

fmsx

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WRITTEN BY		August 4, 2022	

REVISION HISTORY

NUMBER	DATE	DESCRIPTION	NAME

Contents

1	fmsx	1
1.1	"	1
1.2	"	2
1.3	"	3
1.4	"	4
1.5	"	4
1.6	"	4
1.7	"	6
1.8	"	6
1.9	"	7
1.10	"	8
1.11	"	8
1.12	"	9
1.13	"	10
1.14	"	13
1.15	"	13
1.16	"	14
1.17	"	14
1.18	"	15
1.19	"	18
1.20	"	18
1.21	configure	19
1.22	"	19
1.23	"	20
1.24	"	21
1.25	"	22
1.26	"	22
1.27	"	22
1.28	"	23
1.29	"	23

1.30 "	25
1.31 "	25
1.32 "	26
1.33 "	26
1.34 "	27
1.35 "	27

Chapter 1

fmsx

1.1 "

fMSX Amiga 0.7

© 1994 by Marat Fayzullin.

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General information

Introduction to fMSX

Disclaimer

About MSX

Copyright notice

Notes from the author (v0.7)
Installation and usage

Installation

Running fMSX

The control window

The preferences window

The menu bar

Using different ROMs

Using MSX diskdrives

Quitting the emulator

Configuring your MSX
Technical information

System requirements
Using the Amiga hardware
High-speed mode
Program information

Bugs and restrictions

Future plans
History

Problems?

Where to find MSX software
Why are the icons so ugly?
How do I load... ?
When MSX software fails to run
Miscellaneous

How to obtain new versions
About comp.sys.msx
About the authors
About RAMSX:
About AmiMSX
Thanks

1.2 "

Introduction to fMSX

fMSX stands for Fast MSX, and that's what it is: a reasonably speedy emulation of the
MSX
computer system.

It was originally programmed by
Marat Fayzullin
as a generic MSX
emulator - that means that it can be compiled on any machine, in any environment! To reach this goal he programmed fMSX in C code, resulting in a program that runs on UNIX machines, PCs, Macs, and

of course Amigas.

At some point I (Hans Guijt) offered to rewrite the screen drivers for the Amiga, and Marat accepted this offer. I received the sources and went to work.

The first thing I noticed was that the emulation was exceptionally slow! This is okay for a fast UNIX workstation, but most Amiga's are low-end, and the emulation would be next to useless in such an environment.

The solution seemed easy: just rewrite the Z80 emulation in optimized 68020 assembler code (easier said than done!). The results were spectacular. A short BASIC program was selected as the benchmark:

```
10 FORT=1T010000
20 NEXTT
```

Machine	Time
A4000/30	94 seconds (fMSX 0.3, original version)
Sun Sparc 2	86 seconds (fMSX 0.4, UNIX version)
Sun Tatung	43 seconds (fMSX 0.4, UNIX version)
a4000/30	22 seconds (fMSX 0.3, modified version)
VG-8235 MSX2	
	21 seconds
a4000/40	15 seconds (fMSX Amiga 0.2, standard settings)
a4000/40 (warp 4040)	9 seconds (fMSX 0.3, modified)
MSX Turbo-R/RAM mode	
	6 seconds

Note that this chart is not particularly valid anymore. The Z80 emulation in fMSX v0.7 was rewritten almost from scratch, causing incredible speedups in some operations (bankswitching and memory mapping) and some slowdown in others (memory reads/writes).

The end result is that BASIC programs run quite a bit slower (BASIC is fairly memory intensive), but games run faster (and that's what counts).

1.3 "

The Philips VG-8235 MSX2

This is my own MSX machine. It is from 1985, and is equipped with a single sided 3.5" diskdrive. It is an MSX2 machine, but unfortunately the VDP (video chip) is broken, so I lose half the screen once the machine starts to get warm.

I have bought a new machine! It is a Sanyo PHC-70FD, which is an MSX2+ machine with several nice features:

- 256KB RAM (expanded from the original 64KB)
- Numeric keypad
- Joystick autofire control
- Double-sided diskdrive, which is turned to the front of the machine (rather than the side as is usual on many other machines)
- Pause button
- Built-in FM Pac

As an added 'bonus', it is equipped with a Japanese keyboard! That means that every key carries four or five different symbols, including the European glyphs.

1.4 "

The MSX Turbo-R

The newest MSX system, the Turbo-R is equipped with a very fast CPU: the R800, which is comparable to a Z80/28MHz. It can do multiplications faster than the 68030 in my a4000!

The Turbo-R has a slow ROM system, and the designers made it possible to copy ROM to RAM and use that instead. In the speed test this method was used.

1.5 "

Disclaimer

THIS SOFTWARE IS PROVIDED AS-IS. NEITHER
AUTHOR
WILL BE HELD RESPONSIBLE
FOR ANYTHING IT DOES, WHETHER RIGHT OR WRONG, GOOD OR EVIL, LAWFUL OR
CHAOTIC. RUN AT YOUR OWN RISK!

