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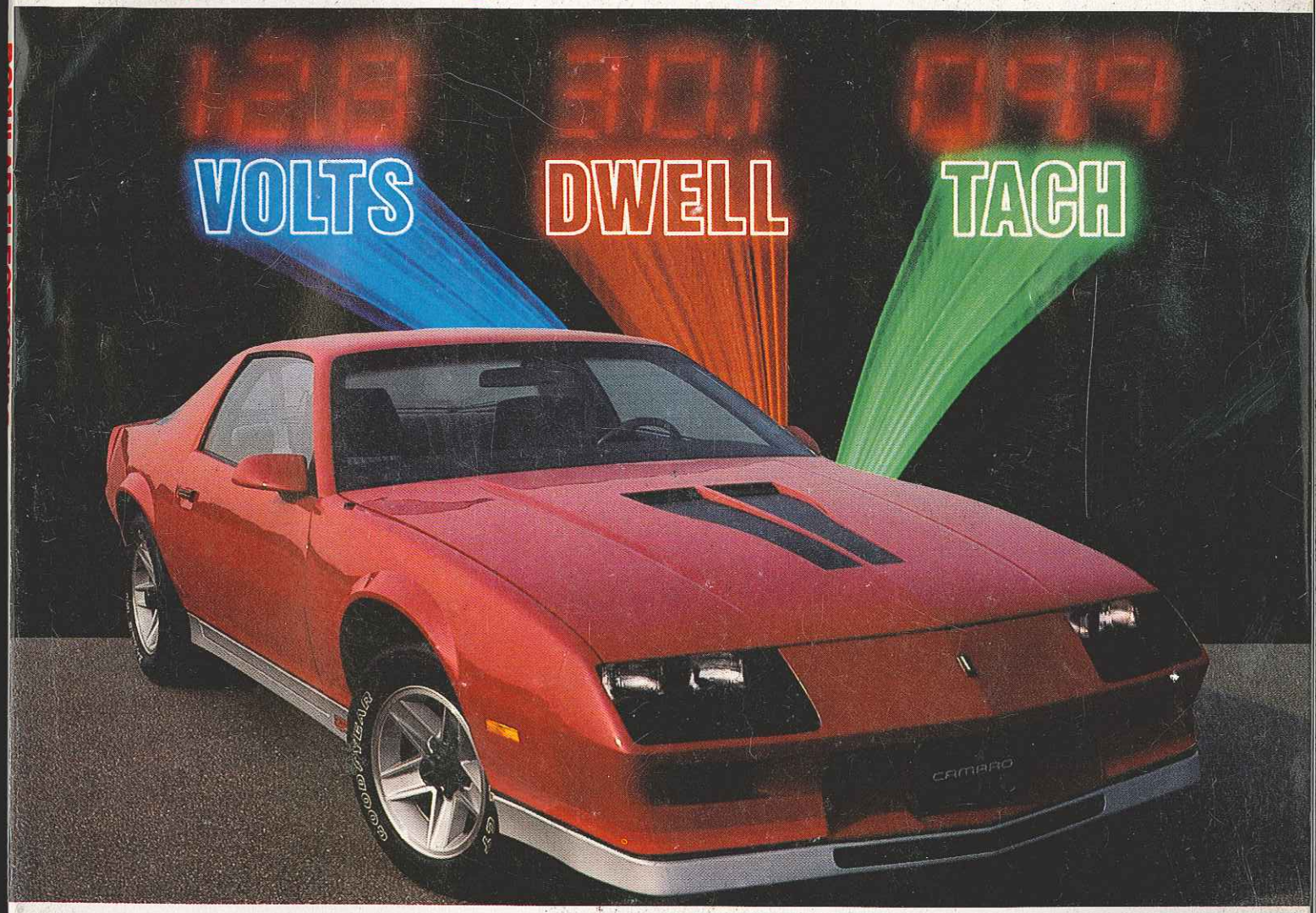
THE ELECTRONIC WORLD

Microcomputers: Which One Is Right for You?

