

Radio- Electronics

**BUILD A COMPUTER POWERLINE
TRANSIENT SUPPRESSOR**

\$1.50 SEPT. 1983
U.K. 85p

DGS

COMPUTERS - VIDEO - STEREO - TECHNOLOGY - SERVICE

A
GERNSBACK
PUBLICATION

Build this
MINI-PLAYER PIANO

with keyboard, LED's and memory

from the CES Show:

UNUSUAL CONSUMER PRODUCTS

1983 design competition winners

The in's and out's of
ECL LOGIC CIRCUITS

and how to use them

Build a digital
PRESSURE GAUGE

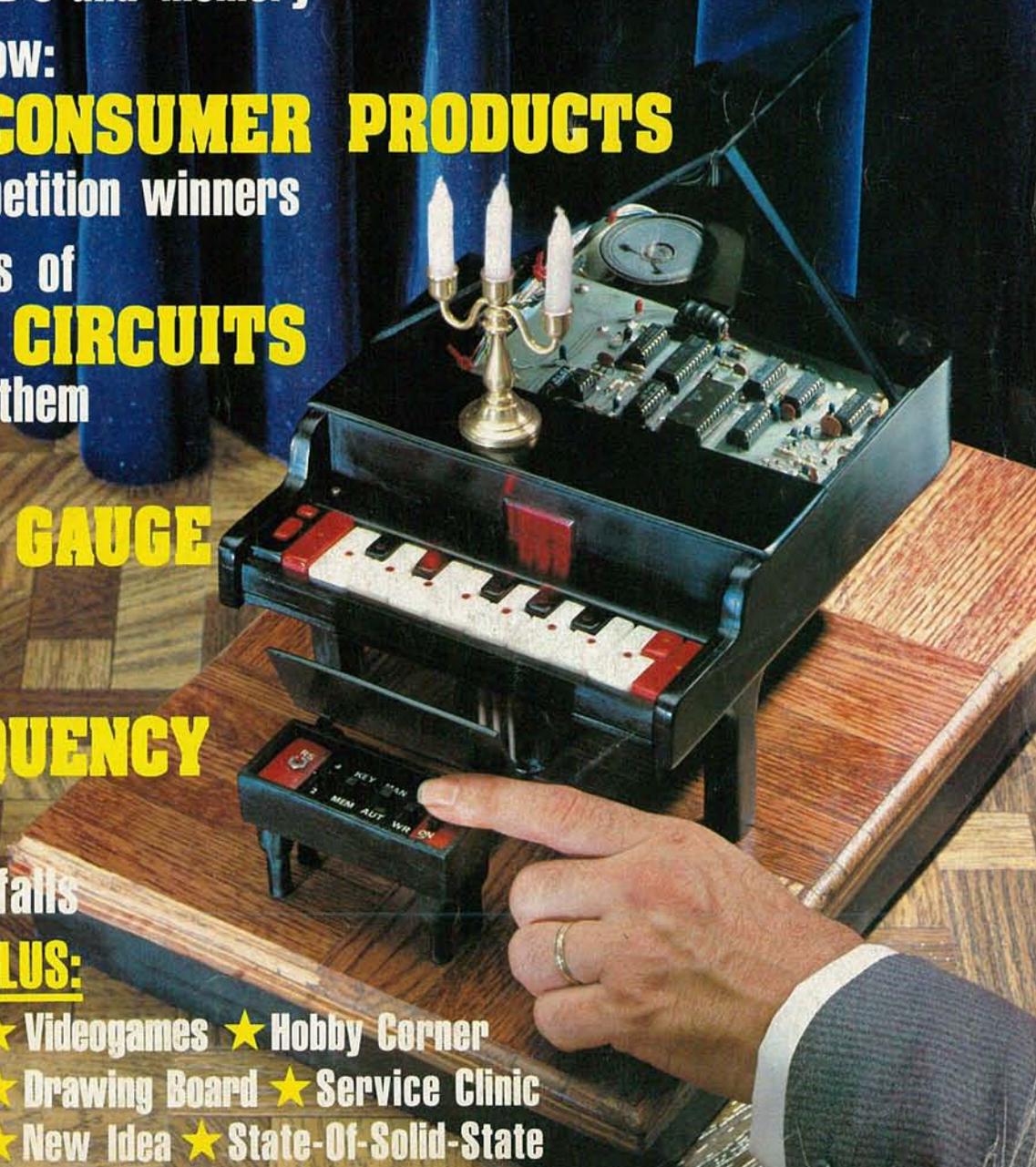
for your car

How to design
**HIGH-FREQUENCY
CIRCUITS**

and avoid the pitfalls

PLUS:

