VT01
Console and LCD Interface
(Real 4 colors or Virtual 16 colors)

Features

System
- CPU: 6502
- Internal Program RAM: 2K Bytes
- Internal Video RAM: 2K Bytes
- DMA (Sprite)
- Multiple control of IRQ
- Programmable timer
- T.V. signal output (NTSC, PAL)

Peripheral Applications
- Joystick
- STN and TFT LCD interface built in.

Graphic Processor
- Resolution:
  TV: 256x240 pixels
  STN LCD:R/C check board 16colors 120x2x240.
  STN LCD:B/W 4 gray level 240x240.
  TFT LCD: 64 colors 160x3x240.
- 64 sprites in one frame
- Two pages of figure for Background.
- Sprites have 8X8, 8X16.
- Color palette has 28 colors.

Sound Generator
- 2 Rhythm channels,
- 2 special sound channels,
- 1 Data waveform synthesizer.

General Description

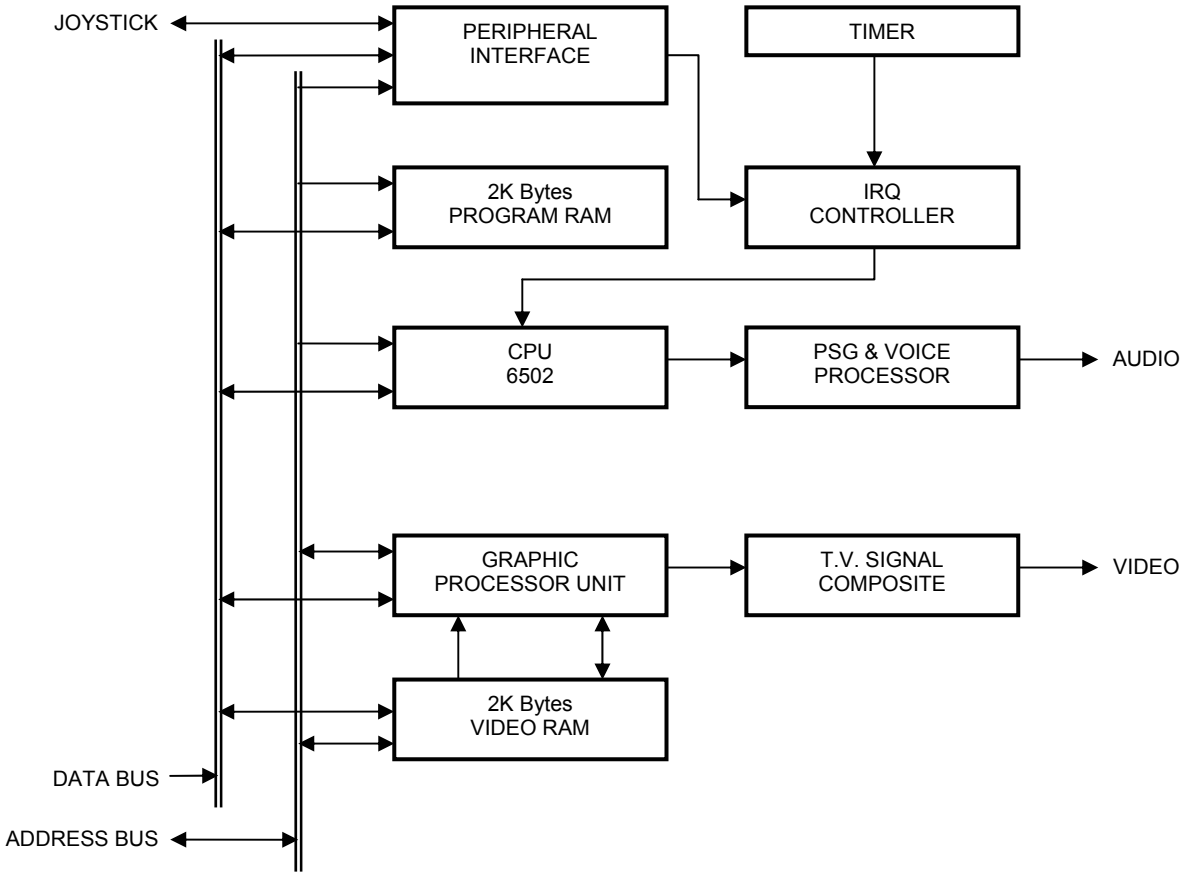
VT01 includes the CPU, Graphic Unit, Sound Unit, two internal 2KBytes SRAMs, and some I/O controller. There are two main systems in VT01, program system and video system.