1.6 "

The MSX system

The MSX originally came out in 1983, with the intention to create a low-cost low-performance all-compatible computer system (a gap that is now filled by the PC, ironic when you consider what MSX stands for):

MicroSoft eXtended

which means that it is an enhanced version of earlier Microsoft products, notably their BASIC and DOS (that's right, MS-DOS!).

The MSX1 standard

Among other things, the MSX standard specifies that machines should have

at least a Z80/3.5Mhz, 16KB RAM (although most machines had 64KB RAM), 16KB video RAM, and the MSX ROM's. Graphics, produced by the v9918, are functional:

screenmode	resolution	colors
0	40*24 characters	2
1	32*24 characters	16 (with restrictions)
2	256*192 pixels	16 (with restrictions)
3	64*48 pixels	16

In addition, screens 1-3 can have single-colored sprites, either 8*8 or 16*16, either at normal size or enlarged.

Sound is delivered by the AY-3-8912, a three-channel sound chip also used in the Spectrum 128K and the Atari ST.

One thing that sets MSX machines apart from other comparable systems is the ability to run cartridge software - most machines can, but for MSX the system was very popular. Although I have never seen one, it should be possible to build an MSX console.

Another unique feature is the popularity in both Japan and western Europe. This resulted in a software catalogue filled with the best of both worlds, a feature that always attracted me to the system.

Finally, it must be mentioned that MSX is not the product of a single manufacturer. Instead, MSX is a minimum standard decided upon by ASCII corporation, with individual manufacturers licensing and adding to the system, much like 3D0 today.

There have been over 40 MSX manufacturers, and MSX machines were manufactured by Daewoo in Korea after Commodore went broke in 1994!

The MSX2 standard

In 1985 the MSX2 came out, which sported several large improvements. The most remarkable is the graphics, provided by the v9938; it offers all the MSX1 modes, and several others:

screenmode	resolution	colors
0+	80*26.5 characters	4
4	256*192 pixels	16 (with restrictions)
5	256*212 pixels	16
6	512*212 pixels	4
7	512*212 pixels	16
8	256*212 pixels	256

Other improvements to the graphics include an enhanced sprite system, which allowed for more sprites with more colors, a color palette of 512 colors, support for genlocking and digitizing, smooth vertical scroll, and a built-in blitter which can do almost anything the Amiga blitter can, and more.

The rest of the system had been updated as well. MSX2 machines are equipped with at least 64KB RAM (128KB and 256KB are more common configurations), 128KB video RAM, and usually a 3.5" diskdrive.

The MSX system uses exactly the same disk layout as MS-DOS. In fact, CrossDos can be used to read/write MSX disks, even single sided ones (my compliments to the authors for that), while modern PC's have lost that ability!

MSX2+, MSX Turbo-R

These are newer versions of the MSX system. New features include better graphics (the MSX2+ VDP is capable of displaying 19268 colors at once on screen), and a faster processor (the Turbo-R has an R800 CPU, comparable to a Z80/28MHz).

This document used to say they were not on the list for emulation. Today I'm not so sure - if it is remotely possible to run Illusion City on fMSX I will do it.

1.7 "

COPYRIGHT

The following notice is taken from fMSX UNIX. It applies mostly to fMSX Amiga as well.

fMSX is publicly supported freeware. Its sources are on the net, and you can modify them as long as you notify me about modifications. You can't use fMSX for commercial purposes though. If you want to market anything based on fMSX source or executables, contact me please.

The 'me' referred to here is either

Hans
(for the Amiga version) or
Marat
for any other version.

The notice is incorrect in that I do not regularly upload fMSX sources for the Amiga version to any public place. However, if you are interested, you can obtain them by mailing to me.

If your conscience does not allow you to work with software you did not pay for, neither author refuses gifts, money or postcards. I'd appreciate it very much if you were to send me email!

1.8 "

Notes from the author

Hi everybody!

It's been a long time. I tried (unsuccessfully) to implement the MSX2 VDP using the Amiga blitter, but in the end this turned out to be too problematic without much notable gain. I scrapped this implementation, and went for a slightly easier solution.

What do you get in this version?

Support for two joysticks! Pressing right Amiga-J in the emulation screen toggles between mouse and joystick.

Greater speed. Smarter Z80 emulation partially accounts for this, and enhanced graphics routines do the rest.

Less bugs. This is somewhat conditional: MSX1 emulation is more stable, but the dreaded 'die when you leave highspeed mode' bug is still there. One person reports that pressing left Amiga-N before leaving highspeed mode helps slightly.

Finally, reasonably MSX2 support. At least some MSX2 games work with this version, including Firebird, King's Valley 2 MSX2, Metal Gear and Vampire Killer. Some games seem to run but fail to produce graphics (this only makes it more interesting for some hardened gamers). Other games completely lock up the Amiga - this is obviously very wrong and will be addresses in future versions.

For now, if you want to experiment with MSX2 games, the best thing is to run fMSX *without* important stuff in the background.

Also note that sprites still look rather weird in screen 5. A real MSX2 does a better job of them, and so will fMSX in the next version.