- ★ Videogames
- ★ Hobby Corner
- ★ Drawing Board
- ★ Service Clinic
- ★ New Idea
- ★ State-Of-Solid-State



SPECIAL FEATURE

- 49 **INNOVATIVE CONSUMER PRODUCTS OF 1983**
A look at some of the outstanding products of the past year as honored at this past summer's CES. **Danny Goodman**

BUILD THIS

- 43 **MINI PLAYER-PIANO**
A music box that can "remember" up to four tunes. **Robert Grossblatt**
- 57 **POWERLINE TRANSIENT SUPPRESSOR**
Keep your computer and its contents safe with this simple yet effective device. **Herb Friedman**
- 59 **DIGITAL PRESSURE GAUGE FOR YOUR CAR**
A handy instrument that can warn you of problems before they become critical. **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**
- 10 **SATELLITE/TELETEXT NEWS**
The latest happenings in communications technology. **Gary H. Arlen**
- 12 **VIDEOGAMES**
Rolling your own. **Danny Goodman**
- 62 **FREQUENCY CALIBRATION USING WWV**
How to calibrate your own frequency standard using WWV. **R.W. Burhans**

CIRCUITS AND COMPONENTS

- 53 **ECL LOGIC CIRCUITS**
A look at a little-used logic family that offers some interesting capabilities. **TJ Byers**
- 67 **HOW TO DESIGN ANALOG CIRCUITS**
Working with high-frequencies. **Manny Horowitz**
- 80 **NEW IDEAS**
An award-winning project from one of our readers.
- 82 **HOBBY CORNER**
Some questions and answers. **Earl "Doc" Savage, K4SDS**
- 84 **DRAWING BOARD**
Designing and breadboarding. **Robert Grossblatt**
- 90 **STATE OF SOLID STATE**
Thermometer circuits and more. **Robert F. Scott**

VIDEO

- 64 **SERVICING HORIZONTAL SWEEP CIRCUITS**
Some helpful hints. **Frank A. Salerno**
- 96 **SERVICE CLINIC**
Opening your own shop. **Jack Darr**
- 97 **SERVICE QUESTIONS**
Radio-Electronics' Service Editor solves technicians' problems.

RADIO

- 94 **COMMUNICATIONS CORNER**
Phones are for more than talking. **Herb Friedman**

COMPUTERS

- 92 **COMPUTER CORNER**
Shopping for a word processor. **Les Spindle**

EQUIPMENT REPORTS

- 24 **Microbuffer In-Line Printer Buffer**
- 30 **Vidicraft Model IVE-100 Integrated Video Enhancer**
- 38 **Tektronix Model 212 Dual-Trace Oscilloscope**

DEPARTMENTS

- | | |
|---------------------------------|-------------------|
| 8 Advertising and Sales Offices | 104 New Books |
| 136 Advertising Index | 91 New Literature |
| 137 Free Information Card | 100 New Products |
| 20 Letters | 6 What's News |
| 105 Market Center | |

ON THE COVER

Projects that are built just for fun are sometimes enjoyed most of all. But what's even better is a fun project that can teach you something new. The Pianomatic mini player-piano does just that. Sure to be an entertaining conversation piece when it is finished, building it will introduce you to such topics as computer memory organization and retention, digital logic, keyboard encoding and decoding, and the like. As a bonus, the techniques you'll pick up here can easily be adapted for use in your own designs. The story begins on page 43.



THE KOALAPAD from Koala Technology, Inc., allows you to control your computer's cursor movement by just tracing on the touch-sensitive pad. It's just one of the most innovative products of the past year as honored at the Summer CES. Turn to page 49 to find out more about it, and others similarly honored.

**COMING NEXT MONTH
On Sale September 15**

Our special supplement: Your Own Computer. Among the things we'll look at are:

- **Hardware**—a comprehensive look at systems, and their cost!
- **Word-processing software**
- **Software and hardware compatibility**
- **Everything you need to know about CP/M**
- **And lots more!**

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VIDEOGAMES

Rolling your own

DANNY GOODMAN, CONTRIBUTING EDITOR

LAST MONTH, WE SAW HOW AN APPLE computer, a working knowledge of 6502 microprocessor assembly-language, and a special development system can help you design your own games for the Atari 2600 and 5200 systems. But for those who like to program their own games, there is another game system—and a darn good one at that—that has been open to user programming for years. And you don't need assembly language or a computer to get anywhere. I'm talking about the unit that started out as the Bally *Professional Arcade*, more recently known as the *Astrocade* (shown in Fig. 1).



