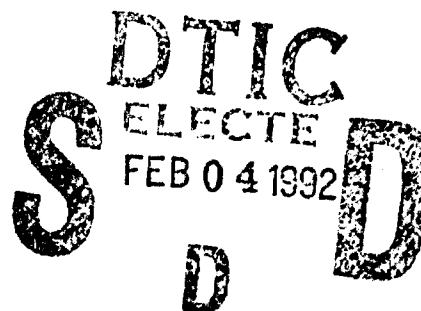


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STATLIB/PC USERS GUIDE

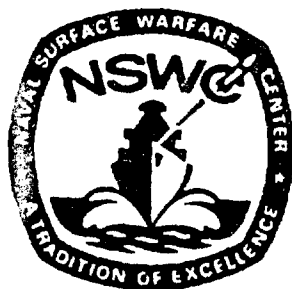


BY GARY JOHNSON

ENGINEERING AND INFORMATION SYSTEMS DEPARTMENT

NOVEMBER 1991

Approved for public release; distribution is unlimited.



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NAVSWC TR 91-549

STATLIB/PC USERS GUIDE

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FOREWORD

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This report was reviewed by Raymond O. Brancolini, Head of the Computing Systems and Networks Division.

Approved by:



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ABSTRACT

STATLIB/PC Users Guide is an addendum to *STATLIB: NSWC Library of Statistical Programs and Subroutines* (NSWC TR 89-97). *STATLIB/PC* is composed of 34 programs for statistical data analysis and probability evaluation and 24 subroutines for random number generation. This document is intended to aid Center scientists and engineers in applying *STATLIB* software on the IBM PC.

CONTENTS

Section	Page
1.0 INTRODUCTION TO STATLIB/PC	1-1
1.1 OVERVIEW OF STATLIB/PC	1-1
1.2 RELATIONSHIP TO MAINFRAME VERSION	1-1
2.0 SYSTEM CONFIGURATIONS TO OPERATE STATLIB/PC	2-1
2.1 NECESSARY CONFIGURATIONS	2-1
3.0 FILES REQUIRED TO RUN STATLIB/PC	3-1
3.1 INVENTORY LIST/BACKUP	3-1
3.2 INVENTORY OF FILES FOR EACH PROGRAM CATEGORY	3-2
4.0 ACCESSING PROGRAM AND DATA FILES	4-1
4.1 ACCESSING EXISTING PROGRAM AND DATA FILES	4-1
4.2 CONSTRUCTING AND EDITING DATA FILES	4-3
5.0 STATLIB/PC PROGRAMS	5-1
5.1 STATLIB BATCH FILES	5-1
5.2 STATMNU BATCH FILES	5-2
5.3 PROGRAM EXECUTION WITHOUT BATCH FILES	5-4
6.0 STATLIB/PC SUBROUTINES	6-1
6.1 RANDOM NUMBER GENERATOR SUBROUTINES	6-1
6.2 FETCH	6-2
7.0 ERRORS ENCOUNTERED WHEN EXECUTING PROGRAMS	7-1
7.1 MODIFICATIONS TO STATLIB INPUT GUIDES	7-1
7.2 COMMON ERROR IDENTIFICATION AND CORRECTION	7-1
7.3 ERROR REPORTING	7-2
8.0 REFERENCES	8-1
DISTRIBUTION	(1)

NAVSWC TR 91-549

TABLES

Table		Page
3-1	BATCH FILES AND DRIVER PROGRAMS	. 3-1
3-2	STATLIB PROGRAM REFERENCE	. 3-2
6-1	RANDOM NUMBER GENERATOR SUBROUTINE REFERENCE	. 6-1

1.0 INTRODUCTION TO STATLIB/PC

1.1 OVERVIEW OF STATLIB/PC

STATLIB/PC is a collection of statistics programs and subroutines constructed to run on personal computers equipped with DOS. It contains 34 programs for statistical data analysis and 24 subroutines for random number generation. The STATLIB/PC programs are executed interactively by using the batch menu driver files STATLIB.BAT or STATMNU.BAT, which query the user for information concerning name and location of program and input files and the name and location for the output file.

