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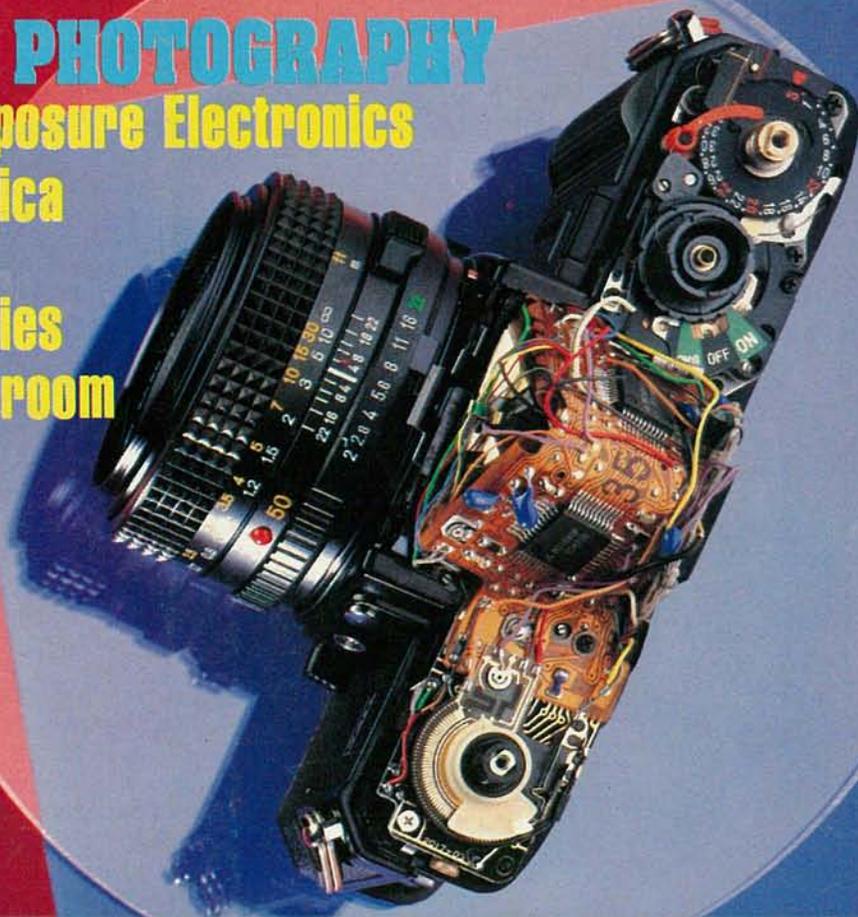
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- ★ New Idea ★ State-Of-Solid-State



SPECIAL SECTION

- 57 ELECTRONICS IN PHOTOGRAPHY, Marc Stern
- 59 The All-Electronic Mavica
- 63 The New Disc Cameras
- 67 Auto-Focus and Auto-Exposure Systems
- 75 Accessories: Smart Strobes and Meters
- 79 Electronics in the Darkroom

BUILD THIS

- 83 TIMEX/SINCLAIR MEMORY EXPANSION
Part 2. Finishing up construction, and a number of useful machine-language utilities you can store in your add-on RAM. Paul W.W. Hunter
- 92 DIGITAL TEMPERATURE GAUGE
This valuable accessory for your car can also be used anywhere you need a remote temperature display. Fred L. Young, Sr. and Fred L. Young, Jr.

TECHNOLOGY

- 4 VIDEO ELECTRONICS
Tomorrow's news and technology in this quickly changing industry. David Lachenbruch
- 12 SATELLITE/TELETEXT NEWS
The latest happenings in communications technology. Gary H. Arlen
- 14 VIDEOGAMES
A game-development system for the Atari. Danny Goodman
- 51 NIKOLA TESLA
Some insights into the life of this unsung inventor. E.J. Quinby
- 104 STATE OF SOLID STATE
Two precision voltage-references. Robert F. Scott

