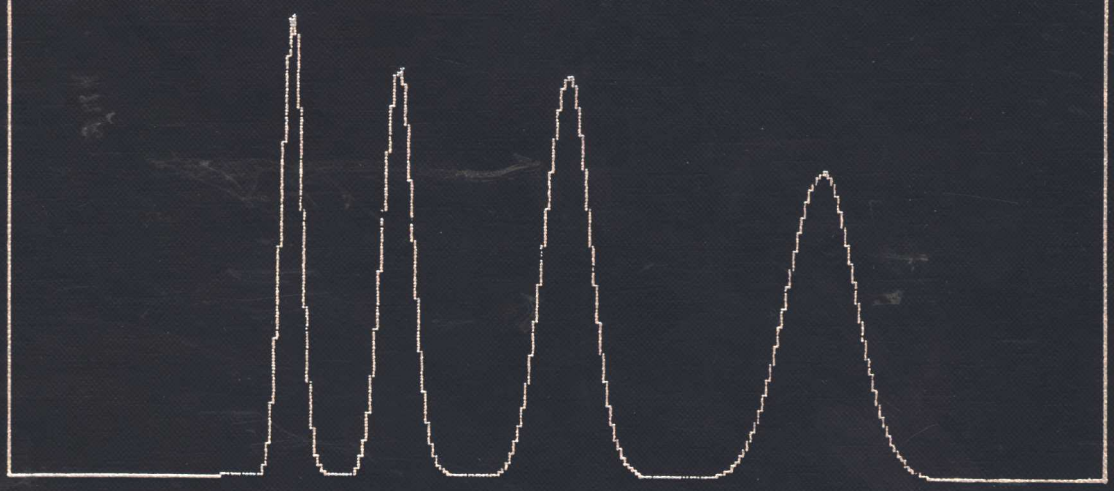
Raymond Annino
Richard Driver

SCIENTIFIC AND ENGINEERING APPLICATIONS WITH PERSONAL COMPUTERS



Scientific and Engineering Applications with Personal Computers

A SOFTWARE APPROACH WITH EXAMPLES FOR THE APPLE-, IBM-PC-, AND CP/M-BASED MICROCOMPUTER SYSTEMS

RAYMOND ANNINO
RICHARD D. DRIVER

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Preface

As scientists and experimentalists we view a laboratory computer system as an instrument to aid us in our work—to ease the burden of data acquisition and reduction, and to enhance the quality and value of experimental data. The availability of data acquisition and control hardware interfaced to personal computers (PCs), as well as the cost effectiveness of these systems, which can be a fraction of the total instrumentation cost in an experiment, has accelerated their laboratory use. In addition, the host microcomputer can be used for such tasks as modeling or word processing.

We have used computers for years in our own research and are aware of the problems faced by the laboratory user. We have also been fortunate to participate in the recent explosive growth of PCs in science and engineering. For us at least, using PCs for data acquisition and control has made laboratory work much easier. Although a number of books are available that discuss the interfacing of PCs to the real world, there is no single book that adequately discusses the important software aspects of these systems. We feel that the strength of these systems will only be realized by fully utilizing and extending the software tools currently available.

Our purpose, therefore, in writing this book is to provide the experimentalist with a single source that introduces the important software aspects of laboratory PC usage. Although the material is primarily software oriented, some basic hardware considerations are discussed. But this is *not* an "interfacing" book. Rather, it continues where many of these interfacing books end. Our contention is that whereas it is one thing to connect hardware to perform a specific function, it is yet another to have the system do meaningful work. Resolving this latter problem is our concern here.

Finally, we recognize that, in this fast-moving computer world, specific

hardware and software items quickly become obsolete. But if we tried to generalize too much, the book would lose its practical value. Hence, we tried to compromise as much as possible. We use existing software and computer products in all our examples, yet at the same time endeavoring to explain the particular solutions in terms of the limitations of the system used.

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Cambridge, Massachusetts
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The systems houses were more than cooperative. Paul Warme of Interactive Microware not only furnished us with user manuals but also reviewed the text of the ADLAB software. Likewise, Rush Slivjanovski of MIA supplied documentation and a complementary demonstration disk and reviewed the EASY-LAB software description that we wrote. Cheryl Lekstrom of Data Translation sent us all the documentation she could lay her hands on. Mike Mathison, Marketing Director of Keithley DAS, supplied us with user manuals for their IBM-based systems, and Peg Burgess loaned us her copy of their Apple-based user's manual.

The people at Cyborg were super. Rick Kramer was a tremendous help in programming the ISAAC/Apple system in assembly language. Ron Sostek, Gary Gaudet, Jeff Hookaloo, Jim Ciocolo, and Joy Dardinski were always eager to demonstrate hardware, furnish us with whatever information or documentation we needed, and do whatever else they could to help us to finish the book. The people at Madwest Software provided us their graphics package, and Southwestern Data Systems kindly provided us their assembly language library package. Jeff Bernoff of Software Arts was particularly helpful in helping us develop the TKSolver engineering model and to demonstrate the power of that software. Dick Miller of the Foxboro Company guided us through the intricacies of fluid flow and came up with a modeling exercise from his handbook that is guaranteed to challenge any programmer.

Don Nadon of National Instruments and their representatives in the Boston area, Scheinffein Associates, were very willing to help and gave us much valuable information on the GPIB bus. Bill Kemper of Hewlett-Packard

provided invaluable help on the HP-IL interface. We would especially like to thank the Manx Software Company and Harry Suckow for providing us a C compiler on such short notice. Other individuals and organizations deserving our thanks are Jeff Burman of Ashton Tate, Judy Hanby of Quadram, Adam Green of Software Banc, the people at Eco-C, and Tandy Trower of Microsoft. Gerard Geggis of Computer Showcase, Norwood and Leo Wong of Computer Maintenance Service gave us invaluable help in keeping our trusty Kaypros in top form.

Without the help of an old friend and fantastic programmer, Aaron Sawyer, assembly programming would have been much more difficult—if not impossible. He also reviewed and edited the assembly language chapter. Individuals who provided invaluable hints and suggestions throughout the course of this project were Jan Pejchar, Dave Johnson, Duane Thompson, Greg Maurer, Bob Vernon, and Bob McNally.

Finally, I (RA) would like to acknowledge the patience of my wife, who, for a year and a half, watched me disappear every night into my study with my faithful Kaypro II. She not only put up with this nonsense, but she learned Perfect Writer and typed a large portion of this manuscript during the day while I was at work. I (RDD) would like to thank my family for the support and encouragement necessary to complete this project, and the Delaneys for allowing me to spread my papers across their dining room table during the most intense phase of this project.

R.A.
R.D.D.

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