Experimenting with Fiber Optics

Audio-Actuated Camera Flash

Easy Car Tuneup with a Digital Meter



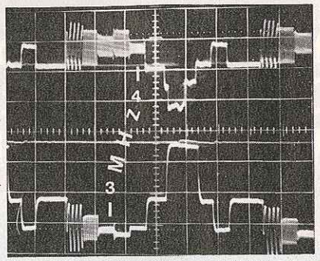
Laboratory Measurements. As previously stated, only 3 MHz of video information is delivered to the CRT. The intensity of luminance is 7000°K, producing a sharp, bold picture. (Note that degrees Kelvin in this instance is not a temperature, but a scale of brightness—7000°K being at the high end of the scale for a CRT.) The regulation of high and low voltages is good—ranging between 96 and 100% in all instances. Video signal-to-noise ratio is 42 dB, and dc restoration is a quite adequate 88%. Convergence ranks with the finest: 99%. Tuner sensitivity is satisfactory, and there is very good protection from CB interference.

Comments. This is a well-built chassis that uses the latest of Sylvania's advanced integrated circuits. These chips are augmented with a surface acoustic-wave input filter, overload protection, and a sharpness circuit that senses weak signal conditions and compensates by rolling off high frequencies and masking the noise. We also like the Perma-Tint feature for automatically "holding" fleshtones. And should you need to adjust this manually, the rear-panel controls are easy to reach.

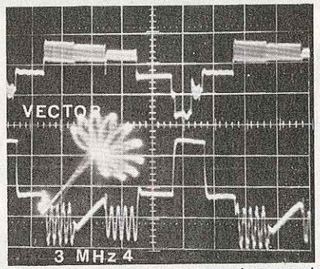
The versatile remote-control keyboard, however, is large and a bit unwieldy, with a left-handed scan button position and a "zero" key in the middle. Its quick-view position to glimpse a second programmed channel is a plus. It would be nice if Sylvania would add a 4-MHz comb filter to the set. Overall, though, the receiver offers good video color and a steady picture that's remarkably crisp for 3 MHz of luminance bandwidth. In practical terms, therefore, the smallness of the screen reduces the need for a 4-MHz comb filter for standard picture viewing, with savings passed on to the consumer.

—Stan Prentiss

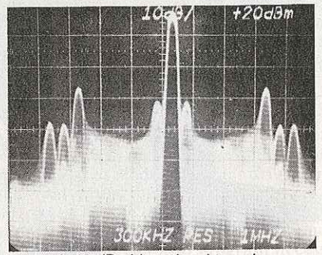
CIRCLE NO. 103 ON FREE INFORMATION CARD



Multiburst test shows 4 MHz at video detector, 3 MHz at CRT.



Swept chroma measurements show good vector and little rolloff at 4.08 MHz.



A 42-dB video signal-to-noise ratio rates with the best.

SYLVANIA MODEL CAA118WR 13″ COLOR TV RECEIVER LABORATORY DATA

Parameter	Measurement
Tuner/receiver sensitivity (before snow):	vhf (Ch. 6): −5.5 dBmV uhf (Ch. 30): −3 dBmv
Voltage regulation w/signal input:	Low voltage: 24-V supply—100% 112-V supply—98.8% High voltage: 26-kV supply—96%
Video S/N at CRT:	42 dB
Luminance bandpass at CRT:	3 MHz
Luminance bandpass at video detector:	4 MHz
Dc restoration:	88%
Agc swing from saturation to cutoff:	62.5 dB (min.)
CRT color temperature:	7000°K
Horizontal overscan:	12%
Convergence:	99%
Power requirements (signal applied):	95 W (avg.)

Note: Instruments used in these measurements are: Tektronix 7L5, 7L12 spectrum analyzers; Telequipment D66, D67A oscilloscopes; Sadelco FS-30 VU f/s meter; Winegard DX-300 amplifier; Data Precision 245, 258, 1750 multimeters; B&K-Precision 1250 and 3020 NTSC and sweep/function generators; Sencore VA48 (modified), CG169 video & color bar generators and PR56 variable power supply; Tektronix C-5A, Minolta XD-11 cameras; and Gossen Luna-Pro light meter.

Popular Electronics Tests

Radio Shack TRS-80 Model III Desktop Computer

THE Radio Shack TRS-80 Model III offers more capability than the older Model I, yet Model III users can enjoy all the older machine's programming options since the units are software-compatible. Also, the Model III's self-contained packaging eliminates the unsightly external cabling required for the Model I.

The basic Model III features a high-resolution 12-in. black-and-white video monitor that can display 64 characters per line (the full display height is 16 lines) from a selection of 96 text characters, 64 graphics characters, and 160 "special" characters. Also, there is a 65-key board which includes a 12-key numeric pad, a cassette port (cassette recorder optional) capable of handling 250 baud with Level I BASIC, a parallel printer interface, a buffered bus for external expansion, and provisions for adding two internal and two external double-density 5¼″ disk drives and an RS-232 port. A Z80 CPU operating at 2.03 MHz, 4K bytes of RAM internally expandable to 48K bytes, and 4K bytes of ROM expandable to 14K bytes are the principal electronic features.

