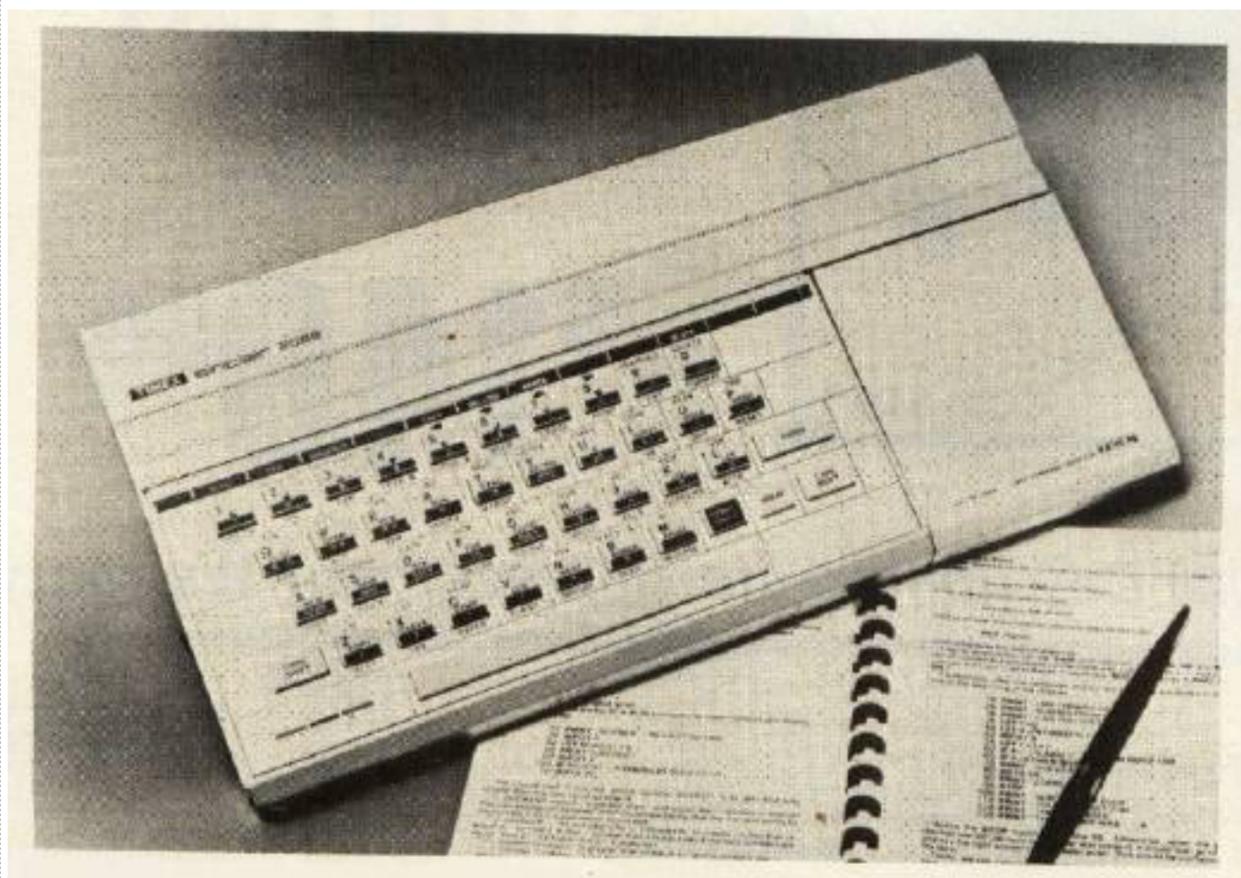


The Timex/Sinclair 2068

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The Timex/Sinclair 2068 offers 72K of internal memory, eight colors, and sound.

