1. Introduction

This manual describes how to use this board . The chapter structure is as follows.

2. Overview

This is an overview of this board. Please be sure to take a look.

3.Initial setup

It contains instructions for installing this board and installing B IOS .

4.Known issues

This section describes problems that may occur when using this board.

5.Specifications

This page describes the specifications of this board.

6.Functional explanation

This section describes the functions of this board. Please refer to this page for detailed functions regarding the operation of this board, rather than the tutorial-style setup method.

7.Included software

Describes how to use the included software. There is no need to read anything if you follow the tutorial.

8.License

It describes the IP being used .

2. overview

This board is an MSX turboR version upgrade board designed for SONY's MSX2+ (HB-F1XDJ/HB-F1XV.Hereinafter , both will be referred to as X DJ). By removing XDJ's Z80 and installing this board, it is possible to upgrade to the equivalent of

M SX turboR. Bundled items

parts	quantity
MSX turboR version upgrade board	1
40pin IC socket	1

Implementation of this board requires modification of the main body. If the modification fails, the main unit may be irreparably damaged.

Appropriate electrostatic countermeasures are required, the ability to correctly disassemble and assemble the main unit, and the skill to replace the IC on a single-sided board is required.

There are two types of SONY MSX2 + main boards: 1-628-265-11 and 1-628-265-12 . Both HB-F1XDJ/HB-F1XV boards seem to be used.

The model number is written under the sub-board near Z 80 , and the first half is hidden and cannot be seen without removing the sub-board, but the -11 and -12 at the end can be confirmed without removing the sub-board. .

Both versions of this updated board have been confirmed to work.

3.　First time setup

3.1.　Initial setup overview

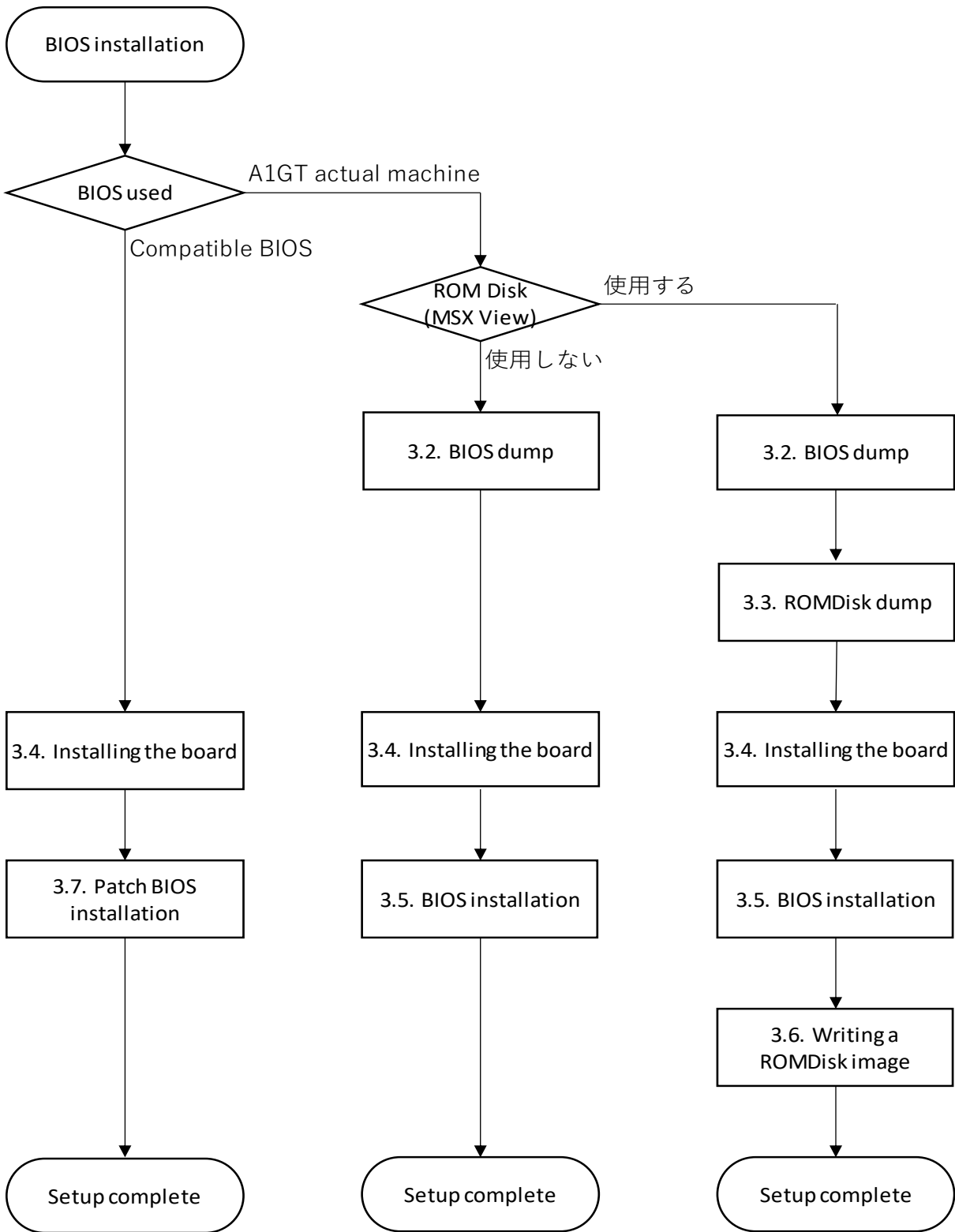requires BIOS installation when used for the first time .

