

# ROUND UP

THE CONCEPT BEHIND POCKET-TV IS NOT NEW; ITS origins can be traced to the science-fiction pulps and comic strips of the first part of this century and beyond. Science fiction became science fact in January, 1977 when Sir Clive Sinclair, that English genius of micro-miniaturization, introduced and sold the *Microvision* "pocket" TV through his company, which was called Sinclair Radionics at that time. The *Microvision* was a black-and-white TV set; it used a CRT with a 2-inch (diagonal measure) screen. Despite having some interesting features, that set's price (about \$300) and size (pocketbook size would have been more accurate) contributed to its eventual demise.

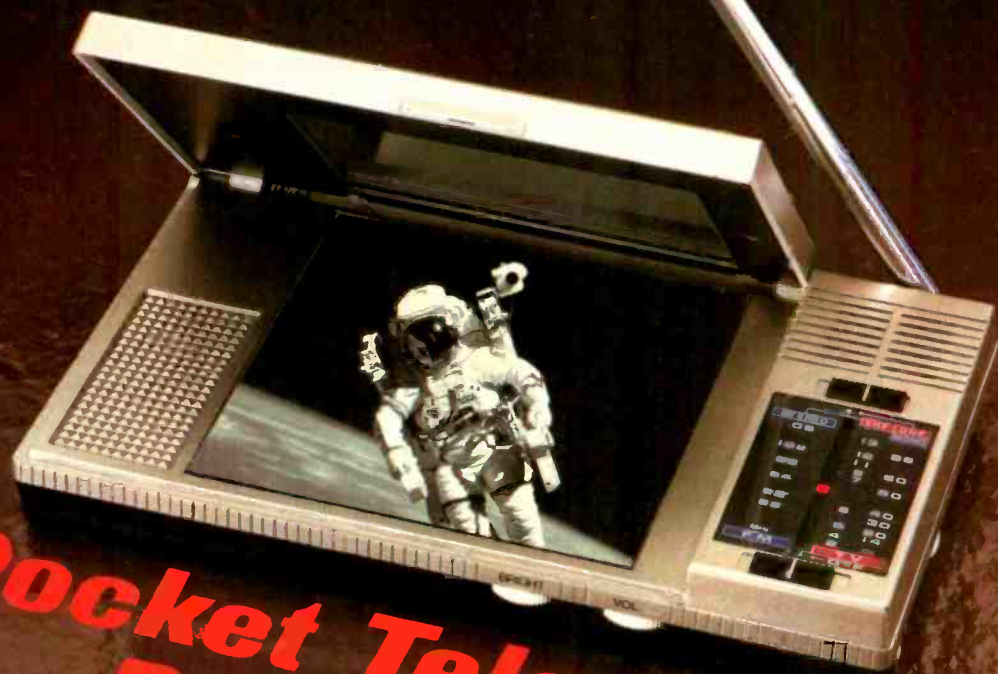
The reasons behind both the high cost and the relatively large size of the *Microvision* could be traced to the CRT (specifically, its manufacturing

costs and long neck). Realizing that, Sinclair launched research aimed at producing a "flat" CRT. His efforts, and those of his competitors, have led to the birth of a whole new branch of consumer electronics—pocket-TV sets

## This report

As we stated, Sinclair is not the only player in this field. In developing products, various manufacturers have embraced new technologies, and have added colors as well. Sony's *Watchman* line, originally offered in 1982, recently passed the one-million-unit production mark.

In this report we will look at 24 pocket-TV sets that are either available now or about to be introduced. For quick reference, the features of each set are summarized in Table 1. More details on each set



