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Civilian Radioactive Waste Management System
Management & Operating Contractor

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USERS MANUAL
Rev 00

for

LHS, Version 2.51

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DISCLAIMER

CHANGE HISTORY

Revision Number	Effective Date	DESCRIPTION OF CHANGE
00A	12/02/03	Initial issue of UM for LHS Version 2.51
00B	1/06/04	Second issue of UM in response to Control Point B review
00	1/29/04	Final issue of Rev 00

CONTENTS

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CRWMS	Civilian Radioactive Waste Management System
DEC	Digital Equipment Corporation
FORTRAN	Formula Translator
LAN	Local Area Network
LHS	Latin Hypercube Sampling
M&O	Management and Operating Contractor
OCRWM	Office of Civilian Radioactive Waste Management
PA	Performance Assessment
SNL/NM	Sandia National Laboratories/New Mexico
TSPA	Total System Performance Assessment
VMS	Virtual Machine Memory
WIPP	Waste Isolation Pilot Plant
YMP	Yucca Mountain Site Characterization Project

1.0 INTRODUCTION

1.1 Purpose and scope:

This document is the User's Manual for the Latin Hypercube Sampling code, LHS V2.51, in the context in which it is envisaged for the Yucca Mountain Project (YMP) Total System Performance Assessment (TSPA) Site recommendation (SR), and in that context only. LHS is a constrained-Monte-Carlo-sampling code. It was the Monte Carlo code used in WIPP PA. This code along with its preprocessor and postprocessor may be exercised in sequence, as a group. If so, it is recommended that they be learned as a group. The main code, treated herein, is called LHS. Its preprocessor routine is called PRELHS, and its post processor routine is called POSTLHS. This manual identifies LHS's sponsors and its expert consultants. It describes the code's YMP TSPA purposes and functions, provides recommended user training, outlines the code's mathematical basis and numerical methods, its capabilities and limitations, describes user interactions, input files, error messages, and output files, and provides examples of relevant input, output, and debug files in its Appendices as well as calculations of interest.

1.2 Software Identifier:

Code Name: LHS

Version Number: 2.51

Date: 10/24/03

Platform: FORTRAN 77 for OpenVMS AXP, ver. 7.3-1, on a DEC Alpha

1.3 Points of Contact:

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2.0 FUNCTIONAL REQUIREMENTS

Section 2.1 lists LHS's YMP relevant Functional Requirements as taken from the code's Requirements Document 10205-RD-2.51-00.

2.1 Functional Requirements of LHS

The functional requirements for LHS are listed below:

2.1 LHS performs Latin Hypercube Sampling.

2.2 LHS generates the distribution for each parameter to be sampled: NORMAL, LOGNORMAL, UNIFORM, LOGUNIFORM, TRIANGULAR, USER-DEFINED DISTRIBUTIONs (Cumulative, continuous, discrete).

2.3 LHS correctly uses the general input data sets used for analysis: TITLE, NOBS, RANDOM SEED, OUTPUT.

2.4 LHS generates a correlation matrix as requested.

2.5 LHS can detect invalid input in data sets.

Input requirements for LHS can be created by two methods:

4.5 LHS can read the ASCII Text output file from PRELHS.

4.6 LHS can read a user generated ASCII input file created using the format used by PRELHS.

3.0 REQUIRED USER TRAINING AND/OR BACKGROUND

To exercise LHS, users should have basic knowledge of (1) OpenVMS, (2) Digital Command Language, and (3) they should also have access to a DEC Alpha microcomputer with an OpenVMS AXP Version 7.3-1 operating system.

To manipulate and/or interpret the results of LHS, users should have (1) a basic understanding of introductory probability theory, and especially sampling theory and probability distribution functions, (2) a fairly complete, if basic, overview understanding of the appropriate YMP TSPA computer model, and especially of, the uncertain physical parameters that are used, the data distributions they lead to, how distributions for different physical parameters are either related or not related, the rational basis of uncertainty sampling methods, and the use of input-data. An operational familiarity with and general understanding of LHS's preprocessor, PRELHS, and postprocessor, POSTLHS, may be advantageous.

The installation procedures for LHS are described in the YMP Installation Test Plan for LHS V 2.51 10205-ITP-2.51-00.

4.0 DESCRIPTION OF THE MODELS AND METHODS

4.1 Description of the Model

LHS neither models physical phenomena nor solves differential equations that model physical process. It's principal role is to sample, using Latin-Hypercube Sampling methods, distributions that represent reasonable values of input-parameter data. LHS treats each parameter independently, but permits user-specified correlations (restricted pairings) between parameters. Latin Hypercube sampling reduces the minimum number of sample vectors [nv] required to assure representative sampling. The minimum is roughly [(4/3) na], where na is the number of uncertain parameters.

More specifically, LHS is designed to generate multivariate samples by a constrained randomization method known as Latin-hypercube sampling. LHS is capable of sampling using unconstrained random methods, but such applications are unforeseen in regulatory applications.

The situation generally addressed by LHS is the following. We are given a variable of interest, Y, that is a dependent function of several other variables, including a discrete set of physical parameters $X_1, X_2,...,X_k$. The Xs are independent, but may be pairwise correlated. However, due to unresolvable uncertainties, the physical parameters are not specifiable as single, unique numbers. Rather, they are characterized by ranges or distributions of values together with probabilities of occurrence associated with the values included in the distributions. These so-called distributions of uncertain data (i.e., one for each of the X_ks) are specified by an analyst. The function that maps the Xs into Y may be quite complicated. For example, in the case at hand, the function involved may be any of the YMP TSPA computer models. The question of central interest is: How does Y change when the k X's vary over their ranges of allowable values according to a given joint probability distribution?

The conventional approach to the above question is provided by Monte Carlo sampling. By sampling repeatedly from the given joint-probability-density function of the X's and evaluating Y for each sample, the distribution of Y , its mean, percentiles, etc., can be estimated. However, Monte-Carlo sampling is inefficient in the sense that most of its samples will be taken from the higher probability-of-occurrence portions of the distributions, which makes sense. Thus, extreme values, which usually reside toward the outer wings of the distributions, tend to be ignored for all but very large samples, which is worrisome in regulatory work. To remedy that shortcoming, an alternative, so-called "constrained sampling system" was introduced. The particular system selected is known as Latin-Hypercube sampling.

In Latin-Hypercube sampling, one selects n different values of each of k variables $X_1, ..., X_k$, but one does not sample according to the joint probability distribution, as would be the case for Monte-Carlo sampling. Rather, the sampling is as follows: The range of each variable is divided into n non-overlapping intervals. To accomplish that, the probability axis of the cumulative probability distribution of that variable is divided onto n bands of equal width, where n is the number of samples to be made (see Figure 1). The n bandwidths of equal change in probability are then reflected through the cumulative probability distribution function so as to divide the parameter axis into n non-overlapping but unequal (in width) intervals of parameter values. One value of the parameter from each such interval is selected at random with respect to the probability density in that interval. Thus, one acquires n samples of that parameter with absolute certainty that samples from the wings of the distribution will be included.

It remains only to combine the samples so as to form n *different* sets of k-many variables. That can be accomplished as a fully random process, as follows: the n values obtained for the first parameter, X_1, are paired in a random manner (equally likely combinations) with the n similarly-sampled values of X_2. These n pairs are combined in the same random manner with the n sampled values of X_3 to form n triplets, and so on, until n k-tuplets are formed. The n k-tuplets comprise the Latin-Hypercube sample. LHS is also capable of pairing parameters so they are correlated by rank. That feature is absolutely necessary because certain parameter pairs are indeed correlated in nature. For example, it would be wholly aphysical to pair high porosities with low permeabilities, or vice versa. It is a well known fact that porosity and permeability are usually correlated in nature. Other YMP TSPA model parameter pairs may also be correlated in nature. It is convenient to treat the n k-tuplets as an (n x k) matrix of input data where the ith row contains one specific sampled value for each of the k input variables and can therefore be used to specify completely a sampled realization of the input data for the ith run of the computer model. There are, of course, many details in actual practice. For example, the 1.0% probability wings are often clipped from normal distributions to make them numerically more manageable. Without that precaution, sampled values would lie between plus and minus infinity

4.2 Description of the Methods

LHS performs Latin-hypercube sampling on an ASCII input data furnished directly from PRELHS's output transfer file or as created by an analyst. Once all input-file information has been successfully read, the execution keywords, data-distribution information, and distribution correlation-structure information are echoed to LHS's output files for reference. If the input file specifies a distribution correlation structure, the correlation matrix will be echoed and checked to assure that it is positive definite. The Cholesky factorization is then computed. It will be used subsequently in the process that induces the desired correlation structure. Once that is completed, subroutines will be called to generate each requested distribution in the order in which it is listed in the input file.

For TSPA applications calculations, the distribution types that may be generated (with the qualified use of LHS) are: NORMAL, LOGNORMAL, UNIFORM, LOGUNIFORM, TRIANGULAR, CUMULATIVE USER DISTRIBUTION, DATA USER DISTRIBUTION, and DELTA USER DISTRIBUTION.

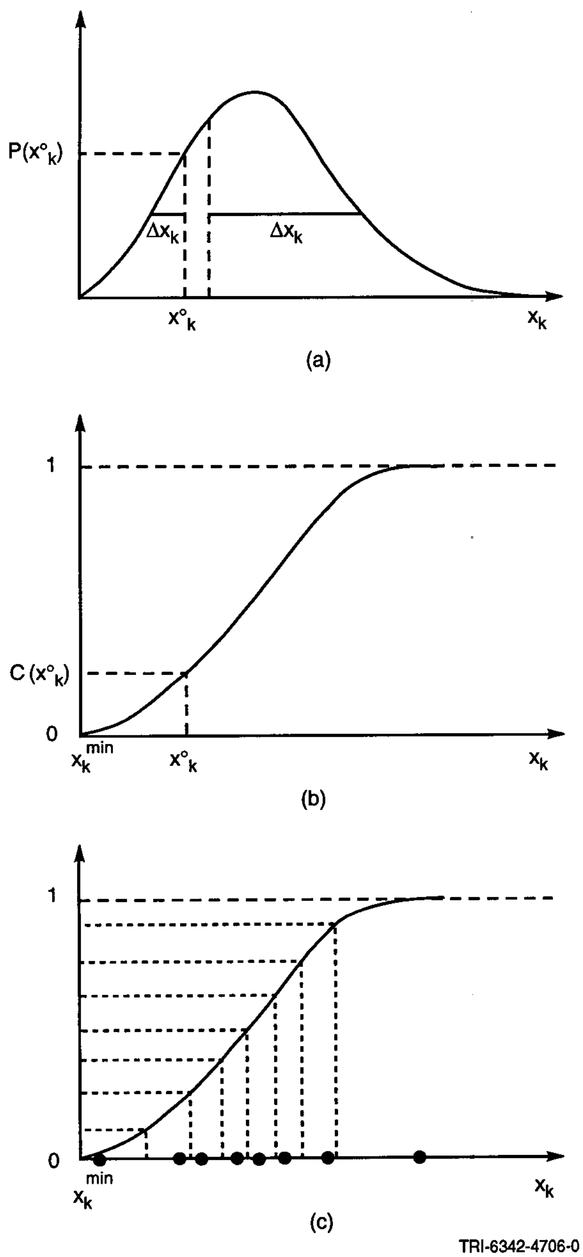

Figure 1. Graphical Representation of the LHS Sampling Technique for a Single Uncertain Variable x_k, where k = 1, 2, ..., N.

Note: The uncertain variable is depicted in part (a) as nearly normally distributed. $P(x^*_k)\Delta x$ is the probability that the value of the uncertain parameter lies between x^*_k and $x^*_k + \Delta x$. The integral of the part-(a) distribution is shown in part (b). It is the cumulative distribution function (CDF). The ordinate represents the probability that x_k is less than or equal to the value of the abscissa. In LHS sampling, the ordinate of the CDF (part (c)) is divided into n equally-sized bins. For simplicity, n is here taken to be 8. In the 1992 WIPP PA, n was 70. Those bins are reflected through the CDF to the abscissa, where they form n unequally-sized bins. One value of the abscissa is selected randomly from each bin. These are depicted as solid dots on the x axis. The dots are the 8, LHS-sampled values of the uncertain parameter x_k.

When all the distributions given in the input file have been sampled, subroutines are called to arrange the sampled outcomes for each distribution type according to the correlation structure specified in the input file. The completed sample is then written to the output files.

Two output files are created. One ASCII output file contains the values of all of the distribution samples on a vector-by-vector basis. The other ASCII output file contains echoed input-file information, the raw values for the sampled-distribution outcomes in tabular format for each distribution type, and tables of rank values for the sampled distribution outcomes. Depending on the output keywords specified, additional output tables may be generated showing raw and rank correlation tables for the sampled distributions, and histogram plots of each sampled distribution. Included with the distribution histograms is a listing of statistical information applicable to the distribution portrayed in the plot.

Each distribution is sampled in a slightly different way, but the basic process used is the same for all. It is the sampling process outlined above in terms of a normal distribution

5.0 CAPABILITIES AND LIMITATIONS INHERENT IN THE SOFTWARE

LHS is capable of performing Latin-hypercube sampling, a form of stratified Monte Carlo sampling. It can sample 17 distribution types, although only eight of those are qualified for use in YMP TSPA applications. The chosen eight are: NORMAL, LOGNORMAL, UNIFORM, LOGUNIFORM, TRIANGULAR, CUMULATIVE USER, DATA USER, and DELTA USER distributions.

To execute, LHS reads an ASCII formatted text file which may either be created by an analyst or by PRELHS as described in the User's Manual for PRELHS Versio 2.10 (MOL 20000127.0049). Contained in that file are input records describing the various types of distributions to be generated and keywords used to control the run, including, for example: TITLE, NOBS, RANDOM SEED, and OUTPUT.

LHS is capable of generating a correlation matrix of sampled distribution data as directed by its input file. Specific keywords that can be read and acted upon by LHS, but will *not* be qualified for use in calculations here, are: NREPS, RANDOM PAIRING, and RANDOM SAMPLE.

LHS produces two ASCII output files during each run. (i) The main ASCII output file serves solely as the input control file for postprocessing (POSTLHS is a postprocessor that can process this file). It contains echoed input file information, the raw values for the sampled distribution outcomes in tabular format for each distribution type, and tables of rank values for the sampled distribution outcomes. Depending on the keywords provided, additional output tables may be present showing raw and rank correlation tables for the sampled distributions, and histogram plots of each sampled distribution. Included with the distribution histograms is a listing of statistical information applicable to the distribution portrayed in the plot. (ii) The secondary ASCII text output file contains the raw sampled distribution data on a vector-by-vector basis. No other information is present in the second file.

LHS has considerable error-checking capability. It performs a number of internal checks to ensure that execution keywords and distribution input parameters have been specified correctly. In the event that an improper specification is detected, an appropriate message is printed and the execution of the program is terminated.

LHS is programmed using ANSI X3.9-1978 FORTRAN 77, except that comments are written in lower-case characters. At present, LHS is limited to the generation of 100 parameter distributions, 10,000 outcome vectors for a single sampling run, and 50 distribution correlations specified in the input file. These limits may be increased, but the code would have to be recompiled.

6.0 USER INTERACTIONS WITH THE SOFTWARE

LHS requires the user to specify the names of (i) certain already-existent input files and of (ii) the output files the code will create as a result of being exercised. LHS requires only one input file. Its output files are one required data output file and one required debug file. Before reviewing the methods by which LHS is exercised, we will discuss in the subsection that follows the file specification requirements of LHS.

6.1 LHS's Input/Output File Structure

The section that follows is a brief discussion of LHS's input and output files.

6.1.1 LHS's Input TEXT TRANSFER File

LHS's input file may be obtained as the ASCII text output file from PRELHS or may be a user-generated input file. LHS's input file is dual purpose. It serves (i) as a control file that directs LHS's function by specifying the code-execution keywords in a format suitable for direct usage by LHS, and (ii) as a data file that provides the parameter-distribution data on which LHS will operate.

An example of an LHS input file is the PRELHS output transfer file is described in detail in Section 7.0 and listed in full in Appendix A.

6.1.2 LHS's Output TEXT File

The results from LHS are written to an ASCII text file, which, in turn, may be forwarded to LHS's post processor, POSTLHS. The ASCII text file contains the outcomes of the Latin-Hypercube sampling procedure, echoes LHS's input file, and shows parameter-correlation tables and histogram plots of each sampled distribution. A collection of Computational Data Base (CDB) files, each containing a set of selected (sampled) parameter values for corresponding to a single sampling realization may be written using POSTLHS User's Manual Version 4.06ZO, MOL 20000127.0065).

An example of LHS's output text file is described in detail in Section 9.0 and listed in full in Appendix B.

6.1.3 LHS's Output DEBUG File

The optional output debugging text file contains the actual numerical values LHS produces for each sampled parameter, on an outcome-by-outcome basis. The information in this file is the same as that available in the output ASCII text file, but without the inclusion of descriptive text or plots.

An example of a LHS debugging text file is reproduced in full in Appendix C of this document.

6.2 Exercising LHS

LHS can be run by COMMAND file, or it can be run interactively if the user types the proper commands directly. In COMMAND-file mode, LHS can execute either interactively or in batch mode. Given those capabilities, it is recommended that COMMAND-file mode be employed as a rule.

An example COMMAND file that runs LHS is show below:

```
$!
$! DEFINE INPUT, OUTPUT, & SCRATCH FILES.  RUN THE LHS CODE.
$!
$  DEFINE LHS2_UIF$INPUT       U1:[LNSMITH.LHS.PRETEST.TEST]LHS2_T1.INP
$  DEFINE LHS2_OUT$OUTPUT      U1:[LNSMITH.LHS.PRETEST.TEST]LHS2_T1.OUT
$  DEFINE LHS2_DBG$OUTPUT      U1:[LNSMITH.LHS.PRETEST.TEST]LHS2_T1.DBG
$  DEFINE LHS2_NO2$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR002.DAT
$  DEFINE LHS2_NO3$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR003.DAT
$  DEFINE LHS2_NO4$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR004.DAT
$  DEFINE LHS2_NO7$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR007.DAT
$  DEFINE LHS2_NO8$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR008.DAT
$  DEFINE LHS2_NO9$SCRTCH      U1:[LNSMITH.LHS.PRETEST.TEST]FOR009.DAT
$!
$!
$ RUN WP$PRODROOT:[LHS.EXE]LHS.EXE
$!
$  DEASSIGN LHS2_UIF$INPUT
$  DEASSIGN LHS2_OUT$OUTPUT
$  DEASSIGN LHS2_DBG$OUTPUT
$  DEASSIGN LHS2_NO2$SCRTCH
$  DEASSIGN LHS2_NO3$SCRTCH
$  DEASSIGN LHS2_NO4$SCRTCH
$  DEASSIGN LHS2_NO7$SCRTCH
$  DEASSIGN LHS2_NO8$SCRTCH
$  DEASSIGN LHS2_NO9$SCRTCH
$!
$!
$  EXIT
```

In the above COMMAND file, nine VMS "DEFINE" commands are used to link the names of user-selected input and output files (far right side of the DEFINE statements) with the logical symbols that define those same files internally within LHS (near right side of the DEFINE statements). The first three DEFINE commands link LHS's input and output files with their corresponding logical symbols. The remaining six DEFINE commands link LHS's internal scratch-file logical symbols with their corresponding internally-chosen file names. The scratch-file names are designed to indicate the unit number of each file. Since scratch files are opened, used, closed, and deleted during execution of LHS, they are of no consequence to users.