CIRCUITS AND COMPONENTS

- 96 NEW IDEAS
Electronic insect-repeller
- 98 DRAWING BOARD
The final word about power supplies. Robert Grossblatt
- 100 HOBBY CORNER
For the birds. Earl "Doc" Savage, K4SDS

VIDEO

- 106 SERVICE CLINIC
Bits and pieces. Jack Darr

EQUIPMENT REPORTS

- 26 Engineering Specialties Model 770 Serial-Parallel Converter
- 32 Philips Model PH 3207 Oscilloscope
- 40 Global Specialties Model 3002 Capacitance Meter
- 42 Heath Semiconductor Devices Course

DEPARTMENTS

- | | |
|----------------------------------|-------------------|
| 10 Advertising and Sales Offices | 108 Market Center |
| 136 Advertising Index | 46 New Products |
| 137 Free Information Card | 8 What's News |
| 22 Letters | |

ON THE COVER

One field that has been strongly affected by microelectronics is that of photography. Once-bulky equipment is now built right into pocket-size cameras. And, in the darkroom, microprocessors are making things as easy as 1-2-3. Sony has even unveiled a completely filmless electronic-photography system. All that, and more, is covered in our special section on electronics and photography beginning on page 57.



AS YOUR CAR creeps along in the stop-and-start summertime traffic, its most dangerous enemy is probably the heat. And you have no idea how badly your engine is suffering until the "idiot light" marked "TEMP" comes on...and the radiator blows its top! This digital temperature gauge will let you know at any time exactly how hot the engine is, and allow you to cool things off before it's too late. Construction details start on page 92.

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- **The Pianomatic.** An attention-getting programmable music maker you can build yourself.
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- Plus lots more!

Because of lack of space, the installment of "Analog Design" scheduled to appear this month will appear in next month's issue.

Radio-Electronics, (ISSN 0033-7862) Published monthly by Gernsback Publications, Inc., 200 Park Avenue South, New York, NY 10003. Second-Class Postage Paid at New York, N.Y. and additional mailing offices. One-year subscription rate: U.S.A. and U.S. possessions, \$14.97, Canada, \$17.97. Other countries, \$22.47 (cash orders only, payable in U.S.A. currency.) Single copies \$1.50. © 1983 by Gernsback Publications, Inc. All rights reserved. Printed in U.S.A.

Subscription Service: Mail all subscription orders, changes, correspondence and Postmaster Notices of undelivered copies (Form 3579) to Radio-Electronics Subscription Service, Box 2520, Boulder, CO 80322.

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VIDEOGAMES

Do-it-yourself games

DANNY GOODMAN, CONTRIBUTING EDITOR

THE DO-IT-YOURSELF PHENOMENON HAS affected almost every aspect of life in this country. If there is a task requiring an expensive professional, you can be sure that someone has written a book, or has packaged a set of tools and parts that lets the weekend carpenter, would-be attorney or shade-tree auto mechanic get the job done more cheaply, though not necessarily more quickly. And, of course, there's the satisfaction of doing the work yourself and the pride in showing off the finished product.

But the world of home videogames may seem off-limits to mere "mortals" who must buy professionally designed game cartridges to plug into their consoles. In the meantime, the "David Cranes" of the industry get all the glory for their design work.

There are surely many game players out there—perhaps you are one—who have great game ideas, or would like to try their hand at inventing a better Pac-Man. Well, now you have a way to apply your talents at game design to the Atari 2600 and 5200 videogame systems—a way that doesn't require access to the vast mini- and mainframe-computer development systems the "Big Guys" use.

A company called Frobco (603 Mission Street, Santa Cruz, CA 95060) is offering a game-development system for the two Atari videogame machines. Before you rush out to buy one, though, you should know that the system does require an Apple II computer and a healthy knowledge of assembly language programming for the Apple's (and Atari's) 6502 microprocessor. But with that equipment and knowledge, both models, the FROB-26 and FROB-52 will allow you to set up a free-lance game design

