

V9968 Programmer's Manual

Attention!

This document has been translated from Japanese to English from its original source at:

https://github.com/hra1129/V9968_Cartridge/blob/main/fpga/V9968_Cartridge_TangNano20K/src/th9958/manual/v9968_programmers_manual_screen_mode.pdf

This documentation was translated on March 6, 2026, and it is important to note that it is part of a Work in Progress documentation on the development of V9968 and information could change or it can contain errors.

For the most up-to-date and accurate information, please refer to the original documentation and repository:

https://github.com/hra1129/V9968_Cartridge

V9968 Programmer's Manual

Screen mode

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1. Introduction

This document explains how to set up each screen mode of the V9968 processor and how it works.

2. Screen Mode

We will explain each screen mode one by one.

The original MSX was equipped with the TMS9918, the MSX2 with the V9938, and the MSX2+ and MSXturboR with the V9958. MSX2++ is planned to be equipped with the V9968. MSXturboR+ is planned to be equipped with the V9978.

The versions have been upgraded in the order of TMS9918 → V9938 → V9958 → V9968 → V9978, and most of the functions from the previous versions have been inherited. Therefore, for example, functions equipped from the V9958 are described as "9958 Compatible".



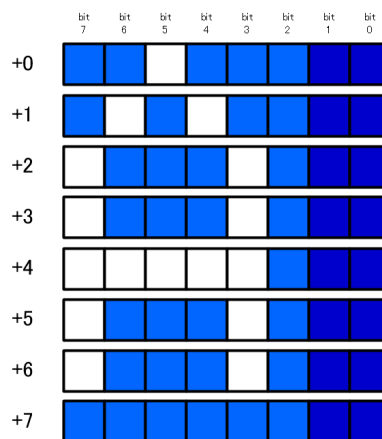
The screen modes of the V9968 are the same as those of the V9958. There are no new screen modes.

An explanation is provided in the Technical Data Book for the V9938/V9958, but as the detailed behavior is not mentioned, this book will explain the behavior in more detail. We hope that this will be useful when creating compatible software.

In addition, in the V9958, undefined behaviors that are useful to have will be promoted to official functions. This book will also describe how they are handled in the V9958.

Each square in the diagram corresponds to one character and is assigned one byte of space. Values from 0 to 255 can be stored, and these values are used as the character code.

The 256 character shapes are arranged in the order of the character codes above in an area called the Pattern Generator Table, with each character taking up 8 bytes. The diagram below shows an example of the Pattern Generator Table values if the first character is the shape of an "A." The +0, +1, ..., +7 on the left are offset addresses. When the 1-byte value stored at each address is displayed as an 8-digit binary number, the 0s become the background (blue) and the 1s become the foreground (white).



The foreground and background colors are specified by R#7. The color is the same for all characters.

Since one character is 6 dots horizontally, the lowest 2 bits of the pattern stored in the Pattern Generator Table are not used in this mode. In the diagram above, the dark blue areas have no effect on the display, no matter what is written there.

The starting address of the Pattern Generator Table is specified by R#4.

In this mode, the VRAM address auto-increments to 00000h after 03FFFh. The carry from bit 13 to bit 14 is blocked. This is an intentional feature designed to ensure compatibility with machines equipped with the TMS9918.

However, with V9938 and later, it is also possible to access 04000h to 3FFFFh by specifying a value in R#14. Note that because carry from bit 13 to bit 14 is blocked, the value after 7FFFh will return to 4000h.

The values that can be set in the Pattern Name Table and Pattern Generator Table are shown in the table below.

Table 1 Text1 Pattern Name Table (R#2)

| Starting address | R#2 setting value | notes |
|------------------|-------------------|--------------------------|
| 00000h | 00h | MSX-BASIC initial values |
| 00400h | 01h | |
| 00800h | 02h | |
| 00C00h | 03h | |
| Omitted | Omitted | |
| 3F800h | FEh | |
| 3FC00h | FFh | |

Table 1 Text1 Pattern Generator Table (R#4)

| Starting address | R#4 setting value | notes |
|------------------|-------------------|--------------------------|
| 00000h | 00h | |
| 00800h | 01h | MSX-BASIC initial values |
| 01000h | 02h | |
| 01800h | 03h | |
| Omitted | Omitted | |
| 3F000h | 7Eh | |
| 3F800h | 7Fh | |

2.2. Text2 (SCREEN0 WIDTH80)

It is a text mode with 80 columns and 24 lines.

2.3. Multicolor (SCREEN3)



It is a 64 dot x 48 dot bitmap graphics mode.

2.4. Graphic1 (SCREEN1)



It is a 32-character, 24-line PCG (Programmable Character Generator) mode.

2.5. Graphic2 (SCREEN2)



This is PCG mode with 32 columns and 24 lines.

2.6. Graphic3 (SCREEN4)

This is PCG mode with 32 columns and 24 lines.

2.7. Graphic4 (SCREEN5)

It is a bitmap graphics mode with 256 dots x 212 dots and a 16-color palette.

2.8. Graphic5 (SCREEN6)

It is a bitmap graphics mode with 512 dots x 212 dots and a 4-color palette.

2.9. Graphic6 (SCREEN7)

It is a bitmap graphics mode with 512 dots x 212 dots and a 16-color palette.

2.10. Graphic7 (SCREEN8)

It is a 256 dot x 212 dot, 256 color bitmap graphics mode.

2.11. Graphic7-YAE (SCREEN10, 11)

It is a bitmap graphic mode with 256 dots x 212 dots, YJK natural image + 16-color palette.

2.12. Graphic7-YJK (SCREEN12)

It is a bitmap graphic mode with 256 dots x 212 dots and YJK natural images.

3. New Features