

# ROCKWELL AIM 65 MICROCOMPUTER



**THE INTEGRATED SINGLE-BOARD SOLUTION  
IN EDUCATION, SCIENCE AND INDUSTRY.**

**AIM 65® Microcomputer:**  
**The self-contained microcomputer product ready for use in hundreds of applications.**

Now there's a board-level microcomputer product that gives educators, scientists and engineers the ideal combination of capability, flexibility, and low cost. The AIM 65® Microcomputer's standard features include keyboard, display, printer, and on-board software—all commanded by Rockwell's powerful, easy-to-use microprocessor, the 8-bit R6502. And because AIM 65 comes in an "open frame" format, users have easy access to all components for examination, modification, or expansion.

Whether you're an engineer learning the fundamentals of computer science or advanced microcomputer system development, or even if you're configuring economical microcomputer systems to solve real-world-problems, you can't beat an AIM 65 Microcomputer. No other microcomputer delivers so many possibilities on a single-board—at such a low cost.

**In the classroom**

The beauty of the AIM 65 Microcomputer as a learning tool lies in its accessibility. Regardless of whether the subject is electrical, mechanical, chemical or industrial engineering—or even computer science—students now have a rugged, easy-to-operate microcomputer system whose components and capabilities encompass the full scope of the microelectronics revolution.

□ **Hardware.**

The AIM 65 module contains all the basic elements of computer systems—from CPU, control and memory, to the essential peripherals and expansion connections for building more complex systems.

□ **Software.**

The AIM 65 Interactive Monitor program resides in ROM as on-board firmware. In addition to streamlined interactive monitoring, this operating system enables you to interface with other programs for text editing, symbolic assembly, interpreting BASIC or FORTH\* programs, and learn structured programming, with Instant Pascal.

□ **System development.**

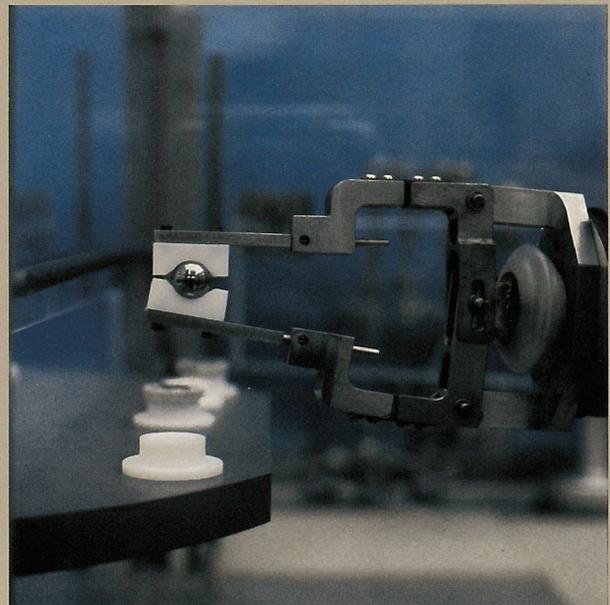
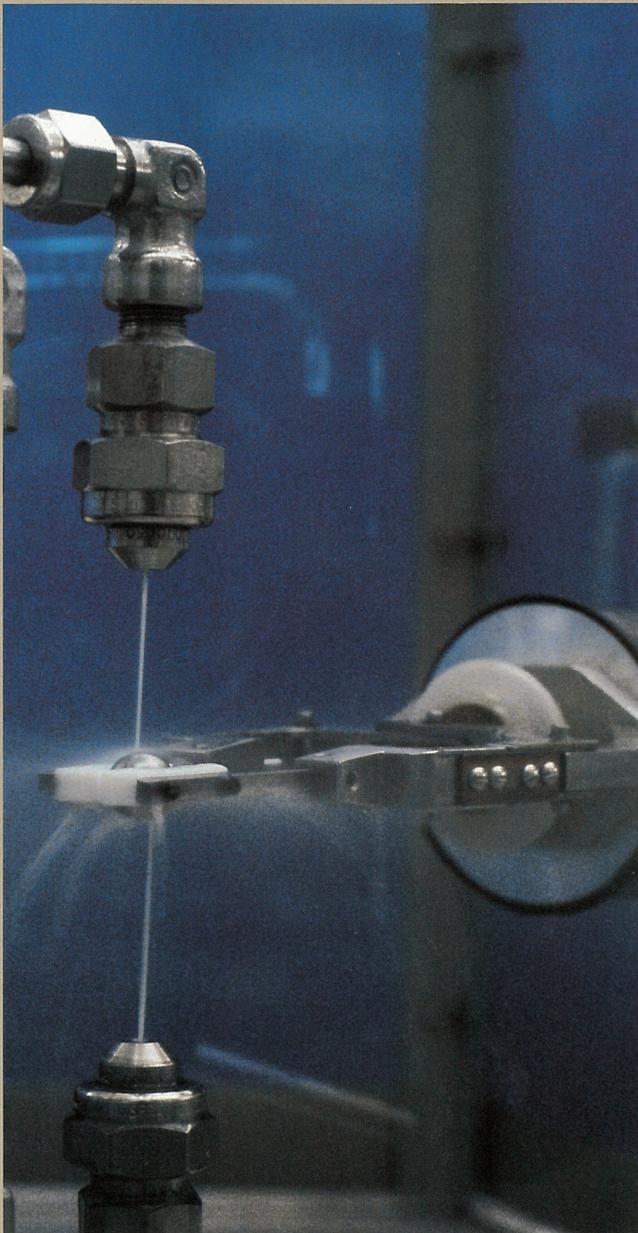
For advanced students and professionals, an AIM 65 Microcomputer presents a wide world of design opportunity. Not only does the system meet or exceed the capabilities of most small personal computers, but it can be expanded to solve a broad range of industrial/scientific problems. Add memory, in chip or cassette form. Control a terminal or teletype. Or for even greater capability, you can expand an AIM 65 Microcomputer using the RM 65 family of modules. Professionals can even design full-scale system solutions using the AIM 65 Microcomputer as a development system.