The DEFINE commands are followed by a RUN command that directs the computer to run the LHS executable located in the "PRODUCTION" directory. That command is followed by a series of DEASSIGN commands that deactivate the logical-symbol/file-assignment matches made prior to the run. The DEASSIGN step is primarily a *good housekeeping* policy. It is not a requirement. However, if DEASSIGN commands are not implemented and the code is then run interactively, it is possible that subsequent runs might access the wrong input files. For that reason, it is prudent to apply the DEASSIGN commands.

Any COMMAND file similar to the one listed above can be run interactively. If the file is named LHS.COM , it can be executed at the VMS $ prompt as follows:

$ @LHS.COM

7.0 DESCRIPTION OF THE INPUT FILES

The LHS input file is described in detail in the paragraphs that follow. A sample listing of the LHS input file is given in Appendix A of this manual. It contains all of the information necessary for LHS to exercise and thereby create a sample.

The first two records are informative records referred to as "title records". The first title record is carried through to the completion of the LHS run and appears on the ASCII text output file. After the initial title record, a second title record gives a descriptive title that identifies the LHS input file. It serves no other purpose.

Following the two title records, the LHS input file lists code execution keywords. In the case of the sample file in Appendix A, keywords NOBS and RANDOM SEED appear and specify that a sample of 75 outcomes will be created by LHS, along with specifying the value of the starting random seed as 933090934. Next comes the information necessary to calculate each of the distributions to be included in the sample. For the example file in Appendix A, seven data distribution types are included. They are NORMAL, LOGNORMAL, UNIFORM, LOGUNIFORM, CUMULATIVE USER DISTRIBUTION, DATA USER DISTRIBUTION, and DELTA USER DISTRIBUTION.

After specification of the data distribution input, the LHS input file in Appendix A lists further input. The CORRELATION MATRIX keyword is listed, followed by the various correlation pairs and the desired correlation values. Next, the OUTPUT keyword is listed, followed by its attendant keywords: CORR, HIST, and DATA. These keywords are used to instruct LHS as to which of three types of output are to be prepared and written to one of the two LHS output files. The last record in the LHS input file is a repeat of the title record found at the beginning of the file.

PRELHS can be used to create an ASCII output transfer file (see the User's Manual for PRELHS Version 2.10, MOL 20000127.0049) that serves as LHS's input control file LHS. The input file has as its first and last record a title line created by PRELHS from information found in a formatted database input file, referred to in WIPP as a "secondary database" (SDB), and containing that file's title and version number. Also included is the date and time stamp signifying when PRELHS created the LHS input file. The LHS input file, thus created, is designed to be used without modification. Therefore, it does not need to be edited or otherwise modified in any way after it has been created by PRELHS.

7.1 Detailed Description of LHS Input File Entries

The following is a description of LHS's input file entries. Each paragraph gives the entry name and a brief description of its function. Please note that some input keywords applicable to the LHS code are not used in regulatory calculations.

LHS KEYWORD COMMANDS USED IN REGULATORY CALCULATIONS

The following commands are used by LHS to set up the run or control its execution.

TITLE — The TITLE record specifies the title for the LHS run. The record after TITLE may contain up to 100 alphanumeric characters. An example of usage of this keyword follows:

```
TITLE CMS TEST INPUT FILE FOR THE LHS CODE
```

NOBS — The NOBS record is used, with its associated parameter value, *no._obs*, to specify the number of vectors to be created for a sample (sample size [n_V]). An example of usage of this keyword follows:

```
NOBS 75
```

RANDOM SEED

The RANDOM SEED record, along with its associated parameter value, *number*, is used to specify the starting point for the random number generator. An example of usage of this keyword follows:

```
RANDOM SEED 933090934
```

CORRELATION MATRIX

The CORRELATION MATRIX record, along with its associated parameter values, establishes the desired rank correlation among variables. If this parameter is omitted, all pairwise correlations will be zero. The CORRELATION MATRIX record is followed by one or more lines containing the number of pairs to be rank correlated, *no._rank_corr*, followed by that many ordered triplets *no._rank_corr* specifying the number IDs of the two variables being correlated and their rank correlation. An example of usage of this keyword follows:

```
CORRELATION MATRIX
   4
   1   3   0.999
   2   5   0.950
   4   6   0.800
   5   2   0.950
```

OUTPUT — The OUTPUT record, along with its associated parameter keywords CORR, HIST, and DATA, controls the amount and type of output generated. The parameter keywords are defined as follows:

CORR signifies that both the raw and rank correlation matrices of the sample will be printed out in tabular form.

HIST signifies that histograms and associated statistical information will be printed for each variable in the sample.

DATA signifies that the individual values of each sampled variable will be printed, followed by the ranks of each variable. For the regulatory calculation, this output control keyword must be specified in conjunction with the OUTPUT keyword.

Examples of usage of the OUTPUT keyword follow:

OUTPUT CORR HIST DATA

OUTPUT CORR DATA

OUTPUT HIST DATA

LHS COMMANDS *NOT* QUALIFIED HERE FOR USE IN THE YUCCA MOUNTAIN PROJECT

The following LHS execution commands may be included in the input file, as described previously. **However, these particular commands are not qualified for use in TSPA applications.**

NREPS The NREPS record specifies the number of repetitions of the sample (each with a sample size of *no._obs*. If not specified, NREPS defaults to 1).

RANDOM PAIRING

When present, the RANDOM PAIRING record specifies that sample values are to be paired randomly; otherwise, sample values are restrictively paired subject to any conditions under the CORRELATION MATRIX parameter.

If both RANDOM PAIRING and CORRELATION MATRIX records appear, the former is ignored with a message to that effect printed after the correlation matrix.

RANDOM SAMPLE

When present, the RANDOM SAMPLE record specifies that a random sample is to be generated; otherwise, a Latin hypercube sample is generated.

A description of the input for the different distribution types capable of being sampled by LHS is included here. Since all of the distribution information will be present on the LHS input file generated by PRELHS, the treatment of the distribution parameters is brief. The first eight distribution types listed cover the types qualified for TSPA application calculations. The remaining nine entries will pertain to distribution types that can be processed by LHS but will not be qualified for TSPA application calculations. In general, there are no limits to the range of values except those ascribable to the estimated uncertainty in a sampled parameter. The exception is whenever a lognormal or loguniform distribution is specified, the range of values must be strictly positive.

LHS DISTRIBUTION TYPES QUALIFIED HERE FOR USE IN THE YUCCA MOUNTAIN PROJECT

NORMAL — The NORMAL record specifies a truncated normal distribution. An example of the distribution format follows:

```
NORMAL        material_name    parameter_name
    minimum  maximum
```

LOGNORMAL — The LOGNORMAL record specifies a LOGNORMAL distribution. An example of the distribution format follows:

```
LOGNORMAL     material_name    parameter_name
    minimum  maximum
```

UNIFORM — The UNIFORM record specifies a uniform distribution. An example of the distribution format follows:

```
UNIFORM       material_name    parameter_name
    minimum  maximum
```

LOGUNIFORM — The LOGUNIFORM record specifies a loguniform distribution. An example of the distribution format follows:

```
LOGUNIFORM    material_name    parameter_name
    minimum  maximum
```

USER DISTRIBUTION (CUMULATIVE)

The USER DISTRIBUTION (CUMULATIVE) record specifies a cumulative user supplied distribution. An example of the distribution format follows:

USER DISTRIBUTION (CUMULATIVE) material_name parameter_name

nval SPECIFIED CONTINUOUS

$value_1$ $probability_1$

$value_2$ $probability_2$

... ...

$value_{nval}$ 0.

USER DISTRIBUTION (DATA)

The USER DISTRIBUTION (DATA) record specifies a data user supplied distribution. An example of the distribution format follows:

USER DISTRIBUTION (DATA) material_name parameter_name

nval EQUAL CONTINUOUS

$value_1$ $value_2$ ... $value_{nval}$

USER DISTRIBUTION (DELTA)

The USER DISTRIBUTION (DELTA) record specifies a delta user-supplied distribution. An example of the distribution format follows:

USER DISTRIBUTION (DELTA) material_name parameter_name

nval SPECIFIED DISCRETE
value$_1$ probability$_1$
value$_2$ probability$_2$

TRIANGULAR The TRIANGULAR record specifies a triangular distribution. An example of the distribution format follows:

TRIANGULAR material_name parameter_name
minimum apex maximum
... ...
value$_{nval}$ probability$_{nval}$

LHS DISTRIBUTION TYPES *NOT* QUALIFIED HERE FOR USE IN THE YUCCA MOUNTAIN PROJECT

BETA The BETA record specifies a beta distribution. An example of the distribution format follows:

BETA material_name parameter_name
minimum maximum shape_p shape_q

EXPONENTIAL The EXPONENTIAL record specifies an exponential distribution. An example of the distribution format follows:

EXPONENTIAL material_name parameter_name
minimum maximum lambda

RAYLEIGH The RAYLEIGH record specifies a Rayleigh distribution. An example of the distribution format follows:

RAYLEIGH material_name parameter_name
minimum maximum lambda

RAYLEXP The RAYLEXP record specifies a Rayleigh-exponential distribution. An example of the distribution format follows:

RAYLEXP material_name parameter_name
minimum crossover maximum lambda

STUDENT The STUDENT record specifies a student-t distribution. An example of the distribution format follows:

STUDENT material_name parameter_name
nval
value$_1$ value$_2$ ... value$_{nval}$

LOGSTUDENT The LOGSTUDENT record specifies a logstudent-t distribution. An example of the distribution format follows:

LOGSTUDENT material_name parameter_name

nval
$value_1$ $value_2$ ... $value_{nval}$

UNIFORM* The UNIFORM* record requests a uniform distribution with specific sampling frequencies on subintervals. An example of the distribution format follows:

UNIFORM* material_name parameter_name
m $freq_1$ ... $freq_m$ c_1 ... c_{m+1}

LOGUNIFORM*

The LOGUNIFORM* record requests a loguniform distribution with specific sampling frequency on subintervals. An example of the distribution format follows:

LOGUNIFORM* material_name parameter_name
m $freq_1$ ... $freq_m$ c_1 ... c_{m+1}

USER DISTRIBUTION (CUMHISTOGRAM)

The USER DISTRIBUTION (CUMHISTOGRAM) record specifies a cumhistogram user-supplied distribution. An example of the distribution format follows:

USER DISTRIBUTION (CUMHISTOGRAM) material_name parameter_name
nval SPECIFIED DISCRETE
$value_1$ $probability_1$
$value_2$ $probability_2$
... ...
$value_{nval}$ $probability_{nval}$

8.0 ERROR MESSAGES

Detailed error detection is implemented in LHS through an assortment of error-checking subroutines. Errors detected during execution result in the generation of corresponding error messages written to the ASCII text output file. If the code regards the error as serious, and that is generally the case, the run will abort after an error message has been written.

LHS's error messages are numerous and specific in nature. In most cases, the error message describes the subroutine where the error occurred, and is accompanied by text describing the error. Often that is sufficient to track the problem down, especially if a "debug" version of the code is available. "Debug" versions of LHS allow interaction with the code during its execution and facilitate tracking down errors. However, the user should always perform a detailed visual inspection of the *entire* ASCII output file to assure (i) the output looks as it should and (ii) that no error messages have appeared. A skeptical user is valuable insurance in protecting against error.

LHS error messages fall into several categories. Numerous error messages are devoted to improperly-specified input data records. All of the execution keywords, problem size specifications, and distribution input data are checked for proper form. LHS is utterly incapable of determining whether a particular data distribution accurately reflects the physical information it is supposed to portray in the real world, but it is acutely able to determine whether that information is entered in a syntactically correct way. LHS easily detects errors such as the maximum range being smaller than the minimum range for a given distribution.

The following input field format errors may occur and are flagged by LHS:

- LHS captures the error of a non-numeric character in an integer field then issues an error message and stops execution of the program. The computer program LHS reads all input data as character strings. It uses a parser to process appropriate character string data into integer data, including the data sets NOBS, RANDOM SEED, and NREPS (see SUBROUTINE RDPAR in the source code). An example error message generated is;

```
THE PARAMETER CARD NOBS CONTAINS THE NON-NUMERIC CHARACTER T
```

- LHS captures the error of a negative number of observations being entered on the NOBS input record then issues an error message and stops execution of the program. An example error message generated is;

```
THE NUMBER OF OBSERVATIONS REQUESTED IS LESS THAN ONE  -75
```

LHS captures the error of too many variables being requested via the distribution input then issues an error message and stops execution of the program. At present, LHS is limited to the generation of 100 parameter distributions, 10,000 outcome vectors for a single sampling run, and 50 distribution correlations specified in the input file. These limits may be increased, but the code would have to be recompiled.

- An example error message generated is;

```
THE NUMBER OF VARIABLES REQUESTED 105

EXCEEDS THE MAXIMUM NUMBER OF VARIABLES CURRENTLY PERMITTED 100

PLEASE CONSULT THE USER MANUAL FOR INSTRUCTIONS ON HOW TO ALLOW MORE VARIABLES
```

- LHS captures the error of a missing or bad parameter record then issues an error message and stops execution of the program. See Section 7.0, 7.1 for correct input requirements and format. An example error message is;

```
THE FOLLOWING PARAMETER CARD DID NOT HAVE THE CORRECT DATA CARD ASSOCIATED WITH IT
PLEASE CONSULT THE USER MANUAL FOR THE CORRECT DATA CARD SYNTAX
***NORMAL                  NORMMAT3  NORMPRP3                                    ***,
```

- LHS captures the error for Random Seed of an integer value of more than 11 characters being entered then issues an error message and stops execution of the program. A example error message is;

```
THE DATA ON PARAMETER CARD RANDOM SEED CONTAINS 12 DIGITS
THE MAXIMUM NUMBER OF DIGITS ALLOWED IS 11
```

- LHS captures the error of an invalid output option keyword, then issues an error message and stops execution of the program. An example error message is;

```
THE FOLLOWING OUTPUT OPTION CARD REQUESTED AN UNDEFINED OUTPUT OPTION
PLEASE CHECK THE USER MANUAL FOR THE CORRECT OUTPUT OPTION CARD SYNTAX

***OUTPUT CORR HITS DATA                                                         ***
```

Once the input-file information has been successfully read, LHS checks to see if parameters set in the input file (such as the number of distributions to be sampled, the number of outcome vectors to be generated, and the number of distribution parameter correlations specified) exceed the limits imposed by maximum-value parameters specified internally. LHS also checks to see that at least a minimum number of distributions and sample outcome vectors have been specified.

As the code creates the sample for the various distributions, error checks are invoked that are internal to the subroutines used to calculate the distributions. This type of error checking is most prevalent in the generation of BETA distributions. Lastly, LHS utilizes numerous error-checking routines to assure that the correlation table calculated during a run meets the mathematical tests it must pass to be deemed acceptable.

9.0 DESCRIPTION OF THE OUTPUT

The LHS code creates two output files during a run. The first is an ASCII text log file suitable for use as an input file to a postprocessor (POSTLHS has been tailored to process this file into CDBs), and the second is an ASCII text debug file. Both files are described in detail in the paragraphs that follow. Sample listings of the LHS output files are given in Appendix B and Appendix B of this report.

9.1 LHS Output Log File

The LHS output log file is an ASCII text file created specifically for use as the input control file to a postprocessor (e.g. POSTLHS). It contains all the LHS sampling information required for the process of producing the necessary input to a software model for doing a constrained Monte Carlo analysis. This process is facilitated by POSTLHS but the user must be familiar with Sandia's CAMDAT database. Appendix B contains a sample output log file.

The first data block of LHS's output log file contains an echoed listing of the LHS input file. Included in the "echoed input" section are the LHS execution keywords, input execution-parameter data specifications, a recapitulation of the input information for the various distributions sampled, and information concerning the correlation matrix. In the sample problem of Appendix B, the input correlation matrix was not positive definite and warnings were printed to inform the user that the correlation matrix had been altered and should be checked for acceptability.

The next data block of the output log file is a group of tables showing resulting values over all outcomes for each of the distributions sampled. In general, there are no limits to the range of values output except those ascribable to the estimated uncertainty in a sampled parameter. Thus the range of output values should be within the range of values specified in the input. The table heading **RUN NO.** identifies the outcome vector number, there being 1 - 75 in the case of the sample problem. The headers **X(1) X(2) X(3) ...X(21)** signify each sampled value, the overall distributions for a single outcome vector. For the example there were 75 outcome vectors and 21 sampled distributions. Since the LHS output format is limited to 10 columns and there are 21 separate sampled distributions, it was necessary to present the entire sample output on three consecutive sets of 2 pages each (in other words, the data is tabulated over six pages). Each set of two pages contains 75 outcome vectors; the first page contains output for vectors 1-47; the second page contains output for vectors 48-75. The first set contains sampled results for distributions 1 - 10, the second set contains the sampled results for distributions 11 -20, and the third set contains the singular results for distribution number 21. The information in these pages is used as input to POSTLHS.

Once the *raw data* tables have been presented, in a similar way, pages are written for the ranks of the Latin-hypercube sample values. These pages show the rank of a given distribution's sampled value in comparison to all the other values for that particular distribution over the entire 75-outcome vector sample. For example, in sampled distribution number **X(1)**, which is a normal distribution, outcome vector number 31 is ranked first. That means the actual sampled value for outcome vector number 31 of that distribution is the smallest of the entire 75-outcome sample (in this case it is -2.235E-08). At the other end of the spectrum, outcome vector number 39 is the largest value for that distribution (ranked 75th at a value of 0.2000). The minimum to maximum range for sample variable number 1 is 0.0000 - 0.2000. Since those bounds delimit the 99th percentile, the smallest sampled value may lie, as it does in this case, slightly to the left of the lower bound. Correlations called for in LHS's input file are implemented on the basis of ranked data rather than raw data.

