

PAC-V™

for MSX

User's Manual

Copyright 2016 Yeongman Seo. All rights reserved.

<sharksym@hitel.net>

Edition 2016.11.02

목차

1. Introduction	3
1.1. Copyright policy & Disclaimer of Liability.....	3
1.2. Requirements.....	4
1.3. Features.....	4
2. Getting started	5
2.1. Insert Cartridge	5
2.2. S/W Tool	6
3. Features	7
3.1. Main BIOS.....	7
3.1.1. PAC mode	7
3.1.2. FM-PAC mode.....	8
3.1.3. BASIC KUN mode.....	9
3.1.4. Game Cartridge mode	9
3.2. PAC-SRAM	10
3.3. LED Visualizer.....	11
3.3.1. FM Channel indicator	12
3.3.2. Another indicator.....	13
4. Appendix	14
4.1. Mapper & SRAM mode Registers	14
4.2. LED I/O Register map.....	15
4.3. LED Pattern data	16
5. Acknowledgments	17
6. History.....	18

1. Introduction



PAC-V™ (PAC with Visualizer) is a cartridge for MSX.
This document contains using and maintaining PAC-V™.

1.1. Copyright policy & Disclaimer of Liability

[Copyright policy]

All H/W, S/W and documents of PAC-V™ are property of Yeongman Seo.

You have permissions as below.

- Use: You may use all H/W, S/W, and documents of this product for your private purpose..
- Study: You may utilize all information and knowledge of this product for your study.
- Distribute: You may distribute a part of S/W & documents with a copyright holder mentioned.

You must follow duty as below.

- No modification: You can't make new works by modifying any H/W & S/W of this product.

[Disclaimer of Liability]

All products are provided to you "as is" without warranties or conditions of any kind, whether oral or written, express or implied. The author specifically disclaims any implied warranties or conditions of merchantability, satisfactory quality, non-infringement and fitness for a particular purpose.

1.2. Requirements

Minimum: MSX1, MSX-DOS1

Recommended: MSX2, MSX-DOS2, MSX-Music

[Notice]

A SRAM on PAC-V™ is NiMH battery backedup.

Its contents may be erased due to a battery discharge for months.

1.3. Features

PAC-V™ is consist of various features.

Main BIOS:

BIOS area is supported as maximum 64KB.

It can be used for extension BIOS or Game ROM image via downloading.

Eg) Dummy BIOS(16KB), FM-PAC BIOS(64KB), BASIC KUN(16KB), Game ROM(16KB/32KB)

PAC-SRAM:

It is same feature of Panasonic PAC (Pana Amusement Cartridge).

8KB PAC data is supported.

Eg) Save or load state with YS2.

LED Visualizer:

Nine LED bars are available in front of cartridge.

They work as channel indicator of MSX-Music. And they can be operated with special program using LED I/O.

예) ALESTE, XEVIIOUS and etc for MSX-Music indicator.

Rechargeable Battery:

PAC data, BIOS ROM and LED pattern data are stored on SRAM.

Contents of SRAM is backedup by rechargeable NiMH battery.

2. Getting started

2.1. Insert Cartridge

PAC-V™ can be used in any SLOT.

It is still recommended to use SLOT1 for watching LED Visualizer.

Here is a screenshot of boot message.



Main feature of PAC-V™ is PAC & LED Visualizer.

Its operations are depend on a program that you are using.

[Notice]

If a battery is discharged, boot message does not appear due to SRAM erase.

In this case, you have to download BIOS again.

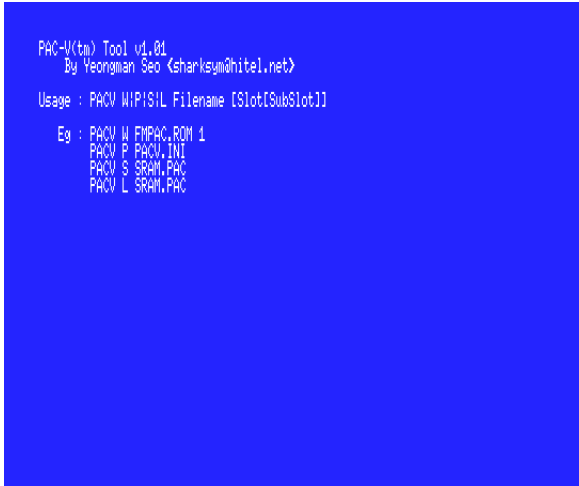
Please be noticed that battery is normally charged by MSX SLOT 5V power.

2.2. S/W Tool

One S/W tool is provided to support various feature of PAC-V™.

Tool's name is **PACV.COM** which is running on MSX-DOS1/DOS2.

Here is a screenshot of running PACV.COM.



```
PAC-[Kta) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>
Usage : PACV WIPIS:L Filename [Slot[SubSlot]]
Eg : PACV W FMPAC.ROM 1
     PACV P PACV.INI
     PACV S SRAM.PAC
     PACV L SRAM.PAC
```

If you check new version of PACV.COM, please visit below home page.