\* FORTH is a trademark of FORTH, Inc.  
AIM 65 is a registered trademark of Rockwell International.



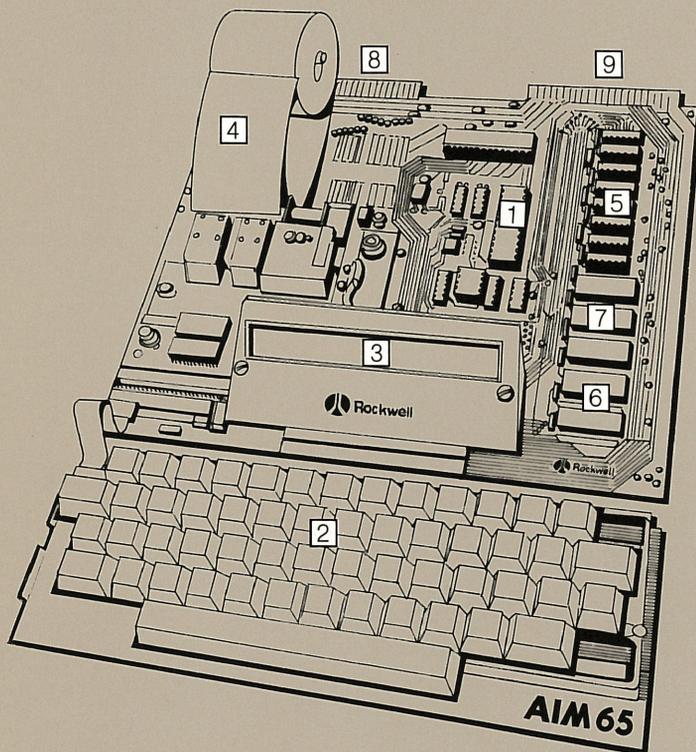
### ***In the laboratory or factory***

The flexibility of the AIM 65 Microcomputer makes it a popular solution for one-of-a-kind and low-volume scientific and industrial problems. The single-board format and ample expansion connections mean easy design and easy building. The low price means a balanced budget. Today, scientists and engineers are successfully using AIM 65 Microcomputers in such varied applications as digital plotting, chemical mixing, data logging, and medical instrument monitoring and control. Beyond those, the potential applications are unlimited.