Since the OUTCOME keyword HIST was specified in the LHS input file, histogram density function plots, together with applicable statistical data, are presented for each of the 21 distributions generated in the example file. A header at the top of each histogram identifies the distribution being displayed. The graphical plot gives a rough outline of the distribution shape and shows where the sampled values fall between the function's upper and lower bounds. For density, the distance between the function's bounds is subdivided into segments, and the sampled outcomes are allocated to their associated segment, depending on their value. Statistical data located directly beneath the histogram plots show the actual minimum and maximum values sampled for a given distribution, the mean and median values of the sampled distribution, and the associated variance. These statistical measures can assist users endeavoring to assure that a sampled distribution is correct.

The last data block found on the LHS log output file gives correlation tables for the raw sampled data, including ranks. These tables give the correlations between each distribution and all of the other distributions present in the sample. Positive correlations indicate that high values in one variable correlate with high variables in the other. Negative correlations indicate that high values in one variable correlate with low values in the other. The user *should* assure the suitability of the correlations by inspecting the rank-correlation table and determining whether the correlations specified in the LHS input file were implemented. The user *should* scour the entire table for spurious correlations. To accomplish that, users must have prior knowledge of the distributions being generated and their interrelationships.

9.2 LHS Output Debug File

The LHS output debug file is a simple free-formatted list containing the raw sampled values for each of the distributions over all of the vector outcomes. The sample file in Appendix C contains raw data for each of the 21 distributions, for each of the 75 outcome vectors. The first number listed is the outcome vector number. It is followed by the number of data entries in the outcome, and then by the sampled data values themselves. The sampled data are listed in the same order in which they were given in the LHS input file. For the sample output debug file the first outcome vector lists the value 0.1545607 as the value associated with distribution 1. The value of the last (or 21st) sampled distribution for outcome vector 1 is 40.00000. This first distribution is a NORMAL distribution with lower and upper bounds of 0.00000 and 0.20000. The twenty-first distribution is a DELTA USER distribution with lower and upper bounds of -10.0 and 40.0.

10.0 REFERENCES

User's Manual for PRELHS, Version 2.10. MOL.20000127.0049

WIPP PA User's manual for POSTLHS. Version Number: 4.06ZO. MOL.20000127.0065.

APPENDIX A: EXAMPLE OF AN LHS INPUT TEXT FILE (PRELHS_TUTORIAL.TRN)

Listed below is an example LHS input control file, as produced by PRELHS, and described in detail in Sec. 7.0.

```
TITLE SDB Name = CMSTEST         , Ver = X-2.31ZO         08/02/95 14:38:00
TITLE CMS Test Input File for the LHS Code
NOBS               75
RANDOM SEED    933090934
NORMAL                      NORMMAT1   NORMPRP1
    0.00000E+00    2.00000E-01
NORMAL                      NORMMAT2   NORMPRP2
    5.77000E+02    1.04200E+03
NORMAL                      NORMMAT3   NORMPRP3
   -3.67370E-02    8.32640E-02
LOGNORMAL                   LOGNMAT1   LOGNPRP1
    1.00000E-02    2.13000E+00
LOGNORMAL                   LOGNMAT2   LOGNPRP2
    1.00000E-03    3.50000E+02
LOGNORMAL                   LOGNMAT3   LOGNPRP3
    1.00000E-04    5.25000E+04
UNIFORM                     UNIFMAT1   UNIFPRP1
   -5.00000E-01    5.00000E-01
UNIFORM                     UNIFMAT2   UNIFPRP2
    0.00000E+00    1.00000E+00
UNIFORM                     UNIFMAT3   UNIFPRP3
    1.25000E+01    5.00000E+02
LOGUNIFORM                  LOGUMAT1   LOGUPRP1
    1.00000E-17    1.00000E-11
LOGUNIFORM                  LOGUMAT2   LOGUPRP2
    1.00000E-06    1.00000E+03
LOGUNIFORM                  LOGUMAT3   LOGUPRP3
    5.60000E+13    5.60000E+15
USER DISTRIBUTION  (CUMULATIVE)      CUMMAT1    CUMPRP1
         4           SPECIFIED    CONTINUOUS
   -8.00000E+00   0.10000
   -6.57000E+00   0.80000
   -4.77000E+00   0.10000
   -2.00000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)      CUMMAT2    CUMPRP2
         4           SPECIFIED    CONTINUOUS
   -1.25000E+01   0.15000
   -9.00000E+00   0.45000
   -6.51000E+00   0.40000
   -5.00000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)      CUMMAT3    CUMPRP3
         4           SPECIFIED    CONTINUOUS
   -8.60000E+00   0.10000
   -8.00000E+00   0.60000
   -3.25000E+00   0.30000
```

```
   -2.00000E+00    0.00000
 USER DISTRIBUTION   (DATA)          DATAMAT1   DATAPRP1
        21             EQUAL        CONTINUOUS
   5.80565E-02  9.55000E-02  1.03330E-01  1.07400E-01  1.15000E-01  1.20500E-01
   1.22250E-01  1.23500E-01  1.29000E-01  1.38500E-01  1.44330E-01  1.46500E-01
   1.61600E-01  1.61800E-01  1.65170E-01  1.78000E-01  1.78400E-01  1.79600E-01
   2.02500E-01  2.07750E-01  2.52500E-01
 USER DISTRIBUTION   (DATA)          DATAMAT2   DATAPRP2
         9             EQUAL        CONTINUOUS
   2.30500E+01  2.90600E+01  3.45620E+01  4.13200E+01  5.53900E+01  6.34200E+01
   7.94300E+01  8.90880E+01  1.03800E+02
 USER DISTRIBUTION   (DATA)          DATAMAT3   DATAPRP3
        12             EQUAL        CONTINUOUS
   1.22250E+00  9.30000E+00  1.09000E+01  1.38500E+01  2.74330E+01  3.46500E+01
   4.61600E+01  5.01800E+01  6.15170E+01  7.38000E+01  8.78400E+01  9.49600E+01
 USER DISTRIBUTION   (DELTA)           DELTMAT1   DELTPRP1
        14             SPECIFIED    DISCRETE
     5.08000E-02   0.07143
     1.01600E-01   0.07143
     1.52400E-01   0.07143
     1.93680E-01   0.07143
     2.19080E-01   0.07143
     2.28600E-01   0.07143
     2.50830E-01   0.07143
     2.79400E-01   0.07143
     3.04800E-01   0.07143
     3.49250E-01   0.07143
     3.81000E-01   0.07143
     4.44500E-01   0.07143
     5.58800E-01   0.07143
     6.09600E-01   0.07141
 USER DISTRIBUTION   (DELTA)           DELTMAT2   DELTPRP2
         4             SPECIFIED    DISCRETE
     1.00000E+00   0.30000
     2.00000E+00   0.15000
     3.00000E+00   0.20000
     4.00000E+00   0.35000
 USER DISTRIBUTION   (DELTA)           DELTMAT3   DELTPRP3
         6             SPECIFIED    DISCRETE
    -1.00000E+01   0.13000
     2.00000E+00   0.13000
     8.00000E+00   0.26000
     2.30000E+01   0.15000
     3.40000E+01   0.15000
     4.00000E+01   0.18000
 CORRELATION MATRIX
     7
     1     3 0.999
     2     5 0.950
     4     6 0.800
     5     2 0.950
     7     8 0.650
```

```
    7    9 0.650
    8    9 0.650
OUTPUT CORR HIST DATA
TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO        08/02/95 14:38:00
```

END OF APPENDIX A

APPENDIX B: EXAMPLE OF AN LHS OUTPUT TEXT FILE (LHS_TUTORIAL.OUT)

Listed below is an example LHS ASCII text output log file, as described in detail in Sec. 9.1. This file is suitable in its present form for use as an input file to the POSTLHS code.

```
1

    TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO        08/02/95 14:38:00

    RANDOM SEED =    933090934

    NUMBER OF VARIABLES =  21

    NUMBER OF OBSERVATIONS =    75
0   AN INPUT CORRELATION MATRIX HAS BEEN SPECIFIED
0   THE SAMPLE INPUT VECTORS WILL BE PRINTED ALONG WITH THEIR CORRESPONDING RANKS
0   HISTOGRAMS OF THE ACTUAL SAMPLE WILL BE PLOTTED FOR EACH INPUT VARIABLE
0   THE CORRELATION MATRICES (RAW DATA AND RANK CORRELATIONS) WILL BE PRINTED
1

    TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO        08/02/95 14:38:00

    VARIABLE  DISTRIBUTION             RANGE              LABEL
0       1     NORMAL               0.0000E+00 TO   0.2000       NORMMAT1  NORMPRP1
0       2     NORMAL                577.0     TO    1042.       NORMMAT2  NORMPRP2
0       3     NORMAL              -3.6737E-02 TO   8.3264E-02   NORMMAT3  NORMPRP3
0       4     LOGNORMAL            1.0000E-02 TO    2.130       LOGNMAT1  LOGNPRP1
0       5     LOGNORMAL            1.0000E-03 TO    350.0       LOGNMAT2  LOGNPRP2
0       6     LOGNORMAL            1.0000E-04 TO   5.2500E+04   LOGNMAT3  LOGNPRP3
0       7     UNIFORM             -0.5000     TO   0.5000       UNIFMAT1  UNIFPRP1
0       8     UNIFORM              0.0000E+00 TO    1.000       UNIFMAT2  UNIFPRP2
0       9     UNIFORM               12.50     TO    500.0       UNIFMAT3  UNIFPRP3
0      10     LOGUNIFORM           1.0000E-17 TO   1.0000E-11   LOGUMAT1  LOGUPRP1
0      11     LOGUNIFORM           1.0000E-06 TO    1000.       LOGUMAT2  LOGUPRP2
0      12     LOGUNIFORM           5.6000E+13 TO   5.6000E+15   LOGUMAT3  LOGUPRP3
0.     13     USER SUPPLIED DISTRIBUTION             (CUMULATIVE)      CUMMAT1   CUMPRP1
0      14     USER SUPPLIED DISTRIBUTION             (CUMULATIVE)      CUMMAT2   CUMPRP2
0      15     USER SUPPLIED DISTRIBUTION             (CUMULATIVE)      CUMMAT3   CUMPRP3
0      16     USER SUPPLIED DISTRIBUTION             (DATA)         DATAMAT1  DATAPRP1
0      17     USER SUPPLIED DISTRIBUTION             (DATA)         DATAMAT2  DATAPRP2
0      18     USER SUPPLIED DISTRIBUTION             (DATA)         DATAMAT3  DATAPRP3
0      19     USER SUPPLIED DISTRIBUTION             (DELTA)          DELTMAT1  DELTPRP1
0      20     USER SUPPLIED DISTRIBUTION             (DELTA)          DELTMAT2  DELTPRP2
0      21     USER SUPPLIED DISTRIBUTION             (DELTA)          DELTMAT3  DELTPRP3
```

```
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0INPUT RANK CORRELATION MATRIX                                                                                        PAGE
1
0    1  1.0000
0    2  0.0000  1.0000
0    3 -0.9990  0.0000  1.0000
0    4  0.0000  0.0000  0.0000  1.0000
0    5  0.0000 -0.9500  0.0000  0.0000  1.0000
0    6  0.0000  0.0000  0.0000 -0.8000  0.0000  1.0000
0    7  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000
0    8  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000 -0.6500  1.0000
0    9  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000 -0.6500 -0.6500  1.0000
0            1       2       3       4       5       6       7       8       9
0VARIABLES
0********* CAUTION USER PLEASE NOTE ********* CAUTION USER PLEASE NOTE ********* CAUTION USER PLEASE NOTE **********

 THE INPUT RANK CORRELATION MATRIX IS NOT POSITIVE DEFINITE
 AN ITERATIVE PROCEDURE HAS BEEN USED TO PRODUCE A SUBSTITUTE RANK CORRELATION MATRIX
 THIS ADJUSTED RANK CORRELATION MATRIX APPEARS ON THE NEXT PAGE
 THE USER SHOULD EXAMINE THIS MATRIX TO MAKE SURE THAT THE CORRELATION REQUIREMENTS ARE STILL SATISFIED

 ***************************************************************************************************************
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0ADJUSTED RANK CORRELATION MATRIX                                                                                     PAGE
1
0    1  1.0000
0    2  0.0000  1.0000
0    3 -0.9990  0.0000  1.0000
0    4  0.0000  0.0000  0.0000  1.0000
0    5  0.0000 -0.9500  0.0000  0.0000  1.0000
0    6  0.0000  0.0000  0.0000 -0.8000  0.0000  1.0000
0    7  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000
0    8  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000 -0.4997  1.0000
0    9  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000 -0.4997 -0.4997  1.0000
0            1       2       3       4       5       6       7       8       9
0VARIABLES
```

```
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0LATIN HYPERCUBE SAMPLE INPUT VECTORS
```

	RUN NO.	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)	X(9)	X(10)
0	1	1.546E-01	7.814E+02	-9.647E-03	1.390E-01	6.784E-01	5.535E+00	-9.939E-02	7.892E-01	1.523E+02	5.540E-14
0	2	1.008E-01	7.908E+02	2.337E-02	2.382E-01	1.427E+00	3.707E-01	3.863E-01	6.532E-02	3.777E+02	5.642E-13
0	3	1.157E-01	9.056E+02	1.356E-02	1.250E-01	8.364E-02	3.557E-01	-3.450E-01	9.205E-01	1.429E+02	2.014E-12
0	4	8.294E-02	7.667E+02	3.145E-02	6.878E-01	4.408E-01	1.419E-02	-1.557E-02	5.252E-02	4.723E+02	3.438E-13
0	5	8.873E-02	7.847E+02	3.065E-02	1.112E-01	1.152E+00	4.016E+02	-4.615E-01	7.217E-01	4.427E+02	6.390E-15
0	6	1.283E-01	7.455E+02	6.720E-03	1.062E-01	9.696E+00	5.073E+00	2.662E-01	3.613E-01	1.864E+02	2.306E-17
0	7	1.191E-01	7.361E+02	1.213E-02	2.668E-02	3.038E+00	4.051E+01	-5.500E-02	9.027E-01	7.340E+01	6.034E-12
0	8	1.201E-01	7.604E+02	1.062E-02	1.191E-01	3.872E+00	9.461E-01	-2.172E-01	2.055E-01	4.490E+02	1.352E-13
0	9	1.305E-01	9.646E+02	5.339E-03	1.953E-02	4.000E-03	5.145E+01	6.570E-02	3.210E-02	4.743E+02	1.049E-16
0	10	1.439E-01	8.224E+02	-4.801E-03	3.728E-02	1.338E-01	8.056E+00	3.796E-01	1.405E-01	2.962E+02	9.759E-14
0	11	1.419E-01	6.056E+02	1.472E-03	8.737E-02	3.702E+01	2.091E+00	-4.083E-01	4.203E-01	4.626E+02	6.477E-13
0	12	7.728E-02	8.496E+02	3.438E-02	2.585E-02	8.935E-01	1.660E+03	3.198E-01	2.650E-01	2.235E+02	2.775E-13
0	13	1.796E-01	7.938E+02	-2.378E-02	7.830E-02	1.303E+00	3.627E+01	4.362E-01	8.742E-01	1.491E+01	1.412E-16
0	14	7.080E-02	8.654E+02	4.188E-02	1.657E-01	3.486E-01	2.421E-01	-3.165E-01	3.894E-01	4.405E+02	3.463E-17
0	15	9.041E-03	7.430E+02	7.501E-02	1.168E-01	2.459E+00	2.217E+01	3.944E-01	1.488E-01	2.636E+02	1.457E-17
0	16	1.001E-01	8.848E+02	2.482E-02	6.072E-02	2.013E-02	2.923E+01	2.133E-01	7.512E-01	4.211E+01	1.049E-15
0	17	1.611E-01	8.787E+02	-1.326E-02	5.243E-02	2.087E-01	1.027E+03	1.117E-01	3.576E-01	2.800E+02	8.034E-12
0	18	9.597E-02	7.648E+02	2.577E-02	1.364E-01	1.912E+00	2.762E+01	-1.102E-01	2.503E-01	4.128E+02	6.211E-16
0	19	1.055E-01	5.853E+02	1.983E-02	1.568E-01	1.134E+02	7.931E+00	-1.559E-01	5.414E-01	3.730E+02	5.719E-12
0	20	1.844E-01	9.998E+02	-3.176E-02	8.939E-01	1.307E-02	1.000E-04	-3.952E-01	6.048E-01	4.167E+02	2.270E-15
0	21	5.024E-02	6.346E+02	5.291E-02	3.389E-02	3.500E+02	4.658E+03	3.543E-01	1.310E-01	3.001E+02	1.249E-14
0	22	9.894E-02	7.756E+02	2.217E-02	4.646E-02	5.157E-01	2.212E+00	2.383E-02	5.723E-01	2.077E+02	7.872E-16
0	23	1.093E-01	8.304E+02	1.730E-02	1.145E+00	1.764E-01	1.465E-01	3.285E-01	4.622E-01	1.242E+02	2.777E-14
0	24	1.474E-01	8.392E+02	-2.770E-03	2.055E-01	4.041E-01	2.084E-01	-2.349E-01	8.223E-01	2.333E+02	1.772E-14
0	25	1.041E-01	8.830E+02	2.051E-02	6.689E-02	4.196E-02	1.238E+01	1.811E-01	1.928E-01	3.394E+02	3.750E-17
0	26	1.154E-01	7.080E+02	1.480E-02	1.535E-01	7.333E+00	2.653E-01	4.953E-01	3.375E-03	2.034E+02	2.322E-14
0	27	8.641E-02	8.195E+02	3.215E-02	9.178E-02	3.735E-01	1.809E+01	-2.550E-01	9.578E-01	6.199E+01	1.096E-14
0	28	2.398E-02	8.252E+02	6.895E-02	2.565E-01	9.333E-01	1.480E-02	-3.291E-01	3.214E-01	4.575E+02	9.587E-12
0	29	1.076E-01	8.627E+02	1.857E-02	2.933E-02	7.731E-01	1.175E+04	-3.117E-01	3.766E-01	4.277E+02	1.937E-14
0	30	9.421E-02	8.154E+02	2.679E-02	3.339E-01	8.740E-02	8.677E-01	1.257E-01	5.329E-01	1.809E+02	8.343E-15
0	31	-2.235E-08	7.721E+02	8.326E-02	1.288E-01	1.950E+00	3.504E+00	4.576E-01	2.207E-01	1.197E+02	4.264E-15
0	32	4.387E-02	7.776E+02	5.773E-02	9.959E-01	4.892E-01	9.654E-02	1.448E-01	6.863E-01	9.136E+01	3.500E-12
0	33	8.915E-02	9.309E+02	2.962E-02	1.021E-01	5.680E-02	7.355E+01	-7.949E-02	6.655E-01	2.001E+02	7.668E-14
0	34	6.021E-02	9.024E+02	4.878E-02	8.412E-02	7.515E-02	2.695E+02	-3.625E-01	9.459E-01	1.351E+02	1.003E-12
0	35	3.629E-02	8.695E+02	6.012E-02	2.009E-01	1.192E-01	5.176E-01	8.825E-02	3.199E-01	3.244E+02	4.624E-15
0	36	3.104E-02	6.750E+02	6.336E-02	1.720E-02	1.170E+01	2.492E+03	-1.755E-01	5.833E-01	3.166E+02	2.459E-13
0	37	4.249E-02	8.345E+02	5.587E-02	9.341E-02	1.841E-01	1.130E+02	2.864E-01	5.197E-01	1.131E+02	3.349E-16
0	38	2.834E-02	8.066E+02	6.589E-02	4.260E-02	6.922E-01	1.300E+01	-4.790E-01	7.718E-01	4.337E+02	2.445E-16
0	39	2.000E-01	7.523E+02	-3.674E-02	5.589E-02	3.417E+00	7.326E+02	-4.317E-03	4.277E-01	2.881E+02	1.098E-13
0	40	1.351E-01	6.850E+02	1.586E-03	1.000E-02	1.577E+02	5.250E+04	-4.278E-01	8.836E-01	3.669E+02	1.165E-16
0	41	6.824E-02	9.757E+02	4.096E-02	4.446E-02	8.289E-03	3.374E+02	1.709E-01	1.638E-01	3.589E+02	2.968E-16
0	42	1.371E-01	7.162E+02	-6.423E-04	1.821E-01	4.954E+01	1.124E+00	-1.203E-01	7.019E-01	1.888E+02	1.023E-17
0	43	1.287E-01	8.089E+02	4.962E-03	3.277E-01	2.744E-01	1.676E+00	5.480E-02	6.708E-01	1.406E+02	9.289E-16
0	44	5.503E-02	7.992E+02	4.901E-02	2.905E-01	1.074E+00	6.069E-03	1.375E-01	8.498E-01	4.974E+01	2.370E-12
0	45	6.337E-02	7.315E+02	4.433E-02	2.197E-01	3.349E+01	1.029E-03	2.272E-01	7.196E-01	5.309E+01	2.832E-12
0	46	1.118E-01	8.382E+02	1.830E-02	3.525E-01	5.773E-01	3.211E-02	-4.935E-01	9.075E-01	3.904E+02	8.817E-17
0	47	7.213E-02	7.130E+02	3.832E-02	7.458E-02	5.203E+00	5.264E-02	-2.891E-01	6.392E-01	3.350E+02	1.289E-17
0	48	1.593E-01	8.024E+02	-1.195E-02	6.304E-02	1.549E-01	3.863E+00	-2.043E-01	9.812E-01	3.494E+01	1.680E-16