The random number generator subroutines are not accessible through the STATLIB or STATMNU batch option. They are found in a separate file entitled "RANDOM.LIB." All subroutines in RANDOM.LIB are initiated within the user's main program. The use of RANDOM.LIB will be discussed in more detail later.

As with STATLIB, STATLIB/PC has been constructed for public use. All software used in STATLIB/PC is nonproprietary. STATLIB/PC is available to the user upon request.

1.2 RELATIONSHIP TO MAINFRAME VERSION

STATLIB/PC is an adaptation of STATLIB, a package of programs and subroutines originally designed for use on the CDC General Purpose Computers at the Naval Surface Warfare Center (NAVSWC). All programs and subroutines in STATLIB/PC are equivalent to those in STATLIB. Each program and subroutine is discussed in detail in the NAVSWC document *STATLIB: NSWC Library of Statistical Programs and Subroutines*.¹ To run any program or subroutine in STATLIB/PC, the user must refer to STATLIB; this document contains the input guides necessary to direct the user in constructing program data files. It also contains the necessary information for using the subroutines. In this report, Section 3 contains the locations within the STATLIB document where input guides and operating information can be found for each program. Section 6 contains the

locations within the STATLIB document where input guides and operating information can be found for each subroutine. Since in some cases a 100-percent conversion of source code from STATLIB to STATLIB/PC was impossible, Section 7 lists the cases where modifications have taken place in the input guides that affect user input.

2.0 SYSTEM CONFIGURATIONS TO OPERATE STATLIB/PC

2.1 NECESSARY CONFIGURATIONS

As mentioned before, STATLIB/PC has been constructed in two parts: The first part consists of the executable programs; the second part, discussed below, consists of the RANDOM.LIB subroutines. The programs are executable on any IBM or IBM compatible PC/XT/AT containing

- (1) MS-DOS/PC-DOS, Version 3.30 or higher;
- (2) 640 KB of RAM;
- and (3) one 5.25-in. low density (360 KB) disk drive and one hard disk with at least 10 MB memory;
- or (4) one 5.25-in. low density (360 KB) disk drive and one 5.25-in. high density (1.2 MB) disk drive.

STATLIB/PC has been compressed to allow large programs to be stored on a minimum number of low or high density disks. Systems with just a low density disk drive can only have complete access to STATLIB/PC through the compressed version stored on low density disks; however, systems with a high density disk drive can access STATLIB/PC through either low or high density disks. Two versions of the program are available: One version is compiled for use on systems equipped with either the 8087, 80287, or 80387 mathematics coprocessor chip. The other version must be used on systems not equipped with the coprocessor; this version is compiled with an emulation of the coprocessor. Either version can be stored on low or high density disks. The standard configuration for STATLIB/PC is with coprocessor compilation on high density disks. Configurations that include low density disks and either coprocessor or coprocessor emulated compilation are nonstandard. All configurations are available, but the nonstandard configurations are only available by special request.

STATLIB/PC cannot be fully used on systems equipped with just low density disk drives and no hard disk. As is discussed in the following section, the space taken by some programs exceeds that available on the low density disk. (See Table 3-2 for a lists of all programs available in STATLIB/PC, including those programs that fall into this category.)

The second part of STATLIB/PC is the STATLIB library of random number generator subroutines identified as RANDOM.LIB. The STATLIB subroutines are accessible through either a 5.25-in. low or high density disk drive. The language used for RANDOM.LIB subroutines is American National Standards Institute (ANSI) Standard FORTRAN 77. The programs and subroutines will be discussed in more detail in the following sections.

3.0 FILES REQUIRED TO RUN STATLIB/PC

3.1 INVENTORY LIST/BACKUP

The standard configuration of STATLIB/PC is contained on three disks: The first disk contains the batch files, identified as 1.BAT through 7.BAT, and the driver programs, identified as ASK.EXE and OPERATR.EXE, which are used exclusively by the batch files. The remaining two disks contain the program files, example data files, and the random number generator subroutine library, all found in the compressed files STATLB1.LZH and STATLB2.LZH. Table 3-1 contains a complete list of the STATLIB/PC files. If the floppy disks are to be used frequently, a set of backup disks should be made from these.

