PCN micropaedia

Vol. 12 Part 1

MONITORS

Your complete reference guide

PULL OUT AND KEEP

SCREEN YOUR MICRO

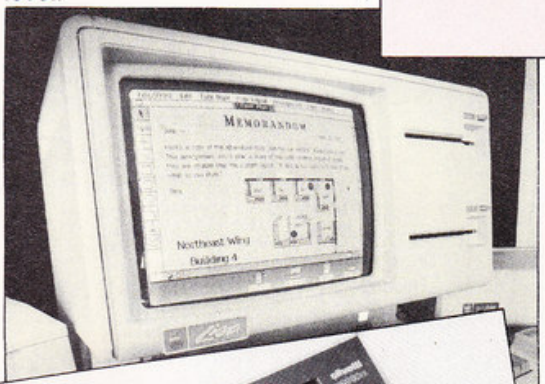
When computers were first built, there was no conception of hooking them up to televisions.

In fact, until the 1970s most computers were big mainframes — like the one in the photo at left — on which all but the privileged had to work without TV monitors. On these machines, the most common way of seeing what your computer was doing involved looking at a big shared printer.

This gulf between the TV screen and computer has a lot to do with why old-style adventure games didn't use graphics — there was no screen on which to put them.

Even when home computers were first introduced to the television screen, they weren't seen fit to consort with colour TVs, but only little black and white jobs.

Clive Sinclair's ZX80 and ZX81 computers — the first to achieve mass popularity in the UK — both supported only black and white. It took machines like Sinclair's Spectrum and the Vic-20 (pictured opposite) to bring down the price of colour computing to an affordable level.



Having established a low price for the facility to run colour TVs, the trend on more expensive machines is oddly enough moving back toward black and white displays.

Apple's Lisa — the Maserati of personal computer business — uses a high-resolution monochrome (non-colour) display for its fantastic range of windows and symbolic graphic 'ikons'.

A liquid crystal display uses much less power than most conventional Cathode Ray Tubes and can be fitted into the very small space required on portable computers. Olivetti's use of the LCD is demonstrated in their new M-10 machine (pictured in the photo opposite at the bottom).

It's often said that beauty is in the eyes of the beholder, but in case of computer graphics beauty will largely depend on your choice of monitor.

Often this choice is no choice at all, but merely an optimistic assumption that your ordinary old TV will do the job quite nicely, thank-you. This assumption is understandable enough and one that certainly spares your chequebook a good deal of grief — but it's unfortunately often a false assumption.

If you want to get real beauty out of your computer graphics, and some relief for your eyes when hours of hacking threaten to drill them deep into their sockets, then consider a few things about the job a monitor has to do and then size up whether your TV is really up to it all.

1 A monitor must maintain a consistent and stable lock on the signal from the computer. In the case of some popular home computers (the early releases of the Sinclair Spectrum and Oric machines in particular), only certainly televisions will do justice to the machine's capabilities.

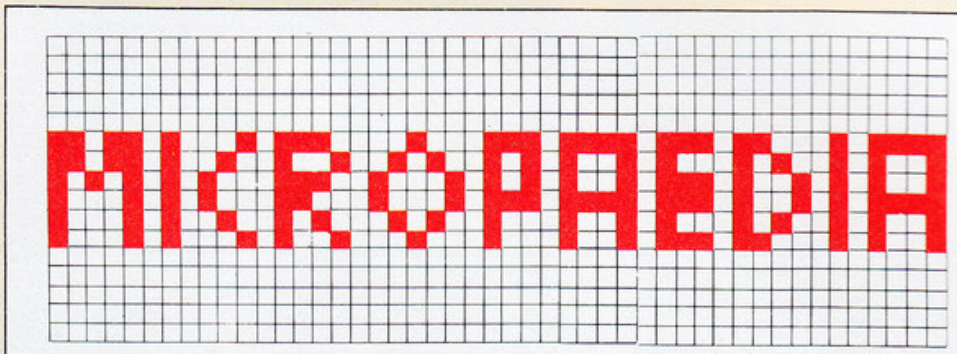
It's always a good idea to see if your TV can easily tune into a computer's signal before you decide that the TV is up to the job. If it takes a lot of fiddling and twiddling, chances are that the slightest bit of drift on the video signal will send your picture wonky and either turn your colour computer into a black and white machine or blind you because of the eyestrain involved in reading characters which aren't quite impossible to make out.