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0   49  1.245E-01  6.250E+02  8.893E-03  4.294E-01  1.383E+01  1.209E-01  8.149E-02  4.829E-01  2.141E+02  4.455E-17
0   50  5.349E-02  7.223E+02  5.170E-02  1.487E-01  2.830E+00  1.227E+00 -4.536E-01  9.870E-01  1.628E+02  3.711E-13
0   51  1.029E-01  7.299E+02  2.118E-02  1.895E+00  5.316E+00  1.747E-01 -2.655E-01  9.732E-01  8.006E+01  7.048E-17
0   52  7.995E-02  6.874E+02  3.534E-02  6.994E-02  1.701E+01  1.503E+02  1.990E-01  2.321E-01  3.064E+02  1.459E-13
0   53  9.713E-02  1.019E+03  2.427E-02  7.187E-02  2.019E-03  7.030E+01  2.953E-01  1.107E-01  3.268E+02  5.948E-17
0   54  1.267E-01  8.115E+02  7.381E-03  1.703E-01  1.590E+00  4.492E-01  4.842E-01  3.424E-01  2.039E+01  1.712E-12
0   55  9.081E-02  9.263E+02  2.837E-02  3.688E-01  2.807E-02  4.733E-02  3.437E-01  4.949E-01  1.046E+02  1.667E-15
0   56  6.703E-02  6.973E+02  4.279E-02  1.748E-01  1.853E+01  6.347E+00 -1.426E-01  5.582E-01  3.529E+02  3.865E-14
0   57  1.324E-01  9.445E+02  3.472E-03  7.538E-01  2.866E-02  5.156E-04  1.871E-02  8.132E-01  8.458E+01  7.669E-13
0   58  5.828E-02  9.125E+02  4.693E-02  6.577E-01  1.934E-02  6.366E-02 -4.390E-01  8.295E-01  3.995E+02  4.717E-14
0   59  1.103E-01  7.953E+02  1.651E-02  4.846E-01  1.544E+00  1.038E-02  4.101E-01  1.813E-01  2.361E+02  1.978E-15
0   60  7.518E-02  8.924E+02  3.795E-02  9.944E-02  1.030E-01  6.270E+02  4.311E-01  4.097E-01  6.483E+01  3.014E-15
0   61  7.916E-02  8.439E+02  3.702E-02  5.538E-01  3.068E-01  2.935E-02  1.630E-01  2.816E-01  2.761E+02  5.298E-16
0   62  9.209E-02  8.738E+02  2.723E-02  3.131E-01  4.898E-02  5.694E-01  4.694E-01  2.754E-01  2.874E+01  5.688E-15
0   63  1.717E-01  8.967E+02 -1.865E-02  4.494E-01  3.666E-02  8.707E-02 -4.655E-02  2.131E-02  4.901E+02  6.438E-14
0   64  1.530E-01  6.560E+02 -6.991E-03  2.724E-01  2.385E+01  3.042E+00  2.542E-01  3.000E-01  2.451E+02  2.018E-16
0   65  4.705E-02  9.394E+02  5.535E-02  2.230E-01  1.188E-02  7.594E-01 -3.696E-01  6.459E-01  4.033E+02  1.741E-17
0   66  1.668E-01  8.573E+02 -1.740E-02  2.817E-01  2.590E-01  2.469E+00 -2.004E-02  5.963E-01  2.546E+02  1.300E-15
0   67  1.490E-01  7.574E+02 -7.449E-03  1.943E-01  2.271E+00  1.942E-02 -1.918E-01  4.400E-01  3.856E+02  1.805E-13
0   68  7.340E-02  7.512E+02  4.016E-02  1.744E+00  7.981E+00  2.941E-03  3.002E-01  8.291E-02  3.451E+02  1.445E-14
0   69  8.526E-02  1.042E+03  3.400E-02  1.433E-02  1.000E-03  1.575E+01  2.383E-01  4.697E-01  1.555E+02  1.397E-12
0   70  1.126E-01  9.194E+02  1.557E-02  2.465E-01  6.026E-02  1.057E+02 -3.909E-01  1.034E-01  4.950E+02  4.216E-12
0   71  6.463E-02  8.554E+02  4.596E-02  4.937E-01  2.333E-01  4.761E-03 -6.939E-02  8.539E-01  9.704E+01  2.752E-17
0   72  8.353E-02  8.461E+02  3.308E-02  3.997E-01  1.286E-01  1.485E+00 -2.740E-01  7.781E-01  2.692E+02  1.202E-12
0   73  1.397E-01  6.636E+02 -1.370E-03  5.024E-02  6.045E+00  1.022E+01  3.504E-02  6.221E-01  1.695E+02  5.119E-13
0   74  1.174E-01  9.570E+02  1.271E-02  3.850E-02  7.021E-03  1.799E+02 -2.252E-01  7.453E-01  2.487E+02  3.228E-15
0   75  1.228E-01  7.042E+02  9.935E-03  5.807E-01  4.391E+00  1.539E-03 -1.302E-01  7.148E-02  4.857E+02  4.260E-16
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1TITLE SDB Name = CMSTEST , Ver = X-2.31ZO 08/02/95 14:38:00
0LATIN HYPERCUBE SAMPLE INPUT VECTORS

	RUN NO.	X(11)	X(12)	X(13)	X(14)	X(15)	X(16)	X(17)	X(18)	X(19)	X(20)
0	1	7.931E-06	1.740E+14	-5.323E+00	-5.598E+00	-7.694E+00	2.029E-01	9.254E+01	3.910E+00	1.016E-01	4.000E+00
0	2	1.162E-05	2.606E+14	-6.077E+00	-6.342E+00	-4.229E+00	1.390E-01	2.639E+01	4.954E+01	4.445E-01	4.000E+00
0	3	2.020E-01	8.655E+14	-6.272E+00	-8.964E+00	-6.927E+00	5.809E-02	9.880E+01	8.743E+01	5.588E-01	4.000E+00
0	4	5.276E+01	1.147E+14	-4.858E+00	-7.018E+00	-5.523E+00	1.184E-01	3.721E+01	6.643E+00	1.524E-01	1.000E+00
0	5	8.870E-04	1.618E+14	-6.544E+00	-7.284E+00	-2.801E+00	9.187E-02	4.016E+01	4.867E+01	2.508E-01	4.000E+00
0	6	9.155E-01	1.266E+15	-5.448E+00	-6.650E+00	-2.386E+00	1.546E-01	3.788E+01	1.295E+01	5.080E-02	1.000E+00
0	7	1.167E+00	7.919E+13	-6.325E+00	-5.726E+00	-3.235E+00	1.617E-01	9.387E+01	9.369E+00	1.524E-01	1.000E+00
0	8	8.915E-02	4.253E+15	-5.680E+00	-5.539E+00	-4.360E+00	1.265E-01	2.935E+01	2.941E+00	3.492E-01	1.000E+00
0	9	4.286E-05	6.288E+13	-2.816E+00	-7.866E+00	-4.954E+00	1.790E-01	9.540E+01	3.575E+01	5.588E-01	4.000E+00
0	10	3.566E-06	7.147E+14	-5.855E+00	-6.146E+00	-2.228E+00	1.042E-01	7.958E+01	1.898E+01	4.445E-01	1.000E+00
0	11	1.046E+02	3.135E+15	-5.930E+00	-5.096E+00	-2.658E+00	1.527E-01	7.727E+01	3.341E+01	2.508E-01	3.000E+00
0	12	3.711E-02	3.900E+14	-6.433E+00	-5.502E+00	-3.435E+00	1.616E-01	4.345E+01	5.509E+01	2.286E-01	4.000E+00
0	13	1.824E-06	1.205E+14	-4.924E+00	-8.077E+00	-3.955E+00	1.087E-01	3.136E+01	2.777E+01	1.524E-01	4.000E+00
0	14	2.884E-06	2.402E+15	-5.174E+00	-8.495E+00	-8.596E+00	1.453E-01	3.038E+01	4.826E+01	1.937E-01	4.000E+00
0	15	1.509E+02	1.618E+15	-3.614E+00	-5.048E+00	-3.864E+00	1.063E-01	3.188E+01	1.248E+01	6.096E-01	4.000E+00
0	16	5.276E-04	2.576E+14	-5.040E+00	-5.416E+00	-2.138E+00	1.165E-01	4.919E+01	7.986E+01	1.524E-01	4.000E+00
0	17	2.215E+01	5.745E+14	-4.782E+00	-6.160E+00	-8.515E+00	2.499E-01	3.491E+01	1.498E+00	5.588E-01	4.000E+00
0	18	6.188E-06	1.313E+14	-5.554E+00	-7.962E+00	-7.874E+00	1.630E-01	3.437E+01	9.084E+00	4.445E-01	1.000E+00
0	19	4.446E-01	6.348E+13	-6.465E+00	-1.044E+01	-6.234E+00	1.451E-01	6.324E+01	7.122E+01	3.810E-01	1.000E+00
0	20	2.177E-05	2.886E+14	-6.375E+00	-6.057E+00	-5.655E+00	8.774E-02	2.338E+01	3.003E+01	5.080E-02	2.000E+00
0	21	4.528E-06	8.433E+13	-7.205E+00	-7.603E+00	-2.730E+00	1.894E-01	3.293E+01	9.062E+01	5.080E-02	3.000E+00
0	22	3.669E+00	1.790E+15	-6.146E+00	-9.911E+00	-5.386E+00	1.716E-01	7.481E+01	1.757E+01	2.508E-01	4.000E+00
0	23	9.180E-03	2.847E+15	-5.608E+00	-9.540E+00	-2.300E+00	1.211E-01	3.920E+01	4.713E+01	2.794E-01	2.000E+00
0	24	1.214E-04	1.436E+15	-3.356E+00	-9.305E+00	-2.536E+00	1.461E-01	1.014E+02	4.219E+01	2.286E-01	4.000E+00
0	25	3.844E+01	5.852E+14	-7.014E+00	-7.034E+00	-5.905E+00	1.787E-01	3.890E+01	4.573E+01	2.191E-01	1.000E+00
0	26	2.949E-04	4.683E+14	-4.904E+00	-8.935E+00	-6.054E+00	1.231E-01	5.800E+01	5.843E+01	2.286E-01	3.000E+00
0	27	2.034E+02	7.099E+13	-5.007E+00	-8.805E+00	-2.852E+00	1.288E-01	7.179E+01	8.787E+01	6.096E-01	2.000E+00
0	28	3.459E+02	1.505E+14	-4.962E+00	-5.303E+00	-4.791E+00	1.435E-01	5.999E+01	9.238E+01	1.937E-01	3.000E+00
0	29	1.260E-02	4.891E+14	-2.437E+00	-6.685E+00	-3.170E+00	1.149E-01	4.242E+01	5.108E+01	3.810E-01	1.000E+00
0	30	2.382E+00	4.751E+15	-6.111E+00	-7.784E+00	-2.962E+00	1.784E-01	3.644E+01	9.891E+00	1.937E-01	4.000E+00
0	31	3.535E-01	5.139E+14	-5.262E+00	-7.622E+00	-6.037E+00	1.230E-01	8.278E+01	1.180E+01	5.080E-02	4.000E+00
0	32	1.789E-01	4.172E+14	-5.898E+00	-8.326E+00	-5.506E+00	1.781E-01	5.685E+01	4.652E+01	2.794E-01	4.000E+00
0	33	4.521E+02	1.006E+14	-5.477E+00	-5.231E+00	-3.361E+00	1.331E-01	6.183E+01	5.002E+01	1.016E-01	3.000E+00
0	34	1.642E-06	9.649E+14	-4.840E+00	-8.163E+00	-6.391E+00	1.783E-01	6.929E+01	1.138E+01	2.286E-01	1.000E+00
0	35	6.130E-02	1.283E+15	-7.555E+00	-5.638E+00	-7.416E+00	1.226E-01	4.677E+01	4.763E+01	2.191E-01	2.000E+00
0	36	1.450E-04	1.976E+15	-6.357E+00	-7.368E+00	-7.793E+00	1.782E-01	5.607E+01	8.451E+01	4.445E-01	4.000E+00
0	37	7.340E+02	8.058E+14	-4.122E+00	-8.664E+00	-2.675E+00	1.491E-01	6.143E+01	1.081E+01	2.191E-01	1.000E+00
0	38	1.114E-01	3.532E+15	-5.715E+00	-1.005E+01	-4.735E+00	1.791E-01	8.897E+01	2.471E+01	2.794E-01	3.000E+00
0	39	7.733E+02	8.949E+14	-5.875E+00	-7.507E+00	-2.604E+00	2.183E-01	2.446E+01	5.961E+01	3.810E-01	3.000E+00
0	40	2.162E+00	3.960E+15	-5.069E+00	-7.398E+00	-8.154E+00	1.195E-01	5.421E+01	3.116E+01	1.016E-01	3.000E+00
0	41	6.482E-05	3.253E+14	-7.719E+00	-5.184E+00	-7.490E+00	1.409E-01	8.699E+01	4.422E+01	3.048E-01	3.000E+00
0	42	1.147E+01	2.128E+14	-6.234E+00	-1.185E+01	-5.187E+00	1.804E-01	6.034E+01	6.648E+01	3.810E-01	2.000E+00
0	43	1.390E-03	1.469E+15	-4.988E+00	-5.253E+00	-4.115E+00	1.386E-01	7.844E+01	8.948E+01	1.937E-01	4.000E+00
0	44	2.300E-03	2.175E+15	-6.514E+00	-7.166E+00	-4.619E+00	1.654E-01	3.086E+01	1.015E+01	3.048E-01	4.000E+00
0	45	3.214E-03	1.118E+15	-5.286E+00	-8.632E+00	-2.068E+00	1.360E-01	5.172E+01	8.248E+00	5.588E-01	4.000E+00
0	46	7.334E+00	3.742E+14	-6.059E+00	-7.237E+00	-4.306E+00	2.076E-01	9.112E+01	1.349E+01	5.080E-02	1.000E+00
0	47	1.936E-04	9.169E+13	-6.471E+00	-5.850E+00	-3.804E+00	1.052E-01	3.393E+01	2.201E+01	6.096E-01	3.000E+00
0	48	7.717E-02	2.324E+15	-5.576E+00	-6.931E+00	-6.622E+00	1.211E-01	2.751E+01	7.243E+01	6.096E-01	3.000E+00