FIG. 1

The system has had a long and checkered career in the volatile videogame industry. As we go to press, the future of Astrocade is unsure as they attempt to extricate themselves from Chapter XI. But that's not what this story is about.

As a good many of the estimated 120,000 *Astrocade* owners know, the *Astrocade*, in addition to playing some of the graphically and sonically best videogame cartridges ever, is programmable in BASIC with the help of the BASIC language/cassette-interface adapter. In recent times, this accessory and well-prepared BASIC tutorial/reference manual has been included as standard equipment with the unit.

The open access to the *Astrocade* has caused a closely knit and loyal following of *Astrocade* enthusiasts to band together in users groups and in an open exchange of information via the major news pipeline for Astrocoders called *The Arcadian*, a monthly newsletter published by Bob Fabris (3626 Morrie Dr., San Jose, CA 95127). Each issue contains program listings and more advanced programming tips from experienced users like Andy Guevera.

Andy has taken his interest in the *Astrocade* up to the assembly-language level (Z80 microprocessor). But in so do-

ing, he left tracks for others to follow. He now produces a plug-in cartridge called the *Machine Language Manager* (The Bit Fiddlers, P.O. Box 11023, San Diego, CA 92111-0010), which guides the way for novice programmers. You'll still need to know Z80 machine language, but in the manual that comes with the cartridge, Andy recommends some introductory books. Machine language allows you to program faster action within the limited built-in RAM of the *Astrocade*. But there is still plenty going on in BASIC.

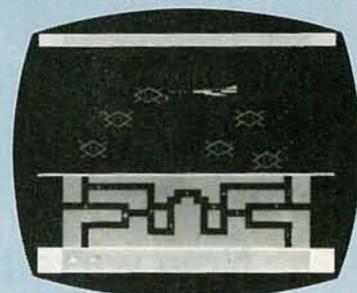
The 114-page *Astrocade Sourcebook* (635 Los Alamos Ave., Livermore, CA 94450), produced semi-annually by Richard Houser, lists practically every one of the hundreds of third-party programs available—a large percentage of them in BASIC on cassette. Most of these tapes have been designed by dedicated hobbyists with a love for the capabilities of the *Astrocade* system. Every once in a while, one of these hobbyists finds a programming specialty.

George Moses, for example, has unlocked the secrets to the three-voice music synthesizer of the *Astrocade*. His company (George Moses Co., P.O. Box 686, Brighton, MI 48116) offers several cassettes of straight music (Scott Joplin rags, Christmas carols, Bach, and more) playable through the console's synthesizer. For the musically creative, he also has a music-assembler program to let you try your hand at it.

George, by the way, produced the continuously running musical score for one of the first third-party game cartridges for the *Astrocade*, a family-oriented game called *Treasure Cove* by Spectre Systems (Box 1741 Dearborn, MI 48121). Bret Bilbrey, one of the principals at Spectre was attracted to the Bally system back in 1977 (in the days of the Fairchild *Channel F* and dedicated Atari videogames) because he could do things with the BASIC cartridge that no other videogame could let him do. Since then, Bret and a few others have turned what was a hobby interest into a career, designing games for the *Astrocade*.

With the right system, imagination, and a strong desire to master the technical side of programming in BASIC or (preferably) machine language, rolling your own videogames is certainly within almost everyone's reach.

Fox Video Games' Flash Gordon for Atari 2600



CIRCLE 101 ON FREE INFORMATION CARD

Fox Video Games Flash Gordon										
GRAPHICS										
SOUND										
EASE OF LEARNING										
CHALLENGE										
VALUE										
	1	2	3	4	5	6	7	8	9	10
	Poor		Fair			Good			Excellent	

I'd hate to be in the shoes of the videogame designer who steps into the boss' office to receive an order to develop a game around a popular theme. It can't be easy to force a game to fit a particular mold. That's what I expected to find when I plugged Fox Video Game's *Flash Gordon* cartridge into my 2600 console. But after playing the game for a while (and being a Flash Gordon fan), I got the impression that somebody came up with a space game, and Fox simply pulled "Flash Gordon" out of its list of space movie titles.

The screen is divided into two main game-action areas. The top half is where the prime action is located—your rocket ship, targets, and stranded spacemen you can rescue. In the lower half is an aerial map of tunnels through which your rocket ship travels. Your goal is to clear each tunnel level of hatching pods and the spider warriors they produce. Two amorphous alien fields, called Disrupters, pursue your every step, trying

continued on page 14

VIDEOGAMES

continued from page 12

to enshroud your ship in deadly debris. Every time you successfully shoot five spider warriors from a hatching pod, you have the added power of a temporary shield. Floating through the tunnels at random are your fellow spacemen whom you must pick up by touching them with your ship.

