GEOLOGICAL SURVEY OF CANADA
COMMISSION GEOLOGIQUE DU CANADA
OPEN FILE 2374

USER GUIDE

PETROLEUM RESOURCES APPRAISAL SYSTEM SOFTWARE

PRASS1

VERSION 2.0

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April, 1991

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USER GUIDE

for the

PETROLEUM RESOURCES APPRAISAL SYSTEM SOFTWARE

(Version 2.0) February 1991

CHAPTER 1 - INTRODUCTION

DISCLAIMER

Although all of the modules have been extensively tested, no guarantee (expressed or implied) is made by the authors or the GEOLOGICAL SURVEY OF CANADA regarding program correctness, accuracy, or proper execution on all computer systems.

ACKNOWLEDGEMENTS

The Geological Survey of Canada in response to initiatives pressed by the International Union of Geological Sciences in the early nineteen eighties, began a project involving technology transfer to Developing Countries of methods for hydrocarbon resource assessment. As the project developed it became apparent that there was a need for a fairly comprehensive micro-computer or PC based system incorporating the Geological Survey's methodology that would be more relevant to the requirements of the individual nations.

A second initiative pressing for the development of a PC based system arose from a project of Petro Canada International Assistance Corporation (PCIAC) with their sponsorship of the Sub-Andean Cooperative Hydrocarbon Studies Project. Central to the project was the need of the six cooperating countries to adequately assess their resources. In part significantly funded by PCIAC and in association with Meneley Enterprises (managing contractor for PCIAC's Sub-Andean Cooperative Hydrocarbon Studies project) the decision was made by the GSC to create PRASS1.

PRASS1, as it exists in this release, is the product of a long history of methods development in resource assessment at the Geological Survey of Canada. It has been derived from a set of programs designed primarily by Dr. P. J. Lee for application on a mainframe computer. PRASS1 was created in order to provide a portable system that does not require major investment in computing facilities. As such it may lack some of the elegance associated with more powerful computing systems as a compromise with its broader availability.

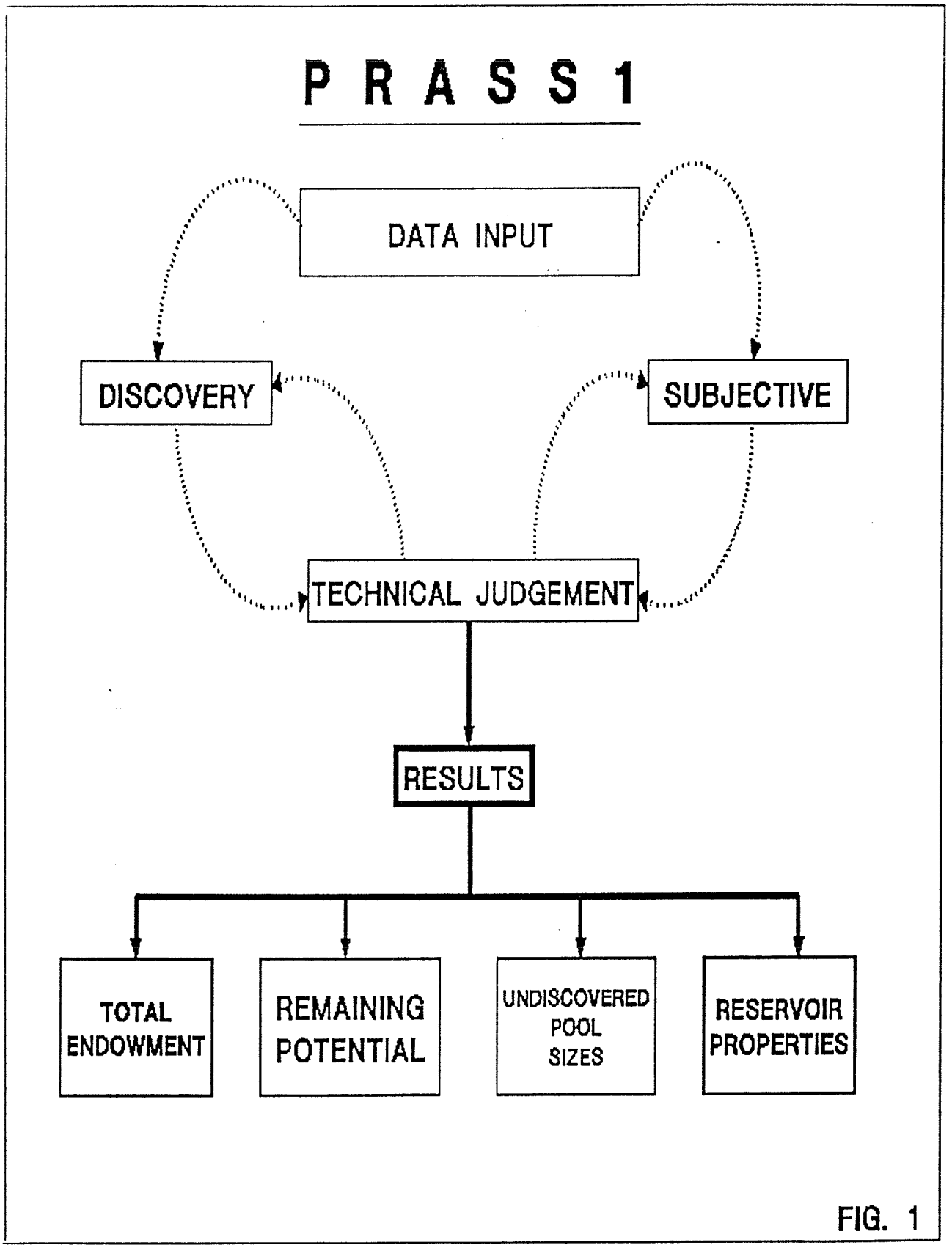
PRASS 1
DATA INPUT
DISCOVERY
SUBJECTIVE
TECHNICAL JUDGEMENT
RESULTS
TOTAL ENDOWMENT
REMAINING POTENTIAL
UNDISCOVERED POOL SIZES
RESERVOIR PROPERTIES

FIG. 1

Similarly, this manual has evolved from earlier ones developed primarily by Dr. P. J. Lee for Petroleum Resources Management and Evaluation System (PRIMES) that was designed to run on a Hewlett Packard 3000 computer system. This manual itself has evolved through many versions and the authors gratefully acknowledge all critics who have pointed out most of its inadequacies. The assistance of Paul R. Price who contributed to earlier versions of the manual is also acknowledged.

SUMMARY

The Petroleum Resources Appraisal System Software (PRASS1) provides an overall management and analysis system within which one can assess the occurrence of oil and gas in exploration plays. The end product is a well considered estimate of the critical characteristics of the hydrocarbon endowment of the exploration play, sedimentary basin or area under study. The process is schematically illustrated in Figure 1.

The most important aspect of using hydrocarbon endowment data is the need to **USE IT CAREFULLY!** with a mature understanding of the geological concepts on which the estimates are based.

A hydrocarbon endowment estimate should be generated using all of the available input data and the best technical judgement that can be brought to bear on the analysis. If this is done then hydrocarbon endowment estimates can be used for a wide range of applications.

1. On a prospect or play basis;

   - input for economic analysis,
   - understanding exploration play concepts and play limits,
   - organization of exploration programs to evaluate a play,
   - new exploration play concepts can be developed and analyzed,
   - the type and detail of additional technical work that will be required to bring the prospect or play to the drilling stage can be outlined together with the go/no go signals that indicate whether or not the geological play concept is still valid.

2. For a sedimentary basin, country or region;

   - combined undiscovered potential for all of the exploration plays can be used for resource allocation and petroleum supply forecasts,
   - The combined undiscovered potential can be used to evaluate the impact of various fiscal regime alternatives.

By far the most important associated benefit is derived from the Endowment Analysis process itself which requires the careful assembly of a wide range of geological, geophysical and engineering data in an organized and disciplined format.

The data input is derived from the technical knowledge of the user and consists of information describing the geology and reservoir engineering aspects of each exploration play or area that is to be studied.

Data analysis in PRASS1 is handled through two major streams of analytic modules. The choice of stream is dependant upon the number of discoveries that have been made in a play. If information on at least eight discoveries is available then the preferred technique is to use the Discovery Process Model to generate the statistical description of the play based on observations from those discoveries.

If fewer than eight discoveries have been made, then the Subjective Model, which combines estimated probability distributions of the physical components of potential pools, is used to generate the pool size distribution for the play.

The product of either the Discovery Process or Subjective Model analysis is a pool size by rank description of the play in which the discoveries are matched with specific pools. Endowment analysis results include; the estimate of the total hydrocarbon endowment for an exploration play, an analysis of the remaining undiscovered potential and an estimate of the size-range of each undiscovered pool. Some estimate of the reservoir properties of the

undiscovered pools can also be generated either from the information on existing discoveries or from the subjective input data.

The interim and final results are illustrated using various graphics modules and are presented in a series of graphs and tabular reports. The program has the capability to aggregate the results from a series of exploration play analyses to make estimates for an entire sedimentary basin. The User Guide provides the instructions which are required to conduct the analysis in PRASS1 in a logical sequence on a personal computer in a user interactive mode. Because the program modules are used in various combinations for different analysis there is no unique flow path for program operations. The user must understand the purpose of each module and use each one in the sequence required for the specific analysis being conducted.

BASIC CONCEPTS OF RESOURCE EVALUATION IN PRASS1

Hydrocarbon Endowment Analyses should use "in place" hydrocarbon reserves as the basis for an analysis. The reason for this is that the natural population is that of oil in place. The amount of the "in place" resource that is recoverable is subject to a host of economic and political factors that are unrelated to the statistical population. Recoverable hydrocarbons are of course, of critical importance in the economic production of hydrocarbon reserves, however, the recovery factor and the other economic variables such as development cost, oil price and fiscal regime should be addressed separately rather that within an endowment analysis.

GEOLOGIC MODELS

The basic definitions that are used in basin analysis and hydrocarbon endowment analysis are:

The hydrocarbon endowment of a sedimentary basin is:

- *an estimate of the total volume of hydrocarbons, both oil and gas, that have been generated, migrated, accumulated and preserved in some type of trap within a sedimentary basin. The hydrocarbon endowment includes the hydrocarbons that have been discovered and an estimate of the volumes remaining to be discovered.*

An Exploration Play is defined as:

- *a geological configuration within a defined area, that combines RESERVOIR, TRAP, SOURCE ROCK, MIGRATION and PRESERVATION in such a way that the CRITICAL FACTORS which control the occurrence of oil and/or gas are essentially constant.*

A Prospect is defined as:

- *a geological configuration, within a defined Exploration Play, (for example, a structure mapped with seismic or a stratigraphic trap) that is considered to have the potential to trap oil and/or gas and which, as a result, is the target for an exploratory well. A well on a Prospect may test more than one Exploration Play*

In the basin analysis phase of resource assessment, the objective is to identify all of the opportunities for the accumulation of oil and or gas. Isopach/Structure/Facies/Oil Occurrence Maps and Cross Sections are the basic tools of basin analysis. The opportunities may be already demonstrated by discovered pools, or they may represent potential or conceptual opportunities that on the basis of geological analysis can be seen as having some probability of existence. In a basin analysis, these "opportunities" are recognized by a modelling process in which geologists visualize configurations such as structures, facies changes, pinch-outs, etc, that may have been charged by hydrocarbons from perceived source rocks, trapped in porous rocks and subsequently preserved. Each of the models that result from the basin study leads to the definition of an exploration play and each play represents a geological model. **As it is actually the model that is evaluated in resource assessment it is important that they be as well defined as possible, and that the basin analysis has been thorough enough to identify all significant models or exploration play opportunities.**

SUPERPOPULATION CONCEPT

Various geologic processes (such as sedimentation, tectonism, compaction, heat flow, organic maturation, diagenesis, and others) have produced families of accumulations of oil and or gas throughout the geologic column. These families can be defined as exploration plays where the oil and or gas pools share common characteristics of hydrocarbon generation, migration, reservoir type and preservation. Plays constitute natural populations that can be described in statistical terms, are limited geographically, and are usually stratigraphically constrained. Although the pools in a play constitute a finite population, they can be viewed as one, or a single, outcome from the interaction of geological processes that produced them. Those same processes, acting with essentially the same, duration, sequence, etc, would produce like but different sets of pool families. The combination of the full range of these sets can be viewed as a superpopulation. Any one set of pools (a play) can be viewed as a random sample of the superpopulation. Because the superpopulation is infinite, or continuous, any random sample of it can be characterized as continuous. This superpopulation concept is used extensively in PRASS1 to generate the pool-size distributions for individual plays. The validity or accuracy of estimation of the final pool-size distribution depends on the degree to which the modelling of the superpopulation reflects the specific play attributes. PRASS1 includes features that assist in testing this compatibility (see MATCH below).

LOGNORMALITY

The tendency for the oil or gas pools in a play to be approximately lognormally distributed has been widely recognized for decades (Kaufman, 1965). This observation, that the logarithms of pool sizes are normally distributed and can therefore be completely specified by the parameters mu (μ) and sigma squared (σ^2), constitutes a major assumption of the PRASS1 methodology. Mu (μ) and sigma squared (σ^2), the standard descriptive parameters of a lognormal distribution, represent the mean and variance respectively of the log-transformed data. The use of the lognormal assumption facilitates numerous complex calculations in many modules of PRASS1. The lognormal distribution is adequately robust and flexible to be able to treat or approximate distributions of variables with widely differing variances (including those with outliers), which is a common characteristic in many assessment computations. Use of the lognormal assumption also provides a convenient mechanism for handling of correlation among variables (commonly observed for example between net pay and pool area and other geological variables).

Lognormally distributed pools approximate a straight line when plotted on log-probability graph paper in the LPLT module, providing a simple test for mixed populations. The values of mu (μ) and sigma squared (σ^2) can be estimated from that plot using the following equations.

$$\mu = \ln \zeta_{50\%} \tag{1}$$

$$\sigma = \ln\{\frac{1}{2}(\frac{\zeta_{50\%}}{\zeta_{16\%}} + \frac{\zeta_{84\%}}{\zeta_{50\%}})\} \tag{2}$$

Several additional reasons for adoption of the lognormal distribution are provided by Lee and Wang, 1983a and 1990.

ANALYTICAL PROCEDURES

PRASS1 provides two different approaches to the assessment of oil and gas resources at the play level. The Discovery Process Model is designed for evaluation of plays in which there are a significant number of discoveries; and the Subjective Method which is appropriate for conceptual and immature plays. In the use of either approach, the fundamental objective is to determine two things - the parameters of the underlying pool-size distribution (a superpopulation) and an estimate of the total number of pools in the play. As the pool-size distribution has been

assumed to be lognormal in nature, it can be defined by specific values of mu (μ) and sigma squared(σ^2). The estimate of N (the total number of pools) can be in the form of a distribution or a single value. The determination of mu (μ), sigma squared (σ^2) and N are fundamental in that these three parameters are all that is necessary to calculate the total quantities of oil and gas (endowment) believed to exist in a play, as well as to determine the size ranges of each of the pools that should exist. The latter calculation is achieved using the field of "order statistics", and readers are referred to Bickel and Doksum, 1977 for further detail.

Both the Discovery Process and Subjective methods lead to the generation of the three essential parameters. In practice, both approaches could be used for any play if there is sufficient discovery data. Once the pool-size distribution parameters and an estimate of N have been obtained there are a series of analytic modules that can be used to refine the answers, identify the remaining potential in a play, modify the results conditional to the discoveries and finally to sum plays and regions for total estimates. These additional analytic modules are discussed following the descriptions of the two basic assessment methods.

DISCOVERY PROCESS MODEL

> "A discovery process model is one built from assumptions that directly describe both physical features of the deposition of individual pools and fields and the fashion in which they are discovered. When such a model describes in complete detail a probability law governing the generation of observable data, it may also be called an objective probability model. The parameters of this probability law may not be known with certainty, but it is generally assumed that the functional form of the class of distribution functions characterizing the law is known with certainty" (Kaufman, 1983, p.213).

Several discovery process models have been described, but the one used in PRASS1 is essentially that designed by Kaufman, Balcer and Kruyt (1975), and Barouch and Kaufman (1977), subsequently modified by Lee and Wang (1985). The model is based on the observation that the discovery process is one of sampling proportional to size and without replacement. Discovered pools are a sample from the underlying population of pools that constitute a play. This sample is generally observed to be non-random or biased - that is, there is a tendency for larger pools of the population to be discovered early in the exploration cycle. The reason for this bias is that explorationists tend to both "see" and test the larger targets before the smaller less attractive ones. The degree of bias may be termed "exploration efficiency" but may also include elements of land availability, logistical impediments to exploration, competitive exploration companies, etc.

For simplicity the equation describing the probability of discovering pool j proportional to its size x_j is given by:

$$P_j = \frac{X_j^{\beta}}{X_1^{\beta} + \ldots + X_j^{\beta} + \ldots + X_N^{\beta}} \qquad (3)$$

(after Lee and Wang, 1990)

where N is the total number of pools in the play, and ß is an exponential that approximates exploration efficiency. When ß has a value = 0, then exploration could be seen as a random process with each pool having an equal chance of discovery. When ß has a value = 1 or greater, then discovery will be approximately in order of size. It is also possible for ß to be negative with values = -1 or smaller in which case the discovery sequence would be in order approximately from smallest to largest size.

The Discovery Process Model in PRASS1, PDSCV, mathematically models the discovery process using the probability of discovery proportional to size expressed in the equation above. The module requires as input only the sizes and dates of discoveries, ordered from oldest to youngest. Because these two data items are known with relative accuracy, this method is particularly powerful. From the size and sequence data of the sample (discoveries) the program calculates the most likely values of mu (μ) and sigma squared (σ^2) of the underlying super population (pool-size distribution); the beta value that reflects the exploration bias of the sample; and N, the number of pools in the play. In addition, the module predicts the class size range into which the undiscovered pools may be expected

to fall. The calculation is complex, and because there is uncertainty associated with each of the parameters being investigated a "best fit" type of solution is obtained using a maximum-log-likelihood solution.

Lee and Wang (1990) describe the mathematical basis for the discovery process model using lognormality as follows:

> "In general, the probability of the j-th pool to be discovered is the product of the following probabilities: the probability of pool j in the lognormal pool size distribution $f_\Theta(x_j)$; and the probability of pool j to be discovered in a sequence. Thus, the joint density function of all discovered pools can be shown as follows:

$$L(\theta) = \frac{N!}{(N-n)!} \prod_{j=1}^{n} f_\theta(x_j)\, E_\theta \left[\prod_{j=1}^{n} \frac{x_j^\beta}{b_j + y_{n+1}^\beta + \ldots + y_N^\beta} \right] \qquad (4)$$

> where Θ represents the distribution parameters (μ,σ^2), N!/(N-n)! is the number of ordered samples of size n without replacement from a population of N pools, and $b_j = x_j^\beta + \ldots + x_n^\beta$ [discovered pool sizes] ,and y_{n+1}^β ,.., $y_N\beta$ = undiscovered pool sizes.
>
> Quantity $L(\Theta)$ indicates the likelihood of a discovery sequence. The maximum likelihood method is used to obtain solutions for μ, σ^2, β and N such that $L(\Theta)$ is maximized. The resultant $L(\Theta)$ value is the maximized log-likelihood value. The pool size distribution $f_\Theta(Y)$, in fact, can be any probability distribution, but the lognormal family is applied here."