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0   49  1.754E-03  1.138E+15 -5.757E+00 -6.269E+00 -4.495E+00  1.962E-01  6.658E+01  1.683E+01  4.445E-01  3.000E+00
0   50  1.021E-04  1.874E+14 -4.814E+00 -5.914E+00 -8.025E+00  1.038E-01  2.608E+01  2.825E+01  1.524E-01  4.000E+00
0   51  3.285E-01  5.950E+13 -5.788E+00 -6.066E+00 -8.288E+00  1.108E-01  4.061E+01  4.917E+00  4.445E-01  3.000E+00
0   52  2.149E-02  4.403E+14 -6.170E+00 -1.135E+01 -3.156E+00  1.253E-01  2.831E+01  1.195E+01  2.286E-01  1.000E+00
0   53  4.726E+00  6.430E+14 -5.983E+00 -1.226E+01 -3.003E+00  1.628E-01  2.983E+01  4.066E+01  1.524E-01  4.000E+00
0   54  4.179E-03  1.327E+14 -7.931E+00 -6.829E+00 -7.041E+00  1.617E-01  4.426E+01  7.681E+01  3.810E-01  2.000E+00
0   55  2.857E+02  9.049E+13 -5.145E+00 -5.787E+00 -5.032E+00  1.618E-01  5.578E+01  3.404E+01  1.016E-01  1.000E+00
0   56  1.272E-06  1.886E+15 -5.204E+00 -6.525E+00 -2.405E+00  9.943E-02  8.351E+01  6.284E+01  2.191E-01  1.000E+00
0   57  2.964E-02  1.052E+15 -5.819E+00 -8.229E+00 -3.707E+00  2.037E-01  3.551E+01  7.484E+01  3.048E-01  4.000E+00
0   58  1.304E-05  1.471E+14 -5.384E+00 -8.768E+00 -2.461E+00  2.061E-01  2.421E+01  6.930E+01  6.096E-01  2.000E+00
0   59  1.887E-05  2.438E+14 -5.532E+00 -6.439E+00 -8.201E+00  1.767E-01  8.841E+01  8.179E+01  3.492E-01  2.000E+00
0   60  6.706E+01  4.434E+15 -6.295E+00 -8.414E+00 -8.430E+00  1.021E-01  9.971E+01  6.068E+01  2.794E-01  1.000E+00
0   61  4.249E-04  3.681E+15 -5.999E+00 -8.516E+00 -2.010E+00  1.219E-01  8.488E+01  1.052E+01  2.286E-01  3.000E+00
0   62  2.774E-05  3.412E+15 -5.633E+00 -5.693E+00 -8.093E+00  1.612E-01  8.161E+01  2.599E+01  3.492E-01  1.000E+00
0   63  5.867E+00  2.940E+15 -6.216E+00 -5.965E+00 -6.487E+00  7.594E-02  4.827E+01  3.893E+01  3.810E-01  2.000E+00
0   64  3.264E+01  3.033E+14 -5.415E+00 -6.464E+00 -3.545E+00  1.158E-01  1.034E+02  9.121E+01  2.191E-01  4.000E+00
0   65  5.601E-05  2.212E+14 -6.016E+00 -5.402E+00 -2.211E+00  2.312E-01  6.872E+01  5.656E+01  3.048E-01  3.000E+00
0   66  7.792E-03  3.531E+14 -7.362E+00 -5.116E+00 -3.094E+00  1.672E-01  8.631E+01  9.617E+00  5.588E-01  3.000E+00
0   67  1.636E+00  1.660E+15 -4.284E+00 -7.703E+00 -7.309E+00  1.830E-01  8.113E+01  5.271E+01  3.492E-01  1.000E+00
0   68  6.515E-04  6.657E+14 -2.311E+00 -5.870E+00 -7.181E+00  2.059E-01  5.039E+01  9.370E+01  3.492E-01  1.000E+00
0   69  1.986E+01  7.220E+13 -5.098E+00 -1.105E+01 -6.295E+00  1.121E-01  3.297E+01  1.056E+01  2.508E-01  1.000E+00
0   70  5.516E-03  1.933E+14 -6.569E+00 -1.068E+01 -2.895E+00  1.312E-01  9.691E+01  3.777E+01  3.048E-01  4.000E+00
0   71  1.183E+02  7.764E+14 -6.760E+00 -8.041E+00 -6.732E+00  1.439E-01  7.268E+01  6.463E+01  2.508E-01  1.000E+00
0   72  6.520E-01  5.433E+15 -5.344E+00 -6.244E+00 -5.252E+00  1.235E-01  5.921E+01  1.383E+01  2.794E-01  2.000E+00
0   73  1.991E-02  2.674E+15 -5.699E+00 -6.386E+00 -6.887E+00  1.645E-01  2.775E+01  7.804E+01  5.080E-02  1.000E+00
0   74  1.131E-03  5.099E+15 -5.422E+00 -6.773E+00 -5.748E+00  1.221E-01  2.514E+01  9.420E+01  2.286E-01  1.000E+00
0   75  1.210E+01  1.072E+14 -5.228E+00 -1.188E+01 -7.573E+00  9.805E-02  6.484E+01  3.144E+01  1.937E-01  4.000E+00
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1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0LATIN HYPERCUBE SAMPLE INPUT VECTORS

 RUN NO.   X(21)
0    1  4.000E+01
0    2  3.400E+01
0    3  4.000E+01
0    4  4.000E+01
0    5  8.000E+00
0    6  4.000E+01
0    7 -1.000E+01
0    8  2.300E+01
0    9 -1.000E+01
0   10  4.000E+01
0   11  3.400E+01
0   12  2.300E+01
0   13  2.000E+00
0   14  2.000E+00
0   15  2.300E+01
0   16  8.000E+00
0   17  4.000E+01
0   18  8.000E+00
0   19  8.000E+00
0   20  2.000E+00
0   21  8.000E+00
0   22  2.300E+01
0   23  8.000E+00
0   24  4.000E+01
0   25  8.000E+00
0   26  4.000E+01
0   27  2.300E+01
0   28  2.300E+01
0   29 -1.000E+01
0   30  3.400E+01
0   31  3.400E+01
0   32  8.000E+00
0   33 -1.000E+01
0   34  3.400E+01
0   35  4.000E+01
0   36  2.300E+01
0   37  3.400E+01
0   38  8.000E+00
0   39  8.000E+00
0   40  2.300E+01
0   41  2.000E+00
0   42  4.000E+01
0   43  8.000E+00
0   44  2.300E+01
0   45 -1.000E+01
0   46  8.000E+00
0   47  8.000E+00
0   48  2.000E+00
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```
0    49  2.000E+00
0    50  4.000E+01
0    51  8.000E+00
0    52 -1.000E+01
0    53  3.400E+01
0    54  4.000E+01
0    55  8.000E+00
0    56  3.400E+01
0    57  2.000E+00
0    58  4.000E+01
0    59  2.000E+00
0    60  8.000E+00
0    61 -1.000E+01
0    62  8.000E+00
0    63  3.400E+01
0    64  2.300E+01
0    65  4.000E+01
0    66  3.400E+01
0    67  8.000E+00
0    68  8.000E+00
0    69  2.300E+01
0    70  8.000E+00
0    71  2.000E+00
0    72 -1.000E+01
0    73 -1.000E+01
0    74  3.400E+01
0    75  2.000E+00
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1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO        08/02/95 14:38:00
0RANKS OF LATIN HYPERCUBE SAMPLE INPUT VECTORS
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	RUN NO.	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)	X(9)	X(10)
0	1	68.	30.	8.	37.	39.	44.	31.	60.	22.	47.
0	2	39.	32.	38.	50.	47.	26.	67.	5.	57.	60.
0	3	49.	63.	27.	34.	18.	25.	12.	70.	21.	67.
0	4	26.	26.	47.	69.	35.	9.	37.	4.	71.	57.
0	5	30.	31.	46.	31.	45.	67.	3.	55.	67.	36.
0	6	56.	20.	20.	30.	64.	43.	58.	28.	27.	5.
0	7	51.	18.	25.	6.	55.	57.	34.	68.	10.	73.
0	8	52.	24.	24.	33.	57.	32.	22.	16.	68.	52.
0	9	58.	71.	19.	4.	3.	58.	43.	3.	72.	13.
0	10	64.	42.	11.	9.	23.	47.	66.	11.	44.	50.
0	11	63.	2.	15.	25.	71.	37.	7.	32.	70.	61.
0	12	23.	50.	51.	5.	42.	71.	62.	20.	33.	56.
0	13	73.	33.	3.	23.	46.	56.	71.	66.	1.	15.
0	14	19.	54.	58.	41.	32.	23.	14.	30.	66.	7.
0	15	2.	19.	74.	32.	53.	53.	68.	12.	39.	3.
0	16	38.	59.	40.	17.	9.	55.	54.	57.	5.	26.
0	17	70.	57.	6.	15.	27.	70.	46.	27.	42.	74.
0	18	35.	25.	41.	36.	50.	54.	30.	19.	62.	23.
0	19	42.	1.	34.	40.	73.	46.	26.	41.	56.	72.
0	20	74.	73.	2.	71.	7.	1.	8.	46.	63.	30.
0	21	10.	4.	66.	8.	75.	73.	65.	10.	45.	39.
0	22	37.	28.	37.	13.	37.	38.	40.	43.	31.	24.
0	23	44.	44.	31.	73.	25.	20.	63.	35.	18.	44.
0	24	65.	47.	12.	47.	34.	22.	20.	62.	34.	41.
0	25	41.	58.	35.	19.	13.	49.	52.	15.	51.	8.
0	26	48.	12.	28.	39.	62.	24.	75.	1.	30.	43.
0	27	29.	41.	48.	26.	33.	52.	19.	72.	8.	38.
0	28	3.	43.	73.	52.	43.	10.	13.	25.	69.	75.
0	29	43.	53.	33.	7.	41.	74.	15.	29.	64.	42.
0	30	34.	40.	42.	58.	19.	31.	47.	40.	26.	37.
0	31	1.	27.	75.	35.	51.	41.	72.	17.	17.	33.
0	32	8.	29.	69.	72.	36.	18.	49.	52.	13.	70.
0	33	31.	67.	45.	29.	15.	60.	32.	50.	29.	49.
0	34	14.	62.	63.	24.	17.	65.	11.	71.	19.	63.
0	35	6.	55.	70.	46.	21.	28.	45.	24.	48.	34.
0	36	5.	7.	71.	3.	65.	72.	25.	44.	47.	55.
0	37	7.	45.	68.	27.	26.	62.	59.	39.	16.	20.
0	38	4.	37.	72.	11.	40.	50.	2.	58.	65.	18.
0	39	75.	22.	1.	16.	56.	69.	38.	33.	43.	51.
0	40	60.	8.	16.	1.	74.	75.	6.	67.	55.	14.
0	41	18.	72.	57.	12.	5.	66.	51.	13.	54.	19.
0	42	61.	14.	14.	44.	72.	33.	29.	53.	28.	1.
0	43	57.	38.	18.	57.	30.	36.	42.	51.	20.	25.
0	44	12.	35.	64.	55.	44.	7.	48.	64.	6.	68.
0	45	15.	17.	60.	48.	70.	3.	55.	54.	7.	69.
0	46	46.	46.	32.	59.	38.	13.	1.	69.	59.	12.
0	47	20.	13.	55.	22.	59.	15.	16.	48.	50.	2.
0	48	69.	36.	7.	18.	24.	42.	23.	74.	4.	16.

0	49	54.	3.	22.	62.	66.	19.	44.	37.	32.	9.
0	50	11.	15.	65.	38.	54.	34.	4.	75.	24.	58.
0	51	40.	16.	36.	75.	60.	21.	18.	73.	11.	11.
0	52	25.	9.	52.	20.	67.	63.	53.	18.	46.	53.
0	53	36.	74.	39.	21.	2.	59.	60.	9.	49.	10.
0	54	55.	39.	21.	42.	49.	27.	74.	26.	2.	66.
0	55	32.	66.	44.	60.	10.	14.	64.	38.	15.	28.
0	56	17.	10.	59.	43.	68.	45.	27.	42.	53.	45.
0	57	59.	69.	17.	70.	11.	2.	39.	61.	12.	62.
0	58	13.	64.	62.	68.	8.	16.	5.	63.	60.	46.
0	59	45.	34.	30.	64.	48.	8.	69.	14.	35.	29.
0	60	22.	60.	54.	28.	20.	68.	70.	31.	9.	31.
0	61	24.	48.	53.	66.	31.	12.	50.	22.	41.	22.
0	62	33.	56.	43.	56.	14.	29.	73.	21.	3.	35.
0	63	72.	61.	4.	63.	12.	17.	35.	2.	74.	48.
0	64	67.	5.	10.	53.	69.	40.	57.	23.	36.	17.
0	65	9.	68.	67.	49.	6.	30.	10.	49.	61.	4.
0	66	71.	52.	5.	54.	29.	39.	36.	45.	38.	27.
0	67	66.	23.	9.	45.	52.	11.	24.	34.	58.	54.
0	68	21.	21.	56.	74.	63.	5.	61.	7.	52.	40.
0	69	28.	75.	50.	2.	1.	51.	56.	36.	23.	65.
0	70	47.	65.	29.	51.	16.	61.	9.	8.	75.	71.
0	71	16.	51.	61.	65.	28.	6.	33.	65.	14.	6.
0	72	27.	49.	49.	61.	22.	35.	17.	59.	40.	64.
0	73	62.	6.	13.	14.	61.	48.	41.	47.	25.	59.
0	74	50.	70.	26.	10.	4.	64.	21.	56.	37.	32.
0	75	53.	11.	23.	67.	58.	4.	28.	6.	73.	21.

1TITLE SDB Name = CMSTEST , Ver = X-2.31ZO 08/02/95 14:38:00
0RANKS OF LATIN HYPERCUBE SAMPLE INPUT VECTORS

	RUN NO.	X(11)	X(12)	X(13)	X(14)	X(15)	X(16)	X(17)	X(18)	X(19)	X(20)
0	1	8.	19.	50.	64.	11.	68.	68.	3.	9.	63.
0	2	9.	26.	24.	49.	44.	35.	6.	47.	63.	63.
0	3	45.	45.	18.	12.	18.	1.	72.	68.	68.	63.
0	4	65.	12.	65.	39.	31.	18.	23.	5.	14.	12.
0	5	25.	18.	9.	35.	61.	4.	27.	46.	36.	63.
0	6	50.	51.	45.	44.	69.	44.	24.	19.	4.	12.
0	7	51.	6.	16.	61.	53.	47.	69.	8.	14.	12.
0	8	42.	71.	38.	65.	42.	29.	10.	2.	51.	12.
0	9	14.	2.	73.	27.	37.	62.	70.	35.	68.	63.
0	10	5.	42.	32.	53.	71.	9.	57.	24.	63.	12.
0	11	67.	66.	29.	74.	64.	43.	55.	33.	36.	42.
0	12	39.	32.	13.	66.	51.	46.	30.	51.	30.	63.
0	13	3.	13.	63.	24.	46.	12.	14.	28.	14.	63.
0	14	4.	62.	55.	19.	1.	40.	12.	45.	19.	63.
0	15	69.	55.	71.	75.	47.	11.	15.	18.	73.	63.
0	16	23.	25.	59.	67.	73.	17.	34.	65.	14.	63.
0	17	62.	38.	68.	52.	2.	75.	20.	1.	68.	63.
0	18	7.	14.	42.	26.	9.	51.	19.	7.	63.	12.
0	19	48.	3.	12.	7.	25.	39.	47.	60.	57.	12.
0	20	12.	27.	14.	55.	30.	3.	1.	30.	4.	29.
0	21	6.	7.	5.	31.	62.	66.	16.	71.	4.	42.
0	22	55.	57.	22.	9.	33.	55.	54.	23.	36.	63.
0	23	34.	64.	40.	10.	70.	21.	26.	43.	41.	29.
0	24	18.	53.	72.	11.	66.	41.	74.	39.	30.	63.
0	25	64.	39.	6.	38.	28.	61.	25.	41.	24.	12.
0	26	21.	35.	64.	13.	26.	26.	41.	53.	30.	42.
0	27	70.	4.	60.	14.	60.	30.	52.	69.	73.	29.
0	28	72.	17.	62.	69.	38.	37.	43.	73.	19.	42.
0	29	35.	36.	74.	43.	54.	15.	29.	49.	57.	12.
0	30	54.	73.	23.	28.	58.	60.	22.	10.	19.	63.
0	31	47.	37.	52.	30.	27.	25.	60.	16.	4.	63.
0	32	44.	33.	30.	21.	32.	57.	40.	42.	41.	63.
0	33	73.	10.	44.	71.	52.	32.	46.	48.	9.	42.
0	34	2.	47.	66.	23.	23.	59.	51.	15.	30.	12.
0	35	40.	52.	3.	63.	14.	24.	32.	44.	24.	29.
0	36	19.	59.	15.	34.	10.	58.	39.	67.	63.	63.
0	37	74.	44.	70.	16.	63.	42.	45.	14.	24.	12.
0	38	43.	68.	36.	8.	39.	63.	66.	26.	41.	42.
0	39	75.	46.	31.	32.	65.	73.	3.	54.	57.	42.
0	40	53.	70.	58.	33.	6.	19.	37.	31.	9.	42.
0	41	16.	29.	2.	72.	13.	36.	64.	40.	46.	42.
0	42	59.	22.	19.	3.	35.	64.	44.	58.	57.	29.
0	43	27.	54.	61.	70.	45.	34.	56.	70.	19.	63.
0	44	29.	60.	10.	37.	40.	53.	13.	11.	46.	63.
0	45	30.	49.	51.	17.	74.	33.	36.	6.	68.	63.
0	46	58.	31.	25.	36.	43.	72.	67.	20.	4.	12.
0	47	20.	9.	11.	59.	48.	10.	18.	25.	73.	42.
0	48	41.	61.	41.	40.	21.	20.	7.	61.	73.	42.