## Pocket Television Receivers

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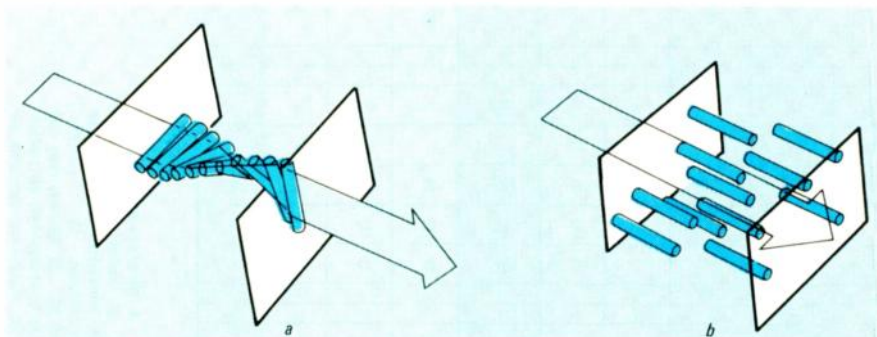


FIG. 1—IN THE ABSENCE of an electric field, liquid-crystal molecules twist the light 90°, allowing it to pass through the display (a). When an electric field is present, that twisting does not take place and the light is absorbed by the top polarizer (b).

By contrast, the circuitry required with LCD's is compact and lightweight. Therefore, the *Elf* and similar units easily can be held in the palm of the hand. Moreover, the low power consumption of an LCD eases the drain on the unit's batteries. Because the electrodes in a liquid crystal display can be made of transparent materials, the screen can be lit from behind (backlighted) with ambient light or from a built-in source.

In developing the Epson liquid-crystal color TV, Suwa Seikosha's scientists and engineers had to overcome some formidable obstacles. For one thing, the liquid crystals commonly used in watch and calculator displays respond slowly to electrical signals. That is unacceptable for video displays, where the liquid crystals must be turned on and off many times a second. Also, most liquid-crystal displays are low in contrast and limited to black images on a light background.

To solve the problems of slow response times and low contrast, Suwa Seikosha's research team turned to TFT's to turn on and off each of the 52,800 pixels in the *Elf* display. The transistors, deposited on a glass substrate, are made of polycrystalline silicon, a material known for its stability and reliability.

To understand how the TFT's improve performance, it is necessary to know a little about how liquid-crystal displays operate. In the type of LCD used in watches, calculators, and the Epson *Elf*, liquid-crystal material, which is composed of long, organic molecules, is sandwiched between two polarizers; for our discussion, let's designate those the top and bottom polarizers. The polarizers are placed in the display so that their transmission axes are separated by 90 degrees. When no electric field is present, the liquid crystal molecules have their long axes parallel to the top and bottom polarizers and the

in-between layers gradually twist through the 90 degrees between top and bottom. Light entering through the bottom polarizer gradually gets twisted through a 90-degree angle by the liquid-crystal layers and exits through the top polarizer as shown in Fig 1-a. A person viewing the display sees a light spot.

In the presence of an electric field, however, the molecules stand up on their ends, parallel to the direction of the field. In that state, they can no longer rotate light. Therefore, light entering the bottom does not get twisted; instead it gets absorbed by the top polarizer as shown in Fig. 1-b. To a person viewing the display, that spot appears dark.

To create the hundreds or thousands of pixels needed to form an image in a complex liquid-crystal display suitable for use as a video screen, the earlier (and still widely used) approach is "multiplexing." In multiplexing, rows of electrodes are deposited on one side of the liquid-crystal layer, and columns of electrodes are deposited on the other side. The pixels are created at the junctions of rows and columns.

To simulate the scanning processes of a CRT, electric pulses are fed to the row electrodes in succession; during that interval, all of the column electrodes are pulsed simultaneously. Whenever the voltage at a row-column junction exceeds a threshold value, the liquid crystals respond. In that way, every field of a standard TV signal can be displayed.

Multiplexing has its problems, however. Because many rows must be addressed in a short time by a single electric pulse, the time-weighted average on/off ratio of black to white is very low, and that results in poor contrast.

Those problems were solved by resorting to an approach called *active-matrix addressing*. In that system, the 240 row and 220 column electrodes of the display are deposited on a single glass substrate. On the opposite side of the display is a common electrode. The TFT's, placed at each row and column junction, are turned on whenever a pixel is to be activated. Driver circuitry controls which pixels are activated at what times.

With the TFT's, each pixel receives the full voltage needed to turn it on, not a time-weighted average, as in multiplexed devices. The result is a very high on/off ratio and good contrast.