Hatching pods are distributed unequally through the maze of tunnels. When they are grouped together, there is a likelihood that the sluggish Disrupters will catch up to you. Unless your shields are intact while you escape from the Disrupter's field, you'll have a tough battle on your hands trying to survive the onslaught of debris. Occasionally, however, a Disrupter Generator flies across the screen. If you can shoot one, the Disrupter is stalled momentarily, giving you a head start away from it.

The joystick control in this game is a bit odd at first. When you want to move your rocket ship to the left on the tunnel map, for example, the rocket ship on the screen glides toward the left margin. But if a spaceman comes into view on the right, and you push your joystick to the right, your blip on the map immediately reverses direction while your rocket ship slowly glides over to the right of the screen. I suppose that it is the two speeds (instant on the lower map, gradual on the top screen) that makes it feel awkward. I'm sure it was designed that way, too, so that the lure of the spacemen would perhaps draw you backwards toward an oncoming Disrupter.

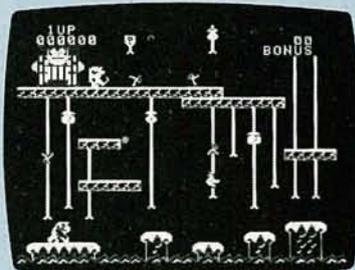
But after being tricked into retrieving spacemen for bonus points a few times, only to be annihilated by a disrupter, you lose interest in rescuing spacemen. Even though you're passing up extra bonus points, you'll gather more points in the long run if you simply ignore the men and go after the next hatching pod as planned. That takes away from the urgency of rescuing spacemen. If the game play required you to pick up spacemen by penalizing you if you didn't, then you'd have a more interesting game on your hands.

But with the same screen images reappearing wave after wave, the game doesn't hold interest for long. That's true even though the waves rapidly become more difficult. There is little in the way of discovery in this cartridge—it becomes a

simple durability contest from the first wave.

And if this game action has some connection with Flash Gordon, it eludes me. At least there should be *some* reference to Ming, Dale, and Dr. Zarkhov.

Coleco Donkey Kong Junior for Colecovision



CIRCLE 102 ON FREE INFORMATION CARD

Coleco	Donkey Kong Junior									
GRAPHICS										
SOUND										
EASE OF LEARNING										
CHALLENGE										
VALUE										
	1	2	3	4	5	6	7	8	9	10
	Poor		Fair			Good			Excellent	

If you have ever followed the exploits of Mario and his efforts to rescue his girl from the clutches of the fierce Donkey Kong, then you'll better understand the story behind *Donkey Kong Junior*, another stunning arcade translation by Coleco for their *Colecovision* system.

The story goes that Mario finally captured Kong. Now the tables are turned. Mario is the bad guy, as jailor of Kong. Kong's pint-sized protege, Kong Junior, is on the trail of his father, trying to reach the key that unlocks cages and chains.

With the typical *Colecovision* high-resolution graphics, *Junior* is certainly one of the cutest games available for a home videogame, yet the cuteness doesn't get in the way of

sincerely challenging game play.

The game features three completely different game screens, each with its own particular challenge. The first screen makes Junior swing from vine to vine while eluding the harmful Snapjaws (they like to climb vines at random). Swinging Junior from vine to vine is accomplished by moving the joystick to one side, unless he needs to leap from a platform to a vine, in which case you need to use a side action-button to make him jump.

On to the second screen, which has Kong's cage chained down. Junior must swing to six dangling chains. As he pushes each lock to the platform, the chain holding the cage is released. All six locks need to be pushed to the top while avoiding both Snapjaws and flying Nitpicker birds.

The third screen is a repetition of the first screen, but the fourth screen features a unique jump board (a precisely timed bounce buys Junior some extra time and bonus points), moving platforms and chains, and egg-dropping Stookybirds, which Junior must swing amidst on his way to the key for dad's cage.

I find the game graphically interesting for longer periods than the excellent-looking *Donkey Kong*. For instance, the graphic depiction of this little diapered chimp character swinging from vine to vine is clever.

Each screen has its own background music or sound, and the tune played at the end of a successful screen is catchy. Moreover, as Junior makes his way through a screen, the sound he makes is believably ape like.