0	49	28.	50.	35.	50.	41.	67.	49.	22.	63.	42.
0	50	17.	20.	67.	57.	8.	8.	5.	29.	14.	63.
0	51	46.	1.	34.	54.	4.	13.	28.	4.	63.	42.
0	52	37.	34.	21.	4.	55.	28.	9.	17.	30.	12.
0	53	56.	40.	28.	1.	57.	50.	11.	38.	14.	63.
0	54	31.	15.	1.	41.	17.	48.	31.	63.	57.	29.
0	55	71.	8.	56.	60.	36.	49.	38.	34.	9.	12.
0	56	1.	58.	54.	45.	68.	6.	61.	56.	24.	12.
0	57	38.	48.	33.	22.	49.	69.	21.	62.	46.	63.
0	58	10.	16.	48.	15.	67.	71.	2.	59.	73.	29.
0	59	11.	24.	43.	47.	5.	56.	65.	66.	51.	29.
0	60	66.	72.	17.	20.	3.	7.	73.	55.	41.	12.
0	61	22.	69.	27.	18.	75.	22.	62.	12.	30.	42.
0	62	13.	67.	39.	62.	7.	45.	59.	27.	51.	12.
0	63	57.	65.	20.	56.	22.	2.	33.	37.	57.	29.
0	64	63.	28.	47.	46.	50.	16.	75.	72.	24.	63.
0	65	15.	23.	26.	68.	72.	74.	50.	52.	46.	42.
0	66	33.	30.	4.	73.	56.	54.	63.	9.	68.	42.
0	67	52.	56.	69.	29.	15.	65.	58.	50.	51.	12.
0	68	24.	41.	75.	58.	16.	70.	35.	74.	51.	12.
0	69	61.	5.	57.	5.	24.	14.	17.	13.	36.	12.
0	70	32.	21.	8.	6.	59.	31.	71.	36.	46.	63.
0	71	68.	43.	7.	25.	20.	38.	53.	57.	36.	12.
0	72	49.	75.	49.	51.	34.	27.	42.	21.	41.	29.
0	73	36.	63.	37.	48.	19.	52.	8.	64.	4.	12.
0	74	26.	74.	46.	42.	29.	23.	4.	75.	30.	12.
0	75	60.	11.	53.	2.	12.	5.	48.	32.	19.	63.

```
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0RANKS OF LATIN HYPERCUBE SAMPLE INPUT VECTORS

 RUN NO.      X(21)
0    1         69.
0    2         56.
0    3         69.
0    4         69.
0    5         30.
0    6         69.
0    7          5.
0    8         45.
0    9          5.
0   10         69.
0   11         56.
0   12         45.
0   13         15.
0   14         15.
0   15         45.
0   16         30.
0   17         69.
0   18         30.
0   19         30.
0   20         15.
0   21         30.
0   22         45.
0   23         30.
0   24         69.
0   25         30.
0   26         69.
0   27         45.
0   28         45.
0   29          5.
0   30         56.
0   31         56.
0   32         30.
0   33          5.
0   34         56.
0   35         69.
0   36         45.
0   37         56.
0   38         30.
0   39         30.
0   40         45.
0   41         15.
0   42         69.
0   43         30.
0   44         45.
0   45          5.
0   46         30.
0   47         30.
0   48         15.
```

```
0   49       15.
0   50       69.
0   51       30.
0   52        5.
0   53       56.
0   54       69.
0   55       30.
0   56       56.
0   57       15.
0   58       69.
0   59       15.
0   60       30.
0   61        5.
0   62       30.
0   63       56.
0   64       45.
0   65       69.
0   66       56.
0   67       30.
0   68       30.
0   69       45.
0   70       30.
0   71       15.
0   72        5.
0   73        5.
0   74       56.
0   75       15.
1   TITLE SDB Name = CMSTEST         , Ver = X-2.31ZO        08/02/95 14:38:00
```

```
0  HISTOGRAM FOR VARIABLE NO.  1     NORMAL          DISTRIBUTION
     MIDPOINT                FREQ.

   -0.5000000E-02             1    X
    0.5000000E-02             1    X
    0.1500000E-01             0
    0.2500000E-01             2    XX
    0.3500000E-01             2    XX
    0.4500000E-01             3    XXX
    0.5500000E-01             4    XXXX
    0.6500001E-01             5    XXXXX
    0.7500000E-01             7    XXXXXXX
    0.8500000E-01             6    XXXXXX
    0.9500000E-01             6    XXXXXX
    0.1050000                 7    XXXXXXX
    0.1150000                 7    XXXXXXX
    0.1250000                 6    XXXXXX
    0.1350000                 5    XXXXX
    0.1450000                 4    XXXX
    0.1550000                 3    XXX
    0.1650000                 2    XX
    0.1750000                 2    XX
    0.1850000                 1    X
    0.1950000                 1    X
0                            75

      MIN            MAX           RANGE           MEAN          MEDIAN        VARIANCE

  -0.2235174E-07  0.2000000     0.2000001     0.9982305E-01  0.1000560     0.1784751E-02
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  2      NORMAL           DISTRIBUTION

     MIDPOINT          FREQ.

    586.5001              1     X
    609.5001              1     X
    632.5001              2     XX
    655.5001              2     XX
    678.5001              3     XXX
    701.5001              4     XXXX
    724.5001              4     XXXX
    747.5001              6     XXXXXX
    770.5001              7     XXXXXXX
    793.5001              6     XXXXXX
    816.5001              7     XXXXXXX
    839.5001              7     XXXXXXX
    862.5001              6     XXXXXX
    885.5001              5     XXXXX
    908.5001              4     XXXX
    931.5001              3     XXX
    954.5001              3     XXX
    977.5001              1     X
    1000.500              1     X
    1023.500              1     X
    1046.500              1     X
0                        75

      MIN          MAX          RANGE         MEAN         MEDIAN       VARIANCE

    585.3286     1042.000     456.6714     809.8748     808.8511     9664.427
```

```
1   TITLE SDB Name = CMSTEST           , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  3       NORMAL            DISTRIBUTION

      MIDPOINT               FREQ.

   -0.3899998E-01             1    X
   -0.3299998E-01             1    X
   -0.2699999E-01             0
   -0.2099999E-01             2    XX
   -0.1499999E-01             2    XX
   -0.8999996E-02             4    XXXX
   -0.2999999E-02             4    XXXX
    0.2999999E-02             5    XXXXX
    0.8999996E-02             5    XXXXX
    0.1499999E-01             7    XXXXXXX
    0.2099999E-01             7    XXXXXXX
    0.2699999E-01             7    XXXXXXX
    0.3299998E-01             7    XXXXXXX
    0.3899998E-01             6    XXXXXX
    0.4499998E-01             4    XXXX
    0.5099998E-01             4    XXXX
    0.5699997E-01             3    XXX
    0.6299997E-01             3    XXX
    0.6899997E-01             1    X
    0.7499997E-01             1    X
    0.8099996E-01             1    X
0                            75

       MIN            MAX           RANGE          MEAN           MEDIAN         VARIANCE

  -0.3673701E-01  0.8326402E-01  0.1200010    0.2322436E-01  0.2336514E-01  0.6370938E-03
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  4      LOGNORMAL        DISTRIBUTION

     MIDPOINT          FREQ.

   0.4699997E-01        27     XXXXXXXXXXXXXXXXXXXXXXXXXXX
   0.1409999            17     XXXXXXXXXXXXXXXXX
   0.2349999            10     XXXXXXXXXX
   0.3289998             6     XXXXXX
   0.4229998             3     XXX
   0.5169997             3     XXX
   0.6109996             2     XX
   0.7049996             1     X
   0.7989995             1     X
   0.8929994             1     X
   0.9869993             1     X
    1.080999             0
    1.174999             1     X
    1.268999             0
    1.362999             0
    1.456999             0
    1.550999             0
    1.644999             0
    1.738999             1     X
    1.832999             0
    1.926999             1     X
0                       75

      MIN            MAX           RANGE          MEAN          MEDIAN        VARIANCE

   0.9999994E-02   1.894962       1.884962      0.2694961      0.1486647      0.1208851
```

```
1   TITLE SDB Name = CMSTEST            , Ver = X-2.31ZO          08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  5      LOGNORMAL         DISTRIBUTION

     MIDPOINT            FREQ.

    8.500001              66    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
    25.50000               4    XXXX
    42.50001               2    XX
    59.50001               0
    76.50002               0
    93.50002               0
    110.5000               1    X
    127.5000               0
    144.5000               0
    161.5000               1    X
    178.5000               0
    195.5000               0
    212.5000               0
    229.5000               0
    246.5000               0
    263.5000               0
    280.5000               0
    297.5000               0
    314.5000               0
    331.5000               0
    348.5000               1    X
0                         75

      MIN           MAX          RANGE          MEAN         MEDIAN        VARIANCE

  0.9999980E-03   350.0006      349.9996      12.15909     0.5773439      2080.278
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  6      LOGNORMAL       DISTRIBUTION

     MIDPOINT           FREQ.

    1300.000             72    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
    3900.001              1    X
    6500.001              0
    9100.002              0
    11700.00              1    X
    14300.00              0
    16900.00              0
    19500.00              0
    22100.00              0
    24700.00              0
    27300.00              0
    29900.00              0
    32500.00              0
    35100.00              0
    37700.00              0
    40300.00              0
    42900.00              0
    45500.00              0
    48100.00              0
    50700.00              0
    53300.00              1    X
0                        75


      MIN            MAX          RANGE          MEAN         MEDIAN        VARIANCE

   0.9999979E-04   52500.10      52500.10      1033.231      2.212465     0.3796621E+08
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO        08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  7     UNIFORM          DISTRIBUTION

     MIDPOINT            FREQ.

   -0.5144998              1    X
   -0.4654998              3    XXX
   -0.4164998              4    XXXX
   -0.3674998              4    XXXX
   -0.3184998              3    XXX
   -0.2694998              4    XXXX
   -0.2204998              4    XXXX
   -0.1714998              3    XXX
   -0.1224999              5    XXXXX
   -0.7349989E-01          3    XXX
   -0.2449990E-01          4    XXXX
    0.2450008E-01          3    XXX
    0.7350007E-01          4    XXXX
    0.1225001              4    XXXX
    0.1715000              3    XXX
    0.2205000              4    XXXX
    0.2695000              3    XXX
    0.3185000              4    XXXX
    0.3675000              4    XXXX
    0.4165000              4    XXXX
    0.4655000              3    XXX
    0.5145000              1    X
0                         75

      MIN           MAX          RANGE          MEAN          MEDIAN          VARIANCE

  -0.4935275     0.4952782     0.9888058     0.1103552E-03 -0.4317144E-02  0.8310926E-01
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  8      UNIFORM          DISTRIBUTION

     MIDPOINT           FREQ.

   0.2449999E-01          3     XXX
   0.7349998E-01          4     XXXX
   0.1225000              4     XXXX
   0.1715000              4     XXXX
   0.2204999              3     XXX
   0.2694999              4     XXXX
   0.3184999              4     XXXX
   0.3674999              4     XXXX
   0.4164999              4     XXXX
   0.4654999              3     XXX
   0.5144999              3     XXX
   0.5634999              4     XXXX
   0.6124998              3     XXX
   0.6614998              4     XXXX
   0.7104998              4     XXXX
   0.7594997              4     XXXX
   0.8084997              4     XXXX
   0.8574997              3     XXX
   0.9064996              4     XXXX
   0.9554996              3     XXX
    1.004500              2     XX
0                        75

      MIN            MAX          RANGE          MEAN          MEDIAN        VARIANCE

   0.3375098E-02  0.9870160    0.9836408     0.5003692     0.4948947     0.8341296E-01
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO.  9     UNIFORM          DISTRIBUTION

     MIDPOINT                FREQ.

     12.00000                  2    XX
     36.00001                  3    XXX
     60.00002                  4    XXXX
     84.00002                  4    XXXX
     108.0000                  4    XXXX
     132.0000                  4    XXXX
     156.0000                  3    XXX
     180.0000                  4    XXXX
     204.0000                  4    XXXX
     228.0000                  3    XXX
     252.0000                  4    XXXX
     276.0000                  3    XXX
     300.0000                  4    XXXX
     324.0000                  4    XXXX
     348.0000                  4    XXXX
     372.0000                  3    XXX
     396.0000                  4    XXXX
     420.0000                  3    XXX
     444.0000                  4    XXXX
     468.0000                  4    XXXX
     492.0000                  3    XXX
0                             75

      MIN         MAX          RANGE        MEAN         MEDIAN       VARIANCE

     14.91024    495.0190     480.1088     255.6820     254.5961     19852.67
```

```
1  TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0 HISTOGRAM FOR VARIABLE NO. 10     LOGUNIFORM      DISTRIBUTION

    MIDPOINT           FREQ.

   0.2399999E-12        58    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   0.7199997E-12         4    XXXX
   0.1200000E-11         3    XXX
   0.1679999E-11         1    X
   0.2159999E-11         2    XX
   0.2639999E-11         1    X
   0.3119999E-11         0
   0.3599999E-11         1    X
   0.4079999E-11         1    X
   0.4559999E-11         0
   0.5039998E-11         0
   0.5519998E-11         1    X
   0.5999998E-11         1    X
   0.6479998E-11         0
   0.6959997E-11         0
   0.7439997E-11         0
   0.7919997E-11         1    X
   0.8399997E-11         0
   0.8879997E-11         0
   0.9359996E-11         1    X
0                       75

      MIN            MAX            RANGE           MEAN           MEDIAN         VARIANCE

   0.1022584E-16  0.9586601E-11  0.9586591E-11  0.7263153E-12  0.1096473E-13  0.3241791E-23
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 11     LOGUNIFORM       DISTRIBUTION

     MIDPOINT            FREQ.

    19.50000              64   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
    58.49999               2   XX
    97.49998               1   X
    136.5000               2   XX
    175.5000               0
    214.5000               1   X
    253.5000               0
    292.5000               1   X
    331.5000               1   X
    370.5000               0
    409.5000               0
    448.5000               1   X
    487.5000               0
    526.4999               0
    565.4999               0
    604.4999               0
    643.4999               0
    682.4999               0
    721.4999               1   X
    760.4999               1   X
0                         75

      MIN            MAX          RANGE          MEAN          MEDIAN        VARIANCE

   0.1271550E-05   773.3129     773.3129      46.09647    0.2964271E-01   19776.59
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 12     LOGUNIFORM       DISTRIBUTION

     MIDPOINT           FREQ.

   0.1350000E+15        26    XXXXXXXXXXXXXXXXXXXXXXXXXX
   0.4050000E+15        11    XXXXXXXXXXX
   0.6750001E+15         7    XXXXXXX
   0.9450001E+15         4    XXXX
   0.1215000E+16         4    XXXX
   0.1485000E+16         3    XXX
   0.1755000E+16         3    XXX
   0.2025000E+16         1    X
   0.2295000E+16         3    XXX
   0.2565001E+16         1    X
   0.2835001E+16         2    XX
   0.3105001E+16         1    X
   0.3375001E+16         1    X
   0.3645001E+16         2    XX
   0.3915001E+16         1    X
   0.4185002E+16         1    X
