Magic Wands

Light pens are computer add-ons that can be used to draw or mark on the screen. We discover how these remarkable devices work

'Keyboard phobia' is one of the commonest reasons why people are reluctant to get to grips with computers, either at home or in the office. Because the keyboard resembles a typewriter and they haven't learnt to type, and worse still it contains several keys with unfamiliar signs on them, they are afraid of making fools of themselves. The light pen is one solution to this problem (along with devices such as voice-input) though it does have other uses.

A light pen is a cylindrical device (looking much like an ordinary pen, from which its name is derived) with a telephone-style coiled wire coming from one end. At the other end of this wire is a plug, which fits into the back of the computer. Whenever the light pen is pointed directly at the screen (some systems require that the pen is pressed onto the screen, in order to activate a switch inside the pen), the computer can detect the exact position on the screen at which it is being pointed.

What is actually happening is that a photo-detector in the tip of the pen is responding with an electrical pulse every time it is passed by the point of light that continuously scans the whole screen to create the image. Circuitry inside the video controller chip calculates where the scanning point was at the time when the light pen emitted its signal.

The most common use for a light pen is therefore to select an item that is displayed on the screen. Knowing the dot at which the pen is pointing, the computer can deduce the character or symbol of which that dot is a part. Many applications programs feature 'menus' as part of their operation. A menu is simply a list of options displayed on the screen, from which the user must make a choice — just like in a restaurant. In a home finances program, the menu might be:

1) Make a payment
2) Examine bank balance
3) Enter a receipt
   and so on.

Normally, the user would indicate his chosen course of action by pressing a single key (1, 2 or 3) or typing in a command word. With a light pen, he merely has to point to the required option. The computer usually responds by flashing that particular option to indicate that it has accepted the input. Some quite sophisticated programs are operated almost entirely by means of such menus (these are described as menu-driven), in which

Lens
The amount of light emitted by a single pixel being refreshed is so small that a lens must be used to concentrate it onto the surface of the photo detector
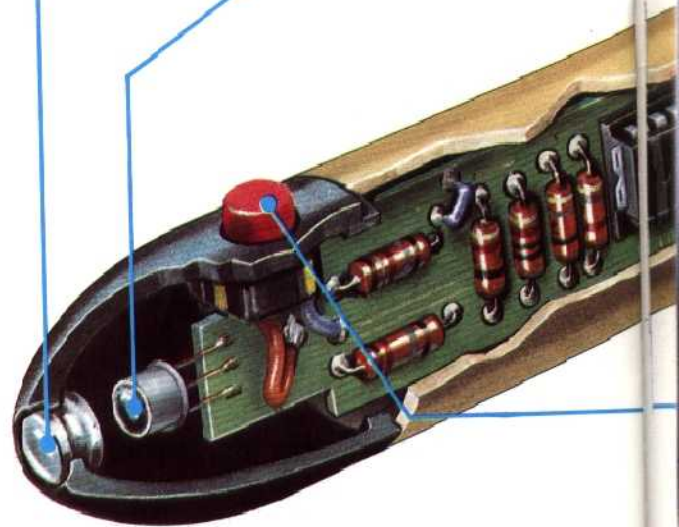
case the user need only touch the keyboard when actual data is needed, such as someone's name and address.

Special Routines

The difficulty is that such a program has to be written specially to work with the light pen, as distinct from the keyboard. This is only really a matter of writing a small routine that takes the co-ordinates indicating the current position of the light pen from the video controller, and works out which of the options occurs in that position on the screen. Unfortunately, few manufacturers of software supply versions of their packages that work with a light pen.

However, in addition to selecting items, a light pen can be used to create images on the screen. Most home computers for which a light pen is available have a suitable software package for this purpose. The user is presented with a blank screen on which to draw his diagram, picture or doodle, and a separate section (usually along the bottom of the screen) that provides a series of special functions to help in the creation process. One of these will be a palette of colour, which works just like the palette used by an oil painter. The light pen is placed over the colour next required by the user, and wherever the pen is subsequently moved over