I wasn't sure whether the greater ease of attaining higher levels was a result of playing so many dozens of hours of *Donkey Kong* or whether it was because *Junior* is actually a little easier to control. It may just be that I have become accustomed to *Colecovision's* controllers and response-time characteristics. But whatever the reason, you will probably find that you can progress through at least one shot at all the screens within a couple of hours of dedicated play.

Unlike most spin offs (Ms. Pac-Man, most noticeably), *Donkey Kong Junior* is a far differently playing game from its predecessor. It's different enough to warrant placing *Junior* high on your "to buy" list for the *Colecovision*. **R-E**



Innovative Consumer Products of 1983

At each Summer Consumer Electronics Show the outstanding designs of the past year are honored. Here are some of the highlights of this year's exhibition.

ONE OF THE MOST EXCITING DISPLAYS AT every summer consumer electronics show in Chicago is a special exhibit of design and engineering accomplishments of the past year. Sponsored by the Consumer Electronics Group of the Electronic Industries Association (EIA), that event is the only place at the vast show where the entire industry—manufacturers of everything from hand-held games to esoteric audio—comes together to honor innovative design and the application of state-of-the-art technology. This year, the eighth time that the special exhibit has appeared, judges from the consumer-electronics press honored more than 125 individual products and, in a separate event, over 60 computer, game, videodisc, and videocassette software titles as the most innovative products in their categories. Let's take a look at some of the highlights.

DANNY GOODMAN

Audio

There is little question that the compact disc (CD) in general won the hearts of judges. Several new players were on display. But to see all those machines together, it is apparent that the only "compact" thing about most CD players is the disc; practically all of the first-generation players are rather large. The exception is the Magnavox (I-40 and Straw Plains Pike, Knoxville, TN 37914) *FD 1000SL*, which may be the smallest CD player in production.

Controls are kept at a minimum on that low-profile player, shown in Fig. 1, yet with the nine front-panel function buttons and the LED track indicators, the audiophile has full programmability for setting up any sequence of tracks on the disk, as well as forward and reverse

search. For that premium design there is fortunately not a premium in price, at least not when compared to other CD players. The *FD 1000SL* has a suggested retail price of \$800.

One hi-fi technology that's getting off to a slow start is AM stereo. With the lack of a standard or recommended AM-stereo transmission method, broadcasters are free to select whichever system they want, even though each is incompatible



FIG. 1—THE MODEL *FD1000* from Magnavox; a truly compact, compact-disc player.

with all others. Needless to say, that creates quite a dilemma for receiver and tuner manufacturers. But with the Sansui (1259 Valley Brook Ave., Lyndhurst, NJ 07071) *TU-S77AMX* tuner, the listener doesn't have to worry about which systems the various stations in his area are using. That's because that new tuner (see Fig. 2) automatically detects which of the four AM-stereo methods is received and adjusts to the proper decoding circuitry automatically. All of that operates invisibly to the listener, without any indication as to which stereo method is in use. The tuner also features a few other state-of-the-art listener features. Up to eight preset stations can be stored for both AM and FM, and the memories can be scanned.



FIG 2—BILLED AS A UNIVERSAL RECEIVER, the model *TU-S77AMX* is capable of receiving all of the four AM-stereo systems.

Video

While Metal-Oxide Semiconductor (MOS) cameras for VCR recording have been more or less a novelty item for the last year-and-a-half, the technology of that solid-state image sensor has improved. Hitachi (401 W. Artesia Blvd., Compton, CA 90220) now feels confident enough about it to package a full-featured portable camera using the tiny sensor instead of a pickup tube. The compact, five-pound *VKC3400* camera, shown in Fig. 3, is one of the first cameras to include a color viewfinder as well. Thus, the video-camera operator will see that all settings are accurate before shooting, and can play back any segment of tape, in full color, to double check. Also built into the small unit are automatic focus, even in macro (closeup) settings; a character generator for titles; a date timer; a time-lapse counter; negative/positive reverse, and VCR transport controls. As



FIG. 3—HITACHI'S *VKC3400* boasts an MOS image sensor, a full-color electronic viewfinder, and a range of special-effects features.

far as optics go, the camera uses an *f1.2* lens and a six times power-zoom lens. Iris and white balance adjustments can be set automatically or manually. Surprisingly, the camera lists at about the same price as the first, rather featureless MOS camera of about a year ago: \$1995.