And if your micro produces sound through the TV speaker, remember to check that as well. It's no advantage if your TV tube will draw a lovely colourful Donkey Kong, but the essential 'mood music' to encourage your high scores has been silenced by some TV sound tuning circuitry that doesn't co-operate.

Moreover, don't think that just because your micro is new that it won't need to use the TV's speaker. Both old and new machines depend on the voice of the small screen; the TI 99/4a computer, the Atari line of machines, as well as Commodore's Vic-20 and 64 micros have used the TV speaker system.

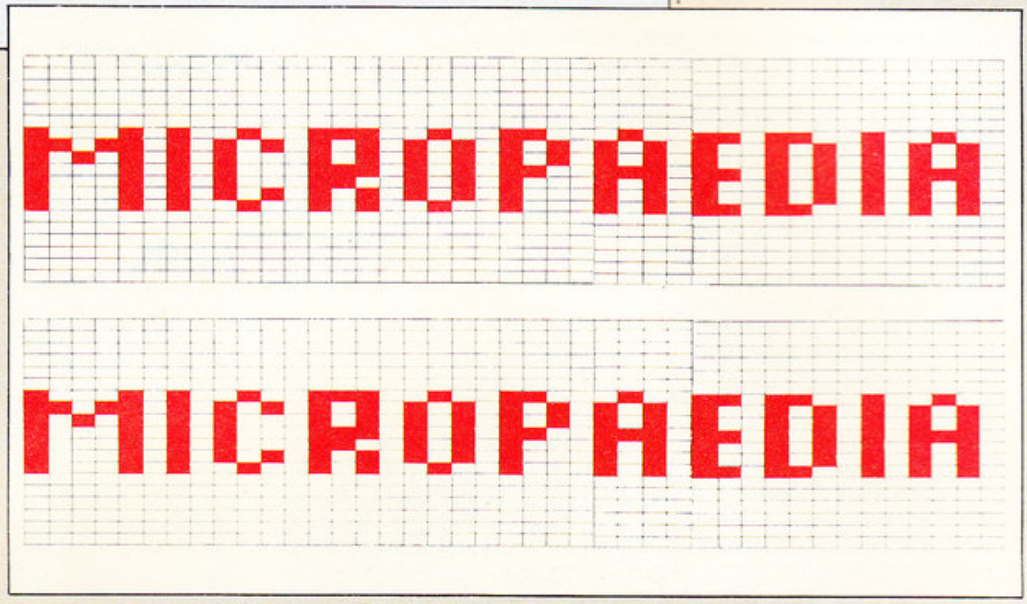
2 The monitor must be the right size to compliment the majority of applications to which the micro will be put. A huge home television set in your living-room is probably not the monitor you would want to use for close-up 80-column work with word-processing and spreadsheets, although it may be perfectly suited to games playing.

Consider, as well, that if you want to use the television for a number of different applications with the micro then it might not be convenient to constantly move the thing around (especially if there are still people in the house who want to use it as a TV).



What is known as the 'resolution' (how fine the definition on a computer monitor is) often has more to do with the kind of graphics the computer is capable of generating than the actual monitor itself.

In the diagrams we reproduce some resolution grids for the BBC Micro — demonstrating two 'modes'.



Immediately above, you'll see part of a grid that's made up of a 640 by 256 unit rectangle: if you were to plot all the points around it and examine them in detail you would see 640 dots across the screen and 256 dots down the screen.

