

Take your world with you ...  
by land or by sea.



Four great RCA product lines that let you enjoy yourself wherever you are, through TV reception, stereo radio or tape, scanners and CB... for your boat or RV.

**RCA Mini-State TV Antenna System** — housed in a weather-resistant 21" diameter case, this compact, rotating antenna pulls in VHF and UHF TV up to 35 miles over land or water.

**RCA Stereo Radio and Tape Players** — take your choice from RCA's full line of AM/FM radios and cassette or stereo-8 especially suitable for boats and RV's.

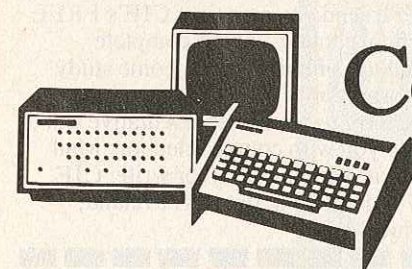
**RCA CB Co-Pilot Two-Way Radios** — top performance, transmitting or receiving. A "must" for emergencies or travel information. Can be installed in any boat or vehicle with 12 volt system.

**RCA Scan-Aire Scanning Monitors** — hear the real-life drama of public service broadcasts, as well as important information aired on weather, police or marine channels.

See your RCA dealer for detailed information, and start taking your world with you. Or contact RCA Distributor and Special Products Division, Bldg. 206-2, Cherry Hill, N.J. 08101.

**RCA**

CIRCLE NO. 54 ON FREE INFORMATION CARD



## Computer Bits

### BOOKS ON PROGRAMMING

By Stephen B. Gray  
Senior Editor

PERHAPS the manual that came with your microcomputer kit is a little light on the software side, and doesn't tell you what you want to know about programming in assembly language. Or maybe there was no manual at all with the BASIC interpreter you bought, and you're not familiar with that language. So you start looking for a book. But first, a few words about both languages.

In talking with a number of computer hobbyists about what programming languages they use, it turns out that only a few are really into heavy assembly-language programming; most of them use BASIC. Assembly language, to quote from a Scelbi book, "is by far the most efficient method for packing a program

into a small amount of memory," and for that reason is widely used in business, where there is a demand for highly efficient programs. But since the average person is more interested in what can be accomplished with a program than in the program itself, or in its efficiency, BASIC is in much greater use in schools, colleges, and among computer hobbyists. However, since there is an interest in assembly language, and because a computer with a minimum amount of memory can be programmed only in assembly language, let's look at some books on that subject.

**Assembly Language.** Although there are several excellent books on as-

sembly language, there isn't one I've seen so far that's meant for the average electronics hobbyist—that is, a book that assumes the reader knows nothing at all about programming. Perhaps this is because assembly language is a rather difficult language for programming, as far as most hobbyists are concerned. I don't mean the "Computer Freaks," who enjoy working down at the machine-language level. I mean a person who knows little or nothing about computers, and who in fact may not even know what assembly-language programs are. Writing such programs requires a great amount of attention to tiny detail, as well as a great deal of time, in comparison with writing a program in BASIC (or other high-level language) to perform the same task.

The ideal (but nonexistent) book on assembly language should assume the reader is starting from zero. After a chapter or two on the elements of programming and flowcharting, it should introduce him to instructions such as LDA, MOV and STA, in small groups or one at a time, explain them thoroughly, and give a variety of short programs using them. It should fully explain how each program works and what it does.

The problem with creating such a book is that, in order to be as all-encompassing as it should be for the beginner, going into detail for each of the 78 instructions for the 8080 MPU, or the 158 for the Z-80, the book would have to be an inch or two thick. It's much easier to assume, as most of the current books do, that the reader is a programmer or an engineer, or at least has had quite a bit of exposure to computers and programming. This is similar to a manual on jet-engine repair that assumes you know all about tools and techniques.

**Osborne.** The best book I know of for learning about microcomputers won't tell you as much as you may want to know about programming, but it does an outstanding job of going into the hardware and software of seven of the top microprocessors. *An Introduction to Microprocessors*, published by Adam Osborne and Associates at \$7.50, starts out with six chapters on the fundamentals, going into binary arithmetic and Boolean algebra, microcomputer organization, what's in an MPU (microprocessor unit) and how it works, CPU logic, and the elements of programming (memory addressing, stacks, and in-

struction sets); in meticulous detail.