In practise, the discovery process module PDSCV can be used in two separate modes. The user is asked "Do you want to maximize over ß ?"

If you answer yes, then the user must specify the range within which the value of ß is expected to occur, along with stepped values of N. The program will operate maximizing on ß, and specify the most likely values of μ, σ^2 and N for the underlying population.

If the user answers no, then stepped ranges of both N and ß must be supplied. The program will execute to identify the most likely (maximum log likelihood solution) combination of μ, σ^2 and N of the population.

In many cases however, no mathematically unique (and geologically acceptable) maximum-log-likelihood solution is obtained directly from PDSCV. That is, "closure" is not obtained in terms of a maximum log likelihood (MLL), and instead there is a suggestion in the results that the MLL value will move with the limiting factors, usually N. Commonly in this situation, however, the PDSCV module output does provide valuable information about acceptable values of μ, σ^2 and N that can be evaluated further in the MATCH module (see MATCH below).

SUBJECTIVE METHODS

The subjective methods are thus named because they rely in large part on geological judgement or expert opinion more than on statistical analysis of substantial "hard" data. In the case of conceptual plays there may be little or no data derived from exploration; whereas immature plays may have data from both successful and unsuccessful exploratory drilling plus geophysics, etc. The methods used to derive the parameters of the underlying superpopulation in the subjective approaches in PRASS1 are consequently different than those used in the discovery process methods.

Each of the subjective methods stem from the equation commonly used to calculate the reserves discovered in a pool, that can take many forms but is generally of the form:

$$Pool\ Size = \frac{C \times Area \times Net\ Pay \times Porosity \times Hydrocarbon\ Saturation}{Formation\ Volume\ Factor} \qquad (5)$$

where C is a constant required to convert the measurement units to the proper values.

When used to calculate reserves, this formula is usually solved deterministically, with fair confidence of the values of each variable. The same equation can be used to calculate the resources expected to occur in an undrilled prospect, but in this case the single values for the variables are substituted by ranges of values in order to capture the uncertainty. This can be done using three point distributions, or by describing complete frequency distributions for each of the variables, reflecting the total range of possible values for the prospect. The product of this process is an estimate of prospect size in the form of a frequency distribution. In trying to compute the underlying pool size distribution for a play the same basic process is used, except that the distributions for each of the variables must reflect the values appropriate for all of the prospects and pools in the play. The product of these distributions is a frequency distribution of possible pool sizes in the play (ie the underlying pool size distribution for the play).

The use of a reservoir equation in play assessment is well established and described by White and Gehman (1975), Roy et al (1975), Lee and Wang (1983), Procter et al (1982) and others. The subjective procedure also requires the separate estimation of the number of pools, either directly as a single value or a distribution; or by estimation of both the number of prospects and the marginal probabilities (exploration risk or chance of success) that prospects will turn out to be pools. The product of the pool size distribution, the number of prospects distribution and "risk" generates a distribution of the total resources estimate for the play.

PRASS1 uses two separate modules to combine the probability distributions to formulate the pool size distribution for a play. The first, MPSD, uses Monte Carlo procedures to derive the pool size distribution. It has the advantage of simplicity in that analysts can easily picture each of the input distributions being randomly sampled with hundreds or thousands of iterations, faithfully combining their best judgment expressed in the distributions. It has the disadvantage that the simulation process requires the input distributions to be independent. Although methods can be developed to accommodate some types of correlation between the variables, the process becomes inconvenient, and this important covariance element tends to be omitted from consideration.

The other PRASS1 module, LPSD, performs essentially the same function as MPSD but uses a different method for the combination of variables. For each of the input distributions, a lognormal distribution is approximated, described by μ and σ^2 values. The product of the input distributions is then approximated by summing the ln of the constant plus the sum of each of the μ values to obtain μ, and summing the σ^2 values to obtain σ^2 for the pool size distribution. LPSD has the advantages of better preservation of the total variance than MPSD; is computational simple and fast; and can easily incorporate covariance if sufficient reservoir data from discoveries is available. A possible disadvantage is that analysts may find that the log approximations to the input distributions may not be as close as desirable, leading to some loss of confidence.

Either of the two PRASS1 modules MPSD or LPSD will provide the essential values of μ and σ^2 for the underlying pool size distribution (superpopulation). The estimation of a value for N or a distribution of N is obtained using the module MPRO, which combines the number of prospects distribution with estimated marginal probabilities. The end products of the subjective methods then are essentially the same as those of the discovery process model. The equations describing the relevant parameters are given below, as described in Lee and Wang (1990)

$$Mean = e^{(\mu + \frac{1}{2}\sigma^2)} \tag{6}$$

$$Variance = e^{(2\mu + \sigma^2)} \times (e^{\sigma^2} - 1) \tag{7}$$

$$\mu = \ln(constant) + \sum \mu_{ij} \tag{8}$$

$$\sigma^2 = \sum \sigma_i^2 + 2 \sum \sum \sigma_{ij} \quad (9)$$

Where μ, σ^2, and σ_{ij} denote the means, variances, and covariances (with i<j) of the natural logarithms of the geological variables.

In practice the outputs from either set of methods can usually be substantially improved by the use of some additional analytic modules, described below.

ADDITIONAL ANALYTIC MODULES

The two main streams of analysis described above can be viewed as attempts to model the pool size distribution appropriate for a play, and derive the parameters μ, σ^2 and N. Each of the methods has its limitations, and the resulting parameters can be considered "preliminary parameters" subject to further refinement by examining the sizes ranges of individual pools implied by those parameters, and by comparing those individual pool sizes to the discoveries that have been made in the play. The module PSRK generates distributions of N pools from a lognormal pool size distribution with parameters μ and σ^2 using order statistics. The analyst can consider these distributions or view them graphically using RPLT to see if the results are consistent with available geological opinion. A more effective process is to examine the degree to which the sizes of discoveries "match" those predicted by the use of the preliminary parameters. This is done in the module MATCH.

In the MATCH module, the preliminary parameters are used to define a search area for each of the parameters, looking for the combination that best reflects a match of discoveries to predictions. For each value of mu (μ), sigma squared (σ^2) and N used, the module generates the pool ranks for the individual pools. The discovered pools are then matched to the pool ranks for each case and the case demonstrating the best overall fit is selected. The matching process is one of testing to determine from which pool size distribution (superpopulation) the sample (discovered pools) was drawn. Selection of the correct match is one of the most challenging and critical aspects of using PRASS1. The selection process requires the iteration through a number of cases and, most of all, the application of a high level of technical judgement using all of the information which is available on the play.

THERE IS NO UNIQUE MEASUREMENT OF THE QUALITY OF A MATCH, THE FINAL ANSWER REQUIRES THAT THE ANALYST EXERCISE A HIGH LEVEL OF TECHNICAL JUDGEMENT BASED ON ALL FACTORS AFFECTING HYDROCARBON OCCURRENCE IN THE PLAY INCLUDING THE TECHNICAL FACTORS, LOGISTICS OF EXPLORATION AND ANY POLITICAL FACTORS WHICH MAY HAVE IMPACTED THE COURSE OF EXPLORATION IN THE PLAY.

The details of the measurement tools and the matching process are contained in the description of the command module MATCH.

Once final acceptable values of mu (μ), sigma squared (σ^2) and N have been selected, using MATCH, then additional analytic modules can be run. Because a match has been made, the distributions of those matched pools can be collapsed to the sizes of the discoveries, and the remaining "undiscovered pools" rescaled to reflect this added information. PSDR is the module that constrains the remaining pool size ranges reflecting the reduced uncertainty. The impact of this constraint can also be examined using the graphics module RPLT that displays the pool size ranges of the unmatched pools in a rank plot in which discoveries are shown as point values.

The module PPDR can then be used to obtain a distribution of the sum of the unmatched pols, or the remaining potential in the play. The PSUM module is used to calculate the hydrocarbon endowment of an exploration play and in addition the module can be used to sum the endowment of a number of plays, for example, an entire basin, a region, a country or the world. When output from the PPDR module is used the PSUM module can be used to sum remaining potentials in the same manner as the endowment is calculated.

TRICKS AND TRAPS

The predecessor mainframe program, from which PRASS1 was derived, evolved over a number of years into a large and complex suite of interrelated program modules. Most of these have been converted for operation on a personal

computer; however in the evolution and subsequent conversion process a number of quirks have arisen which can complicate the use of the program. As a result there are definite rules and procedures that must be followed in order to run the system successfully. When these conditions may arrise in the execution of a program, the following notation of tricks and traps will be used.

TRAPS: ***These represent conditions or actions that will cause the program module to abort or to run incorrectly.***

Other aspects which are helpful to know are designated as:

TRICKS: ***These are points which we have noted that will facilitate program operations.***

This User Guide is designed for use by persons who are familiar with basin analysis techniques, exploration play definitions and the principles, concepts and statistical assumptions that underlie the PRASS1 programs.

It is further assumed that the user is familiar with the elements of handling a personal computer and the basic file management procedures of the Disc Operating System (DOS) on the specific computer which is being used.

The PRASS1 program includes an array of individual executable files that are contained in the \PRASS1\PROG subdirectory, a series of supplemental program files contained in the \PRASS1\VALDATA subdirectory while the data files generated during the analyses are held in the \PRASS1\DATA subdirectory.

The technical specifications of the equipment required to run the program and the details for installing the software on the system are described in the Installation Instructions in APPENDIX 1.

CHAPTER 2 - DATA ENTRY AND IDENTIFICATION

There are very specific file identification and manipulation protocols within PRASS1 that must be understood and used carefully in order to execute the various analytic and graphics modules successfully. These are described in this chapter arranged in alphabetic order, with the exception of two important unique "identifiers" at the beginning, and some general editing facilities at the end. It is important to note that modules must be run in a sequence appropriate to the task being undertaken, and the function of each command in the chapter has been highlighted to assist the user in this regard. Users are referred to "Startup" comments in Appendix 1 for additional instructions regarding initial use of the PRASS1 Program.

The following functions and identifiers are described in Chapter 2:

UAI Unique Assessment Identifier
UDI Unique Distribution Identifier
Table 2 Codes for Types of Reservoir Variables
Table 3 Codes for Units of Measurement
Table 4 Types of Variables and Legitimate Units
COPY Data Transfer Between UAI's
CREATE To Create a Play Code (UAI)
DELETE To Remove a Distribution from an UAI
DIGIT To Input or Modify Types 2 and 3 Data
PURGE To Remove an UAI and all Associated Data
RMKS To append Text for Report Writer
RTRL To Retrieve Data for use in Modules
Miscellaneous Computer Commands
Text Editor
Kedit Commands

UNIQUE ASSESSMENT IDENTIFIER

Command *UAI*

The first command that is entered is usually the identification code for the exploration play to be studied. In PRASS1 each exploration play is identified with a Unique Assessment Identifier (UAI) which is used to collect and control all of the analysis relating to that play. Before this command can be executed the UAI must have been created in the CREATE module.

For PRASS1 a system of Unique Assessment Identifiers can be developed in the following manner for the specific purpose of a Project. These are contained in the VALUAI.DAT file. The format of the UAI is as follows:

CRBPYYMM

where C: is the Country Code
R: is the Region Code
B: is the Basin/Geological Sequence or Cycle Code
P: is the Exploration Play Code
YY and MM indicate the year and month that the analysis started. These attributes are assigned automatically by the program and do not need to be specified.

All of the valid codes that may be used are contained in the \PRASS1\DATA\VALUAI.DAT file and an example of the structure of such a file is shown in Table 1.

The initial alpha character in the UAI is the "Country Code". Because many exploration plays extend across national boundaries, composite country codes can be provided to group the countries when an exploration play extends across the border between them.

The second alpha numeric code denotes the "Region" in which the exploration play is defined. Some of the Region names are sometimes used synonymously for sedimentary basins and some are not.

The "Basin\Geological Sequence or Cycle" identifier may be coded according to the next most appropriate level of classification identified during the basin analysis process.

The final alpha-numeric code is the "Exploration Play Code".

By using this system of definition, one can examine a Unique Assessment Identifier and determine the country, region, stratigraphic cycle and cycle position for the play that has been analyzed. PRASS1 will use the designated UAI to set up all the intermediate files that are necessary in the analysis. These intermediate files will be collected as a unit and compiled to generate the final output reports for analysis for each individual UAI.

The command **UAI** is used to identify the play being assessed to PRASS1 . The input is 8-character UAI format. PRASS1 does an internal check using dictionary elements held in the file VALUAI.DAT to verify that UAI is valid. If it is accepted, then the prompt, **>** , will be displayed on the screen. If it is incorrect, then PRASS1 will request UAI again. The command, **UAI**, is the first step to enter PRASS1, and the operation is as follows:

TRAP: ***At the start of each PRASS1 session set "caps lock" as the UAI must be entered in upper case letters.***

COMPUTER OPERATION:

> *UAI (cr)*

UAI (CRBPYYMM) >?_ **enter C4218912** *(cr)* The screen will display-

C4218912 Last access\89\03\23
Country: CANADA
Region: Western Canada
Basin: Mississipian
Play: Alberta Foothills
Geologist: RMP
Assessor: GCT
Remarks: GSC input from ERCB files.

If you are not sure which UAI to use type LIST at the PRASS1 prompt:

>LIST (cr)

this will display a complete list of all UAI codes that have been created.

If you type in an incorrect UAI code you will get the message:

** Error: UAI is eight characters*

If you type in a UAI code which has not yet been created, for example AAA78903, then you get the error message:

UAI: AAA78903 needs to be created.

UNIQUE DISTRIBUTION IDENTIFIER

The technical information associated with each exploration play (**UAI**) including measurement units, hydrocarbon type and version of information is described by a Unique Distribution Identifier (**UDI**). There is an unique identifier (**UDI**) for each probability distribution or data set from which a probability distribution can be constructed. A distribution is identified by the code sequence:

NNUUPVTRRR

where **NN:** is the name of the geological variable,
UU: is the unit of measurement,
P : is the product code where O = oil and G = gas,
V : is the version of the distribution,
T : is the type of data, and
RRR: is the pool rank for individual pools ie: 001,002,.... ,999 for individual pools or @@@ for all pool ranks.

Geological Variables

NN: The names of geological variables are listed in Table 2 with their respective codes. These are self explanatory geological and reservoir engineering terms.

Units of Measurement

UU: The units of measurements are listed in Table 3 with their respective codes. Input data can have different types of units of measurements and the output may be in either metric or British units as selected by the user. Table 4 lists all codes of geological variables and their legitimate unit of measurement.

In Table 4, the units of measurement with the odd number codes are in metric units while the next even number is the equivalent British units. If conversion of units is requested, then the corresponding units in the same category will be converted.

TRAP: ***There are some variables used where different unit codes (UU) apply when the variables are used for oil rather than gas.***

Product Code

P: The Product code is used to signify whether the analysis is directed toward oil or gas. Oil = O and Gas = G. This information is used for scaling and labelling graphics output.

TRAP: ***On a computer the number 0 and the letter O are two totally different characters. They must not be interchanged or an error will result!***

Version

V: Different versions of input data and generated data distributions are distinguished from one another by using different Version designations. These may be either alpha or numeric codes. Input data codes should be numeric codes ranging from 1 to 9 so that they do not become confused with generated output codes which may be a 0 or an alpha code.

For example, in a gas play, if the distribution of pool area measured in acres derived from one data source, is Version 1, then the UDI will be 0206G1. If the distribution of pool area measured in acres derived from a second data source is Version 2 then the UDI will be 0206G2. Different cases and data assumptions may be tested and evaluated by applying different Version designations to the data within the same UAI.

Type of Data

T: Three types of data can be utilized in PRASS1:

Note: PRASS1 does not use Type 1 data.

Type 2 data is subjective data used to describe the characteristics of an exploration play (Fig. 2). Each data value is associated with its corresponding probability of occurrence. The first number of each pair is the value, whereas the second number is the probability of its occurrence.

The data values must be input to at least one decimal place and must increase downward.

The probability values should decrease from 1.0 to 0.0 for all distributions except for the number of prospects distribution which begins with a probability value of 0.99 and decreases to 0.0.

A maximum of 100 pairs of numbers may be input.

Type 3 data is measured data from pools or fields. For each pool or field one or more measurements of separate variables are entered and each is defined by a separate UDI (Fig. 2). Input of these measurements must be to at least one decimal place.

All of these measurements together constitute a data matrix. For each row, measurements are obtained from the same hydrocarbon pool or field. For each column, measurements are obtained for the same variable, but from different pools, or fields. Covariance and correlation matrices are computed from this data matrix in the CPSD and LPSD modules.

TRAP: *Dates must be entered as follows. YYMMDD.0 where MM and DD may be 0.*

TRAP: *Each UDI (ie column) must contain the same number of data points.*

TRICK: *If values for some data entries for some pools is not available then enter -1.00 to fill out the data set as required.*

TRAP: *Less than 200 data lines for pool parameters can be entered.*

Type 4 data is generated from statistical analyses within PRASS1. These can only be retrieved for evaluations and graphic displays. Each set of Type 4 data has a specific version code (V) attached to it and in some cases a specific geological unit code (NN) as well. These are very important when retrieving the output from an analysis. The NN and V codes for each module are listed in the discussion of output for each module.

The pool ranks RRR for individual pool sizes are attached to the last three positions of the UDI definition for Type 4 data.

Table 2.

Codes for Types of Reservoir Variables (NN)

Code	Name
01	Area of closure
02	Area of pool
03	Formation thickness
04	Reservoir fraction
05	Net pay
06	Porosity
07	Trap fill
08	Hydrocarbon saturation
09	Water saturation
10	Recovery factor
11	Yield
12	Reservoir pressure
13	Gas fraction
14	Oil fraction
15	Shrinkage factor
17	Gas/oil ratio
19	Permeability
21	Enhanced recovery factor
30	Reservoir temperature
31	Gas deviation factor
32	Gas formation volume factor
33	Oil formation volume factor
50	Depth
56	Cumulative production
61	Number of prospects
62	Number of pools, derived
63	Number of pools, data
68	In-place pool size, Monte Carlo
69	Recoverable pool size, Monte Carlo
70	In-place pool size, lognormal
71	Recoverable pool size, lognormal
72	In-place pool size, data
73	Recoverable pool size, data
76	Reserves (primary recovery)
77	Reserves (enhanced recovery)
78	In-place individual pool size (derived)
79	Recoverable individual pool size (derived)
80	In-place play potential or endowment (derived)
81	Recoverable play potential or endowment (derived)
82	In-place group potential or endowment (derived)
83	Recoverable group potential or endowment (derived)
84	In-place district potential or endowment (derived)
85	Recoverable district potential or endowment (derived)
86	In-place basin potential or endowment (derived)
87	Recoverable basin potential or endowment (derived)
88	In-place country potential or endowment (derived)
89	Recoverable country potential or endowment (derived)
90	Discovery date
94	Observed pool rank
95	Production year

Table 3.

