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## Video display pages

The Apple IIe generates its video displays using data stored in specific areas in memory. These areas, called *display pages*, serve as buffers where your programs can put data to be displayed. Each byte in a display buffer controls an object at a certain location on the display. In text mode, the object is a single character; in low-resolution graphics, the object is two stacked colored blocks; and in high-resolution and double high-resolution modes, it is a line of seven adjacent dots.

The 40-column-text and low-resolution-graphics modes use two display pages of 1024 bytes each. These are called *text Page 1* and *text Page 2*, and they are located at 1024–2047 (hexadecimal \$0400–\$07FF) and 2048–3071 (\$0800–\$0BFF) in main memory. Normally, only Page 1 is used, but you can put text or graphics data into Page 2 and switch displays instantly. Either page can be displayed as 40-column text, low-resolution graphics, or mixed mode (four rows of text at the bottom of a graphics display).

The 80-column text mode displays twice as much data as the 40-column mode—1920 bytes—but it cannot switch pages. The 80-column text display uses a combination page made up of text Page 1 in main memory plus another page in auxiliary memory located on the 80-column text card. This additional memory is *not* the same as text Page 2—in fact, it occupies the same address space as text Page 1, and there is a special soft switch that enables you to store data into it. (See the next section, “Display Mode Switching.”) The built-in firmware I/O routines, described in Chapter 3, take care of this extra addressing automatically; that is one reason to use those routines for all your normal text output.

The high-resolution graphics mode also has two display pages, but each page is 8192 bytes long. In the 40-column text and low-resolution graphics modes each byte controls a display area seven dots wide by eight dots high. In high-resolution graphics mode each byte controls an area seven dots wide by one dot high. Thus, a high-resolution display requires eight times as much data storage, as shown in Table 2-8.

The double high-resolution graphics mode uses high-resolution Page 1 in both main and auxiliary memory. Each byte in those pages of memory controls a display area seven dots wide by one dot high. This gives you 560 dots per line in black and white, and 140 dots per line in color. A double high-resolution display requires twice the total memory as high-resolution graphics, and 16 times as much as a low-resolution display.