The programming chapter ends by creating a "complete, but hypothetical, microcomputer instruction set," and showing why each instruction is required. This hypothetical set becomes the standard to which the seven real sets are compared, those of the F8, PACE and SC/MP, 8080, 6800, PPS-8 (Rockwell), and 2650. A meaty 138-page chapter has a "look at the way in which a variety of manufacturers have chosen to implement the basic concepts which have been described in Chapters 1 through 6."

For each MPU, the book goes into the registers, addressing modes, status flags, pins and signals, interfaces, interrupts, DMA (direct memory access), and instruction set. This is not an easy book to read because a great deal is packed into it, in rather small type, and it moves at a very fast pace. But no other book available today contains so much information about microcomputers in such a small package—only a little larger than most paperbacks. It's included with every Imsai computer as part of the support documentation. IMS calls it "an excellent 460-page book that teaches how a computer is programmed and pre-

sents an overview of microcomputer technology."

The second edition of the Osborne book has been revised and expanded to two volumes, at \$7.50 each. Volume 1, "Basic Concepts," covers the first six chapters of the first edition, with new sections on chip-slice products and serial I/O. Volume 2, "Some Real Products," which expands on the original Chapter 7 to include more microprocessors, was due to be published late in October, as of this writing.

**Scelbi.** Scelbi was an early producer of a hobby computer kit. It later dropped out of the hardware business to concentrate on software. To date, Scelbi has produced half a dozen software manuals, on an assembler, editor and monitors for the 8080 MPU, and several others. They've just come out (at this writing) with a new book, a small paperback called *Scelbi 8080 Software Gourmet Guide & Cook Book*, at \$9.95. The book has eight chapters, on the 8080 stack, general-purpose routines, conversions routines, decimal arithmetic routines, floating-point routines, input/output processing, and search and sort routines plus a number of helpful appen-



dices for the computer enthusiast.

The book is meant for people with some knowledge of programming, as it goes right into a discussion of the instruction set, breaking up the 78 instructions into small groups and discussing them in moderate detail. From chapter two on, dozens of programs and subroutines are presented, with a full set of comments for each program. Flowcharts are provided for over 20 of the programs. Most of the programs are quite short, although several run to a couple of pages, such as the floating-point programs for add, multiply, and divide. This

book shows, better than most, the complexity of having to load a group of assembly-language programs into your computer, such as decimal-to-binary input, floating-point normalization, floating-point multiplication, binary-to-decimal output, operating program, etc. Of course, if you're interested only in simple programs, without decimals, for games or for control applications, then you don't need all those routines. How much simpler to work in BASIC, where all the necessary routines are included in one program!

This new Scelbi book, on the 8080, is

bound to become better known than their first best-seller, *Machine Language Programming for the 8008 and Similar Microcomputers*, at \$19.95 (twice the price as well as twice the size). This larger book (8½" x 11") has been recommended to me by several computer-kit manufacturers, and can be found on the shelves of many computer stores. It has nine chapters. They cover the 8008 instruction set, initial steps for developing programs, fundamental programming skills, basic programming techniques, mathematical operations, input/output programming, real-time programming, PROM programming considerations, and creative programming concepts.

The first chapters of the two books are pretty much the same, except that the 8080 book covers 78 instructions to the 8008 book's 48, but most of the remaining material is very different. The floating-point programs are almost identical, because the 8008 instruction set is a subset of the 8080 set. An 8008 program will run on an 8080 machine without having to be changed. For the 8080 book, the author has improved on the 8008 programs by taking advantage of some of the more powerful 8080 instructions, such as those for double-precision operations, not found in the 8008 set.

**BASIC.** Over 40 books about programming in BASIC have been written, and most of them are fairly good. The authors write with varying degrees of enthusiasm, ranging from "BASIC is great!" to "BASIC is OK, but let me tell you a little about FORTRAN." A small handful of these books is outstanding. Here are two of them.

**Kemeny and Kurtz.** The best book on BASIC is a classic, the standard by which all other such books must be measured. It was written by the originators of the language, John Kemeny (now president of Dartmouth) and Thomas Kurtz (Dartmouth's Director of Academic Computing). *BASIC Programming*, published by Wiley at \$8.50, pays very careful attention to every detail, taking great care that the reader will have as little difficulty as possible in learning BASIC. The first chapter presents and explains a five-line program that divides one constant by another.