Level I BASIC, stored in the 4K-byte ROM, features most standard BASIC commands, a screen display of 16 lines of 64 upper-case characters, 48 x 128 video graphics, a 250-baud cassette I/O rate, floating-point arithmetic, six-digit numeric accuracy, single-dimension arrays, limited string variables, command abbreviations, and simplified error codes. It also includes such printer commands as LLIST and LPRINT.

The optional Model III BASIC is stored in 14K bytes of ROM and requires 16K bytes of RAM to store variables. Execution time is about 30% faster than Level I and more features are available—repeating keys, a screen format of 16 lines of either 32 or 64 upper/lower-case characters, auto-scrolling, and a screen print command. The cassette baud rate is user-selectable (500 or 1500 baud), and you get multi-dimensional arrays, definable cursor, comprehensive string variable handling, automatic line numbering, extensive editing commands, TRACE/PEEK/POKE for machine-language routines, initialization of the optional RS-232 port, 23 error codes, and a special graphics set. Accuracy is 16 digits, and there is compressed storage for video display text. Program lines and string variables may contain up to 255 characters.

The Model III can control four double-density disk drives, each having 40 tracks of eighteen 256-byte sectors. The first drive (installed within the system) contains TRSDOS and Disk BASIC and allows 131K bytes of user space. Each of the other three drives provide 175K bytes. (Certain system information must be stored on every diskette.) Two disk drives can be installed within the Model III's cabinet, while two more can be externally mounted.

The unadorned Model III with 4K-byte Level I BASIC is priced at $699, the 16K-byte Model III BASIC system is tagged at $999 (more RAM can be added in 16K-byte increments at $99 each), and the RS-232 Serial Interface costs $99. The first internally mounted disk drive—including TRSDOS and Disk BASIC—is $849, and a second internally mounted drive is $399. Each external disk drive costs $499.

Several Model III configurations are also available—from a "starter" system to a full-blown business package—along with a considerable variety of software.

Expansion. It is very easy to expand or add peripherals to the Model III. If you want to add extra RAM or disks, the necessary items are available at your local Radio Shack store. However, be aware that the warranty is broken once *you* open the case.

For peripherals like printers, external disk drives, or a modem, the Model III

provides easy access via plug-in connectors underneath the unit. The parallel printer port, for example, uses a 40-pin, Centronics-compatible edge connector, and the RS-232C port uses a recessed DB-25. The external disk-drive connector, located behind the printer port, can cause problems if you make any wrong connections. However, sufficient documentation is available to show what goes where.

Besides standard peripheral connectors, there is an expansion connector for adding new items as they become available. If you're inventive, you can expand the Model III with designs of your own. However, don't approach this capriciously since you need a pretty good understanding of digital electronics and interfacing techniques to avoid damage to the computer.

Documentation. One of the highlights of the Model III is the quality of its documentation. Packaged with the machine is *Getting Started with BASIC*, a handy little book that covers the ins and outs of setting up the system, and easing you into ROM BASIC. By the time you finish reading, you know how to use the computer and have become a fair BASIC programmer.

For the disk system, Radio Shack has provided in-depth discussions of how disk BASIC works, with excellent examples to familiarize you with the operating system.

Something that we found unusual in the Model III documentation is the explanation of where everything is located in the ROM monitor. Exact locations are shown and various examples explain how all the functions are used.

The TRSDOS-operating system isn't CP/M, but it is very capable. And unlike CP/M, where you have to specify a drive that the desired file exists on, all you have to do is call TRSDOS. Then it looks for the name file on the available drives. This useful function makes this version of TRSDOS stack up well against other operating systems.

Radio Shack uses an unusual method of setting up its disk drives. Each disk has 40 tracks and each track is divided into 18 sectors of 256 bytes each. Nine sectors taken together is called a *gran* and equals 2304 bytes. When you save a program or data file, the system allocates one gran. If more disk space is required, the system assigns another full gran. On the Model III an initialized diskette with no data will have 80 grans.

In operation, a logical record is 255 bytes (one sector) long, and is the amount TRSDOS buffers during a read/write operation.

The disk system isn't the only thing intriguing about the Model III. Besides offering the normal display characteristics of upper/lower case and character graphics, Radio Shack has included 96 special characters that you can employ to enhance games or special applications programs. Character codes 192 to 255 are switched to by entering PRINT CHR$(21) in BASIC. What you'll get are numeric functions like pi.