Codes for Units of Measurement (UU)

CODE	UNIT	PRINT SYMBOL
00	Dimensionless	
01	Numbers	no
02	Decimal fractions	dec fr
03	Meters	m
04	Feet	ft
05	Hectares	ha
06	Acres	ac
07	Square meters	sq m
08	Square feet	sq ft
09	Square kilometres	sq km
10	Square miles	sq mi
11	Kilopascals	kPa
12	Pounds/sq inch	psi
13	Kelvin	K
14	Rankin	R
15	Celsius	C
16	Fahrenheit	F
17	Cubic meters	cu m
18	Cubic feet	cu ft
19	Million cubic meters	M cu m
20	Billion cubic feet	Bcf
22	Barrels	bbl
24	Million barrels	MM bbl
25	Million cubic meters/hectare-meter (used for gas only)	M cum/ha-m

Table 3. (cont'd)

Codes for Units of Measurement (UU)

CODE	UNIT	PRINT SYMBOL
26	Million cubic feet/acre-foot	MMcf/ac-ft
27	Cubic meters/ hectare-meter	cu m/ha-m
28	Barrels/acre-foot	bbl/ac-ft
29	Cubic meters/cubic meter (used for GOR only)	cu m/ cu m
30	cubic feet/barrel	cu ft/bbl
31	Billion cubic meters (gas)	B cu m
32	Trillion cubic feet	Tcf
33	Billion cubic meters (oil)	B cu m
34	Billion barrels	B bbl
35	Cubic meters/kPa (gas)	cu m/kPa
36	Thousand cubic feet/psi	Mcf/psi
37	Cubic meters/kPa (oil)	cu m/kPa
38	Barrels/psi	bbl/psi
39	Cubic meters/day (gas)	cu m/day
40	Thousand cubic feet/day	Mcf/day
41	Cubic meters/day (oil)	cu m/day
42	Barrels/day	bbl/day
43	Millidarcy (gas)	md
44	Millidarcy (oil)	md
45	Million cubic meters (gas)	M cu m/ww
46	Billion cubic feet	Bcf
47	Million cubic meters (oil)	M cu m/ww
48	Million barrels/ww	MM bbl/ww
49	Kilogram/cubic meter	kg/ cu m
50	Degree	API

Table 4.
Types of Variables and Their Legitimate Units of Measurement for PRASS1

Code	Variable	Unit of Measurement	
		S.I.	British
01	Area of closure	05 ha	06 ac
02	Area of pool	07 Sq m 09 Sq km	08 Sq ft 10 Sq mi
03	Formation thickness	03 m	04 ft
05	Net pay		
50	Depth		
04	Reservoir fraction	02 dec fr	02 dec fr
06	Porosity		
07	Trap fill		
08	Hydrocarbon saturation		
09	Water saturation		
10	Recovery factor		
13	Gas fraction		
14	Oil fraction		
15	Shrinkage factor		
18	Favourable facies fraction		
20	Surface loss		
11	Yield	25 M cum/ha-m 27 cu m/ha-m	26 MMcf/ac-ft 28 bbl/ac-ft
12	Reservoir pressure	11 kPa	12 psi
31	Gas deviation factor	00 Dimensionless	00 Dimensionless
32	Gas formation volume factor		
33	Oil formation volume factor		
90	Discovery date		
91	Field/pool code		

Table 4. (cont'd)
Types of Variables and Their Units

Code	Variable	Unit of Measurement		
			S.I.	British
16		No. of net pay zone	01 number	01 number
61		No. of prospects		
62		No. of pools, derived		
63		No. of pools, data		
94		Observed pool rank		
64		No. of wells/pools		
65		No. of wells/field		
66		Cumulative number of wildcats		
30		Reservoir temperature	13 Kelvin 15 Celsius	14 Rankin 16 Fahrenheit
17		Gas/oil ratio	29 cu m/cu m	30 cu ft/bbl
68		In-place pool size, Monte Carlo	19 M cu m (gas) 19 M cu m (oil)	20 Bcf (gas) 24 MM bbl (oil)
69		Recoverable pool size, Monte Carlo		
70		In-place pool size, lognormal		
71		Recoverable pool size, lognormal		
72		In-place pool size, data		
73		Recoverable pool size, data		
76		Reserves (primary)		
77		Reserves (enhanced)		
78		In-place individual pool size		
79		Recoverable individual pool size		

Table 4 (cont'd)
Types of Variables and Their Units

Code	Variable	Unit of Measurement	
		S.I.	British
80	In-place play potential or endowment	19 M cu m 19 M cu m 31 B cu m (gas) B cu m (oil)	20 BCF 24 MM bbl 32 Tcf 34 B bbl
81	Recoverable play potential or endowment		
82	In-place group potential or endowment		
83	Recoverable group potential or endowment		
84	In-place district potential or endowment		
85	Recoverable district potential or endowment		
86	In-place basin potential or endowment		
87	Recoverable basin potential or endowment		
88	In-place country potential or endowment		
89	Recoverable country potential or endowment		
56	Cumulative production		
19	Permeability	43 md	44 md
54	Flow rate	39 cu m/day (gas) 41 cu m/day (oil)	40 Mcf/day 42 bbl/day
55	Productivity index	35 cu m/kPa 37 cu m/kPa	36 Mcf/psi 38 bbl/kPa
57	Discovery rate	45 M cu m/ww (gas) 47 M cu m/ww	46 Bcf/ww 48 MM bbl/ww
51	Density	49 kg/cu m	50 API

DATA TRANSFER BETWEEN UAI's

Command *COPY*

FUNCTION:

This command is used within a **UAI** to transfer and copy data (a **UDI**) from **another UAI** to an identical **UDI** of the currently declared **UAI**.

COMPUTER OPERATION:

> *COPY (cr)*

Copying to UAI: AAA28903. OK? (Y?N) **Y**

From UAI (CRBPYYMM) >?_ **enter** *<UAI>* **that contains desired distribution.**

From UDI NNUUPVT >?_ **enter** *UDI* **desired** *(cr)*

If a UDI already exists in the UAI to which the data is copied, then the old data will not be replaced by the new data.

UDI: 9000O13 already exists. - Data not copied.

From UAI (CRBPYYMM) >?_

You can copy from a second UAI or *( ]])* **will terminate the operation.**

TRAP: If you attempt to copy from one UDI to another UDI within the same UAI the program will totally abort and return you to C:>.

TO CREATE A PLAY CODE (UAI)

Command *CREATE*

FUNCTION:

The command CREATE is used to generate a UAI code at the time that a new play analysis is started. Only those UAI codes that already exist in the \PRASS1\VALDATA\VALUAI.DAT file can be created.(See UAI)

TRAP: ***The structure of the UAI must be present in the VALUAI.DAT file (Table 1). If it is not then it must be inserted into that file using the text editor from DOS before entering PRASS1 and prior to issuing a command to create the file. If you attempt to access the VALUAI.DAT file while you are in PRASS1, you may corrupt the system.***

COMPUTER OPERATIONS:

At the prompt for PRASS1 issue the command:

> *CREATE (cr)*

Country >?_ **enter C** (cr) **See UAI Codes Table 1 in the section labelled UAI for all codes required to create a new UAI.**

-- CANADA -- ***(generated from dictionary entry in VALUAI.DAT)***

Region >?_ **enter 4** (cr)

-- Western Canada

Basin >?_ **enter 2** (cr)

-- Mississipian --

PLAY >?_ **enter 1** (cr)

-- Alberta Foothills --

UAI: C421YYMM has been created.

Geologist >_

Analyst >_

Remarks >?_ **enter appropriate comments, i.e. GSC Input from ERCB files.**

Note: Because the date is issued automatically by the program you can not CREATE more than one UAI for any specific play during one month. A UAI remains valid for as long as you require it to be used.

C421YYMM Last access YY/MM/DD

Country: Canada
Region: Western Canada
Basin/Cycle: Mississippian
Play: Alberta Foothills
Geologist: ???
Analyst: ???
Remarks: ???

Filename C421YYMM.UDI has been built.
Comments (Y/N) >

History file: C421YYMM.HIS has been created.
>

TO REMOVE A DISTRIBUTION FROM AN UAI

Command *DELETE*

FUNCTION:

This command is used within an UAI to delete all data from specified UDI's in the PRASS1 data base.

COMPUTER OPERATION:

At the prompt for PRASS1;

> *DELETE (cr)*

Deleting from UAI: AAA28903. OK? (Y\N) >?_ **enter Y** *(cr)*

UDI (NNUUPVT) >?_ **enter i.e.** *9000O13*

UDI 9000O13 deleted!

Do you want to delete more? (Y\N) >?_

The message: *Record not found... NOT deleted!* **will be given if the UDI can not be found.**

TO INPUT OR MODIFY TYPES 2 AND 3 DATA SETS INTO PRASS1

Command *DIGIT*

FUNCTION:

Almost all of the input data which is used in PRASS1 analyses is entered by using the DIGIT program module. In addition DIGIT permits the access to basic input information for the purpose of editing. The command, DIGIT, uses the KEDIT Text Editor to enter and update information in the data base within PRASS1.

It is recommended that the data to be used in PRASS1 be stored in Text Files outside of the PRASS1 program data base where amplification text can be appended, because within DIGIT only numerical values can be entered. The data may be readily moved from Text Files using the KEDIT program as part of the data entry process in DIGIT. Any verbal text that is relevant to the data sets may also be transfered to the play document by using the RMKS module and the Text Editor.

COMPUTER OPERATION:

DIGIT requires that the UAI command be executed prior to its operation. If you have not declared a UAI, DIGIT will issue a warning message and terminate, returning to > prompt.

STEPS FOR ENTERING TYPE 2 DATA:

> DIGIT (cr)

"TYPE 3" or UDI numder (NNUUPV) >?_ **enter distribution code (NNUUPV) i.e. 0205G1 (cr)**

where NN = code for geological variable
UU = code for unit of measurement
P = O for oil, G for gas
V = version number 1 - 9

TRAP: Do not include the code for data type when entering the UDI in DIGIT unless you only wish to review the units in the following input summary to insure that they are correct.

The following screen is then presented;

NN > 02
----Area of pool----

UU > 05
----ha----

P > G
----gas----

New curve? (Y/N) Y (cr)

TRICK: Be sure to check the decoding of the UDI illustrated above to ensure that you are actually entering the distribution you intend. A mislabeled distribution can be very difficult to identify as the cause of irrational results from their use in various of modules.

KEDIT opens a new temporary file at this point into which data can be entered.

c:\prass1\data\digitemp Line=0 Col=1 Size=2 Alt=0,0

** * * Top of File * * **
1 (UAI)-0206O1 Curve type : ? Date : YY/MM/DD
2 -----+----------+----------+----------+----------+------
** * * End of File * * **

= = = >

For Type 2 information each UDI is entered separately and requires entering two numbers per line.

The first number is the value of a geological variable, and the values of the geological variables must increase downward. A maximum of 100 data points can be entered.

The second number is the probability expressed as a decimal fraction and these values must decrease downward. The probability values should decrease from 1.0 to 0.0 for all distributions except for the number of prospects distribution which begins with a probability value of 0.99 and decreases to 0.0.

KEDIT commands are used to add new data, or to modify old data, and to update the PRASS1 data base.

Use F2 To insert a new blank line after each data pair

10.0 1.00 (F2)
300.0 0.95 (F2)
2000.0 0.05 (F2)
4000.0 0.00 (F2)

The data may be keyed in directly, or preferably it may be copied from a Text file into the digitemp file in PRASS1. See your Text Editor manual for the procedure to be used for copying data between files. After completion of input or update then you can end the operation by;

HOME
= = = > FILE (cr)

O.K.to post changes to the data base >?_

Updated.

The distribution will be updated into the data base. In the event that there is an error in the format of the input data you will be returned to the DIGITEMP file in the Text Editor.

TRICK: You do not need to a insert line number as they will be generated by the program.

STEPS FOR ENTERING TYPE 3 DATA:

For Type 3 information, you can enter or update as many distributions as you wish, but on one single screen, you can only enter four distributions. Additional distributions can be added at the bottom of the initial four distributions.

Type 3 data is measured data from pools or fields. For each pool or field, there are one or more measurements, each defined by a separate UDI. Input of these measurements must be to at least one decimal place. All of these measurements together constitute a data matrix. For each row, measurements are obtained from the same pool or field. For each column, measurements are obtained for the same variable, but from different pools, or fields.

Covariance and correlation matrices can be computed from the data matrix by using the LPSD program module.

TRAP: *Dates must be entered as follows:*

YYMMDD.0 where MM and DD may be 0.

TRAP: *Each UDI (ie column) must contain the same number of data points.*

TRICK: *If values for some data entries for some pools is not available then enter -1.00 to fill out the data set as required.*

TRAP: *Less than 200 pools must be entered.*

COMPUTER OPERATION:

> *DIGIT (cr)*

'TYPE 3 or UDI number(NNUUPV) >?_ **enter** *TYPE 3 (cr)*

Use KEDIT commands to enter or edit the data.

```
* * * Top of File * * *
1    C4218903        Curve Type:3          Date:89/03/09
2    ---------+----------+---------+---------+---------
1001 (udi???) (udi???)  (udi???)  (udi???)
   * * * End of File * * *
```

= = = >

Enter UDI's into the brackets as follows.

↑ move cursor to Line 1001 and insert the UDI's within the brackets then (F2)

1001 **(7201O1)** **(9000O1)** (F2)
55.8829 **470112.0** (F2)
205.9521 **480123.0** (F2)
46.2387 **490906.0** (F2)

TRAP: *If less than 4 UDI's are entered the unused (udi???) must be deleted.*

HOME
===> FILE (cr)

Do you want to update into the PRASS1 database (Y/N) >?_ enter ***Y*** *(cr)*

Updated.

The new Type 3 data has now been entered into the PRASS1 data base.

Editing Type 3 data is done in the same manner as described above for Type 2 data. Use KEDIT commands to delete lines, blocks of lines or individual columns of data.

TRAP: *If you delete some lines of data from one UDI you must either replace the values with -1.0 or delete the same lines from all of the UDI's in the UAI.*

TO REMOVE AN UAI AND ALL ASSOCIATED DATA

Command *PURGE*

FUNCTION:

If you wish to totally remove a UAI and all of it's contents from the files use the command PURGE, but be sure you want to do it! Once executed, all of the UAI and UDI data associated with the UAI will be erased and cannot be retrieved. It may be desireable to backup all the data from the UAI to a floppy disk before purge is executed.

COMPUTER OPERATIONS:

At the prompt for PRASS1;

>PURGE (cr) **The following display appears -**

UAI (CRBPYYMM) >?_ **enter the <UAI> that you wish to purge. A summary of the information contained in it is displayed and you are asked.**

OK to continue ? (Y/N) >?_ **Enter Y if you wish to continue otherwise enter N. If you enter Y the following message is displayed.**

UAI and ALL associated data will be DELETED !

Are you sure ? (YES/NO) >?_ **If you are sure that you wish to proceed type YES (cr)**

You will see the message ;

******** *Purged* ****** which indicates that the UAI and all associated data has been deleted.**

TO APPEND TEXT FOR REPORT WRITER

Command *RMKS*

FUNCTION:

This command, RMKS, allows entry of text to the play record for the UAI that may be pertinent to the understanding of the various module outputs. This may include sources of data, vintage of data, and any of the assumptions that may be reflected in the assessment.

COMPUTER OPERATIONS:

>RMKS (cr)

The file is presented in KEDIT and text can be input and edited. This file is used to keep track of assumptions which are used or any special sort of information which you may want to include in the final tabular report on the analysis.

TO RETRIEVE DATA FOR USE IN MODULES

Command ***RTRL***

FUNCTION:

The command, RTRL, is used to retrieve information from the PRASS1 data base to the temporary memory of the computer for use in specific modules. In using the manual, check the individual data requirements needed to execute the specific module in the INPUT section for the module. The retrieval is accomplished by using two Boolean operators, **AND** and **OR**. The keywords for retrieval are the basic identifiers, the UAI and UDI. The following is the format for the retrieval statement:

(UAI)- (UDI)
CRBPYYMM-NNUUPVTRRR

where
- **C:** country code
- **R:** region or geological province code
- **B:** basin/geological cycle code
- **P:** play code
- **YY:** the year when the UAI was CREATED
- **MM:** the month when the UAI was CREATED
- **NN:** geological variable name code
- **UU:** unit of measurement code
- **P:** product code oil=O or gas=G
- **V:** version code
- **T:** type of information
- **RRR:** pool rank for identification of individual pool sizes in TYPE 4 data

If the ranks are not specified, then no ranks belonging to the UDI will be retrieved. If only selected ranks are to be retrieved, then those ranks must be specified in the retrieval statement.

The keywords in a retrieval statement may be represented by the specific letters or by the wildcard symbol @ which selects all available variables in the keyword position. For example, if you want **all** data on the play, then the retrieval statement is as follows:

AAA28903-@@@@@@@

Note, the positions for pool rank are blank, this means that no individual pool sizes will be retrieved.

If **all** data for **pool area UDI (02)**, for **all** of the **UAI**'s in the file, which were entered into PRASS1 in **1980**'s is requested, then the retrieval statement would be:

@@@@8@@@-02@@@@@

It is apparent that when the Boolean operator, **AND** , is applied to positions within this statement, information from a number of UAI's may be retrieved.

In addition, one or more retrieval statements can be set, in these cases, the operator, **OR**, is applied to between statements. For example, if both net pay and porosity are requested, then the retrieval statements are:

AAA2@@@@-05@@@@@
AAA2@@@@-06@@@@@

In this example the date is not specified.

