

## At a Glance

**Name**  
Mapper III

**Use**  
To convert the Radio Shack TRS-80 Model III to operate under the CP/M operating system as well as TRSDOS

**Manufacturer**  
Omikron  
1127 Hearst St  
Berkeley, CA 94702  
(415) 845-8013

**Size**  
6 by 3½ by ½ inches

**Weight**  
4 ounces

**Features**  
16K bytes of RAM; Omikron utilities and enhancements available

**Hardware required**  
Radio Shack TRS-80 Model III, 48K bytes of RAM, disk

**Software supplied**  
CP/M 2.2, MBASIC

**Documentation**  
8½- by 11-inch, three-hole punched, 6-page installation manual, 15-page users manual, 150-page MBASIC manual, and 249-page CP/M manual

**Price**  
\$199

use the same language (including version), be set up for the same screen size, and be formatted in a way that can be read by the conversion.

### The Advantages of CP/M

Why then, would you convert to CP/M? The principal advantage for users is the great number of programs available that run under CP/M. There are also a great number of users groups that support CP/M, providing public-domain software and also assistance for modifying CP/M for different machines.

The greatest advantage of CP/M for manufacturers is that it is hardware independent. In other words, only a small part of CP/M—specifically, the BIOS (basic input/output system)—has to be changed to work on different computers. This flexibility enables manufacturers to include an operating system for their computers with relatively little effort. It also makes it possible for programs written on one computer to be used on other computers because they have an operating system in common.

### The Disadvantages of CP/M

Because of its flexibility, CP/M doesn't take advantage of any of the special features of a particular machine. For example, there's no way to access the graphics capabilities of the TRS-80. Also, CP/M works with only one drive at a time. If you want to execute a program, you

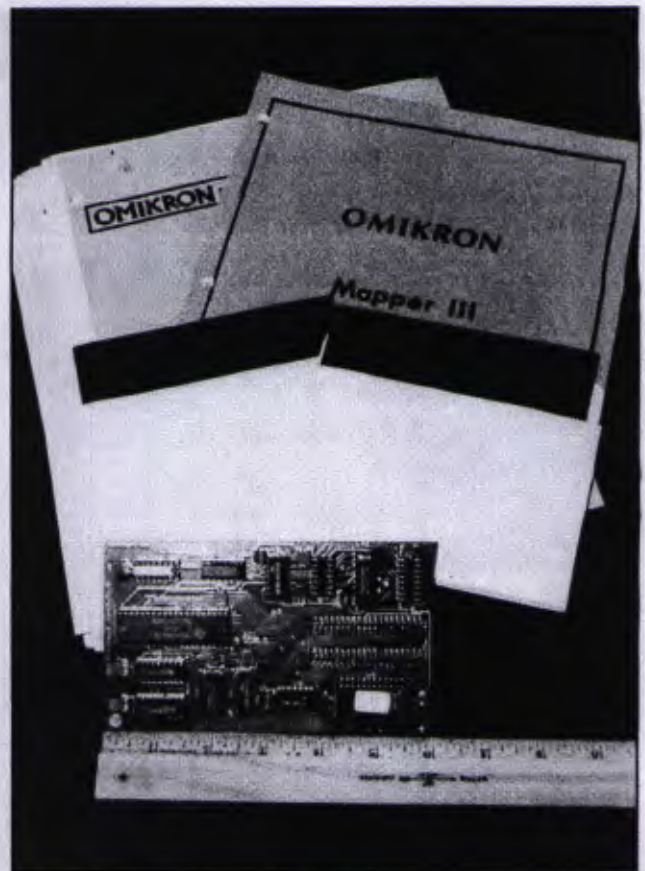


Photo 1: Mapper III from Omikron.

must be "logged on" the correct drive; it does not search all drives for the program as TRSDOS does. There is no password protection on any files, but because any password eventually can be broken, maybe that isn't a drawback. Also, to copy a disk you must use three separate programs. The last problem with CP/M is the quality of error messages—there are only a few, and all are non-descriptive. It's hard to believe, but this operating system reports more cryptic messages than TRSDOS.

### Converting the TRS-80 to CP/M

Let's look at some CP/M conversions available for the TRS-80 Model III. First, this machine requires a hardware conversion rather than just software because the Model III uses the first 14K bytes of memory for ROM (read-only memory) BASIC, while CP/M expects that memory to be empty and available for operating system use. This conflict can be resolved only by a hardware modification. Of course, all modifications still allow you to use TRSDOS for your existing software.