Color is added through the use of thousands of microscopic red, blue, and green primary-color filters; one filter is placed over each pixel electrode. When a red spot is to be created, the TFT's at the blue and green filters in the appropriate region are turned on, blocking out light there and letting light through only the red filters. If blue is desired, the red and green TFT's are turned on. If green is to be displayed, the red and blue TFT's are activated.



PANASONIC CT-101

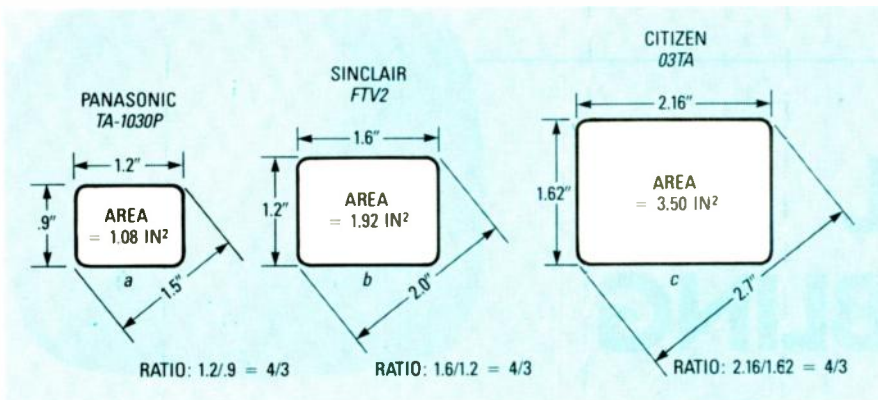


FIG. 2—DIAGONAL MEASURE versus viewing area for three popular pocket-TV sets. The Panasonic TA-1030P is shown in a, the Sinclair FTV2 is shown in b, and the Citizen 03TA is shown in c.

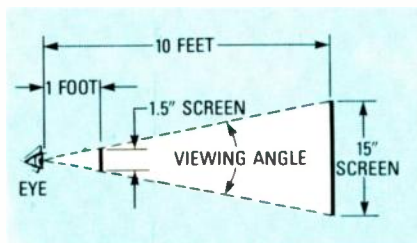


FIG. 3—A 1.5-INCH SCREEN, viewed at a distance of 1 foot, will yield the same viewing angle as a 15-inch screen viewed at a distance of 10 feet.

Other shades are created by turning on various mixtures of the primary-color pixels. If all the TFT's in a region are turned on, no light gets through and the image appears black. If none of them are turned on, all the primary colors get through and the image appears white.

### Charting the sets

While the meaning of many of the entries in Table 1, our comparison chart, are obvious, some require further explanation. So, before discussing the individual TV sets, we'll first explain each of the chart headings. The notes and the remarks at the end of the chart provide much additional information.

**Manufacturer or source:** Most pocket TV sets are still relatively hard to find in local retail stores. Large electronics stores that carry many brands of TV and video equipment are the most likely sources. If you can't find a set you are interested in locally, you may wish to write the manufacturer for assistance. Also, some luxury catalogs, such as those available from Markline and The Sharper Image, frequently offer pocket-TV sets.

**Model:** It's not unusual for some pocket TV sets to look alike and yet be different in performance. Some are made by one manufacturer for another, but specifications may not be the same although appearance is identical. For example, the Citizen 03TA and the Radio Shack *Pocket-vision-3* look almost identical, but use a different screen technology and include

different accessories. Therefore, when shopping with our chart, look for specific model numbers.

**Price:** The prices shown are the manufacturer's suggested retail prices in effect at the time this article was compiled. As with most other types of consumer-electronics products, substantial discounts are usually available, either from dealers or from mail-order houses.

**Size:** The dimensions, given in inches, are approximate, and may not include minor protrusions such as switches or retracted antennas. The intention is to give you an idea of relative size. The designations of wide, high, and deep are made with the assumption that the user is looking at the surface of the unit that contains the viewing screen.

**Screen characteristics:** Some sets offer color but, with the exception of the Panasonic CT-101, you'll be disappointed if you expect picture quality that rivals your home color-TV set. That's because all of the color sets, except the CT-101, use an LCD instead of a CRT. While some LCD sets are surprisingly good, most have a way to go before they will equal the performance of conventional CRT's.