**AIM 65 Microcomputer:**  
**All the power and features you need**  
**on a single, low-cost board.**

As a general-purpose solution in scientific and educational applications, no other single-board microcomputer compares with an AIM 65 Microcomputer. It's the only one that integrates all five essential functions: processor, keyboard, display, hard-copy printer, and software. Compared with prepackaged "personal computers," the AIM 65 Microcomputer offers equal capability and easier expandability at a dramatically low cost: hundreds of dollars, instead of thousands. So, whether you're a student newly discovering microcomputers, or a professional designing a complex microcomputer system, an AIM 65 Microcomputer can give you all the power—and growth potential—you'll ever need.



**[1] Third-Generation, High-Performance 8-bit Microprocessor.**

The popular R6502 microprocessor is currently operating successfully in thousands of microcomputer-based products worldwide. Its familiar architecture makes AIM 65 Microcomputers ideal for a variety of educational, scientific and industrial control tasks.

**[2] 54-Key Alphanumeric Terminal-Style Keyboard.** Standard format keyboard provides 70 different alphabetic, numeric control and special character functions.

**[3] 20-Character Alphanumeric Display.** High contrast, 16-segment characters for optimum readability. 64-character ASCII format.

**[4] 120-Line/Minute, 20-Column, Hard-Copy Printer.** This on-board thermal printer is unique among comparable microcomputers. Easy-to-read 5 x 7 dot matrix, 64-character ASCII.

**[5] Plug-in Sockets for 4K Bytes of RAM.** Sockets for up to eight industry-standard 4-bit wide 2114 static read/write (RAM) memory devices.

**[6] Advanced Interactive Monitor Firmware.** The heart of the AIM 65 Microcomputer is its on-board software. The Interactive Monitor, which includes the AIM 65 Text Editor, is contained in two R2332 ROMs.

**[7] Plug-in Sockets for 12K bytes of ROM or PROM Options.** The FORTH, BASIC, Instant Pascal and PL/65 languages are each available as two-ROM sets. The Symbolic Assembler and floating point Math Package are available as single ROMs. Or you can add your own software in PROM. Sockets accept industry-standard 4-kilobyte R2332 ROMs or compatible PROMs.

**[8] System Applications Connector.** A 44-pin connector lets you interface peripherals, such as one or two cassette recorders, a Teletypewriter (20mA current loop), switches and sensors. The connector features both serial and parallel TTL-level interfaces, timing and control functions via built-in 16-bit timer/counters, plus many other system functions.

**[9] Full-Bus System Expansion Connector.** A 44-pin connector allows extension of address, data, and control lines. This lets you add a PROM programmer or expand the system with additional memory, as well as interfaces for floppy disk, CRT, IEEE-488 bus, and other peripherals.



**AIM 65 Microcomputer:  
Extensive on-board software makes  
operation and programming simple.**

The object of AIM 65 software is to speed and simplify use of the machine—that, after all, is the function of automation itself. Since AIM 65 software resides in ROM chips on the microcomputer system board, instead of on a disk or cassette, it is termed “firmware.”

**Advanced Interactive Monitor**

The Monitor responds to a comprehensive set of single-key commands, which are self-prompting (see table). This means the computer monitors commands and asks the user for more information, if necessary. If an error is made, the Monitor displays an error indicator.

Part of the Interactive Monitor is a Mnemonic Instruction Entry program, which translates easy-to-remember three-character instruction codes in-to binary codes for the computer. This Mnemonic Instruction Entry eliminates the need to communicate in the complex hexadecimal “opcodes” required by many low-cost microcomputers.

Most importantly, the Interactive Monitor allows you to access AIM 65’s other software capabilities with single-keystroke commands. It provides the interface to the Text Editor, Symbolic Assembler, BASIC, FORTH and Instant Pascal Interpreters and the PL/65 compiler.

**Monitor Command Summary**

**Major Function Entry**

RESET	Enter and initialize Monitor
ESC	Re-enter Monitor
E	Enter and initialize Text Editor
T	Re-enter Text Editor
N	Enter Symbolic Assembler
5	Enter and initialize HLL (BASIC, FORTH, etc.)
6	Re-enter HLL (BASIC, FORTH, etc.)