CPU plays the key role in program system. It can access the internal and external program memories. The program memory stores the program command, instructions, and sound data. VT01 is equipped with a 2KByte SRAM as internal program memory. This program RAM will be the zero page RAM, STACK and some memory of CPU. Program system controls the operations of Education machine, including figure, voice, and the title. It means CPU will control the video system to display the specified figure.

Graphic Unit is the main role of the video system. It can access the video memory automatically to display some figures. In addition to the internal program SRAM, VT01 is equipped the other 2KByte SRAM for Video RAM. Internal Video RAM stores pattern vectors for 2 pages of background. External Video memory stores the video characters to be pointed by the pattern vectors.

The function of the decoder is to expendand the memory location. In general, no decoder, the education machine can handle 32K bytes of program ROM and 8K bytes of character ROM. Decoder can help education machine to handle 2M bytes program and even more than this.

Block diagram



Functional description

Console chip is composed of CPU, video, sound function and I/O.

Video:

1. Video can handle two objects, SPRITE and BACKGROUND. SPRITE is the moving object as bullet, car, and man. BACKGROUND is the larger figure as tree, forest, house, scenery which can be scrolled.
2. On A TV screen, VIDEO can display 256 pixels on a horizontal coordinate and 240 pixels on a vertical coordinate.
3. Programmer can specify 64 SPRITE to display on a screen. One SPRITE needs four bytes to define.
4. The maximum SPRITE number on a horizontal scanning line is 8. If it is over 8, the rest will be careless and the message will be responded to CPU.
5. A basic SPRITE or BACKGROUND pattern is a character with 8X8 pixels, one pixel which show 4 kinds of color.
6. Programmer can choose SPRITE being (8X16), (8X8).
7. Two pages of figure for BACKGROUND can be immediately changed page or scrolled with horizontal or vertical way.
8. 28 colors in color plate can be defined. One color needs 6 bits to define.
9. Automatic TV Synchronized signal generation which is independent with program.
10. TV composite signal output.
11. 8 address ports only.

Sound:

1. Providing 256 bytes DMA function for graphic unit.
2. Two address ports, 8 bits for reading peripheral I/O.
3. One address port, 3 bits for controlling peripheral I/O.
4. One port for reading the status of sound generator.
5. PSG gets 18 address ports to control its operation.
6. Every sound channel gets 4 address ports to control its operation.
7. There are 2 Rhythm channels, 2 specail sound channels, a data waveform synthesizer.
8. One independent sound DA output pin.

CPU:

CPU included in Console gets 16 bits program counter, 8 bits AL and Accumulator, status register, two general purposes registers X, Y, 8 bits stack pointer, 16 bits address bus and 8 bits data bus.

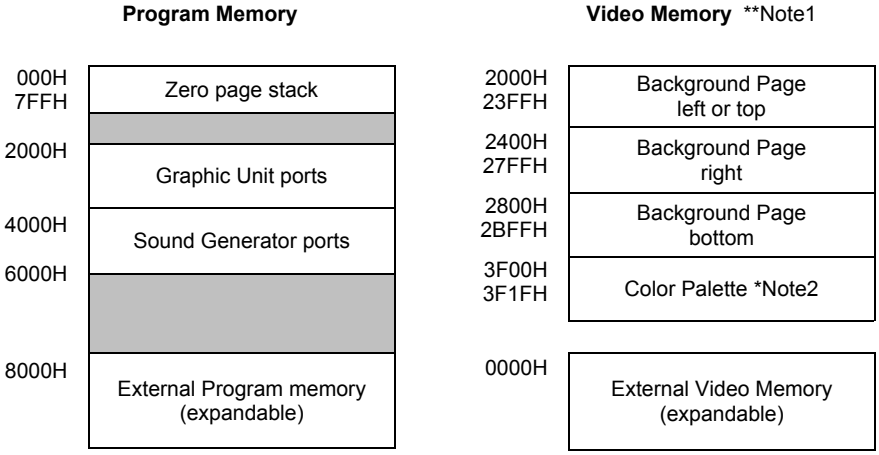
Internal RAM:

One 2K bytes RAM for VIDEO Memory, another for Program RAM.

I/O:

1. 7 pins for reading peripheral I/O, 3 pins for outputting peripheral I/O, 2 clock pins.
2. Built-in optionally 8 bit serial to parallel I/O for joystick.
3. STN and TFT LCD interface built in.

Address Map of Program Memory and Video Memory



**Note1
Address of Video Memory should be asserted through 2006H of Graphic Unit ports. The details methods to access video memory are described in section: Access Video Memory and the Bank Mapping.

*Note2
When XRC = 1
3F00-3F1F is the old color mapping location of color palette, total 25 colors.
3F00 is transparent color, and 3F10, 3F04, 3F14, 3F08, 3F18, 3F0C, 3F1C can be ignored.