For the next version I intend to speed up screen 5 emulation and possibly add emulation code for screens 4, 7 and 8. Double buffering the OS-friendly screenmodes is also on my wishlist (this is necessary for playing Firebird alias Flicker City). Highspeed modes are already double buffered, by the way.

You will find the current version uses 256Kb more fast RAM than the previous version. This cannot be helped, and is probably not too problematic for most people. A bigger problem is that double buffering for the next version will drive up the chip RAM requirements. How many people out there have only 512Kb of chip RAM?

I also included some icons for some megaroms, with my favorite settings. The promised mountlist is also in the archive this time.

Hans

PS. Somebody tell me, is there anyone out there reading this?

1.9 "

Installation

No specific installation procedure is required, just drag the directory containing fMSX to some place of your liking.

To run cartridge images from the Workbench

Many games come with pre-made icons. These icons require that fMSX: is assigned to the directory where you installed fMSX.

1.10 "

System requirements

Required are:

- Amiga OS 2.0
- 68020 processor
- 400 kilobytes chip ram
- 900 kilobytes other ram

Recommended:

- 68030 processor, at least 25MHz
- Those 900 kilobytes of 'other' ram had better be fast ram!

If you want to use MSX disks, you will need to have CrossDos or similar installed.

This program was developed using:

- An a4000/30 with 6Mb RAM and 260Mb HD
- SAS/C 6.51
- GenAm 3.02
- TurboText 2.0

1.11 "

Running the emulator

From the shell

Type fMSX to start the program. It is possible to load a cartridge file by typing fMSX <ROM-NAME>, which will load the specified cartridge. A full pathname may be used when specifying the cartridge.

From workbench

Double click on the fMSX icon to start the emulator without loading any cartridges.

Loading a cartridge is accomplished by double-clicking it. Note that the included game icon requires the directory fMSX: to be assigned to the directory where the emulator resides. You will need the shell to create this assign.

Restrictions

As an MSX1 emulator fMSX Amiga is fairly complete. However, most of the MSX2 features are still missing! Currently supported are screens 5 and 6 (partially), vertical scroll, some blitter commands. Not supported is the rest: line interrupts, screen positioning, screens 7 and 8, MSX2 sprites.

The following sort of software will run:

- Standard ROMs (16KB or 32KB)
- MegaROMs (128KB or bigger)

These are not physical cartridges, but copies that are stored on the harddisk of your Amiga. They can be obtained from several

FTP
sites.

- Disk-based games

These are also available through

FTP
, from the same sites.

The following sort of software will not run:

- MSX tape

Actually, if someone else does a good MSX tape -> Amiga disk conversion program I'm willing to give it a try. Write to me for further discussion if you think this is a nice project!

1.12 "

The control window

The emulator can be controlled from a control window on the workbench screen. This window gives you the following options:

Refresh cycle

This sets the number of times the emulation causes an interrupt before the screen is redrawn. If the refresh cycle is very low the emulation runs smooth and slow. If the refresh cycle is high it runs faster but also less smooth. Try to experiment with what works best for a particular game. Usually a value of about 3 gives good results.

This value is ignored when running in
high-speed mode

.

Interrupt period

This controls the number of operations between interrupts. In interrupt driven games, setting this to a low number speeds the game up, while high numbers slow it down. If the program you run does most of its work outside the interrupt, setting it to a low number may actually slow things down.

In addition to this, the emulator waits for at least 1/50th of a second before issuing an interrupt.

CAUTION: if this number is set too low, it may crash the MSX. Try again with a larger number. A value of 1500 should always be safe.

Again, experiment for the best results. I recommend a value of 1500 when running BASIC, and 800 when running games.

Cartridge 1

Here you can specify the name of a cartridge file. It will be loaded and executed when you reset the MSX.

ROM type

This button specifies the memory mapping method that will be used for the current MegaROM. If this value is not set correctly the MegaROM will certainly not run!

If you do not know the correct setting for a MegaROM you have no option but to try them all.

Load

This button calls up a filerequester which you can use to select a cartridge file. The cartridge file is loaded when you reset the MSX.

Lock drives

If this button has been checked the emulation can access the drive, but the Amiga is locked out. Similarly, if it is not checked, the Amiga can access the drive but the MSX cannot.

Running / Paused

If you need every last cycle your machine can provide, but are unwilling to quit fMSX because you just reached level 48 of Tetris, you can pause and restart the emulation with these buttons. When it is paused it takes absolutely no CPU time.

Reset

This button resets the MSX. It is necessary to reset the MSX for some settings to take effect.

Preferences

This button opens the
preferences window

.

1.13 "

The preferences window

This window allows you to specify several more settings for the emulation. Preferences are saved when the emulation is quitted.

Device A: and B:

In these gadgets you have to specify which Amiga device is used for emulation of MSX drives A: and B:. Normally these would be PC0: and PC1:, but you can also create an MS-DOS compatible hardfile or ramdisk and use it instead.

The device you specify must have certain properties, among which are:

- It must have a blocksize of 512.
- It must have a low-cyl of 0.
- It must have a high-cyl of 79.
- It must have 9 blocks per track.
- It must be a real device, no assign or volume.
- It must be mounted.