<http://sharksym.egloos.com/category/PAC-V%20%28Visualizer%29>

3. Features

3.1. Main BIOS

BIOS area is maximum 64KB on SRAM.

It can be used as FM-PAC BIOS, BASIC KUN and generic game ROM.

You can download ROM file using PACV.COM.

- Usage: PACV.COM W ROM-Filename SLOT-No

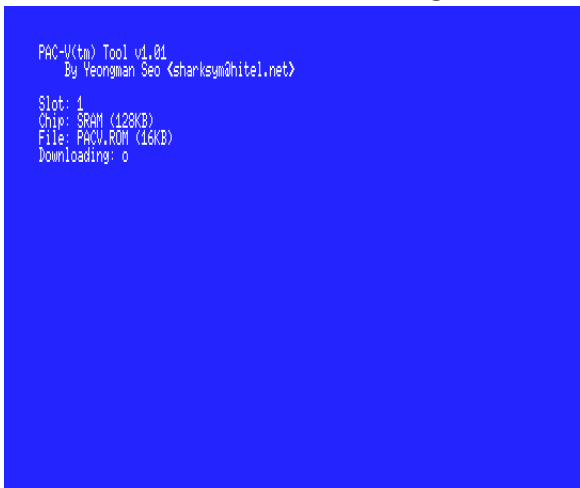
Re-boot is required after downloading ROM.

3.1.1. PAC mode

This mode is same with Panasonic PAC.

You have to download PACV.ROM(16KB).

Here is a screenshot of downloading PACV.ROM.



PAC is supported by many games, which have blow PAC LOGO on a package box.

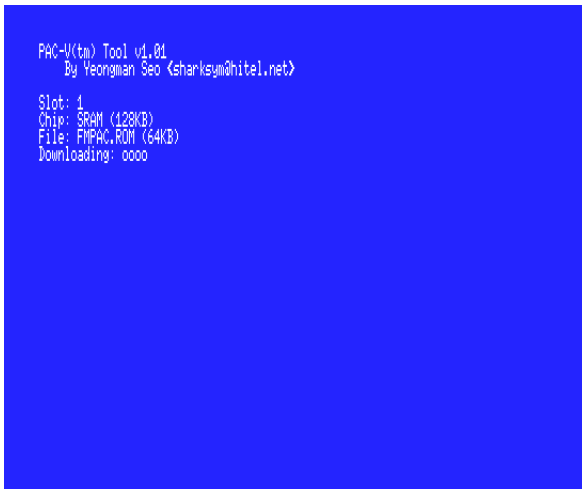


3.1.2. FM-PAC mode

It is similar to Panasonic FM-PAC.

You have to download FMPAC.ROM(64KB).

Here is a screenshot of downloading FM-PAC ROM(64KB).



```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>

Slot: 1
Chip: SRAM (128KB)
File: FMPAC.ROM (64KB)
Downloading: 0000
```

In this mode, Games should detect PAC-V™ as FM-PAC.

You can save or load state on PAC-V™ like PAC/FM-PAC.

This mode is useful, if you have a MSX-Music (OPLL Sound) built-in machine.

Please, use "CALL FMPAC" in BASIC in order to execute PAC commander.

[Notice]

PAC-V™ does not have OPLL sound. So If your machine does not support MSX-Music, PAC mode is recommended rather than FM-PAC mode.

Please see "**3.1.1. PAC mode**" chapter.

3.1.3. BASIC KUN mode

You can BASIC KUN ROM with PAC-V™.

Even if BASIC KUN ROM is downloaded, Games detect PAC-SRAM.

Here is a screenshot of downloading BASIC KUN plus 2.0 ROM(16KB).

```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>

Slot: 1
Chip: SRAM (128KB)
File: BASIC00P.ROM (16KB)
Downloading: 0
```

3.1.4. Game Cartridge mode

You can also use PAC-V™ as generic 32KB ROM cartridge.

16KB or 32KB sized ROM are supported.

Here is downloading ZANAC ROM(32KB).

```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>

Slot: 1
Chip: SRAM (128KB)
File: ZANAC.ROM (32KB)
Downloading: 00
```

You can skip executing Game ROM by pressing **P** key during boot.

3.2. PAC-SRAM

It is same feature with Panasonic PAC(Pana Amusement Cartridge).

PAC is supported by many games, which have blow PAC LOGO on a package box.



PAC data can be saved or restored on disk using PACV.COM.

PAC data save (backup)

- Usage: PACV.COM S Filename

```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>

Slot: 1
Chip: SRAM (128KB)
File: YS2.PAC
PAC Data Saving...Ok
```

PAC data load (restore)

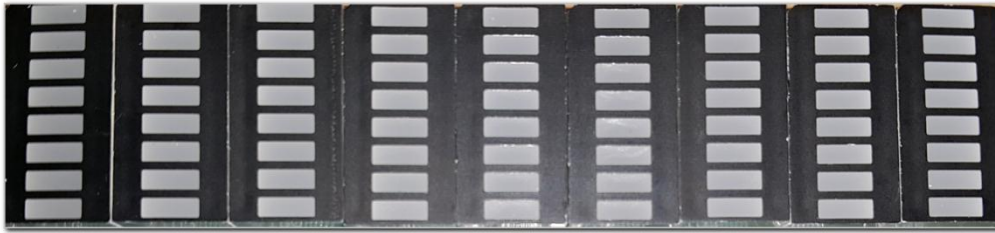
- Usage: PACV.COM L Filename

```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@hitel.net>

Slot: 1
Chip: SRAM (128KB)
File: YS2.PAC (8KB)
PAC Data Loading...Ok
```

3.3. LED Visualizer

It consists of nine LED bars as below.