COMPUTER OPERATIONS:

> RTRL (cr)

Do you want to edit RTRL retrieval statement (Y/N) >?_

If you answer yes the retrieval input file \PRASS1\DATA\(UAI).rti is displayed so that the correct RTRL input statement can be entered. The form of entry is shown below:

** * * Top of File * * **
** RTRLin - Notes:*
***
** 1. For both RTRLin and RTRLout, a "*" in column #1 indicates a comment line. Selections must start in column #1*
** 2. Selection line format, all ranks: CRBPYYMM-NNUUPVT@@@*
** 3. To pull individual ranks, use: CRBPYYMM-NNUUPVTRRR*
** 4. Selection is positional - embedded blanks are not allowed.*
** 5. Use '@' anywhere in the selection for a wild card.*
** 6. The '-' separating the UAI from the UDI must be present.*
***
**RBPYYMM-NNUUPVTRRR*
C4218903-@@@@@@@@

** * * End of File * * **

= = = = >

To edit the retrieval statement move cursor to the retrieval statement.

Enter the UDI codes to retrieve the correct data from the PRASS1 data base. The more specific you make the retrieval statement the less time it takes to retrieve the correct material.

HOME
FILE (cr) **To store the changes**

TRAP. The retrieval statement from the previous run is held in the memory. Unless you are sure you know what is in the statement you should check it.

SHUT C4218903 File

Next the following screen is presented;

RUN RTRL (Y/N) >?_

If the answer is yes, then you are then asked;

Do you want to edit/setup RTRL output? (Y/N) >?_

If you answer Y then the retrieval output file \PRASS1\DATA\(UAI).rto is displayed showing a listing of all of the UDI's, the information they contain, the measurement units, product type and Version code. Unnecessary UDI's can be deleted. While it is not always specifically required it is good practice to delete all of the UDI's except those that are required for the analysis module which is being run. Deletion of a UDI from the retrieval output file does not remove it from the PRASS1 data base.

Use the Text Editor commands to delete data.

HOME
FILE (cr) To return to PRASS1

The requested UDI information is now available in the retrieval output file for ongoing analysis and graphics presentations. Other information sometimes required for data analysis is contained in special PRASS1 data sets which may be generated manually or by a program module.

MISCELLANEOUS COMPUTER COMMANDS

In addition to the PRASS1 module commands the following commands each perform a specific task.

(cr) denotes ←-Enter, or Carriage Return in all modules.

>] (cr) will cancel the current command and step back one step in the command sequence.

>]] (cr) will abort the complete command sequence and will direct the operation back to the PRASS1 prompt >.

>: (cr) shifts control to DOS and permits use of most DOS commands.

> STOP (cr) ends the PRASS1 session and returns to DOS to C:\>

>:PE (cr) activates the Text Editor and permits use of all edit functions in the editor. On completion of the editor function the KEDIT commands FILE, QQUIT, or F3 will revert control to PRASS1 to the same position that the edit function was invoked

> LIST (cr) lists all of the UAI codes that have been created and permits the user to determine the valid UAI codes which are available on the system.

> CTRL P (cr) will direct all output to the printer as well as to the screen. This is a toggle command which means that if it is issued a second time the printer output is turned off.

TRAP: ***Make sure the printer is turned on before issuing the command.***

TEXT EDITOR

The Text Editor which is not included within the PRASS1 package is KEDIT 4.0 produced by Mansfield Software Group, Inc. and is subject to copyright restrictions as noted. Where large files must be handled KEDIT 4.0 is useful for data preparation and may be used outside of the PRASS1 program. The commands required routinely are included in this Guide. The KEDIT 4.0 manuals will provide detailed instructions for more serious users.

The modules which use the Text Editor are identified with the Mansfield Software logo.

KEDIT COMMANDS

Cursor Pad and Numeric Pad Keys:

→	Move cursor one position to the right. Repeat if needed.
←	Move cursor one position to the left.
↑	Move cursor up one line; scroll if at the top of the file area.
↓	Move cursor down one line; scroll if at the bottom of the file area.
PgUp	Scrolls backward one window in the file.
PgDn	Scrolls forward one window in the file.
End	Cursor to end of cursor line.
Del	Delete character at cursor location.
Ins	Toggle Insert Mode on\off.
Ctrl- →	Tab to next word.
Ctrl- ←	Tab to previous word.
Ctrl-PgUp	Top-of-File line becomes current line.
Ctrl-PgDn	Bottom of file becomes current line.
Ctrl-End	Delete from cursor to end of cursor line.
Ctrl-Home	Cursor to upper left corner of file area.
Ctrl-Break	Interrupt long running command.

Typewriter Area Keys:

Enter	If cursor is on command line, enter command. Otherwise, move cursor to beginning of next line
Esc	Attempt to undo changes made to cursor line since cursor entered the line
→| *(Tab)*	Move to next tab column or, if prefix area displayed, to next field
|← *(S-Tab)*	Move to previous tab column or, if prefix area displayed, to previous field
Bksp	Move cursor left, delete character in cursor position
Alt-A	Add a new line, move cursor to left margin column
Alt-B	Box block mark -- mark one corner of a box
Alt-C	Copy a block
Alt-D	Delete a line
Alt-F	Fill box with a specified character
Alt-G	Group delete -- delete a block
Alt-J	Join two lines
Alt-K	Copy a block, and leave block marked
Alt-L	Line block mark - mark one end of a line block
Alt-M	Move a block
Alt-O	Overlay -- box block overlays area starting at cursor
Alt-R	Recover a changed or deleted line
Alt-S	Split a line
Alt-U	Unmark a block
Alt-W	Word delete

Function Keys:

F2	Adds a new line, moves cursor to left margin column
F3	QUIT current file without saving the file
F4	Move cursor to next tab column
F5	Cursor line becomes current line
F6	? -- redisplay last command line
F7	Cursor to column 1 of cursor line

In Prefix Area

K (cr)	Switches to next file in the ring
K filespec(cr)	Loads a new file into the current window and moves the file that is there to the next position in the ring
DELETE n (cr)	Deletes n lines below the current line
*DELETE **	Deletes all lines from current line to end of file
FILE (cr)	Saves the file and removes the file from KEDIT
SAVE (cr)	Saves the file and retains the file in KEDIT
QUIT (cr)	Removes the file from KEDIT without saving. If the file has been changed an error message will tell you what to do.
QQUIT (cr)	Removes the file from KEDIT without saving even though it has been changed.

PRINT Prints the data within a marked block or designated lines.

PRINT ALL Prints the entire file.

SORT Sorts blocks of data. See KEDIT manual for a more detailed explanation.

Make the top of the block to be sorted the Current Line (F5) on the Prefix Line type in the following command

SORT "n" "d or a" "n1 m1"

where

n = number of lines to be sorted
d = descending order
a = ascending order
n1 = left side of column to be sorted
m1 = right side of column to be sorted

for example the command

SORT 20 D 22 36

will sort 20 lines including the current line in descending order based on the contents of columns 22 to 36.

CHAPTER 3 - ANALYTIC MODULES

The analytic modules of PRASS1 provide the analyst a varied array of tools with which to create a mathematical model of the exploration play being assessed. Combined with a clear understanding of the geological model, the more data that can be incorporated into the analysis, the better should be his results. Data should be checked for appropriateness and inter-relationships (STAT, LPLT, XPLT, BPLT),

In effect the analyst should use the program in a series of steps, each step serves to limit the available options, until he arrives at an acceptable approximation of the underlying super population from which pools in the play were derived. The modules (LPSD, MPSD, PDSCV, MPRO, PSRK) are used to generate the initial ranges of variables for input into MATCH. Once an acceptable MATCH is achieved the analyst can describe and summarize his final evaluation. (PSDR, PPDR, PSUM, RVGN).

Table 5. ANALYTIC MODULES

MODULE	NN	VER	DESCRIPTION
CPSD	70-71	C,D,I	Generates Conditional Pool Size distributions of In-Place or Recoverable Hydrocarbons using the CPSD curve fitting algorithm. Outfile <UAI>.CPO.
	01-40	C	Log normal approximations of the geological input variables that generate the Conditional Pool Size Distributions using the CPSD curve-fitting algorithm. Outfile <UAI>.LPO.
LPSD	70-71	L,J,K	Generates Conditional Pool Size Distributions of In-Place or Recoverable Hydrocarbons using the LPSD curve-fitting algorithm. Outfile <UAI>.LPO.
	01-40	L	Lognormal approximations of the distributions of the geological input variables that generate the Conditional Pool Size Distributions using the LPSD curve-fitting algorithm. Outfile <UAI>.LPO.
MATCH	78-79	U	Generates a series of possible matches of discovered pools to numerous sets of pool ranks generated by providing ranges of values for mu, sigma square and N. The matches are ranked according to a preset criterion and the output for Hydrocarbons In-Place or Recoverable includes pool ranks (RRR), with output version label U, for the best match. Outfile <UAI>.MTO.
MPRO	62	B	Generates a distribution of the Number of Pools by combining the number of prospects distribution with geological risk factors input using file INMPRO. Outfile <UAI>.NPO.
MPSD	68-69	1-9	Generates a Conditional Pool Size Distribution for In-Place or Recoverable Hydrocarbons using a Monte Carlo simulation process to multiply input distributions together. (Versions 1 to 9). Outfile <UAI>.MPO.
PDSCV			Estimates the parameters of a pool size distribution (mu and sigma square), and a value of N, that represent the most likely or maximum log likelihood solution in the discovery process model. Input data include size and date of discovery. Outfile <UAI>.PDO.

Table 5. ANALYTIC MODULES (cont'd)

MODULE	NN	VER	DESCRIPTION
PPDR	80-81	R	Generates a distribution of the undiscovered potential of the play for In-Place or Recoverable Hydrocarbons, constrained by the discoveries that have been made and matched, as recorded in the file. INPSDR. Outfile <UAI>.PPO.
PPDR	62	R	The distribution of the number of undiscovered pools, also generated within PPDR. Outfile <UAI>.PPO.
PSDR	78-79	R	Generates the pool size ranges of undiscovered pools (RRR) constrained by the discoveries that have been made, matched and recorded in the file INPSDR. Outfile <UAI>.PSO.
PSRK	78-79	N	Generates pool sizes by rank for given values of mu, sigma square and N. The pool ranks are retrieved by using RRR=@@@ in the RTRL statement. Outfile <UAI>.PRO.
PSUM	80-87	0	Generates the total endowment for a play, basin, province, country, or world. It is used to aggregate endowment data from individual plays. Outfile <UAI>.PMO.
RVGN	01-40	G	Generates distributions of estimates of the reservoir properties for undiscovered pools, based on the reservoir properties described by the input distributions for LPSD. The distributions are retrieved using the RRR=@@@ statement in RTRL. Outfile <UAI>.RVO.
STAT			Computes the means, standard deviations, minimum, maximum, N, and variance of TYPE 3 input data sets. Outfile <UAI>.STO.

LOG NORMAL POOL SIZE DISTRIBUTION

Command *CPSD*

FUNCTION:

The module **CPSD** is used to compute the Pool Size Distribution that best approximates the input parameters with which the analyst chacterizes the play. The module may be used either to chacterize attributes of a sample population by using **TYPE 3** data, or to estimate an underlying superpopulation by using **TYPE 2** data. The module **CPSD** invokes the reservoir engineering equation:

$$Pool\ Size = \frac{C * Area * Net\ Pay * Porosity * Hydrocarbon\ Saturation * Recovery\ Factor}{Gas\ or\ Oil\ Formation\ Volume\ Factor}$$

where C is a unit conversion constant.

Note: The modules CPSD and LPSD are the same except for the curve fitting algorithm that approximates the log normal distribution represented by the data.

INPUT:

a) The **UDI**'s of **TYPE 2** or **TYPE 3** geological variables are retrieved using **RTRL**. The maximum allowable number of distributions is 12. The variables may only include the components for the pool size equation listed above or recognized alternatives (i.e. Shrinkage vs Gas or Oil Formation Volume Factor).

b) Units of measurement can be S.I. or British, or both in one run. PRASS1 will convert units into their equivalent units.

c) You can mix distributions from different UAI's into one equation via the RTRL retrieval statement.

TRICK: ***Set up a dummy UAI to hold generic distributions for porosity, hydrocarbon saturation, recovery factor, etc. and copy the appropriate UDI information to the case being analyzed.***

d) Entry errors are caught in **CPSD** and reported as:

* * * Error in GET DATA * * *

The user is responsible for insuring that the actual input is relevant to the assessment.

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> CPSD (cr)

Assessor >?_ (maximum 16 characters)
Operator >?_ (maximum 3 characters)
Remarks >?_ (maximum 60 characters)

TRICK: If you use an input constant other than 1 then insert the meaning of the constant in the Remarks file, at the Remarks >? prompt.

Do you want to store output for module RPRT (Y/N)>?_
Oil or gas (O/G) >?
Output system of measurement (SI/BR) >?_
Input constant >?_

This may be used for cases where some variables are entered as a constant (i.e: recovery factor can be entered as a constant).If this is done then the meaning of the constant should be entered in the Remarks file.

TRAP: The value, 1.0, must be entered as the input constant if no other value is used.

Recoverable resource (Y/N) >?_
Do you want to input mu and sig. sq. yourself (Y/N) >?_

This allows you to approximate a pool size distribution if you know the log mean and log variance. If the answer is Yes, then;

Enter Mu >?_
Enter unit of measurement code for Mu >?_
Enter sigma square >?_

After you enter all information, PRASS1 will execute CPSD in an interactive mode. If you want a copy of the CPSD output as it is running use :Ctrl-P prior to CPSD.

OUTPUT:

(1) Outfile, **<UAI>.CPO** for the tabular report.

(2) Disk file, **<UAI>.CPD** is generated for subsequent processes,

(3) **UDI**'s for each type of estimated distribution are listed as follows:

Distribution Name	NN	V	T
a) For the case where the pool size equation model is used:			
- In-place pool size (lognormal)	70	C	4
- Recoverable pool size (lognormal)	71	C	4
- Lognormal approximations for other variables	01 - 40	C	4
b) For the case where pool size data (NN=72 or 73) is used:			
- In-place pool size (lognormal)	70	D	4
- Recoverable pool size (lognormal)	71	D	4
c) For the case where mu and sigma square parameters are entered:			
- In-place pool size (lognormal)	70	I	4
- Recoverable pool size (lognormal)	71	I	4

GRAPHICS:

All distributions generated by **CPSD** may be illustrated using the module **CPLT.**

LOG NORMAL POOL SIZE DISTRIBUTION

Command *LPSD*

FUNCTION:

The module **LPSD** is used to compute the Pool Size Distribution that best approximates the input parameters with which the analyst chacterizes the play. The module may be used either to chacterize attributes of a sample population by using **TYPE 3** data, or to estimate an underlying superpopulation by using **TYPE 2** data. The module **LPSD** invokes the reservoir engineering equation:

$$Pool\ Size = \frac{C * Area * Net\ Pay * Porosity * Hydrocarbon\ Saturation * Recovery\ Factor}{Gos\ or\ Oil\ Formation\ Volume\ Factor}$$

where C is a unit conversion constant.

Note: The modules CPSD and LPSD are the same except for the curve fitting algorithm that approximates the log normal distribution represented by the data.

INPUT:

a) The **UDI's** of **TYPE 2** or **TYPE 3** geological variables are retrieved using **RTRL**. The maximum allowable number of distributions is 12. The variables may only include the components for the pool size equation listed above or recognized alternatives (i.e. Shrinkage vs Gas or Oil Formation Volume Factor).

b) Units of measurement can be S.I. or British, or both in one run. PRASS1 will convert units into their equivalent units.

c) You can mix distributions from different UAI's into one equation via the RTRL retrieval statement.

TRICK: ***Set up a dummy UAI to hold generic distributions for porosity, hydrocarbon saturation, recovery factor, etc. and copy the appropriate UDI information to the case being analyzed.***

d) Entry errors are caught in LPSD and reported as:

* * * Error in GET DATA * * *

The user is responsible for insuring that the actual input is relevant to the assessment.

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

>_ LPSD (cr)

Assessor >?_
Operator >?_
Remarks >?_

TRICK: If you use an input constant other than 1 then insert the meaning of the constant in the Remarks file, at the Remarks >? prompt.

Do you want to store output for module RPRT (Y/N)>?_
Oil or gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Input constant >?_

This may be used for cases where some variables are entered as a constant (i.e: recovery factor can be entered as a constant).If this is done then the meaning of the constant should be entered in the Remarks file.

TRAP: The value, 1.0, must be entered as the input constant if no other value is used.

Recoverable resource (Y/N) >?_
Do you want to input mu and sig. sq. yourself (Y/N) >?_

This allows you to approximate a pool size distribution if you know the log mean and log variance. If the answer is Yes, then;

Enter Mu >?_
Enter unit of measurement code for Mu >?_
Enter sigma square >?_

After you enter all information, PRASS1 will execute LPSD in an interactive mode. If you want a copy of the LPSD output as it is running use :Ctrl-P prior to LPSD.

OUTPUT:

(1) Outfile, <**UAI**>.**LPO** for the tabular report.

(2) Disk file, <**UAI**>.**LPD** is generated for subsequent processes,

(3) **UDI**'s for each type of estimated distribution are listed as follows:

Distribution Name	NN	V	T
a) For the case where the pool size equation model is used:			
- In-place pool size (lognormal)	70	L	4
- Recoverable pool size (lognormal)	71	L	4
- Lognormal approximations for other variables	01 - 40	L	4
b) For the case where pool size data (NN=72 or 73) is used:			
- In-place pool size (lognormal)	70	J	4
- Recoverable pool size (lognormal)	71	J	4
c) For the case where mu and sigma square parameters are entered:			
- In-place pool size (lognormal)	70	K	4
- Recoverable pool size (lognormal)	71	K	4

GRAPHICS:

All distributions generated by **LPSD** may be illustrated using the module **CPLT.**

SELECTION OF FINAL PARAMETERS BY COMPARISON OF DISCOVERIES TO PREDICTION

Command, *MATCH*

FUNCTION:

This command executes the program module which matches the discovered pools to a number of prediction scenarios according to the criteria set in the program instructions listed below.

The pool size distribution must be a lognormal. The option to use a distribution that is not log normal is not available in PRASS1.

Unless specific knowledge is available to the contrary use the option to specify that the largest pool has not been discovered ie rank r = 0. If specific knowledge is available you may indicate the ranks of the first r pools (0, 1, 2, ..n) that have been discovered. If 0 pools is selected then you have the option to use a manually generated **INPSDR** file (see **INPSDR** command) to specify the distribution of discoveries.

Ranges for mu, sigma square, and number of pools, N are entered. Increments are specified for sampling within the ranges for each variable. Some appreciation of the possible ranges for these variables should be obtained from running **PDSCV** or **LPSD** and **MPRO** prior to **MATCH**.

The discovered pools are matched to the log normal curve within the specified prediction window. For example; if the prediction interval start was 75 and end was 25 the program would attempt to match the pools to the curve within a window covering the 75% to 25% probability range.

The match may be specified on the best overall least square distance fit from either the median or the mean of each pool size rank. If the match is specified on the fit to the mean then it is important to recognize that the probability range of the mean lies with a window from 50% to 5% in most cases and the prediction interval chosen should reflect this.