   0.4455002E+16         1    X
   0.4725002E+16         1    X
   0.4995002E+16         1    X
   0.5265002E+16         0
   0.5535002E+16         1    X
0                       75

      MIN            MAX           RANGE          MEAN          MEDIAN        VARIANCE

   0.5950341E+14  0.5433227E+16  0.5373723E+16  0.1202509E+16  0.5745110E+15  0.1942293E+31
```

```
1   TITLE SDB Name = CMSTEST           , Ver = X-2.31ZO          08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 13      USER SUPPLIED   DISTRIBUTION

     MIDPOINT             FREQ.

   -7.980001                1    X
   -7.700001                1    X
   -7.420001                2    XX
   -7.140000                2    XX
   -6.860000                1    X
   -6.580000                5    XXXXX
   -6.300000                9    XXXXXXXXX
   -6.020000                9    XXXXXXXXX
   -5.739999               10    XXXXXXXXXX
   -5.459999               10    XXXXXXXXXX
   -5.179999                8    XXXXXXXX
   -4.899999               10    XXXXXXXXXX
   -4.619998                0
   -4.339998                1    X
   -4.059998                1    X
   -3.779998                0
   -3.499998                1    X
   -3.219998                1    X
   -2.939998                1    X
   -2.659998                0
   -2.379998                2    XX
0                          75

      MIN            MAX            RANGE          MEAN           MEDIAN         VARIANCE

   -7.930552      -2.311468       5.619084      -5.605802      -5.680040       1.084381
```

```
1  TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0 HISTOGRAM FOR VARIABLE NO. 14     USER SUPPLIED   DISTRIBUTION

    MIDPOINT           FREQ.

   -12.42000             1    X
   -12.06000             1    X
   -11.70000             1    X
   -11.34000             1    X
   -10.98000             1    X
   -10.62000             1    X
   -10.26000             1    X
   -9.900001             2    XX
   -9.540001             1    X
   -9.180001             1    X
   -8.820002             5    XXXXX
   -8.460002             5    XXXXX
   -8.100002             5    XXXXX
   -7.740002             5    XXXXX
   -7.380002             5    XXXXX
   -7.020002             4    XXXX
   -6.660002             5    XXXXX
   -6.300002             8    XXXXXXXX
   -5.940001             7    XXXXXXX
   -5.580001             8    XXXXXXXX
   -5.220001             7    XXXXXXX
0                       75

      MIN          MAX          RANGE         MEAN          MEDIAN        VARIANCE

   -12.25908    -5.048095     7.210989     -7.399879     -7.033592      3.237962
```

```
1   TITLE SDB Name = CMSTEST           , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 15      USER SUPPLIED   DISTRIBUTION

     MIDPOINT            FREQ.

   -8.745000               1    X
   -8.415000               3    XXX
   -8.085000               4    XXXX
   -7.755000               3    XXX
   -7.425000               4    XXXX
   -7.095000               2    XX
   -6.765000               4    XXXX
   -6.435000               3    XXX
   -6.105000               3    XXX
   -5.775001               3    XXX
   -5.445001               3    XXX
   -5.115001               4    XXXX
   -4.785001               2    XX
   -4.455001               4    XXXX
   -4.125001               2    XX
   -3.795001               4    XXXX
   -3.465001               3    XXX
   -3.135001               5    XXXXX
   -2.805001               7    XXXXXXX
   -2.475001               5    XXXXX
   -2.145001               6    XXXXXX
0                         75

      MIN          MAX          RANGE          MEAN          MEDIAN        VARIANCE

   -8.595756    -2.010489     6.585267     -4.991785     -4.790796      4.205729
```

```
1   TITLE SDB Name = CMSTEST         , Ver = X-2.31ZO        08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 16     USER SUPPLIED   DISTRIBUTION

     MIDPOINT          FREQ.

   0.6239996E-01         1     X
   0.7199995E-01         1     X
   0.8159994E-01         0
   0.9119993E-01         2     XX
   0.1007999             6     XXXXXX
   0.1103999             5     XXXXX
   0.1199999            12     XXXXXXXXXXXX
   0.1295999             5     XXXXX
   0.1391999             6     XXXXXX
   0.1487999             5     XXXXX
   0.1583999             8     XXXXXXXX
   0.1679999             4     XXXX
   0.1775999             9     XXXXXXXXX
   0.1871999             2     XX
   0.1967999             1     X
   0.2063999             5     XXXXX
   0.2159999             1     X
   0.2255999             0
   0.2351999             1     X
   0.2447999             0
   0.2543999             1     X
0                       75

      MIN            MAX            RANGE          MEAN           MEDIAN         VARIANCE

   0.5809073E-01  0.2498642      0.1917735      0.1468146      0.1439133      0.1415730E-02
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 17      USER SUPPLIED   DISTRIBUTION

     MIDPOINT              FREQ.

    22.00000                 1    X
    26.00000                 7    XXXXXXX
    30.00000                 7    XXXXXXX
    34.00000                 6    XXXXXX
    38.00000                 5    XXXXX
    42.00000                 4    XXXX
    46.00000                 2    XX
    50.00000                 4    XXXX
    54.00000                 2    XX
    58.00000                 5    XXXXX
    62.00000                 4    XXXX
    65.99999                 2    XX
    69.99999                 3    XXX
    73.99999                 2    XX
    77.99999                 3    XXX
    81.99999                 4    XXXX
    85.99999                 3    XXX
    89.99999                 3    XXX
    93.99999                 3    XXX
    97.99999                 3    XXX
    102.0000                 2    XX
0                           75

      MIN          MAX          RANGE         MEAN          MEDIAN        VARIANCE

    23.37967     103.3688      79.98914      57.02769      55.78229      582.3454
```

```
1  TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0 HISTOGRAM FOR VARIABLE NO. 18     USER SUPPLIED   DISTRIBUTION

    MIDPOINT           FREQ.

   2.299999              3    XXX
   6.899998              4    XXXX
   11.50000             13    XXXXXXXXXXXXX
   16.09999              3    XXX
   20.69999              2    XX
   25.29999              2    XX
   29.89999              5    XXXXX
   34.49999              3    XXX
   39.09999              3    XXX
   43.69999              3    XXX
   48.29998              7    XXXXXXX
   52.89998              3    XXX
   57.49998              3    XXX
   62.09998              2    XX
   66.69998              2    XX
   71.29998              3    XXX
   75.89998              3    XXX
   80.49998              2    XX
   85.09998              1    X
   89.69997              5    XXXXX
   94.29997              3    XXX
0                       75

     MIN          MAX          RANGE         MEAN         MEDIAN       VARIANCE

   1.497821     94.20219     92.70438     42.20030     40.65907     796.9465
```

```
1   TITLE SDB Name = CMSTEST            , Ver = X-2.31ZO        08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 19      USER SUPPLIED   DISTRIBUTION

      MIDPOINT            FREQ.

    0.4200000E-01           6    XXXXXX
    0.7000001E-01           0
    0.9800001E-01           4    XXXX
    0.1260000               0
    0.1540000               6    XXXXXX
    0.1820000               5    XXXXX
    0.2100000               5    XXXXX
    0.2380000              12    XXXXXXXXXXXX
    0.2660000               5    XXXXX
    0.2940000               5    XXXXX
    0.3220000               0
    0.3500000               5    XXXXX
    0.3780000               6    XXXXXX
    0.4060000               0
    0.4340000               6    XXXXXX
    0.4620000               0
    0.4900000               0
    0.5180000               0
    0.5460000               5    XXXXX
    0.5740000               0
    0.6020000               5    XXXXX
0                          75

       MIN          MAX          RANGE         MEAN          MEDIAN        VARIANCE

    0.5080000E-01  0.6096000    0.5588000     0.2934133     0.2508300     0.2383614E-01
```

```
1  TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0 HISTOGRAM FOR VARIABLE NO. 20      USER SUPPLIED   DISTRIBUTION

   MIDPOINT          FREQ.

  0.9750000            23    XXXXXXXXXXXXXXXXXXXXXXX
   1.125000             0
   1.275000             0
   1.425000             0
   1.575000             0
   1.725000             0
   1.875000             0
   2.025000            10    XXXXXXXXXX
   2.175000             0
   2.325000             0
   2.475000             0
   2.625000             0
   2.775000             0
   2.925000            16    XXXXXXXXXXXXXXXX
   3.075001             0
   3.225001             0
   3.375001             0
   3.525001             0
   3.675001             0
   3.825001             0
   3.975001            26    XXXXXXXXXXXXXXXXXXXXXXXXXX
0                      75

     MIN            MAX           RANGE          MEAN          MEDIAN        VARIANCE

   1.000000       4.000000       3.000000       2.600000       3.000000       1.546667
```

```
1   TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO          08/02/95 14:38:00
0  HISTOGRAM FOR VARIABLE NO. 21      USER SUPPLIED   DISTRIBUTION

     MIDPOINT              FREQ.

   -8.750003                 9     XXXXXXXXX
   -6.250002                 0
   -3.750002                 0
   -1.250001                 0
    1.250000                10     XXXXXXXXXX
    3.750000                 0
    6.250001                 0
    8.750002                20     XXXXXXXXXXXXXXXXXXXX
    11.25000                 0
    13.75000                 0
    16.25000                 0
    18.75000                 0
    21.25000                 0
    23.75000                11     XXXXXXXXXXX
    26.25000                 0
    28.75000                 0
    31.25000                 0
    33.75000                11     XXXXXXXXXXX
    36.25000                 0
    38.75000                14     XXXXXXXXXXXXXX
0                           75

      MIN           MAX           RANGE          MEAN          MEDIAN        VARIANCE

   -10.00000      40.00000      50.00000      17.02667      8.000000      285.4926
```

```
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RAW DATA                                    PAGE   1
0    1  1.0000
0    2 -0.0032  1.0000
0    3 -0.9988 -0.0003  1.0000
0    4 -0.0092 -0.0049  0.0082  1.0000
0    5 -0.0601 -0.4123  0.0600 -0.1191  1.0000
0    6  0.0816 -0.1502 -0.0848 -0.1210  0.4276  1.0000
0    7 -0.0444 -0.0011  0.0393  0.0065  0.0371 -0.1817  1.0000
0    8  0.0349  0.0048 -0.0293  0.0243 -0.0650  0.1240 -0.5134  1.0000
0    9  0.0111 -0.0234 -0.0134 -0.0483  0.0958  0.1256 -0.4504 -0.4727  1.0000
0   10 -0.0674 -0.0364  0.0710 -0.0522  0.0259 -0.0547 -0.1039  0.0357  0.0183  1.0000
0   11 -0.0284  0.0467  0.0254 -0.1098 -0.0680 -0.0416  0.0512 -0.0039 -0.0733  0.0649  1.0000
0   12  0.0034 -0.0143 -0.0018 -0.0599 -0.0210  0.2054 -0.0872  0.0793 -0.0048 -0.1687 -0.1129  1.0000
0   13  0.0000  0.0032  0.0073  0.1273 -0.1628  0.1128 -0.0333 -0.0368  0.0696 -0.0472  0.1372 -0.0053  1.0000
0   14  0.0378 -0.0254 -0.0425  0.0447 -0.0926  0.0130  0.0180  0.0160 -0.0216 -0.0029  0.0640  0.0546  0.0002  1.0000
0   15  0.0023  0.0020  0.0002 -0.1283  0.0538 -0.1496  0.0331  0.0278  0.0294 -0.0597  0.2128 -0.0843  0.0295 -0.0463  1.0000
0   16  0.0153 -0.0096 -0.0123  0.0245  0.0851 -0.0807  0.0328  0.0247  0.0012  0.1524  0.1053 -0.1237  0.0123  0.0291  0.0056
0   17  0.0167  0.0024 -0.0060 -0.0950 -0.0848 -0.0426 -0.0510  0.0286 -0.0208  0.0554 -0.0549 -0.0104  0.0259 -0.0180 -0.0049
0   18  0.0132 -0.0157 -0.0096  0.0210  0.1988 -0.0112 -0.0055  0.0219 -0.0291  0.0053  0.0495 -0.0831 -0.0230  0.0178 -0.0414
0   19  0.0403 -0.0042 -0.0468  0.0418 -0.1808 -0.1352 -0.0661  0.0081  0.0183  0.0973 -0.0443 -0.0632  0.0685  0.0014 -0.0144
0   20 -0.0254 -0.0230  0.0274 -0.0535  0.0066  0.0181 -0.0103  0.0746 -0.0509  0.0756 -0.0964 -0.1124 -0.0244 -0.0340  0.1010
0   21 -0.0372  0.0278  0.0367 -0.1442 -0.0436 -0.0023  0.0023 -0.0409  0.0257 -0.0057 -0.0215 -0.0363 -0.0617  0.0349 -0.0067
0            1       2       3       4       5       6       7       8       9      10      11      12      13      14      15
0VARIABLES
1TITLE SDB Name = CMSTEST          , Ver = X-2.31ZO         08/02/95 14:38:00
0CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RAW DATA                         PAGE   2


0
0   16  1.0000
0   17  0.0187  1.0000
0   18  0.0070  0.0301  1.0000
0   19  0.0409 -0.0216  0.0478  1.0000
0   20  0.0122  0.0311  0.0285  0.1002  1.0000
0   21  0.0378 -0.0171 -0.0212  0.0407  0.0773  1.0000
0           16      17      18      19      20      21
0VARIABLES
```

```
1TITLE SDB Name = CMSTEST         , Ver = X-2.31ZO        08/02/95 14:38:00
0CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RANK DATA                    PAGE   1
0    1  1.0000
0    2 -0.0330  1.0000
0    3 -0.9992  0.0363  1.0000
0    4 -0.0212  0.0265  0.0212  1.0000
0    5  0.0265 -0.9491 -0.0279 -0.0471  1.0000
0    6 -0.0023  0.0273  0.0032 -0.8173 -0.0073  1.0000
0    7 -0.0305 -0.0233  0.0253 -0.0141  0.0102  0.0329  1.0000
0    8  0.0130  0.0169 -0.0070 -0.0011 -0.0366 -0.0309 -0.5167  1.0000
0    9  0.0134 -0.0163 -0.0143 -0.0143  0.0536  0.0182 -0.4484 -0.4709  1.0000
0   10 -0.0148 -0.0252  0.0147  0.0013  0.0496 -0.0019 -0.0395  0.0167 -0.0508  1.0000
0   11  0.0360 -0.0192 -0.0365 -0.0059  0.0107  0.0207  0.0008 -0.0121 -0.0504  0.0080  1.0000
0   12  0.0193  0.0008 -0.0201  0.0008 -0.0321 -0.0182 -0.0037  0.0299 -0.0365 -0.0228  0.0390  1.0000
0   13  0.0262 -0.0368 -0.0228 -0.0038  0.0244 -0.0137 -0.0003  0.0251 -0.0372 -0.0053  0.0112  0.0090  1.0000
0   14  0.0539  0.0170 -0.0547  0.0165 -0.0208 -0.0053  0.0190 -0.0523  0.0394 -0.0139 -0.0623 -0.0034 -0.0165  1.0000
0   15 -0.0229  0.0152  0.0242 -0.0282 -0.0148  0.0766  0.0333  0.0294  0.0224 -0.0031 -0.0057 -0.0228 -0.0346 -0.0389  1.0000
0   16 -0.0012  0.0158  0.0010  0.0128  0.0096 -0.0158  0.0230  0.0260  0.0030  0.0251 -0.0194 -0.0075 -0.0636 -0.0402  0.0074
0   17  0.0368  0.0388 -0.0323  0.0733 -0.0224 -0.0215 -0.0328  0.0170 -0.0322 -0.0453  0.0622 -0.0049 -0.0078 -0.0168  0.0012
0   18  0.0091  0.0424 -0.0072 -0.0183 -0.0037  0.0240 -0.0078  0.0084 -0.0003  0.0139 -0.0468 -0.0288 -0.0574 -0.0250 -0.0191
0   19  0.0478  0.0078 -0.0502  0.0283  0.0032 -0.0593 -0.0535 -0.0324  0.0410  0.0813 -0.0845  0.0032 -0.0911 -0.0473 -0.0372
0   20 -0.0033 -0.0189  0.0042  0.0103  0.0075  0.0017  0.0023  0.0713 -0.0635 -0.0044 -0.1314 -0.0377  0.0031 -0.0352  0.0866
0   21 -0.0169  0.0076  0.0121 -0.0182 -0.0254  0.0173 -0.0037 -0.0401  0.0245  0.1045  0.0176  0.0302  0.0454  0.0455  0.0184
0            1       2       3       4       5       6       7       8       9      10      11      12      13      14      15
0VARIABLES
1TITLE SDB Name = CMSTEST         , Ver = X-2.31ZO        08/02/95 14:38:00
0CORRELATIONS AMONG INPUT VARIABLES CREATED BY THE LATIN HYPERCUBE SAMPLE FOR RANK DATA                    PAGE   2
0
0
0
0   16  1.0000
0   17  0.0657  1.0000
0   18  0.0173  0.0235  1.0000
0   19  0.0726  0.0015  0.0455  1.0000
0   20 -0.0085  0.0171  0.0172  0.0347  1.0000
0   21  0.0388 -0.0084 -0.0329  0.0245  0.0663  1.0000
0           16      17      18      19      20      21
0VARIABLES
```