High-quality, stereo sound for videocassette recordings was the big announcement last January by a consortium of Beta-format VCR manufacturers. They had agreed on a standard for the Beta format to put two audio channels on the tape (with rotating drum heads) with more impressive specifications than traditional analog audio. Those specifications included a dynamic range of 80dB and a frequency response of 20hz-20kHz with less than 0.3% harmonic distortion. Now the products are starting to appear, and the Sanyo (1200 W. Artesia Blvd., Compton, CA 90220) *VCR 7300* is one of the first "portables" to include Beta Hi-Fi. The unit features separate audio inputs (as from a stereo tuner for use during a simulcast) and outputs (for playing through a stereo system), and claims a dynamic range greater than 80dB. A separate, stationary audio-head makes all Beta-format tapes playable on the *VCR 7300*; and all tapes recorded on the deck will play back (in mono) on other Beta decks. Other features include: 105-channel cable-ready tuner with 12 push-button channel selectors; one week, one event programmable timer; 8-function wired remote control, and Betascan picture search. It weighs 15 pounds including the rechargeable battery. It operates from that battery, or from AC or a 12-volt car battery. The price of the unit, (see Fig. 4) is \$1000.

As more television manufacturers join in the move toward component TV, Proton (19600 Magellan Dr., Torrance, CA



FIG. 4—THE SANYO *VCR 7300* is the first portable unit to make use of Beta Hi-Fi.

90502) is taking a different tack by building component-quality video, audio, tuning, and switching sections into their model 619 19-inch receiver/monitor (see Fig. 5). The video-monitor section limits overscan to 5%. Horizontal resolution is rated to be in excess of 370 lines. Built into the receiver is an automatic flesh-tone adjustment, which can be manually



FIG. 5—A 19-INCH RECEIVER/MONITOR, the Proton model 619 features component-quality video, audio, tuning, and switching sections in a single cabinet.

overridden. Picture brightness also automatically adjusts to ambient lighting conditions. There are four video inputs; two for RF and two for composite video. Front-panel pushbuttons select the input. There are also provisions to handle stereo-audio inputs from such sources as stereo-videodisc players and VCR's (the set has only a mono speaker, however). Outputs include one for video (for recording) and two for two-channel audio.

With the proliferation of home audio and video equipment, the cable and cable-switching mess gets increasingly more complex. To combat that problem, what may be the ultimate home-electronics switcher was introduced by Video Interface Products (1930 Ecorse Rd., Allen Park, MI 48101). The *From-To* routing computer, shown in Fig. 6, not only accommodates 10 inputs and 8 outputs, but also has a number of microprocessor-controlled features that allow it to be used as a control board for a small-scale television production. For simple selection of inputs and outputs, all the user needs to do is press the appropriate FROM and TO squares on the grid. More complex combinations involving multiple audio and

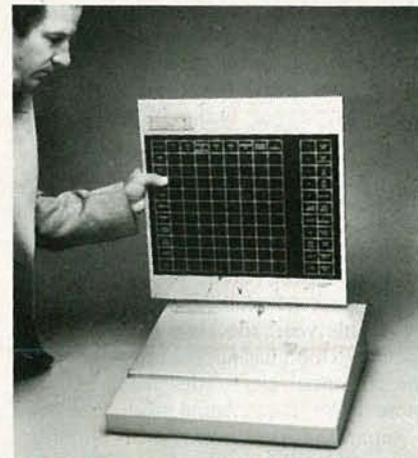


FIG. 6—THE ULTIMATE in convenience and flexibility, the microprocessor-controlled *From-To* switcher from Video Interface Products can handle 10 inputs and eight outputs.

video gear can be stored in up to 5 memories. Two outputs can be RF modulated (built-in) in case you want to display a composite video signal on a standard TV-set. A scan mode automatically switches through up to ten video inputs at infinitely selectable scan rates. The unit was engineered with extensive internal shielding. Crosstalk is less than -60dB . Of the three RF inputs, one features a VHF input amp, while the other two use broadband input amplifiers capable of handling frequencies through 900 MHz. The control-pad of the two-piece unit can be wall hung, if desired, with a 5-conductor cable linking it to the central console. The suggested retail price is \$999.

Games and computers

A relatively new company, Koala Technologies Corp. (4962 El Camino Real, Suite 125, Los Altos, CA 94022), has developed a low-cost touch panel for use on Apple, Atari, Commodore, and IBM personal computers. The *Koalapad*, shown in Fig. 7, may eventually be used as a 40-function controller for some rather sophisticated software, in addition to its obvious applications in computer graphics. The unit's four-inch-square touch-sensitive surface can be used with either a stylus or a finger to move a screen pointer (cursor). In conjunction with the graphics software included with the pad, the neophyte computer artist can have the computer draw straight lines between two points, fill segments with various colors, magnify a segment to rearrange pixels, and create free-form drawings on the screen in response to the tracing on the pad.