The screen sizes are given in inches measured diagonally, as is the convention with TV-screen specifications. However, that can be very deceptive when dealing with small-size sets. For example, the 1.5-inch Panasonic sets have a viewing area that is only about 50% of a 2-inch screen (that's probably why both Panasonic sets come with magnifiers). Figure 2 shows how diagonal measure relates to viewing area for three popular screen sizes. Note that the TV-standard 4:3 aspect ratio is maintained for all sets.

That is not to say that a 1.5-inch screen is too small. It depends upon how far it is from your eye. Figure 3 shows that a 1.5-inch diagonal screen one foot from your eye subtends the same viewing angle as a 13-inch diagonal television screen 10 feet away.

Probably the most important screen characteristic in determining the accept-

ability of the picture is the type of display. Subjectively speaking, a black-and-white CRT offers the highest levels of resolution and contrast. On the other hand, LCD screens, with their limited pixel counts and often poor contrast ratios, are the worst performers.

The clarity and contrast rating provided in the table are strictly the author's judgments, and are based on his comparisons between sets.

**Adjustments:** The trend by manufacturers in recent years has been to delete some of the traditional user controls from their TV sets. Among the controls that have slowly begun to disappear are vertical hold, contrast, and brightness. One reason for that is that modern integrated circuitry can control many of those parameters automatically, thereby eliminating the need for user override. Another is cost. The elimination of seldom-used controls does make the set a little less formidable to operate, but it also reduces your control over what you watch.

**Speaker:** If you don't expect much in the way of good sound from these sets, you won't be disappointed. Speaker location plays a role in the sound quality, with the worst performing units being those with the speakers mounted at the rear. Further, some sets are barely audible at maximum volume in noisy surroundings, such as a fast-food restaurant. Earphones are provided or available with all units, if you can tolerate typical earphone quality. The best sound was provided with the stereo earphones included with the Sony FD-30A and the Magnavox BF390IBK. Where quality ratings are provided (only on those sets tested), the rating was relative to other pocket TV's.

**Computer monitor:** Because of those TV set's small size, their use as a computer monitor is obviously marginal. However, the set's ability to display a 32- or 80-column computer screen is useful as a benchmark in determining its resolution capabilities. For all sets, the computer signal was coupled via a UHF modulator (channel 15) with a stub antenna. Where available, displays coupled via a video or external-antenna input were also evaluated.

**Accessories:** The large range of included and optional items are shown in this section of the chart. Most are self-explanatory, but further information can be found in the discussion of each individual set.

### Next time

Of course, there's a lot more to be said for the various TV's than can be summarized in a chart. Next time, we'll provide in-depth, no-punches-pulled evaluations of many of the pocket-TV set currently available. If you are contemplating purchasing one of those sets, it is a round-up you won't want to miss. R-E

# ROUND UP

**Part 2** WITHOUT A DOUBT, POCKET-TV has become one of the hottest segments of the consumer-electronics marketplace. It can also be a bewildering one, with manufacturers offering different technologies, different features, and a wide variety of price points.

Last time, we presented an overview of the market in tabular form. While that type of overview is useful for comparing all of the TV sets at a glance, there is quite a bit of information that cannot be presented in a table. This month, we'll take a deeper look at the best, and the worst, that those TV sets have to offer.

## Our evaluations

All the manufacturers covered in this survey provided one or more sets for our evaluation.

However, some sets were not available at the time this report was written. Untested sets are noted (see Table 1 in the July issue of *Radio-Electronics*) and our comments on those are based on manufacturer's literature or our experience with sets that are similar.

All testing was conducted in a hilly suburb of Los Angeles, where TV reception is less than ideal, and normally requires an outside antenna, especially for low- and VHF channels (Channels 2 through 6).

The instruction manuals that came with each set varied from barely adequate (Sinclair) to excellent (most of them). All sets included a warranty of some type.