TABLE 3-1. BATCH FILES AND DRIVER PROGRAMS

<u>BATCH FILES (1 disk)</u>	<u>SIZE(bytes)</u>	
1.BAT	16,681	
2.BAT	14,087	
3.BAT	7,814	
4.BAT	19,995	TOTAL FILES: 11
5.BAT	6,520	TOTAL SIZE(bytes): 147,768
6.BAT	9,843	
7.BAT	7,873	
STATLIB.BAT	3,719	
STATMNU.BAT	16,116	
ASK.EXE	7,536	
OPERATR.EXE	37,584	

TABLE 3-1. BATCH FILES AND DRIVER PROGRAMS (CONTINUED)

<u>PROGRAM FILES (2 disks)</u>	<u>SIZE(bytes)</u>	
LHARC.EXE	31,256	
READ.ME	1,721	TOTAL FILES: 4
STATLB1.LZH	1,013,573	TOTAL SIZE(bytes): 1,766,302
STATLB2.LZH	719,752	

3.2 INVENTORY OF FILES FOR EACH PROGRAM CATEGORY

As mentioned earlier, the files called STATLB1.LZH and STATLB2.LZH contain all executable programs. A list of the compressed programs and data files is provided in Table 3-2. This table contains the program name, size, category, and page reference in *STATLIB: NSW Library of Statistical Programs and Subroutines*. Included in the table are names of example data files that can be used to produce example output.

TABLE 3-2. STATLIB PROGRAM REFERENCE

<u>CATEGORY</u>	<u>PROGRAM</u>	<u>SIZE (Kbytes)</u>	<u>DATA FILE</u>	<u>REFERENCE PAGES</u>
REGRESSION	GEMREG	380,304	DATGEMR	29 - 33
	DAMRCA	334,976	DATDAMR	35 - 40
	WEPORU	319,344	DATWEPU	41 - 43
	WEPORC	343,824	DATWEPC	45 - 47
	MROP	462,304	DATMROP	49 - 55
	CANON	210,016	DATCANO	57 - 59
	DURBWAT	44,944	DATDURB	61 - 62
	NEARNEB	182,208	DATNEAR	63 - 65

TABLE 3-2. STATLIB PROGRAM REFERENCE (CONTINUED)

GOODNESS OF FIT	UNORGOF	299,264	DATUNOR	69 - 73
	BNORGOF	301,200	DATBNOR	75 - 80
	EXPGOF	122,000	DATEXPG	81 - 82
	WBLGOF	126,256	DATWBLG	83 - 85
	PERGOF	321,376	DATPERG	87 - 92
GOODNESS OF FIT	UNKSGOF	271,536	DATUNKS	93 - 98
	RANDOM	198,048	DATRAND	99 - 101
DISCRETE POWER	BIN1POW	75,712	DATBIN1	109 - 112
	BIN2POW	331,920	DATBIN2	113 - 120
	POI1POW	61,520	DATPOI1	121 - 124
CONTINUOUS POWER	NOR1PW	45,024	DATNOR1	127 - 130
	NOR2PWE	45,184	DATNR2E	131 - 134
	NOR2PWU	46,656	DATNR2U	135 - 139
	T1POW	109,104	DATT1	141 - 145
	T2POW	110,480	DATT2	147 - 152
	CHIVPOW	70,192	DATCHIP	153 - 156
	FVARPOW	105,392	DATPOWF	157 - 162
	FEMPOW	102,704	DATFPOW	163 - 166
	REMPow	140,880	DATRPOW	167 - 170
PROBABILITY EVALUATION				
	BINVARP	367,712	DATBINV	173 - 175
	NEGBIN	33,296	DATNEGB	177 - 178

TABLE 3-2. STATLIB PROGRAM REFERENCE (CONTINUED)