**Instruction Entry and Disassembly**

I	Enter mnemonic instruction entry mode
K	Disassemble memory

**Display/Alter Registers and Memory**

*	Alter Program Counter to (address)
A	Alter Accumulator to (byte)
X	Alter X Register to (byte)
Y	Alter Y Register to (byte)
P	Alter Processor Status to (byte)
S	Alter Stack Pointer to (byte)
R	Display all registers
M	Display four memory locations, starting at (address)

SPACE	Display next four memory locations
/	Alter current memory location contents

**Manipulate Breakpoints**

#	Clear all breakpoints
4	Toggle breakpoint enable on/off
B	Set one to four breakpoint addresses
?	Display breakpoint addresses

**Control Instruction/Trace**

G	Execute user’s program
Z	Toggle instruction trace mode on/off
V	Toggle register trace mode on/off
H	Trace Program Counter history

**Control Peripheral Devices**

L	Load object code into memory from peripheral I/O device
D	Dump object code to peripheral I/O device
1	Toggle Tape 1 control on/off
2	Toggle Tape 2 control on/off
3	Verify tape checksum
CRTL PRINT	Toggle Printer on/off
LF	Line Feed
PRINT	Print Display contents

**Call User-Defined Functions**

F1	Call User Function 1
F2	Call User Function 2
F3	Call User Function 3



## Text Editor

The Text Editor allows you to insert, delete, and change character strings anywhere in a source program without affecting any other portion. It uses simple, word processing-like commands, which may be displayed or listed to the printer or terminal. Edited text buffers may be input to the Symbolic Assembler or the PL/65 compiler for conversion into machine codes, or used by the BASIC, Instant Pascal and FORTH interpreters. The Text Editor is stored with the Interactive Monitor in ROM.

## Editor Command Summary

### Text Editor Commands

R	Read lines into text buffer from peripheral I/O device
I	Insert line into text buffer from keyboard
K	Delete current line of text
SPACE	Display current line of text
L	List lines of text to peripheral I/O device
U	Move up one line
D	Move down one line
T	Go to top line of text
B	Go to bottom line of text
F	Find character string
C	Change character string
Q	Quit Text Editor, return to Monitor

## Symbolic Assembler

Also contained in an optional on-board ROM is

the Symbolic Assembler, a software module that allows the practicing professional to write exceptionally efficient programs for applications in which execution speed is critical. It shortens the development and documentation time for complex programs by assigning labels to instructions, sub-routines and data locations. For students, it provides a practical introduction to the fundamentals of machine language programming in a relatively simple format.

## BASIC Interpreter

BASIC—which stands for Beginners' All-purpose Symbolic Instruction Code—is perhaps the most popular of all programming languages. It's so easy to learn that most novices should be able to begin writing BASIC programs after only a few hours of study. The AIM 65 BASIC—contained in two ROMs—is the flexible, efficient 8K version developed for Rockwell by Microsoft.

## PL/65 Compiler

When reducing software development time or costs, essential in writing complex programs, the designer can work most efficiently in a high-level language, such as PL/65.

## FORTH Language

FORTH gives AIM 65 users an expandable, stack-oriented language that's ideal for real-time control applications. FORTH is contained in two 4K-byte ROMs, and includes its own compiler, assembler, and run-time interpreter functions. Testing in FORTH is immediate and interactive; simply type arguments onto the stack, execute the newly defined word, and print the results.

## Instant Pascal Language

Pascal is an unusually powerful language, and yet much easier to learn than most high-level languages. Primarily intended for use in learning structured programming techniques, AIM 65 Instant Pascal is a unique implementation which allows writing and debugging entirely at the source language level in a highly interactive manner. (AIM 65 Instant Pascal consists of five ROMs, in addition to the Interactive Monitor, and requires an expanded AIM 65 Microcomputer).