## Casio

The TV-21 is the smallest, and the poorest per-



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forming set we tested. To operate the unit, you flip up a panel that contains the LCD display and a translucent back panel. Light penetrating the back panel (together with the setting of the brightness control) determines image contrast. The screen image is reflected by a mirror, giving the effect of a screen tilted for easy viewing.

An optional backlight clips onto the back of the flip-up screen. Powered by the set's batteries, it contains an electroluminescent panel for use when the ambient light is not sufficient.

To keep the size of the unit small, Casio provides no speaker or retractable telescoping antenna. Instead, an earphone is provided; its wire lead doubles as the set's antenna. With that arrangement, if you move while watching, the earphone-lead/antenna whips around and the picture becomes unstable.

Another choice made in the interest of user simplicity (and to eliminate a tuning dial) is the incorporation of automatic signal-seeking for channel selection. When you turn on the set by selecting either VHF or UHF, a small black cursor appears at the top right side of the screen and starts moving downward, seeking a signal. Up-arrow and down-arrow buttons, marked AUTOTUNING, let you change cursor direction. When a signal is found, the cursor stops, and the picture and sound (usually) lock in. The picture quality, at best, is like a very bad newspaper photo.

The trouble with the automatic tuning is that the set does not discriminate well enough between good and bad signals. It will even lock in on scrambled subscription-TV signals, commonly found on the UHF band. On weak channels, it sometimes locks-in in such a way that video can be seen but sound can not be heard. Since the unit lacks a fine-tune control, there is no way to tweak up reception. Furthermore, the search for the next channel is very slow. Worst of all, if you move the earphone wire and the signal level drops, the set unlocks and starts searching for another channel!

That set, which appears to be identical to Radio Shack's *Pocketvision-2*, might be adequate in a strong signal area, and for watching at a desk where the antenna lead will not be subject to much movement. It is probably great for watching daytime soaps at the office during lunch or break time.

The *TV-60*, not tested, appears to be a *TV-21* with an AM/FM radio added.

The *TV-1000* is an LCD color set with reasonably good performance. It has a built-in fluorescent backlight for indoor viewing. Outdoors you can drop down a reflective back panel to collect sunlight—and we mean sunlight, not just daylight, because that set requires quite a lot of illumination.

Screen viewing angle is restricted with that set. At anything other than the the

best viewing angle, the picture either gets dark or washes out. You can partially compensate for that by using the brightness control.

The color is fair, with a surprising degree of sharpness. Thumb-adjusted color and tint controls let you set the degree and shade of color to your liking.

The *TV-1000* also uses automatic tuning, but the tuner appears to be much more sensitive, and a regular telescoping whip antenna is used. The result is a stable picture.



RADIO SHACK POCKETVISION-20

Video and audio inputs are provided, allowing for improved performance when used with a VCR. That also means that the unit could be used as a computer monitor, though because of the small screen size such use is likely to be impractical.

That unit is apparently identical to the Radio Shack *Pocketvision-20*.

The *TV-5000*, not tested, appears to be a *TV-1000* with an AM/FM-stereo radio added.

#### Citizen

The *037A* was one of the first decent LCD sets in the marketplace. Now discontinued, that small, slim set with a built-in AM radio remains available at discount prices at many stores.

Despite poor contrast, a common problem with LCD sets, that unit has much to recommend it. The picture is relatively large and surprisingly good, at least until you compare it with that produced by a CRT. The video input makes the set easy to use as a monitor. Included accessories include an AC adapter and a 3½-foot plug-in wire antenna.

The flip-up panel and mirror provide a comfortable viewing angle, the drum tuning dial is fast and easy to use, with clear markings, and slide controls for volume and brightness are well-marked and easy to set.

The *057A* color set is another story. The book-style carrying case is beautiful, and the set itself has a great look and feel. Its performance, however, leaves something to be desired. In fact, it was the poorest performing color set we evaluated; in fairness, it was also the least expensive. Indoors, the color picture is fair. But outdoors the picture becomes completely washed out; you almost have to use the

built-in backlight (which greatly shortens battery life), since it takes a lot of external light bouncing off a tilt-down back reflector to produce an acceptable picture, on the screen.