CONFIDENCE LIMITS	BINCL	141,888	DATBINC	181 - 183
	CEPCL	297,072	DATCEPC	185 - 190
			DATCEP4	
	SEPCL	377,680	DATSEPC	191 - 196
			DATSEP4	
MISCELLANEOUS PROGRAMS				
	LD50EST	72,432	DATLD50	199 - 202
	FFAC2K	142,608	DATFFAC	203 - 209

4.0 ACCESSING PROGRAM AND DATA FILES

4.1 ACCESSING EXISTING PROGRAMS AND DATA FILES

STATLIB/PC programs, data files, and fetch files are stored in the two compressed files STATLB1.LZH and STATLB2.LZH. As mentioned above, STATLB1.LZH contains all executable programs and data files found in the categories of Goodness of Fit, Discrete and Continuous Power Evaluation, and Confidence Limit Evaluation. STATLB2.LZH contains all executable programs and data files found in the categories of Regression Analysis, Probability Evaluation, and the Miscellaneous Statistical Analysis programs, in addition to RANDOM.LIB, FD.EXE, and FCH.BAT. The files with the LZH extension have been created using the public domain archiving software package entitled "LHAR113.EXE."² This self-extracting program contains the program called "LHARC.EXE." LHARC.EXE is used to create the compressed files and to allow for file extraction. Since Table 3-2 provides a reference of files to categories, all that is required to extract a particular file is to execute the program LHARC.EXE, while instructing it what to extract and from where.

If only a specific set of files is desired, the instructions used to acquire the files are

```
[D:]\[path]>A:\LHARC E A:\STATLBn.LZH FILE1 FILE2 ...
```

where LHARC.EXE is located in A drive. This command extracts FILE1, FILE2, ... from the STATLBn.LZH file residing in A drive and stores them in uncompressed form in the [D:]\[path] directory. File extensions must be specified for each file, FILE1, FILE2, etc. For example, if the directory is called STATLIB on C drive and the user wishes to extract the program GEMREG and the data file DATGEMR, the following can be typed:

```
C:\STATLIB>A:\LHARC E A:\STATLB2.LZH GEMREG.EXE DATGEMR
```

Note that disk C, onto which GEMREG is to be copied, must be either a hard disk or a high density disk. Notice also that while the .EXE extension is standard for all programs listed in Table II, no data file has an extension.

If the entire set of files is desired instead of a subset, the instructions that must be typed to acquire this set are of the form

```
[D:]\[path1]>A:\LHARC E A:\STATLBn.LZH [D:]\[path2]\
```

where LHARC.EXE is located in A drive. This command extracts all files from the STATLBn.LZH file residing in A drive and stores them in uncompressed form in the [D:]\[path2] directory. If the root directory [D:]\[path1] is the A drive, the "A:\" prefix is unnecessary. If the target directory does not exist, the user will be prompted with the message, "Make directory? [Y/N]." If [D:]\[path2] is omitted, the default target directory for the extracted file is [D:]\[path1]. Referring to the previous example, if the directory is called STATLIB on C drive and the user wishes to extract all STATLIB/PC files, the following can be typed:

```
C:\STATLIB>A:\LHARC E A:\STATLB1.LZH <ENT>
```

and C:\STATLIB>A:\LHARC E A:\STATLB2.LZH

Before performing an extraction, the space allocated to the directory C:\STATLIB should be known. The entire STATLIB/PC package currently resides in more than 6.0 MB of disk space.

To verify what is available in the compressed files prior to extraction and to see exactly how much space any file may take, either of the following can be typed:

```
[D:]\[path]>A:\LHARC A:\STATLBn.LZH FILE1 FILE2 ...
```

or A:>LHARC STATLBn.LZH FILE1 FILE2

This lists such things as file name, file size (in the original form and in the compressed form), originating date, etc. Included in this list is the total number of bytes utilized by the set of files in their uncompressed form. Since, in this case, the compressed file is only to be viewed, the latter statement is appropriate and simpler to implement, although either provides the same information.

Each disk that carries compressed files also carries a copy of the LHARC.EXE program. The instructions for file extraction discussed above are summarized in the file entitled "READ.ME" and are found on the STATLB1.LZH disk.