To install the BIOS, you will need a floppy disk (hereinafter referred to as FD) that runs DOS . From now on, if "D OS " is written without any particular distinction , there is no problem with

either D OS1/ D OS2/ Nextor DOS . It is also possible to use large capacity media such as

an SD card interface instead of FD . In addition to the two files essential for starting D OS , please copy the entire set of installer files to the FD .

There are two ways to use the BIOS: patch the XDJ's built-in BIOS and use the BIOS dumped from the FS-A1GT. When using the XDJ built-in BIOS, the following functions cannot be used.

・PCM recording/playback BIOS (immediate return when CALLed)

・PCM recording/playback BASIC

・High-speed mode LED control

・MSX-DOS2 (However, Nextor can be installed)

the next page to complete the setup process , depending on the BIOS you are using .

```
                    ┌─────────────────────┐
                    │  BIOS installation  │
                    └─────────────────────┘
                               │
                               ▼
                          ◇ BIOS used ◇──────── A1GT actual machine ────┐
                               │                                         │
                        Compatible BIOS                                  ▼
                               │                              ◇ ROM Disk      ◇──── 使用する ────┐
                               │                              ◇ (MSX View)    ◇                    │
                               │                                   │                               │
                               │                              使用しない                           │
                               │                                   ▼                               ▼
                               │                          ┌─────────────────┐           ┌─────────────────┐
                               │                          │  3.2. BIOS dump │           │  3.2. BIOS dump │
                               │                          └─────────────────┘           └─────────────────┘
                               │                                   │                               │
                               │                                   │                               ▼
                               │                                   │                     ┌─────────────────┐
                               │                                   │                     │ 3.3. ROMDisk dump│
                               │                                   │                     └─────────────────┘
                               │                                   │                               │
                               ▼                                   ▼                               ▼
                  ┌─────────────────────┐          ┌─────────────────────┐        ┌─────────────────────┐
                  │3.4. Installing the  │          │3.4. Installing the  │        │3.4. Installing the  │
                  │     board           │          │     board           │        │     board           │
                  └─────────────────────┘          └─────────────────────┘        └─────────────────────┘
                               │                               │                              │
                               ▼                               ▼                              ▼
                  ┌─────────────────────┐          ┌─────────────────────┐        ┌─────────────────────┐
                  │ 3.7. Patch BIOS     │          │3.5. BIOS installation│        │3.5. BIOS installation│
                  │      installation   │          └─────────────────────┘        └─────────────────────┘
                  └─────────────────────┘                      │                              │
                               │                               │                              ▼
                               │                               │                    ┌─────────────────────┐
                               │                               │                    │ 3.6. Writing a      │
                               │                               │                    │      ROMDisk image  │
                               │                               │                    └─────────────────────┘
                               ▼                               ▼                              ▼
                  ┌─────────────────────┐          ┌─────────────────────┐        ┌─────────────────────┐
                  │   Setup complete    │          │   Setup complete    │        │   Setup complete    │
                  └─────────────────────┘          └─────────────────────┘        └─────────────────────┘
```

3.2. BIOS dump

Prepare an F D that runs DOS (hereinafter referred to as F D(1)).