The output can be sorted according to:

(i) **Distance** - Summation of all the distances, that is, the sum of all the differences between the observed pool sizes and the median or mean values of the calculated pool sizes.

(ii) **Percent Undiscovered** - the ratio of the mean of the play potential to the mean of the total resource.

(iii) **Gap** - the rank of the largest or first unmatched pool.

(iv) **Size** - the size of the largest or first unmatched pool.

(v) **Number of pools** - the total number of predicted pools.

(vi) **Log Likelihood** - a statistical index indicating the goodness of fit.

An additional feature has been added to **MATCH** that captures the **E(T)**, the mean play endowment for each of the predicted scenarios. This allows for the estimation of the full range of uncertainty associated with the 100% fits, in addition to the uncertainty that is associated with any specific match.
When sort is by **LogL**: the **E(T)** column replaces the **LRS** column (which is hidden in column 82-end, and will not be printed. The **LRS** column can be viewed when editing the **<UAI>.MTO** outfile and can be printed if the **DOS PRINT** command is used. When sort is by any other than **LogL**: the **E(T)** column replaces the **LogL** column. It too can be viewed or printed in the same manner as the **LRS** exercise.

INPUT:

RTRL for TYPE 3 data NN 72 or 73
Minimum, sample increment and maximum values of mu
Minimum, sample increment and maximum values of sigma square
Minimum, sample increment and maximum values of N

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> *MATCH (cr)*

Assessor >?_
Operator >?_
Remark >?_
Do you want to store output for module RPRT (Y/N) >?_
Do you want to store distribution into the database (Y/N)?_
Oil or Gas (O/G) >?_
Output unit of measurement (SI/BR) >?_
Recoverable resource (Y/N) >?_

TRAP: ***The program will only handle 400 combinations of N, Sigma Squared and Mu (treated in that order). A warning message is issued, but the program runs. Incomplete answers are generated as the entire range of Mu in particular is not utilized.***

TRICK: ***Manually compute the number of combinations (N steps x Sigma Squared steps x Mu steps = < 400).***

Do you want to use the output of LPSD (Y/N) >?_
If the answer is No then;
Minimum value of mu range >?_
Incremental Step for values of mu range >?_
Maximum value of mu range >?_
Unit of measurement code for the mu >?_
Minimum value of sigma square >?_
Incremental Step for values of sigma square <?_
Maximum value of sigma square >?_
If the answer was Yes, then;
Minimum number of pools in play >?_
Incremental Step for No. of pools in play >?_
Maximum number of pools in play >?_
Do you want to examine the various pool sizes by rank scenarios indicated by the input parameters above?
Note:no matching will be done for the scenarios (Y/N) >?_
If the answer is Yes, then;
Minimum pool rank >?_
Maximum pool rank >?_

The program will now execute the request for the scenarios. If the answer to the question was No, then;
No. of discovery records to be used >?_
Maximum number = 199

Enter the first r discoveries for conditional match >?_

If the answer is 0, then:

Do you want to specify the match in INPSDR (Y/N) >?_

Enter prediction interval start (95) >?_

Enter prediction interval end (5) >?_

Distance measured from MEAN or MEDIAN (MSE/MAD) >?_

Do you want to store on INPSDR > (Y/N)?_

Do you want a detail output (Y/N) >?_

USUALLY ANSWER N

Printout sorted by distance, gap, size, N, %U, or Log L

(D/G/S/N/U/L) >?_

No. of top cases to be printed >?_

Note: Maximum of 30 cases can be printed.

TRAP: ***When running a zero option match, the query 'No. of top cases to be printed' must be responded to or the program will abort. A 0 or 1 response is required***

TRICK: ***When entering the responses to the input questions stop at the last response and execute SHIFT PRT SCRN to print a copy of the input to check any problems, because if an error is present the program does not print out the input info.***

OUTPUT:

(1) Outfile, **<UAI>.MTO** for the tabular report. Only the first ranked case is stored when multiple cases are run.

(2) Printer output, :CTRL-P to print while running. This is very important with this module as the output obtained during the run is more comprehensive that which is generated in the report writer.

(3) Distributions are updated into the data base with the following **UDI's**

NNUUPVTRRR

where NN = 78 or 79
UU = unit of measurement,
P = O or G
V = U
T = 4
RRR = pool rank.

GRAPHICS:

RPLT generates the ranked pool size graph. If **INPSDR** is used the discovered pools are plotted in the positions assigned by **MATCH**. The plotting option used to set the size of the pool size box for **RPLT** should use the prediction interval that was used in the **MATCH** process.

TRAP: ***Check the INPSDR file for pools with scientific notation and correct it before attempting to plot using INPSDR.***

TRICK: ***After running MATCH over a range of values select the most appropriate values of mu, sigma square and N and make a final run using those values as both the minimum and maximum values of the variables and some nominal incremental step value. The result is a single case which represents the final judgement of the MATCH and which will generate the final INPSDR file and RPRT file.***

Command *MPRO*

FUNCTION:

This module generates a probability distribution of the number of pools that are estimated to exist in a play, by the combination of the number of prospects distribution with risk. The marginal probability for risk factors is entered through data set command **INMPRO.**

INPUT:

>RTRL Retrieve the TYPE 2 input in UDI 6101PV2 for the number of prospects distribution.

TRAP: ***The maximum allowable number of pools is 200.***

TRAP: ***The probability distribution in UDI 6101PV2 must start at .99 and decrease downward.***

COMPUTER OPERATIONS:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> MPRO (cr)

Note : The data-in file **INMPRO** must exist for the module **MPRO** to run.
Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N) >?_
Do you want to store distributions into the data base (N/Y) >?_
Oil of Gas (O/G) >?_

OUTPUT:
(1) The outfile **<UAI>.NPO** is generated for report writer,

(2) The diskfile, **<UAI>.NPD** is generated for use by other modules.

GRAPHICS:

The number of pools distribution **UDI** 6201PB4 (where **P**= O or G)can be directed to **CPLT.**

PROBABILITY DISTRIBUTIONS DERIVED BY MONTE CARLO SIMULATION PROCEDURE

Command *MPSD*

FUNCTION:

This module is used to multiply two or more TYPE 2 or TYPE 4 probability distributions together, to derive a third (for example curves for formation thickness and reservoir fraction might be combined in order to generate a curve for net pay).
If the pool size equation is applied, **MPSD** automatically places the appropriate distributions in the denominator if necessary.

INPUT:

>RTRL

TYPE 2 or TYPE 4 distributions are retrieved from the data base. Distributions which are not required in your equation should be deleted from the output of **RTRL**.

COMPUTER OPERATIONS:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

MPSD (cr)

Assessor >?
Operator >?
.Remarks >?

TRICK: ***If you use an input constant other than 1, then insert the meaning of the constant in the Remarks file, at the Remarks >?_ prompt.***

Do you want to store output for module RPRT (Y/N) > ?
Do you want to store distributions into the data base (Y/N)> ?
Oil or Gas (O/G)> ?
Output system of measurement (SI/BR) >?
NN of the output distribution >?

When **MPSD** is used to solve the pool size equation the appropriate NN's are, 68 in place/69 recoverable.
If an **NN** of 68 or 69 is imputed, **MPSD** will automatically supply the appropriate **UU** codes.

UU of the output distribution >?

When **MPSD** is used to solve the multiplication of other distributions,then the appropriate **UU**'s must be supplied.

Version,(1 - 9), of the output distribution >?
No of simulation trials >? (Max 5000 trials)

OUTPUT:

The outfile **<UAI>.MPO** is generated for **RPRT** module

GRAPHICS:

Any generated distribution (NNUUPV4 ,where P= O or G) can be directed to **CPLT**.

ESTIMATION OF POOL SIZE DISTRIBUTION UNDER KAUFMAN'S DISCOVERY MODEL: LOGNORMAL

Command *PDSCV*

FUNCTION:

This module is used to estimate the parameters of a Pool Size Distribution using the Discovery Process Model. The parameters estimated (mu, sigma square, and N), represent a best fit or maximum log likelihood solution for the discovery process model that uses as input the size and sequence of discoveries.

INPUT:

Retrieve TYPE 3 UDI data (NN 72 or 73) of pool size ranked by discovery sequence from oldest to youngest, and Discovery Dates (NN 90).

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> *PDSCV (cr)*

Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N) >?_
Oil or gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Recoverable resource (Y/N) >?_
Minimum number of pools in play >?_
Incremental Step for number of pools in play >?_
Maximum number of pools in play >?_

example: **Min 30, Step 10, Max 80 means that the mu and sigma square will be estimated when N = 30, 40, 50, 60, 70 and 80, respectively.**

Number of discoveries >?_
Do you want to maximize over BETA (Y/N) >?_

If the answer is Yes, then;
Enter estimated lower bound for the MLE of Beta >?_
Enter estimated upper bound for the MLE of Beta >?_

If the answer is No, then;
Minimum value of Beta >?_
Incremental Step for Beta >?_
Maximum value of Beta >?_

example: **if you enter the min beta 0.4, step 0.2 and max 0.8 the program will set beta values of 0.4, 0.6 and 0.8 and estimate mu and sigma square for each step value of N.**

Do you want a long output (Y/N) >?_

If long output is requested, then a class for each combination of N and beta will be printed, but this requires an excessive amount of printing. Usually the long output is not required and only the class of the most likely case is printed.

Enter base for class intervals (2/10) >?_ Users enter the class interval by using either base 2 or base 10 logarithm.

TRICK: *This module can take 12 to 48 hours to run if many alternatives are given. Use broad ranges for pool numbers and step values of beta initially and do not maximize over beta. A second run can be made to obtain more precision. Do not request the long output.*

TRAP: *Execute: Ctrl-P to put output to the printer or you will not see the results.*

OUTPUT:

For each N and beta general statistics and grouped distribution are printed. Summary of log-likelihood estimations for each mu and sigma square and N are also tabled.

(1) Outfile **<UAI>.PDO** for the tabular report,

(2) Printer output for users, **:CTRL-P** to print while running.

GRAPHICS:

There is no graphic output associated with **PDSCV.**

PLAY POTENTIAL DISTRIBUTION CONSTRAINED TO A DISCOVERY RECORD

Command, *PPDR*

FUNCTION:

This module will calculate the undiscovered play potential of an exploration play.

INPUT:

The input requirements are mu and sigma square from previous analysis which are combined with the known pool reserves (data) contained in the **INPSDR** data set which must have been created manually or by **MATCH**. See **INPSDR** for the format to enter the file manually if required.

COMPUTER OPERATION:

>_ PPDR (cr)

*Note : The data-in file **INPSDR** must exist for the module **PPDR** to run.*

Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N) >?_
Do you want to store distribution into the data base (Y/N)>?_
Oil or gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Recoverable resource (Y/N) >?_
Do you want to use the output of MPRO (Y/N) >?_
If the answer is 'N', then;
Enter no. of pools in the play >?_
Enter minimum pool rank >?_
Enter maximum pool rank >?_
Do you want to use the output of LPSD (Y/N) >?_
If the answer is 'N', then
Enter value of mu >?_
Enter unit of measurement code for mu >?_
Enter sigma square >?_

TRAP: ***If the INPSDR has been created in MATCH check before using to insure there are no pool sizes shown with scientific notation. Do this by typing INPSDR at the PRASS1 prompt. The file is displayed in KEDIT and the notations can be corrected.***

OUTPUT:

(1) Outfile <**UAI**>.**PPO** for tabular report,
(2) Printer output for users, :**CTRL-P** to print while running,
(3) **UDI** distributions are updated into the data base as follows:

NNUUPVTRRR
where NN = 80 or 81, for play potential,
UU = unit of measurement codes,
P = O or G,
V = R,
T = 4.

GRAPHICS:

The generated distribution for the remaining potential resource can be graphically presented using the module **CPLT**.

POOL SIZES BY RANK CONSTRAINED BY A DISCOVERY RECORD

Command *PSDR*

FUNCTION:

This module can provide a mechanism for the following purposes:

(1) The uncertainties included with predicted individual undiscovered pool sizes can be reduced if a discovered pool and its perceived rank are entered.

(2) For a given pool size distribution and number of pools in a play, we can ask the question? : what would the largest pool size be if the discovered largest pool is the second largest in the play?

TRAP: ***If the INPSDR has been created in MATCH check before using to insure there are no pool sizes shown with scientific notation. Do this by typing INPSDR at the PRASS1 prompt. The file is displayed in KEDIT and the notations can be corrected.***

INPUT:

No data retrieval is needed to initiate the module, however the file INPSDR must exist,however rather than supply the pool size parameters and the number of pools current LPSD and MPRO outfiles may be used.

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

>_ PSDR

Note : The data-in file **INPSDR** must exist for the module **PSDR** to run.

Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N) >?_
Do you want to store distributions into the data base (Y/N)>?_
Oil or Gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Recoverable resource? (Y/N) >?_
Do you want to use the output of MPRO (Y/N) >?_
If the answer is N, then;
Enter no of pools in the play >?_
Minimum pool size rank >?_
Maximum pool size rank >?_
Do you want to use output of LPSD (Y/N) >?_
If the answer is N, then;
Enter value of Mu >?_
Enter unit of measurement code for Mu >?_
Enter value of sigma square >?_

OUTPUT:

(1) Outfile <**UAI**>.**PSO** for the tabular report.
(2) Printer output for users, :**CTRL-P** to print while running.
(3) The distributions updated into the data base as follows:

NNUUPVTRRR

where NN = 78 or 79,
UU = unit of measurement codes,
P = O or G,
V = R,
T = 4, and
RRR = pool rank.

GRAPHICS:

The generated pool sizes can be illustrated in the module **RPLT**.

SIZE RANGES OF INDIVIDUAL POOLS

Command, *PSRK*

FUNCTION:

This module generates the size range for individual pools, given values of mu, sigma square, and N. Values for these variables can be input directly by the operator, or transferred from data base using the output of **LPSD** and **MPRO**.

INPUT:

No retrieval is required to implement this module, however the modules, **MPRO** and /or **LPSD**, must have been successfully executed if their outputs are to be used. The pool size distribution may be obtained from the output of **LPSD** or users enter the parameters during the execution of **PSRK**.

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

TRAP: ***Remember to delete all individual pool size distributions (78/79) version N from the data base, before you update the new distributions.***

>_ PSRK (cr)

Assessor >?_
Operator? >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N)>?_
Do you want to store distributions into the database (Y/N) >?_
Oil or Gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Recoverable resource (Y/N) >?_
Do you want to use the output of MPRO (Y/N) >?_
If the answer is N, then;
Enter no. of pools in the play >?_
If the answer is Y, then the MPRO output will be used;
Minimum pool size rank >?_
Maximum pool size rank >?_
Users can compute from rank i to rank j, j > i, i.e. 15,30
Do you want to use output of LPSD (Y/N) >?_
If the answer is No, then;
Enter value of Mu >?_
Unit of measurement code for MU >?_
Enter value of sigma square >?_

OUTPUT:

(1) Outfile **<UAI>.PRO** for the tabular report.
(2) Printer output for users, **:CTRL-P** to print while running.
(3) The UDI from this output is as follows:

NNUUPVTRRR

where NN = 78 or 79,
UU = unit of measurement codes,
P = O or G,
V = N,
T = 4, and
RRR = pool ranks.

GRAPHICS:

The output from this module can be illustrated using the graphics module **RPLT.**

PLAY POTENTIAL OR ENDOWMENT DISTRIBUTIONS

Command *PSUM*

FUNCTION:

This module can be implemented to calculate the hydrocarbon endowment for a given play, and can also be used to sum the total of either the endowments or the remaining potential of a group of plays, those of a district, basin, or country.

INPUT:

(1) When computing a play endowment distribution, the programs, **LPSD** and **MPRO** must have been executed successfully before you execute this command, otherwise, users must enter the number of pools and the parameters of the pool size distribution.

(2) When computing distributions of country, basin, district, or group levels of potential or endowment, the relevant distributions must be retrieved from **RTRL**. To compute endowments, version **0** distributions are retrieved; to compute potentials, version R distributions are retrieved.

TRICK: ***When computing distributions above the play level, the use of the wild cards in your retrieval statement is time saving. By specifying the exact UDI element, and using the appropriate wild cards in the UAI element you can retrieve all and only the distributions you require.***

COMPUTER OPERATIONS:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

>_ PSUM (cr)

Note: If summing ENDOWMENTS, use version 0
If summing REMAINING POTENTIAL, use version R

Assessor >?_
Operator >?_
Remarks >?_
Enter types of potential or endowment (C/B/D/G/P) >_

C: country potential or endowment
B: basin potential or endowment
D: district potential or endowment
G: group potential or endowment
P: play potential or endowment
Note: for all levels of summation above the play option, the previous level of summation must have been executed.

Enter number of simulations (maximum 10000 - takes about 13 min.) >?_
Do you want to store output for module RPRT (Y/N) >?_

Do you want to store distribution into the data base (Y/N) >?_
Oil or Gas (O/G) >?_
Output system of measurement (SI/BR) >?_
Recoverable resource (Y/N) >?_
If the module is being used to compute play endowment,then;
Do you want to use the output of MPRO (Y/N)>?_
If the answer is N, then;
Enter no. of pools in the play >?_
Do you want to use the output of LPSD (Y/N) >?
If the answer is 'N', then;
Enter value of mu >?_
Enter unit of measurement code for mu >?_
Enter sigma square >?

OUTPUT:

TRAP: ***If both POTENTIAL and ENDOWMENT runs are made on the same play, the last version to be run will overwrite the previous version of the <UAI>.PMO file.***

TRICK: ***To retain both versions of the <UAI>.PMO results, rename the <UAI>.PMO file to <UAI>.PMT after the initial run. After the second run, copy the <UAI>.PMT file to the end of the <UAI>.PMO file using the Text Editor so that both versions appear in the report generated by the Report Writer.***

(1) Outfile **<UAI>.PMO** for the tabular report.
(2) Printer output for users, **:CTRL-P** to print while running.
(3) Distribution is updated into the data base with the **UDI**':

NNUUPVT

where NN = 80/81 for play potential or endowment.

82/83 for group potential or endowment.

84/85 for district potential or endowment.

86/87 for basin potential or endowment.

88/89 for country potential or endowment.

UU = 19, 20, 24, 31, 32 33, or 34
P = O or G
V = 0

GRAPHICS:
The output distributions of this module can be illustrated in the module **CPLT**.

ESTIMATIONS OF RESERVOIR PARAMETERS

Command *RVGN*

FUNCTION:

The purpose of this module is to estimate the various pool parameters that would be consistent with a given pool size by using the distributions of those parameters which have generated the pool size distribution for the play.

INPUT:

No data is required to be retrieved in order to execute the module **RVGN**, however the in-file **INRVGN** must exist, and the module **LPSD** must have been executed successfully. If the last saved run of **LPSD** has used **TYPE 2** data, then the printer output will contain not only the distributions of the parameters, but will also include the specific individual parameter case solutions of the equation for the designated pool sizes. If, however the last saved **LPSD** used **TYPE 3** data, then only the distribution of the individual parameters is printed.