4.2 CONSTRUCTING AND EDITING DATA FILES

All STATLIB/PC programs require data files to provide operating instructions and data. Each program has an example data file in the compressed files. The name for each is listed in Table 3-2. These files can be edited with any line editor provided for the IBM or IBM compatible computer (e.g., EDLIN, PE, PE2, etc.) and can be made to satisfy the various needs of the user. Instructions are given in the user guides provided in *STATLIB: NSWC Library of Statistical Programs and Subroutines* to satisfy the requirements imposed by analysis on other data sets. A page reference for each program's user guide is listed in Table 3-2.

Since the data files are formatted, care must be taken that all input is set in correct columns and set in correct records. If input is incorrect, programs may run but give invalid results. This issue is addressed in more detail in Section 7.

5.0 STATLIB/PC PROGRAMS

When the data file is suitably constructed and its respective program available for use, program execution may commence. Currently there are two ways to execute the program: One way is to use the batch files, constructed to simplify the execution process. A detailed discussion is provided below in the STATLIB and STATMNU batch file sections. The other way to execute a program involves the use of syntax provided by Ryan-McFarland FORTRAN³ and requires that the user understand how to manage the executable file, the input data file, and the output file.

Prior to using any of the batch files, the user must modify the CONFIG.SYS file to include reference to the ANSI.SYS file. If the DOS directory is used in C drive, and ANSI.SYS is located in this directory, CONFIG.SYS must include the statement

```
DEVICE = C:\DOS\ANSI.SYS
```

The batch files will not work properly without this.

5.1 STATLIB BATCH FILES

The STATLIB batch file, STATLIB.BAT, is designed to introduce some general facts about the STATLIB/PC software package to the user. It also identifies the NAVSWC office where it is developed and maintained. To operate the STATLIB.BAT file, the file should be resident at the same location in which it is to be used. For instance, if STATLIB.BAT resides in C drive, then typing at the C prompt

```
C:>STATLIB
```

will run STATLIB.BAT. By responding to requests made by STATLIB.BAT, the user will be automatically provided with the STATLIB/PC menu. This is provided by running the file entitled "STATMNU.BAT." This file can also be run independently of STATLIB.BAT by typing at the C

drive prompt

C:>STATMNU

5.2 STATMNU BATCH FILES

The STATMNU batch file, STATMNU.BAT, is designed to simplify program execution and introduces the user to the necessary steps to either view, print, or store output. To operate the STATMNU.BAT file, the file should be resident at the same location in which it is to be used. For instance, if STATMNU.BAT resides in C drive, then typing at the C prompt

C:>STATMNU

will run STATMNU.BAT.

The STATLIB menu lists the seven categories of statistical programs available, ordered and specified as in Table 3-2. If the user desires basic information about any particular category, then the help "H" option can be selected. This option provides general information about the selected category. In addition, reference is made to specific pages in *STATLIB: NSWC Library of Statistical Programs and Subroutines* where additional information about that category can be found. If the help option is skipped and a category option is selected, the user will be provided with a menu that lists all programs available within that category. Again, the user may select the help option. If the help option is selected and a program name specified, the user will be provided with general information for that program. The user is again provided reference to additional information found within the STATLIB document. If no help is desired, the user can either leave STATMNU (with {Esc} or "E") or proceed to the input prompts (with {CR}). This will start the STATLIB program execution process. Here, the user is provided with four prompts that must be responded to:

PROMPT 1 "TYPE THE PROGRAM NAME FROM THE LIST ABOVE"

This prompt requires that the user type the name of the STATLIB/PC program. Although any name will be accepted, the list of appropriate program names is found under the "PROGRAM" header in Table 3-2. The user is not required to select only program names found on the screen display; however, it is required that a nonblank character be entered.

Once the program name is entered, a second prompt is provided:

PROMPT 2 "WHERE DOES PROGRAM RESIDE (PATH NAME) ?"