The Timex/Sinclair 2068 is the latest addition to the Timex line of home computers. Retailing for \$199.95, the 2068 features 72K of internal memory, eight colors, and sound, making it the most powerful Timex computer yet. The 72K is achieved through the use of bank switching and consists of 24K of ROM and 48K of RAM, of which about 38K is available for BASIC programs. The 2068 comes with three programs on cassette tape so you can put the computer to good use immediately if you have a suitable tape recorder.

The keyboard is full size and has 42 keys arranged in the familiar QWERTY layout. Timex describes the keys as being "full-travel," but they feel more like those on a calculator. They click into position when pressed and snap back when released. Each time a key is pressed, a faint sound can be heard from the internal speaker. This enables you to type without having to look up at the screen to verify that each keystroke was entered. All keys repeat when held down. And small raised dots on the F and J keys make it easier for touch-typists to find the home keys.

To the right of the keyboard is a cartridge port. Timex sells ready-to-run programs on cartridge which you use by simply opening the cartridge door and inserting the cartridge in the slot. Two joystick ports are available—one on the right side of the computer and one on the left. Both are standard Atari-style ports, compatible with a wide variety of joysticks. Located in the back of the computer are ports for connecting a tape recorder and a television or monitor, as well as a port for peripherals such as a printer or modem.

Using The Keyboard

As Timex admits in the manual, the keyboard may seem hopelessly complicated at first. Most of the keys have five or more different functions. The reason for so many functions is that the 2068, like all Timex computers, uses one-key BASIC commands. On most other computers, if you want the PRINT command, for example, you would type the letters P-R-I-N-T. But on the 2068, all you do is hit the P key. (It's not always that simple, as we'll see in a moment.) Since there are more BASIC commands than keys, each key must serve more than one function. Which function the computer uses depends on which shift key is pressed, if any,

and which mode the computer is in at the time.

Five modes are available: keyword, letter, extended, capital, and graphic. The current mode is indicated on the screen by the cursor, which displays the initial of the mode—either K, L, E, C, or G. The extended, capital, and graphic modes can be switched in and out using keyboard commands. The keyword and letter modes are chosen automatically by the computer depending on which would be correct for the particular situation.

Let's examine all the different functions available via the P key. To get a lowercase P, you press the P key when in letter mode. To get a capital P, press P when in capital mode, or press CAPS SHIFT-P while in letter mode. To get the PRINT command, press P while in keyword mode. The quotation mark is chosen by pressing SYMBOL SHIFT-P while in either keyword, letter, or capital mode. To get TAB, you press P when in extended mode. To choose RESET, press SYMBOL SHIFT-P while in extended mode. The same general procedure applies to the other letter keys. This keyboard might be difficult to *learn*, but it's not difficult to *use* once you get used to it.

