

## Popular Electronics Tests

### Atari Model 800 Personal Computer

**T**HE Atari Model 800 is a personal computer based on a 6502 microprocessor with color graphics and sound capability. It comes with a TV/GAME isolation switch that allows its use with any TV receiver. Preferably, the 800 can be connected to a high-quality color monitor, using the RGB (not composite) video output on the computer's rear panel.

Housed in an attractive plastic case covering an RFI-shielded enclosure,

Model 800 features a full-size keyboard with 57 full-stroke and four function typewriter-like keys, four interface connectors for using joystick or paddle controls, an eight-bit parallel interface port, TV channel 2/3 switch, a video monitor connector, 16K bytes of RAM (that can be expanded to 48K), 10K bytes of system ROM (that can be expanded by cartridges), and an Atari BASIC interpreter cartridge. The highest graphics

resolution is 320 x 192, and three text modes are provided.

Base price is \$1080. Optional items include: Model CX8101 Master Diskette with disk operating system and file manager (\$25); Models CX852 and CX853 8K and 16K byte RAM modules (\$124.95 and \$199.95, respectively); Model 410 cassette program recorder (\$89.95); Model 810 5.25-inch single-sided, single-density floppy-disk drive

and controller (\$599.95); Model 815 double-density, dual-disk drive (\$1,499.95); Models 820 and 825 40- and 80-column dot-matrix printers (\$449.95 and \$999.95, respectively); Model 830 modem (\$199.95); Model 850 interface module (\$219.95); Model CX40-04 joystick controller package (\$19.95); and the CX-70 Light Pen (\$74.95). Atari also has a long list of additional useful peripherals, ranging from cables to printer accessories. Software available from Atari includes games, educational courses, and financial programs on cassette tapes (\$14.95 to \$29.95) and in plug-in ROM cartridges (\$24.95 to \$39.95). Besides BASIC (CXL4002) included with the machine, there is an assembly editor (CXL4003 at \$59.95). Soon to be announced are cartridges for PILOT (CX405 at an as yet unknown price) and PASCAL.

**General Description.** The Atari 800 doesn't have a user-oriented bus structure. Instead, it uses an r-f system that minimizes radio-frequency (RFI) and electromechanical interference (EMI) with an electrically tight cartridge-slot

system for RAM and ROM cartridges. A similar system is used for the BASIC interpreter and game cartridges that slip into one or both of the "game" slots in the console. When the cartridge door is opened, the computer automatically switches off.

The 6502 microprocessor operates with a 0.56- $\mu$ s cycle at 1.8 MHz. Since the computer is designed to operate with home TV receivers on channel 2 (54 to 60 MHz) or 3 (60 to 66 MHz), the on-screen display is limited to 24 lines of 40 characters because of the available bandwidth in most sets. The TV/GAME isolation switch mounts directly on the TV receiver and connects to the console via a 15-ft cable terminated with a phono plug. Power for the console is supplied by an ac power adapter.

Before turning on the system, you must set the switch on the console and the receiver's tuner to either channel 2 or channel 3, depending on the channel not in use in your viewing area. About 6 seconds after power-up, "ATARI COMPUTER MEMO PAD" will be displayed on the screen in white on a blue background.

Atari's keyboard is designed to gener-

ate upper- and lower-case alphabetic, numerals, and graphics and has screen-editing functions. Under software control, each key can also be redefined for special functions. You can move the cursor to any desired location on the screen with the up-, down-, left-, and right-arrow keys. Automatic repeat is possible simply by holding down any desired key for about 5 seconds. The repeat function remains enabled for as long as the key is held down thereafter.

A special key, identified with the Atari symbol, allows entry to and escape from the inverse-video mode. Automatic wraparound immediately drops the cursor to the beginning of the next line once the 38th character is typed in any given line, obviating the need to press RETURN and LINE FEED at the end of each line.

Peripherals can be added to the 800 in two ways. If you have the cassette recorder but no disk drive, you can use the port located on the side of the console. For larger system configurations, however, you'll need the Model 850 interface module, which provides four RS232C serial ports (including one with 20-mA capability), and an 8-bit parallel output port. Serial ports have baud rates to 9600, and Baudot rates to 100 wpm.

Software for the 800 is broken down into two distinct groups—system and applications. The latter is further divided into games, educational, and business programs. Many of the games are in ROM cartridges that plug directly into the console and come up instantly. Other games are on cassette tapes that usually load in about a minute. The game programs let you choose speed, number of players, and how you wish to play, all by pushing one of the function keys.

To use many of the educational cassettes, an Education System Master ROM cartridge (\$24.95) is required. This "control" cartridge allows you to carry on a dialogue with the computer. Other educational cassettes are used with BASIC.