Insert FD(1) into A1GT and start DOS.

A>TRDUMPER

Execute .

A file will be created that dumps the BIOS + 12dot font.

Next, put FD(1) into XDJ and start DOS,

A>PATCHER

Execute.

*If this board has already been installed, such as due to re-setup, please start it in M

SX2+ mode. (For M SX2+ mode, please refer to Chapter 6 Functional Description)

3.3. ROMDisk dump

prepare another FD apart from Chapter 3.2 (hereinafter referred to as FD(2)).

Insert FD(2) into A1GT and start DOS.

A>TRDUMPER /V

Execute .

A file will be created that dumps the MSX-View ROMDISK.

next,

A>PATCHER.COM /V

Execute.

3.4. Installing the board

3.4.1. Disassemble the main body

Disassemble it until the main board can be removed.

3.4.2. Removing the Z 80

Remove Z80 . At that time, the blue collective resistor and wire are stuck together in the same hole, so remove them at the same time.

Also, there is a wire connected to pin 6 on the back side, but this is also removed only on the CPU side.

Before removal:
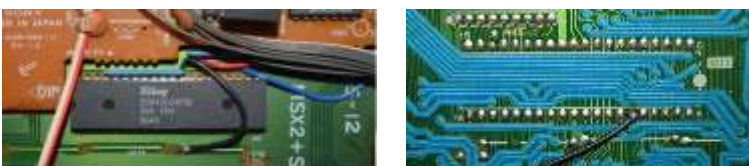
After removal:

3.4.3. Installing the IC socket

Mount the IC socket included in the kit in the location where the Z80 was removed. At this time, be careful not to insert the IC socket all the way in (until it comes into close contact with the main board), otherwise the pattern may peel off later .

All the collective resistors and wires that were removed with Z80 will be moved to the solder side. At that time, install

the collective resistor close to the 1 pin side of Z 80 to avoid interference with R B3 . Also, reattach the wire that was originally attached to the solder side.

After installation, insulate the point where the wire is attached to the collective resistor with polyimide tape, etc. to prevent short circuit with the shield plate.
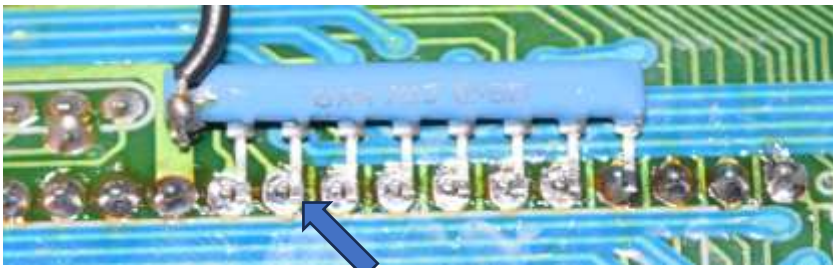
Attach the collective resistance leg to the right side of the Z80 pin (as shown in the image)