Reception is limited with the 2-foot telescoping whip antenna, but improves considerably with the 3½-foot clip-on wire antenna that is provided. The video/audio inputs allow you to monitor a VCR or camera indoors.

The *067A* and the *087A* were not available for testing. In those sets, Citizen claims to be using a special "black matrix" process that produces a screen with a



CITIZEN 067A

contrast ratio of 5:1 (compared with 2.5:1 for their earlier LCD sets, and 10:1 for a typical CRT screen, according to Citizen).

The *067A* is replacing the *037A*; it has a list price of only \$100. It is a little smaller than the *037A*, and has no radio, but it does have a higher pixel count and a smaller screen, which provides better resolution. With its combination of improved contrast and low price, that set could fast become an LCD favorite.

The *087A*, using a 3.5-inch screen with even greater pixel density, improved contrast, and an FM-stereo radio, also could be a winner.

#### Epson America

The *ELF ET-20* (and its Seiko equivalent, the *LDV012*) were, without question, the best LCD units tested. The resolution was remarkable for an LCD screen, with a brightness and contrast approaching that of a CRT.



EPSON ELF ET-20

The *ET-20* uses reflective LCD TFT (Thin-Film-Transistor) technology, so no backlight is required. Furthermore, an acceptable picture is produced with normal room lighting, and the picture does not fade outdoors. The unit is very small, easily fitting in a typical shirt pocket.

However, several design compromises were made that reduce the effective use of that set. Although the sound quality is good, the speaker is at the back, so all sound projects rearward. Since the speaker is so small to start with, the *ET-20* only has sufficient volume for viewing in a quiet area. Making things worse, when an earphone was used, at least on the model tested, there was an annoying low hum. Also, the wire stand provided allowed the set to tilt too far back for convenient viewing. Perhaps that's why the Seiko version left the stand off altogether.

The color *ELF ET-12* has had a lot of favorable reviews—with good reason. The picture offers surprisingly good color, tint, contrast, and resolution. Brightness, color, and tint are adjustable to your liking. The relatively large front-mounted speaker provides good sound.

The picture is watchable outdoors, but is better inside. A reflective panel tilts down from the back for use in locations where the lighting is sufficient. Otherwise, the built-in fluorescent backlight provides sufficient illumination.

#### Magnavox

The *BF390/BK* is an exceptional set in almost every way. It appears to be identical to the *Sony FD-30A* (we'll get to the *Sony* sets in a moment).

The specially-designed *FD* (Flat Display) CRT's picture resolution and contrast are excellent. For even better video quality, a video input is provided (however, there is no audio input); surprisingly, an 80-column computer display was readable. The video input also will allow the unit to be used as a video-camera or portable-VCR monitor. The front-mounted speaker and stereo headset provide good sound.

Since the unit is a CRT set, no external source of light is needed. The best viewing conditions are indoors, with subdued room lighting. Outdoors your eyes become adjusted to the ambient lighting and the picture appears washed out. Direct sunlight on the screen washes the picture out altogether. That's why the carrying case is designed with two flaps: those flaps are held in position with Velcro tabs to form a sunhood for outdoor viewing. The set includes a swing-out stand.

The tuner is about as sensitive as those of most of the other sets tested. There is no provision for an external antenna.

The *BF390/BK* was not tested, but appears to be the same as the *BF390/BK* except for an AM/FM-stereo radio; we assume that its performance is compara-

ble. It does not have a video input and is not supplied with an earphone.

#### Panasonic

The *TR-1030P*, and its sister *CT-101* (more on that in a moment), both use a conventional-design CRT that has the smallest screen size of any of the units in this report. Despite that, the sets are among the largest reviewed. To accommodate the long neck of the CRT, the tube was positioned so that the screen is viewed at what would normally be one of the side panels.

We're impressed with the *TR-1030*. Although the screen is small, the display is clear and bright. An included magnifier is a worthwhile accessory. Although there is no external antenna input, the tuner has better sensitivity than most of the sets and provides a clear picture even on the weaker channels. The fact that it comes with rechargeable batteries and an AC adapter/charger is also a definite plus. (Note that the charger uses a special plug; that makes it impossible to plug the wrong charger/adapter into the TV set.) In fact, all accessories, including a cigarette-lighter adapter (for car use) and earphones, are included.