On a high resolution screen, those dots are just a bit smaller and there are more of them than on a lower resolution screen. Look at the way we can spell out 'Micropaedia' using the small dots in the 640 × 256 high-resolution grid, as compared to the 160 × 256 resolution grid below.

With games, it's not likely to matter so much, but if you want to do any serious business work with your micro you'll probably want to sit it on top of the desk. At this point you'll have to consider what the jargon community calls your machine's 'footprint'.

The footprint of a system is simply the amount of space it takes up on a desk. If your monitor makes too big a footptint, it will become obstructive and downright clumsy. On the otherhand, if the monitor has a footprint that's too tiny, it will probably also have screens too small to read.

3 Have the right adjustments and controls to suit the application — a good brightness and contrast control can be invaluable in setting the system up properly.

If you've got a colour computer, then it's best to have a colour TV with as true colour as possible. This should be relatively easy to test by looking up what the colour values are supposed to be in your computer's handbook and then writing a short program to generate those values.

Once you've written that program, you can use it as your own 'TV test pattern' to get your TV adjusted and balanced correctly.

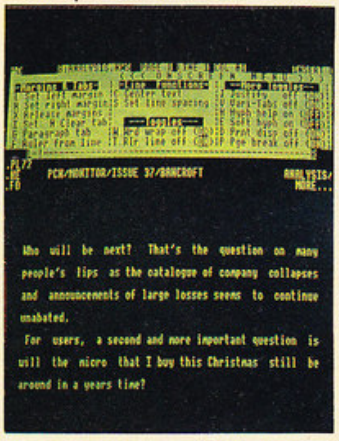
In setting the contrast and brightness, you'll be looking for a picture that doesn't make the screen characters so fat and intense that you're going to be blind from reading them for any great length of time. But you want to avoid the kind of dimness that could start you squinting in order to make them out at all.

The last two factors can often be very important if you're to do any work in an 80-column mode on your computer. Most home TVs, in fact, don't have the ability to give an adequate 'resolution' in 80 columns.

But TVs, of course, aren't the only kind of monitors available for computers. Over the next seven pages, we'll also have a look at dedicated CRT monitors — both the RGB and Composite video varieties. So focus you attentions on the input coming up see what will do for your video output.

This is the kind of eighty-column screen display that you need for professional word processing. The monitor must disply characters both clearly and evenly. Squinting at fuzzy letters and numbers can often play havoc with both your eyesight and your temper.

Perhaps the most famous word processing program to grace a micro's 80-column screen is Micropro's Wordstar.



INSIDE

The insides of TV monitors are usually the subject of diagrams such as the one below, but there are two problems with that approach.

The first problem is that they usually deal with RGB professional monitors – which are above the financial means and requirements of most micro users. And the second is that what goes on inside a monitor is not usually going to have a great deal of relevance to making use of the outside of the machine.

So, we present below an annotated tour round the outside of a household TV/Monitor – giving you everything you're likely to need to make the best use of your TV.

The tuning system – On most home televisions there are allowances for tuning four or more channels. Assuming that you want to maintain your full complement of TV channels, the signal from your computer will probably be assigned to a fifth channel.

Tuning into a micro's UHF signal can be accomplished by either twiddling one of a series of knobs (in the case of a manually-tuning TV) or by using the 'search' function on an automatically tuning TV. On the machine below, you'll see that we're pointing to an electronically-tuned system (on top of the TV) – which has both advantages and disadvantages over the old manually tuning knobs.

The great advantage of a manually tuning TV is that it's far more precise than an electronically-tuned device. In trying to 'suss-out' a computer's often confusing video signal, an automatic-tuning electronic TV will look for only the strongest signal and then lock onto that. Unfortunately, the frequency of that signal can often vary slightly, so that although your micro may have been perfectly-tuned ten minutes ago – it won't necessarily stay that way.

The screen – the screen on most UK television sets is designed to handle the PAL system of TV signal tranmission. The system has an optimal resolution of 625 lines across the screen, meaning that the dots which make up a picture are so small that they scan across the TV to make 625 lines on it – each containing a bit of the picture.