The Atari Telelink-1 program is used with the Model 830 modem and can support a printer when connected to the console via the interface module. This ROM-cartridge program slips into the left slot in the console. The software in it is fairly flexible and takes into account the select and option keys that permit setting up a buffer and dumping to the printer. Moreover, it can be configured to allow for automatic dumping to the printer, signalling the host computer to shut off, or sending an X OFF or X ON to control transmission. Since Telelink doesn't support use of a disk drive, you can't save transmit files.

Atari's disk operating system (DOS) is designed to extend the capabilities of the BASIC cartridge. To boot up the system, you turn on the disk drive, insert the diskette, and then turn on the console. Boot-up is then automatic.

The DOS and file manager let you run programs mounted in cartridge

#### LISTING 1 GRAPHICS TEST PROGRAM FOR DRAWING A TRIANGLE

```

4 GOTO 100
100 CLR
110 GRAPHICS 0
120 PRINT "ENTER NUMBER OF SIDES";
130 INPUT A
140 PRINT "ENTER NUMBER OF FRAMES ";
150 INPUT B
160 DIM C(A,2),D(A,2)
170 REM GENERATE INITIAL COORDINATE ARAY
180 FOR I=1 TO A
190 C(I,1)=RND(-1)*130
200 C(I,2)=RND(-1)*100
210 NEXT I
220 REM GENERATE INCREMENT ARRAY
230 FOR I=1 TO A
240 D(I,1)=(RND(-1)*130-C(I,1))/B
250 D(I,2)=(RND(-1)*100-C(I,2))/B
260 NEXT I
270 GRAPHICS 0
275 GRAPHICS 7
280 FOR J=1 TO B
290 POSITION C(A,1),C(A,2)
300 REM DRAW POLYGON
310 FOR I=1 TO A
320 DRAWTO C(I,1),C(I,2)
330 NEXT I
340 REM ADD INCREMENT ARRAY TO COORDINATE ARRAY
350 C=C+D
360 NEXT J
370 END

```

slots, direct files to either the printer or the screen, and create backup and data diskettes. This is a user-oriented, menu-driven operating system that requires no special setups. Both sequential and random files are supported, and such standard commands as OPEN, CLOSE, READ, and INPUT are employed for ease of developing programs in BASIC. Operating under the Atari DOS, each disk can store up to 73K bytes of data on a system diskette or 84K bytes on a data diskette.

The BASIC interpreter supplied by Atari is designed to support the color graphics and sound functions built into the 800. While it may appear at first glance to be minimal in nature, this BASIC includes such important primitive graphics commands as DRAWTO, POSITION, and PLOT, which are usually found only in more extensive BASICs. The string operators MID\$, LEFT\$, and RIGHT\$ are missing, but string splitting information is provided.

This BASIC is a graphics- and input-oriented language. Consequently, it contains such operators as SOUND, SET-COLOR, and functions that integrate the joystick and paddle controllers for movement on-screen and depression of a firing button.

This computer has facilities for generating 16 colors, each with 8 intensities, that can be called from BASIC using the SETCOLOR command. There are four independent sound synthesizers, in addition to the TV audio, each covering four octaves with variable volume and tone. An internal speaker is provided. The SOUND command permits setting a note on the full musical scale, as well as pitch, volume, and amount of distortion for creating sound effects.

There are nine different graphics modes possible in the 800. The first mode, GRAPHICS 0 permits a 40 x 24 display with two colors without split-screen features. When GRAPHICS 0 is invoked, it clears the screen and places the entire system in its default settings. This mode requires 993 bytes of RAM.

GRAPHICS 1 and 2 are also character/text display modes. In GRAPHICS 1, characters appear on-screen twice normal width but normal height, while in GRAPHICS 2, characters appear double width and double height. Therefore, the displays generated can be either 20 x 24 or 20 x 12, respectively. These two modes permit the use of five colors and provide a split-screen format for mixed graphics and text. Graphics 1 and Graphics 2 require 513 and 261 bytes of RAM respectively.

GRAPHICS 3 through 8 set up additional graphics and screen formats. High-resolution mode GRAPHICS 8, for example, permits creation of a full-screen display consisting of 320 x 192 (61,440) dots. It requires 7.9K bytes of RAM. Graphics 3,4,5,6, and 7 require 273, 537, 1017, 2025, and 3945 bytes of RAM, respectively.

Everything you do in the graphics

modes is I/O related. Therefore, all commands result in an output to a text or graphics window or to the basic text screen. Once you've mastered the handling of the graphics functions, you'll find it relatively easy to develop your own on-screen displays in color, including three-dimensional effects.