It is not necessary to fill in a value in these gadgets, but if you don't you cannot use the corresponding MSX drive. Also note that these settings take effect only when you reset the MSX.

An example of a RAM-based device with correct settings is provided in the archive.

Drives

With this gadget you can specify the amount of drives connected to the MSX. Note that two drives need more MSX memory than one drive. Some games will not run if you have two drives connected due to memory shortage.

This setting only takes effect when you reset the MSX.

Videomode

With this gadget you can set the video mode of the MSX screen. There are four options:

- PAL: always force the screenmode into PAL. This means (among other things) that MSX interrupts are issued 50 times per second.
- NTSC: always force the screenmode into NTSC. Although I have a PAL machine I use NTSC mode for fMSX, because the screen is bigger and interrupts are issued faster (causing the music to run faster as well!).
- Amiga: use the same screenmode as the workbench of your Amiga uses. This option is meant for those people with 30KHz monitors.
- MSX: an MSX2 has PAL/NTSC selection just like the Amiga. This option causes the emulation to choose the same video mode as the MSX.

This setting takes effect when the MSX screenmode changes.

Soundmode

With this gadget you can select between PSG and SCC sound. SCC is a sound chip used in some Konami games. It provides far better sound than the PSG.

Games that support SCC sound can easily be recognized by the following features:

- The game is produced by Konami.
- It is a ROM of 128KB or bigger (only exception to this: S.D. Snatcher).
- PSG sound consists of nothing more than beeps and clicks.

Examples of games that support SCC sound are:

Salamander
Nemesis 2
Nemesis 3
King's Valley 2
F1 Spirit (not that it works with fMSX Amiga or anything...)

And MSX2 games:

Space Manbow
Metal Gear 2
Quarth
Gryzor
King's Valley 2 MSX2

Note that SCC emulation is incomplete; it should emulate 5 SCC channels and the entire PSG chip, rather than just 4 SCC channels. I'm working on a channel mixing procedure that will play all channels from both chips at the same time.

Memory

With this gadget you can select the amount of memory the emulated MSX uses. Note that the amount of free BASIC memory is constant (about 23KB), no matter how big a number you put here. The biggest you will ever need is the 512KB setting. The other settings are provided to let you boast about the amount of memory your MSX can use ;-). And remember, this is for only one memory mapper! A real MSX can use 14 of the buggers!

MSX2 enabled

Enables / disables MSX2 features.

Allow external ROMs

If turned on fMSX will first look on disk for ROM files, otherwise it will use the internal ROMs. Note that internal ROMs are always used when no external ROMs are available.

Quick inactive

This cryptically named option does the following: when it is turned on, and the MSX window is deselected, the emulator will no longer redraw the MSX screen. On most games this means that the music suddenly runs at normal speeds, thus turning fMSX into a music playing system!

Save preferences

When turned on, fMSX preferences are saved when the program ends. When turned off it is necessary to save preferences by hand, using the menu option Project/Save preferences.

1.14 "

The menu bar

Project/About...

Calls up the 'about' requester.

Project/Save preferences

Saves fMSX preferences. Preferences are saved to the file fmsx.prefs in the directory containing the program.

Project/Quit

Quits the program.

Cartridge/Open...

Brings up a filerequester where you can choose a cartridge file for use in the cartridge slot. The cartridge is loaded when you reset the MSX.

Cartridge/Save config

Saves several settings in the icon of the current cartridge. If the cartridge does not have an icon, the fmsx_rom.info icon (in the program directory) is used. If this icon does not exist either, no information is saved.

You can also edit the
icon
manually.

Write bootblock

The MSX cannot boot from disks that have a PC bootblock. With these menu options you can write an MSX bootblock to one of the MSX drives.

CAUTION: some games have their own bootblocks. Overwriting them will kill the game.

1.15 "

Icon tooltypes

The optimal settings for a cartridge can be stored in its icon. To find out what each tooltype means, read the section about the control window

Currently the following tooltypes are supported:

REFRESHCYCLE=value

Legal values are 1 to 10.

INTERRUPTPERIOD=value

Legal values are 0 to 5000.

ROMTYPE=value

Legal values are 0 to 5. These values mean, in order: SCC 1, Konami 1, ASCII 1, ASCII 2, SCC 2, and Konami 2.

SOUNDMODE=value

Legal values are 0 and 1. 0 selects PSG sound, while 1 selects SCC sound.

1.16 "

Using different ROMs

fMSX has built-in ROMs, but it is possible to use different ones. To use different MSX1 ROMs: place a file containing BIOS and BASIC in the same directory as the program itself. The file must be named MSX.ROM.

Using MSX2 ROMs works the same, but requires two files: MSX2.ROM (BIOS and BASIC), and MSX2EXT.ROM (the SUBROM).

You must also turn on external ROMs in the preferences window.

1.17 "

Using MSX diskdrives

The MSX disk system is an extension of the original MS-DOS disk system. Anything you know about MS-DOS probably applies to MSX as well. This section gives a short overview of features.