Attaching collective resistors and wires

Installing the wire
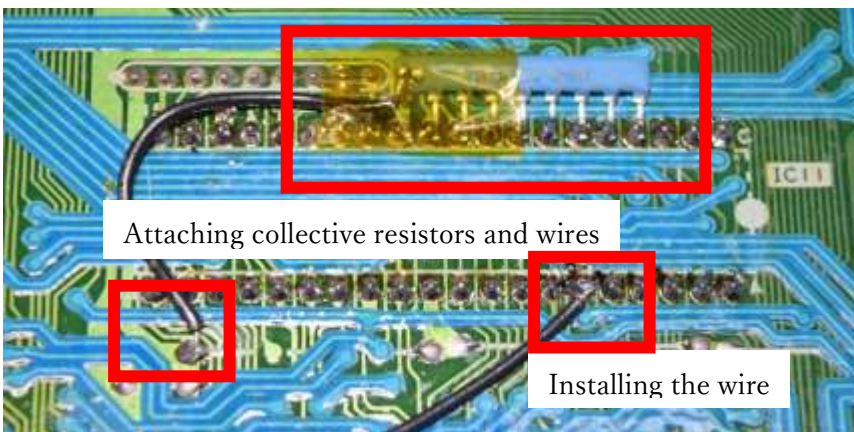
Also, at this time, knock down C

42 next to Z 80 .

3.4.4. Installing the turboR version upgrade board

the turboR version upgrade board with the socket and push it firmly all the way.

If it floats, it may hit the shield plate, causing poor contact and making it unstable.

* There is no need to disable the built-in RAM .

3.4.5. Startup confirmation 1

Before assembling the case, etc., check whether the self-diagnosis starts.

a keyboard, continuous volume control, or FDD.

The speed controller will also work without being connected, but the self-diagnosis speed will be slower, so we recommend connecting it . Although it is not necessary to connect the

L ED board, it is recommended that you connect it just in case, as it allows you to check whether power is being supplied normally.

After connecting X DJ to the monitor , turn on the power and confirm that the self-diagnosis program starts. You can check it even if you connect only the video, but if you also connect the audio, you will also hear the sound.

Once the self-diagnosis program starts without any problems, turn off the power and assemble X DJ. Since the product is inspected before shipping, there is basically no need to wait until the self-diagnosis is completed.

3.4.6. assembly

Assemble as before.

At this time, if you want to connect high-speed mode LED , built-in soft switch, P CM , etc., please do so at the same time. Detailed connection methods are not covered in this manual, so please refer to Chapter 5.5 for connection. The built-in soft switch can be configured from the software configuration, so

it can be used as a built-in software

OFF without installing the built-in soft switch .

3.4.7. Startup confirmation 2

After assembly, please check the startup again.

If the self-diagnosis program starts without any problems , the modification is complete.

3.5. B IOS installation
3.5.1. Start MSX2+ mode

Insert the FD (1) into the XDJ, turn on the power while holding down the reset button, hold down the reset button for more than 5 seconds, and then release it .

If you release the reset, it will boot as MSX2+ without replacing the BIOS (the memory has increased at this point, so you can also use DOS2 or N extor DOS by itself).

3.5.2. Writing BIOS image

Patch B IOS image to B IOS Write to Flash .

A>INIFLAS1

Execute.

3.5.3. Start in turboR mode

After writing is complete, turn off the power and then turn it back on normally (resetting does not change the mode).

*At this time, the DOS2.3 kernel's pseudo-RAM disk devices (such as MEGA-SCSI, which are initialized with KSAVER and MGINST) will not start if the primary mapper is 4MByte, so start up while holding down the DEL key, Please set the RAM capacity to 2048KByte or less.

3.6. Writing a ROMDisk image

Insert FD(2),

A>INIFLAS2

Execute. Writing completed, please reset.

3.7. Patch B IOS installation
3.7.1. Start MSX2+ mode

Insert an FD that runs DOS into the XDJ , turn on the power while holding down the reset button, hold down the reset button for at least 5 seconds, and then release it .

If you release the reset, it will boot as MSX2+ without replacing the BIOS (the memory has increased at this point, so you can also use DOS2 or N extor DOS by itself).

3.7.2. Writing BIOS image

A>EXBIOS < Nextor image file>

Execute. At this time, you can also install

N extor by specifying the N extor ROM image . If you do not specify a Nextor ROM image , D OS2 will not be installed.

See Section

7.4 for information on the distribution location of   REF _Ref158416644 ¥r ¥h Nextor 's ROM images . * If different versions of Nextor coexist in one environment, problems may occur. If you are using it with a Nextor- type external cartridge, we do not recommend installing

Nextor here.

3.7.3. Start in turboR mode

After writing is complete, turn off the power and then turn it back on normally (resetting does not change the

mode).