From Xonox (11311 K-tel Dr., Minnetonka, MN 55343), a division of K-Tel (the same people who bring us 50 original hits on two LP's or cassettes), comes a new brand of videogame cartridge with something really different: *Double-Enders*, a cartridge that is actually two

cartridges. Not just two games—that's been done years ago—but two separate cartridges packaged as if they were glued end-to-end, with their edge connectors facing away from each other; see Fig. 8. While that is certainly clever packaging, a sneak preview of the actual games at the Consumer Electronics Show revealed some interesting play in these 8K (per game) cartridges. Most of the cartridges have from three to five game screens.

One of the smallest direct-connect, RS-232 compatible telephone modems is the *J-CAT* by Novation (18664 Oxnard St., Tarzana, CA 91356). That 300-baud modem, shown in Fig. 9, can be set for auto answer/originate, as well as manual

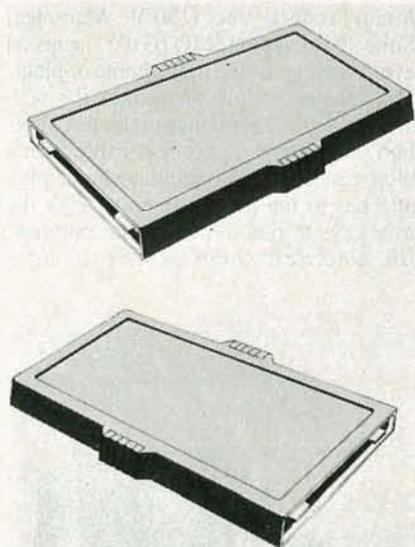


FIG. 8—TWO FOR ONE. The *Double-Enders* cartridges from Xonox feature two separate 8K games in a single, two-ended cartridge.

answer/originate. An audio indicator gives the operator the status of the phone line (dial tone, busy signal, etc.). It features full-duplex operation only and carries a suggested retail price of \$149.

Personal Electronics

In use in Europe for some time, and now available in the New York metropolitan area, a new traffic-conditions alert system is being introduced by Blaupunkt (2800 S. 25th St., Broadview, IL 60153). Called Automatic Radio Information, or ARI, the system uses existing selected FM-broadcast stations to bring timely, localized traffic data to commuters. With an ARI-equipped car stereo, a driver can turn down the radio volume or turn on the tape player without missing traffic reports. When the report comes on, a sub-carrier signal sent by the broadcaster activates the car radio to a pre-set volume, making sure the driver hears it. If the tape player is going, it is paused during the report. Participating broadcasters each have limited geographic zones, thus making sure the driver tuned into that local



FIG. 9—THE *J-CAT* from Novation, one of the smallest direct-connect RS-232 modems available.

station hears only about relevant road information. Blaupunkt is offering ARI adapters for some of its auto-stereo models (see Fig. 10), and is building ARI capability into some of its stereo radio/cassette decks. The company is currently licensing the technology to other manufacturers and plans to bring this system to more cities in the U.S.

Although automatic dialers aren't new, the shirt-pocket-sized *Dial-It*, shown in Fig. 11, from Dictograph (3573 Warden Ave., Buffalo, NY 14086) packs an impressive roster of features in its tiny case. The unit stores up to 100 telephone numbers and then audibly tone-dials them



FIG. 10—IN THE ARI SYSTEM, special signals keep a driver informed of traffic reports in his area. The adapter shown here will adapt a Blaupunkt car stereo to receive those ARI signals.

through a small speaker at the back of the case. Each memory can store up to 32 digits, leaving plenty of room for MCI, Sprint, or other budget long-distance-service access codes. An LCD display shows the number being dialed. For dialing numbers not stored in memory, the keypad can be used just as a pushbutton dialer. Also included is a clock (programmable in 12 or 24-hour time), alarm, memory calculator, and low-battery warning. The circuit lets you change batteries without losing what is in memory. The suggested retail price is \$65.

As frequent users of walkman-type tape players know, batteries are an expensive habit. Clear Electronics (5362 Bolsa "B", Huntington Beach, CA



FIG. 7—THE *KOALAPAD*, from Koala Technologies Inc., is a low-cost touch panel for use with microcomputers.



FIG. 11—THIS TINY AUTOMATIC DIALER, the *Dial-it* from Dictagraph, can store up to 100 numbers.