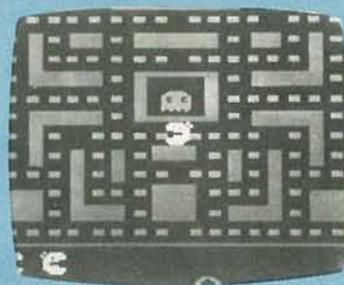
The FROB-26, shown in Fig. 1, comes with an accessory card for the Apple II computer, a couple of 2600 cartridge adapters, a cable that connects between the cartridge slot and the Apple II board, plus software and manuals. The system essentially fools the 2600 into thinking that you have a cartridge plugged into the console. But in reality, your Apple II is acting like a dynamic cartridge, complete with the ability to download game programs onto disk for retrieval and editing later. FROB software allows you to experiment inside the 2600 by learning what the various registers control. You can program the unit in real time, that is, the instructions you enter into the various 2600 registers immediately affect what's happening graphically and aurally. And as long as you know machine-language programming, Frobco has an in-depth tutorial, "Inside the VCS," that will fill you in on all the technical details of the console.

As you develop a game, you can save your work-in-progress on a disk. And when you're done (a game, like Rome, won't be built in a day—professional designers take months to perfect their creations) you can transfer the program over to a 2732 EPROM with the aid of the FROB-Burner. Then you can let your friends play your game directly on their systems. Or perhaps, if you're more ambitious, you will take the bold step and submit your game to the major videogame cartridge producers.

When you consider the cost of add-on boards and software for the Apple computer, \$495 for the basic 4K FROB-26 system gets you a lot for the money. For Atari 5200 game development, you can simply upgrade the FROB-26 to the 4K FROB-52. That upgrade only costs an additional \$195. To design more advanced games, however, a better buy is the 8K FROB-52 system. It allows you to design 4K games for the 2600 and 8K games for the 5200; the cost is just \$990.

The word "frob," by the way, is a computer enthusiast's term suggesting fine-tuning or adjusting something just for the fun of seeing what will happen. But lest you think the FROB systems are just for mindless computer acrobatics, you should know that serious game designers at Activision, Coleco, and Atari use FROB systems to develop the cartridges you're buying today.

Atari Ms. Pac-Man for Atari 2600



CIRCLE 101 ON FREE INFORMATION CARD

| Ms. Pac Man | Atari | | | | | | | | | |
|------------------|-------|---|------|---|---|------|---|---|-----------|----|
| GRAPHICS | | | | | | | | | | |
| SOUND | | | | | | | | | | |
| EASE OF LEARNING | | | | | | | | | | |
| CHALLENGE | | | | | | | | | | |
| VALUE | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | Poor | | Fair | | | Good | | | Excellent | |

Although few good words have been uttered about the original Atari (1265 Borregas Ave., Sunnyvale, CA 94086) Pac-Man cartridge for the 2600, it was nonetheless a popular one. But the critics will have precious little to quibble about over the Atari's latest home version of a popular arcade gobbler, Ms. Pac-Man.

It is apparent that more effort went into recreating the arcade aura of the original Ms. Pac-Man. All the characters closely resemble their coin-op counterparts: Ms. Pac-Man herself has a bow in whatever Pac creatures use for hair, the four ghosts appear in their proper colors, and the game features bouncing bonus fruit symbols, not the featureless box of its home predecessor. Mazes change as you progress through the game. About the only holdover from the original Pac-Man cartridge is that the dots are more like dashes.

For those who have not played the arcade version, Ms. Pac-Man differs from Pac-Man primarily in that the maze changes every other time your Ms. Pac-

continued on page 20



FIG. 1

business right from your family's living room.

VIDEOGAMES

continued from page 14

Man character clears the screen of dots. Three of the four different mazes in the cartridge have two escape tunnels off the sides of the screen. The third maze has a single escape tunnel.

The other major difference is that instead of the bonus fruit appearing as stationary objects below the ghost pen, they bounce around the maze in *Ms. Pac-Man*.

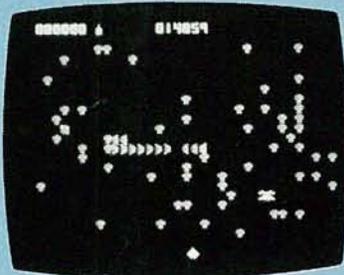
Sound is much improved on this cartridge. When you reset the game from the joystick, the *Ms. Pac-Man* music theme is played in two voices, a programming feat that, until recently, was considered impossible on the 2600.