4. Known issues

The following events have been confirmed at this time. There are no plans to address this issue, so please cover it through operations.

1. Sampling load fails when using O PNA with VGMPLAY

It happens because the IO access is too early, so press IO in the D EL key menu. Please set wait to 2 or more.

2. Luna doesn't work

This cannot be done because the FDC is directly touched .

3. Fake RAM disk system does not work

OS2.3 kernel used when installing the fake RAM disk does not support the 4Mbyte primary mapper. Please obtain the D OS2 kernel again from the turboRized X DJ and reinstall the pseudo RAM disk kernel .

4. MSX-View

the primary mapper exceeds 1MByte . D Set the memory capacity to 1 MB or less using the EL key menu.

5. P AUSE will corrupt the data on the external D RAM cartridge (e.g. SNATCHER)

This cannot be avoided due to the specifications of SONY 's custom chip.

5. specification

5.1. memory map

In turboR mode, the slot map will be as shown below.

	#0-0	#0-1	#0-2	#0-3
0000-3FFFh	MAIN ROM (50000h-57FFFh)	-	-	-
4000-7FFFh		Settings menu/logo （48000h-4BFFFh）	MSX-MUSIC （7C000h-7FFFFh）	MSX-JE with built-in XDJ
8000-BFFFh	-	-	-	
C000-FFFFh	control register See chapter 5.3	-	-	-

	#3-0	#3-1	#3-2	#3-3
0000-3FFFh	DRAM	SUB ROM （700 0 0h-73FFFh）	-	Panasonic mapper
4000-7FFFh		Kanji BASIC （74000h-7BFFFh）	FDC ROM*1 （60000h-6FFFFh）	
8000-BFFFh			-	
C000-FFFFh		-	-	

The address in parentheses is the BIOS Flash address.

*1 7FF8-7FFFh always accesses the XDJ built-in FDC for FDC IO

5.2. BIOS Flash and Panasonic mapper assignment

B IOS Flash and the assignment of Panasonic mapper are as follows.

The file name created with TRDUMPER.COM will be based on the P anasonic mapper, but the B ank specified when writing with F WRITER.COM will be based on the B IOS Flash address.

B IOS Flash address	Panasonic mapper
00_0000h-07_FFFFh	000 h -03F h
08_0000h-09_FFFFh	1 00h-10Fh
0 A_0000h-0F_FFFFh	0 D0h-0FFh , 11 0h-13Fh
10_0000h-13_FFFFh	1 40h-15Fh（＊）
14_0000h-17_FFFFh	0 A0h-0BFh
18_0000h-1F_FFFFh	0 40h-07Fh

0 0_0000h-0F_FFFFh of B IOS Flash corresponds to I C20 of A 1GT actual device , and 1 0_0000h-1F_FFFFh corresponds to I C23 of A1GT actual device .

Areas marked with （＊） are implementations specific to this board. On the actual A 1GT machine, it is assigned to the kanji R OM , and on the actual A 1GT machine , it is not visible from the Panasonic mapper.

## 5.3. control register

Exists in Page 3 of SLOT #0-0 .

address	R W	initial value	Purpose
C000-DFFF	R /W	-	B IOS Flash . Mainly for rewriting.
E000	W	0	B IOS Flash bank . Set the upper address (A20-A13) of B IOS Flash that appears in C000-DFFF .
(*)E001	R /W	0	S PI Flash command (usage not disclosed)
(*)E002[0]	W		S PI CSO (Usage not disclosed)
E003[7:4]	W	F	D RAM capacity mask. Mask address bus A 21-A18 . Therefore, it is almost synonymous with a mask for memory mapper I O.
E003[3:0]	W	-	003[7:4] is valid only when writing F.
E -004	W		Set the V DP wait clock (in 7.16MHz units).
E -005	W		Set the I O wait clock (in 7.16MHz units).
E 006[0]	W		Built-in software Switch settings.
E 006[7]	W		B USREQ mask. Masking disables P AUSE and speed control. However, due to custom chip limitations, it cannot be completely disabled.
E FF0-EFFF	R/ W		S PI Flash access enable. Controls whether or not registers marked with * can be accessed (how to use them is not disclosed).