The second program, although 17 lines long, is quite simple, and converts meters and centimeters to feet and inches, with a page and a half of explanation. An entire chapter is devoted to loops, the heart of many programs. The concept of rounding off numbers with

## Listen to the music.

Noise in the form of hiss, hum and rumble—all the things that effectively cloud the clarity of records, tapes and FM broadcasts.

Ideally, music should be heard against a silent background. The Phase Linear 1000 achieves just that with two unique systems: AutoCorrelator Noise Reduction and Dynamic Range Recovery.

PHASE LINEAR 1000



The AutoCorrelator reduces noise by 10 dB without the loss of high frequency music and without pre-encoding.

The Dynamic Range Recovery System restores 7.5 dB of the overall dynamic range, without the pumping and swishing associated with other systems.

The Phase Linear 1000 represents the most significant improvement in sound reproduction for the money... more than any other single piece of equipment you could add to your system. It is easily installed to any stereo receiver or preamplifier.

Ask your dealer for an audition, and listen to the music.

# Not the noise.

*Phase Linear*  
The Powerful Difference

Manufactured in the USA. Distributed in Canada by H. Roy Gray, LTD.

CIRCLE NO. 50 ON FREE INFORMATION CARD

# altair<sup>T.M.</sup>

## Number One in low-cost computing.

Altair, from Mits, is the number one name in microcomputers for home, business, personal and industrial applications. Because the Altair was first, it has set the standard in the industry. More Altair 8800's are now operational than all other microcomputers combined.

Whether you buy a \$395 complete computer kit\* or a multi-disk system for under \$10,000; Mits will provide you with thorough and lasting support. Satisfied Altair users include schools, corporations, small businesses, students, engineers, and hobbyists.

Altair hardware includes three microcomputers, the Altair 8800a, 8800b, and 680b. Mits has a complete selection of Altair plug-compatible memory and interface options, including the new Altair 16K Static board and Altair multi-port serial and parallel I/O boards. Also available is a complete line of Altair peripherals including line printers, CRT's, and multiple disk systems.

Altair software is by far the most complete and best for any microcomputer. Our Extended BASIC and Disk BASIC have received industry wide acclaim for programming power and efficiency. Application packages are available at many Altair Computer Centers.\*\*

The Altair computer is a revolution in low cost computing. Shouldn't you write for more information including our free, color catalogue.

\*The Altair 680b turnkey model.

\*\*Retail Altair computer outlets now opened in many large cities.



MITS, Inc. 2450 Alamo S.E. / Albuquerque, New Mexico 87106

CIRCLE NO. 77 ON FREE INFORMATION CARD



the INT statement is not simple, yet the authors, by going through each part of such a statement, have found what must be the simplest way of explaining it.

The chapter on simulation contains a baseball program that simulates the batting of one side in a nine-inning game, and one on the Knight's Tour problem. The section on harmony in music gives a long program that writes four-part harmony for a given melody.

Each chapter on applications provides a couple of projects, more complicated than the chapter exercises, that should

provide the reader who has a terminal with a very thorough workout of his knowledge of BASIC. Not all the chapters are easy to understand, since several go into areas such as vectors and matrices, statistics, and calculus. Although most of the book can be understood "with a background of three years of high school mathematics," these three math areas "are normally taught at the college level." Not everybody will dig into these chapters, but they're there for those who want to, and for those who will eventually learn the requisite math.

**Dwyer and Kaufman.** The best of the introductory texts, bright and sparkling, recommended for any young person, or in fact for anybody, is *A Guided Tour of Computer Programming in BASIC*, published by Houghton Mifflin at \$4.40, and written by Thomas A. Dwyer and Michael S. Kaufman, who do their best to make learning fun.

The book is in four parts. "Getting Ready for the Journey" covers the basics and LET, PRINT and END. Six more statements are introduced in "The Economy Tour." "Techniques for the Seasoned Traveler" brings in nine more statements plus library functions. Nine applications programs are presented in "Far Away Places." The book covers 20 statements altogether, all you'll need for most applications. Although it's meant to be used with a terminal, this book doesn't have to be.

As an indication of the book's ingenious variety, the applications programs in Part 4 include those for a hotel reservation system, generating brand names for soap, slot-machine games (cherries, lemons, oranges); monthly installment payments on a loan, and payroll.