## Disk Operating System

Designed specifically to work with the RM 65 Floppy Disk Controller module, the Disk Operating System—DOS 1.0—for the AIM 65 microcomputer allows reading or writing program or data files from 8- or 5 1/4 -inch floppy disks. DOS 1.0 is compatible with the AIM 65 optional programming languages.



**AIM 65 Microcomputer:  
A functional, flexible, expandable solution.**

**Central processing by the  
R6502 microprocessor.**

The AIM 65 Microcomputer's intelligence is provided by Rockwell's high-performance microprocessor, the 8-bit R6502. This multiple-sourced CPU has 4K bytes of address capability, plus the power of a 56-command, 13-addressing mode, minicomputer-like instruction set.

Supporting the R6502 are selected R6500 microprocessor family devices which implement the AIM 65 internal system and provide versatile interfacing for user-dedicated applications.

**Versatile I/O capabilities at your command**

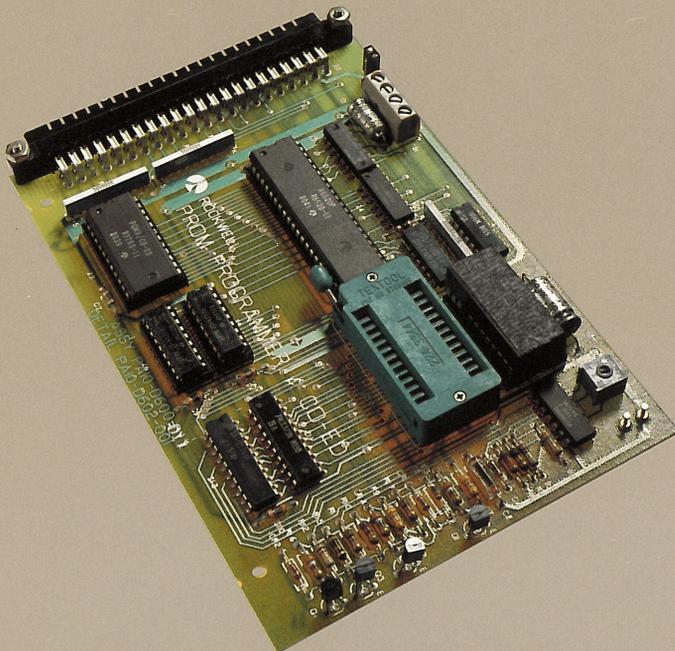
Application flexibility derives from the AIM 65 Microcomputer's ability to interface with a broad range of peripheral devices. Such devices can be quickly added to an AIM 65 system, using the R6522 Versatile Interface Adapter (VIA). The VIA includes two I/O ports (each with eight data lines and a pair of handshake control lines), an 8-bit serial I/O port, and access to two programmable 16-bit counter/timers.

With this I/O capability you can connect an AIM 65 Microcomputer, for example, with sensors and switches to perform item or batch response functions. One ingenious user has even created an automatic telephone dialer based on the AIM 65 system. An AIM 65 Microcomputer can also be easily modified for interfacing with a CRT terminal.

Finally, and most important in many applications, the AIM 65 system can be operated with one or two cassette recorders to expand memory capacity and off-line storage. This allows it to be used by a number of different students, each with their own program cassettes. Or, in a dedicated application, program parameters can be changed by simply changing cassettes.

**Create your own firmware**

Software is the key to differentiating your microcomputer product from your competitor's. Give your AIM 65 Microcomputer its own personality by putting your application software in PROM on the board. The PROM Programmer and CO-ED (Code Editor) module interfaces with the expansion connector to convert the AIM 65 Microcomputer into a device that handles the popular 2K- and 4K-byte UV-erasable PROMs. The PROM Programmer and CO-ED module has its own scratchpad RAM, firmware ROM and I/O control to correctly program the various PROM types without the need for any of the system memory or I/O resources. Even if your program is larger than the AIM 65 Microcomputer's 4K bytes of RAM, the PROM programmer is designed to read a specific 4K-byte block within a tape file. The CO-ED program is firmware on the module that assists in relocating and editing object code directly. You get both the AIM 65 Microcomputer with PROM Programmer and CO-ED module for less than many competitive PROM programmers alone.



