Appendix A

REAL-TIME BASIC (RTB) for Varian 620 Computers (Oregon/Nebraska Version)

INTRODUCTION

The BASIC programming approach described in this section may be implemented on Varian 620/i, 620/L, and 620/f computers. In addition, the Varian 73 computer can be used in the same way. Our development of REAL-TIME BASIC (RTB) for these systems has relied on simple modifications of the BASIC compiler as supplied by Varian. This compiler is a version of the language, originally developed at Dartmouth College, which includes all of the standard arithmetic operations as well as trigonometric functions and matrix-algebra routines. The standard Varian version of the language requires approximately seven thousand words of memory for the compiler, leaving the remainder available for user source code. A user may expand the available source-code area (thus allowing larger programs) by deletion of the matrix algebra and/or trigonometric function packages. This yields about 700 additional words of memory. Since this is a true interpretive compiler, all user source code and the compiler must be stored in core at run time. It is possible to modify the compiler to use a mass storage device (i.e., magnetic disk) to store user source code. At least one user has done this; however, such a procedure slows execution times and is not generally suitable for real-time experimentation. As released by Varian, BASIC contains no subroutines to support devices of the type needed in the laboratory (i.e., analog and digital I/O devices, control and sense lines, etc.). Fortunately, Varian BASIC does provide a CALL statement, which can be used to allow linkage of assembly language subroutines to a BASIC program. It is this feature that we have utilized to develop the RTB systems which are presently in use at the Universities of Oregon and Nebraska. In passing, we should note that Varian does
offer a special hardware/software system, called ADAPTS, which includes an extended BASIC compiler with many of the I/O capabilities required for laboratory computing. This compiler is very similar to our version, but appears only to be available as part of an ADAPTS system. As you might infer from this brief introduction, the addition of assembly-language subroutines (necessary for use of RTB) will place further demands on the available memory and leave less space for storage of edited user source code. Although almost all experiments described in this manual can be performed using an 8-K word computer, we strongly recommend at least a 12-K word system for maximum flexibility. The reasons for this should become clear in the following paragraphs.

![Memory map for an 8-K computer version of RTB with matrix algebra routines deleted.](image)

**Fig. A-1**
Memory map for an 8-K computer version of RTB with matrix algebra routines deleted.