With that standard defined, it's pretty much up to a micro and it's resolution (see explanation on previous page) as to how well-defined the screen image can be. Any micro, however, which has a resolution exceeding the 625 maximum number of lines across the TV screen will find itself needing to move onto a higher-resolution screen that will be able to handle that density.

The composite video monitor input - In this case, a simple BNC connector gives you direct video input to the TV from the computer. Composite video can be a colour signal, but more often it's sent as a black and white signal to 'green screen' professional monitors. If a composite colour video signal is generated, it usually doesn't look any different from the ordinary TV UHF signal.

On the BBC Micro, for example, the Mode O screen resolution moves beyond 625 lines, up to 640 lines across the screen (explaining why you'll find it very difficult to run an 80-column screen on a TV set).

The speaker – Whether or not this gets used while computing depends entirely on the micro. There are many machines which generate their sound through an internal speaker in the computer and don't use the sound facilities of a TV. But on the machines that do, there are ways to take advantage of this system.

On machines with built-in speakers you are not likely, for instance, to be able to easily adjust the volume of the sound coming from the computer. With sound routed through the TV speaker, it's a simple matter of turning the volume knob on the TV set.

More important perhaps, TVs can often provide an outlet for routing the sound to a stereo amplifier or tape deck by allowing you to plug into an earphone jack.

The UHF Antenna input – You can't get here from there without a modulator. In order for any micro to plug into the antenna socket of a TV, it needs to have some form of device to 'modulate' the computer's signal so it can be understood by a computer.

Modulators can be either inside or outside the computer and often have a little switch on them that allows you to choose whether you want to see what's on the micro or what's on TV.

ON SCREEN

Buying a microcomputer is rather like buying a car with no petrol. As it stands you can't do anything with it. With the car you need fuel, with the computer you need some form of display.

The larger, more expensive, business micros come with their own video display units, but most home computers, at present, do not. The logical and least expensive thing to do is connect it up to your existing domestic TV. But having done that are you happy with it? To be honest, most people, until they've seen their computer working on a dedicated monitor, probably don't realise just what they are missing.

To understand what has happened we need to look at what happens to your picture before it hits the television screen.

Televisions

All home computers sold in this country have a provision to connect the output to an ordinary domestic television. This is called RF output. RF stand for Radio Frequency, and that is exactly what happens. The output of the computer is converted through a modulator into a RF signal. Literally what this means is that your computer is transmitting the signal from itself to the television set, rather like the BBC and ITV do from their high powered transmitters to your aerial on top of the house. This is so that an ordinary standard television set can understand the signal it is being sent.

You have to tune the television to a station to 'receive' your computer signal — normally around channel 36.

When your television receives the signal from the computer it 'demodulates' it.

Most people have televisions in the home with a screen size of 22 inches or greater. Although these are excellent for viewing the normal broadcast pictures they are not really very suitable for home computers for a variety of reasons.

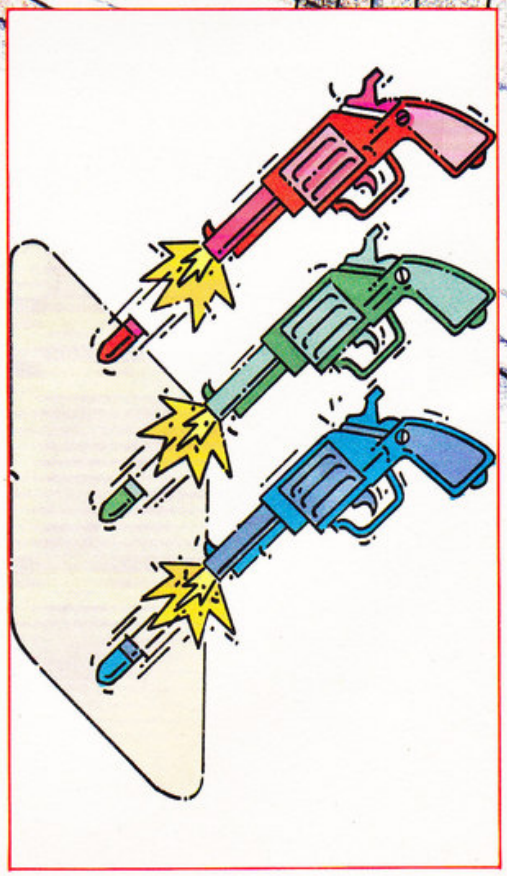
When you get your home computer you will probably find that it comes with a cable for connection to the TV which is not more than 6ft long. By the time you have plugged it into the back of the television you are left with only a short length of cable to the computer, so you are forced to sit very close to the screen.