### **AIM 65 Microcomputer accessories**

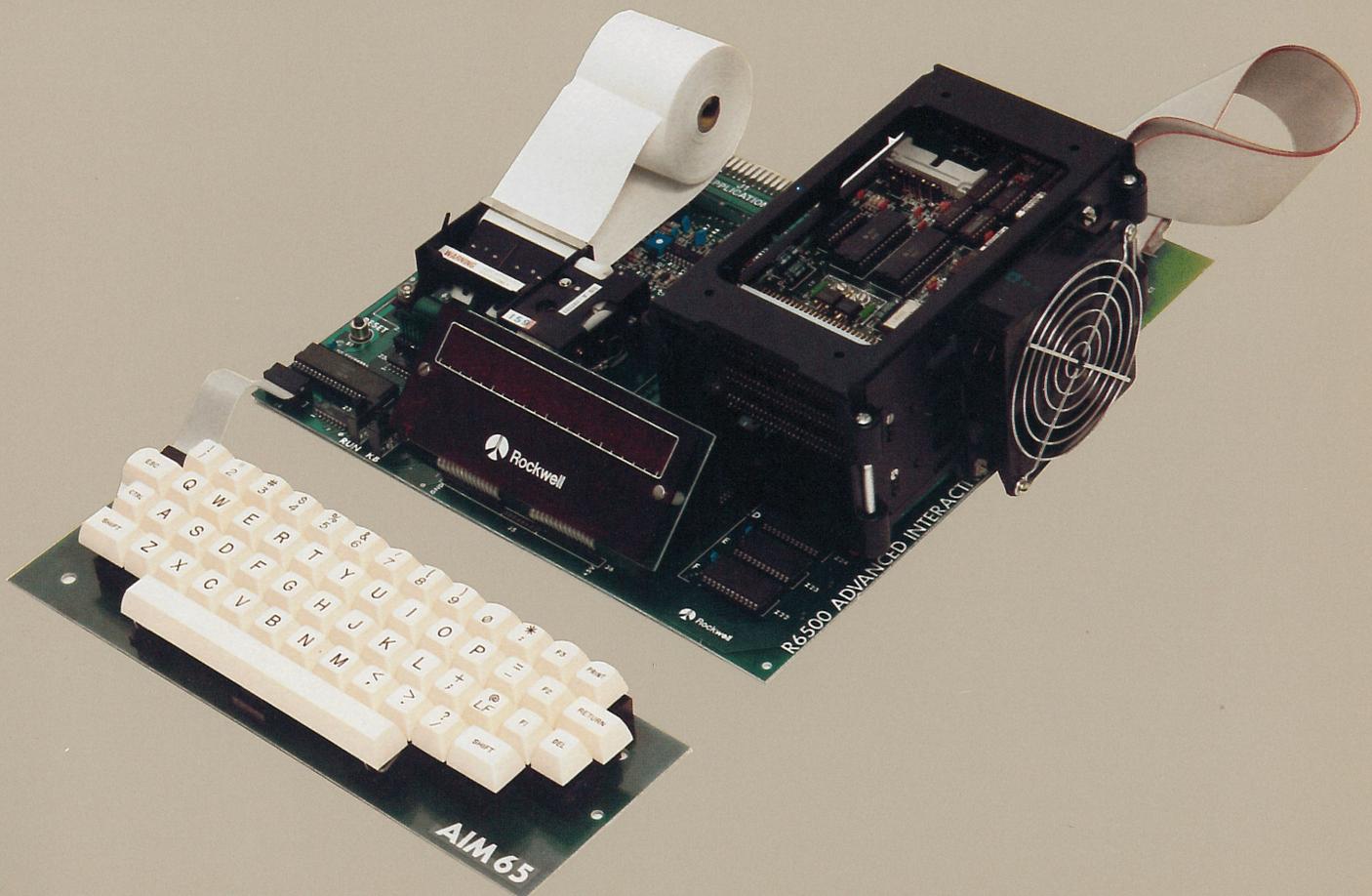
Accessory items offer additional options to simplify and assure your commitment to the AIM 65 Microcomputer. For desktop applications, the low-profile, stylistic design of the AIM 65 enclosure is ideal. Features of the enclosure include external mounting of the printer paper with paper feed guide, clear plastic tear bar, external reset button, and rocker type power on/off switch. Brown in color, the injection molded plastic top is mounted on a sturdy aluminum base. The base includes mounting brackets for the line cord, circuit breakers and power supply. The power supply furnishes +5V and +24V power.