5.4. weight control

A wait is automatically entered for OPLL access (IO 7Ch/7Dh) .

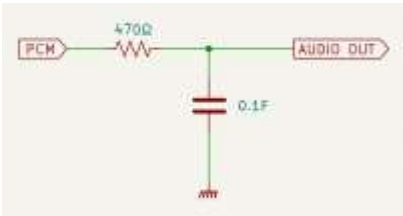| IO address	Number of waits (@7.16MHz)
7C	2 0clk
7D	1 64clk

5.5. expansion terminal
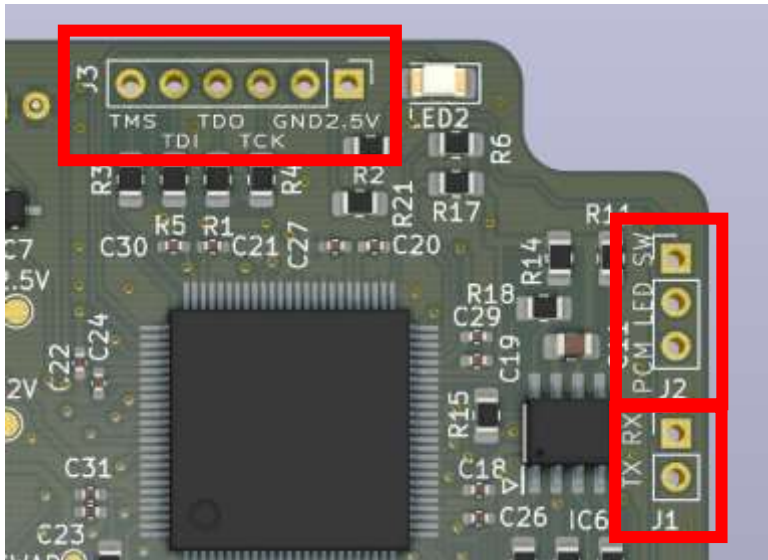
・J1

It is unused.

・J 2 :PCM

3.3V PWM output of PCM . Mix it to the audio output via an appropriate LPF . LPF circuit example:

・J 2: LED

high speed mode LED output . It outputs L (0V) in high speed mode , and outputs H (3.3V) in low speed mode. The current should be 1-2mA or less. It is not 5V tolerant , so please do not connect the anode of the LED to 5V . ・J 2: SW

built-in soft switch input. When opened, the built-in software turns on, and when connected to GND, it turns off.

・J 3 J

TAG terminal for FPGA configuration. Not normally used.

5.6. Flash memory used

・BIOS Flash memory: M29F160FT55N3E2

16Mbit TOP boot

・S PI Flash memory: A T45DB021E-SSHNHC-T

2Mbit 256byte/page

6. Feature Description

6.1. Switching between turboR mode and M SX2+ mode

Turn on the power while holding down the reset button, press and hold for 5 seconds or more, then release to start up in M

SX2+ mode. In MSX2+ mode, the hardware itself actually boots as equivalent to turboR , but since the B IOS ROM is not replaced (XDJ built-in ROM is used), it boots as M

SX2+ . Since the IO device is the same as turboR mode, it is possible to switch CPUs by direct I/ O operation. However, in terms of speed, it is not possible to access the built-in ROM of X DJ , so it is not realistically possible to switch between CPUs . System timers etc. can be used.

6.2. About rewriting Flash memory

This board is equipped with BIOS Flash (for storing BIOS, etc.) and S PI Flash (for storing FPGA configuration). Both can be rewritten using the included software (FWRITER.COM) .

BIOS Flash can be rewritten and used according to the purpose, such as using a modified BIOS or rewriting the ROMDisk image . Even in the unlikely event that rewriting fails and the computer no longer starts, you can recover by starting it in M

SX2+ mode. If the SPI Flash fails to be rewritten or is powered off with incorrect data written , it will not be possible to recover from the M SX , so please do not rewrite it carelessly. A separate Xilinx JTAG download cable is required for recovery . How to use the rewrite IF from the MSX side of SPI Flash is not disclosed.