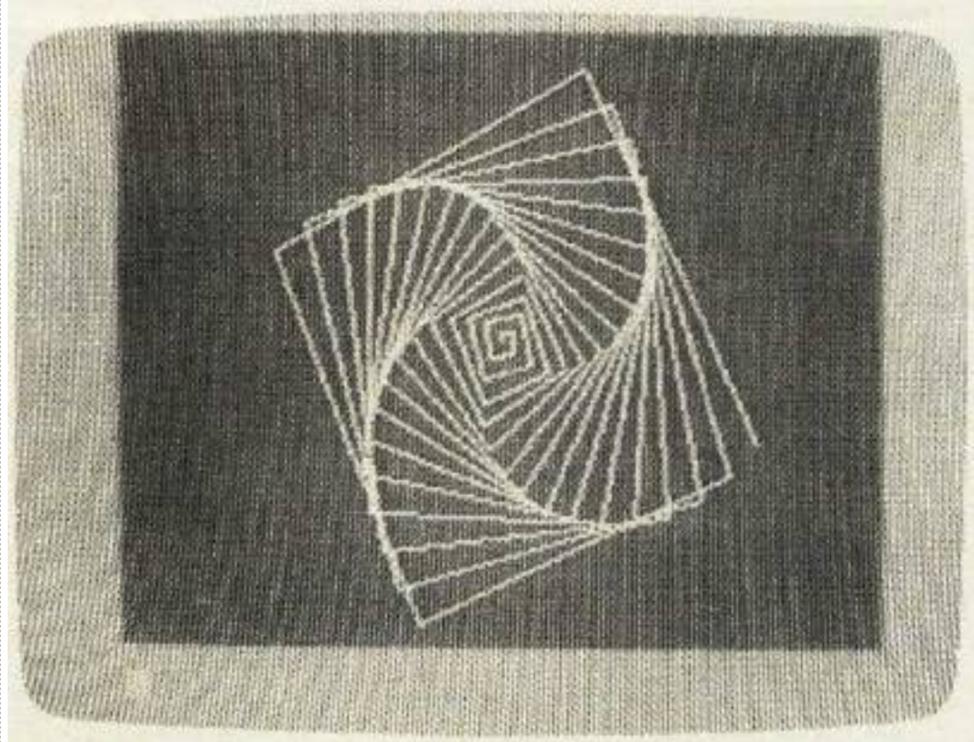
Two-Part Screen

The screen can display 24 lines with 32 characters each and is divided into two parts. The top part, normally 22 lines, is used for program output and listings. The bottom two lines are for entering commands and program lines, and also for displaying error messages by the computer. When you type in a program, each step is entered in the bottom part and is added to the listing above when ENTER is pressed. You can change any program step by moving an arrow to the step, using the up-arrow and down-arrow keys, and pressing EDIT. The step will appear in the bottom part, allowing you to insert or delete characters and then replace the step by pressing ENTER.

Several Graphics Modes

Characters can appear on the screen in many forms. Each character position has six parameters: PAPER, INK, FLASH, BRIGHT, INVERSE, and OVER. INK sets the character color and PAPER sets the background color. The available colors are blue, red, magenta, green, cyan, yellow, white, and black. The border color can also be changed using the BORDER command. INVERSE reverses the colors of INK and PAPER to print inverse characters. FLASH causes characters to flash by rapidly switching INVERSE on and off. BRIGHT makes characters appear brighter for emphasis. OVER allows you to create special characters by overstriking one character with another, as on a typewriter. For example, you could underline a letter by printing over it with the under-line character.

Eight graphics characters are available from graphic mode. Eight more can be obtained by using the inverse of these characters. You can also create your own graphics characters and store them "under" the letter keys A–U. Most computers give you the ability to define your own characters, but the procedure is not easy and usually requires sacrificing other characters. On the 2068, however, it's a breeze. Each character consists of an 8-by-8 matrix of pixels. Each pixel can show either the INK color or the PAPER color. Think of the INK color as a 1 and the PAPER color as a 0. Each row of eight pixels is defined separately. To define the top row of pixels for a character stored "under" the E key, for example, you would type



High-resolution graphics is available on the 2068.

POKE USR "e", BIN 01001100

The other seven rows are similarly defined. Then if you press the E key while in graphic mode, you'll get your character. It's that easy. Moreover, you don't have to sacrifice any of the normal characters.

One of the best features of the 2068 is its high-resolution graphics capability. The screen is 256 pixels wide and 192 pixels high. Three commands are available for drawing in high resolution. The PLOT command puts a dot at a specified place on the screen. DRAW draws a line and CIRCLE draws a circle or arc.

Simple Or Complex

The 2068 has both simple and complex ways of creating sounds. If all you need is a simple beep, you can use the BEEP command followed by two numbers representing the pitch, which has a range of ten octaves, and the duration of the note. For more complex sounds, you use the SOUND command. It allows you to play up to three notes at once and produce special effects. Consequently, it is also more difficult to use.

The SOUND command is followed by up to 15 pairs of numbers. Each pair specifies a number to be stored in one of 15 registers within the sound synthesizer chip. These registers control the pitch (eight octaves), duration, and volume of up to three voices or channels. Each channel can play either a tone or a noise waveform. The envelope of the sound can be changed by specifying the rate of attack (increasing volume), and decay (decreasing volume). You can play the envelope once or make it repeat automatically.