For the OEM, the AIM 65 Self-Test Module and Manual are valuable additions for maintenance and service. The module includes ROM-based software which performs individual tests, all tests, or repetitive tests of the installed ROMs, RAMs, and other MOS devices. Service and fault isolation procedures are included for the peripherals as well as the microcomputer module.

### **Card cage and modules for expanded systems**

Expanding the capabilities of your AIM 65 Microcomputer in industrial and commercial applications is made easy using the RM 65 card cage and modules. Rockwell's RM 65 modular microcomputer product family includes three different adapter modules that allow the AIM 65 Microcomputer to function as the central processing unit for industrial and commercial systems. Four-, eight-, or sixteen-slot card cage/motherboards are available to interconnect the various modules. Functions such as floppy disk control, CRT control, or IEEE-488 bus are each contained on single RM 65 modules. ROM or RAM modules may be added. And for developing and testing applications-unique interfaces, prototyping and extender modules are also available in the RM 65 family of modules.



## **AIM 65 Microcomputer: For a full range of technical support.**

The AIM 65 Microcomputer offers educational, scientific, and industrial users one of the most extensively supported single-board microcomputers available. Whether you're teaching others or solving problems yourself, Rockwell helps you achieve your system goals faster and more economically. For AIM 65 Microcomputer users, we offer a full range of textbooks, reference manuals, application notes, user group materials, courses, and system development tools.

### **Your AIM 65 Library**

Every AIM 65 system comes with full tutorial and reference support.

- **AIM 65 User's Guide.** 400 pages. Everything you need to know about operating AIM 65 in clear, concise language.
- **AIM 65 Monitor Program Listing.** 118 pages. A complete listing—with comments—of AIM 65's ROM-resident Monitor Software. Includes both a symbol table and a cross-reference index.
- **AIM 65 Summary Card.** Pocket size. A handy summary of Monitor, Text Editor and Assembler commands, plus the system memory map, the R6522 VIA memory assignments and a summary of standard AIM 65 subroutines available.
- **AIM 65 Schematic.** A poster-size circuit diagram. Handy for classroom or individual use.
- **R6500 Programming Manual.** 260 pages. Reference guide to R6502 assembly language programming. Provides detailed descriptions of instruction execution, timing and resultant register values.
- **R6500 Hardware Manual.** 208 pages. Reference guide to the R6500 microprocessors, I/O and other devices.
- **R6500 Programming Reference Card.** Pocket size. Summarizes all instructions, opcodes, addressing modes and register use for the R6502 CPU.
- **AIM 65 BASIC Reference Manual.** 89 pages. A complete reference guide to BASIC language and programming.
- **AIM 65 8K BASIC Reference Card.** Pocket size. Summarizes all BASIC statements, operators, commands and error messages.
- **AIM 65 FORTH User's Manual.** 335 pages. Provides programming techniques and examples to aid the user in learning the FORTH language. It also serves as a reference manual for the AIM 65

Microcomputer implementation of the language.

- **AIM 65 PL/65 User's Manual.** 150 pages. Describes the operating procedures, language features, and the detailed syntax of AIM 65 PL/65.
- **AIM 65 Instant Pascal User's Manual.** 80 pages. Installation, operation and the Instant Pascal language are described. Includes a comparison with Standard Pascal as defined by Jensen and Wirth.
- **AIM 65 PROM Programmer and CO-ED User's Manual.** 105 pages. Describes the installation and procedures for programming the various PROM types and also the editing of object code programs.

- **Floppy Disk Controller (FDC) User's Manual.** DOS 1.0 installation instructions, operation with the optional languages, execution of file utility commands, and error messages are all explained in this manual.

In addition, by special arrangement with their publishers, three excellent textbooks are available to AIM 65 users at reduced prices through Rockwell.