One of the most important features is the many callouts to the programs, outlined in red, with a red line pointing to the line or lines they explain. Each of the four parts is divided into sections. At the end of each section is a review of the material covered, and there are several sets of exercises in each of the parts.

This fine book is mainly for young people, but it will be of value to anyone. It is full of detail, with many examples and much thought given to the use of graphics in teaching.

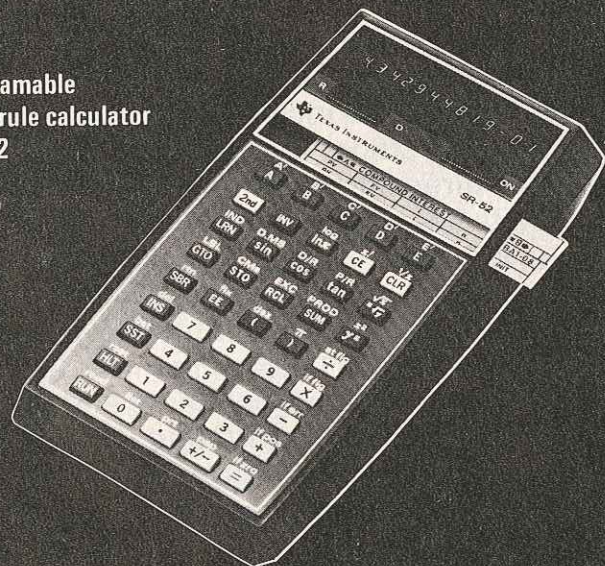
**Your Favorite Book.** If your favorite book on assembly language or BASIC isn't one of the five mentioned here, please don't fret. There are many other fine books, out of the 60 or more on the two languages. The ones discussed are among my favorites, given limited editorial space. However, future columns will refer to other books of interest, on both programming and applications. ♦

#### ADDRESSES

**Adam Osborne and Associates, Inc.**,  
2950 Seventh St., Berkeley, CA 94710  
**Scelbi Computer Consulting Inc.**, 1322  
Rear Boston Post Road, Milford, CT  
06460  
**John Wiley & Sons, Inc.**, 1 Wiley Drive,  
Somerset, NJ 08873  
**Houghton Mifflin**, Wayside Rd., Burling-  
ton, MA 01803. Attn. College Order  
Dept.

## NOW FROM TEXAS INSTRUMENTS . . . three machines in one.

programmable  
slide-rule calculator  
SR-52



- 10 user defined keys
- 224 program storage locations
- 23 preprogrammed key functions
- 8 preprogrammed condition statements
- 20 independent addressable memory registers
- Permanent program storage on magnetic cards

It took TEXAS INSTRUMENTS to invent the SR-52 calculator. It took C & S MARKETING ASSOCIATES to offer it at a price you can afford, now only \$229.95. With such versatility and such an affordable price, you can not afford to be without the problem solving power of card programability. Now solve problems in seconds that would take hours with an ordinary calculator or slideruler if they could be done at all.

For more information or the answer to any question you may have about the SR-52 calculator, call toll free (800-251-6771)\*. Tenn. residents call (800-262-6706). Other TEXAS INSTRUMENT models available from \$49.95.

Each TEXAS INSTRUMENT calculator comes with a 1-year warranty. Should your unit prove defective within 60 days, just return it for a new unit! Finally should you be dissatisfied with your calculator return it within 15 days for a prompt refund. \* COD orders please add \$5.00 shipping and handling.

**C & S MARKETING ASSOC.**  
P.O. BOX 165 ALGOOD, TENN. 38501

QTY. \_\_\_\_\_ PRICE 229.95 ea.

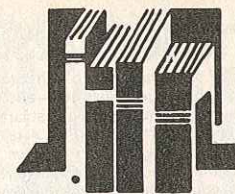
CHECK     M.O.     C.O.D.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, ST., ZIP \_\_\_\_\_

CIRCLE NO. 16 ON FREE INFORMATION CARD



## Electronics Library

### ARRL ELECTRONICS DATA BOOK Edited by Doug DeMaw, W1CER

Here is a compilation of data useful to the electronics experimenter, regardless of his level of experience. It contains ten chapters, and among the subjects treated in depth are r-f circuit data, L, C, and R networks, broad and narrow band transformer design, filter design, antennas and feed systems, and a catalog of practical solid-state circuits. All chapters include pertinent simple equations with representative solutions. Toroidal designs are emphasized in the transformer chapter. Modern filter design covers two- and three-pole Butterworth derivations for most of the frequencies of interest to amateurs, and tables of practical filter values are included. Published by the American Radio Relay League, 225 Main Street, Newington, CT 06111. 128 pages (8½" x 11") \$4.00 soft cover.