6.3. Configuration menu

Holding down the D EL key during startup will enter the configuration menu.

MAIN RAM capacity, V DP Wait when R 800 , I O Wait when R 800 , and built - in soft switch status can be set.

6.4. Expansion B ASIC

The following CPU switching instructions are added.

・C ALL Z80
Switch to Z 80 mode

・C ALL RM
Switch to R 800/ROM mode

・C ALL DM
Switch to R 800/DRAM mode

7. Attached software

7.1. TRDUMPER.COM

Dump the

ROM from A 1GT . How to use:

      A>TRDUMPER <option>

option:

      (Not set)   Required B IOS+12dot Dump FONT .

      /V   Dumps ROMDisk (MSX-View) .

      /A   Dumps all ROMs except Kanji ROMs .

If you specify the /A option, the total capacity of the created file will be 2 Mbyte , so you will need an environment that can use large capacity media. There is no split output function.

7.2. P ATCHER.COM

Create a file (

BANKxxx.MOD) by patching the dumped ROM file (BANKxxx.BIN) . How to use:

      A>PATCHER <option>

option:

      (Not configured)   Required B Patch to IOS .

      /V   Patch to ROMDisk (MSX-View) .

7.3. FWRITER.COM

Write to

Flash ROM . How to use:

      A>FWRITER <filename> <option>

option:

      / C n nnn   Writes the specified file to SPI Flash (Note) .

            n nnn sets the file's C RC16 - CCITT .

      / B n n B Writes the specified file to BANK nn of IOS Flash .

            the specified B ANK has not been deleted, it will be deleted automatically.

      / Wnn B Writes the specified file to BANK nn of IOS Flash .

            An error will occur if it has not been erased.

      /E nn   B Erase BANK nn of IOS Flash .

      /F   B Erases the entire IOS Flash area.

      /A   Expand the erase confirmation area.

B ANK is a number assigned every 8KB from the beginning of B IOS Flash . It is different from

P anasonic bank in S LOT #3-3 . For assignment with Panasonic bank , please refer to chapter 5.2 .

/ A option is not specified, only the 8 KB area of the specified B ANK will be checked for deletion. However, since deletion is performed in b lock units of B IOS Flash , the area including the previous and following B ANKs (up to 6 4KB) will be erased. b lock size varies depending on B ANK . Please refer to the B IOS Flash datasheet for details .

/ A option is specified, the erase confirmation target will be the entire 6 4KB aligned area including the specified B ANK . B IOS Flash 's b lock size is not taken into account.

turboR mode, if you erase the area necessary for system operation, the system will run out of control . Therefore, the B IOS ROM area cannot be rewritten except in D RAM mode. Also, the FDC ROM area cannot realistically be rewritten in turboR mode .

If executed with the correct CRC specified in the /C option, the SPI Flash will be rewritten.
the SPI Flash is rewritten with an invalid file or the power is turned off after rewriting has failed, it will not be possible to repair it with the M SX alone, so be careful when rewriting.
If rewriting fails, do not turn off the power and try again until rewriting is successful.
If you turn off the power after rewriting has failed, you will need a
Xilinx compatible JTAG download cable to recover.

7.4. EXBIOS.COM
Patch the B IOS of X DJ and write it to B IOS Flash as turboR compatible B IOS .
You can also install Nextor by specifying the Nextor ROM image .
How to use:

    A>EXBIOS < Nextor image file>
option:

    there is no

Please specify
the N extor image file that can be used as [Standalone ROM with ASCII 8 mapper] distributed at the following site . https://www.konamiman.com/msx/msx-e.html#nextor

7.5. Other files
・INIFLAS1.BAT / BOOTMENU.BIN / INIT.BIN
BIOS installer.

・INIFLAS2.BAT
ROMDisk installer.

・MWP.BAT
M SX-JE / A1GT built-in software installer. However, since there is no execute/cancel key, the built-in software is virtually unusable.

8. license

・T 80: Daniel Wallner/Kazuhiro Tsujikawa
・FZ80:kwhr0(https://github.com/kwhr0/fz80)