The conversion procedure is similar in all cases. Remove the cover of the TRS-80 as well as the heat shield covering the central processing board. Remove the Z80 chip and replace it with a circuit board that plugs into the Z80 socket. Then plug the Z80 chip into the circuit board. Some modifications also require a RAM (random-access read/write memory) chip to be removed and replaced by a plug connected to the CP/M board. The en-



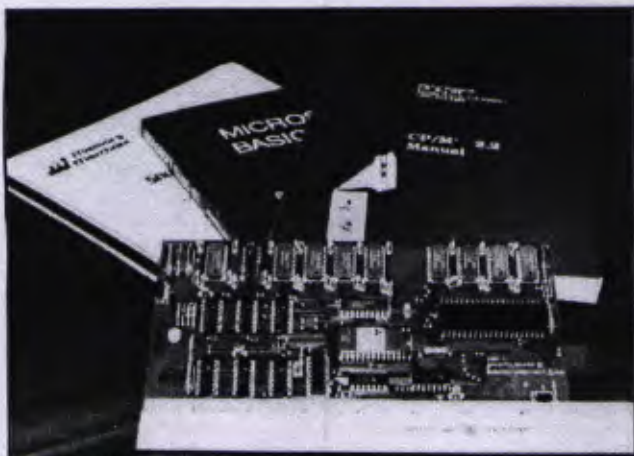


Photo 2: Shuffleboard III from Memory Merchant.

### At a Glance

#### Name

Shuffleboard III

#### Use

To convert the Radio Shack Model III to operate under the CP/M operating system as well as TRSDOS

#### Manufacturer

Memory Merchant  
14666 Doolittle Dr.  
San Leandro, CA 94577  
(415) 483-1008

#### Size

8 by 3 3/4 by 1/2 inches

#### Weight

4 1/2 ounces

#### Features

High-density disk format, 16K bytes of RAM, direct cursor addressing, virtual-drive concept, 15-day free trial

#### Hardware required

Radio Shack TRS-80 Model III, 48K bytes of RAM, disk

#### Software supplied

CP/M 2.2, MBASIC

#### Documentation

7- by 9-inch perfect-bound 77-page users and installation manual, 184-page MBASIC manual, and 214-page Digital Research manual

#### Price

\$299

tire procedure takes about a half-hour and is easy even for those who have had only a casual acquaintance with electronics.

Because the Model III lacks a number of ASCII (American National Standard Code for Information Interchange) characters on the keyboard (braces, brackets, control key, etc.), CP/M modifications must also reconfigure the keyboard to generate all the ASCII characters. Usually this involves a combination of keys, such as the Up-Arrow and another key. I'll discuss each modifica-



Photo 3: Vid-80 from Holmes Engineering.

### At a Glance

#### Name

Vid-80

#### Use

To convert the Radio Shack TRS-80 Model III to operate under the CP/M operating system as well as TRSDOS. Also, converts screen to 80 by 24 under both operating systems.

#### Manufacturer

Holmes Engineering Inc.  
5175 Green Pine Dr.  
Salt Lake City, UT 84107  
(801) 261-5652

#### Size

9 1/2 by 9 by 1/2 inches

#### Weight

14 ounces

#### Features

16K bytes of RAM, 80-character by 24-line board included

#### Hardware required

Radio Shack TRS-80 Model III, 48K bytes of RAM, disk

#### Software supplied

CP/M 2.2, utilities

#### Documentation

8 1/2- by 11-inch 30-page users and installation manual; 320-page CP/M Handbook (with MP/M) by Rodney Zaks

#### Price

\$399



Name	Control Key	Software Included	Disk Formats	Price	Able to use CP/M 3.0	Auto Repeat
Mapper III	Down-Arrow	CP/M 2.2 MBASIC	See text	\$199	no	yes
Shuffleboard III	Up-Arrow	CP/M 2.2 MBASIC	Osborne, Xerox, IBM	\$299	no	no
Vid-80	Clear	CP/M 2.2	Kaypro, Xerox	\$399	yes*	yes

\*optional at extra cost

**Table 1:** A comparison of the CP/M conversion boards.

tion separately, but I've also summarized conversion features in table 1.

### Mapper III

The least expensive board evaluated was the Mapper III from Omikron. Although the board lists for \$199, it functions well and most of its limitations should be eliminated by the time you read this.

The board I evaluated was an early prototype board that Omikron was shipping to its customers. This board is single-density, uppercase only. The manufacturer indicated that double-density should be available very soon, which would be a must for any serious user of CP/M. Omikron indicated that this will be a free upgrade for its customers and will contain a number of enhancements I'll cover later.