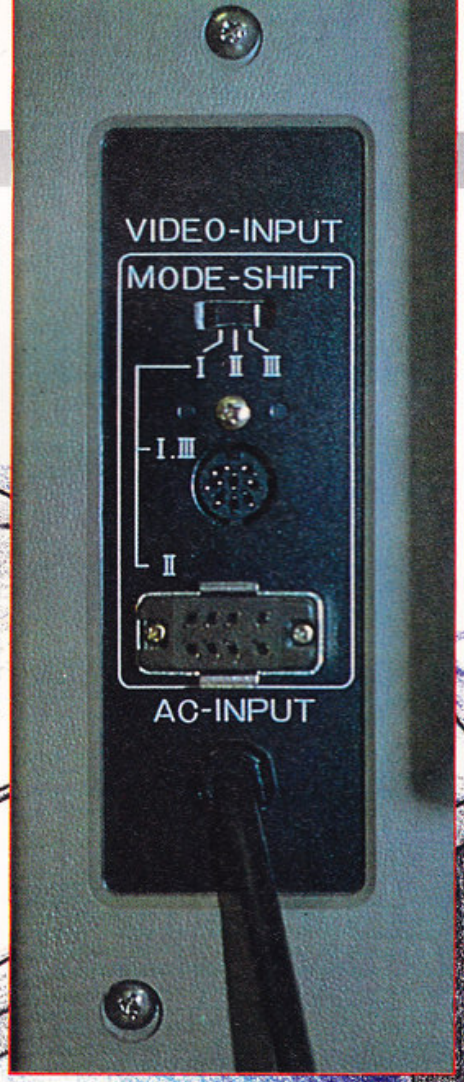
With a large screen this is not good for your eyes, nor will you see a good picture so close to the set. You are then left with the alternative of adding extra cable to the antenna lead, trailing it across the floor to a point far enough away from the television to make viewing acceptable. The problem that now arises is that the longer the lead between the television set and the computer, the greater danger there is of picking up interference along the way and thereby reducing the picture quality still further. Anything is likely to affect it — lights, vacuum cleaners, fridges, deep freezers and so on.

Another problem with the standard domestic television set is that what is known as convergence on the screen is quite likely to be slightly out of alignment. To explain this you have to imagine that at the back of the colour television set there are three 'guns', each producing a signal in one of three colours: red, green and blue. When they get

At the top of this page, you'll see what the display from a BBC Model B looks like on an ordinary TV set. The BBC has the capacity to run all three of the chief sorts of monitors; RGB, composite video and UHF TV so we have picked it to display the same picture on two screens. The first of those screens is at the top of the page, while the second is at the bottom of the opposite page.

And finally, in the diagram at the bottom of the page, is a brief explanation of how colour is produced on a TV set. Imagine that at the back of the TV set there are three 'guns', each producing a signal in one of three colours: red, green and blue. When they get to the screen they mix together to produce a picture give all shades of colour.





This is the back end of a Kaga RGB monitor. You'll note there are a couple of places for signals from a computer to be plugged into the monitor — the most common being the DIN multi-pin plug, which separates colour signals for each of the different primary colours onto a different line.