92649) has combined an AM/FM stereo tape-player and a slide-on rechargeable battery pack that will stop the endless purchases of batteries in their 818 AM/FM stereo tape-player shown in Fig. 12. The power pack has its own retractable AC power-plug; it plugs directly into the wall receptacle for recharging. Each charge keeps the player going for 6 to 10 hours. Packaged with the player and power pack are two pair of lightweight headphones and carrying case; it sells for a suggested retail price of \$140.

What makes the Regency Electronics Inc. (7707 Records St., Indianapolis, IN 46226) *MX 7000* noteworthy is the fact that it covers more of the frequency spectrum than any other consumer-oriented programmable scanner ever has. In addition to the standard VHF and UHF commercial bands, the unit, shown in Fig. 13, has continuous coverage from 27-1250 MHz (that's 1.25 GHz). Services covered in that range include Citizen's Band, FM broadcast, aircraft, 800-MHz public service, and cellular telephone. Front-panel selection is available for three receive modes: narrow-band FM, wide-band FM, and AM. The scanning interval is selectable; the intervals available are 5, 12.5, and 25 kHz. Up to 20 frequencies can be stored. Availability is scheduled for late 1983 and the suggested retail price will be \$599.



FIG. 12—NEVER NEEDS BATTERIES. This personal stereo, the 818 from Clear Electronics, is powered from a rechargeable battery pack.

It may look at first like an electric flyswatter, but it's really a new design for a microphone for use in recording sound in noisy rooms or in rooms with a lot of hard surfaces. The *Sound Grabber*, from Crown International (1718 West Mishawak Rd, Elkhart, IN 46517) lies inconspicuously face-down on a table. The microphone element is set in place about one-quarter inch above its large, flat, plastic surface. The element captures sound in front of it such that all sound reaching the element is in phase. In a demonstration we had of the device, the improvement in recording quality, especially the quality of voices, over a built-in condenser microphone was considerable. The suggested retail price is \$99.

The *Energy\$Teller* from Advanced Micro Products, Inc. (150 W. Meramec, Suite 205, Clayton, MO 63105) keeps an eye on energy usage in the home or plant. The sensor module plugs into the wall socket, and the appliance under test plugs into the module. A six-foot cable with a plug resembling a modular-phone plug attaches to the processor unit. After the user keys in the kilowatt-hour rate paid for electricity, the processor auto-



FIG. 13—THE REGENCY *MX 7000* offers continuous coverage from 27-1250 MHz.

matically keeps track of how much the electricity used by that appliance costs. A log book, called the *Energy\$Checkbook*, is included to record the interval between readings. Tracking actual cost can help isolate wasteful appliances or equipment. The 120-volt module handles up to 25 amps. A 240-volt module will also be available. Suggested retail price for system shown in Fig. 14, is \$80.

American Bell (5 Wood Hollow Rd., Parsippany, NJ 07054), one of the companies created in the break up of AT&T, has introduced a line of telephones for sale to the general public. Of interest here is their *Genesis* system, a microprocessor-controlled, modular telephone that takes on powerful attributes with the addition of plug-in cartridges and modules. The alphanumeric display on the main console, for example, shows names and numbers stored in the electronic directory module shown in Fig. 15. By it-



FIG. 14—THE *ENERGY\$TELLER*, sensor module, and log book help keep track of electricity consumption. The system is manufactured by Advanced Micro Products, Inc.

self, the main console can store seven numbers plus three emergency numbers; the emergency numbers stand out on the console in red. Also built in is a call timer and alarm. Plug-in cartridges feature additional memories or custom-calling functions such as 3-way calling, call forwarding, and call waiting. Each cartridge redefines the keys on the console; slide in cards rename the keys.

Sound Plus from Controlonics (5 Lyberty Rd., Westford, MA 01886) is about the only device singled out for recognition for using electronics to aid the handicapped—in this case, the hard-of-hearing. When a roomful of TV watchers contains one or more people who are hard of hearing, the volume almost always goes up to accommodate the one with the worst hearing, perhaps to the discomfort of the others. But *Sound Plus* lets the hard-of-hearing in the audience hear as



FIG. 15—THE *GENESIS* from American Bell, a modular, microprocessor-controlled telephone.

loudly as they want, while the rest of can have the speaker volume at a lower level. The principle is quite simple. Each listener who needs one has an individually controlled amplifier-headphone combination. The device picks up the sound from the TV speaker with its microphone (plugging any device into the external speaker or earphone jack would cut off the internal speaker for the others in the room). Then the sound is transmitted via infrared up to 50 feet to all wearers of the headset/receiver, a stethoscope-like device.

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