

The low-resolution graphics display uses VC to divide the eight display lines corresponding to a row of characters into two groups of four lines each. Each row of data bytes is addressed eight times, the same as in text mode, but each byte is interpreted as two nibbles. Each nibble selects one of 16 colors. During the upper four of the eight display lines, VC is low and the low-order nibble determines the color. During the lower four display lines, VC is high and the high-order nibble determines the color.

The bit patterns that produce the low-resolution colors are read from the character-generator ROM in the same way the bit patterns for characters are produced in text mode. The 74166 parallel-to-serial shift register converts the bit patterns to a serial bit stream for the video circuits.

The video signal generated by the Apple IIe includes a short burst of 3.58 MHz signal that is used by an NTSC color monitor or color TV set to generate a reference 3.58 MHz color signal. The Apple IIe's video signal produces color by interacting with this 3.58 MHz signal inside the monitor or TV set. Different bit patterns produce different colors by changing the duty cycles and delays of the bit stream relative to the 3.58 MHz color signal. To produce the small delays required for so many different colors, the shift register runs at 14 MHz and shifts out 14 bits during each cycle of the 1 MHz data clock. To generate a stream of fourteen bits from each eight-bit pattern read from the ROM, the output of the shift register is connected back to the register's serial input to repeat the same eight bits; the last two bits are ignored the second time around.

Each bit pattern is output for the same amount of time as a character: 0.98 microseconds. Because that is exactly enough time for three and a half cycles of the 3.58 MHz color signal, the phase relationship between the bit patterns and the signal changes by a half cycle for each successive pattern. To compensate for this, the character generator ROM puts out one of two different bit patterns for each nibble, depending on the state of H0, the low-order bit of the horizontal counter.