MSX filenames, like MS-DOS filenames, are very limited: they have a maximum length of eight characters, followed by a three-character extension. In addition, no lower-case characters or spaces are allowed.

The number of files on a disk is limited to 112. To make matters worse,

subdirectories are not supported by MSX.

There are two wildcards: * and ?. These correspond to the Amiga wildcards #? and ?.

Examples:

```
*.*    Everything
*.BAS  All files with extension .BAS
GAME*. * All files starting with GAME
*.B??  All files that have a B as the first part of the extension.
```

fMSX Amiga supports up to two diskdrives. The MSX calls these drives A: and B:.

There are two ways of dealing with disks on the MSX: by using
MSX-DOS
and from
BASIC
.

1.18 "

About MSX-DOS

MSX-DOS is a control program for the MSX which is based on the very first version of MS-DOS. It is required if you want to use some MSX programs, and it can be useful if you want to perform certain floppy operations. It is close enough to CP/M that some CP/M programs run on it; many others only require minor modifications to run.

MSX programs that require MSX-DOS can easily be recognized by their filename. Programs that end in .BAT are MSX-DOS script files; programs that end in .COM are MSX-DOS executables. Both types can be started by typing the filename (without the extension) after the prompt.

Getting started

To run MSX-DOS you need three things: an MSX-formatted floppy, and the programs MSXDOS.SYS and COMMAND.COM. Obtaining an MSX-formatted floppy is easy: any 720KB PC floppy will do.

Step 1: Find, buy, or format a PC floppy. Assuming you have CrossDos installed this can easily be done from your workbench.

Step 2: Open the Preferences window by clicking on the Preferences button, and check that the Drives button is set to 1 or 2. If it isn't, change the setting and reset fMSX by clicking the Reset button in the Control window.

Step 3: Convert the disk to MSX format by selecting the menu option Write bootblock (for the appropriate device).

Step 4: Copy MSXDOS.SYS and COMMAND.COM to this floppy.

Step 5: Reset fMSX by clicking the Reset button.

Step 6: Wait until MSX-DOS has booted. One of the first things you'll see is the prompt, which looks like this: A>

When MSX-DOS boots it looks for a file called AUTOEXEC.BAT. This is a script file that is executed automatically if found.

Complete overview of commands

Each command is followed by one or more examples. The lines between square brackets represent BASIC equivalents for the MSX-DOS examples.

BASIC

Quits MSX-DOS and returns you to the BASIC interpreter. From there you can type CALL SYSTEM or _SYSTEM to go back to MSX-DOS. Note: this doesn't work if you didn't originally boot from an MSX-DOS disk.

Examples:

```
A>BASIC      (starts BASIC)
[CALL SYSTEM] or [_SYSTEM]
A>BASIC start.bas (starts BASIC and runs the BASIC program start.bas)
[no equivalent]
```

COPY

Copies one or more files.

Examples:

```
A>COPY A:*. * B:      (copies all files from drive A: to drive B:)
[COPY "A:*. *" TO "B:"]
A>COPY MSX.TXT PRN    (copies the file msg.txt to the printer)
[COPY "MSX.TXT" TO "PRN"]
```

DATE

Shows the date. Optionally you can also change it.

Examples:

```
A>DATE      (shows the current date)
[GETDATE A$ : PRINT A$] (requires MSX2 BASIC)
```

DEL

Removes a file from disk.

Examples:

```
A>DEL *.*    (removes all files)
[KILL "*.*"]
```

DIR

Shows the contents of a disk.

Examples:

```
A>DIR *.BAS    (shows all files with extension .BAS)
[FILES "*.BAS"]
A>DIR /P      (shows all files, pausing after every page of output)
[no equivalent]
A>DIR /W      (shows all files in shortened format)
[FILES]
```

ERASE

Same as DEL.

FORMAT

Allows you to format a disk. Not supported by fMSX Amiga, you'll have to format a disk from the workbench instead. Don't forget to write an MSX bootblock to it.

MODE

Change the width of the screen.

Examples:

```
A>MODE 40      (turns on 40-column mode)
[WIDTH 40]
```

PAUSE

Puts the text Strike any key when ready... on the screen and waits until any key has been struck. It can also print an extra message.

Examples:

```
A>PAUSE        (waits until a key has been struck)
[no equivalent]
A>PAUSE Message (prints Message on screen and waits)
[no equivalent]
```

REM

Does nothing at all. If any text follows the REM statement it is printed on screen.

Examples:

```
A>REM Message  (prints Message)
[no equivalent]
```

REN

Renames one or more files.

Examples:

```
A>REN *.LDR *.BAS (changes all .LDR extensions to .BAS extensions)
[NAME "*.LDR" AS "*.BAS"]
```

RENAME

Same as REN.

TIME

Shows the time. Optionally you can also change it.

Examples:

```
A>TIME          (shows the current time)
[GETTIME A$ : PRINT A$] (requires MSX2 BASIC)
```

TYPE

Prints the contents of a file on the screen.