The Model III supports an upper/lower-case alphabet. Unfortunately, TRSDOS doesn't understand lower-case characters, and when used with the operating system, they produce an error message. Therefore, you must enter the lower-case mode by pressing the SHIFT key, holding down 0, and locking. Some application programs, such as Profile, won't recognize the lower-case characters, however, and thus take away some program flexibility.

Evaluation. Besides the 32K-byte, two-disk system hardware, we also evaluated Profile, a disk-based information package ($79.95), Scripsit wordprocessing ($99.95), COBOL ($199 and an additional 16K bytes of memory), Compiler BASIC ($149), and Macro Editor/assembler ($99.95).

The first part of our evaluation involved taking the cover off the system. (We don't recommend this, nor does Radio Shack.) We found a well laid-out arrangement. The logic boards are easily accessible for repair and consist of the main processor board with memory, a disk controller, and an I/O board. All boards are mounted with 1/2-in. spacing for maximum convection cooling.

All boards are wired together using flat cable that snaps into connectors on the boards. In earlier models, these cables were merely slipped in and could wiggle loose during transportation. We learned that the snap-in hardware was added to prevent this situation.

To see how well convection cooling worked, we put back the cover and placed a smoke source under the computer. This "smoke test" determines how well the unit dissipates heat. We found that the smoke moved through the TRS-80 III's top and sides in a smooth flow, indicating that care was taken in designing the computer's thermal characteristics.

Next we checked for RFI and EMI problems. Although the TRS-80 III meets the necessary FCC requirements, we discovered interference in the channel 2 (54-60 MHz) and channel 4 (66-72 MHz) range. This was true even with the cover replaced and tight connection made to a copper ground pole on the chassis. Interference was most severe during disk I/O, and least bothersome during a steady screen display with no memory or disk access taking place.

In order to evaluate the overall operation in terms of environmental extremes, we placed the system in a hot box and raised the ambient temperature to 120 degrees F. This temperature was maintained for 48 hours while multiple reads and writes were made to the disk system, using a finite number of data.

In this test, we write 1000 capital A's and 1000 lower-case a's to disk, read them back, kill the file, and start over. All the characters read were printed out. On inspection of the test data we found no loss on the read data.

Our next test is one that we consider the most severe. We set the hot box to room temperature (approximately 65 degrees F) and kept it filled with dirty air—tobacco smoke pumped in from a pipe-like flask. We ran the same read/write test, looking for soft errors caused by particulants on the media. After 100 cycles of the test, one soft error was produced, and after opening the case, we found a film of smoke particulants.

The only physical attribute we observed that was questionable was that the top drive cover goes under the lip of the system case, making it slightly difficult to flip down. At first we thought the two closing pins in the front could puncture a diskette, but we found that this is not the case unless the diskette is sticking out of the drive.

Software Scenario. Once we were satisfied that the hardware was solid, we attacked the software. Since this was a disk-based system, we first looked at TRSDOS.

As previously mentioned, this is a well thought-out operating system that's continually undergoing enchancements. In fact, this strength is its only weakness. Before we could begin looking at TRSDOS, we had to upgrade it to the latest version (1.3), using the Patch program to fix some known bugs. This took about 10 minutes and then everything worked correctly.

On powerup, the disk operating system looks for a disk in the lower drive (drive 0), and if there is no disk there, it goes to the upper drive (drive 1). If there is no disk there either, push SHIFT and BREAK at the same time to bring up cassette BASIC. Should you have a system disk in either drive, TRSDOS signs on with the copyright and version notice, and asks for the date. You can't bypass this, but are forced to enter the information. Next you're asked for time (which you can bypass). We recommend putting in the time since you'll possibly want to use it in an application program. The Model III's timekeeping utility is quite accurate—we found it lost only 10 seconds in 48 hours of operation.

One of the most important operation system commands is LIB for library. This will generate a list of all the commands available under TRSDOS including:

APPEND	ATTRIB	AUTO	BACKUP
BUILD	CLEAR	CLOCK	CLS
COPY	CREATE	DATE	DEBUG
DIR	DO	DUAL	DUMP
ERROR	FORMS	FORMAT	FREE
HELP	KILL	LIB	LIST
LOAD	MASTER	PATCH	PAUSE

The next most important command is, HELP. If you don't know how to use a particular command, and don't want to look in the manual, simply enter HELP and the command you want information on. The Model III will respond with an explanation on how to use that particular command.