This prompt requires that the user type the path statement to the executable program file only if it resides in a directory other than the current directory. If no statement is necessary, a carriage return is a sufficient response to the prompt. Although no statement is made concerning the maximum number of characters allowed in the path statement, only 30 are read. The standard input structure is of the form [D:] [path], where D refers to a single character disk reference and path refers to the directory and subdirectory names, separated by backslashes. For instance, if the program GEMREG resided on E drive in directory STATLIB and subdirectory STATPRO, PROMPT 2 would be answered with

E:\STATLIB\STATPRO

In this case, the backslash, which succeeds the subdirectory STATPRO, is optional.

Once the program resident path is specified, the third prompt is provided:

PROMPT 3 "INPUT PATH AND FILE NAME (30 CHAR. MAX.) ?"

This prompt requires that the user type the input file name (i.e., the data file) and the path statement to the input file. At the minimum, a name for the input file is required. Any character string is accepted, but only 30 characters are read. The standard input structure is of the form [D:][path]filename, where D refers to a single character disk reference, path refers to the directory and subdirectory names, separated by backslashes, and filename is any input file with extension specified. For instance, if the input file, called DATGEMR, resides on E drive in directory STATLIB and subdirectory DATA1, the prompt would be answered with

E:\STATLIB\DATA1\DATGEMR

If, however, the input file DATGEMR resides in the current directory, then only the name DATGEMR would be necessary. For this prompt, as in the preceeding one, any standard DOS path statement is acceptable.

Once the input path and file name are specified, the fourth and last prompt is provided:

PROMPT 4 "OUTPUT PATH AND FILE NAME (30 CHAR. MAX.) ?"

This prompt will allow more than one type of response from the user. The user may elect to send the output to the screen, in which case a carriage return is all that is necessary. Also, the user may elect to send the output to the printer, in which case the necessary response is PRN. The user may instead elect to send output to a predesignated directory, in which case, the user types the path statement for the destination disk, the directory, and the output file name. Again, any character string is accepted but only 30 characters are read. The standard input structure is of the form [D:]\[path]\filename, where D refers to a single character disk reference, path refers to the directory and subdirectory names, separated by backslashes, and filename is any output file with any desired extension specified. For instance, if the user desires to create an output file, called OUTGEMR, and locate it on E drive in directory STATLIB and subdirectory OUTFILE, the prompt would be answered with

E:\STATLIB\OUTFILE\OUTGEMR

To locate the file in the current directory, only the name of the file is necessary. For this prompt, as in the preceeding ones, any standard DOS path statement is acceptable.

5.3 PROGRAM EXECUTION WITHOUT BATCH FILES

The batch files "STATLIB.BAT" and "STATMNU.BAT" do not have to be used. If the executable file and data file are available on the computer system, then program execution can be accomplished by typing a statement of the form

[D1:]\[path1]\fn1<[D2:]\[path2]\fn2 >[D3:]\[path3]\fn3

where fn1 is any executable program referenced in Table 3-2 (with or without extension .EXE), fn2 is the input file (with extension, if available), and fn3 is the output file name. All path statements (path1, path2, path3) are standard DOS path statements for each respective file. Observe that after the input file name, fn2, a *blank space* must be provided. If the output is to be sent to the screen, no statements are used after fn2. If output is to be sent to the printer, the statement "[D3:]\[path3]\fn3" is replaced with "PRN." A few examples are listed below to illustrate the use of this command.

Assume that the user wishes to run GEMREG using the data file DATGEMR and would like to send the output to the screen. Then, if satisfied with the initial run, the user wants to store a copy of the output in a file called GEMOUT and get a copy of the file sent to the printer. In all cases, both GEMREG and DATGEMR are located in the current directory; however, GEMOUT is to be sent to a specially designated file called OUTFILE, located on E drive. The sequence of runs would appear as follows:

(1) GEMREG<DATGEMR,

which executes GEMREG using data file DATGEMR and sends output to the screen;

(2) GEMREG<DATGEMR >E:\OUTFILE\GEMOUT,

which executes GEMREG using DATGEMR and sends output to the file GEMOUT (in directory E:\OUTFILE);

(3) GEMREG<DATGEMR >PRN,

which executes GEMREG using DATGEMR and sends output to the printer.