Examples:

```
A>TYPE MSG.TXT  (shows the contents of MSG.TXT)
[COPY "MSG.TXT" TO "CON"]
```

VERIFY

Turns on verification mode. This command is actually ignored by MSX.

Examples:

```
A>VERIFY ON      (turns verification on)
[no equivalent]
A>VERIFY OFF     (turns verification off)
[no equivalent]
```

1.19 "

Using the drives from BASIC

Unlike MSX-DOS, BASIC enforces no filenaming conventions for executables or other kinds of files. However, some guidelines exist:

Files ending in .BAS are BASIC files. There are several ways to load them:

```
LOAD "FILENAME.BAS"      (loads the file)
LOAD "FILENAME.BAS",R    (loads the file and executes it)
RUN "FILENAME.BAS"       (loads the file and executes it)
```

If you want to save a BASIC file you can use this:

```
SAVE "FILENAME.BAS"
```

Files ending in .BIN are executable files. There is only one way to load them:

```
BLOAD "FILENAME.BIN",R   (loads the file and executes it)
```

Files ending in .BAT or .COM are files that can only be used from
MSX-DOS

.

If the file you want to load has another kind of extension, try experimenting with it. The MSX will tell you if you did something wrong.

There is one file that has special significance to MSX-BASIC. This file is called AUTOEXEC.BAS and is executed automatically during the boot sequence.

The section about

MSX-DOS

contains BASIC equivalents for some MSX-DOS

statements.

1.20 "

Quitting the emulator

There are two ways to quit the emulator: select Quit from the menu, or

close the control window.

If the option 'Save preferences' is activated, quitting the emulator also causes it to write many current settings to disk. These values are automatically reloaded the next time you run the program.

1.21 configure

Configuring your MSX

A real MSX2 has a small amount of battery-backed RAM, which is used to store (among other things) information about your preferred working environment.

The following commands are used to customize the environment:

SCREEN n

Sets the desired screenmode. n can be 0 or 1.

WIDTH n

Selects the amount of columns of text displayed on screen. Valid values for n are 80 or less for screen 0, and 32 or less for screen 1.

COLOR fore,back,border

Selects foreground, background, and border colors. Screen 0 does not support border colors - one of the many weird features of the MSX2 VDP. Colors range from 0 to 15.

KEY [ON|OFF]

Turns the function key list underneath the screen on or off.

SET SCREEN

Stores the current settings in battery backed RAM. fMSX actually keeps a copy of these values on disk, in the file fmsx.prefs.

1.22 "

Using the Amiga hardware

Keyboard

Keys are directly mapped to their MSX equivalents, which means that the MSX ROMs determine what character results from a key press. The ROMs that come with this version of fMSX Amiga give you an American keymap.

Some keys that may not be obvious:

Amiga key	MSX key
F6	select
F7	stop
F8	clear/home
F9	insert
F10/delete	delete
left alt	graphics
right alt	code

The following Amiga keys do nothing at all:

- Both Amiga keys.
- The keys on the numeric keypad.
- The extra international keys found on some keyboards.

The HELP key switches between system-friendly and
high-speed mode

.

Joystick

The emulator can use two Amiga joysticks. The second joystick is activated by pressing Amiga-J while in the emulation screen. Press Amiga-J again to get the mouse back.

Joysticks with two buttons are very common with MSX systems, and many games take advantage of the second button. Often there is a keyboard equivalent for the second button; Konami games use 'M' and 'N' for this.

Video

The emulator should run fine on any Amiga screen, including PAL, NTSC, and any graphics card that supports workbench emulation. This has been confirmed to work with at least the Retina card.

The

high-speed mode

will certainly not work with a graphics card, and may in fact require a 15KHz mode to be active. Without a 30KHz monitor it's hard to be sure :-(.

Clock

MSX2 machines have a built-in battery-backed clock. The emulator substitutes the Amiga clock for this clock.

Diskdrives

MSX disk drives are emulated as Amiga devices. Read the section about

diskdrives

for more information.

1.23 "

High-speed mode

fMSX Amiga is written with an eye towards system-friendliness. This has the unfortunate drawback that it is at times impossible to tap the full potential of the Amiga. In order to show what is **really** possible with the Amiga custom chips, a new way to refresh the screen was added to fMSX Amiga: high-speed mode.

In high-speed mode the copper controls the blitter, which refreshes the screen every second frame. As far as I am aware there is no way to do this in a system-supported way, which means that some typical Amiga features are disabled as long as high-speed mode is active.

Disabled features

The following features are disabled during high-speed mode:

- Screen dragging.
- Screen switching.

In addition, the blitter is locked up all the time, which may cause other tasks to be put on hold as long as high-speed mode is active.

Enabled features

All other Amiga OS functions remain enabled during high-speed mode, including multitasking.

Highspeed mode is activated with the HELP key. Pressing HELP a second time returns the program to its normal mode of operation.

Not all screenmodes support highspeed mode.

1.24 "

Bugs and restrictions

Z80 emulation

- All instructions except the illegal ones from the XDCB group are emulated.