The Mapper III uses the Down-Arrow key for the Control key and Shift-Break for escape. It emulates the SOROC IQ120 terminal for video addressing and screen display. Installation is easy and requires the removal of only one chip, the Z80. The board contains all chips in sockets for easy repair and upgrade. It's also the smallest board that was tested.

The Mapper III that I tested could read only disks formatted for the Mapper III. Omikron indicated that the production board will read a number of formats with the previously mentioned software upgrade.

Omikron also expects to release a number of very useful utilities that will be standard with the production of the Mapper III, or free to owners of earlier Mapper IIIs, in the near future. These include programs to check memory, check disk condition, emulate a dumb terminal, and transfer programs from TRSDOS to CP/M. The last program will be most useful for long BASIC programs that you don't want to retype. Programs written under TRSDOS probably won't run under CP/M without modification.

For another \$199, Omikron offers an additional software package to go with the Mapper III. The package, which includes CBASIC-II, Wordstar, and Microproof, represents a substantial savings over retail prices of these packages and gives you a good start on CP/M software. Omikron also has a special user's purchase group, Cougar, that enables owners to buy additional software at greatly reduced prices.

The installation instructions are well written and I encountered no problems with the board. Also, Omikron offers a lifetime warranty on the Mapper III. Although the software for the version I tested was not as sophisticated as the other boards, even in its preliminary form, the Mapper III offers a good value for those interested in CP/M. You should check with Omikron, however, to verify current capabilities for a particular application.

### Shuffleboard III

The Shuffleboard III from Memory Merchant is a moderately priced (\$299) yet excellent conversion that contains an additional 16K bytes of memory, for a total of 64K under CP/M with a 48K-byte Model III. It includes both CP/M 2.2 and MBASIC, Microsoft's BASIC interpreter for CP/M, similar to the TRS-80 standard BASIC. A 77-page users manual and 398 pages of Digital Research documentation for MBASIC and CP/M 2.2 provide necessary documentation.

This conversion features an "auto-sense" boot that automatically determines what type of operating system is contained on the disk in drive zero. In other words, once installed, the conversion boots in the proper mode automatically; you can disable this feature if desired. The system normally boots from drive zero, but this also can be disabled, allowing you to boot from any drive for CP/M. (TRSDOS, of course, always boots from drive zero.)

The Up-Arrow key functions as a control key, and all other ASCII characters may be generated from the keyboard. The cursor may be set for either blinking or non-blinking, and linefeeds for the printer may be disabled or enabled easily to accommodate different printers.

A special function allows a remote terminal to be hooked up to the RS-232C port to allow for graphics, an 80 by 24 display, or any other special function. A SET-COM command, similar to that found in TRSDOS, is used to set the data rate, parity, character length, and stop bits. Direct cursor addressing is implemented, and console control characters are equivalent to a Lear-Siegler ADM-3A control set.

Perhaps one of the most unique features of the Shuffleboard III is its *virtual drive function*. Although difficult to explain in this limited space, virtual drive means that it may appear to the system that you have more drives



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than you actually do. For example, the operating system may believe that you have two double-density and two single-density drives even though you have only two double-density configurations. This makes some difficult operations easy. A high-density format routine also increases disk capacity by about 11K bytes.

I strongly believe that any good conversion should include the ability to read many disk formats because very little CP/M software comes in the TRS-80 format. The Shuffleboard III will read *and format* Osborne, IBM, and Xerox disks. Superbrain, Kaypro, and Televideo should be ready soon. Of course, IBM programs won't run on the TRS-80 because IBM uses different central processors, but this conversion does make data transfer possible. Please note that I said Shuffleboard III would also *format* these disks. This enables you to prepare a disk directly on your computer for a friend who owns a different computer, a very nice feature that is well implemented on the Shuffleboard III.

The warranty is good for one year, and Memory Merchant offers a 15-day trial period. Installation instructions are well written and clear. I installed the board quickly and without board or documentation problems. The Shuffleboard III offers a conversion with the features most users require for a reasonable price.

### Vid-80

The \$399 Vid-80 by Holmes Engineering is the one board that not only converts the TRS-80 to CP/M but also converts the screen to 80 by 24. As mentioned earlier, most software is formatted for an 80 by 24 screen, and this conversion makes the Model III compatible with almost all CP/M software. For video and screen formatting, the Vid-80 emulates the Lear-Siegler ADM-3A terminal.