Main purpose is channel indicator for MSX-Music (OPLL).

It can be utilized by IMS Player and MPX Player.

You have to download LED pattern data.

- **Usage: PACV.COM P Filename**

Here is a screenshot of downloading PACV.INI, which is a default pattern data.

```
PAC-V(tm) Tool v1.01
By Yeongman Seo <sharksym@nitel.net>

Slot: 1
Chip: SRAM (128KB)
File: PACV.INI (4KB)
Downloading: 00000000
```

LED pattern data is a simple text file. You can edit it with generic text editor.

Please see "**4.3. LED Pattern data**" chapter for details.

3.3.1. FM Channel indicator

LED shows channel level of MSX-Music (YM2413 OPLL).

In OPLL melody mode, LED 1 to 9 work for OPLL Ch.1 to 9.

In OPLL rhythm mode, LED 1 to 6 work for OPLL Ch.1 to 6. And LED 7 to 9 work for Drum state.

Here is a screenshot of LED Visualizer with ALESTE2



3.3.2. Another indicator

There are special I/O registers to activate LED Visualize.
Some program utilize this I/O for its purpose.

Here is a screenshot of IMS Player on M File manager.



Here is a screenshot of MPX Player on M File manager.

LED Visualizer operates as MP3 Spectrum analyzer.



4. Appendix

It is an internal H/W information for PAC-V™.

4.1. Mapper & SRAM mode Registers

Memory ADDR	TYPE	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
5FFEh	W	SRAM Enable 1							
			4Dh		Enable				
			Not 4Dh		Disable				
5FFH	W	SRAM Enable 2							
			69H		Enable				
			Not 69H		Disable				
7FF7H	W	Page1 Bank No.							
		Bank No. 0 ~ 3			BIOS area				

Memory mapper is available for Page1 (4000H~7FFFH)

It is same with mapper of FM-PAC.

If both of SRAM Enable 1 & 2 are enabled, PAC-SRAM appears on Page1.

4.2. LED I/O Register map

Basic I/O port is same with OPLL port (7CH, 7DH). And mirror port is available also.

Addr Port = 7CH or 5CH

Data Port = 7DH or 5DH

Here is a register information. LED Visualizer operates with RED register bits.

Address	D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀									
00	A	V	E	K	MULTI					User Tone Register							
01	M	I	G	S													
02	KSL		T		L M												
03			DC	DM	F B												
04	A R			D R													
05																	
06	S L			R R													
07																	
0E			R	BD	SD	TOM	T-CT	HH	Rhythm Control								
0F	T E S T								OPLL Test Data								
10	F-Num. 0 ~ 7								F-Number LSB 8 bits								
?																	
18																	
20			S	K	BLOCK 0 ~ 2			F N u m 8	F-Number MSB, Octave set								
?			U	E					Key ON/OFF Register								
28			S	Y					Sustain ON/OFF Register								
			ON	ON													
			OFF	OFF													
30	INST.			VOL.					Instruments Selection and Volume Register								
?																	
38																	

4.3. LED Pattern data

LED bars operate with eight volume level animations.

Volume animation consists of maximum 64 frames.

Here is contents of PACV.INI file, which is default pattern data.

Row shows animation frames (1~64).

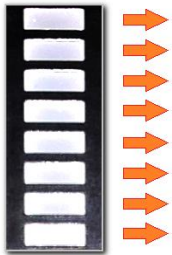
Column shows state of LED ON/OFF. One LED bar consists 8 LEDs.

"O" means LED ON state.

"." means LED OFF state.

In Volume 7 data, total 20 animation patterns are described.

First frame shows all LED ON, and then LEDs will be turned OFF as one by one.



```
#
# PAC-V
# LED pattern data
#

# Volume 7 (MAX)
##### | ##### |
0.....
00.....
0000.....
000000.....
00000000.....
000000000000.....
0000000000000000.....

# Volume 6
##### | ##### |
.....
0.....
00.....
0000.....
000000.....
000000000000.....
0000000000000000.....

.....
```


5. Acknowledgments

Thank you for using PAC-V™.

Please , send a email, if you have any question or bug-reports.

<mailto:sharksym@hitel.net>

Please, check my blog page for latest information.

<http://sharksym.egloos.com/category/PAC-V%20%28Visualizer%29>

Special thanks go to **Overrich** & **ASTERiS** for making cartridge case & label of PAC-V™.

6. History

2016.11

- User manual added

2016.08

- PAC-V™ made