Both plugs on the Kaga are multi-pin and can thus handle the complex series of signals needed to produce RGN colour.

This is what the image looks line on an RGB monitor. You should be able to see, by comparing it to the same image on an ordinary TV in the picture opposite, that the resolution and quality of the RGB picture is much higher than that of the television screen.

Not all micros, however, have connections to use RGB monitors, although some machines — like the Apple II — can be interfaced to an RGB system through a plug-in card in the main bus of the micro.

to the screen they mix together to produce a picture giving all shades of colour. Now it is not too difficult to see that even if one of the guns is very slightly out of alignment strange things can happen to your television picture. Normally when you are watching broadcast television this doesn't matter too much (so long as they are not too far out), but when you are trying to look at a computer program, either in text mode or with graphics, your picture will become blurred. The larger the screen the greater the chance of this happening.

The problem is further increased because a computer may use very high resolution. The BBC Micro, for example, in high resolution graphics mode uses a screen size of 640 × 256. Simply, this means there are 640 vertical columns down the screen. The normal domestic television receiver doesn't approach this figure and consequently you get a blurred image.

A simple way to see how your television set might be compatible with a computer is to look at the test card. You will notice that there are vertical and horizontal bars on the card. If you can see the detail in the finest grating on the vertical bars then this indicates that your set has a bandwidth of at least 5.25MHz which should be suitable.

Looking at the test card is another way of checking that the convergence on your set is good. If there is a blurring at the edges of the lines or definite colour streaks in the black and white area of the screen then you should get the set adjusted.

Dedicated monitors

Dedicated monitors come with two inputs — RGB and composite video. Which type you use much depends on what sort of alternative video output (if any) you have with the computer. Most of the cheaper range of computers don't give you this alternative, although if you really know your electronics and can obtain circuit diagrams of the computer it is possible to pick up a video feed before the modulator.

All monitors get their feed from the computer without going through a modulator, so, in theory at least, the picture should be more stable and have better definition.

There has been much discussion on this subject over the last few years in industry and commerce. People spending much of their working lives in front of a VDU in early days suffered from eye strain, headaches and fatigue. Much of this was put down to the quality of the video display and considerable work and research was put in to try to find the most suitable type of monitor for long term use.

Most business machines have built-in video display units, usually with green screens although amber is an alternative. These monochrome screens are ideal for word processing and general business applications, but not a lot of use if you want to play games or use other colour applications.

Monitors generally produce a more stable, flicker-free picture and it is possible to sit within a foot or two for long periods of time without suffering eyestrain.

Like anything else, you get what you pay for. At the lower end of the market colour monitors are now priced around £200 and provide a good steady display. There are two main ways of defining a monitor. The first is the bandwidth.

ON SCREEN

Inside each monitor is a video amplifier which boosts the incoming signal before sending it to the screen. The bandwidth is determined by the amount that the amplifier can amplify the signal — the larger the amplification, the higher the bandwidth (and the more expensive the monitor).

The higher the bandwidth the more rapidly the video signal can change and the sharper the image on the screen.

The second measure of monitor performance is resolution. The cheaper ones are also cheaper because they do not have very high resolution, *ie* the number of dots they can display on the screen is limited. Most of them at the cheaper end are very similar to the ordinary domestic television, but their big advantage is that because the signal doesn't go through a modulator they have better picture quality.

Most monitors are provided with an anti-glare screen, or one can be bought separately.

The biggest advantage that the home computer user will have in buying a monitor is being able to use the micro while leaving the family at peace with the television set.

The main influence on which monitor to buy will be the kind of output your micro provides.

Composite video was until recently the most common, mainly because RGB monitors were not available within the sort of price range the home computer user could afford.

On composite video the output signal is sent to the monitor as a single unit with the three main colours synchronised. The main disadvantage to this that the video signal is degraded before it leaves the computer and it is still possible to pick up outside interference on its way to the monitor.