**Evaluation.** We tested a fully configured system, including the Model 800 console, interface module, both printer models, two joystick controllers, acous-

**LISTING 2  
GRAPHICS  
TEST PROGRAM  
FOR A POLYGON**

```
10 GRAPHICS 0
20 GRAPHICS 7
30 PLOT 80,10
40 DRAWTO 40,40
50 DRAWTO 120,40
60 DRAWTO 80,10
70 END
```

tic modem, program cassette recorder, 5.25-inch floppy-disk drive, and two 16K- and one 8K-byte RAM cartridges. An additional 10K-byte ROM cartridge was used for system control.

Setting up the system is a simple, straightforward procedure. We encountered a minor problem with the TV/GAME switch, which is supposed to mount on the back of the TV set with a self-stick pad. The weight of the switch box and cable appear to be too much for the adhesive. As a result, the switch box can work loose and pull the interconnecting 300-ohm twinlead from the TV set's antenna terminals. Instead of mounting the box on the rear of the set, we recommend that you place it on top and make interconnection by way of a quick clip.

We observed little or no TV interference (TVI) when the console was operating. All in all, this is a very "quiet" console/cable system. The same can't be said about the Model 825 80-column printer, however. With the printer powered and located within 10 feet of the TV set, we observed RFI noise in the display.

While we very much like the "feel" and flexibility of the console's keyboard, we don't care much for the location of CAPS LOCK (just below the RETURN key). This makes it too easy to accidentally switch between upper- and lower-case.

We also have reservations about the

use of separate ac adapters for the console and each peripheral instead of a single hefty power supply and bus to feed the peripherals. A fully configured system ties up a multitude of ac outlets. Worse still, you end up with a tangle of trailing wires that can be tripped over or accidentally dislodged.

The floppy-disk drive sample supplied to us proved prone to head misalignment and medium warping, and the controller wasn't exactly bug-free either. Testing the drive with multiple reads and writes produced an error on every fourth entry. When we checked several other samples, we found similar problems, albeit on a random basis. Atari is aware of the difficulty, and the necessary redesign is underway. System hardware operated smoothly in all other respects.

Software supplied by Atari is generally excellent, especially in the area of educational software. While Atari's games software creditably exercises the color-graphics capabilities of the system, two games that give a really rigorous demonstration are "Checker King" and "Microchess" from Personal Software on cassette tape for \$19.95 each. The programs are written in machine language to take full advantage of the 6502's speed, displaying a lifelike board and extremely well-defined playing pieces. When a move is made, you actually see motion on the screen.

Since the BASIC interpreter in the Model 800 is unique to this computer, we developed two benchmarks to demonstrate the capabilities of the machine. Listing 1 draws a triangle. Line 10 clears the screen, line 20 sets up a 160-column by 80-row display, line 30 establishes the apex of the triangle, and lines 40 through 60 draw the triangle's sides. The program runs in less than a second and draws fairly smooth lines.

Listing 2 demonstrates the ability of the 800 to draw a multisided polygon by setting up an array using randomly defined points. Although this program readily creates a single-view polygon, expanded views, defined by the frame input, weren't possible. In operation, a 30-sided figure took 11 seconds to format and less than a second to draw. The increment array coordinates remained set at zero, allowing only one view, which demonstrates the inadequacy of the random (RND) statement to correctly generate random numbers that are greater than 1.

**Comment.** Generally speaking, the Atari Model 800 is a top-notch computer that far surpasses its immediate competition. In addition to its fine assortment of peripherals and software, it incorporates various extra features, such as the music synthesizers and built-in speaker. Its capabilities with respect to graphics seem especially comprehensive. Despite our few minor reservations, the overall system deserves high marks.—  
*Carl Warren*

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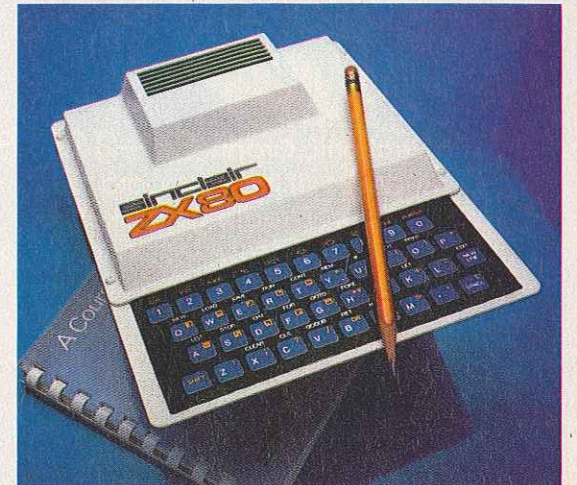
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