The conversion for 80 by 24 also works in TRSDOS with some limitations. Software, especially machine language, will not work without conversion in the 80 by 24 mode. The board also redefines graphics from 127 by 47 to 159 by 71, slightly improving resolution. Locations for the PRINT@ command are also redefined from 0 through 1024 and 0 through 1919. It would take a separate review to evaluate the board for its use in TRSDOS, but it does function under both operating systems.

The latest version of the board has the ability to read and write several 5¼-inch disk formats, including those of the IBM PC, Kaypro II, Xerox 820 (single- and double-density), Osborne-I, Zenith Z-100, Freedom Tech, and Morrow Micro Decision. Maximum storage using the Kaypro standard is 191K bytes. Considering that CP/M uses quite a bit of disk overhead, this is amazing. You end up with more storage capability than TRSDOS.

After the board is installed, the Model III automatically recognizes which operating system is on the disk and boots up in the 80-character mode. If you want a 64-character mode, you hold down a "6" during booting. Installation requires the removal of two integrated circuits and their replacement on the Vid-80 board. Two solderless jumper cords and two power cords must be at-



tached. All this is done without any soldering or permanent change to your TRS-80.

In addition to the CP/M operating system and its utilities, two other programs are included. A Sap utility sorts and packs the directory to conserve space and alphabetize. An Unerase utility lets you restore files that may have been accidentally erased. Auto-repeat capabilities for each key are also standard with the Vid-80.

The Vid-80 RAM can be increased through expansion modules to nearly 1 megabyte. A CP/M 3.0 version should be available by now for Holmes's 64K-byte memory option (112K bytes total), which sells for \$524.

For technical assistance and updates, Holmes maintains both a phone number and a computer bulletin board. This bulletin board, Connection-80, enables Holmes to pass on patches and other technical information and allows the user to leave questions about Vid-80 for Holmes. When I contacted Holmes with technical questions, both as a reviewer and customer, the company was courteous, quick, and correct each time.

Both Omikron and Memory Merchant indicated that they will be marketing an 80 by 24 conversion for their CP/M boards in the future. The Vid-80 already has this feature, which makes the Model III very competitive with the Model 4. The Vid-80 is a complete CP/M conversion and enables you to enter the world of CP/M without reservation.

#### What about the Model 4?

What advantages does the Model 4 have over the Model III? Well, the most significant are a higher speed processor, an 80 by 24 screen, ASCII character generation, a new (TRSDOS 6.0) operating system, and CP/M compatibility. If you're only interested in CP/M, you should consider one of these boards for your Model III. Holmes also sells a speed-up kit for the Model III for about \$100. Converting this way allows you to add one piece at a time, instead of all in one big costly chunk.

#### Conclusions

Each of the conversions is targeted at different users. You should decide which you need for your individual

use. All the conversions worked without major problems and are easy to install following the instructions included with each.

The Omikron Mapper III is aimed at the low-budget user who intends to purchase his software from Omikron. Omikron's Cougar club allows owners to purchase major programs at very low cost. The company has a track record with the Model I Mapper and should have several enhancements included in the future.

The Memory Merchant Shuffleboard III is a full-featured CP/M conversion that meets the needs of most users. It reads three disk formats, and three more will be ready soon. The virtual-drive idea is exciting and very useful to two-drive owners. I was most impressed with this board and its implementation. I have used this board for several months without a single bug.

The Vid-80 from Holmes Engineering is the only conversion I tried that also converts the screen to 80 by 24. Sooner or later all computer users will want this size screen for some application, and Holmes solved that problem. I give Holmes four stars for this conversion. I know that \$400 is quite a bit to spend, but that's a very low price for CP/M, an 80 by 24 display, and accommodation of a wide variety of disk formats. Holmes has been in the TRS-80 business for many years and has a good record with the dealers with whom I spoke. If you can afford to do the conversion all at once, the Holmes board is a good choice.

All in all, the TRS-80 user has a number of conversions from which to choose. With Radio Shack turning to CP/M, it may not be many years before TRSDOS is gone forever. I think all serious users should start looking into CP/M and what it has to offer. ■

#### Author's Note:

*I'd like to thank all the manufacturers for their cooperation and answers to my questions. I'd also like to thank Bob Byars at Mountain Data in Havre, Montana, for the use of his equipment and time.*

*Mark E. Renne (53 Glacier Ct., Bozeman, MT 59715) is a free-lance writer and full-time student at Montana State University in Bozeman.*

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