Ports Table

Port	R/W	Function	Detail
$40	(read_n / write)	ID $08 — MSX2+ FS-A1 Series ; ID $D4 — MSX++ Computers and Compatibles	Z80B 5.37MHz ; 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)
$42	(read / write_n)	BIT 0 CPU Clock	Virtual DIP-SW1
		BIT 1 Video Output (MSB)	Virtual DIP-SW2
		BIT 2 Video Output (LSB)	Virtual DIP-SW3
		BIT 3 Cartridge Slot-1	Virtual DIP-SW4
		BIT 4 Cartridge Slot-2 (MSB)	Virtual DIP-SW5
		BIT 5 Cartridge Slot-2 (LSB)	Virtual DIP-SW6
		BIT 6 Current Mapper Size	Virtual DIP-SW7
		BIT 7 Current MegaSD Mode	Virtual DIP-SW8
$43	(read / write_n)	BIT 0 CPU Clock	
		BIT 1 Video Output	
		BIT 2 Audio Mixer & SCRLK	Lock Mask of the Toggles
		BIT 3 Cartridge Slot-1	
		BIT 4 Cartridge Slot-2	
		BIT 5 System Reset	
		BIT 6 Internal Mapper	
		BIT 7 Internal MegaSD	
$44	(read / write_n)	BIT 0 Led 1 Status	Lights I/O + Dynamic ID (d-ID)
		BIT 1 Led 2 Status	
		BIT 2 Led 3 Status	(SM-X, SX-2 and SX-E only use Led 8
		BIT 3 Led 4 Status	but this register works the same way)
		BIT 4 Led 5 Status	
		BIT 5 Led 6 Status	
		BIT 6 Led 7 Status	
		BIT 7 Led 8 Status	
$45	(read / write_n)	BIT 0 PSG Volume Level (0-7)	BIT 0 (LSB)
		BIT 1	BIT 1
		BIT 2	BIT 2 (MSB)
	(read only)	BIT 3 PSG Mute	Status
	(read / write_n)	BIT 4 Master Volume Level (0-7)	BIT 0 (LSB)
		BIT 5	BIT 1
		BIT 6	BIT 2 (MSB)
	(read only)	BIT 7 Master Mute	Status
$46	(read / write_n)	BIT 0 OPLL Volume Level (0-7)	BIT 0 (LSB)
		BIT 1	BIT 1
		BIT 2	BIT 2 (MSB)
	(read only)	BIT 3 OPLL Mute	Status
	(read / write_n)	BIT 4 SCC-I Volume Level (0-7)	BIT 0 (LSB)
		BIT 5	BIT 1
		BIT 6	BIT 2 (MSB)
	(read only)	BIT 7 SCC-I Mute	Status
$47	(read only)	BIT 0 CPU Custom Speed Level (1-7)	BIT 0 (LSB)
		BIT 1	BIT 1
		BIT 2	BIT 2 (MSB)
		BIT 3 Turbo MegaSD (tMSD)	Status
		BIT 4 Turbo Pana Redirection (tPR)	Status
		BIT 5 VDP Speed Mode	0=Normal, 1=Fast
		BIT 6 Mapper Size Req	0=2048 KB, 1=4096 KB
		BIT 7 MegaSD Mode Req	Status
$48	(read only)	BIT 0 Turbo Pana	Status
		BIT 1 Current Keyboard Layout	0=JP, 1=Non-JP
		BIT 2 SCRLK Toggle	Status
		BIT 3 Lights Mode	0=Auto, 1=ON
		BIT 4 Red Mode (Led 0)	Status
		BIT 5 Last Reset Ack	0=Cold Reset ack, 1=Warm Reset ack
		BIT 6 Reset Required Flag	Status
		BIT 7 MegaSD Blink	Status
$49	(read only)	BIT 0 Pseudo Stereo	Status
		BIT 1 External Clock Mode	0=Sync to CPU, 1=3.58MHz
		BIT 2 Machine Type ID	BIT 0 (LSB)
		BIT 3 (0=1chipMSX, 1=Zemmix Neo/SX-1 and related,	BIT 1
		BIT 4 2=SM-X/MC2P, 3=SX-2, 4=SM-X Mini/SM-X HB/u2-SX,	BIT 2
		BIT 5 5=DE0CV+DE0CM, 6=SX-E/SX-Lite, 7-15=Unknown)	BIT 3 (MSB)
		BIT 6 NTSC/PAL Type	0=Forced, 1=Auto
		BIT 7 Forced Video Mode	0=60Hz (NTSC), 1=50Hz (PAL)
$4A	(read only)	BIT 0 Right Inverse Audio	Status
		BIT 1 Pixel Ratio 1:1 for LED Display	BIT 0 (LSB)
		BIT 2	BIT 1
		BIT 3	BIT 2 (MSB)
		BIT 4 Centering YJK Modes/R25 Mask	
		BIT 5 Assignment of Legacy Output	0=To VGA, 1=To VGA+
		BIT 6 Internal Slot-1 Linear	Status
		BIT 7 Internal Slot-2 Linear	Status
$4B d-ID $00 [Dynamic Port 4B]	IN A,($44) : if A=$00 (read only)	BIT 0 VGA Scanlines Level (Status*25%)	BIT 0 (LSB)
		BIT 1	BIT 1 (MSB)
		BIT 2 Internal PSG2	Status (only for SM-X / SX-2 / SX-E)
		BIT 3 SDRAM Size	BIT 0 (LSB)
		BIT 4 (0=8 MB, 1=16 MB, 2=32 MB, 3=Over 32 MB)	BIT 1 (MSB)
		BIT 5 OCM-BIOS Reloading Req	Status
		BIT 6 Extra-Mapper 4096 KB Req	Status
		BIT 7 Slot-0 Mode Req	0=Primary, 1=Expanded
$4B d-ID $01 [Dynamic Port 4B]	IN A,($44) : if A=$01 (read only)	BIT 0 Extended MegaROM Reading	Status
		BIT 1 Auxiliary SDRAM Size	BIT 0 (LSB)
		BIT 2 (0=64 MB, 1=128 MB, 2=192 MB, 3=256 MB,	BIT 1
		BIT 3 4=384 MB, 5=512 MB, 6=768 MB, 7=1024 MB)	BIT 2 (MSB)
		BIT 4 Vertical Offset (Status+12)	BIT 0 (LSB)
		BIT 5	BIT 1
		BIT 6	BIT 2
		BIT 7	BIT 3 (MSB)
$4B d-ID $02 [Dynamic Port 4B]	IN A,($44) : if A=$02 (read only)	BIT 0 Sprite Limit	0=4/8 (standard), 1=8/8 (enhanced)
		BIT 1 Safe Mode	Status
		BIT 2 C-BIOS Mode	Status
		BIT 3 Extra-Mapper 4096 KB Ack	Status
		BIT 4 Current Slot-0 Mode	0=Primary, 1=Expanded
		BIT 5 VGA Interlace Field	0=Single, 1=Duplicate
		BIT 6 Free	BIT 0 (LSB)
		BIT 7	BIT 1 (MSB)
$4C	(read only)	BIT 0 CPU Clock	Hard DIP-SW1
		BIT 1 Video Output (MSB)	Hard DIP-SW2
		BIT 2 Video Output (LSB)	Hard DIP-SW3
		BIT 3 Cartridge Slot-1	Hard DIP-SW4
		BIT 4 Cartridge Slot-2 (MSB)	Hard DIP-SW5
		BIT 5 Cartridge Slot-2 (LSB)	Hard DIP-SW6
		BIT 6 Internal Mapper	Hard DIP-SW7
		BIT 7 Internal MegaSD	Hard DIP-SW8
$4D	(read / write_n)	BIT 0 64 KB VRAM Slot ID (Page 0)	BIT 0 (LSB)
		BIT 1	BIT 1
		BIT 2	BIT 2
		BIT 3	BIT 3 (MSB)
		BIT 4 64 KB VRAM Slot ID (Page 1)	BIT 0 (LSB)
		BIT 5	BIT 1
		BIT 6	BIT 2
		BIT 7	BIT 3 (MSB)
$4E	(read only)	BIT 0 OCM-PLD main version X.Y.(z)	BIT 0 (LSB)
		BIT 1 (range 0.0.z - 25.5.z)	BIT 1
		BIT 2	BIT 2
		BIT 3	BIT 3
		BIT 4	BIT 4
		BIT 5	BIT 5
		BIT 6	BIT 6
		BIT 7 ID	BIT 7 (MSB)
$4F	(read only)	BIT 0 I/O Revision ID (0 - 31)	BIT 0 (LSB)
		BIT 1	BIT 1
		BIT 2	BIT 2
		BIT 3	BIT 3
		BIT 4	BIT 4 (MSB)
		BIT 5 OCM-PLD sub version (x.y).Z	BIT 0 (LSB)
		BIT 6 (range x.y.0 - x.y.3)	BIT 1 (MSB)
		BIT 7 Default Keyboard Layout	Status