### AUTO ELECTRONICS SIMPLIFIED by Clayton Hallmark

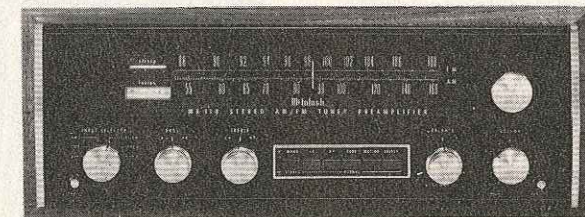
Applications of electricity and electronics—from the basics of alternators to digital computer automotive analysis—are examined in this book. Topics discussed are electronic charging and ignition systems, safety appliances, emission and performance devices, radios and tape players, comfort and convenience systems, automotive test equipment, computers and cars today, computer basics, and advanced automotive technology. Both theory of operation and troubleshooting information are included. Schematics, line drawings, and illustrations supplement the text. Published by Tab Books, Blue Ridge Summit, PA 17214. 266 pages. \$5.95 soft cover.

### RCA SOLID STATE REPLACEMENT GUIDE

The updated RCA Solid State Replacement Guide, SPG-202R, lists more than 103,000 industry types which are replaceable by only 250 RCA SK devices, including 32 new types. Significant ratings and characteristics are given for each device to aid selection of the optimum replacement semiconductor. Dimensional outlines of device packages and terminal diagrams are given, as well as a revised hardware replacement directory. Published by RCA Solid State Division, Box 3200, Somerville, NJ 08876. 156 pages. \$3.00 soft cover.

# FREE McIntosh CATALOG and FM DIRECTORY

Get all the newest and latest information on the new McIntosh Solid State equipment in the McIntosh catalog. In addition you will receive an FM station directory that covers all of North America.



### MX 113

FM/FM STEREO - AM TUNER AND PREAMPLIFIER

**SEND  
TODAY!**

McIntosh Laboratory, Inc.  
East Side Station P.O. Box 98  
Binghamton, N.Y. 13904  
Dept. PE

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

If you are in a hurry for your catalog please send the coupon to McIntosh. For non rush service send the *Reader Service Card* to the magazine.

CIRCLE NO. 43 ON FREE INFORMATION CARD

## CB where the ACTION'S at

Millions of 2-way CB radios are in use—millions of new ones are being sold annually to new CBers and for replacing old units—what a market for repair service. It's the biggest thing in electronics since color TV. There's only one thing wrong with CB growth—the lack of technicians capable of servicing CB radios. That's why many TV shops are expanding into CB and why new CB shops are opening up all over the country. Going CB servicing rates run from \$12 to \$24 per hour.

To get into CB radio servicing, full-time or part-time, you need test equipment, an FCC operator license and to learn how. To learn how, you can buy the **CB RADIO REPAIR COURSE** for cash, on a monthly payment plan, or charge the cost to your BankAmericard or Master Charge account.

To make it easy to study, this 70-lesson course employs the **PROGRAMMED** teaching technique and sticks to the target—CB radio. Study at your own pace as you receive the self-examining lessons. We can't guarantee that you will become a CB expert since that depends on you.

To get the facts about this course, write a letter or card or mail the coupon below today. No salesman will call.

**CB RADIO REPAIR COURSE, INC.** Dept. P-126  
531 N. Ann Arbor  
Oklahoma City, OK 73127

Please send information about your Course to:

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

CIRCLE NO. 73 ON FREE INFORMATION CARD



**DON'T LET  
OUR NAME  
FOOL  
YOU**

## STEREO DISCOUNTERS

WE'RE ALSO  
**CB DISCOUNTERS!**

Save by buying from a high volume dealer. Send for your Free Hi-Fi and CB Catalog... Or call for a price quote on our "Super Service" line...

**301-252-6880**

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**STEREO DISCOUNTERS**  
7A Aylesbury Rd.  
Timonium, Md. 21093

PE-12

CIRCLE NO. 65 ON FREE INFORMATION CARD