Our reaction to the *CT-101* color set was similar. The color, brightness and contrast of that CRT set were far superior to those of any other color set reviewed.

All accessories are included. Among those are a magnifier, an AC adapter/charger, rechargeable batteries, headphones, an audio/video patchcord, and a car cord. Panasonic even includes a matching transformer to allow you to connect either 300-ohm twin-lead or 75-ohm coaxial cable to the antenna input. At a list price of \$450 the *CT-101* is the most expensive set in this report, but you get what you pay for.

#### Radio Shack

The *Pocklevision-2* is similar to the *Casio TV-21*. It differs in that the case and backlight are included; batteries are not included.



CASIO TV-1000

The *Pocklevision-3* (not tested) at first appears to be similar to the *Citizen Q3TA*, without the radio, AC adapter, or a video input, but with a backlight. However, *Citizen* claims that the unit they build for Radio Shack "uses a black screen rather

than a white screen, giving better contrast, but a sepia-toned picture."

The *Pocklevision-20* (not tested) appears to be the same as the *Casio TV-1000*, but it includes a wire antenna and doesn't include batteries.

#### Seiko (Hattori)

The *Seiko LDV012* differs from its sister *Epson ET-20* only in cosmetic details—it has batteries but no stand, and is turned on by pulling down a screen cover (there is no conventional on/off switch).



SEIKO LDV-012

The *LDV202* is a color LCD set with a good picture and a built-in LCD alarm-clock module. That module slips out of the case and has its own battery. That set is the smallest of the color sets tested, and worked very well. The screen tilts up to allow light to bounce off a silver reflector to the back of the screen. Typical room lighting appears to provide sufficient illumination. It works well outdoors in the daytime, and for night (or dark room) viewing, a backlight is included. The backlight, which normally draws power from its own batteries, simply snaps onto the back of the screen. When using the AC adapter or car cord, a small included patchcord connects the external power source to the backlight.

#### Sinclair

*Sinclair's Flat Screen TV*, available in England for over a year, was recently in-



INSIDE THE Sinclair FTV2. That set uses a flat-screen CRT display.

roduced in the United States as the *FTV2*. Because the unit had to be redesigned for use in this country (the British do not use the U.S. VHF frequencies), its performance is markedly better on UHF channels (although its VHF performance is certainly adequate).

The flat-screen CRT produces a very



good picture, though it is not as good as the one produced by the Sony/Magnavox TV sets. Further, it is the least expensive miniature CRT-type TV set available.

We should note that this set does not use alkaline cells for power. Instead it requires a flat Polaroid *Polapulse* lithium battery. That P-500 version of that battery, which is included, can power the unit for up to 15 hours. The P-100 version of the battery, which is available at many hobby stores, will run the set for 2 hours. Unfortunately, those batteries are not rechargeable and are not inexpensive; Sinclair offers a package of three of the P-500's for just under \$10.

The only accessories provided with the *FTV2* are a thin vinyl slip-over case and an earphone. No handstrap is provided or available.

Sinclair does not sell an AC adapter in the U.S. for the set, but you can use the Radio-Shack *Universal AC-to-DC Adapter* (Cat. No. 273-1650). For car use, you'll want the Radio-Shack *Universal DC Auto Adapter* (Cat. No. 270-1560).

The set is generally a good value but does suffer from some deficiencies, mainly poor sound from the small side-mounted speaker, and inaccurate dial markings. It can also be difficult to obtain locally. If you run into trouble, the set is available from a few mail-order dealers. One such dealer is Curry Computers, 5344 West Banff, Glendale, AZ 85312-5607.

### Sony

The Sony *FD-2A* and *FD-30A* use the same 2-inch FD flat CRT as the Magnavox units mentioned earlier. Therefore, it's not surprising that the picture quality of both sets is just as good as that of the Magnavox units.

The *FD-2A* is the only set tested that allows the reception of TV sound without picture, for greatly extended battery life. A rechargeable battery pack is not available, but you can use individual rechargeable cells (penlight type).