6.0 STATLIB/PC SUBROUTINES

6.1 RANDOM NUMBER GENERATOR SUBROUTINES

The library of discrete and continuous random number generator subroutines is known as RANDOM.LIB. This library is capable of generating, for example, Bernoulli random variates (by calling subroutine RANBER) or geometric random variates (by calling subroutine RANGE0) or multivariate normal random variates (by calling subroutine RANNVE). Table 6-1 contains a complete list of the contents of RANDOM.LIB. This table also provides a page reference column. This gives the location in the NAVSWC manual *STATLIB: NSWC Library of Statistical Programs and Subroutines* where the input guide for each subroutine is found.

TABLE 6-1. RANDOM NUMBER GENERATOR SUBROUTINE REFERENCE

<u>CATEGORY</u>	<u>SUBROUTINE</u>	<u>SUBROUTINE DESCRIPTION</u>	<u>REF. PAGES</u>
DISCRETE	RANARB	ARBITRARY DISTRIBUTION	219 - 220
	RANBER	BERNOULLI DISTRIBUTION	221 - 222
	RANBIN	BINOMIAL DISTRIBUTION	223 - 224
	RANGE0	GEOMETRIC DISTRIBUTION	225 - 226
	RANHYP	HYPERGEOMETRIC DIST.	227 - 228
	RANNBI	NEGATIVE BINOMIAL DIST.	229 - 230
	RANPOI	POISSON DISTRIBUTION	231 - 232
	RANUWO	UNIFORM WITHOUT REPLACEMENT	233 - 234
	RANUWR	UNIFORM WITH REPLACEMENT	235 - 236

TABLE 6-1. RANDOM NUMBER GENERATOR SUBROUTINE REFERENCE (CONTINUED)

<u>CATEGORY</u>	<u>SUBROUTINE</u>	<u>SUBROUTINE DESCRIPTION</u>	<u>REF. PAGES</u>
CONTINUOUS	RANBET	BETA DISTRIBUTION	239 - 240
	RANCSQ	CHI-SQUARE DISTRIBUTION	241 - 242
	RANEXP	EXPONENTIAL DISTRIBUTION	243 - 244
	RANFDI	F DISTRIBUTION	245 - 246
	RANGAM	GAMMA DISTRIBUTION	247 - 248
	RANLGS	LOGISTIC DISTRIBUTION	249 - 250
	RANLOG	LOGNORMAL DISTRIBUTION	251 - 253
	RANNOR	NORMAL DISTRIBUTION	255 - 256
	RANNVE	MULTIVARIATE NORMAL DIST.	257 - 259
	RANPDI	PEARSON TYPE DISTRIBUTIONS	261 - 263
	RANTDI	T DISTRIBUTION	265 - 266
	RANUNI	UNIFORM DISTRIBUTION	267 - 268
	RANCIR	UNIFORM DIST. IN A CIRCLE	269 - 270
	RANWEI	WEIBULL DISTRIBUTION	271 - 272
	RANMK1	FIRST-ORDER MARKOV PROCESS	273 - 274

Subroutines in the RANDOM.LIB library are written in single precision codes satisfying the 1966 and 1977 ANSI FORTRAN standards. They can be compiled using Ryan-McFarland FORTRAN, Microsoft FORTRAN, Lahey FORTRAN, or Professional FORTRAN compilers.

6.2 FETCH

Subroutines from the library RANDOM.LIB can be accessed in two ways. Since the library is self-contained, it can be compiled and linked to a program, subprogram, or subroutine without reference to any other library (although subroutines/functions from the MATHLIB.FOR library are used). The alternate approach to access subroutines from RANDOM.LIB is to use the batch file called "FCH.BAT."