The DO command is unique and allows turnkey system operation. What you do is first BUILD a file, then DO it.

For example, entering BUILD TEST will cause a file called TEST to be created, and you'll be asked what TEST is supposed to do. In this case, the following dialog was used in our TEST DO file:

BASIC: loads BASIC
return: answers memory question
return: answers file question
RUN "EXERCISE/BAS": run a file.

Entering DO TEST causes BASIC to be loaded, the setup questions to be answered, and the file called EXERCISE/BAS to load and run. We used this method while in the test mode.

The command DUAL allows whatever is on screen to go to the printer at the same time. This command will stay in effect no matter what program is running, a feature that control-P in CP/M doesn't always allow.

Although TRSDOS will search all the disks on the system for a file, you have the option, by using MASTER, of setting up any drive to be the MASTER (0 drive). This option can become important, especially if you're doing a special application that requires switching diskettes, but it may be of more concern later on if you add hard-disk memory.

Since many reviewers are hung up on how fast BASIC works on a machine, we did the obligatory speed test. We employed 10 GOSUB 10 for our speed determination. The reason is that, when run, BASIC will push everything on to its stack to get to the subroutine (in this case it pushes all memory). For cassette BASIC we counted 10 seconds, the same for disk interpreter BASIC, and 3 seconds for compiler BASIC. This time is contingent on the amount of contiguous RAM. We found it to be acceptable for a system operating at 2 MHz.

For a more thorough test, we used Profile, a data-handling system designed for building data structures such as mailing lists. Using Profile, we built a list with the following attributes for a total of 67 characters (bytes):

Name: 20 characters
Address: 25 characters
City: 15 characters
State: 2 characters
Zip: 5 characters

We then built a datafile holding 100 records, and accessed them one at a time. Worst-case access time was 4.3 seconds for the 100th record. File sorting took a little too long—6 minutes—but we blame this on Profile, which isn't designed for high-speed ordering (it uses a bubble-sort algorhythm). We then printed the list. This took 7 minutes—not bad considering overall system throughput.

Although we did no time trials with COBOL, we brought it up without difficulty and, with reference to the manuals Radio Shack provides, had no problem getting into it.

Even though this version of COBOL is designed for interactivity of a microcomputer, we feel that a 5.25-in. disk isn't sufficient to provide all the functional features you need. A better environment is a hard disk where one has sufficient storage and rapid throughput not possible on a floppy-based system.

Scripsit, Radio Shack's word-processing system, uses a screen format that allows use of special characters—like the symbol for marking the start of a paragraph. Since the TRS-80 III keyboard doesn't have a CONTROL or ESCAPE key, Scripsit comes with stick-on labels to identify the operation of certain keys that will be redefined. The "at" (@) key, for example, is redefined as the CONTROL key, yet another key is redefined as the "at" (@) key.

We found this very confusing. Even though the keyboard layout doesn't handle the needed keys, we think Radio Shack should have elected to shift the keypad for use with Scripsit rather than scattering the function keys around the main keyboard.

Besides the confusion of new definitions, we learned that if you failed to enter the lower-case mode in TRSDOS, there was no convenient way to do so in Scripsit. This may be an oversight that can easily be corrected in a future update to Scripsit.

The Scripsit word processor works differently than others on the market, and only allows you to work on files that fit in existing memory. It operates by filling the available workspace with holes (spaces) and having you fill them in. This technique was used in early word-processing systems and isn't very efficient since you have to take care that no holes are left at the end of a file.

Scripsit comes with a manual and an audio cassette course that tells you how to best use the system. You can become very proficient after spending about an hour-and-a-half listening to the tapes.

Conclusions. The TRS-80 Model III is a highly functional microcomputer system ideally suited for data entry and engineering use. In addition, the system is flexible enough to be implemented easily in a networking environment.

Like many sophisticated personal computers, the Model III can be expanded for business applications. And like most, it is not ideally suited for this purpose, though it could serve well in a very-small-business environment. Some obvious drawbacks for business include the need to redefine some keys for Scripsit, limited disk-storage capacity, and ungainly lower-case implementation with some software.

As a high-quality personal computer with compromised business-use utility, however, the TRS-80 Model III deserves overall high marks for performance, general ease-of-use, and relative compactness. The storehouse of cassette and disk software that can be used with the III is enormous, of course. Coupled with the national support given by Radio Shack, and its expandability from a lowcost "starter" system to a modest desk-top business machine, the III should have wide appeal.

—Carl Warren

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