With all these features, you can create a wide variety of sounds. But it's a shame that these sounds must be heard through the small internal speaker. It would have been better to have an audio output to give you the option of using your monitor's speaker or an audio system. This would give higher quality sound and better volume control.

Included Software

Like all Timex computers, the 2068 has the ability to use a conventional tape recorder for loading and storing programs. Using an ordinary tape recorder has its drawbacks, however. The volume level must be set just right or the program will not load properly. Fortunately, the same volume level works for all programs, so you should have to adjust the volume only once. If you do not already own a cassette recorder, you can purchase the Timex/Sinclair 2020 Computer Program Recorder. It is designed especially for use with Timex/Sinclair computers and can also be used as a conventional tape recorder for speech or music.

The first program is Keyboard Tutorial. It summarizes the material covered in the manual to familiarize you with the keyboard. It also demonstrates the sound

and graphics capabilities of the 2068. As each key is introduced, a picture of the keyboard is drawn, using high-resolution graphics accompanied by sound effects. The appropriate key flashes, allowing the user to find its exact location on the keyboard. At the end of the tutorial is a practice session to test your ability to use the keyboard.

The second program is Turtle Graphics. It lets you draw high-resolution pictures by guiding a "turtle" around on the screen. By typing commands from the keyboard you can tell the turtle to move forward so many pixels and turn left or right so many degrees. As the turtle moves, it leaves behind a trail. The power of Turtle Graphics is its ability to repeat a sequence of commands many times to create interesting patterns on the screen.

The third program is Home Accounting, which helps you keep track of your household budget or business records. You enter your budget and actual amount spent for each month, and the computer calculates the difference. You can display a bar graph of each month's budget versus your actual expenses.

Timex seems to realize the importance of software. They promise to have a "plentiful" supply of programs ranging in price from \$9.95 to \$19.95 on cassette, \$12.95 to \$29.95 on cartridge. Cassette programs developed for the ZX Spectrum can also be used on the 2068.

Documentation

The 290-page *User Manual* explains all the features of the 2068 well. Part I introduces the major features and assumes the user has no computer experience. It also explains how to load programs on tape cassettes so the included software can be used right away. For those who want to write their own programs, Part II provides an introduction to programming in T/S 2068 BASIC. It covers the use of variables, arrays, arithmetic functions, subroutines, and the concepts of looping and branching. Part III describes more advanced features to allow the experienced computer user to get the most from the computer. Such features include user-defined graphics, input and output, and music and sound effects.

The appendices go into detail about the memory configuration and briefly mention several "enhanced display modes," including a 64-character wide screen, a dual screen mode, and an extended color mode. Exactly how these modes are used is not clear, but they are discussed in more detail in the *T/S 2068 Advanced Programming Concepts Manual*.

Throughout the manual there are illustrations showing exactly which keys to press and roughly what should appear on the screen. Beginners will enjoy the cartoons, featuring an old woman and her cat, which have nothing to do with the computer, but help make the computer less intimidating.

Besides a tape recorder, you can add two more peripherals. The 2068 is compatible with the Timex/Sinclair 2040 Thermal Printer used by the TS1500 and TS1000 computers. It prints graphics and text and retails for \$99.95. A modem is also available to provide access to data banks and telecommunications services. Special programs for use with the modem provide home shopping and banking capabilities. Other peripherals *will be* announced, including bulk storage devices. Peripherals are connected to the expansion port, which can accept only two at a time.

In terms of memory, graphics, and sound, the Timex/ Sinclair 2068 is an impressive entry into the under \$200 market. And, where some other computers require that you spend an additional \$60 to \$70 for a cassette recorder, you can use any player with the 2068. Furthermore, the included software enables you to use the computer immediately, without spending another cent.

*Timex/Sinclair 2068 Personal Color
Computer*

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\$199.95

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