Reserved for 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

SMART COMMANDS TABLE

Cmd	(dec)	Description	Note
$00	(000)	Null Command $00 (reserved) (default/break code for IGX smart profile)	
$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	
$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 SCC-I Slot-1 + Internal ASCII-8K Slot-2	
$13	(019)	Set External Slot-1 + Internal ASCII-16K Slot-2	
$14	(020)	Set Internal SCC-I 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 only)	
$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 CPU Clock Toggles	
$2A	(042)	Unlock CPU Clock Toggles	
$2B	(043)	Lock Video Output Toggles	
$2C	(044)	Unlock Video Output 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 System Reset (Reset Combos & Hard Reset Key)	
$36	(054)	Unlock System Reset (Reset Combos & Hard Reset Key)	
$37	(055)	Lock Internal Mapper Toggle	
$38	(056)	Unlock Internal Mapper Toggle	
$39	(057)	Lock Internal MegaSD Toggle	
$3A	(058)	Unlock Internal 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)	
$51	(081)	Set VGA Scanlines 25%	
$52	(082)	Set VGA Scanlines 50%	
$53	(083)	Set VGA Scanlines 75%	
$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) (default)	
$5B	(091)	Set Sprite Limit 8/8 (force MSX1 screens to use 8 sprites per line)	
$5C	(092)	Set VGA Interlace Single Field (not affected by scanlines) (default)	
$5D	(093)	Set VGA Interlace Duplicate Field	
$7E	(126)	Reserve System Logo ON (warm reset only) [No effect via IPL-ROM]	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 (reserved) (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 for IPL-ROM]	
$D5	(213)	Restore Default Turbo Modes	
$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) (default)	
$FB	(251)	Cold Reset [No effect via IPL-ROM]	
$FC	(252)	Warm Reset w/ Mapper 2048 KB (RAM size 6144 KB if Extra-Mapper is ON) [Only set Mapper via IPL-ROM]	
$FD	(253)	Warm Reset [No effect via IPL-ROM]	
$FE	(254)	Warm Reset w/ Mapper 4096 KB (RAM size 8192 KB if Extra-Mapper is ON) [Only set Mapper via IPL-ROM]	
$FF	(255)	Restore All Defaults + Reserve Default Mapper & MegaSD	

R/W Logic

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

Toggles

Toggle	Control	Note
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	