The batch file FCH.BAT is designed to "fetch" subroutines or functions from libraries either by a user request or by reference to unsatisfied externals defined in FORTRAN programs or subroutines. The files entitled "FD.EXE" and "BAT.BAT" must be accessible to FCH.BAT. With this satisfied, fetching can be performed. For example, if a program residing in the file IN.FOR calls the (unsatisfied external) subroutine RANBER from the RANDOM.LIB library, then the following fetch statement could be used:

```
FCH F IN.FOR OUT.FOR RANDOM.LIB
```

where output is directed to the file OUT.FOR. The file OUT.FOR will contain the subroutine RANBER and any other subroutines or functions called by RANBER. This file will also contain the Uniform Random Number Generator subroutine URNG. The subroutine URNG is defined in the NAVSWC document *NSWC Library of Mathematical Subroutines*.⁴ The library of mathematics subroutines is entitled "MATHLIB.FOR." Should the file IN.FOR call subroutines or functions from both libraries, MATHLIB.FOR and RANDOM.LIB, then the above fetch statement could be modified as follows:

```
FCH F IN.FOR OUT.FOR RANDOM.LIB MATHLIB.FOR
```

The advantages of using FCH are that a long compilation is avoided and the user has the option of converting the fetched routines to double precision. The batch file FCH.BAT and all instructions needed to operate FCH.BAT are available in the compressed file STATLB2.LZH. This file contains a READ.ME file that provides a complete set of instructions for using the fetch batch file.

7.0 ERRORS ENCOUNTERED WHEN EXECUTING PROGRAMS

7.1 MODIFICATIONS TO STATLIB INPUT GUIDES

A change was made to the input guide in only one STATLIB program. In converting the program entitled "BINVARP" for STATLIB/PC, there was a requirement that the total number of trials, NLIM, not exceed 200. This was due to memory allocation constraints. The value of NLIM was originally set at 325 (See Reference 1, pp. 174-175). As a result of this, the number of distinct trial probabilities, NP, also cannot exceed 200.

7.2 COMMON ERROR IDENTIFICATION AND CORRECTION

Although it is nearly impossible to address each potential problem that may arise when using STATLIB/PC, an attempt will be made to describe the most frequently occurring ones.

Since nearly every program operates with a formatted data file, a common problem may occur: correct data improperly formatted will be misinterpreted (or misread). If an error message appears such as

2514 INCORRECT INTEGER IN INPUT,

then it is likely that the data file is incorrect. Verify the structure of the input file before assuming that there is a problem with the executable file. To reduce the likelihood of this problem, future versions of STATLIB and STATLIB/PC will be equipped to handle unformatted input.

Another very common problem that occurs when running STATLIB is that some executable files are fairly large with respect to RAM. When a large portion of RAM is being used by a memory resident program, it may need to be purged before some STATLIB programs can be run. The message sent to the output file when the minimum amount of space is not available is

PROGRAM TOO BIG TO FIT INTO MEMORY

The authors of STATLIB do not exclude the possibility that other problems may exist with the executable files. As a result of this, it is requested that the user report problems and/or provide suggestions in the use and improvement of STATLIB.

7.3 ERROR REPORTING

Please report any problems encountered while running STATLIB or STATLIB/PC to

NAVAL SURFACE WARFARE CENTER
ENGINEERING AND ANALYSIS BRANCH
MATHEMATICS AND STATISTICS GROUP (CODE E431)
DAHLGREN, VA 22448

The user is asked to include in the report the following items:

1. Name of the program attempted to be run
2. Listing of the data file used
3. Copy of any output that was acquired using the data file in Item 2
4. Record of the error messages displayed while attempting the run

8.0 REFERENCES

1. Thomas, M. A., Gemmill, G. W., and Crigler, J. R. *STATLIB: NSWC Library of Statistical Programs and Subroutines*, NSWC TR 89-97, Naval Surface Warfare Center, Dahlgren, VA, August 1989.
2. Yoshizaki, Haruyasu, *LHAR113.EXE*, LHarc Version 1.13c, 31 April 1989.
3. Ryan-McFarland FORTRAN (RM/FORTRANTM), Version 2.4, AUSTEC Inc., Rolling Hills Estates, CA, 1987.
4. Morris, A. H., *NSWC Library of Mathematics Subroutines*, NSWC TR 90-21, Naval Surface Warfare Center, Dahlgren, VA, January 1990.

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