COMPUTER OPERATION:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> *RVGN (cr)*

Note : The data-in file INRVGN must exist for the module RVGN to run.

Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT (Y/N) >?_
Do you want to store distributions into the data base (Y/N)>?_

OUTPUT:

(1) Outfile **<UAI>.RVO** the tabular report.
(2) Printer output for users, **:CTRL-P** to print while running.
(3) Distributions are updated to the data base as follows:

NNUUPVT

where N= 01 to 40,
UU = unit of measurement,
P = O or G,
V = G,
T = 4.
RRR = individual pool size

GRAPHICS:

The output distributions can be illustrated using the module **CPLT**, but the operator must retrieve the RRR distributions.

BASIC DISTRIBUTION STATISTICS

Command, *STAT*

FUNCTION:

This module will compute the means, standard deviations, minimum, maximum, N and variances of **TYPE 3** input distributions retrieved by **RTRL**. This information is useful in the initial examination of **TYPE 3** input prior to undertaking the time consuming runs in the Discovery Model **(PDSCV).**

INPUT:

TYPE 3 data input distributions from **RTRL.**

TRAP: ***If no type 3 data has been retrieved the computer will 'hang up' and the keyboard may lock!***

COMPUTER OPERATIONS:

Note: If the module has been previously executed the input screen will show default responses to each request within square brackets [ ]. If no change is required then simply enter (cr) to invoke the default, otherwise enter the new response. In the Remarks section, if you wish to change the previous input, enter ** to delete the existing entry.

> STAT
Assessor >?_
Operator >?_
Remarks >?_
Do you want to store output for module RPRT >?_
Do you want to change the unit of measurement (Y/N) >?_
Output system of measurement (SI/BR) >?_

OUTPUT:

The module generates a listing of the statistics of each variable retrieved. Use **:CTRL-P** to get the complete listing as the output comes through too fast to read. The screen output includes a size ranked array for each of the input hydrocarbon pools and this information is not included in the report storage file **<UAI>.STO.**

NOTE: To convert **STAT** output for comparison **Mu** and **Sigma Square** can be computed in the following way:

Mu = Ln (F-50)
Sigma Square = 2(Ln mean - Mu)

GRAPHICS:

There are no graphics outputs from this module.

Table 8
PRASS1 Data Set Commands

Command	Function
INMPRO	To store risk factors and their marginal probabilities which are entered directly into INMPRO.
INPSDR	To store pool sizes and their ranks which are usually generated in MATCH, but may be entered manually by calling the command INPSDR.
INRVGN	To store pool sizes for RVGN.

RISK FACTORS

Command *INMPRO*

FUNCTION:

Provides for the entry of marginal probabilities and geological factors that will condition the number of prospects that may be considered as pools.

INPUT:

Manual input only.

There are three data items for each geological factor:

a) Level of geological factors

Play level = 1
Prospect level = 2.

b) Risk factor code according to the following table.

Code	Geological Factor
01	Presence of closure
02	Presence of reservoir facies
03	Presence of porosity
04	Adequate seal
05	Adequate timing
06	Adequate source
07	Adequate maturation
08	Adequate preservation
09	Adequacy of recovery
10	Presence of formation
11	Adequate migration
19	Adequate play conditions
20	Adequate prospect conditions

c) Marginal probability (ranging from 0.0 to 1.0).

COMPUTER OPERATION:

>_ *INMPRO (cr)*

Users can use KEDIT's commands to enter or edit data where: level, risk factor code, and marginal probability are entered in the file.

c:\prass1\data\(UAI).rsi line=0 column=5 size=3 memory=44K

```
* * * Top of File * * *
  1, 01, 0.8
  1, 02, 0.95

1, 05, 0.7
* * * End of File * * *
  HOME
= = = = >FILE
```

TRICK: Enter 1, 01, 1.0 in INMPRO if no risk is to be used.

Note: If some discoveries have been made then there is no risk at the play level and the only risk is at the prospect level. In a play in which there have been no discoveries then there may be some risks that affect the entire play and some which affect some of the prospects, in which case both levels of risk will need to be addressed.

MATCHED RANKS OF DISCOVERIES

Command *INPSDR*

The file INPSDR is created automatically when the MATCH module is run. It can also be edited or created manually.

FUNCTION:

The file provides for the entry of the perceived rank of given discoveries and their size that can be used to constrain the range of estimates of the associated undiscovered pools. The file is normally created automatically when the **MATCH** module is executed, however it can also be created manually. To create an **INPSDR** file manually, enter the estimated pool rank, and size for the discoveries that have been made including the unit of measurement code of the units.

INPUT:

When an INPSDR file is created manually it is essential to follow the exact form shown below with respect to the column position occupied by each type of data.

COMPUTER OPERATION:

> *INPSDR (cr)*

Use KEDIT commands to enter or update the data.

```
c:\prass1\data\(UAI).psi  Line=0  Col=1  Size=4  Alt=0,0

  Pool Rank  Reserve Size  Measurement Unit
  12345678901234567890123456789O  < (KEDIT column number)

  * * * Top of File * * *
      1  250.0      19
      3  120.0      19
      5  53.00      19
     21  .0461      19
  * * * End of File * * *
  HOME
  = = = > FILE (cr)
```

TRAP: *If the INPSDR file is to be created manually, care must be taken to position the entry columns precisely. Pool ranks must be right justified under column 6; Reserve size must be left justified under column 9; and unit of measurement right justified under column 21.*

TRAP: *If the INPSDR has been created in MATCH check before using to insure there are no pool sizes shown with scientific notation. Do this by typing INPSDR at the PRASS1 prompt. The file is displayed in KEDIT and the notations can be corrected.*

RESERVOIR CHARACTERISTICS OF UNDISCOVERED POOLS

Command *INRVGN*

FUNCTION:

This Data Set Module is used to specify the pool sizes to be analyzed in the **RVGN** module.

INPUT:

The input for INRVGN is manual and is made in the following form.

COMPUTER OPERATION:

>_ RVGN (cr)

Calls up a blank KEDIT file into which the data may be entered.The entry consists of:Pool Size, Measurement Unit Code, Number of Iterations (1 to 200)

c:\prass1\data\(UAI).rvi Line=0 Col=0 Size=2 Alt=0,0

* * * Top of File * * *
19.70, 19, 100 **Note that the data types are separated by commas and there is no strict requirement to place them in specific columns.**
6.4, 19, 50
* * * End of File * * *
HOME
===> FILE cr

CHAPTER 4 - PRASS1 DISPLAY SYSTEM

GRAPHIC MODULES

There is an array of graphic modules within PRASS1 that provide the analyst with the tools to both evaluate characteristics of input data to the analytical modules, and to facilitate communication of the results of the analysis to his client.

Each of the graphic modules has its own requirement of data to be retrieved and it is a good practice when operating any module to retrieve **only** that data that the module requires. It is important to remember when invoking the **RPLT** module to use the RRR= @@@ codes in the **RTRL** statement. This RRR=@@@ statement is also required when retrieving individual pool parameter distributions generated in the RVGN module.

If the requirement of the client is to have material in a **unit of measurement system** other than in what the material was generated, then the conversion of units should be the **first** exercise done using the options function in the operation of the module.

There are several graphic components available for the display of the data, probability distributions and end products of the petroleum resource evaluation. All graphics can be displayed either on an IBM compatible EGA or VGA colour graphics monitor, an EPSOM printer (or one which emulates an Epsom).

The general procedures for use of all plot modules are as follows:

1. Determine which Version of the data is required for the graphic output and Retrieve the appropriate distributions by using the RTRL module.

TRAP: ***If you attempt to retrieve data from too many distributions simultaneously you may run out of memory.***

2. Execute the appropriate display command selected from (Table 9).

3. In general, the system will set the scales, length and log cycles for each plot, but users can enter their own options to change portions of the plots.

TRAP: ***If you want to change the units to be displayed then the new units must be selected as the first operation upon entering the plot module.***

TABLE 9. PRASS1 DISPLAY COMMANDS

Command	Function
BPLT	To display extremes of TYPE 3 data
CPLT	To plot distributions in cumulative greater-than form
DSEQ	To plot variables in discovery sequence
HPLT	To display TYPE 3 data into a histogram
LPLT	To plot variables in log-log graph
RPLT	To plot individual pool sizes by rank
XPLT	To plot two variables in a cross plot

BOX PLOT

Command, *BPLT*

FUNCTION:

If you want to represent the data values graphically, but you do not want to see all the detail, this is just the task for box plots. This command can construct **Type 3** data into a box plot and can display the outliers of the sample.

INPUT:

Type 3 data from RTRL. BPLT can only display one **UDI** at a time. The same UDI for up to 5 different **UAI**'s can be displayed on the same plot, using the **INCLUDE** switch. (The 5 distributions must have been retrieved together).

TRICK: ***By using the wild card (@) in the appropriate position in the RTRL statement an entire family of UAI's can be retrieved.***

COMPUTER OPERATION:

> *BPLT (cr)* -the following screen will be displayed.

UAI=AAA18903 UDI=7219O13 In-place pool size(data), m cu m, OIL, V
Number of points 20
BPLT :
Please choose a function...
G - SCREEN PLOT , D - PRINTER PLOT
P - PLOTTER PLOT , L - LIST DATA
O - OPTIONS , U - UNITS
I - INCLUDE DATA , R - REMOVE DATA
M - MERGE DATA , C - CLEAR
N - NEXT (re-init) , Q - EXIT PLOT
NEW UDI # , key-in the <UDI#>

(G/D/P/L/U/I/R/M/C/N/Q) >?_

enter *I* (cr) **to place the chosen UDI into a temporary file.**

enter *G* (cr) **to display the graph on the screen. (cr) returns the display to the plot menu.**

enter *D* (cr) **to print the graph on a printer.**

enter *P* (cr) **to plot the graph on a plotter.**

enter *L* (cr) **to display a list of the UDI's available for plotting.**

enter *O* (cr) **to select the options available on the module.**

For Options, *O*,

Which options? (Notch/Vertical axis) >_

For 'N'(notch required), then;

Do you want to have notch? (Y/N) >_

For 'V'(to modify vertical axis), then;

Nature of vertical axis? (LOG/LINear) >_ ***(to choose scale)***

If the answer is 'LOG' or 'LIN", then;

Start(default value) >_

End(default value) >_

 # Divisions (default value) >_

enter ***U*** (cr) **to select the (SI/BR) units for the plot.**

TRAP: ***If you want to change the units to be displayed then the new units must be selected as the first operation upon entering the plot module.***

enter ***M*** (cr) **to merge data from more than one UDI in the plot.**

Users can also apply function, MERGE, to merge several UDI's together into one single distribution for plotting providing that the distributions have the same NN, UU and P codes, but different V codes. A new aggregate probability distribution is created using the merged data sets.

enter ***C*** (cr) **to clear all distributions from the temporary plot file.**

enter ***N*** (cr) **to go to the next UDI available for plotting.**

enter ***R*** (cr) **to remove the last distribution from the temporary file.**

enter ***Q*** (cr) **to exit from the plot module.**

enter ***UDI #*** **to go directly to that UDI for plotting.**

CUMULATIVE PROBABILITY PLOT

Command *CPLT*

FUNCTION:

This display command is used to plot probability distributions in cumulative greater-than form. This plot is used to display the output from a variety of modules and should be used both in the initial evaluation of the input data, and for illustration of the final results.

INPUT: (See output from CPSD,LPSD, MPSD, PPDR, PSUM, RVGN, and TYPE 2 and TYPE 3 inputs).

a) To compare the output of CPSD, and LPSD with the original input data retrieve the NN codes 01-40 Versions C or L and the relative Type 2 data with the same RTRL statement.

b) To plot and compare any or all of the output values of CPSD, LPSD, and MPSD for In-Place Hydrocarbons retrieve NN 70 Version C or L, and NN 68 Version 1 to 9 using the appropriate RTRL input request.

c) To plot and compare any or all of the output values of CPSD, LPSD, and MPSD for Recoverable Hydrocarbons retrieve NN 71 Version C or L and NN 69 Version 1 to 9 using the appropriate RTRL input request.

d) To plot and compare either or both the output values of PPDR or PSUM for In-Place Hydrocarbons retrieve NN 80 Version R and NN 80 Version 0 using the appropriate RTRL input request.

e) To plot and compare either or both the output values of PPDR or PSUM for Recoverable Hydrocarbons retrieve NN 81 Version R and NN 81 Version 0 using the appropriate RTRL input request.

f) To plot the aggregate potential for a number of exploration plays retrieve the appropriate NN codes according to the PSUM output using the RTRL input statement.

g) To plot the output curves of the individual parameters generated in RVGN retrieve NN 01-40 version G using the appropriate RTRL statement. Note: **The RVGN retrieval statement must include the RRR=@@@ element.**

COMPUTER OPERATION:

> *CPLT (cr)* - the following screen is displayed

UAI=AAA18903 UDI=7219O13 In-place pool size (data) 0, m cu m, V
Number of points 20
CPLT : Please choose a function...

G	*SCREEN PLOT*	*D*	*PRINTER PLOT*
P	*PLOTTER PLOT*	*L*	*LIST DATA*
H	*HORIZ. AXIS*	*U*	*UNITS*
I	*INCLUDE DATA*	*R*	*REMOVE DATA*
M	*MERGE DATA*	*C*	*CLEAR*
N	*NEXT (re-init)*	*Q*	*EXIT PLOT*

to set new UDI - key-in UDI#

(G/D/P/L/H/U/I/R/M/C/N/Q) >?_

TRAP: *If you want to change the units to be displayed then the new units must be selected as the first operation upon entering the plot module.*

enter *I* (cr) **to place the chosen UDI into a temporary file.**

enter *G* (cr) **to display the graph on the screen. (cr) returns the display to the plot menu.**

enter *D* (cr) **to print the graph on a printer.**

enter *P* (cr) **to plot the graph on a plotter.**

enter *L* (cr) **to display a list of the UDI's available for plotting.**

enter *H* (cr) **to select the horizontal scale which can be linear or logarithmic. The default option is logarithmic. The vertical scale is fixed and ranges from 0 to 100 percent.**

enter *U* (cr) **to select (SI/BR) units for display**

enter *M* (cr) **to merge data from more than one UDI in the plot.**

Users can also apply function, MERGE, to merge several UDI's together into one single distribution for plotting providing that the distributions have the same NN, UU and P codes, but different V codes. A new aggregate probability distribution is created using the merged data sets.

enter *C* (cr) **to clear all distributions from the temporary plot file.**

enter *N* (cr) **to go to the next UDI available for plotting.**

enter *R* (cr) **to remove the last distribution from the temporary file.**

enter *Q* (cr) **to exit from the plot module.**

enter *UDI #* **to go directly to that UDI for plotting.**

DISCOVERY SEQUENCE PLOT

Command *DSEQ*

FUNCTION:

This command plots selected UDI data according to the discovery sequence. The plot is used to display the discovery sequence prior to using **PDSCV** to get an early sense of the beta factor for a play.

INPUT:

a) Retrieve the UDI's NN 72 or 73 ranked according to the discovery sequence and UDI NN 90 (Discovery Date) using RTRL.

COMPUTER OPERATION:

> *DSEQ (cr)* - **the following screen is displayed**

UAI=AAA18903 UDI=7219O13 In-place pool size(data), m cu m, OIL, V
Number of pools 20
DSEQ : Please choose a function...
G - SCREEN PLOT , D - PRINTER PLOT
P - PLOTTER PLOT , L - LIST DATA
O - OPTIONS , U - UNITS
M - MERGE DATA , C - CLEAR
N - NEXT (re-init) Q - EXIT PLOT
to set new UDI - key-in UDI#

(G/D/P/L/O/U/M/C/N/Q) >?_

enter ***G*** (cr) **to display the graph on the screen. (cr) returns the display to the plot menu.**

enter ***D*** (cr) **to print the graph on a printer.**

enter ***P*** (cr) **to plot the graph on a plotter.**

enter ***L*** (cr) **to display a list of the UDI's available for plotting.**

enter ***O*** (cr) **to select the options for the vertical axis. Data, can be plotted on either logarithmic or linear scales. The horizontal axis, discovery sequence, is set at equal distance.**

enter ***U*** (cr) **to select (SI/BR) units for display**

enter ***M*** (cr) **to merge data from more than one UDI in the plot.**

Users can also apply function, MERGE, to merge several UDI's together into one single distribution for plotting providing that the distributions have the same NN, UU and P codes, but different V codes. A new aggregate probability distribution is created using the merged data sets.

enter *C* (cr) **to clear all distributions from the temporary plot file.**

enter *N* (cr) **to go to the next UDI available for plotting.**

enter *Q* (cr) **to exit from the plot module.**

enter *UDI #* **to go directly to that UDI for plotting.**

HISTOGRAM PLOT

Command *HPLT*

FUNCTION:

This command will construct a histogram using **TYPE 3 data** using the options selected in the plot process.

This type of plot is useful in getting an early understanding of the distribution of the variables in a play prior to starting the Discovery Sequence Analysis. It is also very useful as a guide in constructing TYPE 2 distributions of variables in the sense of illustrating what is a common distribution for this type of variable.

INPUT:

Retrieve Type 3 data from the PRASS1 data base.

COMPUTER OPERATION:

> *HPLT (cr)* **- the following screen is displayed.**

UAI=AAA18903 UDI=0205O13 Area of pool, ha, OIL, Version: 1
Number of points 20
HPLT : Please choose a function...
G - SCREEN PLOT , D - PRINTER PLOT
P - PLOTTER PLOT , L - LIST DATA
H - HORIZ. AXIS , V - VERTICAL AXIS
U - UNITS , M - MERGE
C - CLEAR , N - NEXT <RE-INIT>
Q - EXIT PLOT
to set new UDI - key-in UDI#

(G/D/P/L/H/V/U/M/C/N/Q) >?_

TRAP: ***If you want to change the units to be displayed then the new units must be selected as the first operation upon entering the plot module.***

enter **G** (cr) **to display the graph on the screen. (cr) returns the display to the plot menu.**

enter **D** (cr) **to print the graph on a printer.**

enter ***P*** (cr) **to plot the graph on a plotter.**

enter ***L*** (cr) **to display a list of the UDI's available for plotting.**

First select the options governing the horizontal axis
enter ***H*** (cr) **to modify the horizontal axis), the options are;**

(LOG/LINear/USEer) >?_

If you enter *LOG* (cr), then;

Base TWO/TEN >? **(to select a base 2 or base 10 log scale)**

(Equal/Unequal width) >?_ **(to select the width of the bars)**

If you enter LINear to select a linear scale, then; HPLT will compute the default width according to the input data, but users can overwrite the width by answering the following questions.