The small front-mounted speaker produced fair sound; no earphone is supplied with the unit. Contrast levels (low, medium, or high) are selected using a three-position switch. There is a separate rotary brightness control. There is no video input but there is an external antenna input. The carrying case that comes with the unit is simply an unpadded silver-color bag with a drawstring at the top.

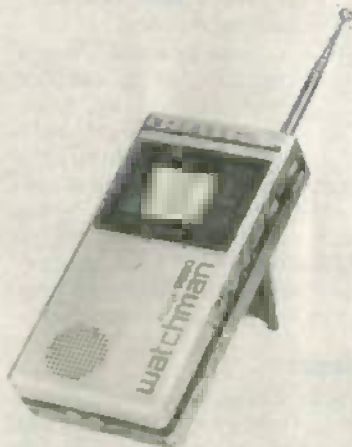
The *FD-30A* is essentially identical to the Magnavox *BF3901BK*. The *FD-30A*, however, comes with batteries and Sony offers a number of optional accessories not offered by Magnavox (note that those will also work with the *BF3901BK*). Among those accessories are an external battery case (which uses four C-size alkaline cells for about ten hours of operation), higher quality stereo headphones

than those supplied with the set, a speaker system, a video-camera monitor cable, and a screen magnifier.

The *FD-40A* uses a large 4-inch diagonal flat-display CRT. It is stretching a point to call that set a "pocket TV," but is included here for those whose interest is in the ultimate in portable monitors. For such applications, that set (and its Zenith clone, the *BT044S*, which we will get to next) may be the most practical choice.

The *FD-40A* screen seems enormous when compared with that of the other sets tested for this report, and it was a pleasure to watch. No stand is required; the base of the unit is wide enough for the unit to stand by itself. The screen is located near the bottom of the unit and is slanted for comfortable viewing from about 2½ feet away. The relatively large speaker produces good quality sound; no earphone is included.

On the down side, the image produced did not seem as sharp as that produced by the other Sony sets, although that may have been due solely to the fact that the screen is larger. Also, the video/audio puts are non-standard and require the use of a special adapter cable that's not included; it is available as an option. Finally,



SONY *FD-30A*

the set goes through batteries at a fairly fast rate; no AC adapter is supplied.

Optional accessories include a rechargeable battery pack, car cord, earphone, external antenna connector, gutter-mounted car antenna, and roof-mounted car antenna.

### Zenith

The *BT044S* is functionally identical to the Sony *FD-40A*, although there are some minor cosmetic differences. The unit comes with an AC adapter and an earphone, but no batteries or carrying case. Zenith does not offer many of the accessories offered by Sony, such as the rechargeable battery pack, but it appears

that those offered by Sony will work with the *BT044S*.



ZENITH *BT044S*

What was a bit surprising, especially considering the set's similarity to the *FD-40A*, was the poor quality of the picture—it was rather gray and fuzzy.

### Summary

After testing all of the units, and examining the specifications and brochures of those not tested, we've formed some opinions about the units.

If you are interested in just having a pocket TV for occasional use, and want to keep the cost low, consider the Citizen *06TA* or Sinclair *FTV2*.

For a better picture, but also a higher cost, consider the Magnavox *BF3900BK* or Sony *FD-2A*. If you want to add stereo FM, get the Citizen *08TA*, the Sony *FD-30A*, or the Magnavox *BF3901BK*.

For monitoring video from a camera or VCR, the Sony *FD-40A* or Zenith *BT044S* will give you the largest picture. If you can get by with a smaller monitor, consider the Sony *FD-30A* or Magnavox *BF3901BK*.

If you can't get by without color, be prepared to pay a lot more for a lot less in picture quality. Of the color sets, the Panasonic *CT-101* is tops, followed by the Seiko *LDV202* and Epson *ET-12*.

In this report we've tried to fairly point out each TV set's strengths and weaknesses. Balancing those against your needs should lead you to the unit that's right for you. Also, the judgments presented here are the author's. Just as you would for any other type of electronics equipment, you should evaluate a set's performance for yourself before making a purchase.

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