Video emulation

- Screens 4, 7 & 8 are not yet emulated.
- Sprites in screen 5 are generally the wrong color, and screen 6 doesn't have any sprites yet.
- Line interrupts don't work.

Sound emulation

- SCC emulation is only 4 channels rather than 5 + PSG.

General

- fMSX does not work well with MCP. I do not know if this is the fault of fMSX or MCP, but consider this: when MCP is running the following programs don't work either: AdPro, Font (the preferences program),

- MUI-prefs, and MCP-prefs (!). This is NOT on the list for repairs.
- One person consistently reports problems with Amiga sprites cluttering his screen. If you experience the same problem please write to me.
 - One person sees his machine crash every time he returns to OS-friendly mode. Again, if you experience the same problem please write to me.

If you find any more bugs, please report them to the authors

.

1.25 "

Future plans

Shortish term

- Remove everything mentioned in the Bugs section.
- Expand available MSX2 features.

Longer term

- Support the FM-PAC.
- Support MSX2+ and MSX Turbo-R

1.26 "

Where to find MSX software

MSX software is available through FTP from the following sites:

Site:	Directory:
altair.komkon.com	/pub/MSX/
ftp.saitama-u.ac.jp	/pub/msx/
ftp.funet.fi	/pub/msx/
riaph.irkutsk.su	/pub/

MSX software is also available via WWW:

Site:
<http://grelb.src.gla.ac.uk:8000/~webster/msx>
<http://www.cs.umd.edu/users/fms/>

1.27 "

Why are the icons so ugly?

There are two possible reasons.

The first is that your Workbench palette is different from mine. If you want to see what the icons should look like, set your Workbench to 8 colors, and use the following palette:

```
color #0-3: standard Commodore colors
color #4: full red
color #5: - (unused)
color #6: full blue
color #7: - (unused)
```

The second reason is that I am a crap artist. Feel free to draw nicer icons, if you like. And *SEND ME A COPY*!

1.28 "

How do I load... ?

A filename consists of eight characters, followed by a dot and another three characters. The last three characters are called the extension. The extension generally tells you how to load a file. So, if the filename is...

xxx.BAT or xxx.COM

Go to

MSX-DOS
and type xxx.

xxx.BAS

Try the following: in BASIC, type RUN "xxx.BAS". If it responds with an error message it isn't a BASIC file, try loading it as an executable file.

xxx.BIN

Try the following: in BASIC, type BLOAD "xxx.BIN",R. If it responds with an error message it isn't an executable file, try loading it as a BASIC file.

any other

Try loading it as either a BASIC file or an executable file.

If none of these work, it is a file that is part of another program, in which case it can only be loaded by that program.

1.29 "

When MSX software fails to run...

Note: many tricks described here require a reboot before they take effect.

Try a higher interrupt period

Some games perform lots of processing between every two interrupts, and the emulated Z80 may not be able to keep up (this is especially true for graphically intensive operations). If interrupts happen too early this may

cause the MSX to crash or behave erratically.

Setting the interrupt period to a higher value causes the emulated Z80 to perform at least a certain number of instructions between two interrupts. This means that the game will run slower, but there is also a better chance of it working at all.

A good example of a game that needs a higher interrupt period is Maze of Galious.

The amount of instructions executed cannot easily be determined, but is normally about five times higher than the interrupt period.

Although it is possible to enter values as high as 5000 it is not normally necessary to go above 1500. Note that you do not need to reboot for this setting to take effect.

Use less drives

Every drive costs a bit of BASIC memory. Many games will not run when more than one drive is present, because the BASIC loader can run out of memory. Turning off the second drive (using the appropriate gadget in the preference window) may help. Allocating more memory to the MSX will not help, this does not increase BASIC memory at all. Such are the wonders of the MSX memory architecture...

Use more memory

Some games require an MSX device called a memory mapper to be installed. 98% of all programs will feel at home on a 256Kb mapper, and the rest will run fine with 512Kb. The amount of memory used by the memory mapper can be selected in the preferences window.

Poking address -1 doesn't help

The mythical address -1, aka 65535, aka &hFFFF, is used by a real MSX for secondary slot selection. fMSX Amiga supports nor needs secondary slots, therefore pokes to this address are ignored. This is a real feature, ask almost any MSX2 owner ;-)

Use MSX1 ROMs

Some MSX1 games do not properly turn off MSX2 features, causing garbage to appear on the screen (shades of ECS vs. AGA here?). Disable MSX2 in the preference window and see if the problem disappears.

Try hacking with BASIC

If all this doesn't help there is still a whole bag of BASIC tricks left to try. Some of the following might do it - then again, it might not:

```
POKE &hFD9F,201
```

This turns off disk interrupt processing. On a real MSX this means the drive engine never stops (this is regulated through this interrupt) but fMSX controls the drive engine on its own.

```
CLEAR 0
```

This frees up extra BASIC memory.

```
MAXFILES = 0
```

This frees up extra BASIC memory.

```
Get the next release
```

fMSX Amiga is still under development. I try to have better compatibility with each new release. If something doesn't work and isn't listed in the

bugs

section send me a report and I'll see what I can do.