Width (default value) >?_

Midpoint (default value) >?_

Start (default value) >?_

End (default value) >?_

 # Divisions (default value) >?_

Enter the default values in the same decimal format as the default display.

If you enter *USE* to select class widths for the histogram, then, at least two bounds must be selected, but with a maximum of 201 bounds.

BOUND(1) >?_ **Users enter the left limit of the first class.**

BOUND(2) >?_ **Users enter the left limit of the second class.**

BOUND(3) >?_ .....

BOUND(4) >?_ **The symbol,], will terminate the operation.**

Next select the options governing the vertical axis;

enter ***V*** (cr) **to select the type of vertical axis, the options are:**

(Frèquency/Percentage/Density) >?_

If you enter;

F (cr) : **the vertical axis is scaled in numbers of occurrences per class.**
P (cr) : **the vertical axis is scaled in relative frequency (percentage).**

D (cr) : **the vertical axis is scaled in density (percentage divided by the class width).**

Default values are displayed which may be selected with (cr) or you may enter a value in the same decimal format as the default is displayed.

enter ***U*** (cr) **to select (SI/BR) units for display**

enter ***M*** (cr) **to merge data from more than one UDI in the plot.**

Users can also apply function, MERGE, to merge several UDI's together into one single distribution for plotting providing that the distributions have the same NN, UU and P codes, but different V codes. A new aggregate probability distribution is created using the merged data sets.

enter ***C*** (cr) **to clear all distributions from the temporary plot file.**

enter ***N*** (cr) **to go to the next UDI available for plotting.**

enter *Q* (cr) **to exit from the plot module.**

enter *UDI #* **to go directly to that UDI for plotting.**

LOG PROBABILITY PLOT

Command *LPLT*

FUNCTION:

This command is used to plot geological variables on logarithmic probability plot to test whether data approximates a log normal population.

INPUT:

Retrieve any Type 3 data sets.

COMPUTER OPERATIONS:

> *LPLT* (cr) **-the following screen is displayed.**

UAI=AAA18903 UDI=7219O13 In-place pool size(data), m cu m, OIL, V
Number of points 20
LPLT : Please choose a function...
G - SCREEN PLOT , D - PRINTER PLOT
P - PLOTTER PLOT , L - LIST DATA
O - OPTIONS , U - UNITS
M - MERGE DATA , C - CLEAR
N - NEXT (re-init) , Q - EXIT PLOT
NEW UDI# - key-in <UDI#>

(G/D/P/L/O/U/M/C/N/Q) >?_

enter *G* (cr) **to display the graph on the screen. (cr) returns the display to the plot menu.**

enter *D* (cr) **to print the graph on a printer.**

enter *P* (cr) **to plot the graph on a plotter.**

enter *L* (cr) **to display a list of the UDI's available for plotting.**

enter *O* (cr) **to select the portions of the plot you wish to display.**

Data minimum: X.X, maximum: XX.X

Log axis selected: Start 0.1, end 1000, # cycles 4

Start (0.1) >?_

End (1000) >?_

enter **U** (cr) **to select (SI/BR) units for display**

enter *M* (cr) **to merge data from more than one UDI in the plot.**

Users can also apply function, MERGE, to merge several UDI's together into one single distribution for plotting providing that the distributions have the same NN, UU and P codes, but different V codes. A new aggregate probability distribution is created using the merged data sets.

enter *C* (cr) **to clear all distributions from the temporary plot file.**

enter *N* (cr) **to go to the next UDI available for plotting.**

enter *Q* (cr) **to exit from the plot module.**

enter *UDI #* **to go directly to that UDI for plotting.**

POOL SIZE BY RANK PLOT

Command *RPLT*

FUNCTION:

This command can be used to plot the individual pool size by rank, i.e. output from PSRK, MATCH or PSDR. This is a very useful plot routine and is used to display both preliminary and final output results.

INPUT:

Use **RTRL** to retrieve the specific version of the of the ranked pool size data that is required for the plot. See the analysis modules to determine the version codes.

TRAP: ***If you attempt to retrieve too many versions at one time you will run out of memory.***

TRICK: ***Do not request more pool ranks than you want to see on the plot as the retrieval time for large numbers of pool ranks can be very slow.***

TRAP: ***If the INPSDR file has been created in MATCH, check before using to insure there are no pool sizes shown in scientific notation. Do this by typing INPSDR at the PRASS1 prompt. The file will be displayed in KEDIT and the notations can then be corrected.***

COMPUTER OPERATIONS:

> *RPLT* (cr) **-the following screen is displayed.**

NOTE :- RTRL format for this plot must be of form NNUUPVTRRR i.e. 7912ON4@@@ for all available pool ranks. If it is not in this form then RPLT will not function. Please check your RTRL input and output statement to make sure they are in the correct format.

UAI=AAA18903 UDI=7819OU4001 In-place pool size(data), m cu m, OIL,
Number of pools 20
RPLT : Pool Size by Rank Plot
Please choose a function...
G - SCREEN PLOT , D - PRINTER PLOT
P - PLOTTER PLOT , L - LIST DATA
O - OPTIONS , U - UNITS
N - NEXT (re-init) Q - EXIT PLOT
NEW UDI# - key-in <UDI#>

(G/D/P/L/O/U/UDI#/N/Q) >?_

TRAP: ***If you want to change the units to be displayed then the new units must be selected as the first operation upon entering the plot module.***

enter *G* (cr) **to display the graph on the screen.**

enter *D* (cr) **to print the graph on a printer.**

enter *P* (cr) **to plot the graph on a plotter.**

enter *L* (cr) **to display a list of the UDI's available for plotting.**

enter *O* (cr) **to select the options available on the module.**

For Options, = = > *O*, **The following options are available;**

(Vert/Horiz./Axislen/%percentiles/# lines plotted) >?_

Once any of the options are selected, the module will ask?

Use INPSDR >?_ **If the answer is Y, then the data set, INPSDR will be used together with the plot. If the answer is 'N', then INPSDR will not be used.**

enter *V* (cr) **to set the vertical scale,**

(LOG/LINear) >?_ **the data minimum and maximum values are displayed and the default specifications. To enter the default just use (cr). To enter your own choice follow the decimal format of the default example.**

enter *H* (cr) **To set the horizontal scale which is always linear. The data minimum and maximum values are displayed and the default specifications. To enter the default just use (cr). To enter your own choice follow the decimal format of the default example.**

enter *A* (cr) **To select the length of the horizontal axis to be plotted.**

enter % (cr) **(to modify the prediction intervals; acceptable values only include 99, 95, 90, 85, 80, 75, 50, 25, 20, 15, 10, 5, 1), then;**

Upper percentile(75) >_ i.e. 99, 95, 90, ..

Lower percentile(25) >_ i.e. 1, 5, 10, ..

enter # (cr) **(to modify the pool ranks to be plotted), then;**

Starting display limit (1) >?_

Ending display limit (999) >?_

enter *U* (cr) **to select the (SI/BR) units.**

enter *C* (cr) **to clear all distributions from the temporary plot file.**

enter *N* (cr) **to go to the next UDI available for plotting.**

enter *Q* (cr) **to exit from the plot module.**

enter *UDI #* **to go directly to that UDI for plotting.**

CROSS PLOT

Command, *XPLT*

FUNCTION:

This command plots one geological variable against another variable to form a cross plot. This allows for a visual representation of the correlation of the two variables.

INPUT:

Use RTRL to retrieve TYPE 3 data from the data base.

COMPUTER OPERATIONS:

> **XPLT** (cr) **-the following screen is displayed.**

```
UAI=AAA18903  UDI=7219O13 In-place pool size(data), m cu m, OIL, V
UAI=AAA18903  UDI=0205O12 Area of pool, ha, Oil, version : 3
Number of points 20
XPLT :       Please choose a function...
   G  -  SCREEN PLOT,    D  -  PRINTER PLOT
   P  -  PLOTTER PLOT,   L  -  LIST DATA
   V  -  VERT. AXIS,     H  -  HORIZ. AXIS
   U  -  UNITS,          C  -  CLEAR
   M  -  MERGE DATA,     Q  -  EXIT PLOT
   N  -  NEXT (re-init)
   set new UDI# - key-in: UDI# VS UDI#

         (G/D/V/P/L/H/U/M/C/N/Q)  >?_
```

The procedures are: The system has chosen the first two distributions for the plot, but users can alter the distribution by entering UDI#, or Next.

enter **G** (cr) **to display the graph on the screen.**

enter **D** (cr) **to print the graph on a printer.**

enter **P** (cr) **to plot the graph on a plotter.**

enter **L** (cr) **to display a list of the UDI's available for plotting.**

The default options are logarithmic scale with an adequate number of cycles. Users can change these default options by entering the options on vertical or horizontal axis.

enter **V** (cr) **to set vertical axis.**

UDI: 7219O13 Nature of vertical axis? (LOG/LINear) >?_ (i.e. LOG)

Data minimum; 0.4, maximum 500

Log axis selected Start 0.1, end 1000, # cycles 4

Start (0.1) >?_

End (1000.0) >?_

enter **H** (cr) **to set horizontal axis.**

UDI: 0205O13 Nature of horizontal axis? (LOG/LINear) >?_

Linear axis selected: Start 68, maximum 22000, delta X, # divisions 6

Start (68.0) >?_

End (22000.0) >?_

divisions (6) >?_

enter **U** (cr) **to select the (SI/BR) units.**

Output unit of measurement? (SISI/SIBR/BRSI/BRBR)? >_

Users can select the units for vertical scale(first position) and horizontal scale(second position).

enter **C** (cr) **to clear all distributions from the temporary plot file.**

enter **N** (cr) **to go to the next UDI available for plotting.**

entèr **Q** (cr) **to exit from the plot module.**

enter **UDI # to go directly to that UDI for plotting.**

RECORD OF ACTIVITIES

Command *HISTORY*

FUNCTION:

PRASS1 keeps track all assessment activities. The command, HISTORY, allows us to examine the record of activities regarding a specific UAI. Example of operation is as follows:

COMPUTER OPERATION:

> *HISTORY (cr)*

The complete chronological history file is displayed in KEDIT. This file shows all of the different types and times of access for each UAI and is useful in reconstructing the steps that were followed in an analysis.

OUTPUT:

The History file (UAI.HIS) is normally printed as a component of the report writer module (RPRT).

REPORT WRITER

Command *RPRT*

FUNCTION:

This module is used to prepare a final report at the end of the evaluation of an exploration play or group of plays, including the final runs of each of the modules that have been run and stored to disk.

The command RPRT gathers the report OUTFILES of each module together for presentation in a format for output as a tabular report. The module will produce a title page (8 1/2" x 11" page size) and then append the individual OUTFILES in the following order with a title block at the top of each page:

The report is stored in \PRASS1\DATA\ <UAI>.RPO

Title Page
RMKS
STAT
LPSD
PDSCV
MATCH
PSRK
PSDR
PSUM
PPDR
RVGN
HISTORY

COMPUTER OPERATION:

> RPRT (cr)

Oil or Gas >?_

when the computer completes compiling the report the > will return with the following message:

PRASSYS LOADING ==> RPRT

To initiate printing of this report, while still in PRASS, type

> :PRINT <UAI>.RPO

Printing will start when you stop PRASS

END OF RPRT

TRICK: Invoke KEDIT either from within or outside of PRASS1 to view and if necessary to edit the report prior to printing.

At the prompt > enter *:PRINT <UAI>.RPO*

the following screen is presented

Name of list device [PRN]: **enter** *LPT1* **or** *LPT2* **as required;**

Resident part of print installed

C:\PRASS!\DATA\(UAI).RPO is currently being printed

When you exit PRASS *(stop)* **the report will actually start to print.**

Once the <UAI>.RPO file has been created, the report may also be printed from outside PRASS1 by using the DOS PRINT command.

To print the report use the following command sequence:

At the *C:>?_* **enter** *CD \prass1\data (cr)*

To print the report file using the DOS command PRINT by:

at C:\PRASS1\DATA> **enter** *:PRINT <UAI>.rpo (cr)*

where <UAI> is the UAI of the report file which you wish to print

Name of list device [PRN]: **enter** *LPT1* or *LPT2* as required.

TRAP: Make sure the printer is ON before you execute the DOS PRINT command. The paper should be properly adjusted to the top of the page before printing is started.

TRAP: Do not use the KEDIT PRINT ALL command as this will not paginate correctly.

TRICK: Invoke KEDIT either from within or outside of PRASS1 to view and if necessary to edit the report prior to printing.

TRICK: Remember to generate all of the graphic illustrations that are required to accompany the report at this time. Once new runs are made the OUTFILES will be overwritten and the graphics and reports will not match.

INDIVIDUAL REPORTS

The same procedure discussed above can be used to print any of the individual OUTFILES listed above. This can be done without prejudicing the chance to later print the total report.

PRASS1 FILE NAME CONVENTIONS

The file name convention is as follows: UAI.nnn where UAI is the UAI to which the file belongs and the extension denotes the program module that is involved. A " _ " in Table 6 signifies that no file of this type is generated by PRASS1.

For example: The file AAA18903.LPO will contain data from the latest output run from the LPSD module under UAI AAA18903.

MODULE	INFILE	OUTFILE	DISKFILE
HISTORY	--	<UAI>.HIS	<UAI>.HIS
LPSD	--	<UAI>.LPO	<UAI>.LPD
MATCH	<UAI>.MTI	<UAI>.MTO	--
MPRO	<UAI>.NPI	<UAI>.NPO	<UAI>.NPD
MPSD	--	<UAI>.MPO	--
PDSCV	--	<UAI>.PDO	--
PPDR	<UAI>.PPI	<UAI>.PPO	--
PSDR	<UAI>.PSI	<UAI>.PSO	--
PSRK	--	<UAI>.PRO	--
PSUM	--	<UAI>.PMO	--
RMKS	--	<UAI>.RMO	--
RPRT	--	<UAI>.RPO	--
RTRL	<UAI>.RTI	--	<UAI>.RTO
RVGN	<UAI>.RVI	<UAI>.RVO	--
STAT	--	<UAI>.STO	--

1.All files in the PRASS1 system use the Assessment UAI as the filename "id".

2,Extensions to the filename "id" are composed of a 2 letter code that forms an abbreviation of the module name that it is associated with.

3.The third letter of the filename extension is either an:

a) I signifying that the file is a module INFILE that is required for the corresponding module to execute;

b) O signifying that the file is a module report OUTFILE that is utilized for the tabular report;

c) D signifying that the file is a module DISKFILE that is used by other programs.

4.Data files are located in the directory C: PRASS1/DATA

5.Hard copies of the file may be obtained by opening the desired file with the editor KEDIT and by using the

PRINT BLOCK or PRINT ALL commands in the KEDIT or by exiting to DOS and using the PRINT command with the desired filename and extension.

TRAP: You cannot invoke the DOS PRINT command from within PRASS1, as the program will place the print file in a queue and not execute it until you exit from PRASS1.

TRAP: Each time a program is run the OUTFILE is replaced with the new version and the previous version is replaced. If you wish to retain a permanent record of the output you need to print the OUTFILE after each run.

TRAP: Make sure the printer is ON before you execute the DOS PRINT command. The paper should be properly adjusted to the top of the page before printing is started.

TRAP: Do not use the KEDIT PRINT ALL command as this will not paginate correctly.

TRICK: Invoke KEDIT either from within or outside of PRASS1 to view and if necessary to edit the report prior to printing.

TRICK: Remember to generate all of the graphic illustrations that are required to accompany the report at this time. Once new runs are made the OUTFILES will be overwritten and the graphics and reports will not match.

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APPENDIX 1 INSTALLATION

To install the PRASS1 system on the computer for the first time follow the installation instructions exactly as they are listed below. Check off each step as it is executed and keep a detailed written record of what has been done and a record of any error messages received. If you require assistance you must provide this detailed record plus an exact description of your computer, the version of the Disk Operating System being used and the configuration of the computer and its memory.

1.CHECK the specifications of your computer against the system requirements listed below.

2.Run CHKDSK and record the amount of RAM available and the amount of fixed disk space available.

-the minimum amount of RAM required is 580 KB with the computer system running at the 'C:>' prompt.

-the minimum available free space required on the hard disk is about 15 MB.

-The system file 'CONFIG.SYS' should have the entries:
FILES=16 (minimum, your applications may require more)
BUFFERS=4 (minimum, your applications may require more)

NOTE that additional device drivers, Terminate and Stay Resident programs (TSR's) all tend to reduce the amount of free RAM available.

3.Create the following subdirectories in the C:\ (root) directory. (Note that in the following scripts, the information that you enter is **BOLDED**. Each line of text is completed by depressing the 'ENTER' or 'RETURN' key).

C:\>**MD \PRASS1**
C:\>**MD \PRASS1\PROG**
C:\>**MD \PRASS1\DATA** note: no files need be copied to this directory
C:\>**MD \PRASS1\VALDATA**

Insert the installation disk marked UTILITY in the [A: or B:] drive (depending on which diskette drive is used). Copy the following files.

C:\>**COPY A:PS.BAT** or **COPY B:PS.BAT** as required

4.Change to the directory C:\PRASS1\PROG and copy all of the files from the PROGRAM diskettes to the C:\PRASS1\PROG directory using the command **COPY A:*.*** or **COPY B:*.*** as required.

e.g.
C:\>**CD PRASS1\PROG**
C:\PRASS1\PROG>**COPY A:*.*** or **COPY B:*.***
Repeat the **COPY** command for program disc #2 and #3

NOTE: PRASS1 HAS BEEN DESIGNED TO OPERATE WITH KEDIT 3.53 OR 4.0 AS ITS EDITOR. YOU MUST LEGALLY OWN A COPY OF THAT PROGRAM FOR PRASS1 TO OPERATE, AND YOU MUST COPY THE KEDIT.EXE FILE TO \PRASS1\PROG AND RENAME IT PE.EXE.

5.Change to the directory C:\PRASS1\VALDATA and copy all of the files from the VALDATA diskette to the C:\PRASS1\VALDATA directory using the command COPY A:*.* or COPY B:*.*

e.g.
C:\PRASS1\PROG>**CD ..\VALDATA**
C:\PRASS1\VALDATA>**COPY A:*.*** or **COPY B:*.***

6.The ROOT.DAT file is a 2.4 MB file containing coefficients that are used in PRASS1 operations. It is too large to be copied with the COPY command, but it can be generated from the enclosed discs. The ROOT.DAT file needs to be generated only once, but the generation will take 4 to 5 hours on a fast '386' computer and 20 to 30 hours on a IBM AT '286' computer.

To generate the ROOT.DAT file, then enter the following script, starting at the DOS prompt;

C:>**CD PRASS1\PROG**

C:\PRASS1\PROG>**ROOT**
The program provides the following prompt:

Input no. of pools (From, To)> **1, 200**

and the computer executes the program.