- **Microprocessor Systems Engineering.** 641 pages. College-level textbook published by Matrix Publishers, Inc. Noted as a fundamental text for acquiring a professional understanding of microprocessing.
- **6502 Software Design.** Published by Howard W. Sams & Co., Inc. A concise, "how-to" approach for programming 6502 microprocessor-based computers in assembly language, with special emphasis on AIM 65.
- **AIM 65 Laboratory Manual and Study Guide.** Published by John Wiley & Sons. Experiments using the AIM 65 Microcomputer are instructive in programming the R6502 microprocessor and I/O devices as well as the AIM 65 Microcomputer.



### **Economical development system**

Now, for a few hundred dollars—instead of many thousands—an AIM 65 Microcomputer can be configured as a versatile evaluation tool and development system.

The AIM 65 Microcomputer is its own development system. This capability is greatly enhanced—particularly for large programs—by adding an RM 65 card cage with additional RAM memory for increased Text Editor buffer space or for the object code or higher-level language codes. If the modules being designed into an RM 65 based system are also attached, the AIM 65 provides in-circuit evaluation as well as the normal debug features. With PROM Programmer and CO-ED module, you can transfer your programs to PROM for field testing in the AIM 65 Microcomputer or the RM 65 modular microcomputer system using its own single-board computer module.

### **User's newsletter**

When you purchase an AIM 65 system, you join a user's group over 20,000 strong. To keep users of Rockwell microcomputers aware of new design techniques, programming shortcuts, and applications solutions, Rockwell publishes *Interactive*, a professional newsletter available free to all AIM 65 Microcomputer owners.

### **Application notes**

New application notes are sent to users free of charge as they are published. They are also previewed in issues of *Interactive*. Here are a few examples of the applications notes currently available.

- Preparing an AIM 65 BASIC Program for PROM/ROM Operations
- SYSTEM 65 to AIM 65 Interface
- RS-232C Interface for AIM 65

### **Design courses**

Rockwell offers a series of R6500 microcomputer design courses in selected locations around the United States, Canada, and Europe. Included in the tuition is your own AIM 65 Microcomputer used as a learning tool. For details, schedules, and locations, contact your local Rockwell office, listed on the back of this brochure.



## **Regional Sales Offices**

### *United States*

Electronic Devices Division  
Rockwell International  
4311 Jamboree Road  
Newport Beach, California 92660  
(714) 833-4700  
TWX: 910 591-1698

Electronic Devices Division  
Rockwell International  
1842 Reynolds  
Irvine, California 92714  
(714) 833-4655  
TWX: 910 595-2518

Electronic Devices Division  
Rockwell International  
921 Bowser  
Richardson, Texas 75080  
(214) 996-6500  
Telex: 73-307

Electronic Devices Division  
Rockwell International  
10700 West Higgins Rd., Suite 102  
Rosemont, Illinois 60018  
(312) 297-8862  
TWX: 910 233-0179 (RI MED ROSM)

Electronic Devices Division  
Rockwell International  
5001B Greentree  
Executive Campus, Rt. 73  
Marlton, New Jersey 08053  
(609) 596-0090  
TWX: 710 940-1377

### *Europe*

Electronic Devices Division  
Rockwell International GmbH  
Fraunhoferstrasse 11  
D-8033 München-Martinsried  
Germany  
(089) 859-9575  
Telex: 0521/2650

Electronic Devices Division  
Rockwell International  
Heathrow House, Bath Rd.  
Cranford, Hounslow,  
Middlesex, England  
(01) 759-9911  
Telex: 851-25463

Electronic Devices Division  
Rockwell Collins Italiana S.P.A.  
Via Boccaccio, 23  
20123 Milano  
Italy  
498.74.79  
Telex: 202/82

### *Far East*

Electronic Devices Division  
Rockwell International Overseas Corp.  
Itohpi HIRAKAWA-cho Bldg.  
7-6, 2-chome, HIRAKAWA-cho  
Chiyoda-ku, Tokyo 102, Japan  
(03) 265-8806  
Telex: J22198

For the name of your nearest U.S. distributor, call  
toll-free (800) 854-8099;  
in California, (800) 422-4230.