1.30 "

How to obtain new versions

New versions of fMSX Amiga will be distributed in three ways: one copy will be uploaded to Aminet, another to the webpage of

Marat Fayzullin

and finally a copy will be mailed to everybody on the fMSX Amiga distribution list. If you want to be placed on this list (or removed from it) simply send mail to

```
h.guijt@inter.nl.net
```

stating what you want. If you have mailed me in the past with questions about fMSX you have automatically been placed on the list; I apologize if you did not intend to receive new versions of fMSX. If you asked to be on the list but aren't, try mailing me again. I am not a mail-demon, and I occasionally misplace mail messages.

You do not need to fear being swamped by mail; there is usually a few months between each successive version of the emulator.

1.31 "

About comp.sys.msx

For public questions about MSX or fMSX, your best bet would be the newsgroup comp.sys.msx.

I'm also on comp.emulations.misc.

Of course, questions can be aimed at the
authors
as well.

1.32 "

About the authors

fMSX Amiga is being written by Hans Guijt. Until march 30 1995 I was a computer science student at the university of Leiden, but since june 1st I am employed by Palm Automatisering in Aalsmeer. I am not averse against bug reports, mail (of any kind), gifts, etc. Actually I quite like receiving email, so write to me!

Past and future projects include: a large UNIX based system for image normalization and recognition (Photobase), an advanced MSX disassembler (MSXResourcer), needed to convert some games from MSX to Amiga but useful for fMSX as well, and a level editor for the first game that is to be converted (Konami's Metal Gear). Unfortunately the game conversion is not getting much time lately, much to the frustration of the other people who work on that project.

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Email: h.guijt@inter.nl.net

fMSX (generic) is being written by Marat Fayzullin. He is a computer science student in University of Maryland in College Park, who is going to graduate this May [any job offers, especially from Europe? :)]. Aside from fMSX, he also wrote WBGames and Dashboard for Amiga, maintains two FAQ lists on USENET, and a large WWW site at

<http://www.cs.umd.edu/users/fms/>

He also doesn't refuse small [and not so small] monetary donations in hard currency [preferably US dollars] sent to:

Marat Fayzullin
6304 Hampton Place
Elkridge, MD 21227
USA

phone: (410)-379-2925
email: fms@wam.umd.edu
IRC: RST38h

1.33 "

About RAMSX:

Included in this package is a mountlist for a device called RAMSX:. This

device (built from ramdrive.device and crossdosfilesystem) can be used with fMSX to play disk-based games directly from RAM (it's not as good as using a harddrive, but it's much better than using disks!).

If you want to use RAMSX: you will need about 720Kb of free RAM and the crossdosfilesystem. You must also enter the device name RAMSX: into the appropriate drive gadget in the preferences window.

I feel that this mountlist can be greatly improved (for example, the device must be formatted before the icon appears on the workbench, and it cannot be recovered after a reset), but I fail to see how this is done. If you can do better than this (or if you have made similar mountlists based on other devices) please contact me.

Update: this time I'll try to put the mountlist in the archive, which I forgot for the v0.7 release.

1.34 "

A big thank-you to:

Peter McGavin

Peter (who wrote an excellent Spectrum emulation) contributed many ideas for the Z80 emulation. It was his Spectrum 1.7 which convinced me that fast Z80 emulation is possible.

Jeroen Vermeulen

Jeroen kindly offered to proof-read the accompanying documentation, and found heaps of spelling errors.

Alex Wulms

Alex owns an MSX Turbo-R, and is the author of Zone Terra, an excellent shoot'em-up for that system. He is also an MSX-wizard, who explained many of the MSX's internal workings to me.

Sergi Martinez and Juan Gomez

Juan and Sergi are the authors of AmiMSX, a program similar to fMSX. Their input so far includes a trick to speed up fMSX by 30%, information about the MSX mouse interface (to be added in a future version), and of course the constant inspiration provided by new AmiMSX features ;-)

...and all the betatesters and supporters!

1.35 "

About AmiMSX

fMSX is not the only MSX emulation available for the Amiga. A similar program called AmiMSX is also available through Aminet. I shall attempt to make an honest, non-biased comparison (and I point you to the AmiMSX documentation for the other side of the story ;-)):

Advantages of fMSX

- fMSX is completely free, whereas AmiMSX needs to be registered.
- fMSX can use cartridges and virtual drives.
- fMSX is completely system-friendly.
- fMSX can run with the 68040 copyback cache enabled (I have heard reports that AmiMSX needs to have copyback disabled).
- fMSX supports amplified sprites (sorry about that Sergi ;-)).

Advantages of AmiMSX

- AmiMSX is quite a bit faster.
- AmiMSX kills the OS for extra speed (it returns to the workbench when paused). I do not personally consider this an advantage but I know some people do.
- AmiMSX is far ahead in VDP (and MSX2) emulation.
- SCC sounds better for some reason.

There are also features common to both programs:

- The user interfaces look somewhat similar.
- Both require 68020+ and OS2.0+.

If you like MSX emulation you will probably want to check out AmiMSX as well.