No further messages are displayed and except for periodic action on the hard disk drive the computer continues to run. Do not touch it or interrupt the program. **BE PATIENT!** The message -- "STOP program terminated" is displayed when the file has been generated.

If there is a power failure while the program is running then it is necessary to start again and generate the ROOT.DAT file according to the instructions above.

7.PRASS1 Version 2.0 is now fully installed and may be used for petroleum resource assessment.

Before you initiate the program:

Check and insure that an appropriate VALUAI.DAT file is present.

Check and insure that the \PRASS1\VALDATA\PLOT.CFG settings are correct for your system. See APPENDIX 5 for settings.

STARTUP

The appearance of the GSC/PRASS1 logo and > prompt indicate that the program has been successfully installed. **Before one can make use of the program however, a set of play codes must be established.** These play codes, the Unique Assessment Identifiers or UAIs, are activated using the CREATE command (see manual) but are derived from the VALUAI.DAT file in PRASS1\VALDATA. Each user group will have to develop its own VALUAI.DAT file reflecting the play types in each basin, region and country being evaluated. (See the section on UAIs in the manual for comment on how these may be structured) An example VALUAI.DAT is included in APPENDIX 3.

To create your own version of VALUAI.DAT one can edit the existing file. Do this outside of the program by changing to the \PRASS1\PROG subdirectory. Type PE At the prompt - What file do you want to edit? Type \PRASS1\VALDATA\VALUAI.DAT (cr). The resident VALUAI.DAT file will appear and can be easily modified using the editor commands. Once the file has been altered to your needs, proceed with entering the program (typing PS at the C:> prompt), and using the CREATE command within the program.

The VALUAI.DAT file is in effect a form of control. In cases where several operators will be using the program it is important that responsibility for changes to this file are assigned, and that indiscriminate changes to it are discouraged or controlled. Otherwise there can be confusion, overwriting, lost data, etc. Do not attempt to edit the VALUAI.DAT file while inside the program, as this may corrupt the system.

To initiate the program at the DOS prompt 'C:>', enter:

C:>**PS**

The PRASS1 system takes over at that point and generates the PRASS1 logo accompanied by the request:

ENTER to continue (cr)

It is not necessary to copy any files to the \PRASS1\DATA in order to run the program, the PS.BAT file will automatically copy the files that are necessary when the program is initiated. If data files are to be transferred then the the procedure for transfering files from one computer to another must be followed. See Appendix 3

SYSTEM REQUIREMENTS

1.An IBM 286 (AT) or 386 compatible computer system running on an appropriate version of DOS 3.0 or higher.

2.640 KB Random Access Memory (RAM) of which at least 580 KB must be available when the system is running at the 'C:>' prompt. (This stringent requirement is necessitated by the concurrent use of the PRASS1 System Interpreter and the text editor KEDIT)

3.A math coprocessor (287 or 387), according to the type of system chip that is installed.

4.A Hard Disk with at least 15 MB available space that can be dedicated to the PRASS1 system.

5.An EGA or VGA graphics adaptor and monitor with at least 128 KB of memory on the colour card.

6.A 1.2 MB 5¼" or 1.4 MB 3½" diskette drive.

7.A printer which will emulate EPSON graphics is required for printed and graphic output.

8.The PRASS1 program will run much faster if a disk cache program can be used on your computer system. This is highly recommended, check with your computer systems personnel.

APPENDIX 2 FILE TRANSFER PROCEDURE

PROCEDURE TO TRANSFER DATA FILES
FROM DISKETTES TO A HARD DRIVE ON A DIFFERENT COMPUTER.

The data files contained in the \PRASS1\DATA directory on one computer may be copied to diskettes and then copied to the \PRASS1\DATA directory on the hard drive of another computer using a standard DOS COPY command; however the files cannot be accessed in the PRASS1 program until the UAI's have been added to the UAIMAST.DAT file on the new computer using the CREATE command in PRASS1.

***DO NOT MAKE ANY CHANGES TO THE UAIMAST.DAT FILE USING THE TEXT EDITOR. THIS WILL CAUSE SERIOUS DISK OVERWRITE ERRORS THAT WILL DAMAGE PRASS1 EXECUTABLE FILES AND DATA FILES. UAIMAST.DAT SHOULD ONLY BE CHANGED THROUGH THE PRASS1 PROGRAM USING THE CREATE OR PURGE COMMANDS.**

1.Review the sections covering UAI and CREATE in the USER GUIDE.
- check for existing \PRASS1\DATA\<UAI>.* files that may be overwritten when the new files are copied.

- check the \PRASS1\VALDATA\VALUAI.DAT to make sure that the necessary UAI codes are present to permit the UAI to be created.

- Enter the PRASS1 program and use the LIST command and print out a list of UAI descriptions that are already available on the computer. The required codes may have already be in the specific UAIMAST.DAT file that was included with your program.

2.Each UAI is assigned a year and month date code when it is created. As this code is assigned during the CREATE command using the system clock on your computer it is necessary to change the date on the system clock to correspond to the date on the UAI which you wish to CREATE so that the transferred files can be accessed.
- While in the PRASS1 program, determine the dates of the UAI's of the files on the diskette(s) using the DOS command :DIR A:*.UDI. The date code YYMM will be the last 4 digits in the UAI codes.

- Change the system date code to correspond to that of the first new UAI(s) that you wish to CREATE.

At the PRASS1 prompt > enter :DATE
The prompt - Current Date is Sun 12-30-1990
Enter new date (mm-dd-yy): will appear.

If for example the UAI is SXOI8910 then enter the date as:-
10-30-89 (cr)this resets the system clock to the required date

- At the PRASS1 prompt use the CREATE command to create the new UAI.

- Repeat the CREATE command for each of the UAI's that have the same date code.

- Change the system date code to the next date required and repeat the CREATE procedure.

- Once the process is complete change the system date back to the current date.

3.Copy the files on the diskette(s) using the DOS COPY command.
- At the PRASS1 prompt >

Enter :COPY A:*.* \prass1\data
This will copy all of the diskette files to the correct directory. PRASS1 analysis can then proceed on any of the UAI's transferred.

APPENDIX 3 EXAMPLE VALUAI.DAT FILE

This example of a VALUAI.DAT file is likely the one which has been included on the program diskettes which you have received. If it is not or if you wish to add or delete entries to your VALUAI.DAT file then the format of this example should be followed. See the section on the UNIQUE ASSESSMENT IDENTIFIER (UAI) in the USER GUIDE.

The final file can be retrieved with F10 retrieve \PRASS1\VALDATA\VALUAI.DAT and WP51 will automatically convert the file format to a WP file.

TABLE 1 LIST OF UAI CODES (VALUAI.DAT)

C CANADA
C1 East Coast
C14 Jean D'Arc Basin
C141 Trans Basin Ben Nevis Avalon
C155 Shale Bounded Sandstones
C15A Trans Basin Play Group

TRICK:It is often useful to create a play within which one can do summing operations that apply to a number of related plays. The use of an alpha character in the valuai.dat file can be a convienient method to remember such collector repositories.

C2 Arctic Islands
C21 Arctic Fold Belt
C22 Paleozoic - Sverdrup Basin
C23 Mesozoic - Sverdrup Basin
C3 Beaufort Sea - MacKenzie Delta
C31 Tuk Penninsula
C32 West Beaufort
C33 South Delta
C34 Central Beaufort
C4 Western Canada
C40 Cambrian
C401 Basal Sandstone
C402 Basal Structures
C41 Devonian
C410 Jean Marie
C411 Rimbey-Meadowbrook Reefs Play
C412 Beaverhill Lake Reefs Play
C413 Bashaw Reefs Play
C414 B.C. Middle Devonian Basin Reefs Play
C42 Mississippian
C421 Alberta Foothills
C422 Kiskatinaw Play
C423 Sweetgrass Arch
C424 Disturbed Belt
C43 Pennsylvanian
C44 Permian
C441 Belloy Peace River Arch
C442 Belloy Erosional Edge
C45 Triassic
C453 Charlie Lake Stray Sand - Pinchout Traps
C454 Halfway Shoreline Sand Traps
C458 Halfway
C46 Jurassic

C461 Sawtooth Sand
C462 Rock Creek Sand
C463 Gilby-Medicine River
C47 Upper Cretaceous
C470 Belly River - Shoreline Sandstone
C471 Belly River - Fluvial Sandstone
C479 Viking Marine Sheet Sandstone, Alberta
C48 Manville, Lower Cretaceous
C480 Colony, Alberta
C481 Sparky, Alberta
C4A2 Glauconite Transitional Facies
C4A3 Ostracod Zone
D MALAYSIA - INDONESIA - BRUNEI
D1 Circum-Borneo Area
D11 Kutei Basin
D111 Kutei Delta Play
D12 Tarakan Basin
D14 Baram Delta
D141 Neogene Rollover Play
F FRANCE
F1 Paris Province
F11 Paris Basin
F111 Middle Jurassic Play
G GABON
G1 South Atlantic Province
G11 Gabon Coastal Basin
G111 Cretaceous Post-Salt Turbidites
M NORWAY
M1 North Sea
M11 Horda Platform
M111 Middle-Lower Jurassic
N UNITED KINGDOM, NORWAY & DENMARK
N1 North Sea
N11 East Shetland
N111 Middle Jurassic
N112 Lower Jurassic
N12 Viking Graben South
N121 Middle Jurassic
N122 Upper Jurassic
N13 E. Shetland & Viking Graben S.
N131 Middle Jurassic
N14 Central Viking Graben
N141 Upper Jurassic Oil Play
N142 Upper Jurassic Gas Play
N143 Cretaceous Chalk Oil Play
N144 Cretaceous Chalk Gas Play
S SOVIET UNION
S1 West Siberia
S11 Northern West Siberian Basin
S111 Pur - Neocomian
S113 Yamal - Neocomian
S114 Yamal - Cenomanian
U U.S.A
U1 Wyoming Thrust Belt
U11 W-U-I Thrust Belt
U111 Absaroka Thrust Mesozoic
U112 Absaroka Thrust Paleozoic
U2 Wyoming-Montana

U21 Powder River Basin
U211 Minnelusa Play
U212 Muddy Play
Z CHINA

APPENDIX 4 LIST OF PRASS1 FILES

Listing of PRASS1 files (Version 2.0 - February 1, 1991)

ps	.bat	507	2-01-91	13:36	\
baslink	.dat	11	2-01-91	13:36	\prass1\valdata
cmnd	.lst	94	2-01-91	13:36	\prass1\valdata
logo	.pic	29184	2-01-91	13:36	\prass1\valdata
plot	.cfg	131	2-01-91	13:36	\prass1\valdata
prasmgr	.bas	40823	2-01-91	13:36	\prass1\valdata
prmsega	.dev	11497	2-01-91	13:36	\prass1\valdata
prmsega	.fnt	7168	2-01-91	13:36	\prass1\valdata
prmsmenu	.mnu	587	2-01-91	13:36	\prass1\valdata
ul	.dat	10	2-01-91	13:36	\prass1\valdata
uldate	.dat	10	2-01-91	13:36	\prass1\valdata
valdist	.dat	5083	2-01-91	13:36	\prass1\valdata
valprob	.dat	739	2-01-91	13:36	\prass1\valdata
valuai	.dat	11397	2-01-91	13:36	\prass1\valdata
valunit	.dat	4029	2-01-91	13:36	\prass1\valdata
cpsd	.exe	145522	2-01-91	13:36	\prass1\prog
edtest	.exe	22156	2-01-91	13:36	\prass1\prog
gpbplt	.exe	194336	2-01-91	13:36	\prass1\prog
gpcplt	.exe	189790	2-01-91	13:36	\prass1\prog
gpdseq	.exe	186048	2-01-91	13:36	\prass1\prog
gphplt	.exe	190708	2-01-91	13:36	\prass1\prog
gplplt	.exe	175724	2-01-91	13:36	\prass1\prog
gprplt	.exe	202850	2-01-91	13:36	\prass1\prog
gpxplt	.exe	192104	2-01-91	13:36	\prass1\prog
inmpro	.exe	103045	2-01-91	13:36	\prass1\prog
inpsdr	.exe	103045	2-01-91	13:36	\prass1\prog
inrvgn	.exe	103045	2-01-91	13:36	\prass1\prog
lpsd	.exe	149036	2-01-91	13:36	\prass1\prog
match	.exe	192716	2-01-91	13:36	\prass1\prog
menu	.exe	20855	2-01-91	13:36	\prass1\prog
mpro	.exe	111452	2-01-91	13:36	\prass1\prog
mpsd	.exe	129670	2-01-91	13:36	\prass1\prog
pdscv	.exe	131798	2-01-91	13:36	\prass1\prog
ppdr	.exe	143934	2-01-91	13:36	\prass1\prog
praslogo	.exe	48896	2-01-91	13:36	\prass1\prog
prass1	.exe	166674	2-01-91	13:36	\prass1\prog
prassys	.exe	26857	2-01-91	13:36	\prass1\prog
primes	.prm	20	2-01-91	13:36	\prass1\prog
prmsega	.dev	11497	2-01-91	13:36	\prass1\prog
prmsega	.fnt	7168	2-01-91	13:36	\prass1\prog
profile	.kex	441	2-01-91	13:36	\prass1\prog
psdr	.exe	108872	2-01-91	13:36	\prass1\prog
psrk	.exe	99396	2-01-91	13:36	\prass1\prog
psro	.exe	99846	2-01-91	13:36	\prass1\prog
psum	.exe	157644	2-01-91	13:36	\prass1\prog
root	.exe	38574	2-01-91	13:36	\prass1\prog
rprt	.exe	59092	2-01-91	13:36	\prass1\prog
rvgn	.exe	67000	2-01-91	13:36	\prass1\prog
stat	.exe	55308	2-01-91	13:36	\prass1\prog
tdate	.exe	6234	2-01-91	13:36	\prass1\prog

```
emr1     .lib      62235   2-01-91   13:36   \prass1\library
emr1     .src      86504   2-01-91   13:36   \prass1\library
emr2     .lib      77653   2-01-91   13:36   \prass1\library
emr2     .src     123462   2-01-91   13:36   \prass1\library
front    .lib     136617   2-01-91   13:36   \prass1\library
front    .src     101292   2-01-91   13:36   \prass1\library
plot88   .lib     305664   2-01-91   13:36   \prass1\library
readme   .doc       1358   2-01-91   13:36   \prass1\library

cpsd     .for      54848   2-01-91   13:36   \prass1\source\gut
gpsrk    .for      14575   2-01-91   13:36   \prass1\source\gut
lpsd     .for      61255   2-01-91   13:36   \prass1\source\gut
machlmt  .for       1166   2-01-91   13:36   \prass1\source\gut
match    .for     103713   2-01-91   13:36   \prass1\source\gut
mpro     .for      32186   2-01-91   13:36   \prass1\source\gut
mpro     .old      32358   2-01-91   13:36   \prass1\source\gut
mpsd     .for      40166   2-01-91   13:36   \prass1\source\gut
mpsd     .org      38966   2-01-91   13:36   \prass1\source\gut
ndscv    .for      74105   2-01-91   13:36   \prass1\source\gut
pdscv    .for     111956   2-01-91   13:36   \prass1\source\gut
ppd      .for      54404   2-01-91   13:36   \prass1\source\gut
ppdr     .for      40035   2-01-91   13:36   \prass1\source\gut
prass1   .for      13964   2-01-91   13:36   \prass1\source\gut
proot    .for       1373   2-01-91   13:36   \prass1\source\gut
psdr     .for      37820   2-01-91   13:36   \prass1\source\gut
psrk     .for      24868   2-01-91   13:36   \prass1\source\gut
psro     .for      25745   2-01-91   13:36   \prass1\source\gut
psum     .for      43475   2-01-91   13:36   \prass1\source\gut
root     .for       2719   2-01-91   13:36   \prass1\source\gut
rprt     .for      33169   2-01-91   13:36   \prass1\source\gut
rvgn     .for      18062   2-01-91   13:36   \prass1\source\gut
stat     .for       8482   2-01-91   13:36   \prass1\source\gut

gpbplt   .for      26529   2-01-91   13:36   \prass1\source\plot
gpcplt   .for      28577   2-01-91   13:36   \prass1\source\plot
gpdseq   .for      36071   2-01-91   13:36   \prass1\source\plot
gphplt   .for      40843   2-01-91   13:36   \prass1\source\plot
gplplt   .for      21645   2-01-91   13:36   \prass1\source\plot
gprplt   .for      41921   2-01-91   13:36   \prass1\source\plot
gpsplt   .for      32459   2-01-91   13:36   \prass1\source\plot
gpstem   .for      20747   2-01-91   13:36   \prass1\source\plot
gpxplt   .for      28889   2-01-91   13:36   \prass1\source\plot

edtest   .for       1107   2-01-91   13:36   \prass1\source\other
menu     .for        472   2-01-91   13:36   \prass1\source\other
praslogo.for        363   2-01-91   13:36   \prass1\source\other
prassys  .for       4313   2-01-91   13:36   \prass1\source\other
prmsega  .dev      11497   2-01-91   13:36   \prass1\source\other
prmsega  .fnt       7168   2-01-91   13:36   \prass1\source\other
prmslogo.exe       18694   2-01-91   13:36   \prass1\source\other
prmslogo.for        3071   2-01-91   13:36   \prass1\source\other
prmslogo.map        2549   2-01-91   13:36   \prass1\source\other
prmslogo.obj        3041   2-01-91   13:36   \prass1\source\other
prmssys  .for       4223   2-01-91   13:36   \prass1\source\other
readme   .doc        243   2-01-91   13:36   \prass1\source\other
tdate    .exe       6234   2-01-91   13:36   \prass1\source\other

f        .bat         40   2-01-91   13:36   \prass1\test
```

```
fix      .doc      2061   2-01-91  13:36   \prass1\test
get      .bat        33   2-01-91  13:36   \prass1\test
getp     .bat        34   2-01-91  13:36   \prass1\test
getprms  .bat        34   2-01-91  13:36   \prass1\test
gpcplt   .for     30473   2-01-91  13:36   \prass1\test
kil      .for      1545   2-01-91  13:36   \prass1\test
l        .bat        45   2-01-91  13:36   \prass1\test
llibfor7.lib    194635   2-01-91  13:36   \prass1\test
logo     .pcx     58837   2-01-91  13:36   \prass1\test
logo     .tif    130374   2-01-91  13:36   \prass1\test
prass    .doc      5533   2-01-91  13:36   \prass1\test
put      .bat        31   2-01-91  13:36   \prass1\test
replace  .bat        33   2-01-91  13:36   \prass1\test
replacep.bat         34   2-01-91  13:36   \prass1\test
replprms.bat         34   2-01-91  13:36   \prass1\test
view     .bas     44540   2-01-91  13:36   \prass1\test
```