical Offset 23	
$4F	(079)	Vertical Offset 24 (useful for Space Manbow)	
$50	(080)	Set VGA Scanlines 0% (default)	only for SM-X / SX-2 / SX-E
$51	(081)	Set VGA Scanlines 25%	only for SM-X / SX-2 / SX-E
$52	(082)	Set VGA Scanlines 50%	only for SM-X / SX-2 / SX-E
$53	(083)	Set VGA Scanlines 75%	only for SM-X / SX-2 / SX-E
$54	(084)	Set Internal PSG2 OFF (default)	only for SM-X / SX-2 / SX-E
$55	(085)	Set Internal PSG2 ON (this second PSG acts as an external PSG)	only for SM-X / SX-2 / SX-E
$56	(086)	Reserve Extra-Mapper 4096 KB OFF (default)	
$57	(087)	Reserve Extra-Mapper 4096 KB ON (only available if SDRAM > 8 MB)	
$58	(088)	Set Extended MegaROM Reading OFF (default for compatibility)	
$59	(089)	Set Extended MegaROM Reading ON (ASCII-8K/16K max size playable)	
$5A	(090)	Set Sprite Limit 4/8 (standard mode)	
$5B	(091)	Set Sprite Limit 8/8 (force MSX1 screens to use 8 sprites per line)	
...	...	...	
...	...	...	
$7E	(126)	Reserve System Logo ON (warm reset only)	old revisions had $FA (250)
$7F	(127)	Pixel Ratio 1:1 for LED Display (default is 0) (range 0 - 7) (60Hz only)	
$80	(128)	Null Command $80 (useful for programming)	
$81	(129)	Assign Legacy Output to VGA	
$82	(130)	Assign Legacy Output to VGA+ (default)	
$83	(131)	Set Internal Slot-1 Linear OFF (default)	
$84	(132)	Set Internal Slot-1 Linear ON (requires SCC-I preset)	
$85	(133)	Set Internal Slot-2 Linear OFF (default)	
$86	(134)	Set Internal Slot-2 Linear ON (requires SCC-I or ASCII-8K/16K preset)	
$87	(135)	Set Internal OPLL OFF (default)	only for SM-X / SX-2 / SX-E
$88	(136)	Set Internal OPLL ON	only for SM-X / SX-2 / SX-E
$89 .. $8F	(137 .. 143)	Reserved (Ducasp)	only for SM-X / SX-2 / SX-E
...	...	...	
$B0 .. $B7	(176 .. 183)	Set Master Volume 0 .. 7 (default level is 7)	
$B8 .. $BF	(184 .. 191)	Set PSG Volume 0 .. 7 (default level is 4)	
$C0 .. $C7	(192 .. 199)	Set SCC-I Volume 0 .. 7 (default level is 4)	
$C8 .. $CF	(200 .. 207)	Set OPLL Volume 0 .. 7 (default level is 4)	
$D0	(208)	Force NTSC Mode	
$D1	(209)	Standard NTSC/PAL Mode (bound by Control Register 9) (default)	
$D2	(210)	Force PAL Mode	
$D3	(211)	Restore Default Keyboard Layout	
$D4	(212)	Null Command $D4 (reserved) + Set C-BIOS Mode ON [Reserved to IPL-ROM]	
$D5	(213)	Restore Default Turbo Mode	
$D6	(214)	Set Centering YJK Modes/R25 Mask OFF (default)	
$D7	(215)	Set Centering YJK Modes/R25 Mask ON	
$F8	(248)	Reserve OCM-BIOS Reloading (cold reset or warm reset to go)	
$F9	(249)	Reserve Slot-0 Primary Mode (warm reset to go) (internal OPLL disabled)	
$FA	(250)	Reserve Slot-0 Expanded Mode (warm reset to go) (internal OPLL enabled)	
$FB	(251)	Cold Reset	
$FC	(252)	Warm Reset w/ Mapper 2048 KB (RAM size 6144 KB if Extra-Mapper is ON)	
$FD	(253)	Warm Reset	
$FE	(254)	Warm Reset w/ Mapper 4096 KB (RAM size 8192 KB if Extra-Mapper is ON)	
$FF	(255)	Restore All Defaults + Reserve Default Mapper & MegaSD	

More info on Switched I/O ports at MSX Assembly Page! < http://map.grauw.nl/resources/msx_io_ports.php#switch_io >

R/W Logic

R/W Logic			
Positive	0 = OFF	(read / write)	
	1 = ON		
Negative	0 = ON	(read_n / write_n)	
	1 = OFF		

Toggles

Toggles		
CPU Clock	[F12] or [DIP-SW1]	
Video Output	[(SHIFT)+PRTSCR] or [DIP-SW2/3]	SCRLK key could handle
Audio Mixer & SCRLK	[(SHIFT)PGUP/PGDOWN/F9/F10/F11] & [SCRLK]	CMT or OPL3 depending
Cartridge Slot-1	[SHIFT+F12] or [DIP-SW4]	on the type of machine
Cartridge Slot-2	[SHIFT+SCRLK] or [DIP-SW5/6]	
System Reset	[LCTRL+(SHIFT)+F12] Cold or Full Reset + [HARD RESET KEY] Short or Long-Click	
Internal Mapper	[DIP-SW7] only	
Internal MegaSD	[DIP-SW8] only	

Reserved to IPL-ROM

Port	R/W	Function	Detail
$4C	(write only)	BITS 7 .. 0 — VDP ID Selector	0-1=ID #0 (V9938), 2-255=ID #2 (V9958)
$4E	(write_n only)	BITS 6 .. 0 — -	-
		BIT 7 — JIS2 Enabler	0=JIS1+JIS2, 1=JIS1 only
$4F	(write_n only)	BITS 6 .. 0 — -	-
		BIT 7 — F4 Device Mode	0=Normal, 1=Inverted