END OF APPENDIX B

APPENDIX C: EXAMPLE OF AN LHS DEBUG FILE (LHSTBL.DBG)

Listed below is a Sample LHS ASCII output debug file, as described in Sec. 9.2. This file contains 75 outcome vectors, each with a parameter value for the 21 distributions sampled in the LHS run.

```
            1              21  0.1545607       781.4318      -9.6473973E-03
  0.1389526       0.6784240       5.534760      -9.9393152E-02  0.7892224
   152.3450       5.5398116E-14  7.9310748E-06   1.7404350E+14  -5.322937
  -5.597586      -7.693778        0.2028905       92.53667        3.910268
  0.1016000        4.000000       40.00000
            2              21  0.1008426       790.8044       2.3365144E-02
  0.2382396        1.427455       0.3706800       0.3862761      6.5317944E-02
   377.7367       5.6421897E-13  1.1620521E-05  2.6061444E+14  -6.077052
  -6.342031      -4.229351        0.1389940       26.39066        49.53764
  0.4445000        4.000000       34.00000
            3              21  0.1157040       905.5831       1.3560470E-02
  0.1249886       8.3644688E-02  0.3557006      -0.3450263       0.9204651
   142.8611       2.0139094E-12  0.2019573       8.6552134E+14  -6.271986
  -8.963967      -6.927151       5.8090732E-02   98.79525        87.43097
  0.5588000        4.000000       40.00000
            4              21  8.2936019E-02  766.7184       3.1450380E-02
  0.6877983       0.4408410       1.4194787E-02 -1.5565155E-02  5.2524272E-02
   472.3125       3.4376644E-13   52.75547       1.1472499E+14  -4.858276
  -7.017709      -5.523153        0.1184337       37.20831        6.642627
  0.1524000        1.000000       40.00000
            5              21  8.8731527E-02  784.7133       3.0651681E-02
  0.1111677        1.151994       401.5794      -0.4615246       0.7217322
   442.6950       6.3903808E-15  8.8698644E-04  1.6180716E+14  -6.544088
  -7.284216      -2.801249       9.1872327E-02   40.15655        48.67480
  0.2508300        4.000000       8.000000
            6              21  0.1283333       745.4642       6.7199897E-03
  0.1061611        9.696396       5.072955       0.2661813       0.3613477
   186.3939       2.3056985E-17  0.9155397       1.2664072E+15  -5.447734
  -6.650149      -2.385618        0.1546134       37.87919        12.94885
  5.0799999E-02    1.000000       40.00000
            7              21  0.1191429       736.0671       1.2127671E-02
  2.6681991E-02   3.037619        40.50797      -5.4997467E-02  0.9027180
   73.40188       6.0338280E-12   1.166909       7.9192234E+13  -6.325395
  -5.725942      -3.234814        0.1616812       93.87169        9.369454
  0.1524000        1.000000      -10.00000
            8              21  0.1201490       760.3921       1.0624357E-02
  0.1190959        3.872429       0.9461449      -0.2172030       0.2054563
   449.0147       1.3521217E-13  8.9154266E-02  4.2529730E+15  -5.680040
  -5.538696      -4.359820        0.1264696       29.34719        2.940919
  0.3492500        1.000000       23.00000
            9              21  0.1304779       964.6353       5.3386856E-03
  1.9528391E-02  4.0002018E-03    51.45200       6.5700896E-02  3.2102186E-02
   474.3467       1.0490560E-16  4.2861200E-05  6.2881509E+13  -2.815944
  -7.866110      -4.954151        0.1789664       95.39558        35.75401
  0.5588000        4.000000      -10.00000
           10              21  0.1439151       822.4287      -4.8008822E-03
  3.7280168E-02   0.1338353       8.056336       0.3796291       0.1405156
   296.2120       9.7588353E-14  3.5660657E-06  7.1472719E+14  -5.855101
  -6.145676      -2.227509        0.1041619       79.58308        18.97822
  0.4445000        1.000000       40.00000
           11              21  0.1418816       605.6358       1.4724825E-03
  8.7366238E-02   37.02394        2.091383      -0.4083081       0.4203447
   462.6299       6.4773387E-13   104.6486       3.1351737E+15  -5.929577
  -5.095601      -2.657763        0.1527489       77.26665        33.40762
  0.2508300        3.000000       34.00000
           12              21  7.7282697E-02  849.6196       3.4381285E-02
  2.5850229E-02   0.8934873       1660.328       0.3198109       0.2649501
   223.4989       2.7751466E-13  3.7111942E-02  3.9002897E+14  -6.433379
  -5.502014      -3.434594        0.1616372       43.44688        55.09224
  0.2286000        4.000000       23.00000
```

```
          13          21  0.1795911       793.8334     -2.3782106E-02
  7.8300193E-02   1.303002        36.27208       0.4362427       0.8742058
   14.91024       1.4117363E-16   1.8244411E-06  1.2045527E+14  -4.924055
  -8.077335      -3.955262        0.1087311       31.36393        27.77015
  0.1524000       4.000000        2.000000
          14          21  7.0799284E-02   865.4016      4.1883115E-02
  0.1657444       0.3485809       0.2420714     -0.3164794       0.3894382
   440.5097       3.4628712E-17   2.8842755E-06  2.4024552E+15  -5.173937
  -8.494556      -8.595756        0.1452621       30.37811        48.25585
  0.1936800       4.000000        2.000000
          15          21  9.0413243E-03   742.9933      7.5009398E-02
  0.1167736       2.458791        22.16658       0.3944481       0.1487817
   263.5519       1.4566680E-17   150.9212       1.6175103E+15  -3.613652
  -5.048095      -3.864034        0.1063395       31.88216        12.47599
  0.6096000       4.000000        23.00000
          16          21  0.1000560       884.8174      2.4818642E-02
  6.0720056E-02   2.0127472E-02   29.22727       0.2132564       0.7512367
   42.11413       1.0488648E-15   5.2760582E-04  2.5763509E+14  -5.039818
  -5.415934      -2.138057        0.1165227       49.19258        79.86359
  0.1524000       4.000000        8.000000
          17          21  0.1611042       878.7213     -1.3262050E-02
  5.2432917E-02   0.2086761       1027.382       0.1117363       0.3575528
   280.0046       8.0338973E-12   22.15319       5.7451100E+14  -4.781981
  -6.160275      -8.515170        0.2498642       34.90754        1.497821
  0.5588000       4.000000        40.00000
          18          21  9.5974669E-02   764.8184      2.5772754E-02
  0.1364077       1.911978        27.61572      -0.1102377       0.2503066
   412.8221       6.2107934E-16   6.1879437E-06  1.3126006E+14  -5.554308
  -7.961989      -7.874256        0.1629699       34.37477        9.083917
  0.4445000       1.000000        8.000000
          19          21  0.1054713       585.3286      1.9830767E-02
  0.1567833       113.4422        7.930654      -0.1558630       0.5413769
   372.9757       5.7187905E-12   0.4446380      6.3482955E+13  -6.464872
  -10.43515      -6.233900        0.1451492       63.23755        71.21859
  0.3810000       1.000000        8.000000
          20          21  0.1843848       999.7736     -3.1763885E-02
  0.8938904       1.3074775E-02   9.9999794E-05 -0.3952282       0.6047936
   416.7058       2.2703431E-15   2.1765734E-05  2.8858184E+14  -6.375309
  -6.056507      -5.655416        8.7743476E-02   23.37967        30.02582
  5.0799999E-02   2.000000        2.000000
          21          21  5.0242126E-02   634.6208      5.2907124E-02
  3.3890665E-02   350.0006        4657.787       0.3542962       0.1310237
   300.0576       1.2490328E-14   4.5276943E-06  8.4328034E+13  -7.204640
  -7.602960      -2.729774        0.1893868       32.93175        90.61648
  5.0799999E-02   3.000000        8.000000
          22          21  9.8940387E-02   775.5859      2.2167627E-02
  4.6459522E-02   0.5156673       2.212465       2.3830244E-02  0.5723140
   207.6783       7.8723576E-16   3.669089       1.7895456E+15  -6.145760
  -9.910959      -5.386211        0.1716057       74.81477        17.56700
  0.2508300       4.000000        23.00000
          23          21  0.1092780       830.3526      1.7302722E-02
   1.144583       0.1763700       0.1464633      0.3285362       0.4622014
   124.1811       2.7771219E-14   9.1804340E-03  2.8466700E+15  -5.608341
  -9.540126      -2.299980        0.1211290       39.20217        47.13262
  0.2794000       2.000000        8.000000
          24          21  0.1473926       839.1978     -2.7701408E-03
  0.2055355       0.4041012       0.2084076     -0.2349220       0.8222960
   233.2639       1.7716184E-14   1.2144701E-04  1.4364089E+15  -3.356156
  -9.304596      -2.536029        0.1460686       101.4457        42.19321
  0.2286000       4.000000        40.00000
          25          21  0.1040813       883.0400      2.0511264E-02
  6.6886239E-02   4.1963976E-02   12.38435       0.1811331       0.1928337
   339.3638       3.7497083E-17   38.44025       5.8522969E+14  -7.014100
  -7.033592      -5.904781        0.1787072       38.89584        45.72637
  0.2190800       1.000000        8.000000
          26          21  0.1153658       708.0184      1.4795112E-02
  0.1534980       7.333383        0.2653019      0.4952782       3.3750979E-03
   203.3943       2.3215752E-14   2.9485486E-04  4.6831488E+14  -4.904170
```

```
 -8.935097      -6.053579      0.1231013       57.99669       58.42524
 0.2286000       3.000000      40.00000
        27             21   8.6405501E-02   819.5421       3.2152295E-02
 9.1783166E-02  0.3735350      18.09103      -0.2550488      0.9578382
  61.98739      1.0964733E-14  203.4368       7.0990944E+13  -5.006979
 -8.805190      -2.851771      0.1288135       71.79455       87.86590
 0.6096000       2.000000      23.00000
        28             21   2.3984574E-02   825.2021       6.8951964E-02
 0.2564806      0.9332977      1.4795519E-02 -0.3291473      0.3213874
  457.5387      9.5866015E-12  345.9212       1.5049983E+14  -4.961998
 -5.302932      -4.790796      0.1434635       59.98808       92.38207
 0.1936800       3.000000      23.00000
        29             21   0.1075543       862.7471       1.8567529E-02
 2.9334752E-02  0.7730999       11754.97      -0.3116770      0.3765564
  427.7097      1.9366206E-14  1.2596020E-02  4.8911413E+14  -2.437245
 -6.684906      -3.170231      0.1148801       42.41900       51.08266
 0.3810000       1.000000     -10.00000
        30             21   9.4210684E-02   815.4112       2.6790790E-02
 0.3338885      8.7399155E-02  0.8676885       0.1256568      0.5329254
  180.9071      8.3433406E-15  2.381631       4.7508169E+15  -6.111165
 -7.783884      -2.962368      0.1783694       36.43957       9.891393
 0.1936800       4.000000      34.00000
        31             21  -2.2351742E-08   772.1395       8.3264016E-02
 0.1287996       1.949571      3.504375       0.4576483      0.2207243
  119.6779      4.2643353E-15  0.3535224      5.1390649E+14  -5.261619
 -7.622089      -6.036912      0.1230133       82.77818       11.79629
 5.0799999E-02   4.000000      34.00000
        32             21   4.3874957E-02   777.5925       5.7725802E-02
 0.9959226      0.4891691      9.6535787E-02  0.1448328      0.6863443
  91.36138      3.4995949E-12  0.1788634      4.1724017E+14  -5.897783
 -8.325941      -5.506006      0.1780631       56.85365       46.51889
 0.2794000       4.000000      8.000000
        33             21   8.9151748E-02   930.8633       2.9617282E-02
 0.1021064      5.6803457E-02  73.54527      -7.9490960E-02  0.6654689
  200.0561      7.6675381E-14  452.0944       1.0059267E+14  -5.476657
 -5.230796      -3.360737      0.1331439       61.83017       50.02116
 0.1016000       3.000000     -10.00000
        34             21   6.0209349E-02   902.3785       4.8783690E-02
 8.4124759E-02  7.5151108E-02  269.4862      -0.3625132      0.9459157
  135.1196      1.0030372E-12  1.6419257E-06  9.6492218E+14  -4.840041
 -8.163492      -6.390976      0.1782537       69.29389       11.38119
 0.2286000       1.000000      34.00000
        35             21   3.6293462E-02   869.4518       6.0121655E-02
 0.2009067      0.1191819      0.5175549      8.8249251E-02  0.3198813
  324.4486      4.6235357E-15  6.1295353E-02  1.2829130E+15  -7.555232
 -5.638025      -7.416132      0.1226264       46.77214       47.62914
 0.2190800       2.000000      40.00000
        36             21   3.1040274E-02   675.0050       6.3363232E-02
 1.7201858E-02   11.69848      2492.083      -0.1754824      0.5832812
  316.6316      2.4587030E-13  1.4497481E-04  1.9761037E+15  -6.356924
 -7.367552      -7.792821      0.1781638       56.07436       84.50849
 0.4445000       4.000000      23.00000
        37             21   4.2485137E-02   834.4941       5.5870786E-02
 9.3408756E-02  0.1840520      112.9663       0.2864496      0.5196751
  113.0651      3.3494309E-16  733.9595       8.0576432E+14  -4.122061
 -8.663731      -2.675073      0.1491414       61.43095       10.80566
 0.2190800       1.000000      34.00000
        38             21   2.8342806E-02   806.6488       6.5893032E-02
 4.2596366E-02  0.6922209      12.99866      -0.4789583      0.7717916
  433.7372      2.4448341E-16  0.1114391      3.5318421E+15  -5.715179
 -10.04586      -4.735479      0.1791399       88.97485       24.70646
 0.2794000       3.000000      8.000000
        39             21   0.2000000       752.2615     -3.6737014E-02
 5.5894848E-02   3.416565      732.6302      -4.3171444E-03  0.4277191
  288.1143      1.0979213E-13  773.3129       8.9490214E+14  -5.875388
 -7.506504      -2.603993      0.2182864       24.46072       59.61431
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        40             21   0.1350698       684.9719       1.5862547E-03
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  9.9999942E-03   157.6752        52500.10        -0.4278333       0.8835753
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  -7.397696       -8.154406       0.1195033        54.20530         31.15950
  0.1016000       3.000000        23.00000
         41            21  6.8242721E-02   975.7275       4.0959861E-02
  4.4463348E-02   8.2887290E-03   337.4442         0.1708683       0.1638039
   358.9185       2.9684479E-16   6.4823900E-05   3.2530159E+14   -7.718829
  -5.184334       -7.489971       0.1408519        86.98928         44.21545
  0.3048000       3.000000        2.000000
         42            21  0.1371141       716.2166      -6.4230524E-04
  0.1821182       49.54443        1.123857        -0.1202636       0.7018581
   188.7747       1.0225837E-17   11.47458         2.1283637E+14   -6.234035
  -11.85233       -5.186780       0.1803908        60.33818         66.48305
  0.3810000       2.000000        40.00000
         43            21  0.1286592       808.8511       4.9617030E-03
  0.3277196       0.2743968       1.676002         5.4799888E-02   0.6708114
   140.5852       9.2888979E-16   1.3901682E-03   1.4685354E+15   -4.987589
  -5.252540       -4.114847       0.1385864        78.44090         89.47703
  0.1936800       4.000000        8.000000
         44            21  5.5029720E-02   799.1602       4.9012296E-02
  0.2904817       1.074178        6.0692350E-03   0.1374702       0.8498181
   49.73783       2.3702648E-12   2.2995460E-03   2.1745288E+15   -6.513910
  -7.166399       -4.618571       0.1653975        30.86196         10.15296
  0.3048000       4.000000        23.00000
         45            21  6.3369058E-02   731.4706       4.4325411E-02
  0.2196892       33.48983        1.0288084E-03   0.2271894       0.7195557
   53.09266       2.8316386E-12   3.2139902E-03   1.1181451E+15   -5.285882
  -8.632032       -2.067733       0.1360062        51.71876         8.247694
  0.5588000       4.000000        -10.00000
         46            21  0.1117918       838.1675       1.8296096E-02
  0.3525111       0.5773439       3.2107309E-02  -0.4935275       0.9074672
   390.4366       8.8165211E-17   7.334500         3.7418859E+14   -6.059345
  -7.237273       -4.305671       0.2076045        91.12393         13.49211
  5.0799999E-02   1.000000        8.000000
         47            21  7.2129808E-02   712.9677       3.8320143E-02
  7.4576460E-02   5.203024        5.2637290E-02  -0.2890834       0.6392287
   334.9814       1.2888116E-17   1.9361857E-04   9.1689851E+13   -6.471012
  -5.850028       -3.803687       0.1052162        33.92787         22.01427
  0.6096000       3.000000        8.000000
         48            21  0.1592591       802.4500      -1.1954645E-02
  6.3043967E-02   0.1548548       3.863371        -0.2042935       0.9812261
   34.93690       1.6798122E-16   7.7171214E-02   2.3236203E+15   -5.575997
  -6.931159       -6.621502       0.1210511        27.51420         72.43291
  0.6096000       3.000000        2.000000
         49            21  0.1244650       625.0376       8.8929096E-03
  0.4294024       13.83089        0.1209379        8.1485003E-02   0.4828631
   214.1352       4.4548225E-17   1.7536888E-03   1.1381364E+15   -5.757116
  -6.268661       -4.494881       0.1962209        66.58025         16.82874
  0.4445000       3.000000        2.000000
         50            21  5.3490359E-02   722.2842       5.1700279E-02
  0.1486647       2.830038        1.227479        -0.4535845       0.9870160
   162.8402       3.7113948E-13   1.0207648E-04   1.8739439E+14   -4.813859
  -5.914269       -8.024968       0.1037585        26.07965         28.24623
  0.1524000       4.000000        40.00000
         51            21  0.1029496       729.9423       2.1178789E-02
   1.894962       5.315967        0.1746683       -0.2655194       0.9731536
   80.05600       7.0482545E-17   0.3285177        5.9503408E+13   -5.788486
  -6.065594       -8.287913       0.1107959        40.60695         4.917380
  0.4445000       3.000000        8.000000
         52            21  7.9951130E-02   687.4132       3.5344537E-02
  6.9943726E-02   17.00610        150.2973         0.1990267       0.2321064
   306.4463       1.4591908E-13   2.1491386E-02   4.4025223E+14   -6.169588
  -11.34826       -3.155846       0.1253020        28.30746         11.94879
  0.2286000       1.000000        -10.00000
         53            21  9.7129531E-02   1019.173       2.4270603E-02
  7.1871690E-02   2.0193707E-03   70.30409         0.2953015       0.1106833
   326.7817       5.9481459E-17   4.725634         6.4302170E+14   -5.983399
  -12.25908       -3.002548       0.1628225        29.82882         40.65907
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 20.39239      1.7123668E-12  4.1788225E-03  1.3269111E+14  -7.930552
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 104.5728      1.6674490E-15  285.7015      9.0487336E+13  -5.144655
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0.1016000       1.000000      8.000000
       56             21  6.7030355E-02  697.2623      4.2785794E-02
0.1747933       18.52932      6.346635      -0.1426465      0.5582331
 352.9118      3.8646956E-14  1.2715499E-06  1.8859942E+15  -5.204083
-6.525177      -2.404608      9.9432379E-02  83.50932       62.84071
0.2190800       1.000000      34.00000
       57             21  0.1324115      944.4750      3.4718439E-03
0.7538222      2.8658718E-02  5.1560166E-04  1.8713607E-02  0.8131768
 84.58386      7.6689696E-13  2.9642707E-02  1.0519118E+15  -5.819171
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       58             21  5.8284659E-02  912.5123      4.6934832E-02
0.6576557      1.9339152E-02  6.3661322E-02 -0.4389788      0.8295445
 399.5457      4.7171773E-14  1.3037428E-05  1.4712758E+14  -5.384358
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0.4846499       1.544492      1.0377421E-02  0.4101467      0.1812982
 236.1060      1.9780921E-15  1.8872537E-05  2.4378167E+14  -5.531923
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       60             21  7.5183563E-02  892.3909      3.7950061E-02
9.9444531E-02  0.1029533      627.0341      0.4311138      0.4096946
 64.82809      3.0135094E-15  67.05783      4.4342684E+15  -6.294568
-8.414183      -8.429814      0.1020508      99.70705       60.67860
0.2794000       1.000000      8.000000
       61             21  7.9156838E-02  843.8694      3.7021201E-02
0.5538464      0.3067941      2.9347785E-02  0.1629729      0.2815572
 276.0825      5.2978438E-16  4.2485510E-04  3.6806914E+15  -5.998934
-8.516259      -2.010489      0.1219166      84.88360       10.51508
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       62             21  9.2091441E-02  873.7877      2.7230665E-02
0.3131334      4.8975382E-02  0.5694020      0.4693877      0.2753886
 28.74454      5.6876941E-15  2.7735536E-05  3.4115470E+15  -5.632586
-5.692557      -8.092862      0.1612027      81.61073       25.98747
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0.4493643      3.6660057E-02  8.7069750E-02 -4.6549860E-02  2.1309398E-02
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0.2723967       23.85061      3.041679      0.2541657      0.2999783
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       65             21  4.7052521E-02  939.3784      5.5353463E-02
0.2230494      1.1884390E-02  0.7593765     -0.3696296      0.6459147
 403.2970      1.7414595E-17  5.6005287E-05  2.2123382E+14  -6.016105
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       66             21  0.1667994      857.3415     -1.7403351E-02
0.2817245      0.2589879      2.468508     -2.0041825E-02  0.5963054
 254.5961      1.2998280E-15  7.7916631E-03  3.5309970E+14  -7.362263
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0.3492500       1.000000        8.000000
        68           21  7.3400863E-02   751.2120       4.0155355E-02
 1.744314       7.980561        2.9411006E-03  0.3001603       8.2914531E-02
 345.0720       1.4454012E-14  6.5148622E-04  6.6566034E+14  -2.311468
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        69           21  8.5257046E-02   1042.000       3.3995938E-02
1.4334649E-02  9.9999795E-04   15.74662       0.2382503       0.4696919
 155.5393       1.3968237E-12   19.85552       7.2201034E+13  -5.098231
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        70           21  0.1125675       919.3640       1.5565268E-02
0.2464713       6.0256936E-02   105.7127      -0.3909304       0.1034184
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0.3048000       4.000000        8.000000
        71           21  6.4629607E-02   855.3886       4.5957506E-02
0.4937094       0.2333088       4.7608973E-03 -6.9387048E-02  0.8538840
 97.03992       2.7520557E-17   118.2527       7.7643868E+14  -6.760269
-8.040679      -6.732109        0.1439133       72.68490        64.62686
0.2508300       1.000000        2.000000
        72           21  8.3528541E-02   846.0546       3.3083837E-02
0.3996807       0.1285744       1.484972      -0.2739784       0.7780518
 269.1959       1.2015068E-12   0.6520208      5.4332265E+15  -5.344124
-6.244138      -5.252406        0.1234910       59.21137        13.83332
0.2794000       2.000000       -10.00000
        73           21  0.1396826       663.6130      -1.3701394E-03
5.0244171E-02  6.045039        10.21676       3.5036895E-02  0.6221201
 169.4518       5.1191516E-13  1.9907456E-02  2.6737640E+15  -5.698890
-6.385972      -6.887171        0.1644952       27.74671        78.03644
5.0799999E-02  1.000000       -10.00000
        74           21  0.1174337       957.0331       1.2709029E-02
3.8497671E-02  7.0206900E-03   179.9073      -0.2252042       0.7453189
 248.6691       3.2283155E-15  1.1312643E-03  5.0988005E+15  -5.422346
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0.2286000       1.000000        34.00000
        75           21  0.1227595       704.1533       9.9352170E-03
0.5807400       4.391447        1.5387583E-03 -0.1302413       7.1480259E-02
 485.6554       4.2595341E-16   12.09654       1.0723943E+14  -5.228073
-11.88188      -7.573250        9.8045692E-02  64.83706        31.44450
0.1936800       4.000000        2.000000
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END OF APPENDIX C