On an RGB interface the signal is sent out as three separate colours (red, green, blue) and a separate sync signal. When these arrive at the monitor they are then combined, amplified and sent to the screen.

Many of the colour problems associated with the output of colour computers can be put down to the fact that even British made sets often have components which are manufactured or designed either in the USA or Japan. Since both those countries use a different television system this can mean that when the signal is encoded for the PAL system which we use here there is a loss of quality.

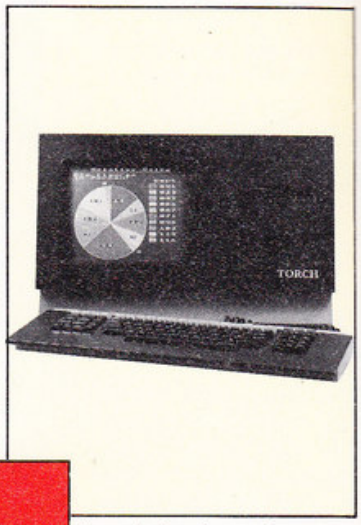
Combined TV/monitors

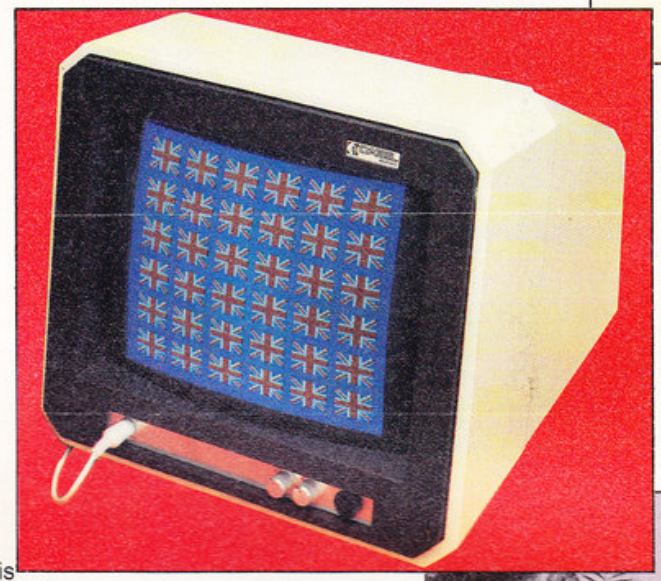
There is another option in the search for image quality without spending vast amounts of money. Some of the manufacturers are starting to bring out television sets which also have monitor connections.

These sets usually use a RGB interface but can be found with composite video and are ordinary domestic portable televisions with the added advantage of being able to plug in a standard direct video feed from a computer (or video recorder) which overrides the RF tuner. Although generally not of such high quality as a dedicated monitor, they do provide a great improvement over the ordinary domestic TV.

If the display you require is for basic text and you either don't have or don't want colour then investment in either a green or amber screen monitor will suffice. Although they are basically monochrome sets — they only produce green/black or amber/black — their selection is as critical as that required for a colour monitor. The higher the bandwidth the better the definition. However, for most home computers using 80-column screen text, the less expensive ones will be quite adequate.

It is as well to try and see your type of micro working with your choice of monitor before you buy. Whatever you do, don't try to mess around inside your own television set to see if you can convert it.





A variety of monitors are popular with certain computers. On Torch computers (top photo), a colour monitor is built into the machine and you don't really have a choice (although the machine does allow for hooking up more than one monitor at a time). Some monitors, such as the early Cabels (see photo opposite), had controls for things like vetical and horizontal hold actually inside the machine and unreachable without taking to cover off. On many popular micros that profess an appetite for word-processing, 'green screen' 80-column monitors such as the Zenith, pictured below, are used.

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NEXT WEEK

We begin our four-part special Christmas buyer's guide. In the four weeks leading up to Christmas, we'll give you a complete look at what to buy in the way of hardware, peripherals and software.

The guide starts next week with our first 16-page special on hardware — incorporating PCN's Databasics section and a new guide to what you'll find in the shops this season.