Game play is not exactly child's play. The ghosts are very aggressive, even on the first couple of screens. Nor are they easily fooled by dodging around corners. According to the instructions, the ghosts' "blue"-time (length of time that the ghosts are blue after *Ms. Pac-Man* gobbles an energy pill) is supposed to decrease with every successful clearance of the board. That is definitely true for the first seven or eight screens. But after that, the blue-time, though indeed short, seems to remain constant. A ghost needs to be right on *Ms. Pac-Man*'s tail for her to catch it after she eats a pill.

One advantage of a home game over the coin-op version—other than the lack of a coin slot—is that the home version can incorporate variations of the game that help newcomers get used to the action. In *Ms. Pac-Man*, there are a total of four variations. There is "regulation play" with four ghosts, and variations with one, two, and three pursuing ghosts. Those last three are identified on the screen legend with one to three teddy-bear heads—presumably intended for children. But there will be non-game playing adults who will rather begin at the one or two-bear level.

Ms. Pac-Man is a fine example of an arcade translation conceived with ample time and thought. If you held off buying the first *Pac-Man* cartridge, don't hesitate about this one. On the other hand, if you already own the male version of the game, you probably won't see enough difference in the female version to make it worth the investment. Just the same, *Ms. Pac-Man* marks a noticeable improvement in the quality of Atari-produced games cartridges for their 2600 videogame system.

Atari Centipede for Atari 5200



CIRCLE 102 ON FREE INFORMATION CARD

| Centipede | Atari | | | | | | | | | |
|------------------|-------|------|------|-----------|---|---|---|---|---|----|
| GRAPHICS | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| SOUND | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| EASE OF LEARNING | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| CHALLENGE | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| VALUE | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | Poor | Fair | Good | Excellent | | | | | | |

Unlike the endless varieties of maze games, Atari's arcade *Centipede* is not "cute." It is a hard-core gamer's game. So it's not surprising to find an arcade look-alike version for Atari's hard-core gamer's home machine, the 5200. In fact it is so much like the arcade version, someone might put a quarter up on the console to reserve the next turn.

The story behind the action in that game has little to do with what is happening on the screen, so let's just say that you must defend yourself against a variety of insect creatures: centipedes, spiders, fleas, and scorpions. Each creature has its peculiar characteristics, hazards, and point values. It won't take long to learn what they are—provided you get far enough along in the game to even see some of them—but it will be a long time before you have mastered them.

Centipede is a wave-advancement game in that each centipede, winding its way between mushrooms from the top of the screen, represents a wave. To advance

to higher levels you must shoot all the sections of the centipede before you are bitten by any of the creatures (including the centipede if he gets low enough to encounter your on-screen character, which is confined to the bottom quarter of the screen). A pesky spider hovers all around you, trying to bite you, so you've got to keep on the move and not stop too long to take aim at the centipede, the vertically falling flea, or the horizontally roaming scorpion at higher levels. By the way, that scorpion leaves behind poison mushrooms that can send the centipede diving straight down to where your character is. With so much action on the screen, you are not likely to survive long, unless you've had lots of practice.

All is not well, however. This game, like so many others for the 5200, suffers from the impossible non-self-centering joystick. You just can't control the movement of your character the way you'd like to. Of course, the arcade original was designed with a trak ball on the control panel. I have played the 5200-version of *Centipede* with a prototype of Atari's *Trak-Ball* controller accessory, and I must say that it helps immensely. With the *Trak-Ball*, you can take better aim, shoot, and move away to avoid trouble all within a very short instant.

A side note about *Centipede*: Atari also has released a version for the 2600. While the graphics don't come even close to the 5200's, the flavor of the game is definitely like the original. It's easier to reach the higher levels of the game, but the action on screen is among the fastest and most enjoyable I've seen from a 2600 cartridge.

R-E

